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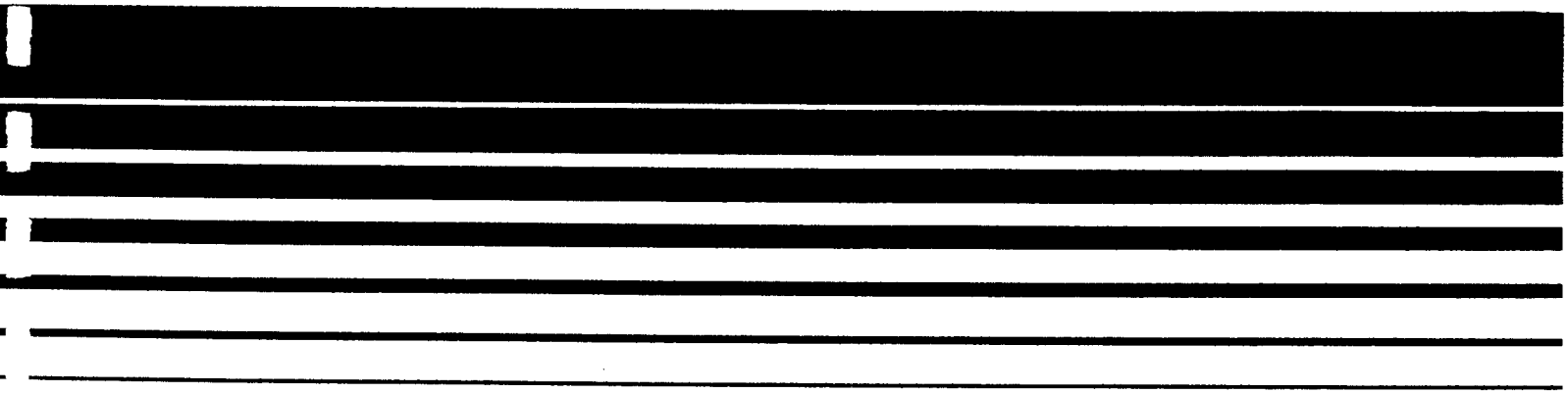

PE-R-474
V. 1

PROCESS EMISSION TESTS AT THE COLUMBIA NITROGEN CORPORATION AMMONIUM NITRATE PLANT IN AUGUSTA, GEORGIA DURING LOW DENSITY AMMONIUM NITRATE PRODUCTION

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Work Assignment 3
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PREFACE

The work herein was conducted by personnel from TRC-Environmental Consultants, Inc. (TRC), the Radian Corporation, Midwest Research Institute (MRI), Columbia Nitrogen Corporation (CNC) in Augusta, Georgia, and the U.S. Environmental Protection Agency (EPA).

The scope of the work, initially issued under EPA Contract No. 68-02-2820, Work Assignment No. 25, and completed under Contract No. 68-02-3543, Work Assignment 3, was under the supervision of the TRC Project Manager, Mr. Willard A. Wade III. Mr. Leigh A. Gammie of TRC served as Project Engineer and Mr. Eric A. Pearson was responsible for summarizing the test and analytical data in this report. Sample analyses were performed at the CNC Augusta, Georgia plant under the direction of Ms. Margaret Fox and at the TRC laboratory in Wethersfield, Connecticut under the direction of Mr. Samuel S. Cha.

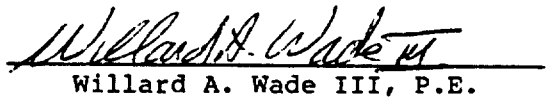
Radian personnel were responsible for monitoring the process operations during the testing program and for preparing Section 3.0 (Process Description and Operations) and Appendix P of this report. MRI personnel were responsible for performing the particle size tests and for summarizing the particle size data for incorporation into this report.

Personnel of the CNC Augusta, Georgia plant whose assistance and guidance contributed greatly to the success of the test program included Mr. Max Beal, Manager, Environmental Activities and Mr. Richard A. Lawson, Environmental Control Chemist.

Mr. Eric A. Noble, Office of Air Quality Planning and Standards, Industrial Studies Branch, EPA, served as Test Process Project Engineer and was responsible for coordinating the process operation monitoring.

Mr. Clyde E. Riley, Office of Air Quality Planning and Standards, Emission Measurement Branch, EPA, served as Technical Manager and was responsible for coordinating the emission test program.

TRC Environmental Consultants, Inc.



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1.0 INTRODUCTION

1.1 Background

Section 111 of the Clean Air Act of 1970 charges the Administrator of the U.S. Environmental Protection Agency (EPA) with the responsibility of establishing Federal standards of performance for new stationary sources which may significantly contribute to air pollution. When promulgated, these standards of performance for new stationary sources (SPNSS) are to reflect the degree of emission limitation achievable through application of the best demonstrated emission control technology. EPA utilizes emission data, obtained from controlled sources in the particular industry under consideration, as a partial basis for SPNSS.

EPA's Office of Air Quality Planning and Standards (OAQPS) selected the Columbia Nitrogen Corporation ammonium nitrate manufacturing plant in Augusta, Georgia as a site for an emission test program. This plant produces ammonium nitrate (AN) for industrial and fertilizer use, and is considered to employ process and emission control technology representative of high and low density AN prilling, drying, and cooling processes. The test program was designed to provide a portion of the emission data base required for SPNSS for the processes associated with AN production.

EPA engaged TRC to measure AN and ammonia concentrations, mass flowrates, and plume opacities at the prill tower, dryers, and fluidized-bed cooler. EPA engaged MRI to measure particle size distributions in gas streams at these same process units. All measurements made at this facility were performed during times of normal low density AN production process operation, as described in Section 3.0, Process Description and Operations.

1.2 Brief Process Description

Figure 1-1 presents a schematic of the low density ammonium nitrate prilling process. This process is described very basically as follows:

> The 96 percent AN melt is pumped from the solution formation process to the top of the prill tower where a spinning perforated bucket receives the melt. The melt is forced through orifices in the bucket and forms discrete droplets as it falls through the tower. A countercurrent of air, induced by fans at the top of the tower, cools the droplets which solidify as they fall. The solid prills are conveyed from the bottom of the tower to a rotary drum predryer and dryer for moisture removal, and then to a fluidized-bed cooler. The prills are then screened, coated with clay (to prevent caking), and then bagged or shipped in bulk.
>
> Emissions from the prill tower are controlled with a shroud that surrounds the spinning bucket and with a Monsanto HE Brinks mist eliminator. Emissions from the predryer and dryer are ducted to a common Peabody tray scrubber. One air stream through the cooler is ducted through a Ducon mechanical impingement scrubber; the other air stream is vented directly to the atmosphere. Emissions from the screening, coating, and bagging operations are controlled with baghouses.

1.3 Measurement Program

The measurement program was conducted at the Columbia Nitrogen Corporation urea and ammonium nitrate manufacturing facility in Augusta, Georgia during the week of August 10-16, 1980. The emission tests were designed to characterize and quantify uncontrolled and controlled emissions from the AN solids production process (prill tower, dryers, and cooler) and to determine control equipment efficiency.

TRC and MRI personnel were responsible for sampling and analyzing process emissions. Concurrently, Radian was responsible for monitoring pertinent process operation parameters. The chronology of the emission tests is contained in Appendix D. The components of the measuring program were as follows.

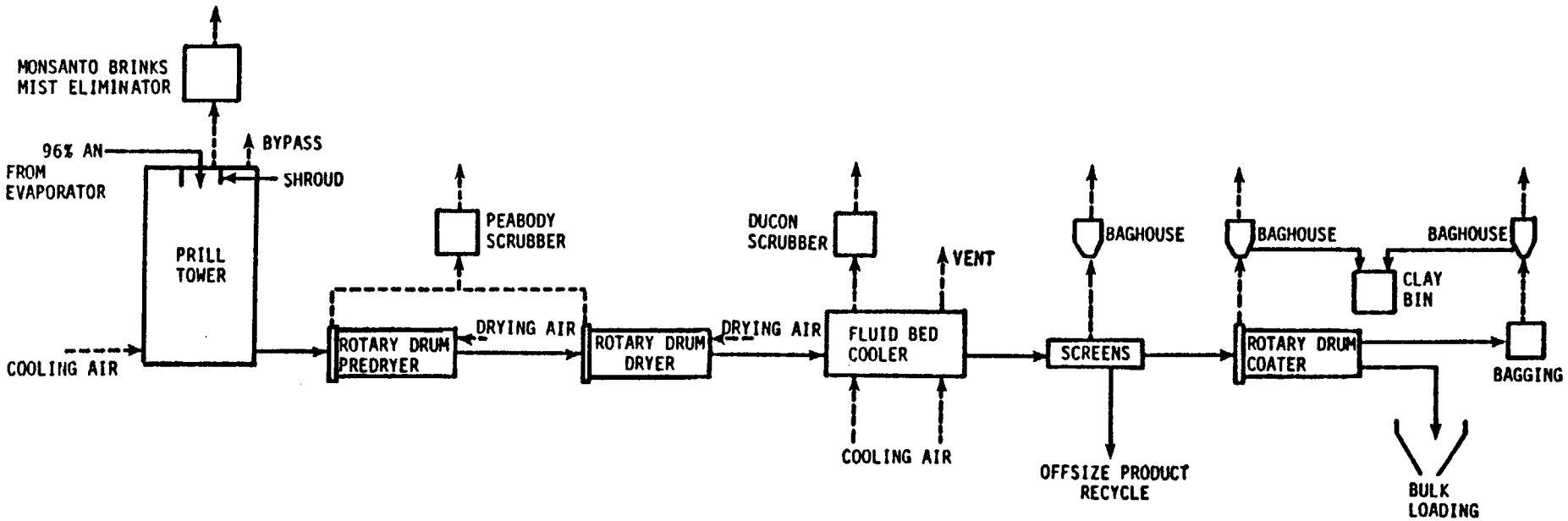


FIGURE 1-1: SCHEMATIC OF LOW DENSITY PRILLING PROCESS AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

1.3.1 Prill Tower

AN, Ammonia, and Insoluble Particulate Sampling in Gas Streams

One test run at each of the three scrubber inlets and bypasses was performed concurrently with test runs at the scrubber outlet. Insoluble particulate measurements were made on bypass and outlet samples only.

Particulate Size Distribution in Gas Streams

One test run at each of the three scrubber inlets and bypasses was performed.

Visible Emissions

The opacities of the bypass plumes and scrubber outlet plume were monitored during the AN emission tests.

Scrubber Liquor Sampling

Samples of the prill tower scrubber liquor were collected periodically during each AN emissions test run. These samples were subsequently analyzed for AN, ammonia, and undissolved solids.

Pressure Drop Across Scrubber

The gas pressure drop across the scrubber was measured periodically during each AN emissions test run.

Flowrates in Scrubber Inlets and Bypasses

During each emission test run, velocity traverses were performed in each of the bypasses and scrubber inlets not being tested for emissions. Flowrates were calculated from the velocity head and temperature data obtained during these velocity traverses.

1.3.2 Prill Dryers

AN, Ammonia, and Insoluble Particulate Sampling in Gas Streams

Three runs of concurrent emission tests were performed in the scrubber inlet from the predryer, the scrubber inlet from the dryer, and in the scrubber outlet. Insoluble particulate measurements were made on outlet samples only.

Particle Size Distribution

Three test runs were performed in both the scrubber inlet from the predryer and the scrubber inlet from the dryer.

Visible Emissions

The opacity of the scrubber outlet plume was monitored during the AN emission tests.

Scrubber Liquor

Samples of the predryer/dryer scrubber liquor were collected periodically during each AN emissions test run. The samples were subsequently analyzed for AN, ammonia, and undissolved solids.

1.3.3 Prill Cooler

AN, Ammonia, and Insoluble Particulate Sampling in Gas Streams

Three runs of concurrent tests were performed in the scrubber inlet and bypass. Insoluble particulate measurements were made on bypass samples only.

Particle Size Distribution

Three test runs were performed in both the scrubber inlet and the bypass.

Visible Emissons

The opacities of the scrubber outlet plume and the bypass plume were monitored during the AN emissions test runs.

1.3.4 Visible Emissions from Coating and Bagging Operations

The opacities of the plumes from the coater and bagging operations baghouses were monitored during the emissions testing program.

1.3.5 Ambient Air Measurements

Ambient air temperature and relative humidity measurements were taken periodically during all prill tower, dryer, and cooler AN emission test runs. Measurements were made in the immediate vicinity of the processes involved.

1.3.6 Cleanup Evaluations and Audit Samples

Before any emissions tests were begun, three sampling trains were assembled and charged as if ready to perform a test for AN and ammonia. The unexposed impinger contents were then recovered, prepared, and analyzed according to procedure in order to establish background/contamination levels of AN and ammonia from the sample collection equipment.

Ammonium nitrate standard solutions were prepared by EPA and were analyzed by TRC at the field laboratory in accordance with EPA instructions in order to assess the accuracy of the AN analysis procedure.

1.4 Description of Report Sections

The remaining sections of this report present the Summary of Results (Section 2.0), Process Description and Operations (Section 3.0), Location of Sampling Points (Section 4.0), and Sampling and Analytical Methods (Section 5.0). Descriptions of methods and procedures, field and laboratory data, and calculations are presented in the various appendices, as noted in the Table of Contents. Appendix N contains the results of audit sample analyses, and Appendix O contains the results of the clean-up evaluations performed on the sampling train equipment.

2.0 SUMMARY OF RESULTS

This section presents summary tables of results and narrative on the emission tests conducted during the week of August 10-16, 1980, at the Columbia Nitrogen Corporation ammonium nitrate (AN) manufacturing facility in Augusta, Georgia. Testing was performed on emissions from the prill tower, predryer/dryer and cooler during low density AN production.

AN concentrations were determined with a nitrate specific ion electrode (SIE) and ammonia concentrations were determined with an ammonia SIE. Both analysis methods are discussed in Section 5.0 and in Appendices L and M.

2.1 Prill Tower Emissions

A summary of the ammonium nitrate controlled and uncontrolled emissions from the prill tower is shown in Table 2-1. The average AN scrubber removal efficiency is 88.4 percent.

The results of the AN and insoluble particulate measurements at the prill tower scrubber inlets, bypasses, and scrubber outlet are shown separately in Tables 2-2, 2-3, and 2-4, respectively. Insoluble particulate analyses were performed on bypass and outlet samples only. As discussed in Section 5.4, the threshold of detection for the insoluble particulate analyses was estimated to be 3.0 mg. Samples containing less than 3.0 mg were therefore considered to contain no insoluble particulate. A rustor orange-colored particulate matter was noticed in the bypass and outlet samples of test run 1. The insoluble particulate measured in the outlet sample may be rust or scale from the scrubber piping, or clay coating material from the scrubber liquor. The nature of the insoluble particulate in the bypass sample is not known.

TABLE 2-1a (English Units)

SUMMARY OF CONTROLLED AND UNCONTROLLED AMMONIUM NITRATE (AN) EMISSIONS
FROM THE PRILL TOWER DURING LOW DENSITY AN PRODUCTION AT
COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

Run Number	Run 1		Run 2		Run 3		Average	
Date	8-12-80		8-12-80		8-13-80			
Description	Uncontrolled	Controlled	Uncontrolled	Controlled	Uncontrolled	Controlled	Uncontrolled	Controlled
SCRUBBER AN EMISSIONS[a]								
Grains/DSCF[b]	0.0159	0.00162	0.0229	0.00147	0.0239	0.00348	0.0209	0.00219
Pounds/Hour	6.436	0.708	9.329	0.667	9.468	1.549	8.418	0.975
Pounds/Ton	0.276	0.030	0.381	0.027	0.371	0.061	0.345	0.040
Collection Efficiency (percent)	89.1		92.9		83.6		88.4	
BYPASS AN EMISSIONS[c]								
Grains/DSCF	0.00455		0.00566		0.00665		0.00562	
Pounds/Hour	8.419		10.467		12.051		10.326	
Pounds/Ton	0.361		0.427		0.473		0.423	
TOTAL AN EMISSIONS[d]								
Grains/DSCF	0.00659	0.00399	0.00877	0.00483	0.00974	0.00603	0.00837	0.00495
Pounds/Hour	14.855	9.127	19.796	11.134	21.519	13.600	18.744	11.301
Pounds/Ton	0.637	0.391	0.808	0.454	0.844	0.534	0.768	0.463

[a]Scrubber Uncontrolled = Inlet totals from Table 2-2.
Scrubber Controlled = Outlet values from Table 2-4.
[b]Grains per Dry Standard Cubic Foot @ 68°F, 29.92 inches Hg.
[c]Bypass totals from Table 2-3.
[d]Total Uncontrolled = Scrubber uncontrolled + bypass. Grains/DSCF are weighted averages (weighted by total flowrates in Tables 2-2 and 2-3).
Total Controlled = Scrubber Controlled + bypass. Grains/DSCF are weighted averages (weighted by total flowrates in Tables 2-3 and 2-4).

NOTE: AN analysis by Specific Ion Electrode. This method measures nitrate (NO_3^-); AN(mg) = Nitrate (mg) x 80/62.

NOTE: Insoluble particulate results not included in this table. See Tables 2-3 and 2-4 for insoluble particulate data.

TABLE 2-1b (Metric Units)
SUMMARY OF CONTROLLED AND UNCONTROLLED AMMONIUM NITRATE (AN) EMISSIONS
FROM THE PRILL TOWER DURING LOW DENSITY AN PRODUCTION AT
COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

Run Number	Run 1		Run 2		Run 3		Average	
Date	8-12-80		8-12-80		8-13-80			
Description	Uncontrolled	Controlled	Uncontrolled	Controlled	Uncontrolled	Controlled	Uncontrolled	Controlled
SCRUBBER AN EMISSIONS[a]								
Grams/DNm^3*	0.0364	0.00371	0.0524	0.00336	0.0547	0.00796	0.0478	0.00501
Kg/Hour	2.92	0.321	4.23	0.303	4.29	0.703	3.82	0.442
Kg/Mg	0.138	0.015	0.191	0.014	0.186	0.031	0.173	0.020
Collection Efficiency (percent)	89.1		92.9		83.6		88.4	
BYPASS AN EMISSIONS[b]								
Grams/DNm^3	0.0104		0.0130		0.0152		0.0129	
Kg/Hour	3.82		4.75		5.47		4.68	
Kg/Mg	0.181		0.214		0.237		0.212	
TOTAL AN EMISSIONS[c]								
Grams/DNm^3	0.0151	0.0091	0.0201	0.0111	0.0223	0.0138	0.0192	0.0113
Kg/Hour	6.74	4.14	8.98	5.05	9.76	6.17	8.50	5.13
Kg/Mg	0.319	0.196	0.404	0.227	0.422	0.267	0.384	0.232

[a]Scrubber Uncontrolled = Inlet totals from Table 2-2.
Scrubber Controlled = Outlet values from Table 2-4.
[b]Bypass totals from Table 2-3.
[c]Total Uncontrolled = Scrubber Uncontrolled + bypass. Grams/DNm^3 are weighted averages (weighted by total flowrates in Tables 2-2 and 2-3).
Total Controlled = Scrubber controlled + bypass. Grams/DNm^3 are weighted averages (weighted by total flowrates in Tables 2-3 and 2-4).
*Grams per Dry Normal Cubic Meters @ 20°C, 760 mm Hg.

NOTE: AN analyses by Specific Ion Electrode. This method measures nitrate (NO_3^-); AN (mg) = Nitrate (mg) x 80/62.

NOTE: Insoluble particulate results not included in this table. See Tables 2-3 and 2-4 for insoluble particulate data.

TABLE 2-2

SUMMARY OF AMMONIUM NITRATE (AN) MEASUREMENTS ON GASES ENTERING THE PRILL TOWER SCRUBBER DURING LOW DENSITY AN PRODUCTION AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

Run Number	Run 1		Run 2		Run 3		Average	
Date	8-12-80		8-12-80		8-13-80			
Location	Inlet B	Total	Inlet A	Total	Inlet C	Total	Inlet	Total
Volume of Gas Sampled (DSCF)[a]	80.03		84.72		80.24		81.66	
Volumetric Flowrate (DSCFM)[b]	15300	47230[d]	16070	47530	15250	46220	15540	46990
Percent Moisture	2.82		2.94		3.28		3.01*	
Stack Temperature (°F)	126		128		120		125*	
Percent Isokinetic	99.9		100.7		100.5		100.4	
Production Rate (Tons/Hour)	23.3		24.5		25.5		24.4	
Ambient Air Temperature (°F)	90		95		85		90	
Ambient Relative Humidity (Percent)	57		45		68		57	
Pressure Drop (inches water)	1.6		1.0		1.0		1.2	
AMMONIUM NITRATE[c]								
Total Sample Weight (milligrams)	82.5		125.8		124.4		110.9	
Grains/DSCF	0.0159	0.0159	0.0229	0.0229	0.0239	0.0239	0.0209*	0.0209
Pounds/Hour	2.086	6.436	3.155	9.329	3.127	9.468	2.789	8.418
Pounds/Ton	0.090	0.276[f]	0.129	0.381	0.123	0.371	0.114	0.345

[a]Dry Standard Cubic Feet @ 68°F, 29.92 inches Hg.
[b]Dry Standard Cubic Feet per Minute.
[c]Specific Ion Electrode analysis method. This method measures nitrate (NO_3^-); AN (mg) = Nitrate (mg) x 80/62.
[d]Total Flowrate equals sum of flowrates actually measured in each inlet during each run. See Section 2.9.
[e]Total pounds per hour is calculated by assuming that the grain loading measured in one inlet existed in the other two inlets. This grain loading is then multiplied by the total flowrate.
[f]Total pounds per ton = (Total pounds per hour)/Production Rate.
*Weighted Averages (weighted by flowrate).

NOTE: Insoluble particulate measurements were not made on inlet samples.

TABLE 2-3

SUMMARY OF AMMONIUM NITRATE (AN) AND INSOLUBLE PARTICULATE MEASUREMENTS ON GASES IN THE PRILL TOWER BYPASSES DURING LOW DENSITY AN PRODUCTION AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

Run Number	Run 1		Run 2		Run 3		Average	
Date	8-12-80		8-12-80		8-13-80			
Location	Bypass B	Total	Bypass A	Total	Bypass C	Total	Bypass	Total
Volume of Gas Sampled (DSCF)[a]	113.2		110.7		107.9		110.6	
Volumetric Flowrate (DSCFM)[b]	79220	215860[d]	77360	215760	71930	211420	75500	214350
Percent Moisture	1.99		2.35		3.02		2.44*	
Stack Temperature (°F)	107		115		104		109*	
Percent Isokinetic	98.4		98.1		103.3		99.9	
Production Rate (Tons/Hour)	23.3		24.5		25.5		24.4	
Percent Opacity**	6.4		6.0		0.0		4.1	
Ambient Air Temperature (°F)	90		95		85		90	
Ambient Relative Humidity (Percent)	57		45		68		57	
AMMONIUM NITRATE[c]								
Total Sample Weight (milligrams)	33.4		40.6		46.4		40.1	
Grains/DSCF	0.00455	0.00455	0.00566	0.00566	0.00665	0.00665	0.00562*	0.00562
Pounds/Hour	3.091	8.419[e]	3.656	10.467	4.100	12.051	3.637	10.326
Pounds/Ton	0.133	0.361[f]	0.149	0.427	0.161	0.473	0.149	0.423
INSOLUBLE PARTICULATES								
Total Sample Weight (milligrams)	13.0		<3.0***		<3.0***		4.3	
Grains/DSCF	0.00177		0		0		0.00059	
Pounds/Hour	1.203	3.275	0		0		0.382	1.084
Pounds/Ton	0.052	0.141	0		0		0.016	0.044
TOTAL PARTICULATE: INSOLUBLE AND AN								
Total Sample Weight (milligrams)	46.4		40.6		46.4		44.4	
Grains/DSCF	0.00632		0.00566		0.00665		0.00621*	
Pounds/Hour	4.294	11.693	3.656	10.467	4.100	12.051	4.019	11.410
Pounds/Ton	0.184	0.502	0.149	0.427	0.161	0.473	0.165	0.468
Percent Insoluble Particulate Catch[g]	28.0		0		0		9.7	

[a] Dry Standard Cubic Feet @ 68°F, 29.92 inches Hg.
[b] Dry Standard Cubic Feet per minute.
[c] Specific Ion Electrode Analysis Method. This method measures nitrate (NO_3^-); AN (mg) = Nitrate (mg) x 80/62.
[d] Total flowrate equals sum of flowrates actually measured in each bypass during each run. See Section 2.9.
[e] Total pounds per hour is calculated by assuming that the grain loading measured in one bypass existed in the other two bypasses. This grain loading is then multiplied by the total flowrate.
[f] Total pounds per ton = (total pounds per hour)/Production rate.
[g] (Insoluble particulate/total particulate) x 100.
*Weighted averages (weighted by flowrate)
**Average of measurements made during each emission test run.
***Less than the detectable limit of the analysis.

TABLE 2-4

SUMMARY OF AMMONIUM NITRATE (AN) AND INSOLUBLE PARTICULATE MEASUREMENTS ON GASES EXITING THE PRILL TOWER SCRUBBER DURING LOW DENSITY AN PRODUCTION AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

Run Number	Run 1	Run 2	Run 3	Average
Date	8-12-80	8-12-80	8-13-80	
Location	Outlet	Outlet	Outlet	Outlet
Volume of Gas Sampled (DSCF)[a]	51.65	52.44	49.18	51.09
Volumetric Flowrate (DSCFM)[b]	51120	52910	51870	51970
Percent Moisture	6.66	3.38	4.35	4.80
Stack Temperature (^{O}F)	94	93	94	94
Percent Isokinetic	105.7	103.7	99.2	102.9
Production Rate (Tons/Hour)	23.3	24.5	25.5	24.4
Percent Opacity*	0	0	0	0
Ambient Air Temperature (^{O}F)	90	95	85	90
Ambient Relative Humidity (Percent)	57	45	68	57
AMMONIUM NITRATE[c]				
Total Sample Weight (milligrams)	5.4	5.0	11.1	7.2
Grains/DSCF	0.00162	0.00147	0.00348	0.00219
Pounds/Hour	0.708	0.667	1.549	0.975
Pounds/Ton	0.030	0.027	0.061	0.040
INSOLUBLE PARTICULATE				
Total Sample Weight (milligrams)	8.1	<3.0**	3.2	3.8
Grains/DSCF	0.00243	0	0.00100	0.00114
Pounds/Hour	1.062	0	0.446	0.503
Pounds/Ton	0.046	0	0.017	0.021
TOTAL PARTICULATE: INSOLUBLE AND AN				
Total Sample Weight (milligrams)	13.5	5.0	14.3	11.0
Grains/DSCF	0.00405	0.00147	0.00448	0.00333
Pounds/Hour	1.770	0.667	2.000	1.479
Pounds/Ton	0.076	0.027	0.078	0.061
Percent Insoluble Particulate Catch:[d]	60.0	0	22.4	27.5

[a]Dry Standard Cubic Feet @ 68°F, 29.92 inches Hg.
[b]Dry Standard Cubic Feet per minute.
[c]Specific Ion Electride analysis method. This method measures nitrate (NO_3); AN (mg) = Nitrate (mg) x 80/62.
[d](Insoluble particulate/total particulate) x 100.
*Average of measurements taken during each emission test run.
**Less than the detectable limit of the analysis.

NOTE: The amount of condensed water collected during Run 1 represented a calculated percent moisture (6.66%) slightly above saturation for the indicated stack temperature. The reason for this excessive amount of moisture is not known.

The results of the ammonia measurements at the prill tower scrubber inlets, bypasses, and scrubber outlet are shown in Tables 2-5, 2-6, and 2-7, respectively. The excess ammonia parameter is calculated by subtracting the ammonia that presumably originated as AN from the total measured ammonia. This calculation is based on the assumption that nitrate is the limiting species in the production synthesis of AN from ammonia and nitric acid. The results of this calculation indicate that 74 percent, 36 percent, and 92 percent of the total ammonia measured at the scrubber inlets, bypasses, and scrubber outlet, respectively, was excess ammonia.

During each test run, emissions were measured at one inlet and one bypass concurrently with measurements at the outlet. Velocity traverses were performed at the other two inlets and two bypasses during each test run in order to determine the flowrates through these ducts (as discussed in Section 2.9). With this flowrate information, estimates of emissions from all inlets and bypasses during each test run were made by assuming that the grain loading measured in a given inlet or bypass existed in the other two inlets or bypasses. The "total" columns in Tables 2-2, 2-3, 2-5, and 2-6 show these estimated emissions.

The effects of the shroud that surrounds the spinning bucket (from which the liquid AN droplets are ejected) are evident from a comparison of the total inlet and bypass data. The bypass average AN and ammonia grain loadings are 27 percent and 11 percent, respectively, of the inlet averages. These results are consistent with the fact that the scrubber inlets are within the shroud and the bypasses are outside the shroud. Since the total flowrate through the bypasses is more than 5 times the flowrate through the inlets, the total bypass AN mass flowrate is 35 percent more than that in the inlets, and the total bypass ammonia mass flowrate is only 45 percent less

TABLE 2-5

SUMMARY OF AMMONIA, CALCULATED AMMONIUM NITRATE (AN) AND CALCULATED EXCESS AMMONIA MEASUREMENTS ON GASES ENTERING THE PRILL TOWER SCRUBBER DURING LOW DENSITY AN PRODUCTION AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

Run Number	Run 1		Run 2		Run 3		Average	
Date	8-12-80		8-12-80		8-13-80			
Location	Inlet B	Total	Inlet A	Total	Inlet C	Total	Inlet	Total
Volume of Gas Sampled (DSCF)[a]	80.03		84.72		80.24		81.66	
Volumetric Flowrate (DSCFM)[b]	15300	47210[f]	16070	47530	15250	46220	15540	46990
Production Rate (Tons/Hour)	23.3		24.4		25.5		24.4	
AMMONIA[c]								
Total Sample Weight (milligrams)	95.2		99.2		80.1		91.5	
Grains/DSCF	0.0184	0.0184	0.0181	0.0181	0.0154	0.0154	0.0173*	0.0173
Pounds/Hour	2.407	7.287[g]	2.488	7.374	2.014	6.101	2.303	6.968
Pounds/Ton	0.103	0.313[h]	0.102	0.301	0.079	0.239	0.094	0.286
AN CALCULATED FROM AMMONIA[d]								
Total Sample Weight (milligrams)	448		467		377		431	
Grams/DSCF	0.0864	0.0064	0.0851	0.0851	0.0725	0.0725	0.0813*	0.0813
Pounds/Hour	11.33	34.98	11.71	34.67	9.48	28.72	10.84	32.75
Pounds/Ton	0.486	1.501	0.478	1.415	0.372	1.126	0.444	1.342
EXCESS AMMONIA[e]								
Total Sample Weight (milligrams)	77.7		72.5		53.7		67.9	
Grains/DSCF	0.0150	0.0150	0.0132	0.0132	0.0103	0.0103	0.0128*	0.0128
Pounds/Hour	1.965	6.072	1.819	5.378	1.350	4.081	1.709	5.155
Pounds/Ton	0.084	0.261	0.074	0.219	0.053	0.160	0.070	0.211

[a]Dry Standard Cubic Feet @ 68°F, 29.92 inches Hg.
[b]Dry Standard Cubic Feet per Minute.
[c]Specific Ion Electrode analysis method.
[d]Calculated from moles of measured ammonia. AN (mg) = Ammonia (mg) x 80/17.
[e]Excess Ammonia (mg) = measured ammonia (mg) - [measured AN (from Table 2-2) x 17/80].
[f]Total flowrate equals sum of flowrates actually measured in each inlet during each run. See Section 2.9.
[g]Total pounds per hour is calculated by assuming that the grain loading measured in one inlet existed in the other two inlets. This grain loading is then multiplied by the total flowrate.
[h]Total pounds per ton = (total pounds per hour)/Production Rate.
*Weighted averages (weighted by flowrate).

TABLE 2-6

SUMMARY OF AMMONIA, CALCULATED AMMONIUM NITRATE (AN) AND CALCULATED EXCESS AMMONIA MEASUREMENTS ON GASES ENTERING THE PRILL TOWER BYPASSES DURING LOW DENSITY AN PRODUCTION AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

Run Number	Run 1		Run 2		Run 3		Average	
Date	8-12-80		8-12-80		8-13-80			
Location	Bypass B	Total	Bypass A	Total	Bypass C	Total	Bypass	Total
Volume of Gas Sampled (DSCF)[a]	113.2		110.7		107.9		110.6	
Volumetric Flowrate (DSCFM)[b]	79220	215860[f]	75360	215760	71930	211420	75500	214350
Production Rate (Tons/Hour)	23.3		24.5		25.5		24.4	
AMMONIA[c]								
Total Sample Weight (milligrams)	12.2		13.3		14.4		13.3	
Grains/DSCF	0.00166	0.00166	0.00185	0.00185	0.00206	0.00206	0.00186*	0.00186
Pounds/Hour	1.13	3.07[g]	1.20	3.42	1.27	3.73	1.20	3.42
Pounds/Ton	0.048	0.132[h]	0.049	0.139	0.050	0.146	0.049	0.140
AN CALCULATED FROM AMMONIA[d]								
Total Sample Weight (milligrams)	57.4		62.6		67.8		62.6	
Grains/DSCF	0.00780	0.00780	0.00875	0.00875	0.00971	0.00971	0.00873*	0.00873
Pounds/Hour	5.29	14.43	5.65	16.18	5.99	17.60	5.65	16.04
Pounds/Ton	0.227	0.619	0.231	0.660	0.235	0.690	0.232	0.657
EXCESS AMMONIA[e]								
Total Sample Weight (milligrams)	5.1		4.7		4.5		4.8	
Grains/DSCF	0.00070	0.00070	0.00066	0.00066	0.00064	0.00064	0.00067*	0.00067
Pounds/Hour	0.472	1.30	0.424	1.22	0.397	1.16	0.433	1.23
Pounds/Ton	0.020	0.056	0.017	0.050	0.016	0.045	0.018	0.050

[a]Dry Standard Cubic Feet @ 68°F, 29.92 inches Hg.
[b]Dry Standard Cubic Feet per Minute.
[c]Specific Ion Electrode analysis method.
[d]Calculated from moles of measured ammonia. AN (mg) = Ammonia (mg) x 80/17.
[e]Excess Ammonia (mg) = measured ammonia (mg) - [measured AN (from Table 2-3) x 17/80].
[f]Total flowrate equals sum of flowrates actually measured in each bypass during each run. See Section 2.9.
[g]Total pounds per hour is calculated by assuming that the grain loading measured in one bypass existed in the other two bypasses. This grain loading is then multiplied by the total flowrate.
[h]Total pounds per ton = (total pounds per hour)/Production Rate.
*Weighted averages (weighted by flowrate).

TABLE 2-7

SUMMARY OF AMMONIA, CALCULATED AMMONIUM NITRATE (AN) AND CALCULATED EXCESS AMMONIA MEASUREMENTS ON GASES EXITING THE PRILL TOWER SCRUBBER DURING LOW DENSITY AN PRODUCTION AT COLUMBIA NITROGEN CORPORATION AUGUSTA, GEORGIA

Run Number	Run 1	Run 2	Run 3	Average
Date	8-12-80	8-12-80	8-13-80	
Location	Outlet	Outlet	Outlet	Outlet
Volume of Gas Sampled (DSCF)[a]	51.65	52.44	49.18	51.09
Volumetric Flowrate (DSCFM)[b]	51120	52910	51870	51970
Production Rate (Tons/Hour)	23.3	24.5	25.5	24.4
AMMONIA[c]				
Total Sample Weight (milligrams)	18.7	16.7	18.6	18.0
Grains/DSCF	0.00559	0.00491	0.00584	0.00544
Pounds/Hour	2.49	2.23	2.60	2.42
Pounds/Ton	0.107	0.091	0.102	0.099
AN CALCULATED FROM AMMONIA[d]				
Total Sample Weight (milligrams)	88.0	78.6	87.5	84.7
Grains/DSCF	0.0264	0.0232	0.0274	0.0256
Pounds/Hour	11.54	10.50	12.19	11.40
Pounds/Ton	0.495	0.429	0.478	0.467
EXCESS AMMONIA[e]				
Total Sample Weight (milligrams)	17.6	15.6	16.2	16.5
Grains/DSCF	0.00526	0.00459	0.00508	0.00498
Pounds/Hour	2.30	2.08	2.26	2.22
Pounds/Ton	0.099	0.085	0.089	0.091

[a]Dry Standard Cubic Feet @ 68°F, 29.92 inches Hg.
[b]Dry Standard Cubic Feet per Minute.
[c]Specific Ion Electrode analysis method.
[d]Calculated from moles of measured ammonia. AN (mg) = Ammonia (mg) x 80/17.
[e]Excess Ammonia (mg) = measured ammonia (mg) - [measured AN (from Table 2-4) x 17/80].

than that in the inlets. The lowest percent excess ammonia exists in the bypasses probably because the solidification of the liquid AN occurs primarily within the shroud. Ammonia given off in the solidification process is therefore primarily caught in the inlets. The high percent excess ammonia in the scrubber outlet may be due to gaseous (excess) ammonia not being scrubbed out and consequently making up a high percentage of measured ammonia.

2.2 Prill Predryer/Dryer Emissions

A summary of the ammonium nitrate measurements at the combined predryer/dryer scrubber inlet and scrubber outlet is shown in Table 2-8. The average AN removal efficiency is 99.5 percent.

The AN data for the individual predryer and dryer scrubber inlets are shown in Table 2-9, and the AN and insoluble particulate data for the scrubber outlet are shown in Table 2-10. Insoluble particulate measurements were made on the outlet samples only.

The ammonia measurements at the scrubber inlets and scrubber outlet are shown in Tables 2-11 and 2-12, respectively. The calculated percent excess ammonia is 3.4 percent, 6.0 percent, and 79.4 percent for the predryer inlet, dryer inlet and outlet, respectively. The relatively high percent excess ammonia at the outlet probably is due to gaseous (excess) ammonia not being scrubbed out and consequently making up a high percentage of measured ammonia in the outlet samples. The negative excess ammonia sample weight for the run 1 dryer inlet samples is probably a reflection of the low excess ammonia present in the dryer and of the inaccuracies inherent in the ammonia analysis method.

The high AN grain loading at the two scrubber inlet locations caused immediate nozzle and pitot tube plugging when the emission tests were begun

TABLE 2-8a (English Units)

SUMMARY OF AMMONIUM NITRATE (AN) MEASUREMENTS ON GASES ENTERING AND EXITING THE PRILL PREDRYER/DRYER SCRUBBER DURING LOW DENSITY AN PRODUCTION AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

Run Number	Run 1		Run 2		Run 3		Average	
Date	8-14-80		8-14-80		8-14-80			
Location	Inlets[d]	Outlet	Inlets	Outlet	Inlets	Outlet	Inlets	Outlet
Volume of Gas Sampled (DSCF)[a]	74.8	53.8	81.8	52.8	80.1	52.8	76.9	53.1
Volumetric Flowrate (DSCFM)[b]	72080	73980	73680	73100	72610	73120	72790	73330
Percent Moisture*	5.0	4.6	4.0	4.8	3.9	4.1	4.3	4.5
Stack Temperature (°F)*	149	108	147	108	148	110	148	109
Percent Isokinetic	83.6	102.3	89.2	101.3	88.1	100.8	87.0	101.5
Production Rate (Tons/Hour)	22.0		20.9		20.4		21.1	
Percent Opacity**		0		0		0.5		0.2
Ambient Air Temperature (°F)	92		95		92		93	
Ambient Relative Humidity (Percent)	56		46		53		52	
AMMONIUM NITRATE[c]								
Total Sample Weight (milligrams)	38240	151 48610	140	45320	159	44060	150	
Grains/DSCF*	8.50	0.0433	10.2	0.0409	9.74	0.0467	9.48	0.0436
Pounds/Hour	4823	27.4	6093	25.6	5675	29.3	5531	27.4
Pounds/Ton	219	1.25	291	1.22	278	1.44	262	1.30
Collection Efficiency (percent)	99.4		99.6		99.5		99.5	

[a]Dry Standard Cubic Feet @ 68°F, 29.92 inches Hg.
[b]Dry Standard Cubic Feet Per Minute.
[c]Specific Ion Electrode analysis method. This method measures nitrate (NO_3^-); AN (mg) = nitrate (mg) x 80/62.
[d]Combined predryer and dryer. Separate data are shown in Table 2-9.
*Inlet values are weighted averages (weighted by flowrates in Table 2-9).
**Average opacity as monitored during each run.

NOTE: Insoluble particulate results are not included in this table. See Table 2-10 for insoluble particulate data.

TABLE 2-8b (Metric Units)

SUMMARY OF AMMONIUM NITRATE (AN) MEASUREMENTS ON
GASES ENTERING AND EXITING THE PRILL PREDRYER/DRYER SCRUBBER
DURING LOW DENSITY AN PRODUCTION AT COLUMBIA NITROGEN CORPORATION,
AUGUSTA, GEORGIA

Run Number	Run 1		Run 2		Run 3		Average	
Date	8-14-80		8-14-80		8-14-80			
Location	Inlets[d]	Outlet	Inlets	Outlet	Inlets	Outlet	Inlets	Outlet
Volume of Gas Sampled (DNm^3)[a]	2.12	1.52	2.32	1.50	2.27	1.49	2.24	1.50
Volumetric Flowrate (DNm^3/min)[b]	2041	2095	2087	2070	2056	2071	2061	2077
Percent Moisture*	5.0	4.6	4.0	4.8	3.9	4.1	4.3	4.5
Stack Temperature (^oC)*	65	42	64	42	64	43	64	42
Percent Isokinetic	83.6	102.3	89.2	101.3	88.1	100.8	87.0	101.5
Production Rate (Mg/Hour)	20.0		19.0		18.5		19.1	
Percent Opacity**		0		0		0.5		0.2
Ambient Air Temperature (^oC)	33		35		33		34	
Ambient Relative Humidity (percent)	56		46		53		52	
AMMONIUM NITRATE[c]								
Total Sample Weight (milligrams)	38240	151	48610	140	45320	159	44060	150
Grams/DNm^3	19.4	0.0991	23.3	0.0936	22.3	0.107	21.7	0.0999
Kg/Hour	2188	12.4	2764	11.6	2574	13.3	2509	12.4
Kg/Mg	110	0.63	146	0.61	139	0.72	131	0.65
Collection Efficiency (percent)	99.4		99.6		99.5		99.5	

[a]Dry Normal Cubic Meters @ 20°C, 760 mm Hg.
[b]Dry Normal Cubic Meters per minute.
[c]Specific Ion Electrode analysis method. This method measures nitrate (NO_3^-); AN (mg) = NO_3(mg) x 80/62.
[d]Combined predryer and dryer. Seperate data are shown in Table 2-9.
*Inlet values are weighted averages (weighted by flowrates in Table 2-9).
**Average opacity as monitored during each run.

NOTE: Insoluble particulate results are not included in this table. See Table 2-10 for insoluble particulate data.

TABLE 2-9

SUMMARY OF AMMONIUM NITRATE (AN) MEASUREMENTS ON
GASES ENTERING THE PRILL PREDYRER/DRYER SCRUBBER DURING LOW DENSITY
AN PRODUCTION AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

Run Number	Run 1		Run 2		Run 3		Average	
Date	8-14-80		8-14-80		8-14-80			
Location	Predryer	Dryer	Predryer	Dryer	Predryer	Dryer	Predryer	Dryer
Volume of Gas Sampled (DSCF)[a]	45.4	29.4	50.8	31.0	50.7	29.4	50.0	29.9
Volumetric Flowrate (DSCFM)[b]	38330	33750	38680	35000	38720	33890	38580	34210
Percent Moisture	4.8	5.2	3.6	4.5	3.5	4.4	4.0	4.7
Stack Temperature (^{o}F)	151	146	151	142	151	144	151	144
Percent Isokinetic	83.9	83.3	93.4	84.9	93.1	83.0	90.1	83.7
Production Rate (tons/hour)	22.0		20.9		20.4		21.1	
AMMONIUM NITRATE[c]								
Total Sample Weight (milligrams)	13630	24610	16280	32330	16610	28710	15510	28550
Grains/DSCF	4.64	12.9	4.94	16.1	5.05	15.1	4.88	14.7
Pounds/Hour*	1402	3421	1639	4454	1677	3998	1573	3957
Pounds/Ton	63.7	156	78.4	213	82.2	196	74.5	188
TOTAL UNCONTROLLED AN EMISSIONS[d]								
Grains/DSCF**	8.50		10.2		9.74		9.48	
Pounds/Hour	4823		6093		5675		5531	
Pounds/Ton	219		291		278		262	

[a]Dry Standard Cubic Feet @ 68°F, 29.92 inches Hg.
[b]Dry Standard Cubic Feet per minute.
[c]Specific Ion Electrode analysis method. This method measures nitrate (NO_3^-); AN (mg) = nitrate (mg) x 80/62.
[d]Sum of predryer and dryer emissions.
*For runs with percent isokinetic less than 90%, mass flowrates (pounds/hour) presented here are averages of mass flowrates calculated by concentration method and area ratio method.
**Weighted averages (weighted by flowrate).

NOTE: Insoluble particulate analyses were not performed on inlet samples.

TABLE 2-10

SUMMARY OF AMMONIUM NITRATE (AN) AND INSOLUBLE PARTICULATE MEASUREMENTS ON GASES EXITING THE PRILL PREDRYER/DRYER SCRUBBER DURING LOW DENSITY AN PRODUCTION AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

Run Number	Run 1	Run 2	Run 3	Average
Date	8-14-80	8-14-80	8-14-80	
Location	Outlet	Outlet	Outlet	Outlet
Volume of Gas Sampled (DSCF)[a]	53.8	52.8	52.6	53.1
Volumetric Flowrate (DSCFM)[b]	73980	73100	73120	73400
Percent Moisture	4.6	4.8	4.1	4.5
Stack Temperature (^{o}F)	108	108	110	109
Percent Isokinetic	102.3	101.3	100.8	101.5
Production Rate (tons/hour)	22.0	20.9	20.4	21.1
Percent Opacity*	0	0	0.5	0.2
Ambient Air Temperature (^{o}F)	92	95	92	93
Ambient Relative Humidity (percent)	56	46	54	52
AMMONIUM NITRATE[c]				
Total Sample Weight (milligrams)	151	140	159	150
Grains/DSCF	0.0433	0.0409	0.0467	0.0436
Pounds/Hour	27.4	25.6	29.3	27.4
Pounds/Ton	1.25	1.22	1.44	1.30
INSOLUBLE PARTICULATE				
Total Sample Weight (milligrams)	<3.0**	4.6	<3.0**	1.5
Grains/DSCF	0	0.00134	0	0.000447
Pounds/Hour	0	0.842	0	0.281
Pounds/Ton	0	0.040	0	0.013
TOTAL PARTICULATE: INSOLUBLE AND AN				
Total Sample Weight (milligrams)	151	145	159	152
Grains/DSCF	0.0433	0.0422	0.0467	0.0441
Pounds/Hour	27.4	26.5	29.3	27.7
Pounds/Ton	1.25	1.26	1.44	1.31
Percent Insoluble Particulate Catch[d]	0	3.3	0	1.1

[a]Dry Standard Cubic Feet @ 68°F, 29.92 inches Hg.
[b]Dry Standard Cubic Feet per minute.
[c]Specific Ion Electrode analysis method. This method measures nitrate (NO_3); AN (mg) = nitrate (mg) x 80/62.
[d](Insoluble Particulate/Total Particulate) x 100.
*Average opacity as monitored during each run.
**Less than the detectable limit of the analysis.

TABLE 2-11

SUMMARY OF AMMONIA, CALCULATED AMMONIUM NITRATE (AN) AND CALCULATED EXCESS AMMONIA MEASUREMENTS ON GASES ENTERING THE PRILL PREDRYER/DRYER SCRUBBER DURING LOW DENSITY AN PRODUCTION AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

Run Number	Run 1		Run 2		Run 3		Average	
Date	8-14-80		8-14-80		8-14-80			
Location	Predryer	Dryer	Predryer	Dryer	Predryer	Dryer	Predryer	Dryer
Volume of Gas Sampled (DSCF)[a]	45.4	29.4	50.8	31.0	50.7	29.4	50.0	29.9
Volumetric Flowrate (DSCFm)[b]	38330	33750	38680	35000	38720	33890	38580	34210
Percent Isokinetic	83.9	83.3	93.4	84.9	93.1	83.0	90.1	83.7
Production Rate (tons/hour)	22.0		20.9		20.4		21.1	
AMMONIA[c]								
Total Sample Weight (milligrams)	2950	5101	3667	7116	3621	7012	3413	6410
Grains/DSCF	1.00	2.68	1.11	3.54	1.10	3.68	1.07	3.30
Pounds/Hour*	304	709	369	979	366	976	346	889
Pounds/Ton	13.8	32.2	17.7	46.8	17.9	47.8	16.4	42.1
AN CALCULATED FROM AMMONIA[d]								
Total Sample Weight (milligrams)	13880	24000	17260	33490	17040	33000	16060	30160
Grains/DSCF	4.72	12.6	5.24	16.7	5.18	17.3	5.05	15.5
Pounds/Hour*	1428	3336	1737	4611	1720	4595	1628	4180
Pounds/Ton	64.9	152	83.1	221	84.3	225	77.2	198
EXCESS AMMONIA[c]								
Total Sample Weight (milligrams)	53.6	-129	208	246	91.4	911	118	386**
Grains/DSCF	0.0140		0.0603	0.119	0.0269	0.471	0.0337	0.196**
Pounds/Hour*	5.57		20.9	34.1	9.14	127	11.9	53.7**
Pounds/Ton	0.253		1.00	1.63	0.448	6.23	0.564	2.55

[a]Dry Standard Cubic Feet @ 68°F, 29.92 inches Hg.
[b]Dry Standard Cubic Feet per minute.
[c]Specific Ion Electrode analysis method.
[d]Calculated from moles of measured ammonia. AN(mg) = ammonia (mg) x 80/17.
[e]Excess Ammonia (mg) = measured ammonia (mg) - [measured AN (from Table 2-9) x 17/80].
*For runs with percent isokinetic less than 90%, mass flowrates (pounds/hour) presented here are averages of mass flowrates calculated by concentration method and area ratio method.
**Average calculated by assuming Run 1 values are zero.

TABLE 2-12

SUMMARY OF AMMONIA, CALCULATED AMMONIA NITRATE (AN) AND CALCULATED EXCESS AMMONIA MEASUREMENTS ON GASES EXITING THE PRILL PREDRYER/DRYER SCRUBBER DURING LOW DENSITY AN PRODUCTION AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

Run Number Date Location	Run 1 8-14-80 Outlet	Run 2 8-14-80 Outlet	Run 3 8-14-80 Outlet	Average Outlet
Volume of Gas Sampled (DSCF)[a]	53.8	52.8	52.6	53.1
Volumetric Flowrate (DSCFM)[b]	73980	73100	73120	73400
Percent Isokinetic	102.3	101.3	100.8	101.5
Production Rate (tons/hour)	22.0	20.9	20.4	21.1
AMMONIA[c]				
Total Sample Weight (milligrams)	139	190	133	154
Grains/DSCF	0.0397	0.0556	0.0391	0.0448
Pounds/Hour	25.1	34.9	24.5	28.2
Pounds/Ton	1.14	1.67	1.20	1.34
AN CALCULATED FROM AMMONIA[d]				
Total Sample Weight (milligrams)	653	898	626	726
Grains/DSCF	0.187	0.262	0.184	0.211
Pounds/Hour	118	164	115	132
Pounds/Ton	5.36	7.85	5.64	6.26
EXCESS AMMONIA[e]				
Total Sample Weight (milligrams)	107	161	99	122
Grains/DSCF	0.0305	0.0469	0.0292	0.0355
Pounds/Hour	19.3	29.5	18.3	22.4
Pounds/Ton	0.877	1.41	0.897	1.06

[a]Dry Standard Cubic Feet @ 68°F, 29.92 inches Hg.
[b]Dry Standard Cubic Feet per minute.
[c]Specific Ion Electrode analysis method.
[d]Calculated from moles of measured ammonia. AN(mg) = ammonia (mg) x 80/17.
[e]Excess Ammonia (mg) = measured ammonia (mg) - [measured AN from Table 2-10 x 17/80].

at these locations. Larger diameter nozzles were then attached to the probes and plugging problems were greatly reduced. However, the sampling train pumps were unable to draw a sufficient flow through these larger nozzles to maintain isokinetic sampling conditions. The first predryer run, and all three dryer runs have isokinetics below 90 percent. In order to compensate for the high bias introduced into the normal mass flowrate calculations due to the subisokinetic sampling conditions, a second method was also used to calculate mass flowrates for these runs. An average of the mass flowrates calculated by these two methods is presented in Tables 2-9 and 2-11.

The method normally used to calculate mass flowrates is the concentration method, whereby the calculated grain loading (sample weight divided by sampled gas volume) multiplied by the flowrate equals mass flowrate. The second mass flowrate calculation method is the area ratio method, whereby the sample weight is divided by the sampling time and then multiplied by the ratio of the stack area to nozzle area. For subisokinetic sampling, the concentration method will overestimate mass flowrate and the area ratio method will underestimate mass flowrate. Therefore an average of the mass flowrates calculated by the two methods is used as a best estimate of the true mass flowrates. The mass flowrates calculated by both methods for the first predryer run and all three dryer runs are shown in Tables 2-13a and 2-13b, respectively. These two mass flowrate calculation methods are discussed further in Section 5.2.1.2.

2.3 Prill Cooler Emissions

The results of the AN measurements at the prill cooler scrubber inlet and bypass are shown in Table 2-14. The insoluble particulate analysis results for the bypass samples were below the threshold of detection (less than 3.0 mg) and are therefore not included with the AN particulate results.

TABLE 2-13a

COMPARISON OF PREDRYER INLET RUN 1
MASS FLOWRATE CALCULATIONS
AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

	Run 1 Mass Flowrate* (% I = 83.9)		
	Concentration Method	Area Ratio Method	Average
AN	1524	1280	1402
NH_3	330	277	304
AN (NH_3)	1552	1304	1428
Excess NH_3	6.09	5.04	5.57

Average Of All Three Runs - Mass Flowrate* (%I = 90.1)

	Concentration Method	Area Ratio Method	Average
AN	1613	1532	1573
NH_3	355	337	346
AN (NH_3)	1670	1587	1629
Excess NH_3	12.0	11.7	11.9

*Pounds per hour

TABLE 2-13b

COMPARISON OF DRYER INLET MASS FLOWRATE CALCULATIONS
AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

	Run 1 Mass Flowrate* (%I = 83.3)			Run 2 Mass Flowrate* (%I = 84.9)		
	Concentration Method	Area Ratio Method	Average	Concentration Method	Area Ratio Method	Average
AN	3736	3105	3421	4830	4078	4454
NH_3	774	643	709	1062	898	979
AN (NH_3)	3643	3028	3336	4996	4225	4611
Excess NH_3	--	--	--	37.2	31.0	34.1

	Run 3 Mass Flowrate* (%I = 83.0)			All Runs-Mass Flowrate* (%I = 83.7)		
	Concentration Method	Area Ratio Method	Average	Concentration Method	Area Ratio Method	Average
AN	4373	3622	3998	4313	3602	3957
NH_3	1068	885	976	968	809	889
AN (NH_3)	5027	4163	4595	4555	3805	4180
Excess NH_3	139	115	127	58.7	48.7	53.7

*Pounds per hour

TABLE 2-14

SUMMARY OF AMMONIUM NITRATE (AN) MEASUREMENTS ON GASES IN THE PRILL COOLER SCRUBBER INLET AND BYPASS DURING LOW DENSITY AN PRODUCTION AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

Run Number	Run 1		Run 2		Run 3		Average	
Date	8-15-80		8-15-80		8-16-80			
Location	Inlet	Bypass	Inlet	Bypass	Inlet	Bypass	Inlet	Bypass
Volume of Gas Sampled (DSCF)[a]	94.98	71.87	94.47	58.27	94.38	69.66	94.61	66.60
Volumetric Flowrate (DSCFM)[b]	40970	20110	40450	19000	40350	19190	40590	19430
Percent Moisture	3.18	2.63	3.20	2.58	3.67	2.75	3.35	2.65
Stack Temperature (^{o}F)	126	113	129	114	127	115	127	114
Percent Isokinetic	99.7	101.5	100.4	102.2	100.6	103.2	100.2	102.3
Production Rate (Tons/Hour)	21.0	21.0	20.9[e]	20.4	22.4	22.4	21.4	21.3
Percent Opacity		**		0.0		0.0		0.0
Ambient Air Temperature (^{o}F)	88		90		83		87	
Ambient Relative Humidity (percent)	67		62		77		69	
AMMONIUM NITRATE[c]								
Total Sample Weight (milligrams)	34264	356	23736	328	26035	367	28132	350
Grains/DSCF	5.63	0.0764	3.88	0.1011	4.26	0.0813	4.59	0.0811
Pounds/Hour	1975	13.2	1344	16.4	1472	13.4	1596	13.5
Pounds/Ton	94.0	0.63	64.3	0.80	65.7	0.60	74.6	0.63
TOTAL UNCONTROLLED AN EMISSIONS[d]								
Grains/DSCF*	3.80		2.67		2.91		3.13	
Pounds/Hour	1988		1360		1485		1610	
Pounds/Ton	94.6		65.1		66.3		75.2	

[a]Dry Standard Cubic Feet @ 68°F, 29.92 inches Hg.
[b]Dry Standard Cubic Feet per Minute.
[c]Specific Ion Electrode analysis method. This method measures nitrate (NO_3^-); AN (mg) = Nitrate (mg) x 80/62.
[d]Combined inlet and bypass.
[e]Weighted average (weighted by time). This run was performed over two days because of process equipment breakdown.
*Weighted average (weighted by flowrate).
**Plume opacity not monitored during this run.

NOTE: Insoluble particulate analyses on bypass samples were all less than the limit of detection (less than 3.0 mg).

The results of the ammonia measurements are shown in Table 2-15. The results of the excess ammonia calculations indicate that very little excess ammonia exists in the prill cooler. The average percent excess ammonia at the scrubber inlet and bypass is 2.0 percent, and 3.5 percent, respectively. The negative excess ammonia values for runs 2 and 3 are relatively small and are probably artifacts of the inaccuracies inherent in the ammonia analyses and in the excess ammonia calculation.

The cooler scrubber inlet run 2 was actually performed over 2 days. All but one traverse was completed by late afternoon on August 15, 1980, at which time the prill bucket elevator broke down. This run was completed early on August 16, 1980, prior to run 3. Additional discussion is presented in Section 5.2.1.3.

2.4 Particle Size Tests

The sampling parameters and results for the particule size tests performed at the prill cooler uncontrolled outlet (bypass) are shown in Table 2-16a and Figures 2-1 and 2-2. The results for the prill cooler scrubber inlet tests are shown in Table 2-16b and Figures 2-3 and 2-4.

The sampling parameters and results for the tests performed at the three prill tower scrubber inlets are shown in Table 2-17 and Figures 2-5 and 2-6. The results for the tests performed at the three prill tower bypasses are shown in Table 2-18 and Figures 2-7 and 2-8.

The sampling parameters and results for the tests performed at the dryer scrubber inlet are shown in Table 2-19 and Figures 2-9 and 2-10. The results of the tests performed at the predryer scrubber inlet are shown in Table 2-20 and Figures 2-11 and 2-12.

TABLE 2-15

SUMMARY OF AMMONIA, CALCULATED AMMONIUM NITRATE (AN) AND CALCULATED EXCESS AMMONIA MEASUREMENTS ON GASES IN THE PRILL COOLER SCRUBBER INLET AND BYPASS DURING LOW DENSITY AN PRODUCTION AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

Run Number	Run 1		Run 2		Run 3		Average	
Date	8-15-80		8-15-80		8-16-80			
Location	Inlet	Bypass	Inlet	Bypass	Inlet	Bypass	Inlet	Bypass
Volume of Gas Sampled (DSCF)[a]	94.98	71.87	94.47	58.27	94.38	69.66	94.61	66.60
Volumetric Flowrate (DSCFM)[b]	40970	20110	40450	19000	40350	19190	40590	19430
Production Rate (Tons/Hour)	21.0	21.0	20.9**	20.4	22.4	22.4	21.4	21.3
AMMONIA[c]								
Total Sample Weight (milligrams)	8006	81.2	4992	73.2	5294	76.8	6097	77.1
Grains/DSCF	1.301	0.0174	0.815	0.0194	0.866	0.0170	0.994	0.0179
Pounds/Hour	457	3.01	283	3.16	299	2.80	346	2.98
Pounds/Ton	21.8	0.143	13.5	0.155	13.3	0.125	16.2	0.140
AN CALCULATED FROM AMMONIA[d]								
Total Sample Weight (milligrams)	37677	382	23492	344	24915	361	28695	362
Grains/DSCF	6.12	0.0820	3.84	0.0911	4.07	0.0800	4.68	0.0839
Pounds/Hour	2149	14.1	1330	14.8	1409	13.2	1628	14.0
Pounds/Ton	102	0.671	63.6	0.725	62.9	0.589	76.1	0.657
EXCESS AMMONIA[e]								
Total Sample Weight (milligrams)	648	5.6	-52	3.5	-238	-1.2	216*	2.7
Grains/DSCF	0.105	0.00120		0.00057			0.0350*	0.00059*
Pounds/Hour	37.0	0.207		0.093			12.3*	0.100*
Pounds/Ton	1.76	0.010		0.005			0.575*	0.005*

[a]Dry Standard Cubic Feet @ 68°F, 29.92 inches Hg.
[b]Dry Standard Cubic Feet per Minute.
[c]Specific Ion Electrode analysis method.
[d]Calculated from moles of measured ammonia. AN (mg) = Ammonia (mg) x 80/17.
[e]Excess Ammonia (mg) = measured ammonia (mg) - [measured AN (from Table 2-13) x 17/80].
*Averages calculated by assuming negative numbers are zero.
** Weighted average (weighted by time). This run was performed over two days because of process equipment breakdown.

TABLE 2-16a

PARTICLE SIZE RESULTS AT THE PRILL COOLER UNCONTROLLED OUTLET (BYPASS)
AT COLUMBIA NITROGEN CORPORATION
AUGUSTA, GEORGIA

Run No./ Stage	Test Date	Particle Concentration[a]	Aerodynamic Size (microns)	Mass in Size Range[b]	Cumulative (%)
1/0	8-12-80	0.036	>9.95	85.06	85.06
1			9.95-5.52	7.81	92.87
Cyclone			5.52-1.21	3.25	96.12
Impinger[c]			<1.21	3.88	100.00
2/0	8-12-80	0.024	>9.64	82.41	82.41
1			9.64-5.28	11.15	93.56
Cyclone			5.28-1.12	2.46	96.02
Impinger			<1.12	3.98	100.00
3/0	8-13-80	0.062	>9.61	90.59	90.59
1			9.61-5.26	6.42	97.01
Cyclone			5.26-1.11	1.59	98.60
Impinger			<1.11	1.40	100.00

a Grains/dry standard cubic foot

b Percent including impinger train catch

c Impinger train catch

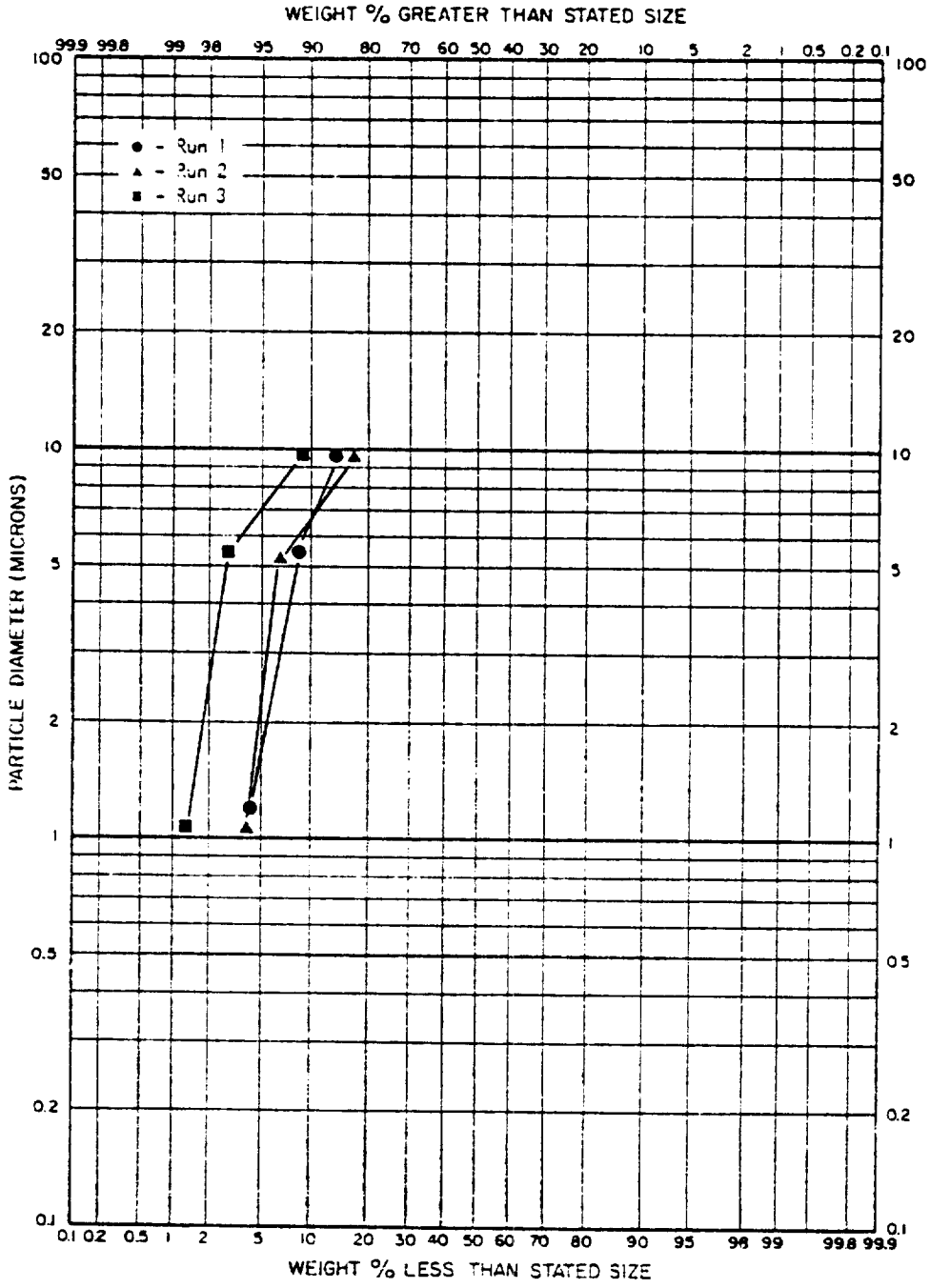


Figure 2-1: HCSS particle size results: particle size versus percent weight less/greater than stated size - prill cooler uncontrolled outlet.

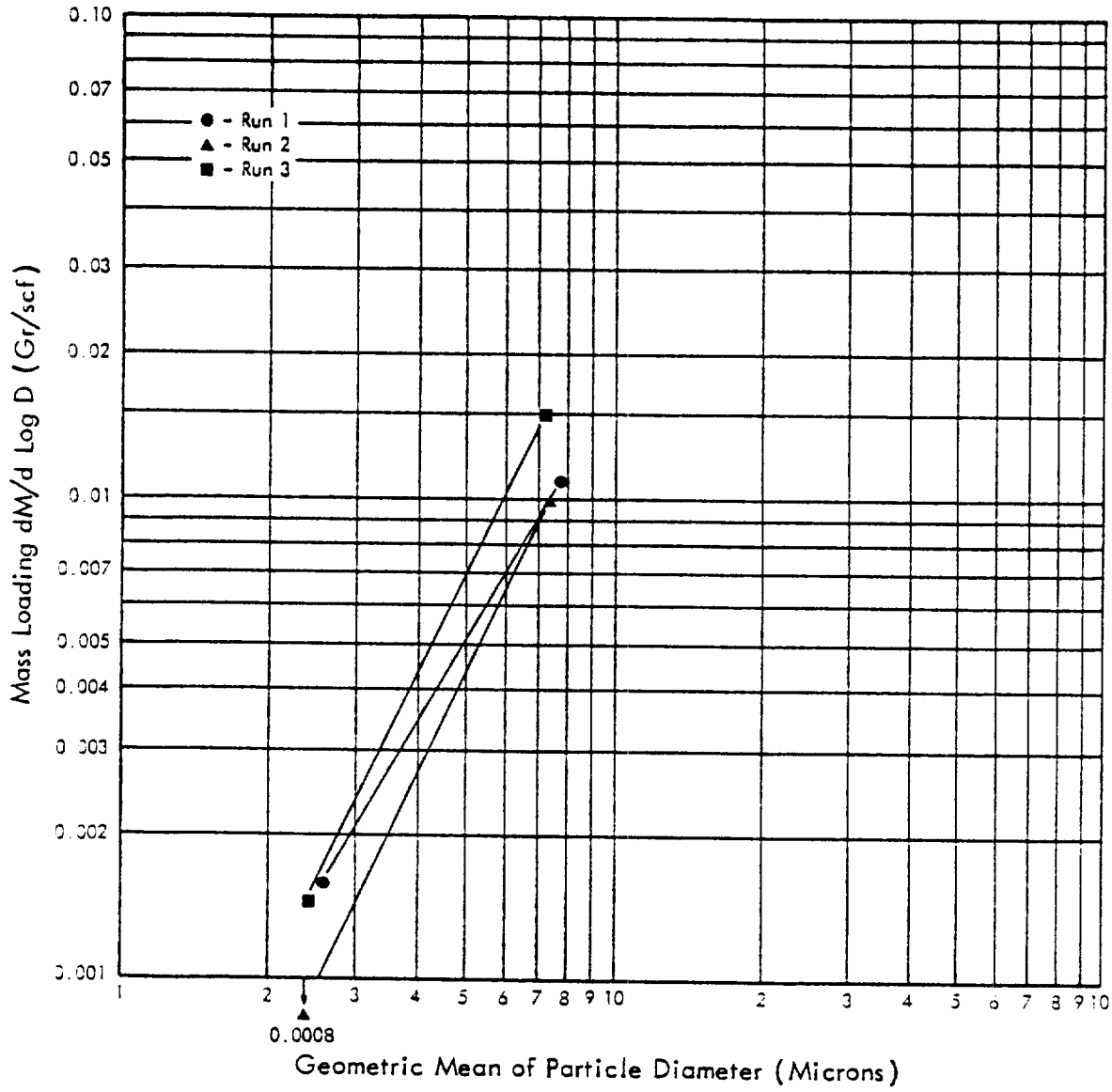


Figure 2-2: HCSS impactor particle size results: differential mass loading (dM/d log D) versus particle diameter - prill cooler uncontrolled outlet.

TABLE 2-16b

PARTICLE SIZE RESULTS AT THE PRILL COOLER SCRUBBER INLET
AT COLUMBIA NITROGEN CORPORATION
AUGUSTA, GEORGIA

Run No./ Stage	Test Date	Particle Concentration[a]	Aerodynamic Size (microns)	Mass in Size Range[b]	Cumulative (%)
1/0	8-13-80	4.147	>9.49	92.07	92.07
1			9.49-5.17	7.86	99.93
Cyclone			5.17-1.10	0.06	99.99
Impinger[c]			<1.10	0.01	100.00
2/0	8-13-80	3.627	>9.50	96.07	96.07
1			9.50-5.17	3.87	99.94
Cyclone			5.17-1.10	0.05	99.99
Impinger			<1.10	0.01	100.00
3/0	8-13-80	4.027	>9.52	92.92	92.92
1			9.52-5.18	6.96	99.88
Cyclone			5.18-1.10	0.07	99.95
Impinger			<1.10	0.05	100.00

a Grains/dry standard cubic foot

b Percent including impinger train catch

c Impinger train catch

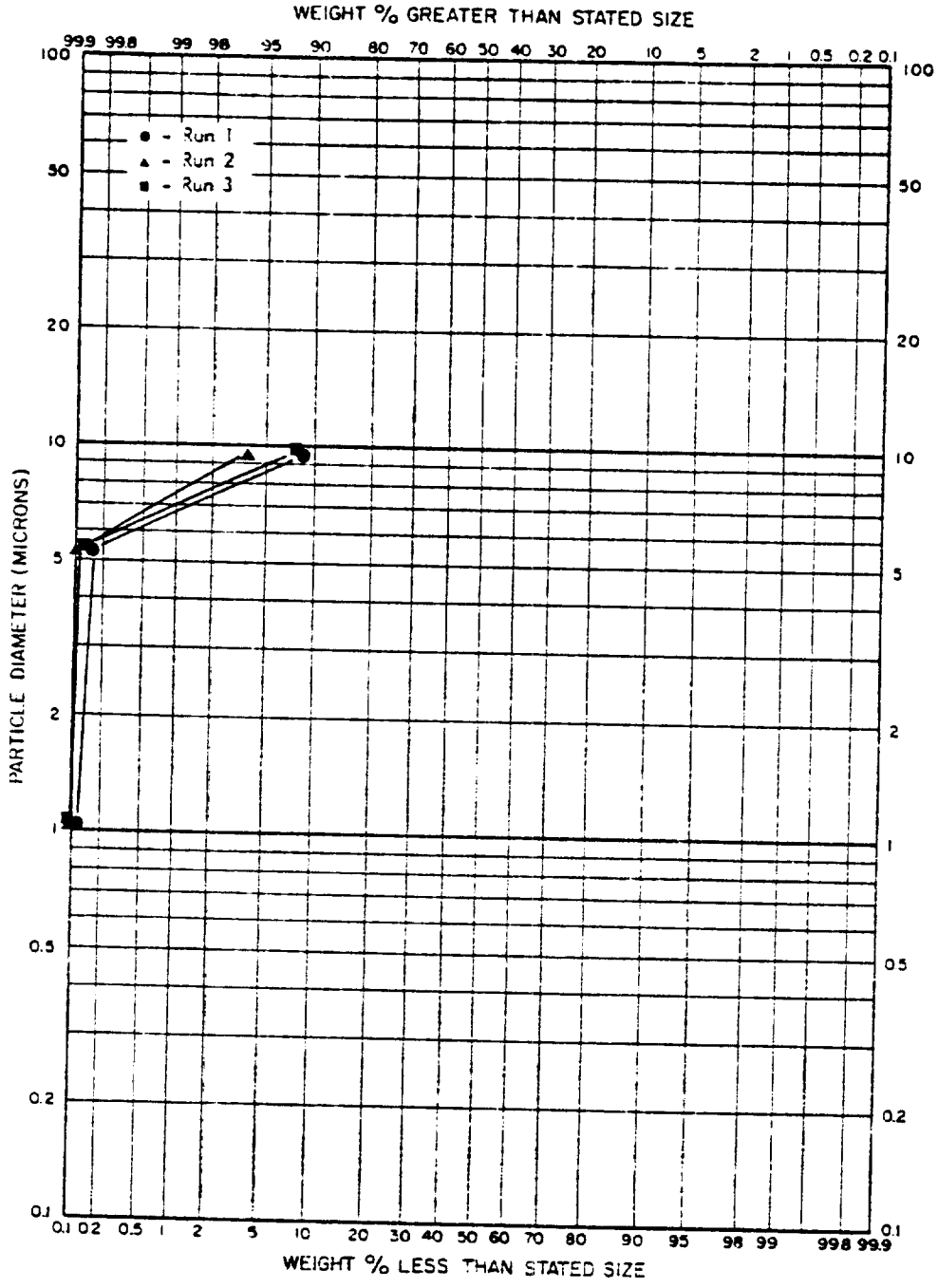


Figure 2-3: HCSS impactor particle size results: particle size versus percent weight less/greater than stated size - prill cooler scrubber inlet.

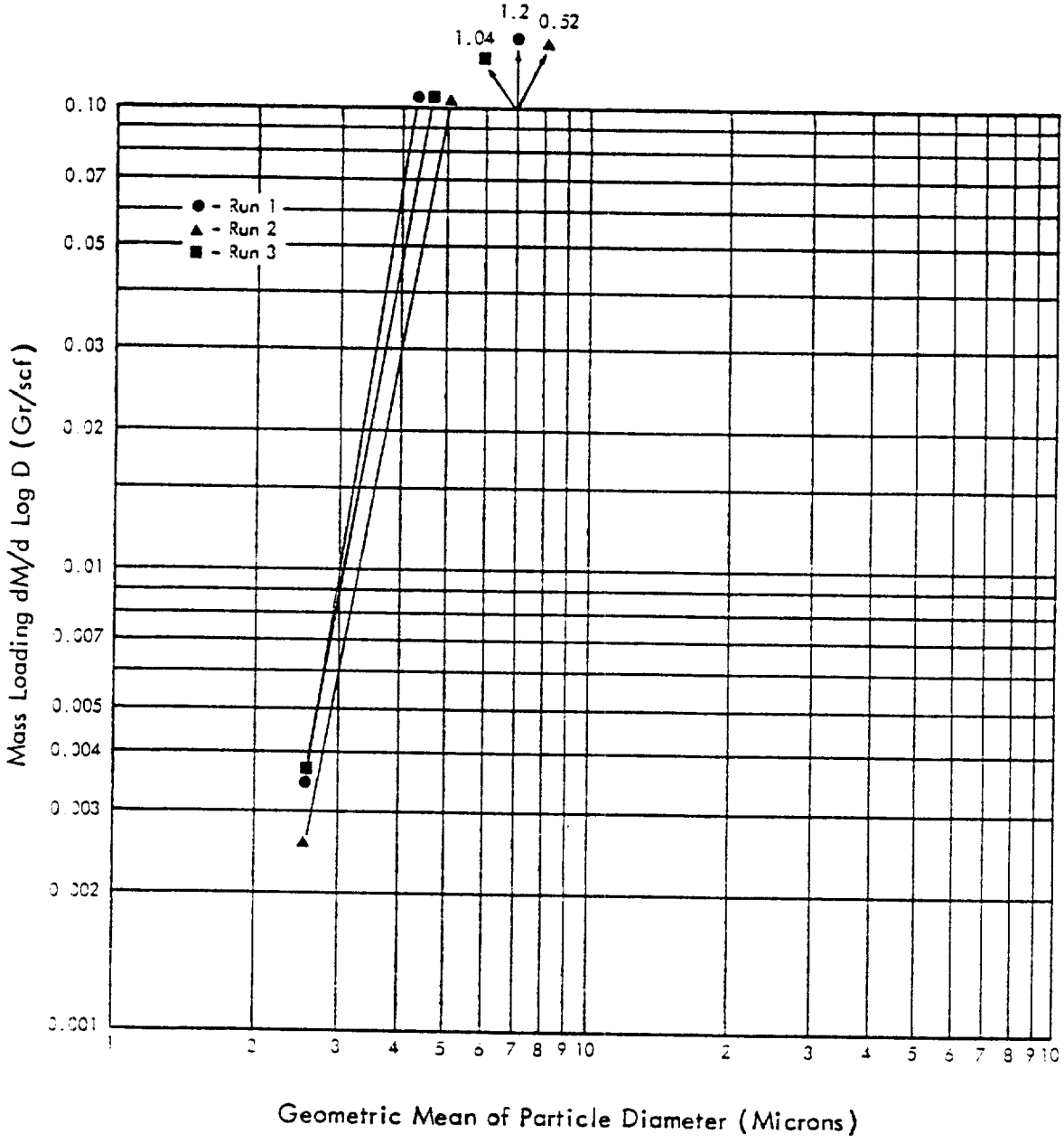


Figure 2-4: HCSS impactor particle size results: differential mass loading (dM/d log D) versus particle diameter - prill cooler scrubber inlet.

TABLE 2-17

PARTICLE SIZE RESULTS AT THE PRILL TOWER SCRUBBER INLETS
AT COLUMBIA NITROGEN CORPORATION
AUGUSTA, GEORGIA

Run No./ Stage	Test Date	Inlet Location	Particle Concentration[a]	Aerodynamic Size (microns)	Mass in Size Range[b]	Cumulative (%)
1/0	8-14-80	A	0.038	>9.86	8.35	8.35
1				9.86-5.44	1.34	9.69
Cyclone				5.44-1.19	34.66	44.36
Impinger[c]				<1.19	55.64	100.00
2/0	8-14-80	B	0.011	>10.25	15.46	15.46
1				10.25-5.74	7.15	22.61
Cyclone				5.74-1.30	38.65	61.26
Impinger				<1.30	38.74	100.00
3/0	8-16-80	C	0.008	>10.04	8.92	8.92
1				10.04-5.57	2.04	10.96
Cyclone				5.57-1.25	29.41	40.37
Impinger				<1.25	59.63	100.00

a Grains/dry standard cubic foot

b Percent including impinger train catch

c Impinger train catch

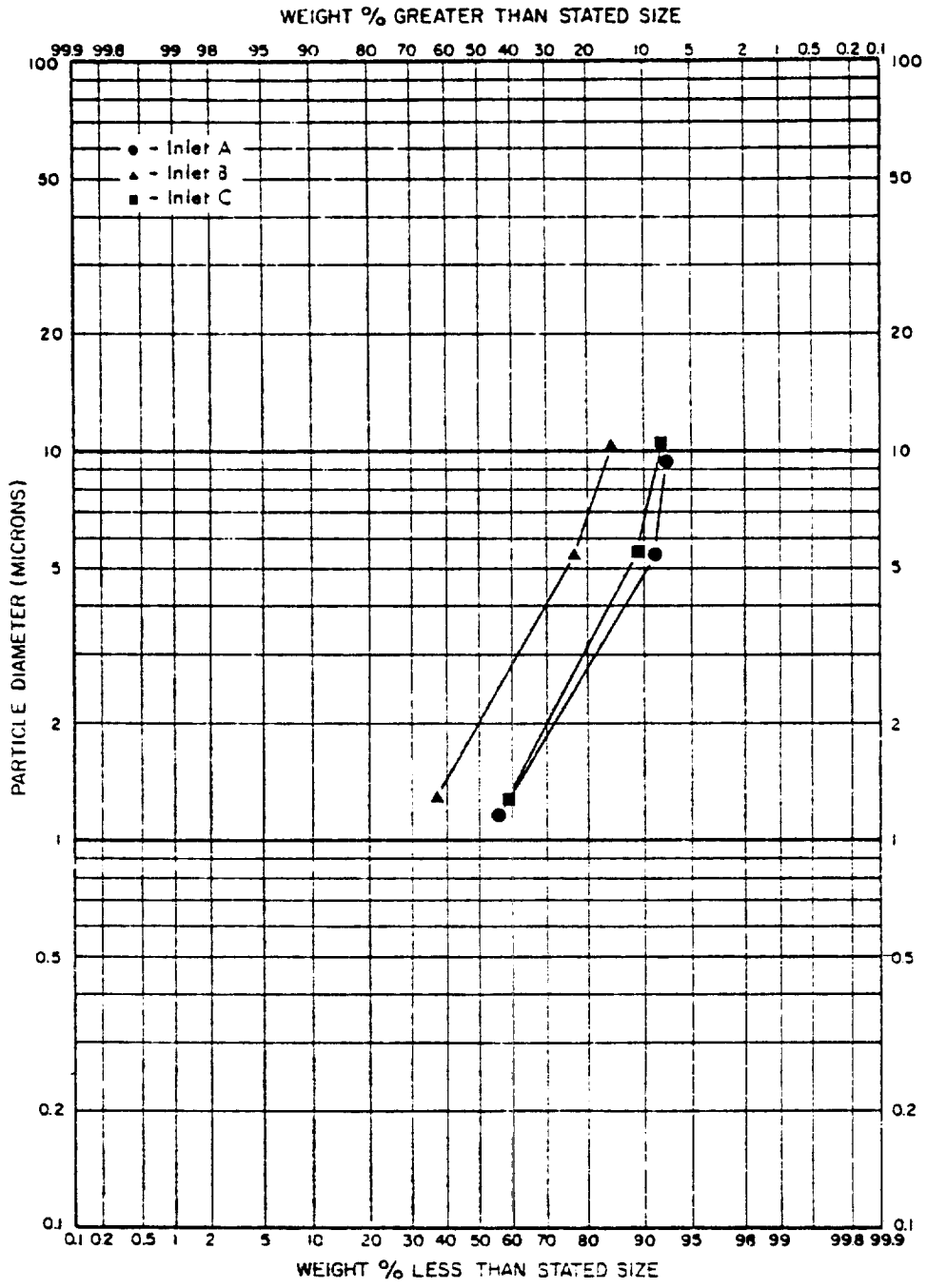


Figure 2-5: HCSS impactor particle size results: particle size versus percent weight less/greater than stated size - prill tower inlets.

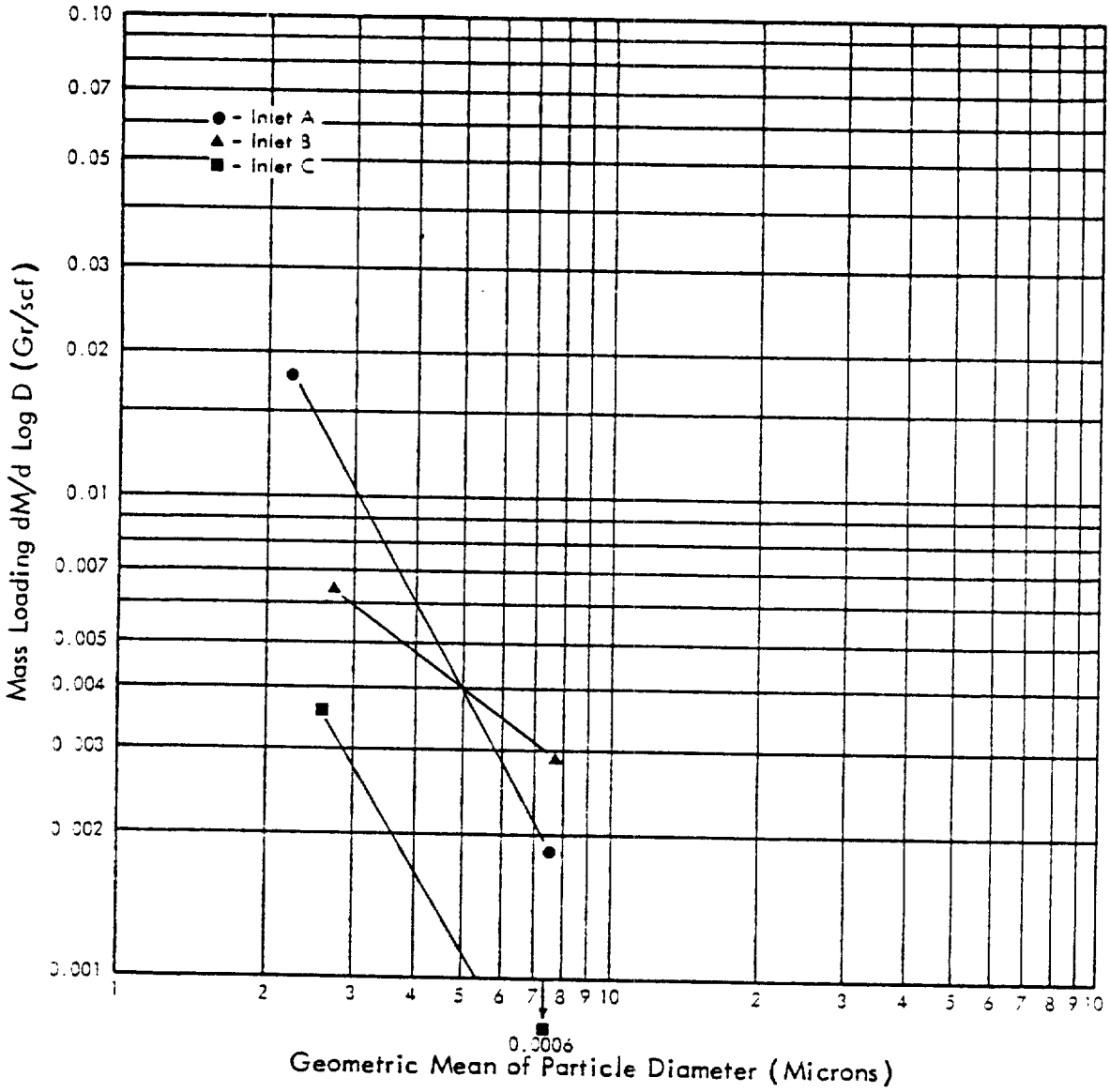


Figure 2-6: HCSS impactor particle size results: differential mass loading (dM/d log D) versus particle diameter - prill tower inlets.

TABLE 2-18

PARTICLE SIZE RESULTS AT THE PRILL TOWER BYPASSES
AT COLUMBIA NITROGEN CORPORATION
AUGUSTA, GEORGIA

Run No./ Stage	Test Date	Inlet Location	Particle Concentration[a]	Aerodynamic Size (microns)	Mass in Size Range[b]	Cumulative (%)
1/0	8-15-80	A	0.006	>9.06	35.74	35.74
1				9.06-4.93	3.50	39.24
Cyclone				4.93-0.96	44.37	83.61
Impinger[c]				<0.96	16.39	100.00
2/0	8-14-80	B	0.006	>8.88	30.80	30.80
1				8.88-4.83	5.74	36.54
Cyclone				4.83-0.95	44.52	81.06
Impinger				<0.95	18.94	100.00
3/0	8-15-80	C	0.005	>9.12	29.02	29.02
1				9.12-4.96	2.94	31.97
Cyclone				4.96-1.00	40.03	72.00
Impinger				<1.00	28.00	100.00

a Grains/dry standard cubic foot

b Percent including impinger train catch

c Impinger train catch

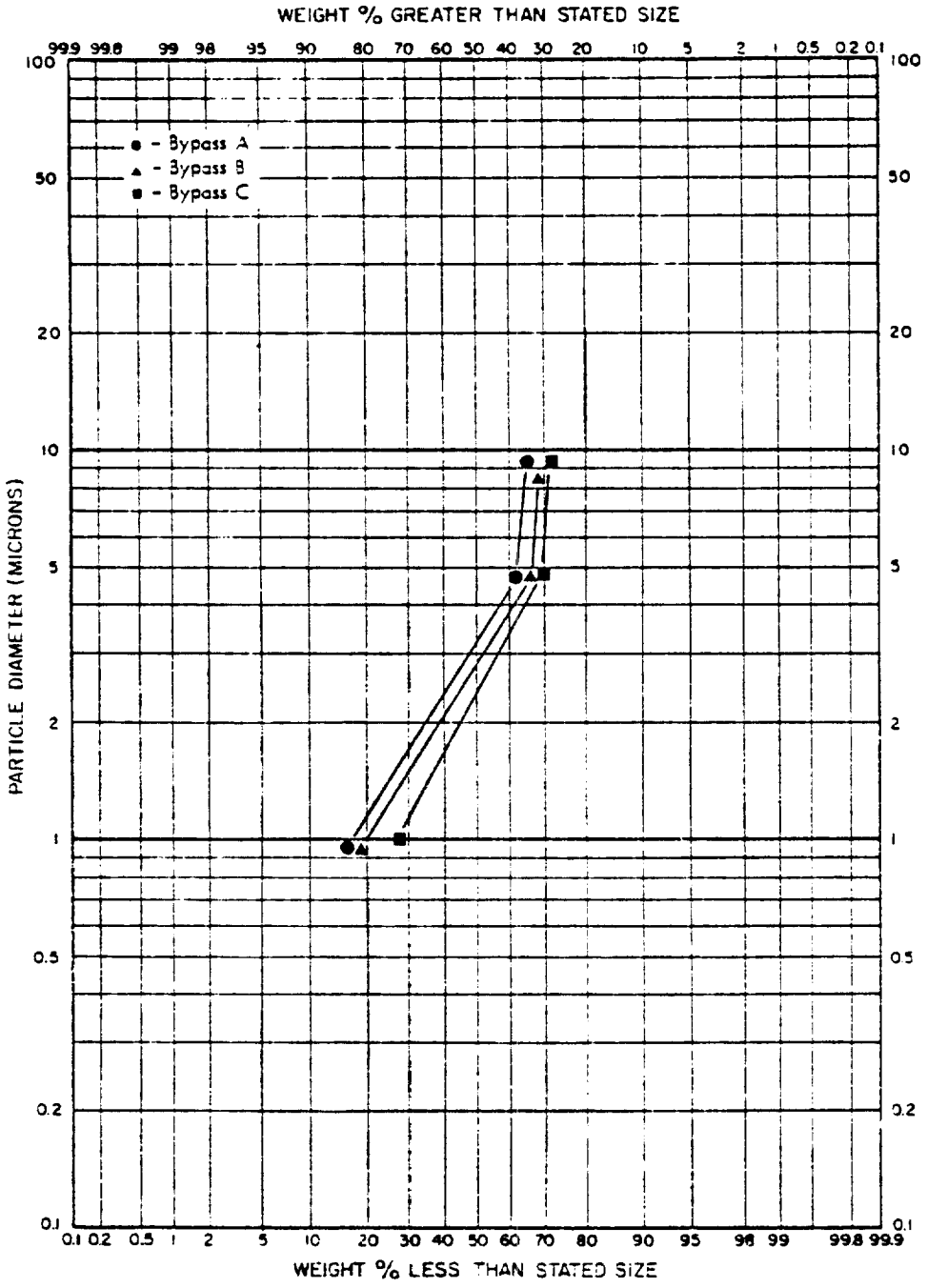


Figure 2-7: HCSS impactor particle size results: particle size versus percent weight less/greater than stated size - prill tower bypass stacks.

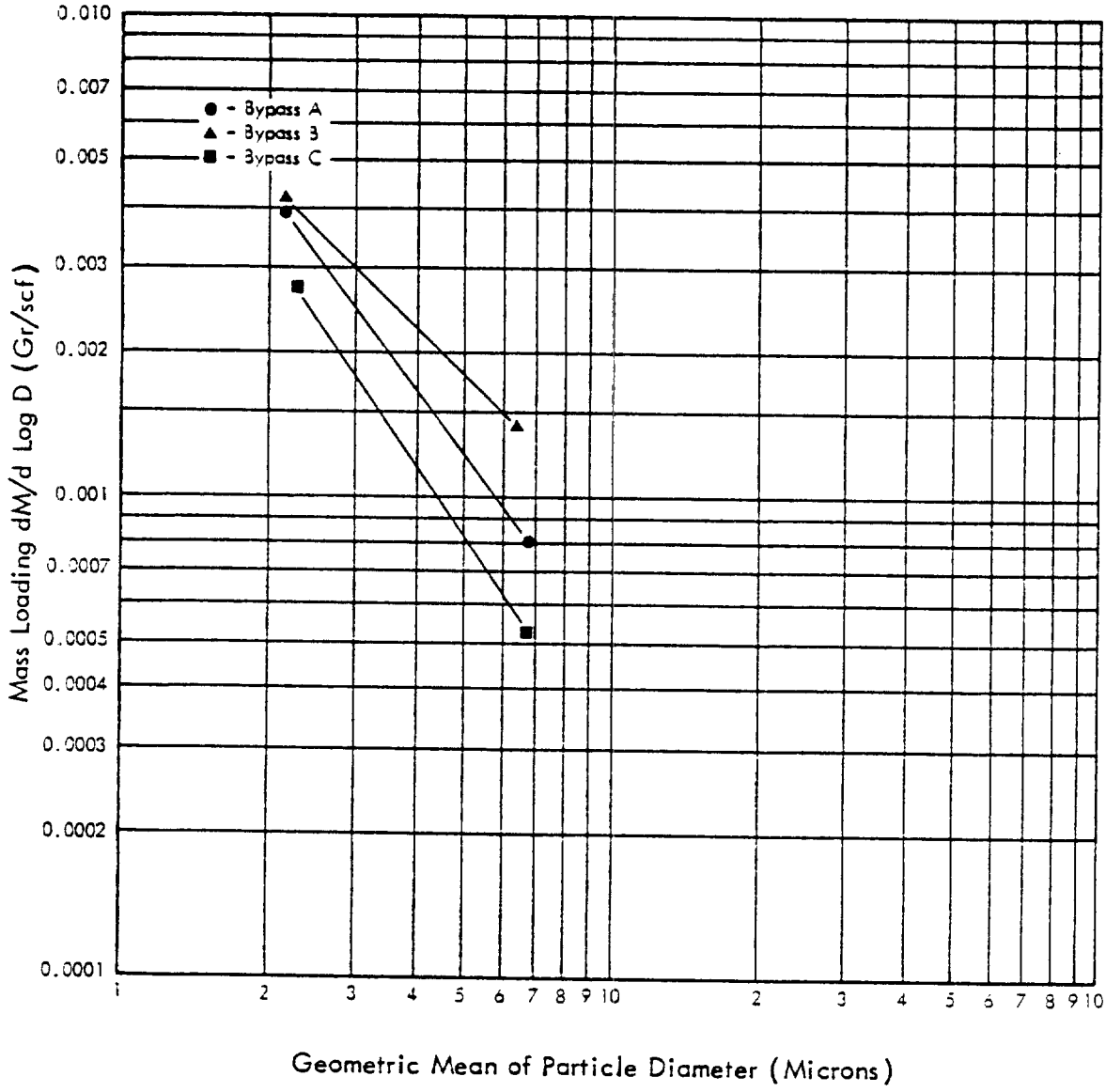


Figure 2-8: HCSS impactor particle size results: differential mass loading (dM/d log D) versus particle diameter - prill tower bypass stacks.

TABLE 2-19

PARTICLE SIZE RESULTS AT THE DRYER SCRUBBER INLET
AT COLUMBIA NITROGEN CORPORATION
AUGUSTA, GEORGIA

Run No./ Stage	Test Date	Particle Concentration[a]	Aerodynamic Size (microns)	Mass in Size Range[b]	Cumulative (%)
1/0	8-15-80	10.689	>10.24	93.50	93.50
1			10.24-5.70	5.46	98.96
Cyclone			5.7 -1.32	0.19	99.14
Impinger[c]			<1.32	0.86	100.00
2/0	8-15-80	2.841	>10.82	95.60	95.60
1			10.82-6.14	3.27	98.86
Cyclone			6.14-1.49	0.17	99.03
Impinger			<1.49	0.97	100.00
3/0	8-15-80	2.234	>8.91	96.27	96.27
1			8.91-4.84	3.23	99.50
Cyclone			4.84-1.00	0.25	99.75
Impinger			<1.00	0.25	100.00

a Grains/dry standard cubic foot

b Percent including impinger train catch

c Impinger train catch

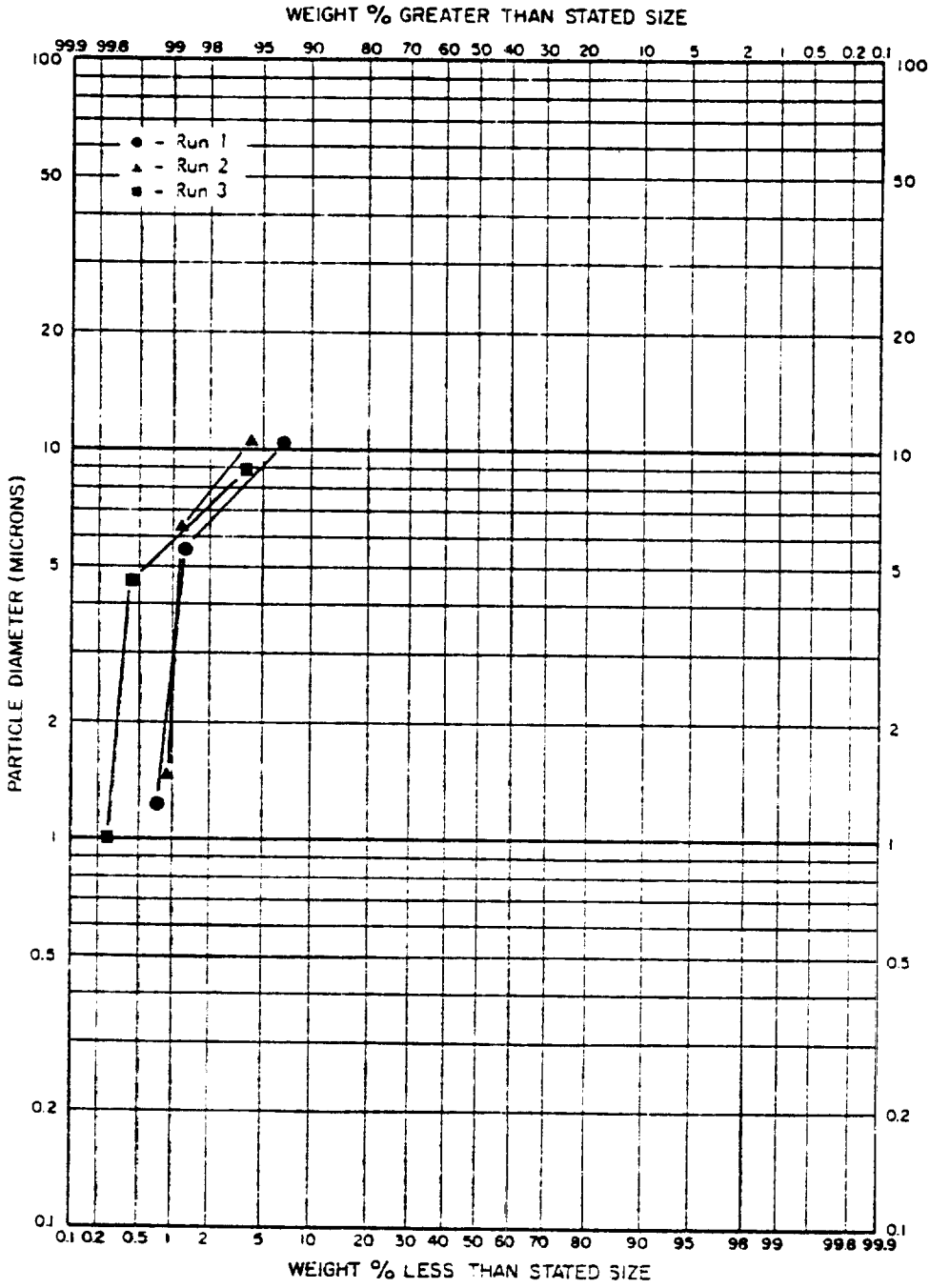


Figure 2-9: HCSS impactor particle size results: particle size versus percent weight less/greater than stated size - dryer uncontrolled exhaust.

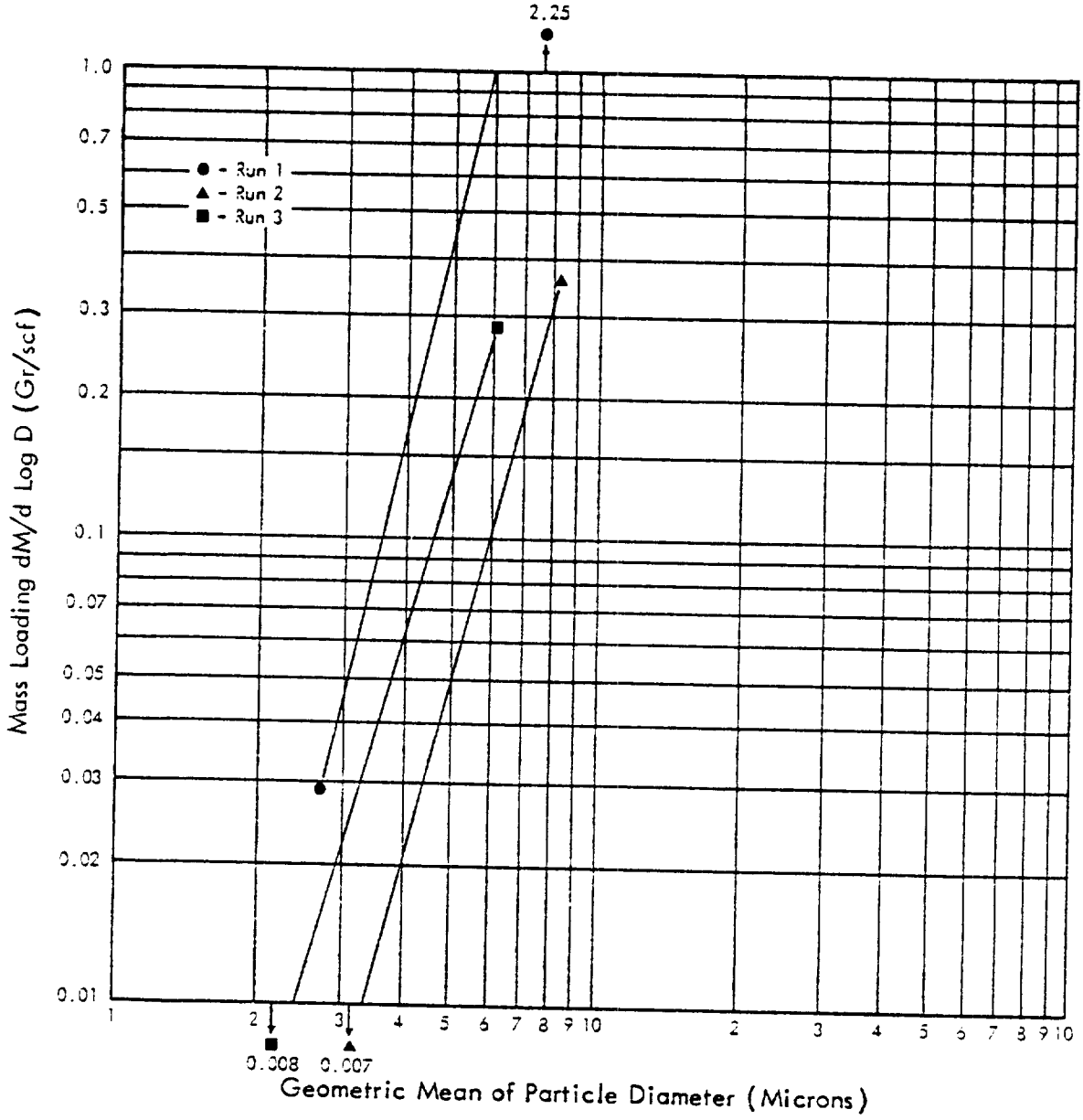


Figure 2-10: HCSS impactor particle size results: differential mass loading (dM/d log D) versus particle diameter - dryer uncontrolled exhaust.

TABLE 2-20

PARTICLE SIZE RESULTS AT THE PREDRYER SCRUBBER INLET
AT COLUMBIA NITROGEN CORPORATION
AUGUSTA, GEORGIA

Run No./ Stage	Test Date	Particle Concentration[a]	Aerodynamic Size (microns)	Mass in Size Range[b]	Cumulative (%)
1/0	8-16-80	1.900	>9.04	92.37	92.37
1			9.04-4.92	5.45	97.82
Cyclone			4.92-1.05	0.42	98.24
Impinger[c]			<1.05	1.76	100.00
2/0	8-16-80	2.934	>9.10	93.76	93.76
1			9.10-4.95	5.22	98.98
Cyclone			4.95-1.06	0.48	99.46
Impinger			<1.06	0.54	100.00
3/0	8-16-80	2.109	>9.42	90.33	90.33
1			9.42-5.13	8.69	99.02
Cyclone			5.13-1.12	0.49	99.52
Impinger			<1.12	0.48	100.00

a Grains/dry standard cubic foot

b Percent including impinger train catch

c Impinger train catch

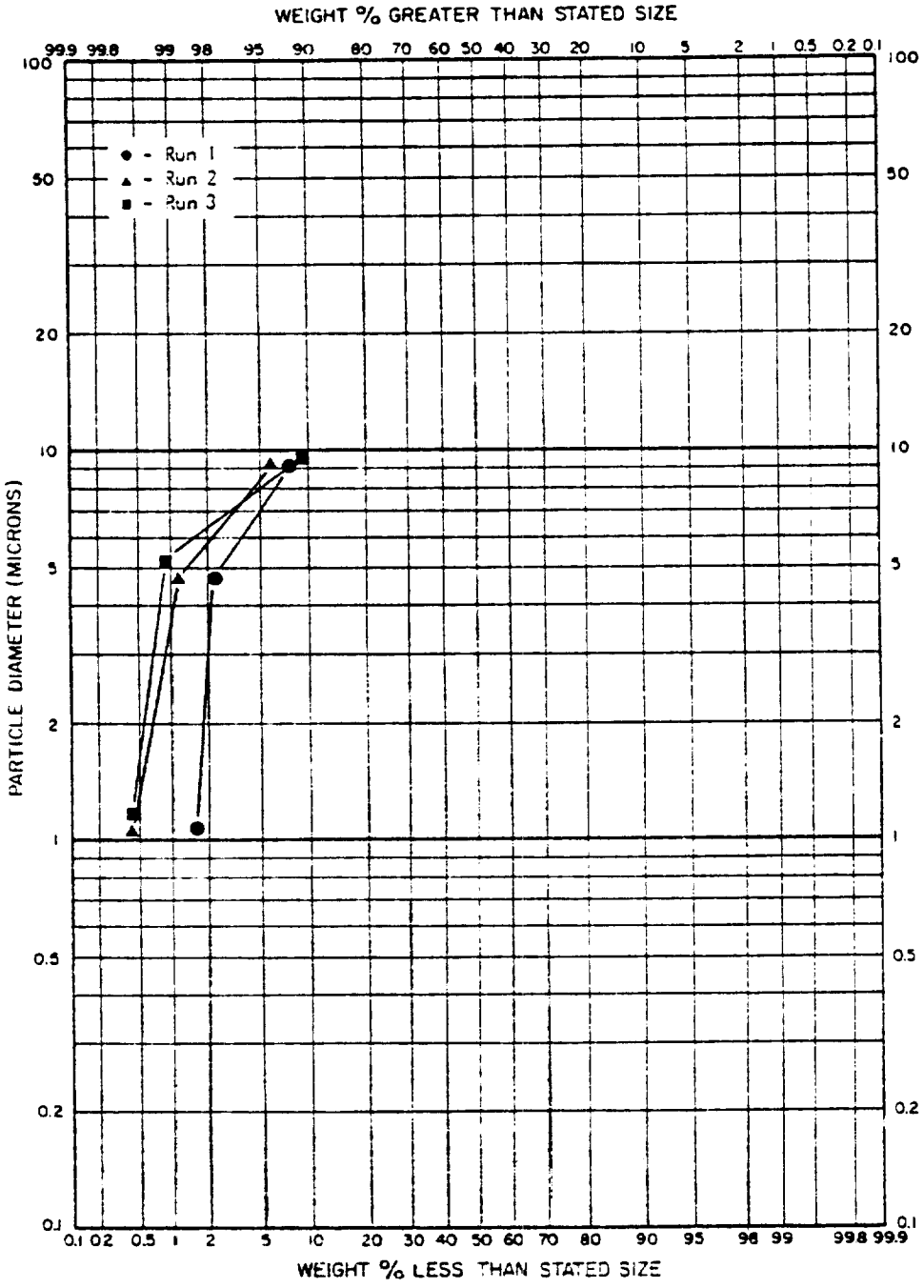


Figure 2-11: HCSS impactor particle size results: particle size versus percent weight less/greater than stated size - predryer uncontrolled exhaust.

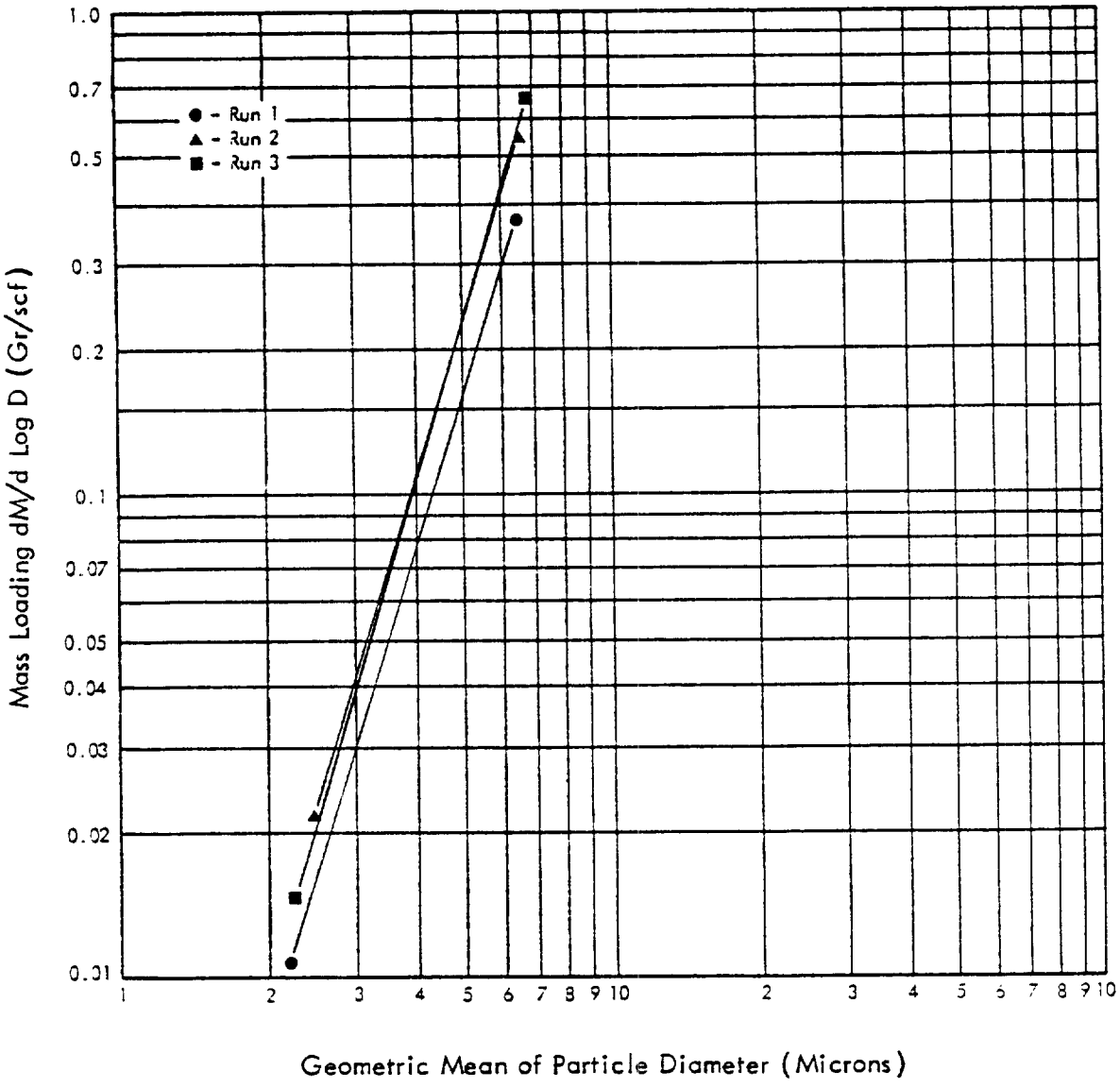


Figure 2-12: HCSS impactor particle size results: differential mass loading (dM/d log D) versus particle diameter - predryer uncontrolled exhaust.

2.5 Visible Emissions

The opacities of the prill tower scrubber outlet and bypass plumes, the predryer/dryer scrubber outlet plume, the cooler scrubber outlet and bypass plumes, and the coater and bagging operations baghouse plumes were monitored during the emission testing program by certified visible emission observers. All observation locations conformed to the guidelines of EPA Method 9.

The prill tower scrubber outlet plume and the plume from the bypass being tested for emissions were monitored during each prill tower emission test run. All outlet opacities were zero, and the bypass 6-minute average opacities ranged from 0 percent to 8 percent. All the outlet and bypass data are shown in Tables 2-21 and 2-22, respectively, and the non-zero bypass data are graphed in Figure 2-13.

The predryer/dryer scrubber outlet plume was monitored during each emission test run at this location. The 6-minute average opacities ranged from 0 percent to 3 percent; non-zero opacities were observed only during test run 3. All data are shown in Table 2-23, and the non-zero data are graphed in Figure 2-14.

The cooler scrubber outlet plume was monitored prior to the emission test runs at the cooler scrubber inlet and bypass and during the first emission test run at these locations. The 6-minute average opacities ranged from 0 percent to 5 percent. These data are shown in Table 2-24 and are graphed in Figure 2-15. The cooler bypass plume was monitored just prior to and during emission test runs 1 and 2 at the scrubber inlet and bypass. All opacities were zero, and these data are shown in Table 2-25.

The plumes from the coater baghouse outlet and the bagging operation baghouse outlet were monitored during the prill tower and predryer/dryer emission test runs. All opacities were zero, and these data are shown in Table 2-26.

TABLE 2-21

VISIBLE EMISSIONS OBSERVATIONS AT THE PRILL TOWER SCRUBBER OUTLET DURING LOW DENSITY AMMONIUM NITRATE PRODUCTION AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

Date	Run Number	Six-Minute Time Period	Average Opacity (Percent)	Observer Location
8-12-80	1	1046 - 1051	0	PT-2
		1052 - 1057	0	30 Feet E
		1058 - 1103	0	of Outlet
		1104 - 1109	0	
		1110 - 1115	0	
		1116 - 1121	0	
		1122 - 1127	0	
		1128 - 1133	0	
		1134 - 1139	0	
		1140 - 1145	0	
		1147 - 1152	0	
		1153 - 1158	0	
		1159 - 1204	0	
		1205 - 1210	0	
		1211 - 1216	0	
		1217 - 1222	0	
		1223 - 1228	0	
		1229 - 1234	0	
		1235 - 1240	0	
		1241 - 1246	0	
		Average	0	
8-12-80	2	1520 - 1525	0	PT-3
		1526 - 1531	0	50 Feet NW
		1532 - 1537	0	of Outlet
		1538 - 1543	0	
		1544 - 1549	0	
		1550 - 1555	0	
		1556 - 1601	0	
		1602 - 1607	0	
		1608 - 1613	0	
		1614 - 1619	0	
		1620 - 1625	0	
		1626 - 1631	0	
		1632 - 1637	0	
		1638 - 1643	0	
		1644 - 1649	0	
		1650 - 1655	0	
		1656 - 1701	0	
		1702 - 1707	0	
		1708 - 1713	0	
		1714 - 1719	0	
		Average	0	

TABLE 2-21 (Continued)

VISIBLE EMISSIONS OBSERVATIONS AT THE PRILL TOWER SCRUBBER OUTLET DURING LOW DENSITY AMMONIUM NITRATE PRODUCTION AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

Date	Run Number	Six-Minute Time Period	Average Opacity (Percent)	Observer Location
8-13-80	3	0845 - 0850	0	PT-3
		0851 - 0856	0	30 Feet E
		0857 - 0902	0	of Outlet
		0903 - 0908	0	
		0909 - 0914	0	
		0915 - 0920	0	
		0921 - 0926	0	
		0927 - 0932	0	
		0933 - 0938	0	
		0939 - 0944	0	
		0945 - 0950	0	
		0951 - 0956	0	
		0957 - 1002	0	
		1003 - 1008	0	
		1009 - 1014	0	
		1015 - 1020	0	
		1021 - 1026	0	
		1027 - 1032	0	
		1033 - 1038	0	
		1039 - 1044	0	
		1045 - 1050	0	
		1051 - 1056	0	
		1255 - 1300	0	PT-2
		1301 - 1306	0	30 Feet E
		1307 - 1312	0	of Outlet
		1313 - 1318	0	
		1319 - 1324	0	
		1325 - 1330	0	
		1331 - 1336	0	
		1337 - 1342	0	
		1343 - 1348	0	
		1349 - 1354	0	
		1355 - 1400	0	
		1401 - 1406	0	
		1407 - 1412	0	
		1413 - 1418	0	
		1419 - 1424	0	
		1425 - 1430	0	
		1431 - 1436	0	
		1437 - 1442	0	
		1443 - 1448	0	
		1449 - 1454	0	
		Average	0	

TABLE 2-22

VISIBLE EMISSIONS OBSERVATIONS AT THE PRILL TOWER SCRUBBER BYPASSES
DURING LOW DENSITY AMMONIUM NITRATE PRODUCTION AT
COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

Location	Date	Run Number	Six-Minute Time Period	Average Opacity (Percent)	Observer Location
Bypass B	8-12-80	1	1049 - 1054	7.7	PT-1
			1055 - 1100	7.5	15 Feet SSW
			1101 - 1106	7.1	of Bypass
			1107 - 1112	5.6	
			1113 - 1118	7.1	
			1119 - 1124	4.8	
			1125 - 1130	5.8	
			1131 - 1136	6.9	
			1137 - 1142	6.3	
			1143 - 1148	8.3	
			1149 - 1154	7.1	
			1155 - 1201	6.3	
			1202 - 1206	6.0	
			1207 - 1212	6.5	
			1213 - 1218	6.3	
			1219 - 1224	5.2	
			1225 - 1230	5.4	
			1231 - 1236	6.7	
			1237 - 1242	6.9	
			1243 - 1248	5.6	
			Average	6.4	
Bypass A		2	1520 - 1525	8.3	PT-3
			1526 - 1531	7.3	25 Feet WNW
			1532 - 1537	7.5	of Bypass
			1538 - 1543	6.7	
			1544 - 1549	6.5	
			1550 - 1555	6.3	
			1556 - 1501	6.5	
			1602 - 1607	5.2	
			1608 - 1613	5.6	
			1614 - 1619	5.4	
			1620 - 1625	6.3	
			1626 - 1631	7.5	
			1632 - 1637	6.0	
			1638 - 1643	5.6	
			1644 - 1649	5	
			1650 - 1655	5	
			1656 - 1701	5	
			1702 - 1707	5	
			1708 - 1713	5	
			1714 - 1719	5	
			Average	6.0	

TABLE 2-22 (Continued)

VISIBLE EMISSIONS OBSERVATIONS AT THE PRILL TOWER SCRUBBER BYPASSES
DURING LOW DENSITY AMMONIUM NITRATE PRODUCTION AT
COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

Location	Date	Run Number	Six-Minute Time Period	Average Opacity (Percent)	Observer Location
Bypass C	8-13-80	3	0952 - 0957	0	PT-1
			0958 - 1003	0	35 Feet SE
			1004 - 1009	0	of Bypass
			1010 - 1015	0	
			1016 - 1021	0	
			1022 - 1027	0	
			1028 - 1033	0	
			1034 - 1039	0	
			1040 - 1045	0	
			1046 - 1051	0	
			1052 - 1057	0	
			1058 - 1103	0	
			1104 - 1109	0	
			1110 - 1115	0	
			1116 - 1121	0	
			1122 - 1119	0	
			1120 - 1133	0	
			1134 - 1139	0	
			1140 - 1145	0	
			1146 - 1151	0	
			Average	0	

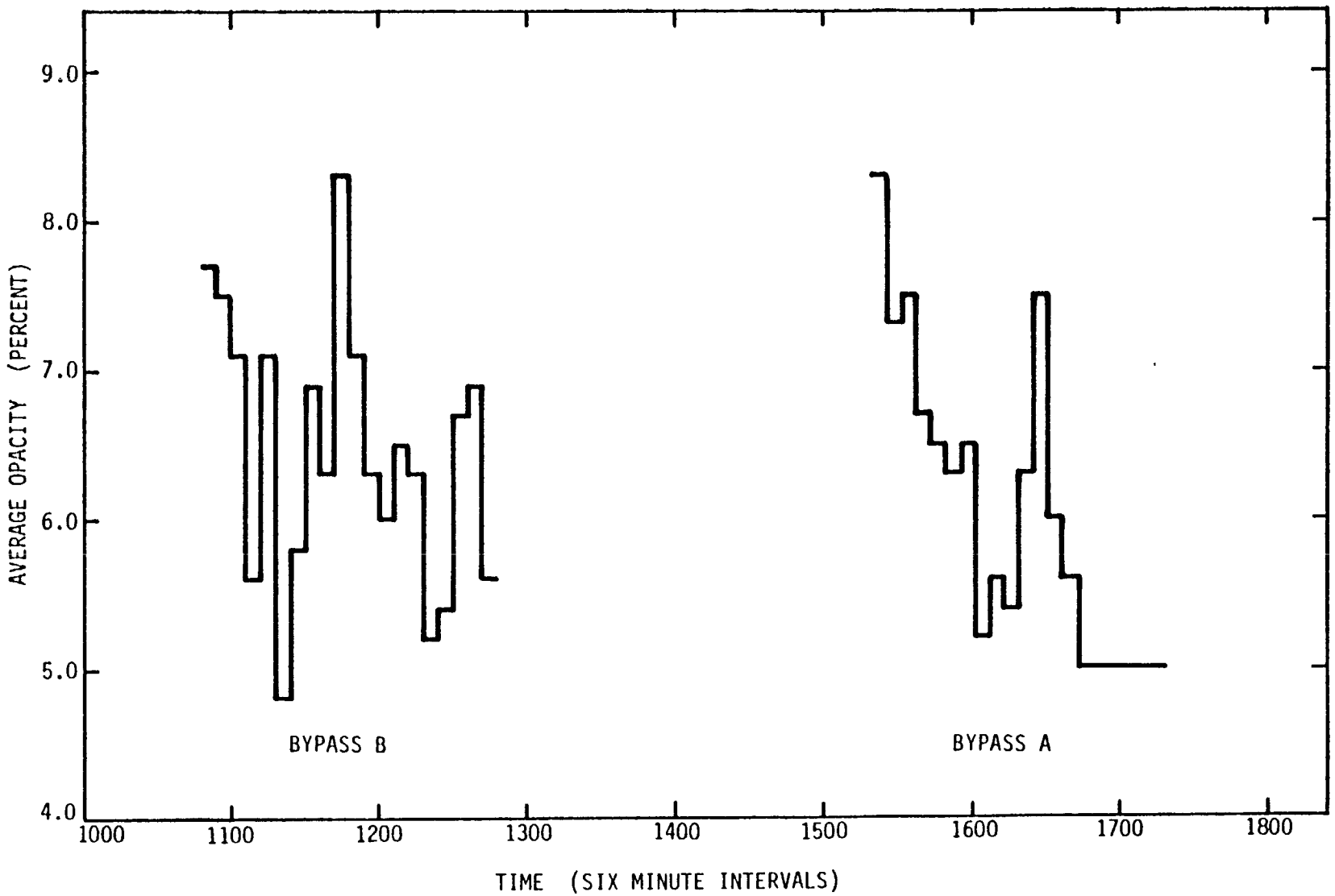


FIGURE 2-13: VISIBLE EMISSIONS OBSERVATIONS AT THE PRILL TOWER SCRUBBER BYPASSES DURING LOW DENSITY AMMONIUM NITRATE PRODUCTION AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA ON AUGUST 12, 1980.

1430-E01

TABLE 2-23

VISIBLE EMISSIONS OBSERVATIONS AT THE PREDRYER/DRYER SCRUBBER OUTLET DURING LOW DENSITY AMMONIUM NITRATE PRODUCTION AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

Date	Run Number	Six-Minute Time Period	Average Opacity (Percent)	Observer Location
8-14-80	1	1105 - 1110	0	PD-1
		1111 - 1116	0	125 Feet
		1117 - 1122	0	SE
		1123 - 1128	0	of Outlet
		1129 - 1134	0	
		1135 - 1140	0	
		1141 - 1146	0	
		1147 - 1152	0	
		1153 - 1158	0	
		1159 - 1204	0	
		1205 - 1210	0	
		1211 - 1216	0	
		1217 - 1222	0	
		1223 - 1228	0	
		1229 - 1234	0	
		1235 - 1240	0	
		1241 - 1246	0	
		1247 - 1252	0	
		1253 - 1258	0	
		1259 - 1304	0	
		Average	0	
8-14-80	2	1510 - 1515	0	PD-2
		1516 - 1521	0	125 Feet
		1522 - 1527	0	S
		1528 - 1533	0	Outlet
		1534 - 1539	0	
		1540 - 1545	0	
		1546 - 1551	0	
		1552 - 1557	0	
		1558 - 1603	0	
		1604 - 1609	0	
		1610 - 1615	0	
		1616 - 1621	0	
		1622 - 1627	0	
		1628 - 1633	0	
		1634 - 1639	0	
		1640 - 1645	0	
		1646 - 1651	0	
		1652 - 1657	0	
		1658 - 1703	0	
		1704 - 1709	0	
		Average	0	

TABLE 2-23 (Continued)

VISIBLE EMISSIONS OBSERVATIONS AT THE PREDRYER/DRYER SCRUBBER OUTLET
DURING LOW DENSITY AMMONIUM NITRATE PRODUCTION AT
COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

Date	Run Number	Six-Minute Time Period	Average Opacity (Percent)	Observer Location
8-14-80	3	1710 - 1715	0.6	PD-2
		1716 - 1721	2.3	125 Feet
		1722 - 1727	3.1	S of
		1728 - 1733	1.5	Outlet
		1734 - 1739	0.8	
		1740 - 1745	1.5	
		1746 - 1751	0	
		1752 - 1757	0.2	
		1758 - 1803	0.6	
		1804 - 1809	0.2	
		1810 - 1815	0	
		1816 - 1821	0	
		1822 - 1827	0	
		1828 - 1833	0	
		1834 - 1839	0	
		1840 - 1845	0	
		1846 - 1851	0	
		1852 - 1857	0	
		1858 - 1903	0	
		1904 - 1909	0	
		Average	0.5	

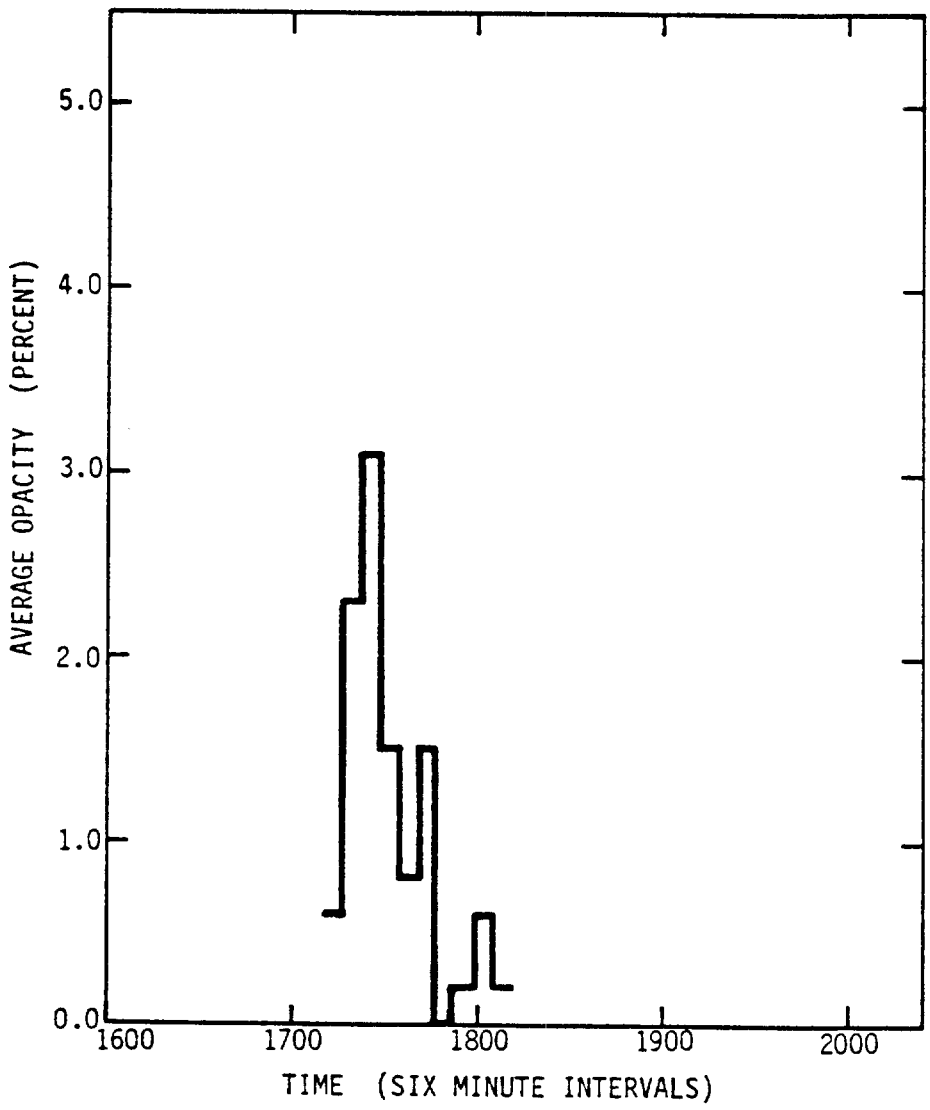


FIGURE 2-14: VISIBLE EMISSIONS OBSERVATIONS AT THE PREDRYER/DRYER SCRUBBER OUTLET DURING LOW DENSITY AMMONIUM NITRATE PRODUCTION AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA ON AUGUST 14, 1980

1430-E02

TABLE 2-24

VISIBLE EMISSIONS OBSERVATIONS AT THE PRILL COOLER SCRUBBER OUTLET DURING LOW DENSITY AMMONIUM NITRATE PRODUCTION AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

Date	Run* Number	Six-Minute Time Period	Average Opacity (Percent)	Observer Location
8-14-80		1450 - 1455	5	PC-1 35 Feet NE of Outlet
		1456 - 1501	5	
		1502 - 1507	5	
		1508 - 1513	5	
		1514 - 1519	5	
		1520 - 1525	5	
		1526 - 1531	5	
		1532 - 1537	5	
		1538 - 1543	5	
		1544 - 1549	5	
		1550 - 1555	5	
		1556 - 1501	5	
		1602 - 1607	5	
		1608 - 1613	5	
		1614 - 1619	5	
		1620 - 1625	5	
		1626 - 1631	5	
		1632 - 1637	5	
		1638 - 1643	5	
		1644 - 1649	5	
		Average	5	
8-15-80		1100 - 1105	0	PC-1 35 Feet NE of Outlet
		1106 - 1111	0	
		1112 - 1117	0	
		1118 - 1123	0	
		1124 - 1129	0	
		1130 - 1135	0	
		1136 - 1141	0	
		1142 - 1147	0	
		1148 - 1153	0	
	1	1154 - 1159	0	

TABLE 2-24 (Continued)

VISIBLE EMISSIONS OBSERVATIONS AT THE PRILL COOLER SCRUBBER OUTLET
DURING LOW DENSITY AMMONIUM NITRATE PRODUCTION AT
COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

Date	Run Number	Six-Minute Time Period	Average Opacity (Percent)	Observer Location
8-15-80	1	1200 - 1205	0	PC-1
		1206 - 1211	0	35 Feet
		1212 - 1217	0	NE
		1218 - 1223	0	of Outlet
		1224 - 1229	0	
		1230 - 1235	1.9	
		1236 - 1241	5	
		1242 - 1247	5	
		1248 - 1253	5	
		1254 - 1259	5	
		Average**	2.2	

*Run number of concurrent inlet and bypass emission tests.
**Average for 1200 - 1259 observation period.

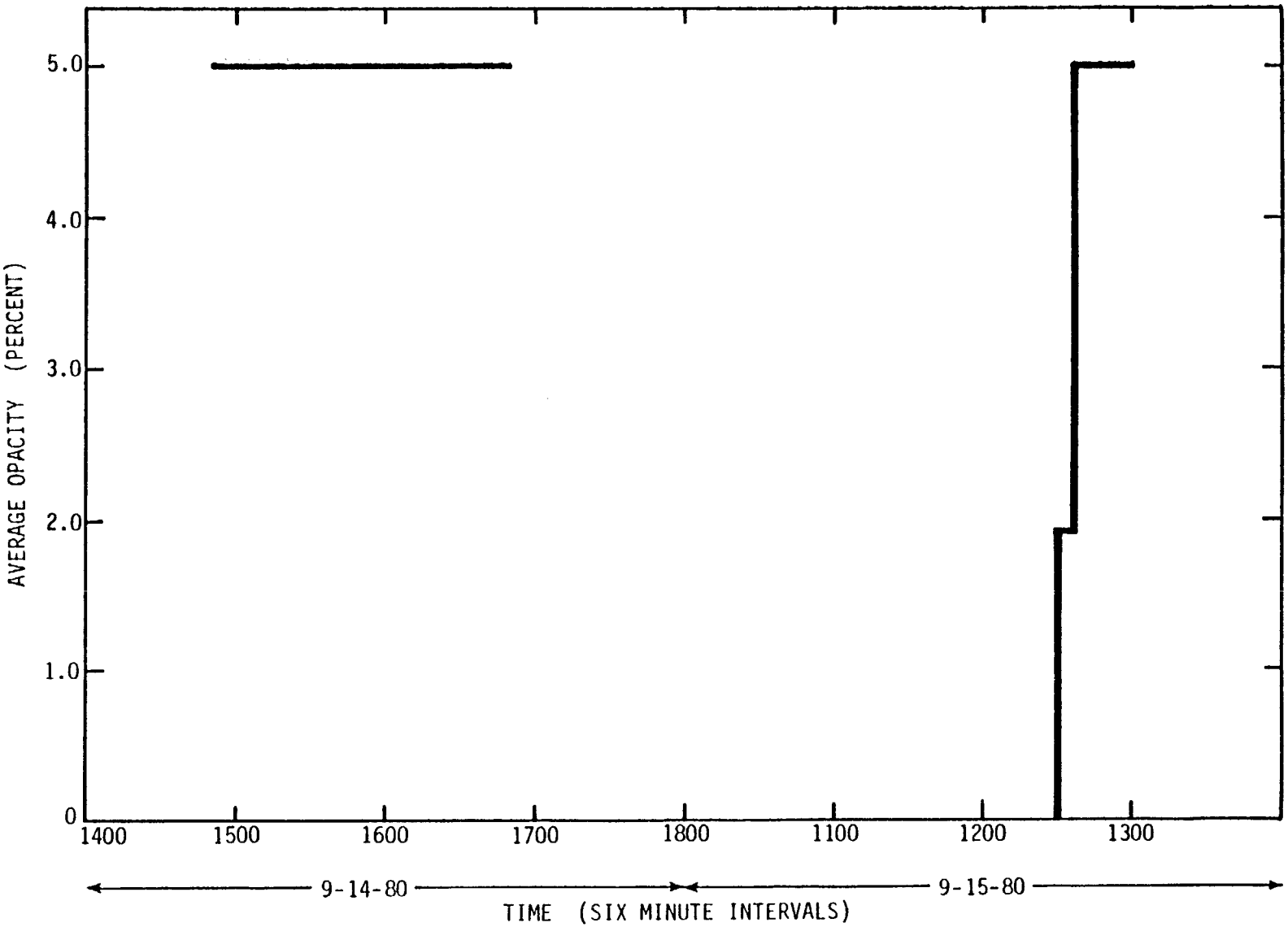


FIGURE 2-15: VISIBLE EMISSIONS OBSERVATIONS AT THE PRILL COOLER SCRUBBER OUTLET DURING LOW DENSITY AMMONIUM NITRATE PRODUCTION AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA ON AUGUST 14-15, 1980

1430-E03

TABLE 2-25

VISIBLE EMISSIONS OBSERVATIONS AT THE PRILL COOLER SCRUBBER BYPASS DURING LOW DENSITY AMMONIUM NITRATE PRODUCTION AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

Date	Run Number	Six-Minute Time Period	Average Opacity (Percent)	Observer Location
8-15-80		1100 - 1105	0	PC-3
		1106 - 1111	0	15 Feet
		1112 - 1117	0	N
		1118 - 1123	0	of Bypass
		1124 - 1129	0	
		1130 - 1135	0	
		1136 - 1141	0	
		1142 - 1147	0	
		1148 - 1153	0	
	1	1154 - 1159	0	
		Average	0	
8-15-80		1210 - 1215	0	PC-3
		1216 - 1221	0	15 Feet
		1222 - 1227	0	N
		1228 - 1233	0	of Bypass
		1234 - 1239	0	
		1240 - 1245	0	
		1246 - 1251	0	
		1252 - 1257	0	
		1258 - 1303	0	
		1304 - 1309	0	
		Average	0	
8-15-80	2	1545 - 1550	0	PC-2
		1551 - 1556	0	45 Feet
		1557 - 1602	0	E
		1603 - 1608	0	of Bypass
		1609 - 1614	0	
		1615 - 1620	0	
		1621 - 1626	0	
		1627 - 1632	0	
		1633 - 1638	0	
		1639 - 1644	0	
		Average	0	

TABLE 2-26

VISIBLE EMISSIONS OBSERVATIONS AT THE COATER AND BAGGING BAGHOUSE OUTLETS DURING LOW DENSITY AMMONIUM NITRATE PRODUCTION AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

Coater Baghouse				Bagging Baghouse			
Date	Six-Minute Time Period	Average Opacity (Percent)	Observer Location	Date	Six-Minute Time Period	Average Opacity (Percent)	Observer Location
8-13-80	0845 - 0850	0	CB-1	8-14-80	1014 - 1019	0	BG
	0851 - 0856	0	20 Feet		1020 - 1025	0	100 Feet
	0857 - 0902	0	ENE		1026 - 1031	0	SE
	0903 - 0908	0	of Outlet		1032 - 1037	0	of Outlet
	0909 - 0914	0			1038 - 1043	0	
	0915 - 0920	0			1044 - 1049	0	
	0921 - 0926	0			1050 - 1055	0	
	0927 - 0932	0			1056 - 1101	0	
	0933 - 0938	0			1102 - 1107	0	
	0939 - 0944	0			Average	0	
	Average	0					
				8-14-80	1123 - 1128	0	BG
8-13-80	1255 - 1300	0	CB-2		1129 - 1134	0	100 Feet
	1301 - 1306	0	40 Feet		1135 - 1140	0	SE
	1307 - 1312	0	SE		1141 - 1146	0	of Outlet
	1313 - 1318	0	of Outlet		1147 - 1152	0	
	1319 - 1324	0			Average	0	
	1325 - 1330	0					
	1331 - 1336	0		8-14-80	1235 - 1240	0	BG
	1337 - 1342	0			1241 - 1246	0	100 Feet
	1343 - 1348	0			1247 - 1252	0	SE
	1349 - 1354	0			1253 - 1258	0	of Outlet
	1355 - 1359	0			1259 - 1304	0	
	Average	0			1305 - 1310	0	
					1311 - 1316	0	
8-13-80	1355 - 1400	0	CB-2		1317 - 1322	0	
	1401 - 1406	0	40 Feet		1323 - 1328	0	
	1407 - 1412	0	SE		1329 - 1334	0	
	1413 - 1418	0	of Outlet		1335 - 1340	0	
	1419 - 1424	0			1341 - 1346	0	
	1425 - 1430	0			1347 - 1352	0	
	1431 - 1436	0			1353 - 1358	0	
	1437 - 1442	0			Average	0	
	1443 - 1448	0					
	1449 - 1454	0					
	Average	0					

2.6 Scrubber Liquor Analyses

Samples of the prill tower Brinks scrubber liquor were collected periodically from the recirculation stream during each prill tower emission test run. Samples of the predryer/dryer Peabody scrubber liquor were collected periodically from the sprayer feed line during each emission test run at this location. The temperature of each sample was measured immediately after collection, and when the sample reached room temperature its pH was measured. After each emission test run, the liquor samples collected during that run were combined into one composite sample. The composite samples were then analyzed for AN, ammonia, and undissolved solids. Summaries of the prill tower scrubber and predryer/dryer scrubber liquor analyses are shown in Tables 2-27 and 2-28, respectively.

2.7 Scrubber Pressure Drop Measurements

Pressure drops across the prill tower scrubber were measured periodically during each prill tower emission test run. During each test run, one side of a vertical U-tube water manometer was connected to a tap in the inlet duct being tested for emissions. The other side of the manometer was open to the atmosphere. An exception to this procedure occurred during test run 2 when the manometer was left in inlet B while inlet A was tested for emissions. During run 3, pressure drops were measured at inlets C and A. All pressure drop measurement data are shown in Table 2-29.

2.8 Ambient Air Measurements

The temperature and relative humidity of the ambient air were measured periodically during all emission test runs in the immediate vicinity of each process unit of concern. These data for the prill tower, predryer/dryer, and cooler test runs are shown in Tables 2-30, 2-31, and 2-32, respectively.

TABLE 2-27

SUMMARY OF MEASUREMENTS ON THE PRILL TOWER SCRUBBER LIQUOR DURING LOW DENSITY AMMONIUM NITRATE PRODUCTION AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

Date	Run Number	Sampling Time	pH*	Temp. (°F)	Measurements on Composite Samples (ppm) Ammonium Nitrate**	Ammonia**	Undissolved Solids***
8-12-80	1	1100	4.40	91			
		1130	3.88	92			
		1200	3.95	92			
		1230	3.65	93			
		1300	4.42	92			
		Average	4.06	92	73.4	17.6	26.0
8-12-80	2	1530	5.88	93			
		1600	5.70	94			
		1630	4.75	92			
		1700	5.22	92			
		1730	5.70	93			
		1800	4.92	92			
		Average	5.36	93	76.6	18.0	56.6
8-13-80	3	0900	4.22	90			
		0930	3.72	90			
		1000	3.88	92			
		1030	4.05	92			
		1100	3.50	92			
		Average	3.87	91	71.8	17.6	46.2

* pH measured at room temperature (75°F).
** Specific Ion Electrode Analysis Procedure
*** Milligrams/Liter

TABLE 2-28

SUMMARY OF MEASUREMENTS ON THE PRILL DRYER SCRUBBER LIQUOR DURING LOW DENSITY AMMONIUM NITRATE PRODUCTION AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

Date	Run Number	Sampling Time	pH*	Temp. (°F)	Measurements on Composite Samples (ppm) Ammonium Nitrate**	Ammonia**	Undissolved Solids***
8-14-80	1	1030	6.45	100			
		1100	6.45	96			
		1130	6.25	98			
		1200	6.20	102			
		1230	6.12	104			
		Average	6.29	100	570	136	44.7
8-14-80	2	1500	6.15	106			
		1530	6.55	104			
		1600	6.58	103			
		1630	6.55	104			
		1700	6.58	102			
		1730	6.40	102			
		Average	6.47	104	645	156	20.1
8-14-80	3	1800	6.32	103			
		1830	6.38	103			
		1900	6.32	103			
		1930	6.32	103			
		1200	6.32	103			
		Average	6.33	103	677	168	8.3

* pH measured at room temperature (75°F).
** Specific Ion Electrode Analysis Procedure
*** Milligrams/Liter

TABLE 2-29

SUMMARY OF PRESSURE DROP MEASUREMENTS MADE ACROSS THE PRILL TOWER SCRUBBER DURING LOW DENSITY AMMONIUM NITRATE PRODUCTION AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

Date	Location	Run Number	Time	Pressure Drop (inches H_2O)	Date	Location	Run Number	Time	Pressure Drop (inches H_2O)
8-12-80	B Inlet	1	1100	1.8	8-13-80	C Inlet	3	0900	1.0
			1130	1.6				0930	1.0
			1200	1.6				1000	1.0
			1230	1.6				1030	1.0
			1300	1.6				1100	1.0
			Average	1.6				1130	1.0
								Average	1.0
8-12-80	B Inlet*	2	1530	1.4					
			1600	1.4	8-13-80	A Inlet	3	0900	1.0
			1630	1.6				0930	1.0
			1700	1.6				1000	1.0
			1730	1.6				1030	1.0
			1800	1.4				1100	1.0
			Average	1.5				1130	1.0
								Average	1.0

*Run 2 emission test was performed on Inlet A. Pressure drops were measured at Inlet B during this run.

TABLE 2-30

SUMMARY OF AMBIENT AIR MEASUREMENTS MADE DURING
EMISSIONS TEST AT THE PRILL TOWER AT COLUMBIA NITROGEN CORPORATION,
AUGUSTA, GEORGIA

Date	Run Number	Time	Ambient Temp (°F)	Relative Humidity (%)
8-12-80	1	1000	85	70
		1100	87	64
		1130	89	58
		1200	91	53
		1230	92	50
		1300	93	49
		Average	90	57
8-12-80	2	1530	95	44
		1600	95	44
		1630	96	44
		1700	94	47
		1730	95	44
		1800	94	44
		Average	95	45
8-13-80	3	0900	82	72
		0930	82	74
		1000	84	73
		1030	86	66
		1000	87	64
		1130	87	58
		Average	85	68

TABLE 2-31

SUMMARY OF AMBIENT AIR MEASUREMENTS MADE DURING
EMISSIONS TESTS AT THE PREDRYER/DRYER AT COLUMBIA NITROGEN CORPORATION,
AUGUSTA, GEORGIA

Date	Run Number	Time	Ambient Temp (°F)	Relative Humidity (%)
8-14-80	1	1030	87	67
		1100	89	61
		1130	90	59
		1200	93	51
		1230	93	54
		1300	95	50
		1330	96	47
		Average	92	56
8-14-80	2	1500	96	42
		1530	97	41
		1600	93	49
		1630	95	44
		1700	94	49
		1730	93	51
		Average	95	46
8-14-80	3	1800	93	51
		1830	92	54
		1900	92	54
		1930	92	54
		2000	92	54
		Average	92	53

TABLE 2-32

SUMMARY OF AMBIENT AIR MEASUREMENTS MADE DURING EMISSIONS TESTS AT THE PRILL COOLER AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

Date	Run Number	Time	Ambient Temp (°F)	Relative Humidity (%)
8-15-80		1100	84	77
		1130	86	70
	1	1200	86	74
		1230	87	70
		1300	90	62
		1330	90	62
		1400	91	59
		1430	91	59
		Average	88	67
	2	1500	91	59
		1530	91	59
		1600	90	62
		1630	89	61
		1700	89	61
		1730	87	67
		Average	90	62
8-16-80	3	0900	78	91
		0930	79	87
		1000	83	76
		1030	85	70
		1100	85	73
		1130	85	73
		1200	87	67
		Average	83	77

2.9 Volumetric Flowrates through the Prill Tower

Emissions were measured at one scrubber inlet, one bypass, and the scrubber outlet during each prill tower emission test run. At the beginning and end of a given test run velocity traverses were performed at the two inlets and two bypasses not being tested for emissions. With the velocity traverse data, flowrates through all three inlets and all three bypasses during each test run were calculated. The scrubber inlet flowrates and bypass flowrates are shown in Tables 2-33 and 2-34, respectively.

Emission test run 2 was begun within one hour after the completion of run 1. Under the direction of the Technical Manager the run 1 "after" traverses at inlet C and bypass C were used as the run 2 "before" traverses. No run 2 "before" traverses were performed at inlet B and bypass B because of time constraints in completing the run 1 emission tests at these B locations.

The average total flowrate through the scrubber inlets was approximately 47,000 dry standard cubic feet per minute (DSCFM). The average total flowrate through the bypasses was approximately 214,000 DSCFM.

TABLE 2-33

FLOWRATES* THROUGH THE PRILL TOWER SCRUBBER INLETS DURING LOW DENSITY AMMONIUM NITRATE PRODUCTION AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

Location	Time	8-12-80 Run 1	8-12-80 Run 2	8-13-80 Run 3
Inlet B	During	15,300		
	Before[a]		**	14,992
	After[b]		15,552	14,360
	Average		15,552	14,676
Inlet A	During		16,070	
	Before	16,261		16,088
	After	15,527		16,495
	Average	15,894		16,291
Inlet C	During			15,250
	Before	15,805	16,258	
	After	16,272	15,566	
	Average	16,039	15,912	
Total[c]		47,200	47,500	46,200

[a] Flowrates calculated from velocity traverse performed before the indicated run.

[b] Flowrates calculated from velocity traverse performed after the indicated run.

[c] Sum of during and average values, rounded to nearest 100 DSCFM.

* Dry Standard Cubic Feet per minute @ 68°F, 29.92 inches Hg.

** Velocity traverse not performed because emission test in inlet had not been completed.

TABLE 2-34

FLOWRATES* THROUGH THE PRILL TOWER SCRUBBER BYPASSES DURING LOW DENSITY AMMONIUM NITRATE PRODUCTION AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

Location	Time	8-12-80 Run 1	8-12-80 Run 2	8-13-80 Run 3
Bypass B	During	79,220		
	Before[a]		**	72,087
	After[b]		72,919	70,976
	Average		72,919	71,531
Bypass A	During		75,360	
	Before	69,836		67,129
	After	68,894		68,784
	Average	69,365		67,956
Bypass C	During			71,930
	Before	66,353	67,371	
	After	68,187	67,593	
	Average	67,270	67,482	
Total[c]		216,000	216,000	211,000

[a]Flowrates calculated from velocity traverse performed before the indicated run.
[b]Flowrates calculated from velocity traverse performed after the indicated run.
[c]Sum of during and average values, rounded to nearest 1000 DSCFM.
*Dry Standard Cubic Feet per minute @ 68°F, 29.92 inches Hg.
**Velocity traverse not performed because emission test in inlet had not been completed.

3.0 PROCESS DESCRIPTION AND OPERATIONS

Emission tests were performed at Columbia Nitrogen Corporation (CNC) in Augusta, Georgia during August 11 through 16, 1980, to characterize emissions from a low density prilling process. Emission data was obtained for the development of a new source performance standard for the ammonium nitrate (AN) manufacturing industry.

The tests were designed to characterize and quantify uncontrolled emissions from solids production facilities (prill tower, predryer, dryer, and cooler) and to determine control equipment efficiency. Also, visible emissions were observed from the bagging and coater discharge stacks. A flow diagram of the solids formation and finishing process is presented in Figure 3-1.

3.1 Process Equipment

A description of process operation and equipment used in the production of low density prills is presented below. This report deals only with emissions from solids formation and finishing equipment; therefore, only these solids production facilities are discussed.

The solid ammonium nitrate is produced in a prill tower which is designed to produce both high and low density prills. The type of product produced depends upon the concentration of the AN melt used. A 99.8 percent AN melt is used to produce high density prills, and a 96 percent AN melt is used to produce low density prills.

During this testing program low density prills were being produced. The 96 percent AN melt is delivered from the evaporators to the top of the prill tower where a spinning bucket receives the melt. The bucket rotates to force a stream of melt through orifices in the bucket. The melt stream breaks up

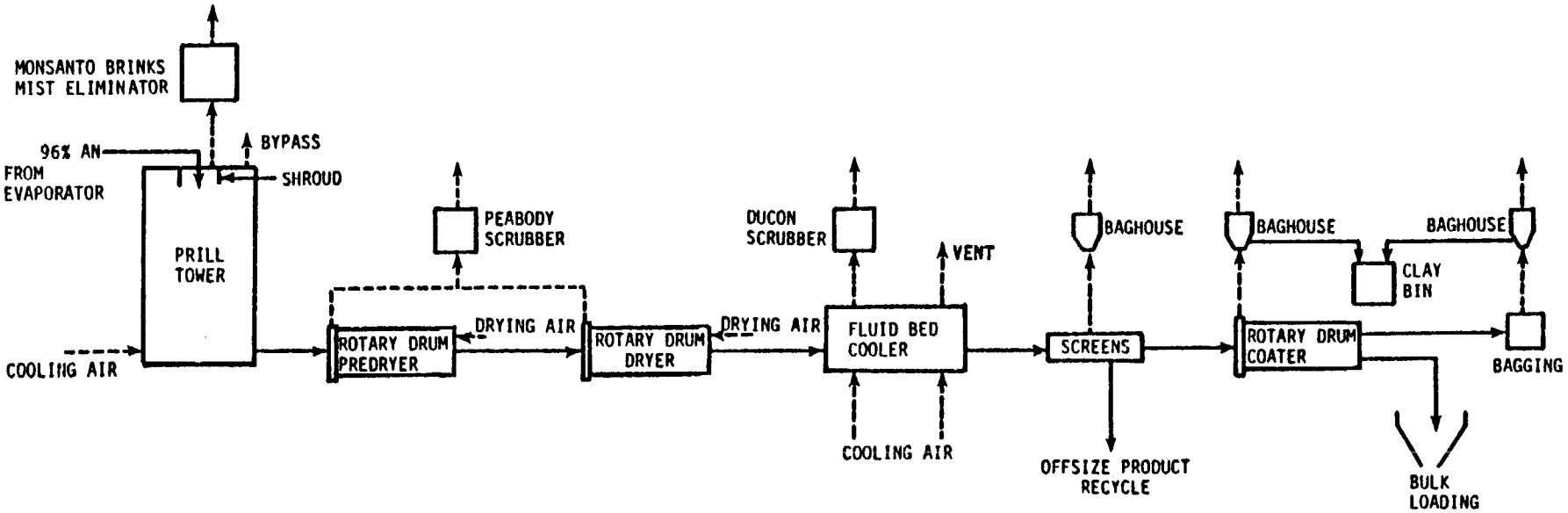


FIGURE 3-1: SCHEMATIC OF LOW DENSITY PRILLING PROCESS AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

into discrete droplets as it falls through the tower. Four fans located at the top of the prill tower create a countercurrent airflow which cools the falling droplets. The prills are conveyed from the bottom of the tower to the finishing units: the predryer, dryer, and cooler.

The finishing operation both removes excess moisture and cools the prills. The low density prills are first conveyed to a rotary drum predryer, where moisture is removed. They are then conveyed to a rotary drum dryer where more moisture is removed. Finally, a fluidized-bed cooler is used to remove nominal amounts of moisture and to cool the prills.

The cooled prills are then screened to yield a properly sized product. The offsize prills are redissolved and recycled to the melt concentration process. The product-sized prills are coated in a rotary drum coater with kaolin (clay) which prevents the solids from becoming moist and caking. The coated product is then either bulk shipped or bagged.

3.2 Emission Control Equipment

Emissions from the prill tower are controlled with a collection device (shroud) within the tower and a Monsanto HE Brinks mist eliminator located atop the tower. The tower is equipped with four fans which draw air through the tower. Three bypass fans are located at the top of the tower along the periphery, and the other fan is located at the top of the tower after the mist eliminator. The inlets to the mist eliminator are located within the collection device. The stainless steel collection device surrounds the spinning bucket. Since most of the fuming and ammonium nitrate emissions occur as the melt exits the bucket, the collection device captures a large portion of the emissions and ducts this portion to the mist eliminator. The air that does not get ducted to the mist eliminator is discharged through the three bypass stacks.

The Brinks mist eliminator contains atomizing sprays and spray catcher elements to remove large particulates, and high efficiency elements to remove fine particulates. The liquor for the sprays comes from the evaporator condensate. The liquor is pH adjusted with nitric acid to maintain the pH near neutral; otherwise, the fiberglass filter elements would corrode. The liquor is recycled through the Brinks until it reaches an AN concentration near 5 percent. The liquor is then recycled to the AN solution formation process.

Emissions from the rotary drum predryer and dryer are combined and ducted to a single Peabody tray scrubber. The fluidized-bed cooler uses two inlet air streams to cool the prills. One of these air streams is discharged to a Ducon mechanical impingement scrubber, and the other stream is vented directly to the atmosphere.

Emissions from the screening operation are ducted to a baghouse fabric filter. Rotary drum coater and bagging operation emissions are also controlled by a baghouse. The clay dust captured by the fabric filters is returned to the clay storage bins and is reused.

3.3 Production and Control Equipment Monitoring

During the emission testing program several process parameters were monitored to determine if the process was operating normally. Prill temperatures and moisture; melt temperatures and flowrates; scrubber pressure drop; scrubber liquor concentration, flowrate and pH; fan amperage, and production rate were monitored. These data are presented in Appendix P. Due to confidentiality claims by CNC, only scrubber pressure drops; fan amperage; scrubber liquor pH, flowrate and concentration; and production rates are presented in this section. These parameters are summarized in Tables 3-1 through 3-3.

TABLE 3-1

SUMMARY OF PRODUCTION RATES AND SCRBUBER OPERATING PARAMETERS
DURING PRILL TOWER MASS EMISSION AND PARTICLE SIZE TESTS AT
COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

Location of Test	Test Type* and Number	Production Rate: Prill Tower Mg/Hr	Prill Tower (TPH)	Final Product[1] Mg/Hr	Final Product[1] (TPH)	Scrubber Parameters (Brinks Mist Eliminator): Pressure Drop kPa	Pressure Drop in. H_2O	Fan Amperage	pH	% AN	Flow Pressure kPa	Flow Pressure psi
Prill Tower Scrubber Inlet, Outlet and Bypass	ME 1	28.7	(31.6)	21.1	(23.3)	3.4	13.7	34	3.8	7.2	359	52
	ME 2	28.7	(31.6)	22.2	(24.5)	3.5	14.2	34	5.7	7.4	365	53
	ME 3	30.2	(33.3)	23.1	(25.5)	3.4	13.6	34	3.4	7.2	359	52
Prill Tower Scrubber Inlet	PS 1	30.6	(33.7)	21.9	(24.1)							
	PS 2	27.1	(29.9)	16.9	(18.6)							
	PS 3	27.1	(29.9)	20.1	(22.1)							
Prill Tower Scrubber Bypass	PS 1	29.2	(32.2)	20.0	(22.0)							
	PS 2	27.1	(29.9)	19.0	(20.9)							
	PS 3	27.1	(29.9)	18.5	(20.4)							

*ME = Mass Emission Test
PS = Particle Size Test

[1] Corrected to remove coating material.

TABLE 3-2

SUMMARY OF PRODUCTION RATES AND SCRUBBER OPERATING PARAMETERS DURING PREDRYER AND DRYER MASS EMISSION AND PARTICLE SIZE TESTS AT COLUMBIA NITROGEN CORPORTION, AUGUSTA, GEORGIA

Location of Test	Test Type and Number*	Production Rate				Scrubber Parameters (Peabody Tray Scrubber)	
		Prill Tower		Final Product[1]		Liquor Flowrate	
		Mg/Hr	(TPH)	Mg/Hr	(TPH)	M^3/min	(gpm)
Predryer Scrubber Inlet Dryer Scrubber Inlet Predryer and Dryer Scrubber Outlet	ME 1	30.3	(33.4)	20.0	(22.0)	.035	(9.3)
Predryer and Dryer Scrubber Outlet	ME 2	27.1	(29.9)	19.9	(20.9)	.069	(18.3)
Predryer and Dryer Scrubber Outlet	ME 3	27.4	(30.2)	18.5	(20.4)	.049	(12.9)
Dryer Scrubber Inlet	PS 1	27.1	(29.9)	18.7	(20.6)		
Dryer Scrubber Inlet	PS 2	27.1	(29.9)	18.7	(20.6)		
Dryer Scrubber Inlet	PS 3	27.1	(29.9)	18.4	(20.3)		
Predryer Scrubber Inlet	PS 1	27.1	(29.9)	20.5	(22.6)		
Predryer Scrubber Inlet	PS 2	27.1	(29.9)	20.5	(22.6)		
Predryer Scrubber Inlet	PS 3	27.1	(29.9)	20.5	(22.6)		

* ME = Mass Emission Test
PS = Particle Size Test

[1] Corrected to remove coating material.

TABLE 3-1

SUMMARY OF PRODUCTION RATES AND SCRUBBER OPERATING PARAMETERS
DURING COOLER MASS EMISSION AND PARTICLE SIZE TESTS AT
COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

Location of Test	Test Type and Number*	Production Rate: Prill Tower Mg/Hr	Prill Tower (TPH)	Final Product[1] Mg/Hr	Final Product[1] (TPH)	Scrubber Liquor Parameters: pH	% AN	Liquor Flowrate M^3/min	Liquor Flowrate gpm
Cooler Scrubber Inlet and Bypass	ME 1	27.1	(29.9)	19.1	(21.0)	7.0	42.2	0.24	(6.3)
	ME 2	27.1	(29.9)	18.5	(20.4)	6.8	50.1	.016	(4.3)
	ME 3	27.1	(29.9)	20.3	(22.4)	6.9	38.6	.020	(5.2)
Cooler Scrubber Inlet	ME 2 (final Traverse)	27.1	(29.9)	20.5	(22.6)	6.9	38.6	.020	(5.2)
Cooler Scrubber Bypass	PS 1	28.7	(31.6)	22.0	(24.3)				
	PS 2	28.7	(31.6)	22.3	(24.6)				
	PS 3	30.1	(33.2)	22.7	(25.0)				
Cooler Scrubber Inlet	PS 1	30.0	(33.1)	24.2	(26.7)				
	PS 2	30.3	(33.4)	24.1	(26.6)				
	PS 3	30.3	(33.4)	24.1	(26.6)				

* ME = Mass Emission Test
PS = Particle Size Test

[1] Corrected to remove coating material.

Scrubber operating parameters were only monitored during the emission tests; therefore, for the particle size tests only production rates are reported. Operating parameters monitored during prill tower, predryer/dryer, and cooler tests are presented in Tables 3-1, 3-2, and 3-3, respectively. As can be seen from the tables, different operating variables are presented for each scrubber. This is due to inconsistencies in the plant scrubber monitoring techniques.

3.4 Process Operation During Testing

A review of the operating logs during testing revealed that during the test period there were no anomalies in process operation that affected emissions. Slight variations in operations which occurred were all within normal operative conditions.

A few minor problems did occur. At 9:00 a.m. on August 13, 1980, there was a ten minute decrease in production due to steam loss in the evaporator. On August 14, 1980 the system was down at 8:00 a.m., and was returned to normal operation at 9:30 a.m. Also on August 14, 1980 at 1:30 p.m. ammonium nitrate production was cut back five percent. The bucket elevator conveying prills from the prill tower to the dryers broke down during the second cooler emission test late in the afternoon of August 15, 1980. As a result, this test was completed the following morning.

4.0 LOCATION OF SAMPLING POINTS

This section presents descriptions of the sampling locations used during the emissions testing program conducted at the Columbia Nitrogen Corporation ammonium nitrate plant in Augusta, Georgia in August 1980. An overhead view of the plant site and pertinent process facilities is shown in Figure 4-1. An overhead schematic of the prill tower is shown in Figure 4-2.

4.1 Prill Tower

4.1.1 Scrubber Inlets - AN Sampling and Velocity Traverses

The three prill tower scrubber inlet sampling locations were each located in 32 1/2-inch ID vertical sections of stainless steel duct. A schematic of one of the three identical inlets is shown in Figure 4-3.

Two 4-inch holes cut through the duct wall were used as sampling ports. These ports were positioned 90 degrees apart in a horizontal plane and were located 12 inches (0.4 duct diameters) upstream from an elbow leading to the scrubber and 27 inches (0.8 duct diameters) downstream from a flow straightening baffle. The inlet locations did not meet the "eight and two diameters" criteria of EPA Method 1. For the AN sampling tests, 24 sampling points were used on each of the two traverse axes, for a total of 48 sampling points in each inlet. For the velocity traverses, 14 sampling points were used on each axis, for a total of 28 sampling points. Figure 4-3 shows a cross-sectional view of an inlet duct at the sampling location, and shows the exact distance of each sampling point from the duct wall for both the AN sampling and the velocity traverses.

4.1.2 Bypasses - AN Sampling and Velocity Traverses

The three prill tower scrubber bypass sampling locations were each located in 59 1/4-inch ID vertical sections of stainless steel duct. A schematic

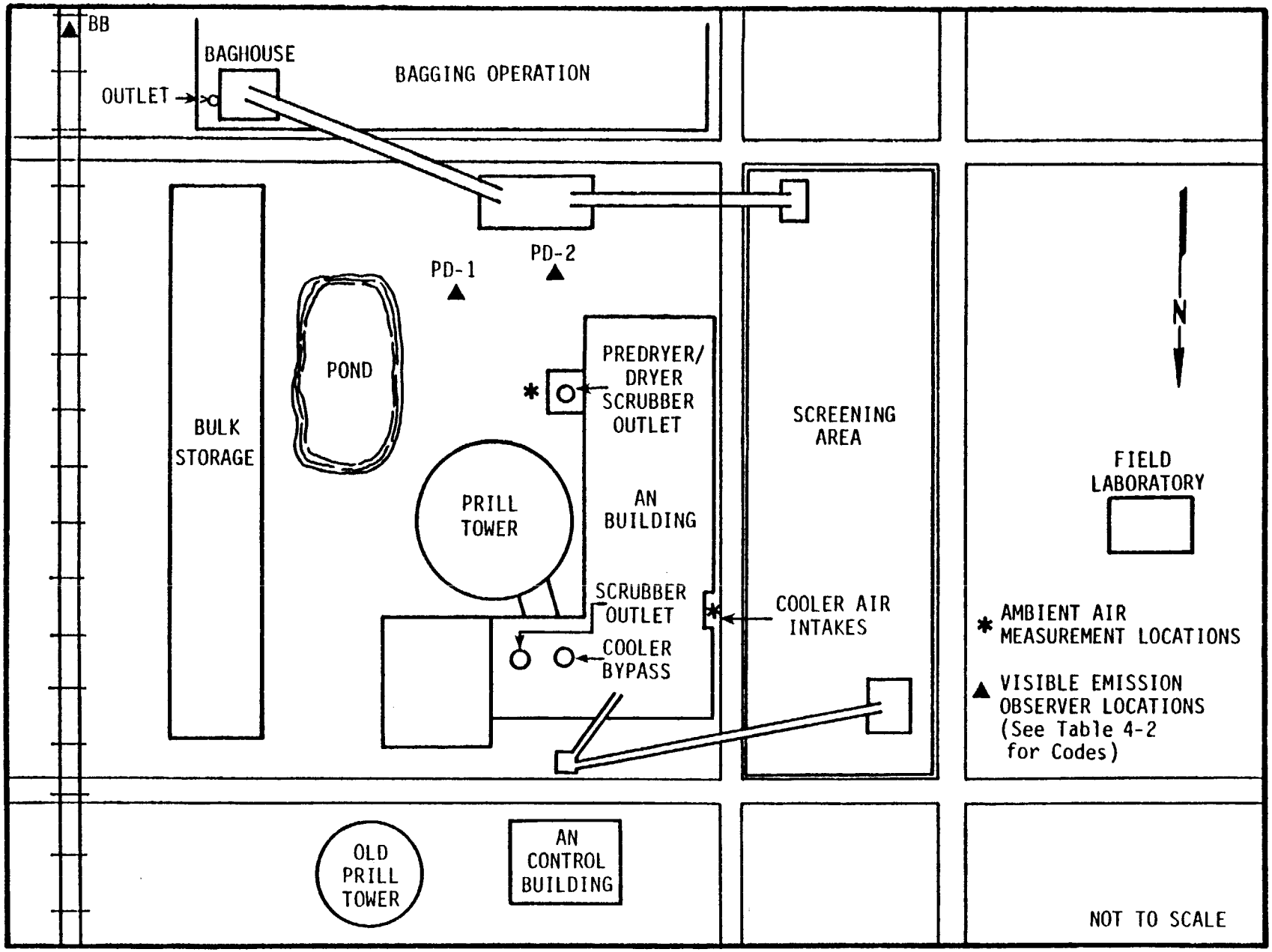


FIGURE 4-1: LAYOUT OF AMMONIUM NITRATE PRODUCTION FACILITIES AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

1430-E16

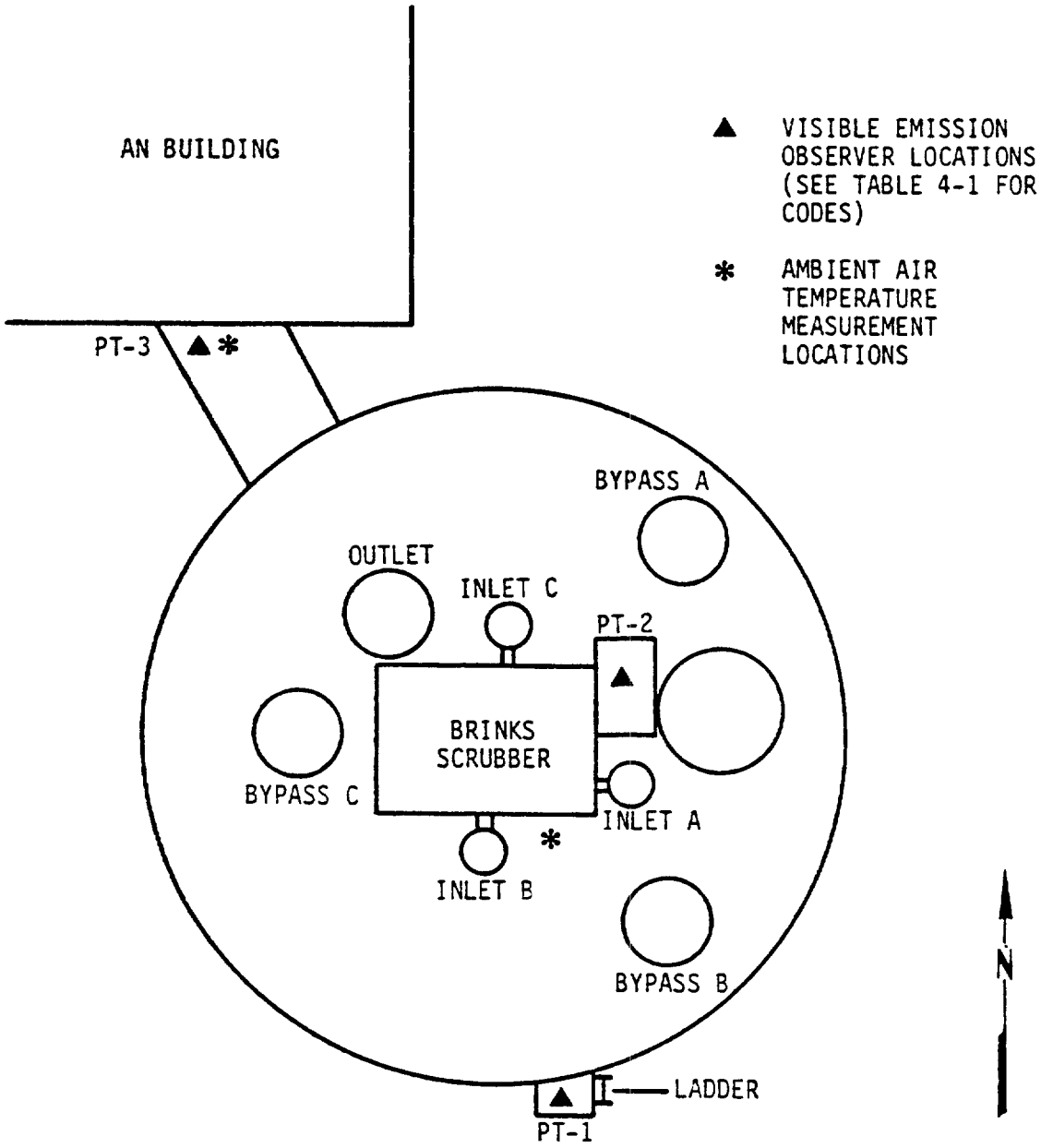
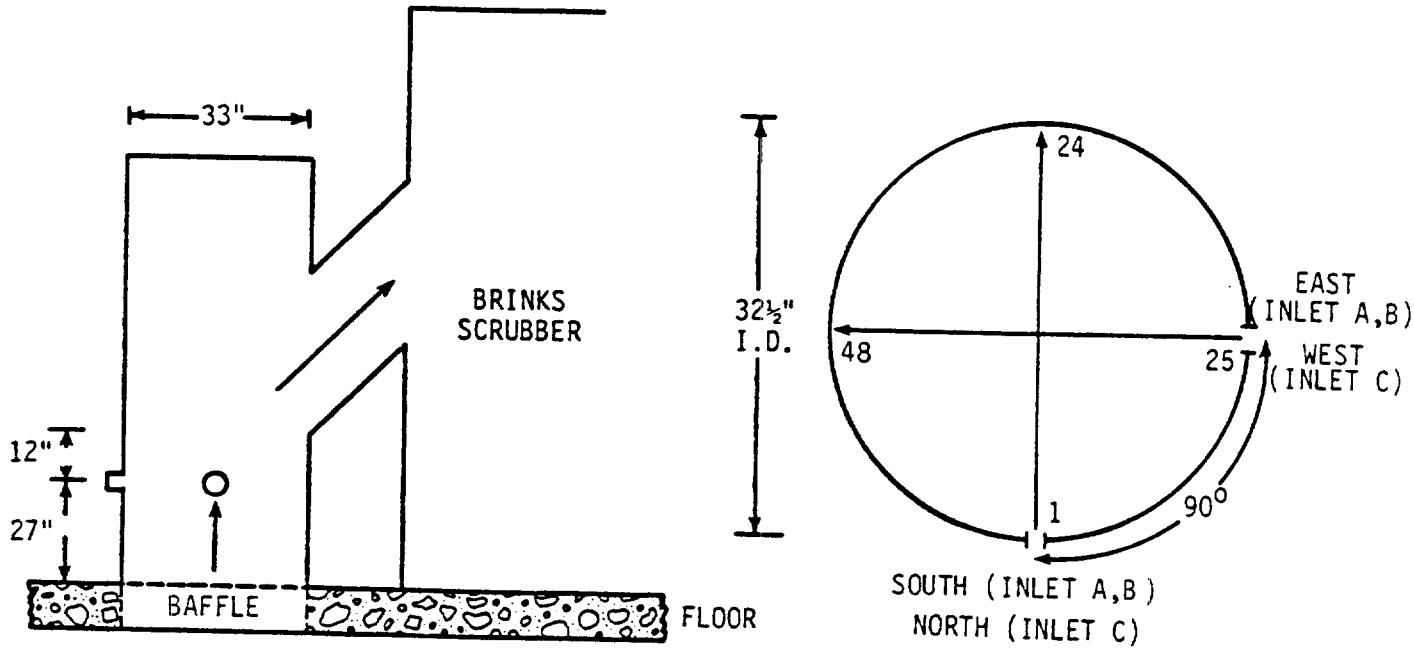


FIGURE 4-2: OVERHEAD VIEW OF PRILL TOWER AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

1430-E04



NOT TO SCALE

TRAVERSE POINT LOCATIONS			
PARTICULATE TESTS		VELOCITY TESTS	
TRAVERSE POINT NUMBER	TRAVERSE POINT LOCATION FROM OUTSIDE OF DUCT (INCHES)	TRAVERSE POINT NUMBER	TRAVERSE POINT LOCATION FROM OUTSIDE OF DUCT (INCHES)
1	1.0	1	1.0
2	1.0	2	1.9
3	1.8	3	3.2
4	2.6	4	4.8
5	3.4	5	6.5
6	4.3	6	8.7
7	5.2	7	11.9
8	6.3	8	20.6
9	7.5	9	23.8
10	8.8	10	26.0
11	10.5	11	27.8
12	12.9	12	29.3
13	19.6	13	30.7
14	22.0	14	31.5
15	23.7		
16	25.0		
17	26.2		
18	27.3		
19	28.2		
20	29.1		
21	29.9		
22	30.7		
23	31.5		
24	31.5		

FIGURE 4-3: PRILL TOWER SCRUBBER INLET SAMPLING LOCATION AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

1430-E05

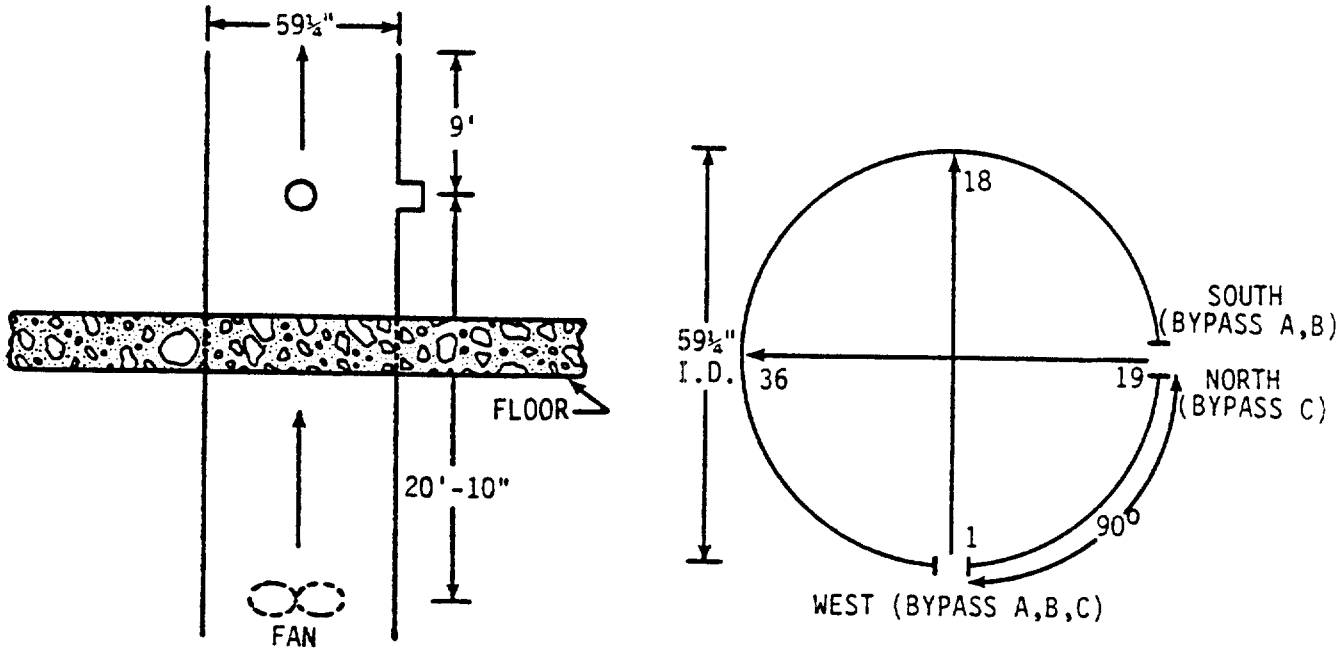
of one of the three identical bypasses is shown in Figure 4-4.

Two 4-inch holes cut through the duct wall were used as sampling ports. These ports were positioned 90 degrees apart in a horizontal plane and were located 6 feet (1.2 duct diameters) upstream from a barometric damper, and 20 feet 10 inches (4.2 duct diameters) downstream from an axial fan. The bypass locations did not meet the "eight and two diameters" criteria of EPA Method 1. For the AN sampling tests, 18 sampling points were used on each traverse axis, for a total of 36 sampling points in each bypass. For the velocity traverses, 12 sampling points were used on each traverse axis, for a total of 24 sampling points. Figure 4-4 shows a cross-sectional view of a bypass duct at the sampling location, and shows the exact distance of each sampling point from the duct wall for both the AN sampling and the velocity traverses.

4.1.3 Scrubber Outlet - AN Sampling

The prill tower scrubber outlet sampling location was located in a 48 1/2-inch ID vertical section of stainless steel duct. A schematic of the outlet is shown in Figure 4-5.

Two 4-inch pipe flange sampling ports (extending 8 inches from the stack wall) were positioned 90 degrees apart in a horizontal plane. The ports were located 8 feet (2 duct diameters) upstream from the top of the stack and 16 feet 6 inches (4.1 duct diameters) downstream from a bend leading from the outlet blower. Since the outlet sampling location did not meet the "eight and two diameters" criteria of EPA Method 1, 18 sampling points were used on each traverse axis, for a total of 36 sampling points. Figure 4-5 shows a cross-sectional view of the outlet duct at the sampling location, and shows the exact distance of each sampling point from the outside flange edge.

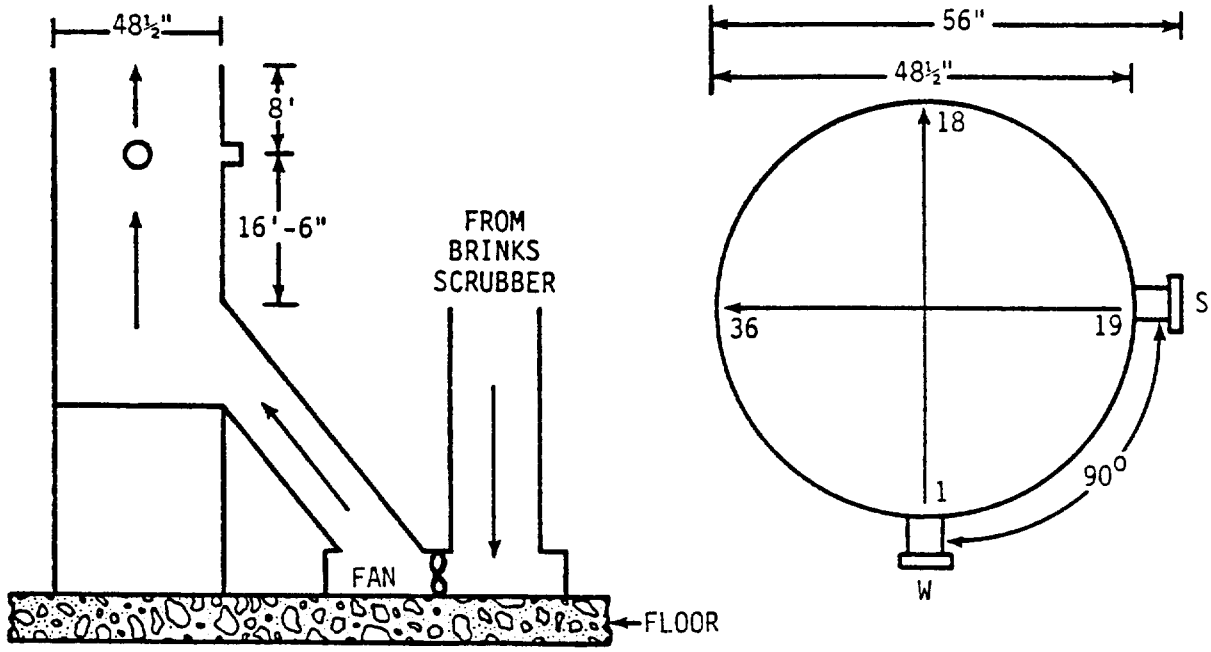


NOT TO SCALE

TRAVERSE POINT LOCATIONS			
PARTICULATE TESTS		VELOCITY TESTS	
TRAVERSE POINT NUMBER	TRAVERSE POINT LOCATION FROM OUTSIDE OF DUCT (INCHES)	TRAVERSE POINT NUMBER	TRAVERSE POINT LOCATION FROM OUTSIDE OF DUCT (INCHES)
1	1.0	1	1.3
2	2.6	2	4.0
3	4.5	3	7.0
4	6.5	4	10.5
5	8.7	5	14.9
6	11.2	6	21.2
7	14.0	7	38.3
8	17.6	8	44.6
9	22.7	9	49.0
10	36.8	10	52.5
11	41.9	11	55.5
12	45.5	12	58.3
13	48.3		
14	50.8		
15	53.0		
16	55.0		
17	56.9		
18	58.5		

FIGURE 4-4: PRILL TOWER BYPASS SAMPLING LOCATION AT COLUMBIA NITROGEN CORPORATION AUGUSTA, GEORGIA

1430-E06



TRAVERSE POINT LOCATIONS	
TRAVERSE POINT NUMBER	TRAVERSE POINT LOCATION FROM OUTSIDE OF DUCT (INCHES)
1	8.5
2	9.6
3	11.1
4	12.8
5	14.6
6	16.6
7	19.0
8	21.9
9	26.0
10	37.5
11	41.6
12	44.6
13	46.9
14	48.9
15	50.7
16	52.4
17	53.9
18	55.0

FIGURE 4-5: PRILL TOWER SCRUBBER OUTLET SAMPLING LOCATION AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

1430-E07

4.2 Prill Dryers - AN Sampling

4.2.1 Scrubber Inlet from the Predryer

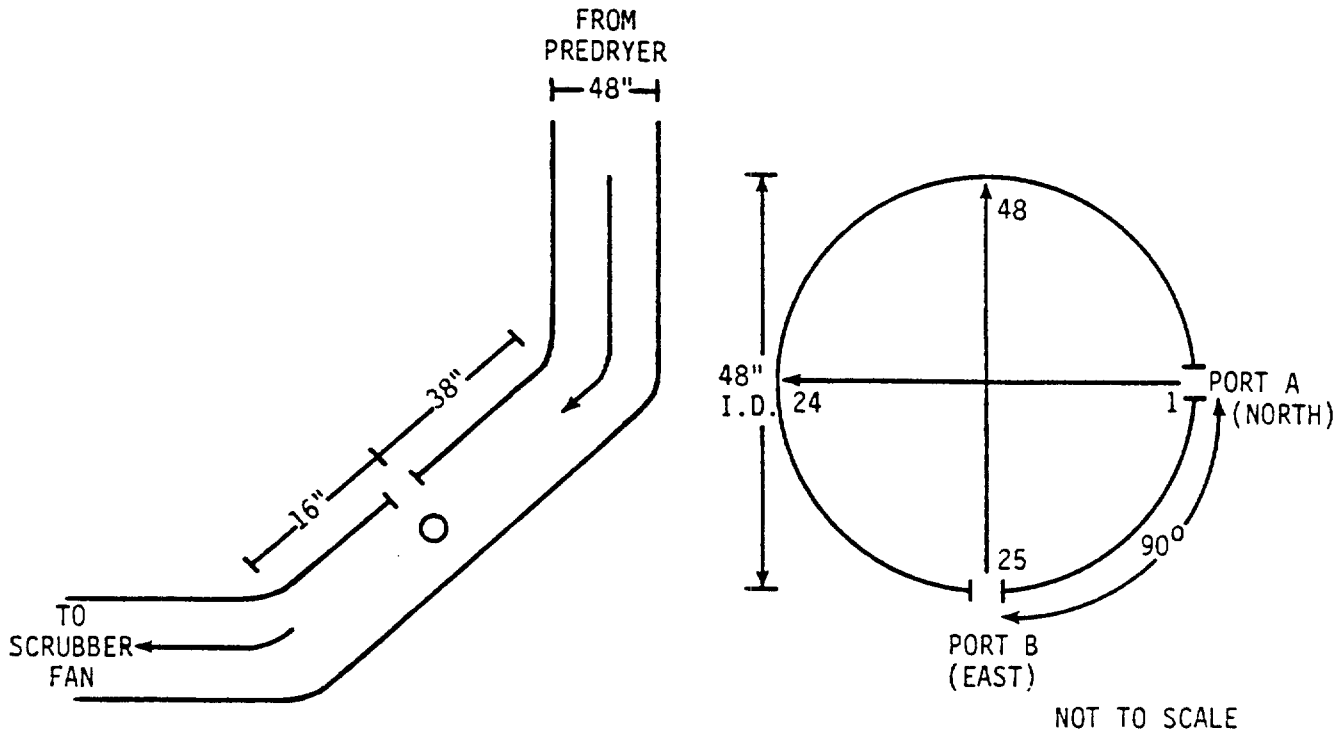
The scrubber inlet-from-the-predryer sampling location was a 48-inch section of stainless steel duct positioned approximately 30 degrees from the vertical. A schematic of this duct is shown in Figure 4-6.

Two 4-inch holes cut through the duct wall were used as sampling ports. These ports were positioned 90 degrees apart in a plane perpendicular to the duct axis. The ports were 38 inches (0.8 duct diameters) downstream from a right angle bend (where the duct goes through the AN building wall) and 16 inches (0.3 duct diameters) upstream from another right angle bend leading to the scrubber. Since this sampling location did not meet the "eight and two diameters" criteria of EPA Method 1, 24 sampling points were used on each traverse axis, for a total of 48 sampling points. Figure 4-6 shows a cross-sectional view of this duct at the sampling location, and shows the exact distance of each sampling point from the duct wall.

4.2.2 Scrubber Inlet from the Dryer

The scrubber inlet-from-the-dryer sampling locations was in a 53 1/2-inch ID section of stainless steel duct positioned approximately 30 degrees from the vertical. A schematic of this duct is shown in Figure 4-7.

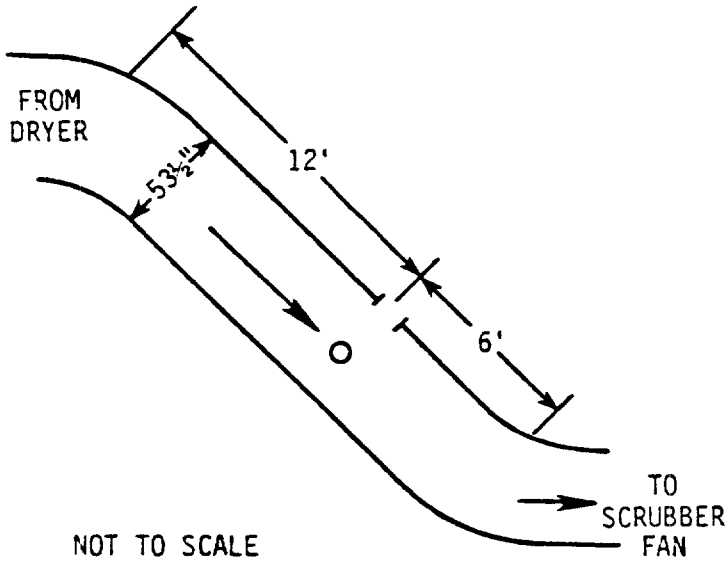
Two 4-inch holes cut through the duct wall were used as sampling ports. These ports were positioned 90 degrees apart in a plane perpendicular to the duct axis. The ports were 6 feet upstream from a bend leading to the scrubber and 12 feet downstream from a bend (where the duct goes through the AN building wall). Since this sampling location did not meet the "eight and two diameters" criteria of EPA Method 1, 22 sampling points were used on each

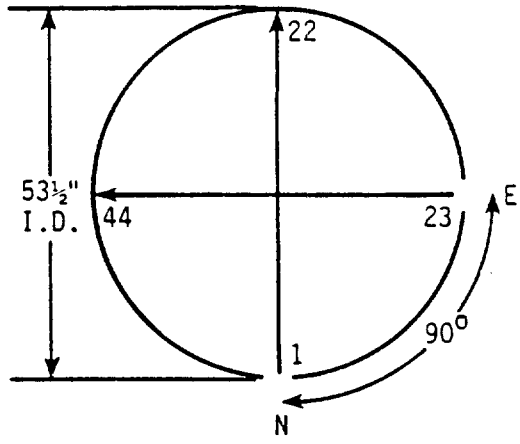


TRAVERSE POINT LOCATIONS	
TRAVERSE POINT NUMBER	TRAVERSE POINT LOCATION FROM OUTSIDE OF DUCT (INCHES)
1	1.0
2	1.5
3	2.6
4	3.8
5	5.0
6	6.3
7	7.7
8	9.3
9	11.0
10	13.0
11	15.5
12	19.1
13	28.9
14	32.5
15	34.9
16	37.0
17	38.7
18	40.3
19	41.7
20	43.0
21	44.2
22	45.4
23	46.5
24	47.0

FIGURE 4-6: PREDRYER INLET-TO-SCRUBBER SAMPLING LOCATION AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

1430-E08





TRAVERSE POINT LOCATIONS	
TRAVERSE POINT NUMBER	TRAVERSE POINT LOCATION FROM OUTSIDE OF DUCT (INCHES)
1	1.0
2	1.9
3	3.2
4	4.7
5	6.2
6	7.8
7	9.6
8	11.7
9	14.0
10	16.9
11	21.0
12	32.5
13	36.7
14	39.5
15	41.8
16	43.9
17	45.7
18	47.3
19	48.9
20	50.3
21	51.6
22	52.5

FIGURE 4-7: DRYER INLET-TO-SCRUBBER SAMPLING LOCATION AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

1430-E09

traverse axis, for a total of 44 sampling points. Figure 4-7 shows a cross-sectional view of this duct at the sampling location, and shows the exact distance of each sampling point from the duct wall.

4.2.3 Scrubber Outlet

The scrubber outlet sampling location was in a 77 1/2-inch ID vertical section of stainless steel duct. A schematic of this duct is shown in Figure 4-8.

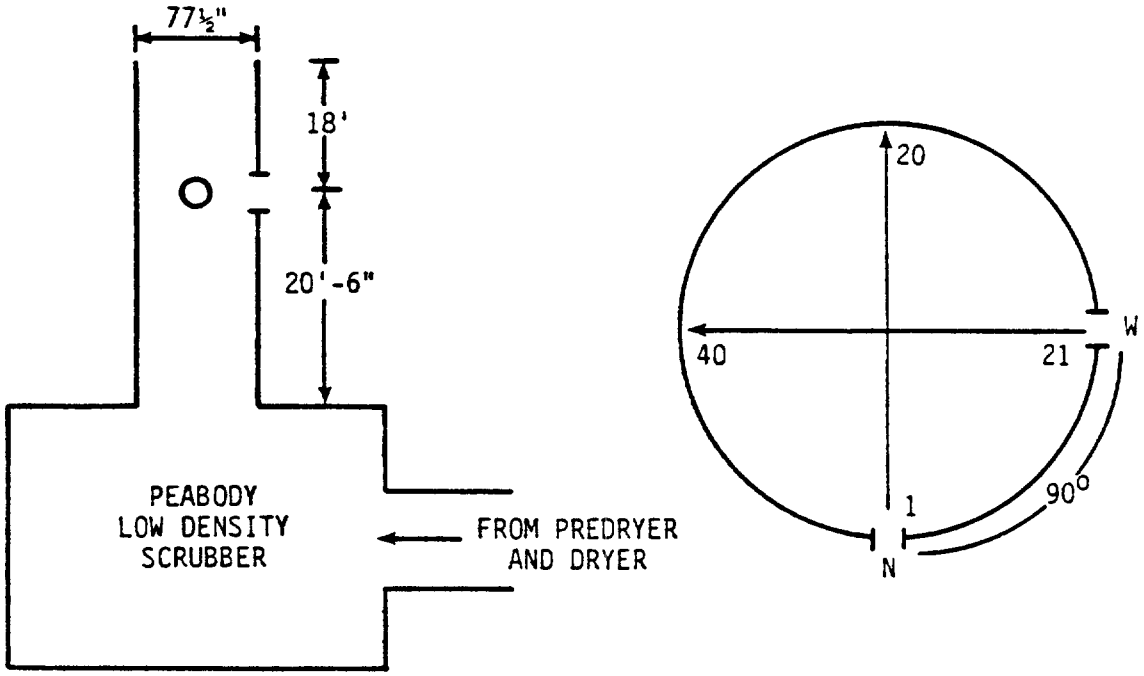
Two 4-inch holes cut through the duct wall were used as sampling ports. These ports were positioned 90 degrees apart in a horizontal plane and were located more than 12 feet (2 duct diameters) upstream from the top of the stack and 20 feet 6 inches (3.4 duct diameters) downstream from the scrubber unit. Since this sampling location did not meet the "eight and two diameters" criteria of EPA Method 1, 20 sampling points were used on each traverse axis, for a total of 40 sampling points. Figure 4-8 shows a cross-sectional view of this duct at the sampling location, and shows the exact distance of each point from the duct wall.

4.3 Prill Cooler - AN Sampling

4.3.1 Scrubber Inlet

The scrubber inlet sampling location was in a 47 1/2-inch ID horizontal section of stainless steel duct. A schematic of this sampling location is shown in Figure 4-9.

Two 4-inch holes cut through the duct wall were used as sampling ports. These ports were positioned 90 degrees apart in a vertical plane, and were located 9 inches (0.2 duct diameters) upstream from a right angle bend and 63 inches (1.3 duct diameters) downstream from a duct reduction leading from the

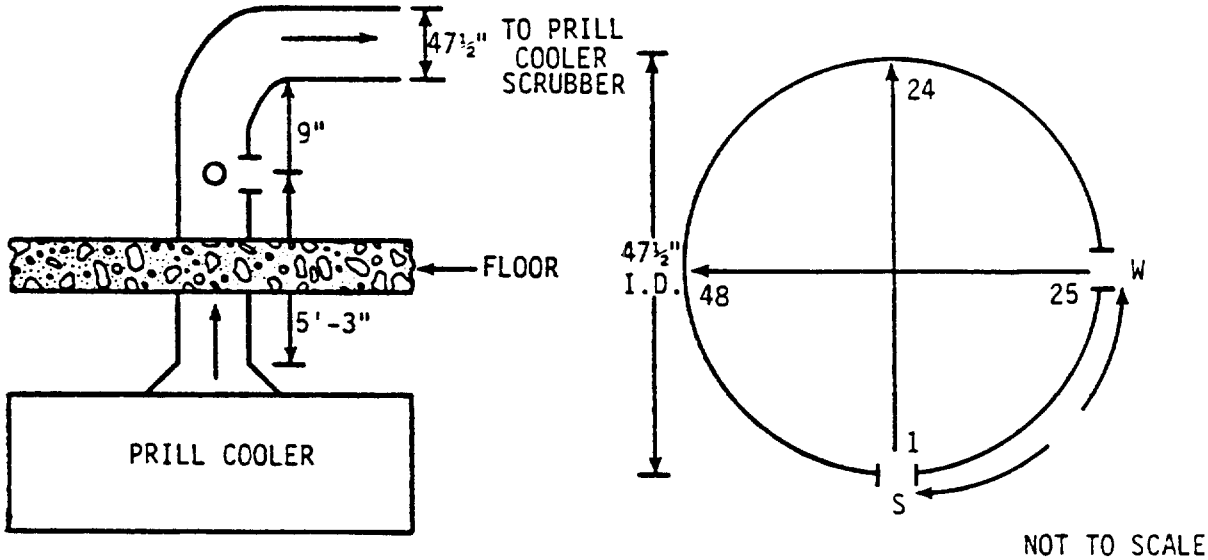


NOT TO SCALE

TRAVERSE POINT LOCATIONS	
TRAVERSE POINT NUMBER	TRAVERSE POINT LOCATION FROM OUTSIDE OF DUCT (INCHES)
1	1.0
2	3.0
3	5.2
4	7.5
5	10.0
6	12.9
7	15.8
8	19.9
9	23.7
10	30.1
11	47.4
12	53.8
13	58.1
14	61.7
15	64.7
16	67.5
17	70.0
18	72.3
19	74.5
20	76.5

FIGURE 4-8: PREDRYER/DRYER SCRUBBER OUTLET SAMPLING LOCATION AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

1430-E10



TRAVERSE POINT LOCATIONS	
TRAVERSE POINT NUMBER	TRAVERSE POINT LOCATION FROM OUTSIDE OF DUCT (INCHES)
1	1.0
2	1.5
3	2.6
4	3.8
5	5.0
6	6.3
7	7.7
8	9.2
9	10.9
10	12.9
11	15.3
12	18.9
13	28.6
14	32.2
15	34.6
16	36.6
17	38.3
18	39.9
19	41.2
20	42.5
21	43.8
22	44.9
23	46.0
24	46.5

FIGURE 4-9: PRILL COOLER SCRUBBER INLET SAMPLING LOCATION AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

1430-E11

cooler unit. Since this sampling location did not meet the "eight and two diameters" criteria of EPA Method 1, 24 sampling points were used on each traverse axis, for a total of 48 sampling points. Figure 4-9 shows a cross-sectional view of the duct at the sampling location and shows the exact distance of each sampling point from the outside duct wall.

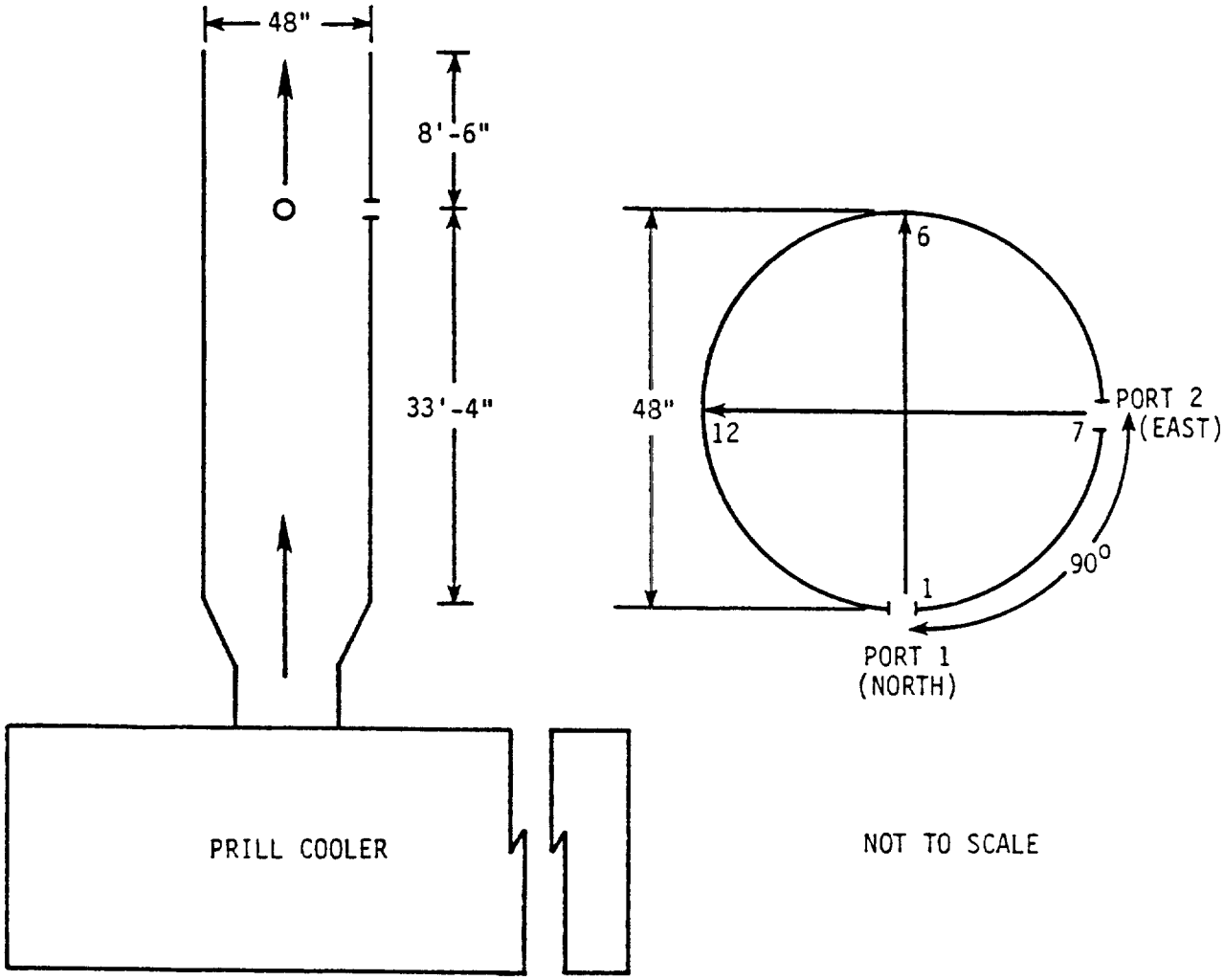
4.3.2 Bypass

The bypass sampling location was in a 48-inch ID vertical section of stainless duct. A schematic of this sampling location is shown in Figure 4-10.

Two 4-inch holes cut through the duct wall were used as sampling ports. These ports were positioned 90 degrees apart in a horizontal plane, and were located 8 feet 6 inches (2.1 duct diameters) upstream from the top of the stack and 33 feet 4 inches (8.3 duct diameters) downstream from a duct reduction leading from the cooler unit. This sampling location did meet the "eight and two diameters" criteria of EPA Method 1, and 6 sampling points were used on each traverse axis for a total of 12 sampling points. Figure 4-10 shows a cross-sectional view of this duct at the sampling location, and shows the exact distance of each sampling point from the outside wall of the duct.

4.4 Particle Size Test Locations

The particle size tests were performed at the same locations as the ammonium nitrate emission tests. Each test run was performed with an Anderson High Capacity Stack Sampler (HCSS) at a single average flow point in each duct. The average flow points were determined by preliminary velocity traverses. The exact sampling points that were used at each location are described in Table 4-1.



TRAVERSE POINT LOCATIONS	
TRAVERSE POINT NUMBER	TRAVERSE POINT LOCATION FROM OUTSIDE OF DUCT (INCHES)
1	2.1
2	7.0
3	14.2
4	33.8
5	41.0
6	45.9

FIGURE 4-10: PRILL COOLER BYPASS SAMPLING LOCATION AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

1430-E12

TABLE 4-1
SAMPLING POINTS USED FOR PARTICLE SIZE TESTS
AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

Unit	Test/ Location	Port	Sampling Point	Reference Figure
Prill Tower	Inlet A	East	4	4-3
	Inlet B	South	4	
	Inlet C	North	5	
	Bypass A	West	6	4-4
	Bypass B	West	5	
	Bypass C	North	3	
Predryer Inlet	1	North	16	4-6
	2	North	12	
	3	North	9	
Dryer Inlet	1	North	15	4-7
	2	North	11	
	3	North	8	
Cooler Inlet	All 3 runs	West	11	4-9
Cooler Bypass	All 3 runs	North	8*	4-10

* A 12-point traverse was used for these particle size tests. Point 8 was located 36 inches from the inside edge of the port.

4.5 Visible Emissions Observation Locations

The prill tower scrubber outlet and bypass plumes were observed from three locations atop the prill tower, shown in Figure 4-2. The predryer/dryer scrubber outlet plume was observed from two ground-level locations, shown in Figure 4-1. The prill cooler scrubber outlet and bypass plumes were observed from three locations atop the AN building near the outlet and bypass stacks. These locations are shown in Figure 4-11.

The coater baghouse plume was observed from two locations atop the AN building near the baghouse outlet. These locations are shown in Figure 4-11. The bagging operation baghouse plume was observed from one ground-level location, shown in Figure 4-1.

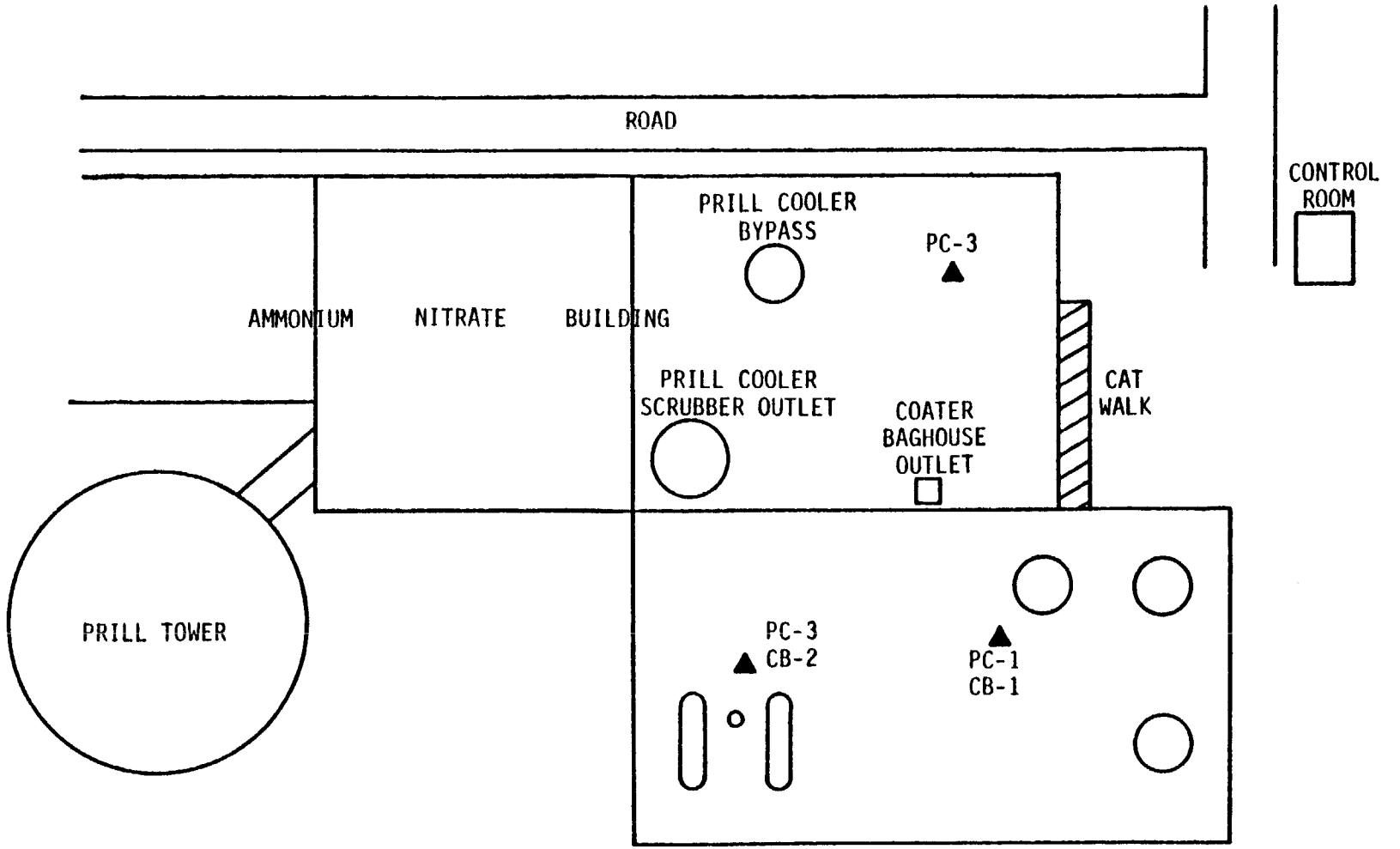
All observation locations were chosen to conform to the guidelines of EPA Method 9. Each observer location is described in Table 4-2.

4.6 Scrubber Liquor Sampling Locations

Scrubber liquor samples were collected from a tap on the recirculation stream pump at the prill tower (Brinks) scrubber, and from the sprayer feed line at the predryer/dryer (low density) scrubber. These sampling locations are shown in Figure 4-12 and 4-13, respectively.

4.7 Scrubber Pressure Drop Measurement Location

Pressure drop measurements were made across the prill tower scrubber with a vertical U-tube water manometer. One side of the manometer was connected to a pressure tap approximately one foot above the sampling ports in each inlet duct. The other side of the manometer was open to the atmosphere.



▲ VISIBLE EMISSION OBSERVER LOCATIONS
(refer to Table 4-2 for codes)

NOT TO SCALE

FIGURE 4-11: OVERHEAD VIEW OF PRILL COOLER OUTLET, BYPASS STACKS AND COATER BAGHOUSE OUTLET AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

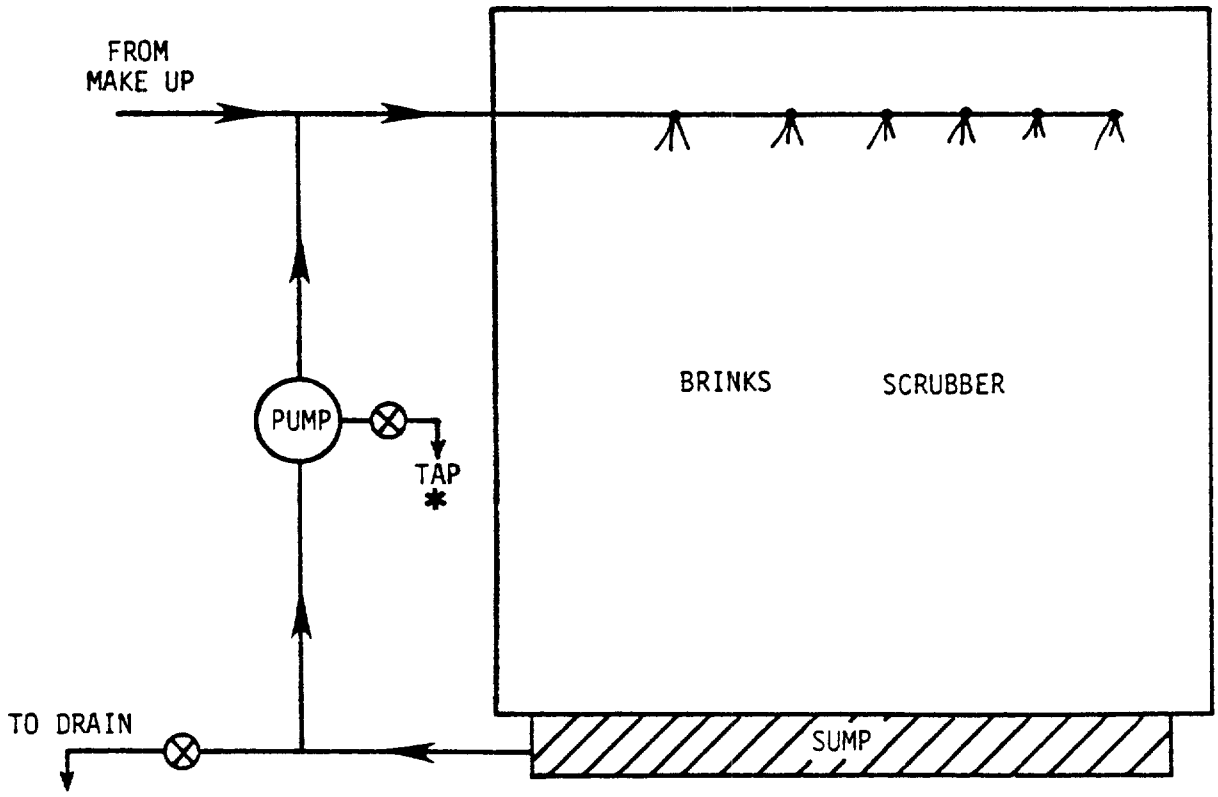
1430-E13

TABLE 4-2

VISIBLE EMISSONS OBSERVATION LOCATIONS AT
COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

Observer Location	Direction from Discharge Point	Distance from Discharge point (feet)	Height Above Ground (feet)	Discharge Description*
PT-1	SSW	15	250	PT bypass B
	SE	35	250	PT bypass C
PT-2	E	30	280	PT scrubber outlet
PT-3	NW	50	250	PT scrubber outlet
	WNW	25	250	PT bypass A
PD-1	SE	125	0	PD scrubber outlet
PD-2	S	125	0	PD scrubber outlet
PC-1	NE	35	115	PC scrubber outlet
PC-2	E	45	115	PC bypass
PC-3	N	15	135	PC bypass
CB-1	ENE	20	115	coater baghouse
CB-2	SE	40	115	coater baghouse
BB	SE	100	0	bagging baghouse

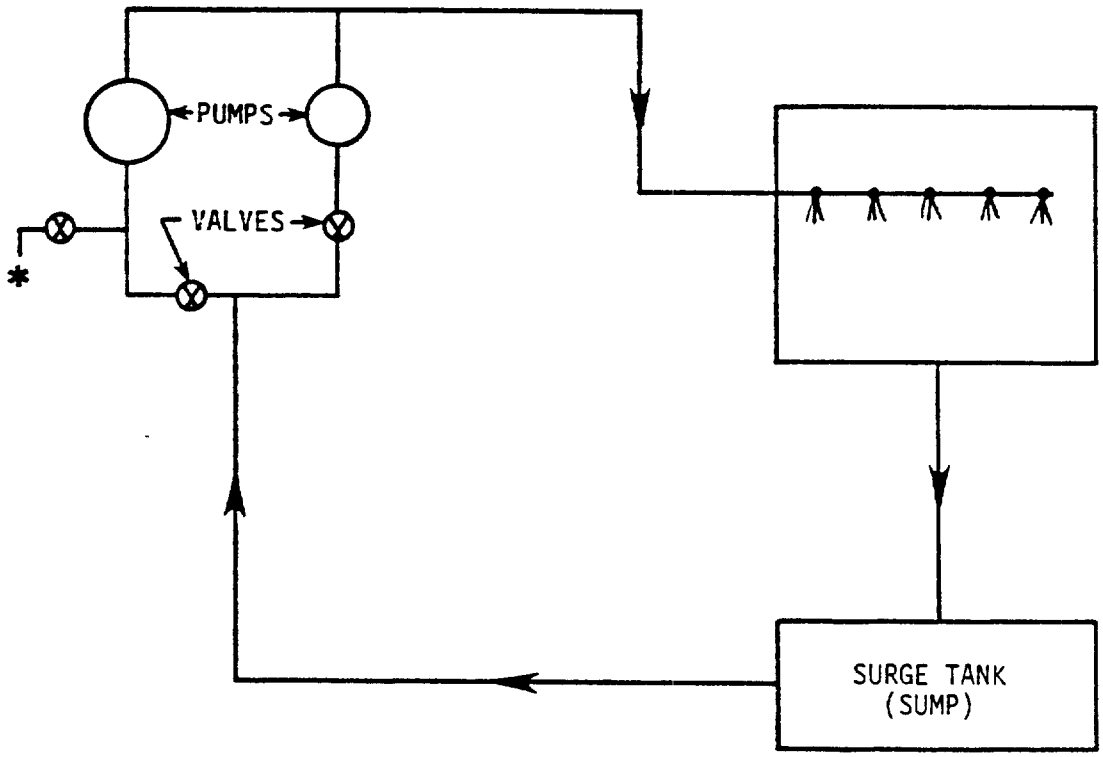
* PT = Prill tower
PD = Prill dryer
PC = Prill cooler



* SAMPLING LOCATION (RECIRCULATION STREAM TO BRINKS SCRUBBER)

FIGURE 4-12: PRILL TOWER SCRUBBER LIQUOR FLOW DIAGRAM AND SAMPLING LOCATION AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

1430-E14



* SAMPLING LOCATION

FIGURE 4-13: PREDRYER - DRYER SCRUBBER LIQUOR FLOW DIAGRAM AND SAMPLING LOCATION AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

1430-E15

4.8 Ambient Air Measurement Locations

Ambient air temperature and relative humidity measurements were taken at the top of the prill tower during the prill tower AN emissions tests, at ground-level at the base of the predryer/dryer scrubber during the predryer/dryer emissions tests, and at ground-level at the prill cooler air intakes during the cooler emissions tests. These locations are shown in Figure 4-2 (prill tower) and Figure 4-1 (dryer and cooler).

5.0 SAMPLING AND ANALYSIS METHODS

This section presents general descriptions of sampling and analysis procedures employed during the emissions testing program conducted at the Columbia Nitrogen Corporation ammonium nitrate manufacturing facility in Augusta, Georgia during August 10-16, 1980. Details of sampling and analysis procedures are contained in Appendices L and M.

5.1 EPA Reference Methods Used in This Program

The following EPA Reference Methods were used during this emission testing program. These methods are taken from "Standards of Performance for New Stationary Sources", Appendix A, Federal Register, Volume 42, (No. 160), Thursday, August 18, 1977, pp. 41755 ff.

- Method 1 - Sample and Velocity Traverses for Stationary Sources

  This method specifies the number and location of sampling points within a duct, taking into account duct size and shape and local flow disturbances.

- Method 2 - Determination of Stack Gas Velocity and Volumetric Flowrate

  This method specifies the measurement of gas velocity and flowrate using a pitot tube, manometer, and temperature sensor. The physical dimensions of the pitot tube and its spatial relationship to the temperature sensor and any sample probe are also specified.

- Method 4 - Determination of Moisture Content in Stack Gases

  This method describes the extraction of a gas sample from a stack and the removal and measurement of the moisture in that sample by condensation impingers. The assembly and operation of the required sampling train is specified.

- Method 9 - Visual Determination of the Opacity of Emissions from Stationary Sources

  This method describes how trained observers are to determine the opacity of emissions. The duration and frequency of observations, orientation of the observer with respect to the source, sun and background, methods of data recording and calculation, and qualifications of observers are specified.

The emissions tests and sample analyses were performed using EPA Reference Method 18, Determination of Particulate Emissions from Ammonium Nitrate Plants. This method incorporates modifications to EPA Reference Method 5, Determination of Particulate Emissions from Stationary Sources, that reflect the characteristics of ammonium nitrate (AN) and AN sources. With Method 5 as a reference, Method 18 specifies the isokinetic sampling of AN particulate from a gas stream utilizing techniques introduced in Methods 1, 2, and 4. Sample collection and recovery, sampling train cleaning and calibration, and gas stream flowrate calculations procedures are specified. No filter is used in the sampling train. Analysis of impinger samples for AN is performed with the specific ion electrode (SIE) method. Method 18 is described in its entirety in Appendix L.

5.2 Ammonium Nitrate Sampling and Analysis

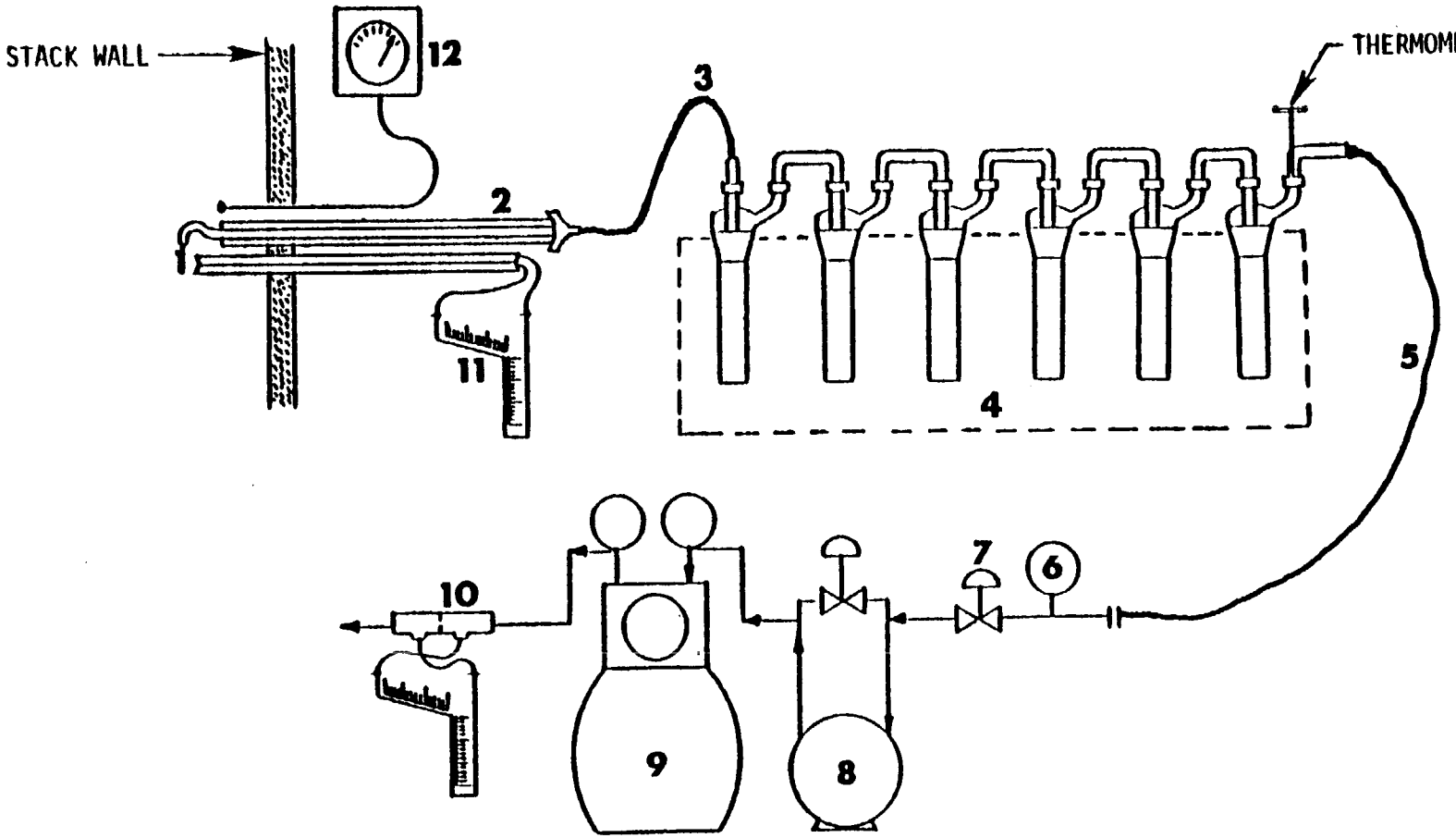
5.2.1 Sampling Methods

5.2.1.1 Prill Tower Sampling Methods

Ammonium nitrate in the prill tower scrubber inlets, bypasses, and outlet gas streams was sampled at points located in accordance with EPA Method 1. Duct gas velocities were measured using S-type pitot tubes constructed and calibrated in accordance with EPA Method 2.

The sampling train used on this program is shown in Figure 5-1 and is a modification to the particulate sampling train specified in EPA Method 18. The modifications used were: two acid impingers (instead of one) and use of a Teflon line. No filter is used in the sampling train.

The sampling train shown in Figure 5-1 consists of a nozzle, probe, Teflon line, six impingers, vacuum pump, dry gas meter, and an orifice flow meter. The nozzle is stainless steel and of buttonhook shape. The nozzle was



LEGEND

1 - NOZZLE	7 - NEEDLE VALVE
2 - PROBE	8 - PUMP
3 - TEFLON LINE	9 - DRY GAS METER
4 - ICE BATH	10 - ORIFICE
5 - FLEXIBLE LINE	11 - PITOT TUBE & INCLINED MANOMETER
6 - VACUUM GAGE	12 - POTENTIOMETER

FIGURE 5-1: MODIFIED EPA PARTICULATE SAMPLING TRAIN
AUGUST 18,1977, FEDERAL REGISTER

connected to a 5/8-inch stainless steel glass-lined probe wrapped with nichrome heating wire and jacketed. Following the probe, the gas stream passed through a 3/8-inch I.D. Teflon line into an ice bath/impinger system. The impinger system consisted of six impingers in series. The first, third, fifth, and sixth impingers were the Greenburg-Smith design, modified by replacing the tip with a 1/2-inch glass tube extended to within 1/2-inch of the impinger bottom. The second and fourth impingers were of regular Greenburg-Smith design including tips with orifice plates located within 1/2-inch of the impinger bottom. The first two impingers contained deionized, distilled water (100 mls each). The next two impingers contained 1N H_2SO_4 (100 mls each). The fifth impinger was empty, and the sixth contained 200 grams of indicating silica gel. Leaving the last impinger, the sample stream flowed through flexible tubing, a vacuum gauge, needle valve, pump, and a dry gas meter. A calibrated orifice and inclined manometer completed the train. The stack velocity pressure was measured with a pitot tube and inclined manometer. Stack temperature was monitored with a thermocouple attached to the probe and connected to a potentiometer. A nomograph was used to determine the orifice pressure drop required for any pitot velocity pressure and stack temperature in order to maintain isokinetic sampling conditions.

The probe temperature was maintained at about $10^{o}F$ above the stack gas temperature (but not higher than $180^{o}F$) in order to prevent condensation within the probe.

Test data recorded at each sampling point included test time, sampling duration at each traverse point, pitot pressure, stack temperature, dry gas meter volume and inlet-outlet temperature, probe temperature and orifice pressure drop.

No sampling problems were encountered during the emissions tests at the prill tower.

5.2.1.2 Prill Dryer Sampling Methods

The same AN sampling methods as described above for the prill tower emissions tests were used at the dryer and predryer scrubber inlet gas streams and at the scrubber outlet gas stream.

Some difficulties were encountered at the dryer and predryer inlets because of the heavy particulate loading at these locations. At the start of the first test run the nozzles and pitot tubes immediately plugged with particulate. Under the direction of the Technical Manager, larger diameter nozzles were attached to the probe (3/16-inch diameters replaced with 1/4-inch diameters) and sampling was resumed. Sampling time at each traverse point was reduced from three minutes to one minute. Plugged pitot tubes were reopened by squirting distilled water into the tubes and blowing them out with air.

Nozzle plugging reoccurred only during the third test run at the dryer inlet, and then only twice during the run. The first time a 10 ml volume of distilled water was poured into the probe to dissolve the plug; this water volume was discounted from impinger water gain measured during sample recovery. The second time plugging occurred, the plug was removed with a wire probe.

During one of the nozzle plugging occurrences some of the acid impinger contents backed up into the second water impinger. As a result, the TRC chemist analyzed the probe wash and water impinger contents separately for this particular run (as discussed in Section 5.2.3 below).

At the conclusion of the first dryer inlet test run the test crew discovered one of the sampling train impingers had broken (the final leak check indicated the train was open). This test run was therefore repeated.

Because of the larger diameter nozzles used at the inlet sampling locations, the sampling train pumps were not always able to produce orifice pressure drops sufficient to maintain isokinetic sampling conditions. The percent isokinetics for all three dryer inlet test runs and one of the predryer inlet runs were less than 90 percent isokinetic. As discussed in Section 2.2, the particulate mass flowrates for these four runs were calculated by two methods: the concentration method (by which calculations are normally done) and the area ratio method.[1] With the former method, the concentration of particulate entering the nozzle is calculated and then multiplied by the volumetric flowrate to obtain the mass flow rate:

$(m/V) \times Q = MFR$ (pounds per hour)

where m = amount of particulate sampled (pounds)

V = volume of sampled gas (dry standard cubic feet)

Q = volumetric flowrate (dry standard cubic feet per hour)

If the nozzle sampling velocity is less than the stack gas velocity (subisokinetic sampling conditions), then the calculated mass flowrate (MFR) will be <u>greater</u> than the true MFR. This is because the heavier particles will leave their streamlines (gas streamlines going around the nozzle) and will enter the nozzle, as they would under isokinetic conditions. Since the volume of gas sampled is <u>less</u> than what would be sampled under isokinetic conditions, the concentration m/V will be greater than that under isokinetic conditions.

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[1] Brenchley, D.F., et al., <u>Industrial Source Sampling</u>, Ann Arbor Science Publishers, Inc., 1973, p. 173 ff.

With the area ratio method, the mass of particulate collected is divided by the sampling time and then multiplied by the ratio of the stack area to the nozzle area to obtain the mass flowrate:

$$(m/t) \times (A_s/A_n) = \text{MFR (pounds per hour)}$$

where m = amount of particulate sampled (pounds)
t = sampling time (hours)
A_s = area of stack (square feet)
A_n = area of nozzle (square feet)

Again, if the nozzle sampling velocity is less than the stack gas velocity, then the MFR calculated by this method will be somewhat less than the true MFR. The lighter particles follow their streamlines around the nozzle and are not sampled; the amount of particulate sampled in time t is therefore less than what should be sampled. The volume of sampled gas is not a factor in this calculation. For a given test run, the average of the two calculated MFR's was calculated as an estimate of the true MFR.

As shown in the particle size data in Section 2.4, approximately 90 percent of the particles in the dryer and predryer scrubber inlets are approximately 10 microns and larger in diameter. Therefore, if 10 micron particles are considered large, the mass of particulate sampled will be within 10 percent of what would be sampled at isokinesis. The data in Tables 2-13a and 2-13b show that for each subisokinetic test run, the concentrations method MFR is approximately 10% greater than the average MFR and the area ratio method MFR is approximately 10% less than the average MFR.

5.2.1.3 Prill Cooler Sampling Methods

The same AN sampling methods as described above for the prill tower and predryer/dryer emissions tests were used at the prill cooler scrubber inlet and bypass gas streams.

During the second test run, the bucket elevator conveying the AN prills from the prill tower to the dryers broke down and a four hour delay was estimated before the elevator would be repaired. At the time (late afternoon) only three traverse points remained to complete the run at the inlet; one complete traverse remained to complete the run at the bypass. Under the direction of the Technical Manager, the inlet run was considered complete. The bypass sampling train was sealed and this run was completed the following morning.

Since the particulate loading was high at these locations, the 1/4-inch nozzles were used. Some nozzle and pitot plugging occurred nevertheless. As described in Section 5.2.1.2 above, pitot plugs were washed and blown out and nozzle plugs were dissolved with measured amounts of distilled water.

During each test run at the bypass, each axis was traversed twice because of the relatively few sampling points and the lighter grain loading in this duct. In this way sampling at the bypass was also kept concurrent with sampling at the inlet.

5.2.2 Sample Recovery and Preparation

At the completion of each test run at all sampling locations (prill tower, dryer, and cooler), the train was leak checked. Then the nozzle, probe, and flexible Teflon line were washed with deionized, distilled water (three times). The volume of the contents of each impinger was measured, and samples were put in glass containers with Teflon-lined caps as follows:

Jar #1 contents of the first two impingers, and the deionized, distilled water wash of their connecting glassware and the nozzle, probe, and Teflon line.

Jar #2 contents of the third, fourth, and fifth impingers and the 1N H_2SO_4 rinse of the impingers and their connecting glassware.

Jar #3 silica gel from the sixth impinger.

At the field laboratory the volumes of the contents of Jars 1 and 2 were measured, and the silica gel was weighed for moisture gain. The water impinger samples (Jar 1) were split into two portions: to one portion 1 ml boric acid solution was added per 100 ml of sample; the other portion remained untreated. The acid impinger samples remained untreated as well.

5.2.3 Sample Analysis

Ammonium nitrate analyses were performed in the field laboratory within 48 hours of sample collection. The boric acid treated portions of the water impinger samples were analyzed for nitrate (NO_3) with an Orion model 93-07 specific ion electrode (SIE) and an Orion model 407 A/F specific ion meter. Because high background ion concentrations interfere with the nitrate SIE analysis and because normally only a very small fraction of AN is not captured in the water impingers, only the water impinger samples were analyzed for nitrate. AN is calculated from nitrate by multiplying the measured nitrate mass by the stoichiometric factor 1.29.

As noted in Section 5.2.1.2 above, the acid impinger contents backed up into the water impingers during the third test run at the dryer inlet. The pH of the water impinger contents was less than 2, so in order to minimize the extent of any acid interference, the probe washings were not combined with the water impinger contents in this case, and the probe washings were analyzed seperately from the water impinger contents. The high nitrate concentration in the water impinger contents required that this sample be diluted 1250 times before analysis. The resulting sample pH was near 7, so no interference is expected to have occurred.

5.3 Ammonia Sampling and Analysis

5.3.1 Sampling, Sample Recovery and Preparation

The same samples collected and recovered as described in Sections 5.2.1 and 5.2.2 were analyzed for ammonia as well as for ammonium nitrate.

5.3.2 Sample Analysis

The untreated portions of the water impinger samples and the acid impinger samples were analyzed for ammonia at the field laboratory within 48 hours of sample collection. These analyses were performed with an Orion model 95-10 specific ion electrode and an Orion model 407 A/F specific ion meter. The SIE method is extremely specific for ammonia and is subject to few interferences.

In general, very little ammonia was detected in the acid impinger samples. For the prill tower emissions tests, the bypass and inlet acid impinger ammonia contents were at the threshold of detection; the outlet acid impinger ammonia contents averaged 39 percent of the total outlet ammonia catch. For the predryer/dryer emissions tests, the predryer inlet acid impinger ammonia contents averaged 1 percent of the total predryer inlet ammonia catch; the dryer inlet acid impinger ammonia contents were at the threshold of detection; the outlet acid impinger ammonia contents averaged 29 percent of the total outlet ammonia catch. For the prill cooler emissions tests, the inlet and bypass acid impinger ammonia contents were at the threshold of detection.

The relatively high acid impinger ammonia catches at the prill tower and predryer/dryer outlets probably reflects the presence of excess ammonia (gaseous ammonia) at these locations. Gaseous ammonia will be caught more readily in an acid solution than in a neutral solution like water. The

ammonia analysis results show that while the absolute amount of ammonia caught was lowest at the outlet locations, the percent excess ammonia (excess ammonia/total ammonia) was highest at the outlets.

5.4 Undissolved Solids Analysis

Analysis of the outlet and bypass samples for undissolved solids was requested by the Technical Manager subsequent to the completion of the field program. These analyses were performed at the TRC laboratory 18 to 22 days after sample collection. The remaining volume of the untreated water impinger sample portion was measured and then suction-filtered through a pre-weighed glass fiber filter to remove the undissolved solids. The filters were then desiccated and weighed to a constant weight.

The minimum detectable weight estimated by the TRC chemist was 1.0 mg, and since only one third of the total water impinger sample volume was filtered the limit of detection for these analyses was estimated to be 3.0 mg. This relatively high limit of detection was required because several filter analyses yielded negative weights. Further details of these analyses are contained in Appendix M.

The bypass sample from the first prill tower test run contained an orange colored particulate which may have precipitated during the time between sample collection and these analyses. The nature of this material is not known.

5.5 Particle Size Distribution Tests

Particle size distributions in the scrubber inlets and bypasses at the prill tower, predryer, dryer, and cooler were measured with an Anderson High Capacity Stack Sampler (HCSS). Particulate catches were washed out of the sampler with distilled water and analyzed for nitrate by SIE.

This section describes the sampling and analytical procedures used by MRI in performing the particle size tests. Further details are contained in Appendix E.

5.5.1 Sampling and Analytical Equipment Descriptions

The HCSS consists of two single jet impaction chambers followed by a third stage cyclone and a backup filter thimble. A schematic of the HCSS is shown in Figure 5-2. For the CNC tests the thimble was replaced by an impinger train.

The HCSS is specifically designed for heavy grain-loading applications where standard impactors cannot be used because of overloading or short sampling times. The HCSS should only be used in stack situations where at least 40 mg of particulates can be collected in Stages 1 and 2.

The sampled gas stream enters the system through a nozzle which is appropriately sized to maintain isokinetic sampling. The gas then passes through the Stage 1 acceleration jet. Particles with sufficient inertia are impacted out against the bottom of the Stage 1 impaction chamber. Smaller particles flow with the gas stream and exit the impaction chamber through three vent tubes.

Stage 2 of the HCSS is simply a scaled version of Stage 1 in which the jet nozzle diameter and the distance from jet exit to impaction surface have been designed for the proper Stage 2 cutpoint.

Stage 3 of the HCSS is a small cyclone of the Southern Research Institute (SoRI) design. A high efficiency glass fiber filter thimble can be used to remove all particles greater than 0.1 micron which remain in the gas stream downstream of the cyclone. The thimble was removed for these tests and an impinger train used to collect the particulate which passed through the HCSS.

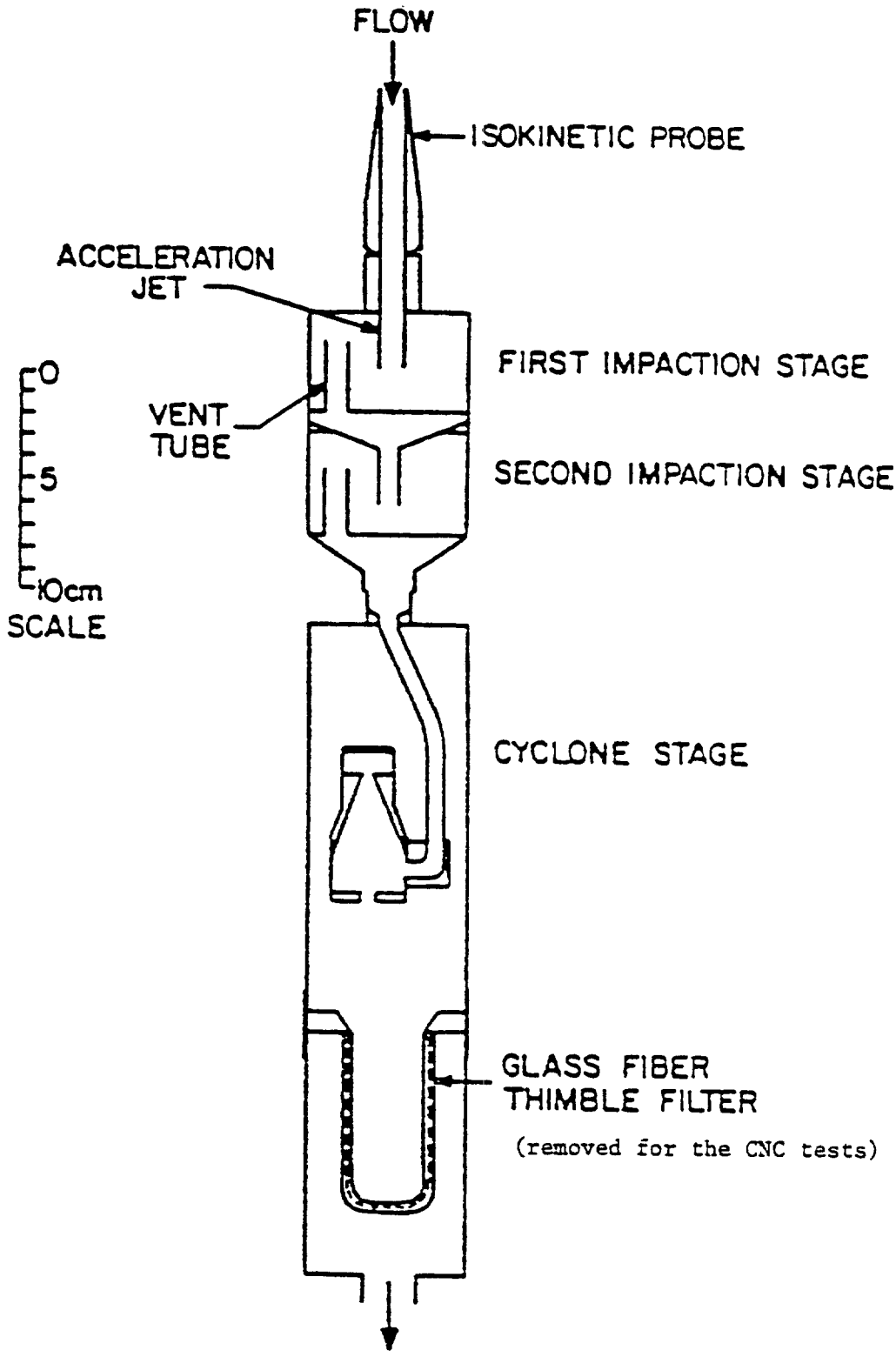


Figure 5-2: Schematic of the Anderson Model HCSS high grain-loading impactor.

Only straight nozzles should be used with the HCSS because gooseneck nozzles have inherent cutpoints lower than the cutpoint of Stage 1. Since the HCSS only provides four data points, it is important that the first point not be distorted by the wall loss material which would be separated out by the gooseneck nozzle.

Separation between Stage 2 and the cyclone stage is provided so that Stages 1 and 2 can be oriented to face directly into the gas stream without changing the orientation of the cyclone and backup filter. Figure 5-3 is a schematic of typical sampling positions for a stack with vertical upward flow.

The complete sampling train consisted of the HCSS, an impinger train, and an EPA Method 5 console as shown in Figure 5-4. The Method 5 modifications included removal of the pitot tube and filter assembly and placement of the HCSS at the end of the probe. A Teflon tube and/or a stainless steel pipe was used to connect the impactor to the impinger train. The first two impingers each contained 100 ml distilled water. The third impinger contained 100 ml 1N H_2SO_4, and the fourth contained 200 g of silica gel.

The analytical equipment consisted of an electrometer (pH meter with millivolt scale), a specific ion electrode, and a reference electrode. This instrumentation was calibrated and used to measure the nitrate ion concentration in the HCSS washes and the impinger catches.

5.5.2 Equipment Calibration

The components of the sampling train which were calibrated included the console and the nozzle dimensions for the HCSS. Each console was calibrated prior to shipment to the field using the techniques described in Method 5, with the exception that the probe temperature was determined with a thermocouple rather than a calibration curve. A post-test calibration was also

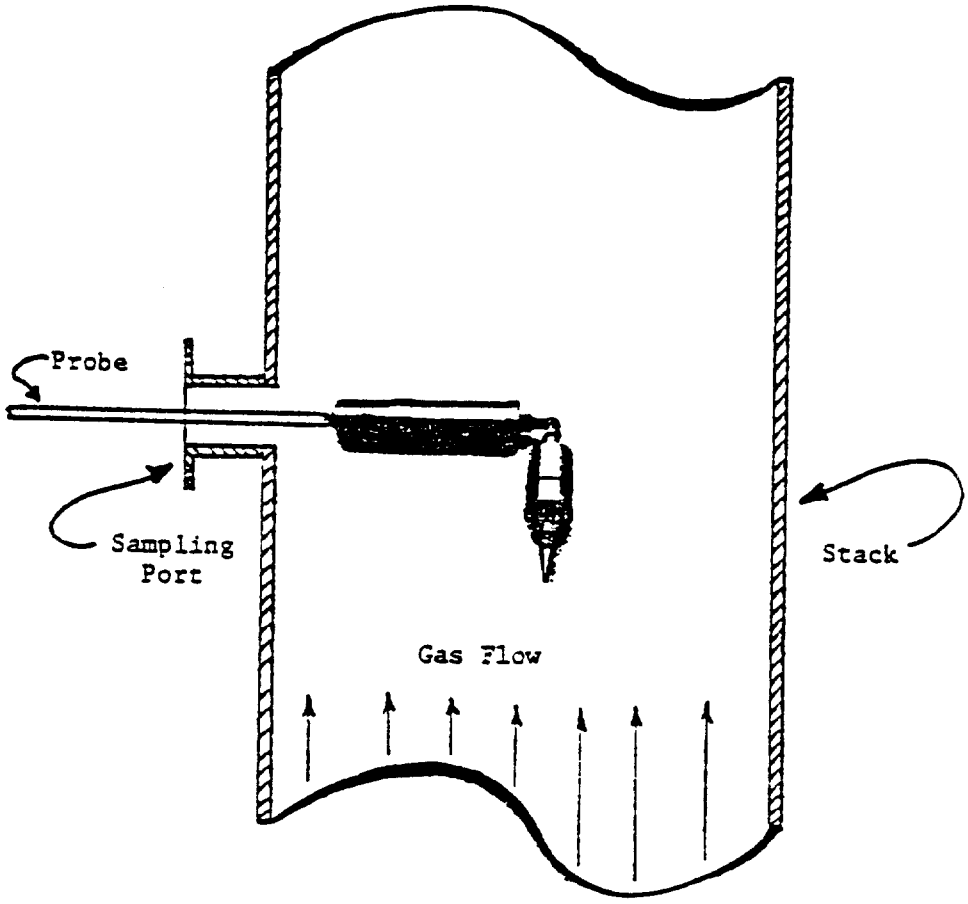


Figure 5-3: HCSS orientation schematic.

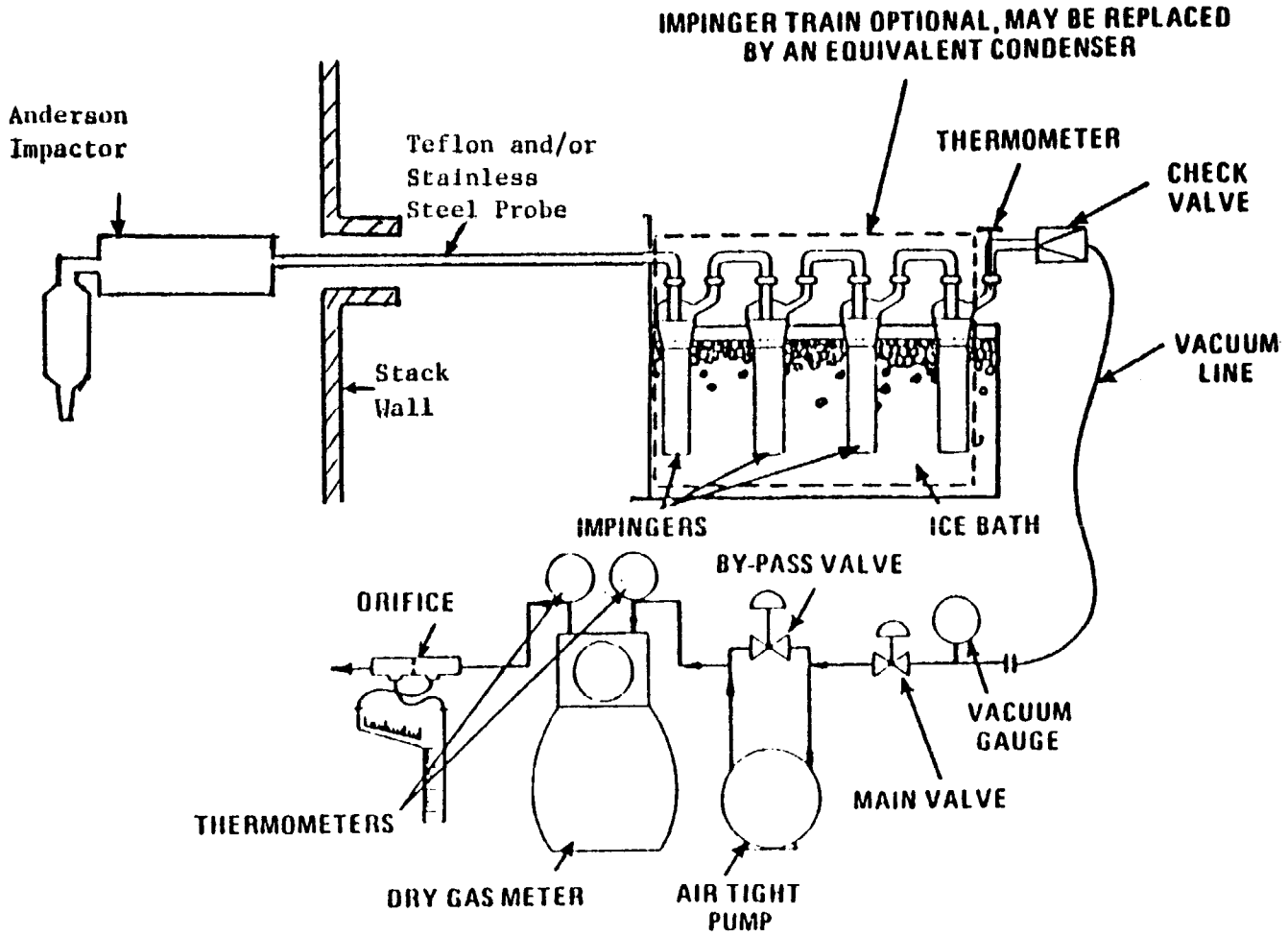


Figure 5-4: Schematic of HCSS sampling train.

performed on the consoles. The nozzle dimensions were determined according to the methods described in Method 5.

The ion electrode instrument was calibrated according to the description provided in EPA Method 18. Standard solutions of nitrate ion were prepared by dilution of stock solutions of known concentration. These standard solutions were individually measured with the electrometer, and a calibration curve was prepared prior to each set of laboratory analyses. A calibration check was performed at the end of each set of analyses.

5.5.3 Determination of Sampling Points

The stack velocity at each sample port as measured by TRC was used when available to calculate an average stack velocity. When data were not available from TRC, or there was reason to suspect that stack conditions had changed, MRI measured the stack velocity using EPA Method 2 procedures. MRI then selected a point as near as possible to the average velocity and temperature of that duct and sampled using isokinetic techniques.

Standard EPA methodologies as described in the Federal Register, Vol. 42, No. 160, Part II - Thursday, August 18, 1977, were used wherever applicable for Methods 1 and 2. The molecular weight of the stack gas was assumed to be 28.84, and the percent moisture was assumed to be 2.

The procedure of sampling at only one point can lead to substantial error if stratification of the particulate has occurred in the stack. Conditions which can lead to stratification include long horizontal ducts where heavier particles tend to collect at the bottom of the duct, bends in the duct which tend to concentrate the heavier particles near the outer radius, stack velocity stratification where the larger particles collect in the lower velocity areas, and changes in stack cross-section area. Since a constant sampling

rate must be maintained to preserve the impactor cutpoints, sampling at locations where the stack velocity varies may require multiple runs.

All sampling locations were evaluated for possible particulate stratification. For those locations where stratification was almost certain to exist, a different sampling point were used for each test run. Under the direction of the Technical Manager, these procesures were followed at the dryer and predryer scrubber inlets.

5.5.4 Determination of Sampling Rate and Nozzle Size

The HCSS collected particles at three distinct cut sizes which varied according to the sampling rate. A sampling rate was selected at each point which gave particle cutpoints of 10 to 12 microns for Stage III. Nozzle sizes which allowed for isokinetic sampling at specified sample rate and particle size were then selected. The nozzle size was determined using the procedure provided in the Anderson HCSS Operating Manual.

5.5.5 HCSS Impactor Test Procedures

The following sequence of events was used at each test location:

1. An impinger train was assembled in the field laboratory. The first, third, and fourth impingers were of the Greenburg-Smith design, modified by replacing the tip with 1.3-cm (1/2-in) ID glass tube extending to about 1.3 cm (1.2 in) from the bottom of the flask. The second impinger was of the Greenburg-Smith design with the standard tip. The first two each contained 100 ml of distilled water; the third, 100 ml of 1N H_2SO_4; and the fourth, 200 g of silica gel.

2. The sampler was cleaned and assembled as described in the Anderson HCSS Operating Manual.

3. The HCSS impactor was preheated in an oven in the field laboratory to a temperature higher than the gas temperature of the source to be tested. The impactor was wrapped in insulation for transport from the lab to the test site. The insultation was removed just prior to insertion into the sampling port. In this way sampling could begin immediately, with no need to wait to condition the sampler to stack temperature.

4. Gas stream parameters for velocity, temperature, moisture, and static pressure were obtained from TRC, if available; otherwise, they were determined by MRI.

5. The sampling apparatus was assembled and leak-checked at the test site following the leak check procedures in the Anderson HCSS Operating Manual.

6. The sample was collected isokinetically over a predetermined time period (15 minutes to 3 hours). Data were recordered every 3 to 5 minutes during each test.

7. Upon completion of the test, the impactor was removed from the sample port while continuing to draw sample. This avoided loss of sample due to possible negative stack pressure sucking the sample back out of the nozzole.

8. The probes and nozzles were then capped, and the impingers, probes and sample trains returned to the field lab for sample recovery.

Only minor problems were encountered in the actual testing. An overheated console pump caused interruptions in run 1 at the prill cooler uncontrolled outlet. This resulted in a low isokinetic value in this test. A fan was furnished by CNC which alleviated the problem. Also at this location, the impactor support was not used because of the small size of the port. A stainless steel pipe was used in line with the Teflon probe to help support the impactor. The stainless steel pipe was cleaned along with the Teflon probe.

5.5.6 Sample Recovery

The sample recovery procedures used for each test run are outlined below. Four sample containers were used for each run. A schematic of the recovery fractions is shown in Figure 5-5.

Sample Container No. 1

1. Remove nozzle from impactor. Wash inside nozzle with distilled, deionized water (DDW), and brush with nylon bristle brush. Wash and brush three times, then give final rinse with DDW.

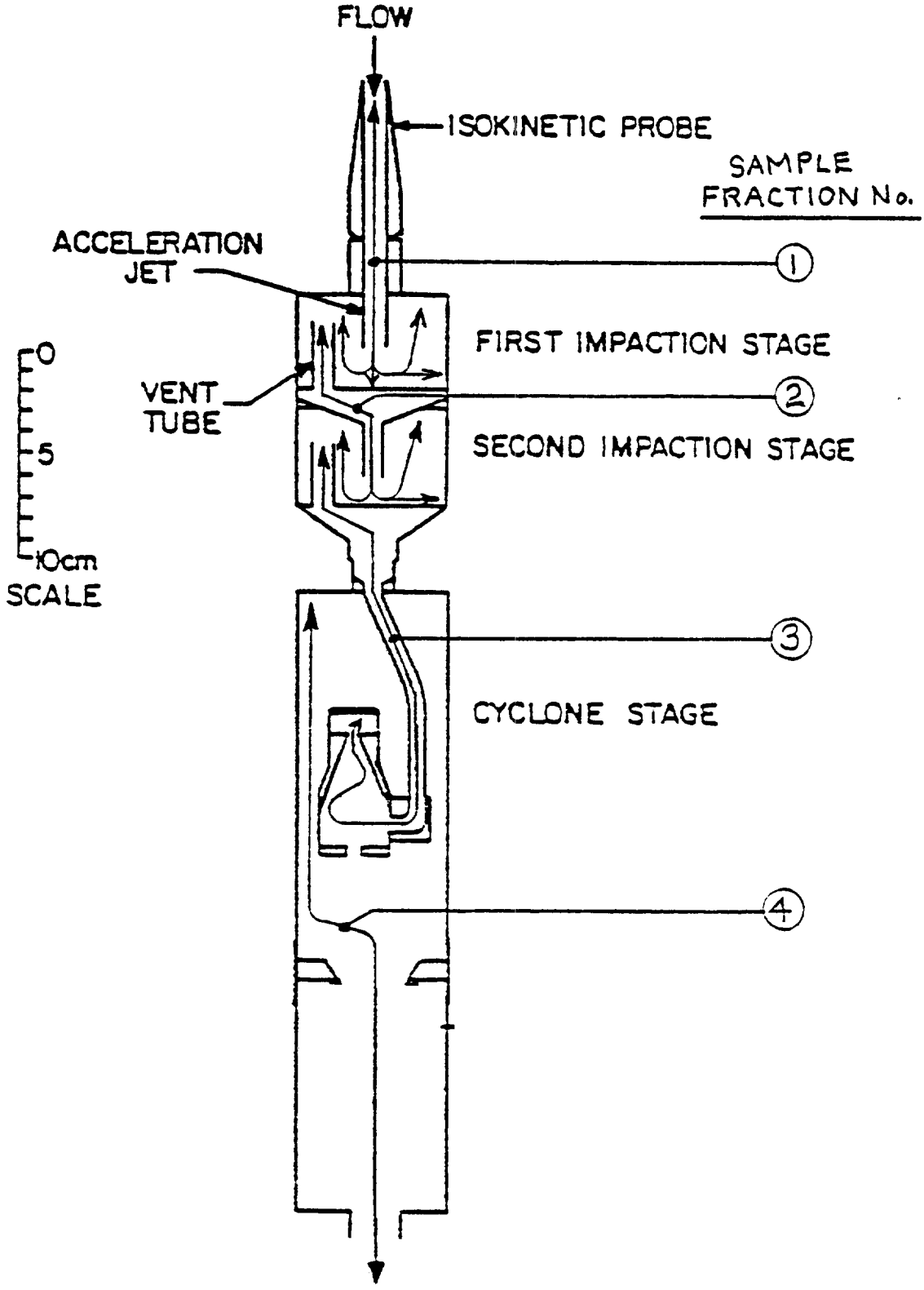


Figure 5-5: Schematic of the Anderson Model HCSS sample fractions.

2. Remove impactor Stage 1 cap. Wash and brush inside of cap and jet nozzle as above.

3. Remove impactor Stage 2 cap. Set aside Stage 2. Wash and brush interior surfaces of Stage 1 collection chamber as above; do not wash the interior surfaces of the three exit tubes.

Sample Container No. 2

1. Wash and brush inside of the three exit tubes of Stage 1 and the jet nozzle and inside cap of Stage 2 with DDW and nylon brush. Wash and brush three times, then give final rinse with DDW.

2. Wash and brush Stage 2 collection chamber as described in Stage 1 above, but do not wash the interior surfaces of the three exit tubes.

Sample Container No. 3

Wash and brush inside of the three exit tubes of Stage 2 and the exit chamber and the 1/2-inch NPT fitting with DDW and nylon brush as described above.

Sample Container No. 4

Solutions from impingers 1 and 2 were each used to rinse the Teflon and stainless steel sample lines connecting the impactor and the impingers. The line was rinsed three times with each portion and placed in a sample container. This was done to minimize sample volume. The contents of impingers 3 and 4 were discarded.

Each sample fraction was rinsed into a clean polypropylene bottle and boric acid preservation was added to each sample. Samples were then shipped to the MRI laboratory.

5.5.7 Field Sample Analysis

An Orion nitrate specific ion electrode and a Corning model 12 potentiometer were calibrated using standard nitrate solutions. The electrode was then placed in each field sample and a millivolt reading was recorded as soon as the meter stabilized. Three aliquots from each sample were measured and an average nitrate concentration calculated. Where necessary, samples were diluted to bring concentrations into the working range of the electrode.

Because of potentiometer malfunctions during the initial analysis of audit samples, the field samples were not analyzed at CNC. All samples were returned to the MRI laboratory in Kansas City and analyzed within four weeks of sample collection.

5.5.8 Analysis of Audit Samples

The audit samples provided by EPA were to be analyzed prior to analysis of the stack samples to establish quality assurance control. Some difficulty was encountered in achieving satisfactory results in the field due to a malfunction in the ion electrode potentiometer. The general problem was manifested by a lack of reproducibility for the calibration curve and the audit sample results. The audit samples were returned to the MRI laboratory in Kansas City. The problem was corrected later by the MRI electronics shop, where the potentiometer was serviced and a new electrode purchased, and all samples were rerun at MRI.

All audit sample data are contained in Appendix E. Five audit samples were provided. Each was measured after a preliminary dilution to ascertain a concentration range. Additional dilutions were made as necessary to bring the concentrations within the optimum analyzer range.

5.6 Visible Emissions Observations

The visible emissions observations were conducted by two certified visible emissions observers in accordance with EPA Method 9. Observations of the prill tower bypass and scrubber outlet plumes were taken from three locations on the prill tower as shown in Figure 4-2. During each of the three emission test runs, one observer monitored the outlet plume and the other observer concurrently monitored the plume from the bypass being tested for AN emissions. Observations of a given plume lasted two hours during an emission test run, and within the two-hour period readings were taken and recorded at 15-second intervals. Six-minute averages were calculated from the 15-second observations. Clear or partly cloudy skies and gray structures on the prill tower were used as backgrounds.

Observations of the predryer/dryer scrubber outlet plume were conducted as described for the prill tower observations. The outlet plume was monitored for two hours during each of the three emission test runs performed at this location. Observations were taken from the ground-level locations as shown in Figure 4-1. Partly cloudy skies and the gray prill tower were used as backgrounds.

Observations of the prill cooler bypass and scrubber outlet plumes were conducted as described for the prill tower observations. The outlet plume was monitored from a roof one story below and to the east of the outlet stack, as shown in Figure 4-11. The gray AN building elevator shaft structure was used as a background. The outlet plume was monitored for four one-hour periods. Only one period was concurrent with any of the three cooler inlet and bypass emission test runs. The bypass plume was monitored from the roof of the AN building (through which the bypass stack projects) and from the roof one story below and to the east. These locations are shown in Figure 4-11. The AN building elevator shaft and clear skies were used as backgrounds. The bypass plume was monitored for three one-hour periods, two of which were concurrent with the cooler inlet and bypass emission test runs.

The coater and bagging baghouse outlet plumes were monitored in the same manner as described above. The coater baghouse plume was monitored from two locations on the same roof from which the cooler scrubber outlet plume was observed, as shown in Figure 4-11. Observations were taken over three one-hour periods, using clear sky as a background. The bagging baghouse plume was monitored from one ground-level location shown in Figure 4-1. Observations were taken over two one-hour and two 1/2-hour periods, using clear sky as a background.

5.7 Scrubber Liquor Sampling and Analysis

Five or six 100-ml liquor samples were collected from the prill tower scrubber and the predryer/dryer scrubber during each emission test run at these locations. Samples were collected in glass jars with Teflon-lined caps. The temperature of each liquor sample was measured immediately following its collection. Once the sample reached room temperature, the pH was measured. The samples collected during a test run were then combined to form one composite sample per run.

At the field laboratory, the composite samples were filtered using a tared glass fiber filter in order to remove undissolved material. The nitrate and ammonia analyses were performed within 24 hours of sample collection using the methods discussed in Sections 5.2 and 5.3. The solids analyses were performed by desiccating and weighing each filter to a constant weight at the TRC laboratory within 10 days of sample collection.

5.8 Scrubber Pressure Drop Measurements

Pressure drops across the prill tower scrubber were measured with a vertical U-tube water manometer. One side of the manometer was connected to a pressure tap in the scrubber inlet duct approximately 12 inches above the emission test sampling ports. The other side of the manometer was open to the atmosphere. During each emission test run at a given inlet, pressure drop measurements were taken every 30 minutes at that inlet, except during run 2. Due to an oversight by the field team leader, pressure drop measurements during run 2 were continued at inlet B instead of inlet A where the emission test was being performed. During emission test run 3 at inlet C, pressure drops were measured at inlet A as well as at inlet C.

5.9 Ambient Air Measurements

Ambient air temperature and relative humidity were measured every 30 minutes during each emission test run at the prill tower, predryer/dryer, and cooler. Measurements were taken at the top of the prill tower, at ground level next to the predryer/dryer scrubber, and at ground level near the air intakes to the cooler. Wet bulb and dry bulb temperature measurements were made with a sling psychrometer. Psychrometric tables were then used to compute relative humidity from these measurements.

5.10 Volumetric Flowrates through the Prill Tower

During each emission test run at the prill tower, velocity traverses were performed at each scrubber inlet and bypass not being tested for emissions. Two perpendicular traverses were performed at each location at the beginning and end of each emission test. Velocity head and stack gas temperature were measured at each sampling point in accordance with EPA Method 2.

Duct static pressure, percent moisture, and stack gas molecular weight values obtained from the scrubber inlet and bypass emission test runs were applied on a run-by-run basis to the inlets and bypasses undergoing velocity traverses in order to compute volumetric flowrates. Velocity head and temperature data are contained in Appendix J.

PE 474
V.2

United States
Environmental Protection
Agency

Office of Air Quality
Planning and Standards
Research Triangle Park NC 27711

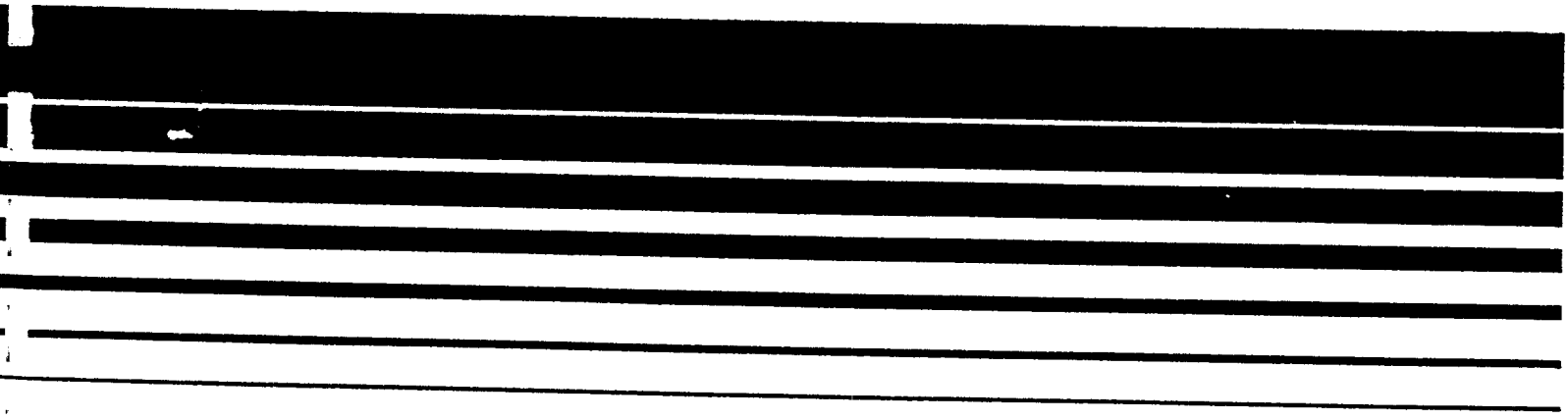
EMB Report 80-NHF-16a
January 1981

Air

EPA

Ammonium Nitrate

Emission Test Report Columbia Nitrogen Corporation Augusta, Georgia



PE-A-474
V. 2

PROCESS EMISSIONS TESTS
AT THE COLUMBIA NITROGEN CORPORATION
AMMONIUM NITRATE PLANT
IN AUGUSTA, GEORGIA
DURING LOW DENSITY AMMONIUM NITRATE PRODUCTION

Appendices A through E

APPENDIX

A COMPUTER PRINTOUT SAMPLING TEST RESULTS
- A.1 Prill Tower (Inlets, Bypasses, Outlet)
- A.2 Predryer/Dryer (Predryer Inlet, Dryer Inlet, Outlet)
- A.3 Cooler (Inlet, Bypass)

B SAMPLE EQUATIONS AND EXAMPLE CALCULATIONS

C FIELD DATA SHEETS FOR PARTICULATE TESTS
- C.1 Prill Tower (Inlets, Bypasses, Outlet)
- C.2 Predryer/Dryer (Predryer Inlet, Dryer Inlet, Outlet)
- C.3 Cooler (Inlet, Bypass)

D SAMPLING LOGS
- D.1 Daily Summary Log
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E PARTICLE SIZE TESTS
- E.1 HCSS Computer Data Reduction Results
- E.2 Sample Calculations
- E.3 Field Data Sheets
- E.4 Ammonium Nitrate Analytical Data
- E.5 Sampling Logs
- E.6 Sampling Train Calibration Data

APPENDIX A

COMPUTER PRINTOUT SAMPLING TEST RESULTS

Includes:

A.1 Prill Tower (Inlets, Bypasses, Outlet)
A.2 Predryer/Dryer (Predryer Inlet, Dryer Inlet, Outlet)
A.3 Cooler (Inlet, Bypass)

APPENDIX A.1

PRILL TOWER (INLETS, BYPASSES, OUTLET)

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 1
IRC PROJECT 1970-160

UNIT TESTED	PRILL TOWER
DATE AND TIME OF TEST	AUGUST 12, 1960 1050 TO 1320
SAMPLING LOCATION	SCRUBBER INLET
NAME OF FIRM	COLUMBIA NITROGEN CORP.
LOCATION OF FIRM	AUGUSTA GEORGIA
POLLUTANTS SAMPLED	AMMONIA AND AMMONIUM NITRATE

BAROMETRIC PRESSURE, IN HG		29.80
DUCT AREA, SQ FT		5.75
NOZZLE DIAMETER, IN		0.196
PITOT CALIBRATION COEFFICIENTS	1	0.825
	2	0.831
	3	0.846
DRY GAS METER CALIBRATION FACTOR, Y		1.000
FINAL LEAK RATE, CFM		0.000
TONS PER HOUR, PRODUCT		0.000

COMPOSITION OF DUCT GAS, % BY VOLUME DRY BASIS

CARBON DIOXIDE	0.00
OXYGEN	20.80
CARBON MONOXIDE	0.00
NITROGEN	79.20

AMMONIA AND AMMONIUM NITRATE COLLECTED, - MG

	AMMONIA	AMMONIUM NITRATE BASED ON NH_3	AMMONIUM NITRATE BASED ON NH_3	UNDISSOLVED SOLIDS
H2O IMPINGERS	0.5440E 02	0.2560E 03	0.8250E 02	0.0000E 00
H2SO4 IMPINGERS	0.4080E 02	0.1920E 03	0.0000E 00	0.0000E 00
TOTAL	0.9520E 02	0.4480E 03	0.8250E 02	0.0000E 00

AMOUNT OF WATER COLLECTED, GRAMS

IMPINGERS	37.0
SILICA GEL	12.3

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 1
TRC PROJECT 1431-E80

PRILL TOWER
COLUMBIA NITROGEN CORP.
SCRUBBER INLET
AUGUST 12, 1980 1050 TO 1320

STANDARD CONDITION TEMPERATURE, DEG F	0.6900E 02
STANDARD CONDITION PRESSURE, IN HG	0.2992E 02
TOTAL SAMPLING TIME, MINUTES	0.1440E 03
AVERAGE SQUARE ROOT VELOCITY HEAD, IN H2O EXP .5	0.8577E 00
AVERAGE ORIFICE PRESSURE DROP, IN H2O	0.1330E 01
AVERAGE METER TEMPERATURE, DEG F	0.9862E 02
AVERAGE DUCT STATIC PRESSURE, IN H2O	-0.1150E 01
AVERAGE DUCT TEMPERATURE, DEG F	0.1257E 03
TOTAL SAMPLE VOLUME, DACF	0.8479E 02
TOTAL SAMPLE VOLUME, DSCF	0.8003E 02
WATER VAPOR VOLUME, DSCF	0.2321E 01
MOISTURE CONTENT OF DUCT GAS, PERCENT	0.2818E 01
MOLE FRACTION DRY GAS	0.9719E 00
MOLECULAR WEIGHT - DRY STACK GAS	0.2983E 02
MOLECULAR WEIGHT - STACK GAS	0.2953E 02
AVERAGE STACK PRESSURE, IN HG	0.2972E 02
DUCT VOLUMETRIC FLOW, ACFM	0.1759E 05
DUCT VOLUMETRIC FLOW, DSCFM	0.1539E 05
AVERAGE DUCT VELOCITY, FPM	0.3054E 04
EXCESS AIR, PERCENT	0.1212E 05
AVERAGE DUCT GAS DENSITY, LBS/ACF	0.6629E-01
ISOKINETIC FACTOR, PERCENT	0.9990E 02

EMISSION DATA

	GR/ ACF	GR/ DSCF	LBS/ HR	LBS/ TON
AMMONIA IN H_2O	0.9125E-02	0.1349E-01	0.1376E 01	0.1376E 01
AMMONIA IN H_2SO_4	0.6849E-02	0.7866E-02	0.1032E 01	0.1032E 01
TOTAL AMMONIA	0.1597E-01	0.1835E-01	0.2407E 01	0.2407E 01
AMMONIUM NITRATE - NH_3 - IN H_2O	0.4294E-01	0.4935E-01	0.6474E 01	0.6474E 01
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.3221E-01	0.3702E-01	0.4855E 01	0.4855E 01
TOTAL AMMONIUM NITRATE	0.7515E-01	0.8637E-01	0.1133E 02	0.1133E 02
AMMONIUM NITRATE - NH_3 - IN H_2O	0.1384E-01	0.1591E-01	0.2086E 01	0.2086E 01
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.1384E-01	0.1591E-01	0.2086E 01	0.2086E 01
UNDISSOLVED SOLIDS IN H_2O	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 1
IRC PROJECT 1477-607

POINT	TIME	VEL HEAD IN H20	ORIFICE PRESS IN H20	METER INLET DEG F	TEMPS EXIT DEG F	DUCT STAT PRESS IN H20	DUCT TEMP DEG F	INITIAL METER VOL CU FT	P P R	CYC ANG
1	3.0	0.4600	0.7300	95.	96.	-1.15	124.	50.08	1	0.
2	3.0	0.4200	0.6700	96.	96.	-1.15	124.	51.52	1	0.
3	3.0	0.4600	0.7900	96.	96.	-1.15	124.	52.73	1	0.
4	3.0	0.7200	1.2500	96.	96.	-1.15	124.	54.41	1	0.
5	3.0	0.7200	1.2500	96.	97.	-1.15	124.	56.21	1	0.
6	3.0	0.8000	1.3500	97.	97.	-1.15	124.	58.06	1	0.
7	3.0	0.8600	1.5000	98.	96.	-1.15	124.	59.57	1	0.
8	3.0	0.8600	1.5000	96.	97.	-1.15	125.	61.48	1	0.
9	3.0	0.8000	1.3500	97.	95.	-1.15	124.	63.36	1	0.
10	3.0	0.8500	1.5000	99.	97.	-1.15	122.	65.13	1	0.
11	3.0	0.6600	1.1500	99.	98.	-1.15	126.	67.06	1	0.
12	3.0	0.8200	1.4000	99.	98.	-1.15	128.	68.59	1	0.
13	3.0	0.9600	1.6500	99.	98.	-1.15	129.	70.73	1	0.
14	3.0	1.0000	1.7000	99.	98.	-1.15	127.	72.53	1	0.
15	3.0	1.0000	1.7000	98.	98.	-1.15	123.	74.66	1	0.
16	3.0	1.0500	1.8000	98.	98.	-1.15	124.	77.04	1	0.
17	3.0	1.0500	1.8000	98.	98.	-1.15	124.	79.73	1	0.
18	3.0	1.0000	1.7000	98.	98.	-1.15	126.	80.72	1	0.
19	3.0	0.9600	1.6500	98.	98.	-1.15	129.	82.93	1	0.
20	3.0	0.9200	1.5000	99.	98.	-1.15	128.	85.04	1	0.
21	3.0	0.9600	1.6500	99.	98.	-1.15	124.	86.24	1	0.
22	3.0	0.9000	1.5000	100.	96.	-1.15	125.	89.05	1	0.
23	3.0	0.9000	1.5000	100.	98.	-1.15	126.	91.34	1	0.
24	3.0	0.8400	1.4500	100.	99.	-1.15	126.	92.61	1	0.
1	3.0	0.1000	0.1700	99.	99.	-1.15	120.	94.44	1	0.
2	3.0	0.1000	0.1700	99.	99.	-1.15	122.	95.10	1	0.
3	3.0	0.4500	0.7800	99.	99.	-1.15	122.	96.03	1	0.
4	3.0	0.5200	0.9000	98.	99.	-1.15	123.	97.48	1	0.
5	3.0	0.5200	0.9000	98.	99.	-1.15	123.	99.03	1	0.
6	3.0	0.6400	1.1000	99.	99.	-1.15	121.	100.26	1	0.
7	3.0	0.6500	1.1000	99.	99.	-1.15	123.	101.37	1	0.
8	3.0	0.6600	1.1500	99.	99.	-1.15	123.	103.42	1	0.
9	3.0	0.7200	1.2500	99.	99.	-1.15	130.	105.06	1	0.
10	3.0	0.7200	1.2500	98.	99.	-1.15	124.	106.69	1	0.
11	3.0	0.7600	1.3000	99.	99.	-1.15	125.	108.47	1	0.
12	3.0	0.6200	1.0500	99.	99.	-1.15	126.	110.43	1	0.
13	3.0	0.7600	1.3000	100.	99.	-1.15	125.	112.18	1	0.
14	3.0	0.9400	1.6000	100.	99.	-1.15	130.	113.54	1	0.
15	3.0	0.9600	1.6500	100.	99.	-1.15	131.	115.97	1	0.
16	3.0	0.9800	1.7000	101.	99.	-1.15	127.	117.06	1	0.
17	3.0	1.0000	1.7000	101.	100.	-1.15	130.	119.64	1	0.
18	3.0	1.0000	1.7000	101.	100.	-1.15	131.	121.53	1	0.
19	3.0	1.0000	1.7000	102.	100.	-1.15	127.	123.76	1	0.
20	3.0	0.9400	1.6000	102.	100.	-1.15	129.	125.60	1	0.
21	3.0	0.8500	1.4500	102.	101.	-1.15	131.	127.55	1	0.
22	3.0	0.8500	1.4500	101.	100.	-1.15	124.	129.54	1	0.
23	3.0	0.7800	1.3500	101.	100.	-1.15	129.	131.25	1	0.
24	3.0	0.7800	1.3500	101.	100.	-1.15	123.	133.03	1	0.

FINAL METER VOLUME 134.92

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 1
TRC PROJECT 1430-E87

PRILL TOWER

COLUMBIA NITROGEN CORP.
SCRUBBER INLET
AUGUST 12, 1980 1050 TO 1320

STANDARD CONDITION TEMPERATURE, DEG C	0.2000E 02
STANDARD CONDITION PRESSURE, MM HG	0.7600E 03
TOTAL SAMPLING TIME, MINUTES	0.1440E 03
AVERAGE SQUARE RROT VELOCITY HEAD, MM H2O EXP.5	0.4374E 01
AVERAGE ORIFICE PRESSURE DROP, MM H2O	0.3379E 02
AVERAGE METER TEMPERATURE, DEG C	0.3701E 02
AVERAGE DUCT STATIC PRESSURE, MM H2O	-0.2921E 02
AVERAGE DUCT TEMPERATURE, DEG C	0.5206E 02
TOTAL SAMPLE VOLUME, DM3	0.2400E 01
TOTAL SAMPLE VOLUME, DNM3	0.2267E 01
WATER VAPOR VOLUME, DNM3	0.6572E-01
AVERAGE STACK GAS PRESSURE, MM HG	0.7548E 03
DUCT VOLUMETRIC FLOW, AM3/M	0.4981E 03
DUCT VOLUMETRIC FLOW, DNM3/M	0.4334E 03
AVERAGE DUCT VELOCITY, M/M	0.9307E 03
VVERAGE DUCT GAS DENSITY, KG/AM3	0.1362E 01

EMISSION DATA

	MG/ AM3	MG/ DNM3	KG/ HR	KG/ MT
AMMONIA IN H_2O	0.2088E 02	0.2400E 02	0.6245E 00	0.2751E 01
AMMONIA IN H_2SO_4	0.1566E 02	0.1800E 02	0.4684E 00	0.2063E 01
TOTAL AMMONIA	0.3654E 02	0.4200E 02	0.1093E 01	0.4815E 01
AMMONIUM NITRATE - NH_3 - IN H_2O	0.9827E 02	0.1129E 03	0.2939E 01	0.1295E 02
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.7370E 02	0.8471E 02	0.2204E 01	0.9710E 01
TOTAL AMMONIUM NITRATE	0.1720E 03	0.1976E 03	0.5143E 01	0.2266E 02
AMMONIUM NITRATE - NH_3 - IN H_2O	0.3167E 02	0.3640E 02	0.9471E 00	0.4172E 01
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.3167E 02	0.3640E 02	0.9471E 00	0.4172E 01
UNDISSOLVED SOLIDS IN H_2O	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 2
IRC PROJECT 1430-EBD

UNIT TESTED	PRILL TOWER
DATE AND TIME OF TEST	AUGUST 12, 1980 1530 TO 1759
SAMPLING LOCATION	SCRUBBER INLET
NAME OF FIRM	COLUMBIA NITROGEN CORP.
LOCATION OF FIRM	AUGUSTA GEORGIA
POLLUTANTS SAMPLED	AMMONIA AND AMMONIUM NITRATE

BAROMETRIC PRESSURE, IN HG		29.73
DUCT AREA, SQ FT		5.76
NOZZLE DIAMETER, IN		0.196
PITOT CALIBRATION COEFFICIENTS	1	0.825
	2	0.831
	3	0.816
DRY GAS METER CALIBRATION FACTOR, Y		1.000
FINAL LEAK RATE, CFM		0.000
TONS PER HOUR, PRODUCT		0.000

COMPOSITION OF DUCT GAS, % BY VOLUME DRY BASIS

CARBON DIOXIDE	0.00
OXYGEN	20.80
CARBON MONOXIDE	0.00
NITROGEN	79.20

AMMONIA AND AMMONIUM NITRATE COLLECTED, - MG

	AMMONIA	AMMONIUM NITRATE BASED ON NH_3	AMMONIUM NITRATE BASED ON NH_3	UNDISSOLVED SOLIDS
H2O IMPINGERS	0.6400E 02	0.3010E 03	0.1258E 03	0.0000E 00
H2SO4 IMPINGERS	0.3520E 02	0.1660E 03	0.0000E 00	0.0000E 00
TOTAL	0.9920E 02	0.4670E 03	0.1258E 03	0.0000E 00

AMOUNT OF WATER COLLECTED, GRAMS

IMPINGERS	42.0
SILICA GEL	12.5

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 2
IRC PROJECT 1431-E83

POINT	TIME	VEL HEAD IN H20	ORIFICE PRESS IN H20	METER INLET DEG F	TEMPS EXIT DEG F	DUCT STAT PRESS IN H20	DUCT TEMP DEG F	INITIAL METER VOL CU FT	P R B	CYC ANG
1	3.0	0.3600	0.6200	102.	103.	-1.30	96.	135.37	1	0.
2	3.0	0.6000	1.0500	101.	103.	-1.30	98.	136.64	1	0.
3	3.0	0.6600	1.1500	101.	102.	-1.30	117.	138.08	1	0.
4	3.0	0.7200	1.2500	100.	102.	-1.30	116.	139.67	1	0.
5	3.0	0.7200	1.2500	100.	102.	-1.30	119.	141.29	1	0.
6	3.0	0.7200	1.2500	99.	101.	-1.30	122.	143.06	1	0.
7	3.0	0.8300	1.4000	99.	101.	-1.30	126.	144.77	1	0.
8	3.0	0.8500	1.4500	99.	101.	-1.30	129.	146.61	1	0.
9	3.0	0.8700	1.5000	99.	101.	-1.30	127.	148.53	1	0.
10	3.0	0.9800	1.7000	98.	100.	-1.30	129.	150.09	1	0.
11	3.0	0.9800	1.7000	99.	100.	-1.30	130.	152.44	1	0.
12	3.0	0.9800	1.7000	99.	100.	-1.30	129.	154.76	1	0.
13	3.0	0.9800	1.7000	99.	100.	-1.30	129.	156.58	1	0.
14	3.0	1.1000	1.8500	99.	100.	-1.30	131.	158.86	1	0.
15	3.0	1.1000	1.8500	98.	99.	-1.30	131.	160.63	1	0.
16	3.0	1.0000	1.7000	98.	99.	-1.30	133.	163.09	1	0.
17	3.0	1.0000	1.7000	98.	99.	-1.30	134.	164.76	1	0.
18	3.0	1.0500	1.8000	98.	99.	-1.30	132.	166.93	1	0.
19	3.0	1.0500	1.8000	98.	99.	-1.30	133.	169.85	1	0.
20	3.0	1.0000	1.7000	99.	99.	-1.30	132.	173.96	1	0.
21	3.0	0.9800	1.7000	98.	99.	-1.30	132.	173.71	1	0.
22	3.0	0.9800	1.7000	98.	99.	-1.30	131.	175.30	1	0.
23	3.0	0.9800	1.7000	98.	99.	-1.30	130.	177.28	1	0.
24	3.0	0.9800	1.7000	98.	99.	-1.30	134.	179.61	1	0.
1	3.0	0.3400	0.5900	98.	99.	-1.30	130.	181.02	1	0.
2	3.0	0.4000	0.6900	98.	98.	-1.30	128.	182.41	1	0.
3	3.0	0.4400	0.7500	98.	98.	-1.30	128.	183.68	1	0.
4	3.0	0.5000	0.8600	98.	97.	-1.30	128.	185.09	1	0.
5	3.0	0.5800	0.9500	98.	97.	-1.30	128.	186.87	1	0.
6	3.0	0.6600	1.1500	97.	98.	-1.30	126.	188.13	1	0.
7	3.0	0.6600	1.1500	97.	98.	-1.30	128.	189.76	1	0.
8	3.0	0.6600	1.1500	97.	98.	-1.30	129.	191.30	1	0.
9	3.0	0.7400	1.2500	97.	98.	-1.31	125.	193.06	1	0.
10	3.0	0.8000	1.3700	97.	98.	-1.30	129.	194.92	1	0.
11	3.0	0.8200	1.4000	97.	97.	-1.30	129.	196.79	1	0.
12	3.0	0.7200	1.2500	97.	97.	-1.30	126.	198.63	1	0.
13	3.0	1.0000	1.7000	97.	97.	-1.30	130.	200.31	1	0.
14	3.0	1.0000	1.7000	97.	97.	-1.30	131.	202.36	1	0.
15	3.0	1.1000	1.8500	97.	97.	-1.30	131.	204.24	1	0.
16	3.0	1.0500	1.8000	97.	98.	-1.30	132.	206.41	1	0.
17	3.0	1.0500	1.8000	97.	98.	-1.30	133.	208.51	1	0.
18	3.0	1.0500	1.8000	97.	97.	-1.30	131.	210.62	1	0.
19	3.0	1.0500	1.8000	97.	97.	-1.30	130.	212.63	1	0.
20	3.0	1.0500	1.8000	97.	97.	-1.30	130.	214.83	1	0.
21	3.0	0.9800	1.7000	97.	98.	-1.30	132.	217.41	1	0.
22	3.0	0.9800	1.7000	97.	98.	-1.30	135.	219.04	1	0.
23	3.0	0.9000	1.5500	98.	98.	-1.30	136.	221.06	1	0.
24	3.0	0.9000	1.5500	98.	98.	-1.31	135.	223.30	1	0.

FINAL METER VOLUME 224.24

TEST DATA -- AMMONIA AND AMMONIUM NITRATE --- TEST NO 2
IRC PROJECT 1431-681

PRILL TOWER
COLUMBIA NITROGEN CORP.
SCRUBBER INLET
AUGUST 12, 1980 1530 TO 1759

STANDARD CONDITION TEMPERATURE, DEG F	0.6807E 02
STANDARD CONDITION PRESSURE, IN HG	0.2992E 02
TOTAL SAMPLING TIME, MINUTES	0.1440E 03
AVERAGE SQUARE ROOT VELOCITY HEAD, IN H2O EXP .5	0.9147E 00
AVERAGE ORIFICE PRESSURE DROP, IN H2O	0.1463E 01
AVERAGE METER TEMPERATURE, DEG F	0.9852E 02
AVERAGE DUCT STATIC PRESSURE, IN H2O	-0.1303E 01
AVERAGE DUCT TEMPERATURE, DEG F	0.1276E 03
TOTAL SAMPLE VOLUME, DACF	0.8987E 02
TOTAL SAMPLE VOLUME, DSCF	0.8472E 02
WATER VAPOR VOLUME, DSCF	0.2565E 01
MOISTURE CONTENT OF DUCT GAS, PERCENT	0.2939E 01
MOLE FRACTION DRY GAS	0.9706E 00
MOLECULAR WEIGHT - DRY STACK GAS	0.2883E 02
MOLECULAR WEIGHT - STACK GAS	0.2851E 02
AVERAGE STACK PRESSURE, IN HG	0.2963E 02
DUCT VOLUMETRIC FLOW, ACFM	0.1860E 05
DUCT VOLUMETRIC FLOW, DSCFM	0.1607E 05
AVERAGE DUCT VELOCITY, FPM	0.3230E 04
EXCESS AIR, PERCENT	0.1912E 05
AVERAGE DUCT GAS DENSITY, LBS/ACF	0.6586E-01
ISOKINETIC FACTOR, PERCENT	0.1007E 03

EMISSION DATA

	GR/ ACF	GR/ DSCF	LBS/ HR	LBS/ TON
AMMONIA IN H_2O	0.1037E-01	0.1165E-01	0.1605E 01	0.1605E 01
AMMONIA IN H_2SO_4	0.5537E-02	0.6411E-02	0.8829E 00	0.8829E 00
TOTAL AMMONIA	0.1561E-01	0.1807E-01	0.2488E 01	0.2489E 01
AMMONIUM NITRATE - NH_3 - IN H_2O	0.4735E-01	0.5482E-01	0.7550E 01	0.7550E 01
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.2611E-01	0.3023E-01	0.4164E 01	0.4164E 01
TOTAL AMMONIUM NITRATE	0.7347E-01	0.8505E-01	0.1171E 02	0.1171E 02
AMMONIUM NITRATE - NH_3 - IN H_2O	0.1979E-01	0.2291E-01	0.3155E 01	0.3155E 01
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.1979E-01	0.2291E-01	0.3155E 01	0.3155E 01
UNDISSOLVED SOLIDS IN H_2O	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 2
TRC PROJECT 1430-EA0

PRILL TOWER

COLUMBIA NITROGEN CORP.
SCRUBBER INLET
AUGUST 12, 1980 1530 TO 1759

STANDARD CONDITION TEMPERATURE, DEG C	0.2300E 02
STANDARD CONDITION PRESSURE, MM HG	0.7600E 03
TOTAL SAMPLING TIME, MINUTES	0.1440E 03
AVERAGE SQUARE ROT VELOCITY HEAD, MM H2O EXP.5	0.4610E 01
AVERAGE ORIFICE PRESSURE DROP, MM H2O	0.3716E 02
AVERAGE METER TEMPERATURE, DEG C	0.3695E 02
AVERAGE DUCT STATIC PRESSURE, MM H2O	-0.3302E 02
AVERAGE DUCT TEMPERATURE, DEG C	0.5312E 02
TOTAL SAMPLE VOLUME, DM3	0.2545E 01
TOTAL SAMPLE VOLUME, DNM3	0.2399E 01
WATER VAPOR VOLUME, DNM3	0.7265E-01
AVERAGE STACK GAS PRESSURE, MM HG	0.7527E 03
DUCT VOLUMETRIC FLOW, AM3/M	0.5264E 03
DUCT VOLUMETRIC FLOW, DNM3/M	0.4551E 03
AVERAGE DUCT VELOCITY, M/M	0.9844E 03
AVERAGE DUCT GAS DENSITY, KG/AM3	0.1055E 01

EMISSION DATA

	MG/ AM3	MG/ DNM3	KG/ HR	KG/ MT
AMMONIA IN H_2O	0.2304E 02	0.2667E 02	0.7288E 00	0.3211E 01
AMMONIA IN H_2SO_4	0.1267E 02	0.1467E 02	0.4008E 00	0.1766E 01
TOTAL AMMONIA	0.3571E 02	0.4134E 02	0.1130E 01	0.4976E 01
AMMONIUM NITRATE - NH_3 - IN H_2O	0.1084E 03	0.1254E 03	0.3428E 01	0.1510E 02
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.5976E 02	0.6919E 02	0.1890E 01	0.8327E 01
TOTAL AMMONIUM NITRATE	0.1681E 03	0.1945E 03	0.5318E 01	0.2343E 02
AMMONIUM NITRATE - NH_3 - IN H_2O	0.4529E 02	0.5243E 02	0.1433E 01	0.6311E 01
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.4529E 02	0.5243E 02	0.1433E 01	0.6311E 01
UNDISSOLVED SOLIDS IN H_2O	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 3
IRC PROJECT 1470-E80

UNIT TESTED	PRILL TOWER
DATE AND TIME OF TEST	AUGAST 13 1980 0855 TO 1125
SAMPLING LOCATION	SCRUBBER INLET
NAME OF FIRM	COLUMBIA NITROGEN CORP.
LOCATION OF FIRM	AUGUSTA GEORGIA
POLLUTANTS SAMPLED	AMMONIA AND AMMONIUM NITRATE

BAROMETRIC PRESSURE, IN HG		29.75
DUCT AREA, SQ FT		5.75
NOZZLE DIAMETER, IN		0.196
PITOT CALIBRATION COEFFICIENTS	1	0.825
	2	0.831
	3	0.846
DRY GAS METER CALIBRATION FACTOR, Y		1.030
FINAL LEAK RATE, CFM		0.000
TONS PER HOUR, PRODUCT		0.000

COMPOSITION OF DUCT GAS, % BY VOLUME DRY BASIS

CARBON DIOXIDE	0.00
OXYGEN	20.80
CARBON MONOXIDE	0.00
NITROGEN	79.20

AMMONIA AND AMMONIUM NITRATE COLLECTED, - MG

	AMMONIA	AMMONIUM NITRATE BASED ON NH_3	AMMONIUM NITRATE BASED ON NH_3	UNDISSOLVED SOLIDS
H2O IMPINGERS	0.4820E 02	0.2270E 03	0.1244E 03	0.0000E 00
H2SO4 IMPINGERS	0.3190E 02	0.1500E 03	0.0000E 00	0.0000E 00
TOTAL	0.8010E 02	0.3770E 03	0.1244E 03	0.0000E 00

AMOUNT OF WATER COLLECTED, GRAMS

IMPINGERS	44.0
SILICA GEL	13.8

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 3
IRC PROJECT 1430-G87

POINT	TIME	VEL HEAD IN H20	ORIFICE PRESS IN H20	METER INLET DEG F	TEMPS EXIT DEG F	DUCT STAT PRESS IN H20	DUCT TEMP DEG F	INITIAL METER VOL CU FT	P R B	CYC ANG
1	3.0	0.3800	0.6500	84.	84.	-0.88	115.	225.20	1	0.
2	3.0	0.4000	0.6900	84.	84.	-0.89	116.	226.34	1	0.
3	3.0	0.6600	1.1500	84.	84.	-0.89	117.	227.73	1	0.
4	3.0	0.6200	1.0500	84.	84.	-0.88	121.	229.36	1	0.
5	3.0	0.6200	1.0500	84.	84.	-0.89	122.	230.00	1	0.
6	3.0	0.6200	1.0500	84.	84.	-0.89	121.	232.52	1	0.
7	3.0	0.5400	0.9300	84.	85.	-0.88	120.	233.94	1	0.
8	3.0	0.7400	1.2500	85.	85.	-0.88	119.	235.59	1	0.
9	3.0	0.7500	1.3000	85.	85.	-0.89	117.	237.26	1	0.
10	3.0	0.7600	1.3000	84.	85.	-0.88	119.	239.07	1	0.
11	3.0	0.7700	1.3500	85.	85.	-0.89	118.	240.93	1	0.
12	3.0	0.8000	1.4000	85.	86.	-0.88	119.	242.75	1	0.
13	3.0	0.6200	1.0500	86.	86.	-0.88	123.	244.57	1	0.
14	3.0	0.7000	1.2000	86.	86.	-0.89	122.	246.11	1	0.
15	3.0	0.9200	1.5500	86.	86.	-0.85	123.	247.81	1	0.
16	3.0	0.7400	1.2700	87.	87.	-0.83	122.	249.83	1	0.
17	3.0	0.7600	1.3000	87.	87.	-0.83	122.	251.48	1	0.
18	3.0	0.7400	1.2700	87.	87.	-0.83	124.	253.16	1	0.
19	3.0	0.7600	1.3000	88.	87.	-0.83	122.	255.49	1	0.
20	3.0	0.7600	1.3000	88.	88.	-0.83	124.	256.77	1	0.
21	3.0	0.7000	1.2000	89.	88.	-0.83	123.	259.24	1	0.
22	3.0	0.7200	1.2500	89.	89.	-0.83	125.	260.33	1	0.
23	3.0	0.7200	1.2500	89.	89.	-0.83	124.	261.94	1	0.
24	3.0	0.7200	1.2500	89.	89.	-0.83	122.	263.71	1	0.
1	3.0	0.4900	0.8500	90.	89.	-0.83	109.	265.44	1	0.
2	3.0	0.4900	0.8500	90.	89.	-0.83	110.	266.78	1	0.
3	3.0	0.6000	1.0000	91.	90.	-0.83	113.	268.53	1	0.
4	3.0	0.5400	0.9300	90.	90.	-0.83	116.	270.08	1	0.
5	3.0	0.5500	0.9500	90.	90.	-0.83	112.	271.43	1	0.
6	3.0	0.5500	0.9300	90.	90.	-0.83	117.	272.96	1	0.
7	3.0	0.6200	1.0500	90.	90.	-0.83	116.	274.83	1	0.
8	3.0	0.6800	1.1500	90.	90.	-0.83	119.	276.09	1	0.
9	3.0	0.6800	1.1500	90.	90.	-0.83	119.	277.72	1	0.
10	3.0	0.8000	1.3700	90.	90.	-0.83	113.	279.55	1	0.
11	3.0	0.7700	1.3000	90.	90.	-0.83	121.	281.23	1	0.
12	3.0	0.8800	1.5000	90.	90.	-0.83	118.	283.16	1	0.
13	3.0	0.8800	1.5000	91.	91.	-0.83	121.	285.13	1	0.
14	3.0	1.0000	1.7000	91.	91.	-0.83	123.	286.79	1	0.
15	3.0	1.0000	1.7000	90.	91.	-0.83	123.	289.00	1	0.
16	3.0	1.0000	1.7000	91.	91.	-0.83	130.	290.96	1	0.
17	3.0	1.0500	1.8000	91.	91.	-0.83	125.	292.97	1	0.
18	3.0	1.0500	1.8000	91.	91.	-0.83	124.	295.10	1	0.
19	3.0	1.1000	1.8500	92.	91.	-0.83	123.	296.95	1	0.
20	3.0	1.1000	1.8500	92.	91.	-0.83	123.	299.15	1	0.
21	3.0	1.0500	1.8000	92.	92.	-1.30	126.	301.16	1	0.
22	3.0	1.0500	1.8000	92.	92.	-1.30	124.	303.93	1	0.
23	3.0	1.0000	1.7000	93.	92.	-1.30	125.	305.95	1	0.
24	3.0	1.0000	1.7000	92.	92.	-1.30	126.	307.63	1	0.

FINAL METER VOLUME 309.90

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 3
TRC PROJECT 1430-ERT

PRILL TOWER

COLUMBIA NITROGEN CORP.
SCRUBBER INLET
AUGAST 13 1980 0855 TO 1126

STANDARD CONDITION TEMPERATURE, DEG F	0.6900E 02
STANDARD CONDITION PRESSURE, IN HG	0.2992E 02
TOTAL SAMPLING TIME, MINUTES	0.1440E 03
AVERAGE SQUARE ROOT VELOCITY HEAD, IN H2O EXP .5	0.8647E 00
AVERAGE ORIFICE PRESSURE DROP, IN H2O	0.1298E 01
AVERAGE METER TEMPERATURE, DEG F	0.8832E 02
AVERAGE DUCT STATIC PRESSURE, IN H2O	-0.8842E 00
AVERAGE DUCT TEMPERATURE, DEG F	0.1201E 03
TOTAL SAMPLE VOLUME, DACF	0.8354E 02
TOTAL SAMPLE VOLUME, DSCF	0.8024E 02
WATER VAPOR VOLUME, DSCF	0.2721E 01
MOISTURE CONTENT OF DUCT GAS, PERCENT	0.3279E 01
MOLE FRACTION DRY GAS	0.9672E 00
MOLECULAR WEIGHT - DRY STACK GAS	0.2883E 02
MOLECULAR WEIGHT - STACK GAS	0.2849E 02
AVERAGE STACK PRESSURE, IN HG	0.2968E 02
DUCT VOLUMETRIC FLOW, ACFM	0.1747E 05
DUCT VOLUMETRIC FLOW, DSCFM	0.1525E 05
AVERAGE DUCT VELOCITY, FPM	0.3032E 04
EXCESS AIR, PERCENT	0.1912E 05
AVERAGE DUCT GAS DENSITY, LBS/ACF	0.6670E-01
ISOKINETIC FACTOR, PERCENT	0.1005E 03

EMISSION DATA

	GR/ ACF	GR/ DSCF	LBS/ HR	LBS/ TON
AMMONIA IN H_2O	0.8075E-02	0.9269E-02	0.1212E 01	0.1212E 01
AMMONIA IN H_2SO_4	0.5357E-02	0.6134E-02	0.8019E 00	0.8019E 00
TOTAL AMMONIA	0.1345E-01	0.1540E-01	0.2014E 01	0.2014E 01
AMMONIUM NITRATE - NH_3 - IN H_2O	0.3812E-01	0.4365E-01	0.5707E 01	0.5707E 01
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.2519E-01	0.2884E-01	0.3771E 01	0.3771E 01
TOTAL AMMONIUM NITRATE	0.6331E-01	0.7249E-01	0.9477E 01	0.9477E 01
AMMONIUM NITRATE - NH_3 - IN H_2O	0.2089E-01	0.2392E-01	0.3127E 01	0.3127E 01
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.2089E-01	0.2392E-01	0.3127E 01	0.3127E 01
UNDISSOLVED SOLIDS IN H_2O	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 3
TRC PROJECT 1420-E07

PRILL TOWER

COLUMBIA NITROGEN CORP.
SCRUBBER INLET
AUGAST 13 1980 0855 TO 1126

STANDARD CONDITION TEMPERATURE, DEG C	0.2000E 02
STANDARD CONDITION PRESSURE, MM HG	0.7600E 03
TOTAL SAMPLING TIME, MINUTES	0.1440E 03
AVERAGE SQUARE ROOT VELOCITY HEAD, MM H20 EXP.5	0.4359E 01
AVERAGE ORIFICE PRESSURE DROP, MM H20	0.3296E 02
AVERAGE METER TEMPERATURE, DEG C	0.3129E 02
AVERAGE DUCT STATIC PRESSURE, MM H20	-0.2246E 02
AVERAGE DUCT TEMPERATURE, DEG C	0.4897E 02
TOTAL SAMPLE VOLUME, DM3	0.2366E 01
TOTAL SAMPLE VOLUME, DNM3	0.2272E 01
WATER VAPOR VOLUME, DNM3	0.7705E-01
AVERAGE STACK GAS PRESSURE, MM HG	0.7540E 03
DUCT VOLUMETRIC FLOW, AM3/M	0.4946E 03
DUCT VOLUMETRIC FLOW, DNM3/M	0.4320E 03
AVERAGE DUCT VELOCITY, M/M	0.9242E 03
AVERAGE DUCT GAS DENSITY, KG/AM3	0.1069E 01

EMISSION DATA

	MG/ AM3	MG/ DNM3	KG/ HR	KG/ MT
AMMONIA IN H_2O	0.1852E 02	0.2121E 02	0.5501E 00	0.2423E 01
AMMONIA IN H_2SO_4	0.1226E 02	0.1404E 02	0.3641E 00	0.1604E 01
TOTAL AMMONIA	0.3078E 02	0.3525E 02	0.9142E 00	0.4027E 01
AMMONIUM NITRATE - NH_3 - IN H_2O	0.9724E 02	0.9989E 02	0.2591E 01	0.1141E 02
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.5765E 02	0.6601E 02	0.1712E 01	0.7542E 01
TOTAL AMMONIUM NITRATE	0.1449E 03	0.1659E 03	0.4303E 01	0.1895E 02
AMMONIUM NITRATE - NH_3 - IN H_2O	0.4781E 02	0.5474E 02	0.1420E 01	0.6255E 01
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.4781E 02	0.5474E 02	0.1420E 01	0.6255E 01
UNDISSOLVED SOLIDS IN H_2O	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 1
IRC PROJECT 1431-EB1

UNIT TESTED	PRILL TOWER
DATE AND TIME OF TEST	AUGUST 12 1980 1345 TO 1324
SAMPLING LOCATION	SCRUBBER BYPASS
NAME OF FIRM	COLUMBIA NITROGEN CORP.
LOCATION OF FIRM	AUGUSTA GEORGIA
POLLUTANTS SAMPLED	AMMONIA AND AMMONIUM NITRATE

BAROMETRIC PRESSURE, IN HG		29.80
DUCT AREA, SQ FT		19.31
NOZZLE DIAMETER, IN		0.189
PITOT CALIBRATION COEFFICIENTS	1	0.825
	2	0.831
	3	0.846
DRY GAS METER CALIBRATION FACTOR, Y		1.030
FINAL LEAK RATE, CFM		0.035
TONS PER HOUR, PRODUCT		0.007

COMPOSITION OF DUCT GAS, % BY VOLUME DRY BASIS

CARBON DIOXIDE	0.00
OXYGEN	20.80
CARBON MONOXIDE	0.00
NITROGEN	79.20

AMMONIA AND AMMONIUM NITRATE COLLECTED, - MG

	AMMONIA	AMMONIUM NITRATE BASED ON NH_3	AMMONIUM NITRATE BASED ON NH_3	UNDISSOLVED SOLIDS
H2O IMPINGERS	0.1220E 02	0.5720E 02	0.3340E 02	0.1303E 02
H2SO4 IMPINGERS	0.9200E 01	0.4330E 02	0.0000E 00	0.0000E 00
TOTAL	0.2140E 02	0.1005E 03	0.3340E 02	0.1303E 02

AMOUNT OF WATER COLLECTED, GRAMS

IMPINGERS	29.0
SILICA GEL	19.9

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 1
IPC PROJECT 1430-140

POINT	TIME	VEL HEAD IN H20	ORIFICE PRESS IN H20	METER INLET DEG F	TEMPS EXIT DEG F	DUCT STAT PRESS IN H20	DUCT TEMP DEG F	INITIAL METER VOL CU FT	P R H	CYC ANG
1	4.0	1.2500	1.8400	100.	100.	-0.53	104.	432.93	2	0.
2	4.0	1.2500	1.8400	100.	100.	-0.53	105.	435.77	2	0.
3	4.0	1.3000	1.9000	100.	100.	-0.53	103.	438.72	2	0.
4	4.0	1.4500	2.1200	98.	100.	-0.53	105.	441.68	2	0.
5	4.0	1.5000	2.1800	99.	102.	-0.53	104.	444.78	2	0.
6	4.0	1.7000	2.5000	99.	102.	-0.53	104.	447.95	2	0.
7	4.0	1.7000	2.5000	98.	102.	-0.53	105.	451.37	2	0.
8	4.0	1.7000	2.5000	99.	103.	-0.53	106.	454.75	2	0.
9	4.0	1.5500	2.2500	99.	104.	-0.53	105.	457.19	2	0.
10	4.0	1.7000	2.5000	99.	104.	-0.53	105.	461.46	2	0.
11	4.0	2.1000	3.1000	99.	104.	-0.53	104.	464.99	2	0.
12	4.0	2.1000	3.1000	99.	104.	-0.53	105.	469.55	2	0.
13	4.0	2.1500	3.1800	99.	104.	-0.53	107.	472.43	2	0.
14	4.0	2.1500	3.1800	99.	104.	-0.53	107.	476.28	2	0.
15	4.0	2.2000	3.2000	99.	104.	-0.53	107.	480.07	2	0.
16	4.0	2.2000	3.2000	99.	104.	-0.52	106.	483.94	2	0.
17	4.0	2.2000	3.2000	100.	105.	-0.52	107.	487.70	2	0.
18	4.0	2.1000	3.0500	100.	105.	-0.52	105.	491.54	2	0.
1	4.0	1.2500	1.8200	101.	106.	-0.52	105.	495.39	2	0.
2	4.0	1.2000	1.7500	101.	106.	-0.52	106.	498.25	2	0.
3	4.0	1.2500	1.8200	101.	106.	-0.52	108.	501.13	2	0.
4	4.0	1.3000	1.9000	101.	106.	-0.52	110.	504.12	2	0.
5	4.0	1.3000	1.9000	101.	106.	-0.52	110.	507.00	2	0.
6	4.0	1.4500	2.1000	101.	106.	-0.52	110.	510.00	2	0.
7	4.0	1.4500	2.1000	101.	106.	-0.52	109.	513.11	2	0.
8	4.0	1.4000	2.0500	101.	106.	-0.52	110.	516.37	2	0.
9	4.0	1.4000	2.0500	101.	106.	-0.52	111.	519.39	2	0.
10	4.0	1.8000	2.6000	101.	106.	-0.52	109.	522.55	2	0.
11	4.0	1.7000	2.5000	102.	106.	-0.52	107.	525.75	2	0.
12	4.0	1.8000	2.6000	102.	106.	-0.52	107.	529.54	2	0.
13	4.0	1.7000	2.7500	103.	107.	-0.52	107.	532.93	2	0.
14	4.0	2.0000	2.9500	103.	107.	-0.52	107.	536.56	2	0.
15	4.0	2.1000	3.1000	103.	107.	-0.52	107.	540.25	2	0.
16	4.0	2.0000	2.9500	103.	107.	-0.52	106.	544.10	2	0.
17	4.0	2.0000	2.9500	103.	107.	-0.52	106.	547.94	2	0.
18	4.0	1.9500	2.9000	103.	107.	-0.52	106.	551.60	2	0.

FINAL METER VOLUME 553.27

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 1
IRC PROJECT 1430-E81

PRILL TOWER

COLUMBIA NITROGEN CORP.
SCRUBBER BYPASS
AUGUST 12 1987 1045 TO 1324

STANDARD CONDITION TEMPERATURE, DEG F	0.6800E 02
STANDARD CONDITION PRESSURE, IN HG	0.2992E 02
TOTAL SAMPLING TIME, MINUTES	0.1440E 03
AVERAGE SQUARE ROOT VELOCITY HEAD, IN H2O EXP .5	0.1299E 01
AVERAGE ORIFICE PRESSURE DROP, IN H2O	0.2504E 01
AVERAGE METER TEMPERATURE, DEG F	0.1026E 03
AVERAGE DUCT STATIC PRESSURE, IN H2O	-0.5242E 00
AVERAGE DUCT TEMPERATURE, DEG F	0.1066E 03
TOTAL SAMPLE VOLUME, DACF	0.1203E 03
TOTAL SAMPLE VOLUME, DSCF	0.1132E 03
WATER VAPOR VOLUME, DSCF	0.2302E 01
MOISTURE CONTENT OF DUCT GAS, PERCENT	0.1993E 01
MOLE FRACTION DRY GAS	0.9801E 00
MOLECULAR WEIGHT - DRY STACK GAS	0.2983E 02
MOLECULAR WEIGHT - STACK GAS	0.2862E 02
AVERAGE STACK PRESSURE, IN HG	0.2976E 02
DUCT VOLUMETRIC FLOW, ACFM	0.8723E 05
DUCT VOLUMETRIC FLOW, DSCFM	0.7922E 05
AVERAGE DUCT VELOCITY, FPM	0.4516E 04
EXCESS AIR, PERCENT	0.1912E 05
AVERAGE DUCT GAS DENSITY, LBS/ACF	0.6985E-01
ISOKINETIC FACTOR, PERCENT	0.9940E 02

EMISSION DATA

	GR/ ACF	GR/ DSCF	LBS/ HR	LBS/ TON
AMMONIA IN H_2O	0.1511E-02	0.1663E-02	0.1129E 01	0.1129E 01
AMMONIA IN H_2SO_4	0.1139E-02	0.1254E-02	0.8515E 00	0.8515E 00
TOTAL AMMONIA	0.2650E-02	0.2917E-02	0.1981E 01	0.1981E 01
AMMONIUM NITRATE - NH_3 - IN H_2O	0.7084E-02	0.7797E-02	0.5294E 01	0.5294E 01
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.5362E-02	0.5903E-02	0.4008E 01	0.4008E 01
TOTAL AMMONIUM NITRATE	0.1245E-01	0.1370E-01	0.9302E 01	0.9302E 01
AMMONIUM NITRATE - NH_3 - IN H_2O	0.4136E-02	0.4553E-02	0.3091E 01	0.3091E 01
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.4136E-02	0.4553E-02	0.3091E 01	0.3091E 01
UNDISSOLVED SOLIDS IN H_2O	0.1614E-02	0.1776E-02	0.1206E 01	0.1206E 01
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.1614E-02	0.1776E-02	0.1206E 01	0.1206E 01

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 1
TRC PROJECT 1437-EHJ

PRILL TOWER

COLUMBIA NITROGEN CORP.
SCRUBBER BYPASS
AUGUST 12 1980 1045 TO 1324

STANDARD CONDITION TEMPERATURE, DEG C	0.2000E 02
STANDARD CONDITION PRESSURE, MM HG	0.7600E 03
TOTAL SAMPLING TIME, MINUTES	0.1440E 03
AVERAGE SQUARE ROOT VELOCITY HEAD, MM H2O EXP.5	0.6547E 01
AVERAGE ORIFICE PRESSURE DROP, MM H2O	0.6359E 02
AVERAGE METER TEMPERATURE, DEG C	0.3918E 02
AVERAGE DUCT STATIC PRESSURE, MM H2O	-0.1331E 02
AVERAGE DUCT TEMPERATURE, DEG C	0.4142E 02
TOTAL SAMPLE VOLUME, DM3	0.3408E 01
TOTAL SAMPLE VOLUME, DNM3	0.3206E 01
WATER VAPOR VOLUME, DNM3	0.6518E-01
AVERAGE STACK GAS PRESSURE, MM HG	0.7559E 03
DUCT VOLUMETRIC FLOW, AM3/M	0.2469E 04
DUCT VOLUMETRIC FLOW, DNM3/M	0.2344E 04
AVERAGE DUCT VELOCITY, M/M	0.1376E 04
AVERAGE DUCT GAS DENSITY, KG/AM3	0.1103E 01

EMISSION DATA

	MG/ AM3	MG/ DNM3	KG/ HR	KG/ MT
AMMONIA IN H_2O	0.3458E 01	0.3805E 01	0.5127E 00	0.2258E 01
AMMONIA IN H_2SO_4	0.2607E 01	0.2870E 01	0.3866E 00	0.1703E 01
TOTAL AMMONIA	0.6065E 01	0.6675E 01	0.8993E 00	0.3962E 01
AMMONIUM NITRATE - NH_3 - IN H_2O	0.1621E 02	0.1784E 02	0.2404E 01	0.1059E 02
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.1227E 02	0.1351E 02	0.1820E 01	0.8016E 01
TOTAL AMMONIUM NITRATE	0.2848E 02	0.3135E 02	0.4223E 01	0.1860E 02
AMMONIUM NITRATE - NH_3 - IN H_2O	0.9466E 01	0.1042E 02	0.1404E 01	0.6183E 01
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.9466E 01	0.1042E 02	0.1404E 01	0.6183E 01
UNDISSOLVED SOLIDS IN H_2O	0.3693E 01	0.4065E 01	0.5475E 00	0.2412E 01
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.3693E 01	0.4065E 01	0.5475E 00	0.2412E 01

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 2
TRC PROJECT 1430-E&D

UNIT TESTED	PRILL TOWER
DATE AND TIME OF TEST	AUGUST 12 1980 1532 TO 1803
SAMPLING LOCATION	SCRUBBER BYPASS
NAME OF FIRM	COLUMBIA NITROGEN CORP.
LOCATION OF FIRM	AUGUSTA GEORGIA
POLLUTANTS SAMPLED	AMMONIA AND AMMONIUM NITRATE

BAROMETRIC PRESSURE. IN HG		29.80
DUCT AREA. SQ FT		19.31
NOZZLE DIAMETER. IN		0.199
PITOT CALIBRATION COEFFICIENTS	1	0.825
	2	0.831
	3	0.896
DRY GAS METER CALIBRATION FACTOR. Y		1.000
FINAL LEAK RATE. CFM		0.010
TONS PER HOUR, PRODUCT		0.003

COMPOSITION OF DUCT GAS. % BY VOLUME DRY BASIS

CARBON DIOXIDE	0.00
OXYGEN	20.80
CARBON MONOXIDE	0.00
NITROGEN	79.20

AMMONIA AND AMMONIUM NITRATE COLLECTED. - MG

	AMMONIA	AMMONIUM NITRATE BASED ON NH_3	AMMONIUM NITRATE BASED ON NH_3	UNDISSOLVED SOLIDS
H2O IMPINGERS	0.1330E 02	0.6280E 02	0.4060E 02	0.0000E 00
H2SO4 IMPINGERS	0.1070E 02	0.5040E 02	0.0000E 00	0.0000E 00
TOTAL	0.2400E 02	0.1132E 03	0.4060E 02	0.0000E 00

AMOUNT OF WATER COLLECTED. GRAMS

IMPINGERS	39.0
SILICA GEL	17.6

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 2
TRC PROJECT 1430-E80

POINT	TIME	VEL HEAD IN H20	ORIFICE PRESS IN H20	METER INLET DEG F	TEMPS EXIT DEG F	DUCT STAT PRESS IN H20	DUCT TEMP DEG F	INITIAL METER VOL CU FT	P R R	CYC ANG
1	4.0	1.2500	1.8400	107.	107.	-0.63	115.	555.66	2	0.
2	4.0	1.2500	1.8400	106.	107.	-0.63	115.	559.55	2	0.
3	4.0	1.6000	2.3200	107.	106.	-0.63	116.	561.47	2	0.
4	4.0	1.6500	2.4000	107.	106.	-0.63	118.	566.50	2	0.
5	4.0	1.8000	2.6500	108.	106.	-0.63	115.	569.05	2	0.
6	4.0	1.8500	2.7000	107.	106.	-0.63	114.	571.58	2	0.
7	4.0	1.8500	2.7000	106.	107.	-0.63	117.	575.15	2	0.
8	4.0	1.8000	2.6500	105.	107.	-0.63	114.	579.75	2	0.
9	4.0	1.7000	2.4500	105.	107.	-0.63	115.	582.32	2	0.
10	4.0	1.4000	2.0000	105.	107.	-0.63	114.	585.80	2	0.
11	4.0	1.4000	2.0000	105.	106.	-0.63	114.	589.92	2	0.
12	4.0	1.6000	2.3200	106.	107.	-0.63	114.	592.04	2	0.
13	4.0	1.6500	2.4000	107.	106.	-0.63	114.	595.37	2	0.
14	4.0	1.9000	2.7300	107.	106.	-0.63	114.	598.67	2	0.
15	4.0	1.9000	2.7300	107.	106.	-0.63	114.	602.27	2	0.
16	4.0	1.9500	2.8000	107.	106.	-0.63	114.	605.90	2	0.
17	4.0	1.7500	2.5500	107.	106.	-0.63	115.	609.54	2	0.
18	4.0	1.5500	2.5500	107.	106.	-0.60	115.	613.05	2	0.
1	4.0	1.2500	1.8000	107.	106.	-0.60	117.	616.32	2	0.
2	4.0	1.1500	1.7000	107.	106.	-0.60	117.	619.26	2	0.
3	4.0	1.5000	2.1800	107.	106.	-0.63	117.	622.20	2	0.
4	4.0	1.5000	2.1800	107.	106.	-0.63	116.	625.45	2	0.
5	4.0	1.7000	2.5000	107.	106.	-0.63	113.	628.70	2	0.
6	4.0	1.7000	2.5000	107.	106.	-0.60	117.	632.14	2	0.
7	4.0	1.7000	2.5000	107.	106.	-0.63	116.	635.61	2	0.
8	4.0	1.6500	2.4000	107.	106.	-0.63	117.	639.07	2	0.
9	4.0	1.6000	2.3500	107.	106.	-0.60	116.	642.50	2	0.
10	4.0	1.2500	1.8000	107.	106.	-0.63	114.	646.08	2	0.
11	4.0	1.3000	1.9000	107.	106.	-0.63	115.	648.97	2	0.
12	4.0	1.5000	2.1500	107.	106.	-0.63	115.	651.97	2	0.
13	4.0	1.5000	2.1500	107.	106.	-0.63	115.	655.17	2	0.
14	4.0	1.5000	2.1500	107.	106.	-0.63	114.	658.40	2	0.
15	4.0	1.5000	2.1500	107.	106.	-0.60	114.	661.62	2	0.
16	4.0	1.5000	2.1500	108.	105.	-0.63	112.	665.90	2	0.
17	4.0	1.5000	2.1500	107.	106.	-0.63	113.	668.13	2	0.
18	4.0	1.2500	1.8000	107.	106.	-0.63	113.	671.32	2	0.

FINAL METER VOLUME 674.27

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 2
IRC PROJECT 1430-E60

PRILL TOWER

COLUMBIA NITROGEN CORP.
SCRUBBER BYPASS
AUGUST 12 1980 1532 TO 1803

STANDARD CONDITION TEMPERATURE. DEG F	0.6800E 02
STANDARD CONDITION PRESSURE. IN HG	0.2992E 02
TOTAL SAMPLING TIME. MINUTES	0.1443E 03
AVERAGE SQUARE ROOT VELOCITY HEAD. IN H2O EXP .5	0.1249E 01
AVERAGE ORIFICE PRESSURE DROP. IN H2O	0.2282E 01
AVERAGE METER TEMPERATURE. DEG F	0.1065E 03
AVERAGE DUCT STATIC PRESSURE. IN H2O	-0.6125E 00
AVERAGE DUCT TEMPERATURE. DEG F	0.1151E 03
TOTAL SAMPLE VOLUME. DACF	0.1186E 03
TOTAL SAMPLE VOLUME. DSCF	0.1107E 03
WATER VAPOR VOLUME. DSCF	0.2664E 01
MOISTURE CONTENT OF DUCT GAS. PERCENT	0.2349E 01
MOLE FRACTION DRY GAS	0.9765E 00
MOLECULAR WEIGHT - DRY STACK GAS	0.2883E 02
MOLECULAR WEIGHT - STACK GAS	0.2858E 02
AVERAGE STACK PRESSURE. IN HG	0.2975E 02
DUCT VOLUMETRIC FLOW. ACFM	0.8453E 05
DUCT VOLUMETRIC FLOW. DSCFM	0.7536E 05
AVERAGE DUCT VELOCITY. FPM	0.4378E 04
EXCESS AIR. PERCENT	0.1912E 05
AVERAGE DUCT GAS DENSITY. LBS/ACF	0.6772E-01
ISOKINETIC FACTOR. PERCENT	0.1012E 03

EMISSION DATA

	GR/ ACF	GR/ DSCF	LBS/ HR	LBS/ TON
AMMONIA IN H_2O	0.1652E-02	0.1853E-02	0.1197E 01	0.1197E 01
AMMONIA IN H_2SO_4	0.1329E-02	0.1491E-02	0.9631E 00	0.9631E 00
TOTAL AMMONIA	0.2982E-02	0.3344E-02	0.2160E 01	0.2160E 01
AMMONIUM NITRATE - NH_3 - IN H_2O	0.7802E-02	0.8751E-02	0.5653E 01	0.5653E 01
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.6261E-02	0.7023E-02	0.4536E 01	0.4536E 01
TOTAL AMMONIUM NITRATE	0.1406E-01	0.1577E-01	0.1019E 02	0.1019E 02
AMMONIUM NITRATE - NH_3 - IN H_2O	0.5044E-02	0.5657E-02	0.3654E 01	0.3654E 01
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.5044E-02	0.5657E-02	0.3654E 01	0.3654E 01
UNDISSOLVED SOLIDS IN H_2O	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00

TEST DATA -- UREA, AMMONIA, FORMALDEHYDE -- TEST NO 2
TRC PROJECT 1430-E80

PRILL TOWER

COLUMBIA NITROGEN CORP.
SCRUBBER BYPASS
AUGUST 12 1980 1532 TO 1803

STANDARD CONDITION TEMPERATURE, DEG C	0.2000E 02
STANDARD CONDITION PRESSURE, MM HG	0.7600E 03
TOTAL SAMPLING TIME, MINUTES	0.1440E 03
AVERAGE SQUARE ROOT VELOCITY HEAD, MM H2O EXP.5	0.6294E 01
AVERAGE ORIFICE PRESSURE DROP, MM H2O	0.5795E 02
AVERAGE METER TEMPERATURE, DEG C	0.4137E 02
AVERAGE DUCT STATIC PRESSURE, MM H2O	-0.1556E 02
AVERAGE DUCT TEMPERATURE, DEG C	0.4617E 02
TOTAL SAMPLE VOLUME, DM3	0.3359E 01
TOTAL SAMPLE VOLUME, DNM3	0.3136E 01
WATER VAPOR VOLUME, DNM3	0.7545E-01
AVERAGE STACK GAS PRESSURE, MM HG	0.7558E 03
DUCT VOLUMETRIC FLOW, AM3/M	0.2394E 04
DUCT VOLUMETRIC FLOW, DNM3/M	0.2134E 04
AVERAGE DUCT VELOCITY, M/M	0.1334E 04
AVERAGE DUCT GAS DENSITY, KG/AM3	0.1085E 01

EMISSION DATA

	MG/ AM3	MG/ DNM3	KG/ HR	KG/ MT
AMMONIA IN H_2O	0.3781E 01	0.4241E 01	0.5435E 00	0.2394E 01
AMMONIA IN H_2SO_4	0.3042E 01	0.3412E 01	0.4372E 00	0.1926E 01
TOTAL AMMONIA	0.6823E 01	0.7653E 01	0.9807E 00	0.4320E 01
AMMONIUM NITRATE - NH_3 - IN H_2O	0.1785E 02	0.2003E 02	0.2566E 01	0.1131E 02
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.1433E 02	0.1607E 02	0.2060E 01	0.9073E 01
TOTAL AMMONIUM NITRATE	0.3218E 02	0.3610E 02	0.4626E 01	0.2038E 02
AMMONIUM NITRATE - NH_3 - IN H_2O	0.1154E 02	0.1295E 02	0.1659E 01	0.7309E 01
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.1154E 02	0.1295E 02	0.1659E 01	0.7309E 01
UNDISSOLVED SOLIDS IN H_2O	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00

FS01 STOP 00000 00000001

TEST DATA -- I AMMONIA AND AMMONIUM NITRATE -- TEST NO 3
TRC PROJECT 1430-E87

UNIT TESTED	PRILL TOWER
DATE AND TIME OF TEST	AUGUST 13, 1980 0947 TO 1117
SAMPLING LOCATION	SCRUBBER BYPASS
NAME OF FIRM	COLUMBIA NITROGEN CORP.
LOCATION OF FIRM	AUGUSTA GEORGIA
POLLUTANTS SAMPLED	AMMONIA AND AMMONIUM NITRATE

BAROMETRIC PRESSURE, IN HG		29.75
DUCT AREA, SQ FT		19.31
NOZZLE DIAMETER, IN		0.199
PITOT CALIBRATION COEFFICIENTS	1	0.825
	2	0.831
	3	0.846
DRY GAS METER CALIBRATION FACTOR, Y		1.000
FINAL LEAK RATE, CFM		0.002
TONS PER HOUR, PRODUCT		0.000

COMPOSITION OF DUCT GAS, % BY VOLUME DRY BASIS

CARBON DIOXIDE	0.00
OXYGEN	20.80
CARBON MONOXIDE	0.00
NITROGEN	79.20

AMMONIA AND AMMONIUM NITRATE COLLECTED, - MG

	AMMONIA	AMMONIUM NITRATE BASED ON NH_3	AMMONIUM NITRATE BASED ON NH_3	UNDISSOLVED SOLIDS
H2O IMPINGERS	0.1440E 02	0.6790E 02	0.4650E 02	0.0000E 00
H2SO4 IMPINGERS	0.1040E 02	0.4890E 02	0.0000E 00	0.0000E 00
TOTAL	0.2480E 02	0.1168E 03	0.4650E 02	0.0000E 00

AMOUNT OF WATER COLLECTED, GRAMS

IMPINGERS	54.0
SILICA GEL	17.5

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 3
TRC PROJECT 1439-E8J

POINT	TIME	VEL HEAD IN H20	ORIFICE PRESS IN H20	METER INLET DEG F	TEMPS EXIT DEG F	DUCT STAT PRESS IN H20	DUCT TEMP DEG F	INITIAL METER VOL CU FT	P R B	CYC ANG
1	4.0	1.1500	1.6800	87.	87.	-0.50	99.	674.74	2	0.
2	4.0	1.1500	1.6800	87.	87.	-0.50	99.	677.46	2	0.
3	4.0	1.2000	1.7500	87.	87.	-0.50	99.	680.20	2	0.
4	4.0	1.2500	1.8300	87.	88.	-0.50	98.	683.12	2	0.
5	4.0	1.3000	1.9000	88.	87.	-0.50	99.	685.06	2	0.
6	4.0	1.3500	2.0000	89.	88.	-0.50	100.	687.25	2	0.
7	4.0	1.4000	2.0500	88.	86.	-0.50	100.	692.37	2	0.
8	4.0	1.5500	2.2500	89.	87.	-0.50	100.	695.15	2	0.
9	4.0	1.5500	2.2500	89.	87.	-0.50	100.	699.38	2	0.
10	4.0	1.6500	2.4000	88.	90.	-0.50	100.	701.62	2	0.
11	4.0	1.6500	2.4000	88.	90.	-0.50	100.	704.95	2	0.
12	4.0	1.4000	2.0500	88.	90.	-0.50	104.	709.30	2	0.
13	4.0	1.3500	2.0000	88.	90.	-0.50	104.	711.90	2	0.
14	4.0	1.3500	2.0000	88.	90.	-0.50	105.	714.43	2	0.
15	4.0	1.2500	1.8300	88.	90.	-0.50	105.	717.52	2	0.
16	4.0	1.2500	1.8300	88.	90.	-0.50	106.	720.40	2	0.
17	4.0	1.1500	1.6500	88.	90.	-0.50	106.	723.40	2	0.
18	4.0	1.1500	1.6500	88.	90.	-0.50	106.	726.25	2	0.
1	4.0	0.9800	1.4200	89.	92.	-0.50	104.	729.01	2	0.
2	4.0	0.9800	1.4200	89.	92.	-0.50	104.	731.63	2	0.
3	4.0	1.2000	1.7200	89.	92.	-0.50	105.	734.23	2	0.
4	4.0	1.3000	1.9000	90.	93.	-0.50	104.	737.05	2	0.
5	4.0	1.3000	1.9000	90.	93.	-0.50	105.	740.00	2	0.
6	4.0	1.3000	1.9000	90.	93.	-0.50	106.	743.00	2	0.
7	4.0	1.2500	1.8300	90.	93.	-0.50	107.	746.00	2	0.
8	4.0	1.1000	1.5800	90.	93.	-0.50	106.	748.93	2	0.
9	4.0	1.1000	1.5800	90.	93.	-0.50	106.	751.73	2	0.
10	4.0	1.3000	1.9000	90.	93.	-0.50	106.	754.51	2	0.
11	4.0	1.5000	2.1500	90.	93.	-0.50	107.	757.46	2	0.
12	4.0	1.8000	2.5700	90.	93.	-0.50	107.	760.55	2	0.
13	4.0	1.9500	2.8000	90.	93.	-0.50	108.	764.03	2	0.
14	4.0	2.1500	3.1000	91.	94.	-0.50	109.	767.65	2	0.
15	4.0	2.1500	3.1000	91.	94.	-0.50	108.	771.40	2	0.
16	4.0	2.1500	3.1000	91.	94.	-0.50	110.	775.18	2	0.
17	4.0	1.9000	2.7000	91.	94.	-0.50	110.	781.90	2	0.
18	4.0	1.9000	2.7000	91.	94.	-0.50	109.	785.43	2	0.

FINAL METER VOLUME 787.17

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 3
TRC PROJECT 1423-E80

PRILL TOWER

COLUMBIA NITROGEN CORP.
SCRUBBER BYPASS
AUGUST 13, 1980 0847 TO 1117

STANDARD CONDITION TEMPERATURE, DEG F	0.6900E 02
STANDARD CONDITION PRESSURE, IN HG	0.2992E 02
TOTAL SAMPLING TIME, MINUTES	0.1440E 03
AVERAGE SQUARE ROOT VELOCITY HEAD, IN H2O EXP .5	0.1188E 01
AVERAGE ORIFICE PRESSURE DROP, IN H2O	0.2071E 01
AVERAGE METER TEMPERATURE, DEG F	0.8994E 02
AVERAGE DUCT STATIC PRESSURE, IN H2O	-0.5000E 00
AVERAGE DUCT TEMPERATURE, DEG F	0.1042E 03
TOTAL SAMPLE VOLUME, DACF	0.1124E 03
TOTAL SAMPLE VOLUME, DSCF	0.1079E 03
WATER VAPOR VOLUME, DSCF	0.3366E 01
MOISTURE CONTENT OF DUCT GAS, PERCENT	0.3925E 01
MOLE FRACTION DRY GAS	0.9697E 00
MOLECULAR WEIGHT - DRY STACK GAS	0.2983E 02
MOLECULAR WEIGHT - STACK GAS	0.2950E 02
AVERAGE STACK PRESSURE, IN HG	0.2971E 02
DUCT VOLUMETRIC FLOW, ACFM	0.7980E 05
DUCT VOLUMETRIC FLOW, DSCFM	0.7193E 05
AVERAGE DUCT VELOCITY, FPM	0.4133E 04
EXCESS AIR, PERCENT	0.1912E 05
AVERAGE DUCT GAS DENSITY, LBS/ACF	0.6876E-01
ISOKINETIC FACTOR, PERCENT	0.1033E 03

EMISSION DATA

	GR/ ACF	GR/ DSCF	LBS/ HR	LBS/ TON
AMMONIA IN H_2O	0.1956E-02	0.2360E-02	0.1270E 01	0.1270E 01
AMMONIA IN H_2SO_4	0.1341E-02	0.1489E-02	0.9170E 00	0.9170E 00
TOTAL AMMONIA	0.3297E-02	0.3547E-02	0.2187E 01	0.2187E 01
AMMONIUM NITRATE - NH_3 - IN H_2O	0.8753E-02	0.9712E-02	0.5987E 01	0.5987E 01
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.6304E-02	0.6994E-02	0.4312E 01	0.4312E 01
TOTAL AMMONIUM NITRATE	0.1506E-01	0.1671E-01	0.1030E 02	0.1030E 02
AMMONIUM NITRATE - NH_3 - IN H_2O	0.5994E-02	0.6651E-02	0.4100E 01	0.4100E 01
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.5994E-02	0.6651E-02	0.4100E 01	0.4100E 01
UNDISSOLVED SOLIDS IN H_2O	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 3
IRC PROJECT 1471-EG

PRILL TOWER

COLUMBIA NITROGEN CORP.
SCRUBBER BYPASS
AUGUST 13, 1990 0847 TO 1117

STANDARD CONDITION TEMPERATURE, DEG C	0.2000E 02
STANDARD CONDITION PRESSURE, MM HG	0.7600E 03
TOTAL SAMPLING TIME, MINUTES	0.1440E 03
AVERAGE SQUARE ROOT VELOCITY HEAD, MM H20 EXP.5	0.5986E 01
AVERAGE ORIFICE PRESSURE DROP, MM H20	0.5261E 02
AVERAGE METER TEMPERATURE, DEG C	0.3219E 02
AVERAGE DUCT STATIC PRESSURE, MM H20	-0.1279E 02
AVERAGE DUCT TEMPERATURE, DEG C	0.4009E 02
TOTAL SAMPLE VOLUME, DNM3	0.3184E 01
TOTAL SAMPLE VOLUME, DNM3	0.3055E 01
WATER VAPOR VOLUME, DNM3	0.9531E-01
AVERAGE STACK GAS PRESSURE, MM HG	0.7547E 03
DUCT VOLUMETRIC FLOW, AM3/M	0.2260E 04
DUCT VOLUMETRIC FLOW, DNM3/M	0.2037E 04
AVERAGE DUCT VELOCITY, M/M	0.1260E 04
AVERAGE DUCT GAS DENSITY, KG/AM3	0.1101E 01

EMISSION DATA

	MG/ AM3	MG/ DNM3	KG/ HR	KG/ MT
AMMONIA IN H_2O	0.4248E 01	0.4713E 01	0.5765E 00	0.2539E 01
AMMONIA IN H_2SO_4	0.3068E 01	0.3404E 01	0.4163E 00	0.1834E 01
TOTAL AMMONIA	0.7316E 01	0.8117E 01	0.9928E 00	0.4374E 01
AMMONIUM NITRATE - NH_3 - IN H_2O	0.2003E 02	0.2222E 02	0.2718E 01	0.1197E 02
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.1443E 02	0.1601E 02	0.1958E 01	0.8624E 01
TOTAL AMMONIUM NITRATE	0.3446E 02	0.3823E 02	0.4676E 01	0.2060E 02
AMMONIUM NITRATE - NH_3 - IN H_2O	0.1372E 02	0.1522E 02	0.1862E 01	0.8203E 01
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.1372E 02	0.1522E 02	0.1862E 01	0.8203E 01
UNDISSOLVED SOLIDS IN H_2O	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 1
IRC PROJECT 1430-EB1

UNIT TESTED	PRILL TOWER
DATE AND TIME OF TEST	AUGUST 12, 1980 1052 TO 1318
SAMPLING LOCATION	SCRUBBER OUTLET
NAME OF FIRM	COLUMBIA NITROGEN CORP.
LOCATION OF FIRM	AUGUSTA GEORGIA
POLLUTANTS SAMPLED	AMMONIA AND AMMONIUM NITRATE

BAROMETRIC PRESSURE, IN HG		29.79
DUCT AREA, SQ FT		12.83
NOZZLE DIAMETER, IN		0.125
PITOT CALIBRATION COEFFICIENTS	1	0.825
	2	0.831
	3	0.846
DRY GAS METER CALIBRATION FACTOR, Y		1.000
FINAL LEAK RATE, CFM		0.010
TONS PER HOUR, PRODUCT		0.000

COMPOSITION OF DUCT GAS, % BY VOLUME DRY BASIS

CARBON DIOXIDE	0.00
OXYGEN	20.80
CARBON MONOXIDE	0.00
NITROGEN	79.20

AMMONIA AND AMMONIUM NITRATE COLLECTED, - MG

	AMMONIA	AMMONIUM NITRATE BASED ON NH_3	AMMONIUM NITRATE BASED ON NH_3	UNDISSOLVED SOLIDS
H2O IMPINGERS	0.1870E 02	0.8923E 02	0.5410E 01	0.8130E 01
H2SO4 IMPINGERS	0.1110E 02	0.5220E 02	0.0000E 00	0.0000E 00
TOTAL	0.2980E 02	0.1404E 03	0.5410E 01	0.8130E 01

AMOUNT OF WATER COLLECTED, GRAMS

IMPINGERS	70.0
SILICA GEL	8.3

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 1
TRC PROJECT 1431-E80

POINT	TIME	VEL HEAD IN H20	ORIFICE PRESS IN H20	METER INLET DEG F	TEMPS EXIT DEG F	DUCT STAT PRESS IN H20	DUCT TEMP DEG F	INITIAL METER VOL CU FT	P R B	CYC ANG
1	4.0	1.3000	0.3600	93.	95.	-0.64	88.	132.63	3	0.
2	4.0	1.5000	0.4100	92.	95.	-0.64	89.	134.01	3	0.
3	4.0	1.6000	0.4400	92.	96.	-0.64	95.	135.44	3	0.
4	4.0	1.7000	0.4700	92.	96.	-0.64	95.	136.95	3	0.
5	4.0	1.7000	0.4700	93.	96.	-0.64	95.	138.47	3	0.
6	4.0	1.7000	0.4700	93.	96.	-0.64	94.	140.04	3	0.
7	4.0	1.7000	0.4700	94.	97.	-0.64	95.	141.66	3	0.
8	4.0	1.6000	0.4400	93.	97.	-0.64	94.	143.12	3	0.
9	4.0	1.5000	0.4100	93.	97.	-0.64	94.	144.61	3	0.
10	4.0	1.4000	0.3800	93.	97.	-0.64	94.	146.08	3	0.
11	4.0	1.6000	0.4400	93.	97.	-0.64	93.	147.46	3	0.
12	4.0	1.7000	0.4700	93.	97.	-0.64	93.	143.96	3	0.
13	4.0	1.8000	0.4900	92.	97.	-0.64	94.	150.50	3	0.
14	4.0	1.9000	0.5200	92.	97.	-0.64	95.	152.07	3	0.
15	4.0	2.0000	0.5500	92.	97.	-0.64	95.	153.70	3	0.
16	4.0	2.1000	0.5700	93.	97.	-0.64	94.	155.36	3	0.
17	4.0	2.0000	0.5400	93.	97.	-0.64	95.	157.06	3	0.
18	4.0	1.7000	0.4700	94.	98.	-0.64	95.	158.72	3	0.
1	4.0	1.1000	0.3000	95.	98.	-0.60	92.	161.28	3	0.
2	4.0	1.2000	0.3300	95.	99.	-0.60	95.	161.55	3	0.
3	4.0	1.3000	0.3600	95.	99.	-0.60	95.	162.98	3	0.
4	4.0	1.3000	0.3600	95.	99.	-0.60	94.	164.26	3	0.
5	4.0	1.4000	0.3800	95.	98.	-0.60	95.	165.64	3	0.
6	4.0	1.3000	0.3600	94.	99.	-0.60	95.	167.06	3	0.
7	4.0	1.4000	0.3800	94.	98.	-0.60	95.	169.45	3	0.
8	4.0	1.4000	0.3800	94.	99.	-0.60	94.	167.85	3	0.
9	4.0	1.4000	0.3800	94.	98.	-0.60	94.	171.26	3	0.
10	4.0	1.5000	0.4000	94.	98.	-0.60	95.	172.67	3	0.
11	4.0	1.6000	0.4400	95.	98.	-0.60	95.	174.13	3	0.
12	4.0	1.6000	0.4400	95.	99.	-0.60	95.	175.65	3	0.
13	4.0	1.8000	0.4900	95.	99.	-0.60	96.	177.16	3	0.
14	4.0	1.7000	0.4650	94.	99.	-0.60	95.	178.75	3	0.
15	4.0	2.1000	0.5700	94.	98.	-0.60	95.	180.32	3	0.
16	4.0	2.1500	0.5800	94.	99.	-0.60	96.	182.01	3	0.
17	4.0	2.2000	0.6000	94.	99.	-0.60	95.	183.73	3	0.
18	4.0	2.1000	0.5700	95.	99.	-0.60	96.	185.48	3	0.

FINAL METER VOLUME 187.18

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 1
IRC PROJECT 1430-EB7

PRILL TOWER

COLUMBIA NITROGEN CORP.
SCRUBBER OUTLET
AUGUST 12, 1980 1052 TO 1318

STANDARD CONDITION TEMPERATURE, DEG F	0.6800E 02
STANDARD CONDITION PRESSURE, IN HG	0.2992E 02
TOTAL SAMPLING TIME, MINUTES	0.1440E 03
AVERAGE SQUARE ROOT VELOCITY HEAD, IN H2O EXP .5	0.1276E 01
AVERAGE ORIFICE PRESSURE DROP, IN H2O	0.4487E 00
AVERAGE METER TEMPERATURE, DEG F	0.9564E 02
AVERAGE DUCT STATIC PRESSURE, IN H2O	-0.6200E 00
AVERAGE DUCT TEMPERATURE, DEG F	0.9429E 02
TOTAL SAMPLE VOLUME, DACF	0.5455E 02
TOTAL SAMPLE VOLUME, DSCF	0.5165E 02
WATER VAPOR VOLUME, DSCF	0.3686E 01
MOISTURE CONTENT OF DUCT GAS, PERCENT	0.6660E 01
MOLE FRACTION DRY GAS	0.9334E 00
MOLECULAR WEIGHT - DRY STACK GAS	0.2883E 02
MOLECULAR WEIGHT - STACK GAS	0.2911E 02
AVERAGE STACK PRESSURE, IN HG	0.2973E 02
DUCT VOLUMETRIC FLOW, ACFM	0.5785E 05
DUCT VOLUMETRIC FLOW, DSCFM	0.5112E 05
AVERAGE DUCT VELOCITY, FPM	0.4509E 04
EXCESS AIR, PERCENT	0.1912E 05
AVERAGE DUCT GAS DENSITY, LBS/ACF	0.6907E-01
ISOKINETIC FACTOR, PERCENT	0.1057E 03

EMISSION DATA

	GR/ ACF	GR/ DSCF	LBS/ HR	LBS/ TON
AMMONIA IN H_2O	0.4936E-02	0.5586E-02	0.2448E 01	0.2448E 01
AMMONIA IN H_2SO_4	0.2930E-02	0.3316E-02	0.1453E 01	0.1453E 01
TOTAL AMMONIA	0.7866E-02	0.8902E-02	0.3900E 01	0.3900E 01
AMMONIUM NITRATE - NH_3 - IN H_2O	0.2328E-01	0.2635E-01	0.1154E 02	0.1154E 02
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.1378E-01	0.1559E-01	0.6832E 01	0.6832E 01
TOTAL AMMONIUM NITRATE	0.3706E-01	0.4194E-01	0.1838E 02	0.1838E 02
AMMONIUM NITRATE - NH_3 - IN H_2O	0.1428E-02	0.1615E-02	0.7081E 00	0.7081E 00
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.1428E-02	0.1615E-02	0.7081E 00	0.7081E 00
UNDISSOLVED SOLIDS IN H_2O	0.2146E-02	0.2429E-02	0.1064E 01	0.1064E 01
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.2146E-02	0.2429E-02	0.1064E 01	0.1064E 01

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 1
TRC PROJECT 1439-E80

PRILL TOWER

COLUMBIA NITROGEN CORP.
SCRUBBER OUTLET
AUGUST 12, 1980 1052 TO 1318

STANDARD CONDITION TEMPERATURE, DEG C	0.2300E 02
STANDARD CONDITION PRESSURE, MM HG	0.7600E 03
TOTAL SAMPLING TIME, MINUTES	0.1440E 03
AVERAGE SQUARE ROOT VELOCITY HEAD, MM H2O EXP.5	0.6431E 01
AVERAGE ORIFICE PRESSURE DROP, MM H2O	0.1140E 02
AVERAGE METER TEMPERATURE, DEG C	0.3535E 02
AVERAGE DUCT STATIC PRESSURE, MM H2O	-0.1575E 02
AVERAGE DUCT TEMPERATURE, DEG C	0.3460E 02
TOTAL SAMPLE VOLUME, DM3	0.1545E 01
TOTAL SAMPLE VOLUME, DNM3	0.1463E 01
WATER VAPOR VOLUME, DNM3	0.1044E 00
AVERAGE STACK GAS PRESSURE, MM HG	0.7553E 03
DUCT VOLUMETRIC FLOW, AM3/M	0.1639E 04
DUCT VOLUMETRIC FLOW, DNM3/M	0.1448E 04
AVERAGE DUCT VELOCITY, M/M	0.1374E 04
AVERAGE DUCT GAS DENSITY, KG/AM3	0.1106E 01

EMISSION DATA

	MG/ AM3	MG/ DNM3	KG/ HR	KG/ MT
AMMONIA IN H_2O	0.1130E 02	0.1279E 02	0.1111E 01	0.4895E 01
AMMONIA IN H_2SO_4	0.6705E 01	0.7588E 01	0.6596E 00	0.2906E 01
TOTAL AMMONIA	0.1800E 02	0.2037E 02	0.1771E 01	0.7801E 01
AMMONIUM NITRATE - NH_3 - IN H_2O	0.5328E 02	0.6030E 02	0.5241E 01	0.2309E 02
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.3153E 02	0.3569E 02	0.3102E 01	0.1366E 02
TOTAL AMMONIUM NITRATE	0.8481E 02	0.9599E 02	0.8343E 01	0.3675E 02
AMMONIUM NITRATE - NH_3 - IN H_2O	0.3268E 01	0.3698E 01	0.3215E 00	0.1416E 01
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.3268E 01	0.3698E 01	0.3215E 00	0.1416E 01
UNDISSOLVED SOLIDS IN H_2O	0.4911E 01	0.5559E 01	0.4831E 00	0.2128E 01
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.4911E 01	0.5559E 01	0.4831E 00	0.2128E 01

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 2
IRC PROJECT 1030-EBJ

UNIT TESTED	PRILL TOWER
DATE AND TIME OF TEST	AUGUST 12, 1980 1530 TO 1757
SAMPLING LOCATION	SCRUBBER OUTLET
NAME OF FIRM	COLUMBIA NITROGEN CORP.
LOCATION OF FIRM	AUGUSTA GEORGIA
POLLUTANTS SAMPLED	AMMONIA AND AMMONIUM NITRATE

BAROMETRIC PRESSURE, IN HG		29.75
DUCT AREA, SQ FT		12.83
NOZZLE DIAMETER, IN		0.125
PITOT CALIBRATION COEFFICIENTS	1	0.825
	2	0.831
	3	0.846
DRY GAS METER CALIBRATION FACTOR, Y		1.000
FINAL LEAK RATE, CFM		0.007
TONS PER HOUR, PRODUCT		0.000

COMPOSITION OF DUCT GAS, % BY VOLUME DRY BASIS

CARBON DIOXIDE	0.00
OXYGEN	20.80
CARBON MONOXIDE	0.00
NITROGEN	79.20

AMMONIA AND AMMONIUM NITRATE COLLECTED, - MG

	AMMONIA	AMMONIUM NITRATE BASED ON NH_3	AMMONIUM NITRATE BASED ON NH_3	UNDISSOLVED SOLIDS
H2O IMPINGERS	0.1670E 02	0.7870E 02	0.5000E 01	0.0000E 00
H2SO4 IMPINGERS	0.1120E 02	0.5290E 02	0.0000E 00	0.0000E 00
TOTAL	0.2790E 02	0.1316E 03	0.5000E 01	0.0000E 00

AMOUNT OF WATER COLLECTED, GRAMS

IMPINGERS	31.0
SILICA GEL	8.0

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 2
TRC PROJECT 1430-F80

POINT	TIME	VEL HEAD IN H20	ORIFICE PRESS IN H20	METER INLET DEG F	TEMPS EXIT DEG F	DUCT STAT PRESS IN H20	DUCT TEMP DEG F	INITIAL METER VOL CU FT	P R B	CYC ANG
1	4.0	1.4000	0.3900	102.	100.	-0.73	91.	187.34	3	0.
2	4.0	1.6300	0.4500	99.	102.	-0.73	93.	189.77	3	0.
3	4.0	1.7000	0.4800	98.	102.	-0.73	93.	190.30	3	0.
4	4.0	1.6000	0.5000	98.	102.	-0.73	92.	191.97	3	0.
5	4.0	1.8000	0.5000	98.	102.	-0.73	93.	193.46	3	0.
6	4.0	1.7000	0.4900	98.	102.	-0.73	94.	195.07	3	0.
7	4.0	1.7000	0.4800	98.	102.	-0.73	93.	196.63	3	0.
8	4.0	1.6000	0.4500	98.	102.	-0.73	95.	198.20	3	0.
9	4.0	1.5000	0.4200	99.	103.	-0.73	95.	199.74	3	0.
10	4.0	1.5000	0.4200	99.	103.	-0.73	94.	201.23	3	0.
11	4.0	1.6000	0.4500	99.	103.	-0.73	95.	202.71	3	0.
12	4.0	1.7000	0.4800	99.	103.	-0.73	95.	204.24	3	0.
13	4.0	1.8000	0.5000	99.	103.	-0.73	93.	205.84	3	0.
14	4.0	2.0000	0.5600	99.	102.	-0.73	93.	207.46	3	0.
15	4.0	2.0000	0.5600	98.	102.	-0.73	93.	209.16	3	0.
16	4.0	2.1000	0.5900	98.	102.	-0.73	93.	210.87	3	0.
17	4.0	2.0000	0.5600	99.	103.	-0.73	95.	212.60	3	0.
18	4.0	1.8000	0.5000	98.	103.	-0.73	93.	214.31	3	0.
1	4.0	1.1000	0.3000	99.	103.	-0.75	93.	215.92	3	0.
2	4.0	1.2000	0.3300	99.	103.	-0.75	93.	217.22	3	0.
3	4.0	1.2000	0.3300	98.	103.	-0.75	92.	218.55	3	0.
4	4.0	1.3000	0.3700	99.	103.	-0.75	93.	219.99	3	0.
5	4.0	1.3000	0.3700	99.	103.	-0.75	92.	221.30	3	0.
6	4.0	1.4000	0.3900	99.	103.	-0.75	91.	222.71	3	0.
7	4.0	1.3000	0.3700	100.	104.	-0.75	93.	224.15	3	0.
8	4.0	1.3000	0.3700	100.	104.	-0.75	94.	225.56	3	0.
9	4.0	1.5000	0.4200	100.	103.	-0.75	94.	226.97	3	0.
10	4.0	1.6000	0.4500	99.	102.	-0.75	93.	228.46	3	0.
11	4.0	1.6500	0.4650	98.	102.	-0.75	93.	230.00	3	0.
12	4.0	1.8000	0.5000	98.	102.	-0.75	94.	231.56	3	0.
13	4.0	1.8000	0.5000	98.	102.	-0.75	93.	233.18	3	0.
14	4.0	1.9000	0.5300	99.	103.	-0.75	94.	234.80	3	0.
15	4.0	2.1000	0.5900	99.	103.	-0.75	93.	236.47	3	0.
16	4.0	2.0000	0.5500	99.	103.	-0.75	94.	238.22	3	0.
17	4.0	2.0000	0.5500	99.	103.	-0.75	94.	239.50	3	0.
18	4.0	2.0000	0.5500	98.	102.	-0.75	92.	241.61	3	0.

FINAL METER VOLUME 243.28

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 2
IRC PROJECT 1431-E87

PRILL TOWER
COLUMBIA NITROGEN CORP.
SCRUBBER OUTLET
AUGUST 12, 1980 1530 TO 1757

STANDARD CONDITION TEMPERATURE, DEG F	0.6900E 02
STANDARD CONDITION PRESSURE, IN HG	0.2992E 02
TOTAL SAMPLING TIME, MINUTES	0.1440E 03
AVERAGE SQUARE ROOT VELOCITY HEAD, IN H2O EXP .5	0.1284E 01
AVERAGE ORIFICE PRESSURE DROP, IN H2O	0.4640E 00
AVERAGE METER TEMPERATURE, DEG F	0.1007E 03
AVERAGE DUCT STATIC PRESSURE, IN H2O	-0.7400E 00
AVERAGE DUCT TEMPERATURE, DEG F	0.9328E 02
TOTAL SAMPLE VOLUME, DACF	0.5559E 02
TOTAL SAMPLE VOLUME, DSCF	0.5244E 02
WATER VAPOR VOLUME, DSCF	0.1836E 01
MOISTURE CONTENT OF DUCT GAS, PERCENT	0.3382E 01
MOLE FRACTION DRY GAS	0.9662E 00
MOLECULAR WEIGHT - DRY STACK GAS	0.2883E 02
MOLECULAR WEIGHT - STACK GAS	0.2847E 02
AVERAGE STACK PRESSURE, IN HG	0.2970E 02
DUCT VOLUMETRIC FLOW, ACFM	0.5782E 05
DUCT VOLUMETRIC FLOW, DSCFM	0.5291E 05
AVERAGE DUCT VELOCITY, FPM	0.4507E 04
EXCESS AIR, PERCENT	0.1912E 05
AVERAGE DUCT GAS DENSITY, LBS/ACF	0.6997E-01
ISOKINETIC FACTOR, PERCENT	0.1037E 03

EMISSION DATA

	GR/ ACF	GR/ DSCF	LBS/ HR	LBS/ TON
AMMONIA IN H_2O	0.4497E-02	0.4914E-02	0.2228E 01	0.2228E 01
AMMONIA IN H_2SO_4	0.3016E-02	0.3295E-02	0.1495E 01	0.1495E 01
TOTAL AMMONIA	0.7512E-02	0.8209E-02	0.3723E 01	0.3723E 01
AMMONIUM NITRATE - NH_3 - IN H_2O	0.2119E-01	0.2316E-01	0.1050E 02	0.1050E 02
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.1424E-01	0.1556E-01	0.7059E 01	0.7059E 01
TOTAL AMMONIUM NITRATE	0.3543E-01	0.3872E-01	0.1756E 02	0.1756E 02
AMMONIUM NITRATE - NH_3 - IN H_2O	0.1346E-02	0.1471E-02	0.6672E 00	0.6672E 00
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.1346E-02	0.1471E-02	0.6672E 00	0.6672E 00
UNDISSOLVED SOLIDS IN H_2O	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 2
IRC PROJECT 1430-E8J

PRILL TOWER

COLUMBIA NITROGEN CORP.
SCRUBBER OUTLET
AUGUST 12, 1980 1530 TO 1757

STANDARD CONDITION TEMPERATURE, DEG C	0.2000E 02
STANDARD CONDITION PRESSURE, MM HG	0.7600E 03
TOTAL SAMPLING TIME, MINUTES	0.1440E 03
AVERAGE SQUARE ROOT VELOCITY HEAD, MM H2O EXP.5	0.6470E 01
AVERAGE ORIFICE PRESSURE DROP, MM H2O	0.1172E 02
AVERAGE METER TEMPERATURE, DEG C	0.3915E 02
AVERAGE DUCT STATIC PRESSURE, MM H2O	-0.1880E 02
AVERAGE DUCT TEMPERATURE, DEG C	0.3404E 02
TOTAL SAMPLE VOLUME, DM3	0.1584E 01
TOTAL SAMPLE VOLUME, DNM3	0.1485E 01
WATER VAPOR VOLUME, DNM3	0.5199E-01
AVERAGE STACK GAS PRESSURE, MM HG	0.7543E 03
DUCT VOLUMETRIC FLOW, AM3/M	0.1634E 04
DUCT VOLUMETRIC FLOW, DNM3/M	0.1499E 04
AVERAGE DUCT VELOCITY, M/M	0.1374E 04
AVERAGE DUCT GAS DENSITY, KG/AM3	0.1121E 01

EMISSION DATA

	MG/AM3	MG/DNM3	KG/HR	KG/MT
AMMONIA IN H_2O	0.1029E 02	0.1124E 02	0.1012E 01	0.4457E 01
AMMONIA IN H_2SO_4	0.6931E 01	0.7541E 01	0.6795E 00	0.2989E 01
TOTAL AMMONIA	0.1719E 02	0.1879E 02	0.1690E 01	0.7446E 01
AMMONIUM NITRATE - NH_3 - IN H_2O	0.4849E 02	0.5299E 02	0.4768E 01	0.2100E 02
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.3260E 02	0.3562E 02	0.3205E 01	0.1412E 02
TOTAL AMMONIUM NITRATE	0.8109E 02	0.8861E 02	0.7973E 01	0.3512E 02
AMMONIUM NITRATE - NH_3 - IN H_2O	0.3081E 01	0.3367E 01	0.3029E 00	0.1334E 01
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.3081E 01	0.3367E 01	0.3029E 00	0.1334E 01
UNDISSOLVED SOLIDS IN H_2O	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 3
TRC PROJECT 1031-E81

UNIT TESTED	PRILL TOWER
DATE AND TIME OF TEST	AUGUST 13, 1980 0857 TO 1124
SAMPLING LOCATION	SCRUBBER OUTLET
NAME OF FIRM	COLUMBIA NITROGEN CORP.
LOCATION OF FIRM	AUGUSTA GEORGIA
POLLUTANTS SAMPLED	AMMONIA AND AMMONIUM NITRATE

BAROMETRIC PRESSURE, IN HG		29.71
DUCT AREA, SQ FT		12.83
NOZZLE DIAMETER, IN		0.125
PITOT CALIBRATION COEFFICIENTS	1	0.825
	2	0.831
	3	0.846
DRY GAS METER CALIBRATION FACTOR, Y		1.000
FINAL LEAK RATE, CFM		0.031
TONS PER HOUR, PRODUCT		0.000

COMPOSITION OF DUCT GAS, % BY VOLUME DRY BASIS

CARBON DIOXIDE	0.00
OXYGEN	20.80
CARBON MONOXIDE	0.00
NITROGEN	79.20

AMMONIA AND AMMONIUM NITRATE COLLECTED, - MG

	AMMONIA	AMMONIUM NITRATE BASED ON NH_3	AMMONIUM NITRATE BASED ON NH_3	UNDISSOLVED SOLIDS
H2O IMPINGERS	0.1860E 02	0.8740E 02	0.1110E 02	0.3220E 01
H2SO4 IMPINGERS	0.1040E 02	0.4890E 02	0.0000E 00	0.0000E 00
TOTAL	0.2900E 02	0.1363E 03	0.1110E 02	0.3220E 01

AMOUNT OF WATER COLLECTED, GRAMS

IMPINGERS	41.0
SILICA GEL	6.5

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 1
IRC PROJECT 1050-E80

POINT	TIME	VEL HEAD IN H20	ORIFICE PRESS IN H20	METER INLET DEG F	TEMPS EXIT DEG F	DUCT STAT PRESS IN H20	DUCT TEMP DEG F	INITIAL METER VOL CU FT	P R B	CYC ANG
1	4.0	1.5000	0.3600	81.	82.	-0.56	91.	243.38	3	0.
2	4.0	1.6000	0.3800	81.	83.	-0.56	93.	244.73	3	0.
3	4.0	1.6000	0.3800	81.	83.	-0.56	94.	245.07	3	0.
4	4.0	1.7000	0.4100	81.	84.	-0.56	94.	247.45	3	0.
5	4.0	1.7000	0.4100	81.	84.	-0.56	94.	248.90	3	0.
6	4.0	1.7000	0.4200	81.	84.	-0.56	94.	250.34	3	0.
7	4.0	1.7000	0.4100	81.	85.	-0.66	94.	251.78	3	0.
8	4.0	1.6500	0.4000	82.	86.	-0.66	95.	253.23	3	0.
9	4.0	1.6000	0.3800	82.	86.	-0.66	94.	254.66	3	0.
10	4.0	1.5000	0.3600	83.	87.	-0.66	95.	256.06	3	0.
11	4.0	1.6000	0.3900	84.	87.	-0.66	95.	257.44	3	0.
12	4.0	1.7000	0.4100	84.	88.	-0.66	94.	259.94	3	0.
13	4.0	1.8000	0.4300	84.	88.	-0.69	95.	261.30	3	0.
14	4.0	1.9000	0.4600	84.	89.	-0.69	95.	261.78	3	0.
15	4.0	2.0000	0.4900	84.	86.	-0.69	95.	263.32	3	0.
16	4.0	2.0000	0.4800	85.	89.	-0.69	94.	264.88	3	0.
17	4.0	2.0000	0.4800	85.	89.	-0.69	95.	266.45	3	0.
18	4.0	1.8000	0.4300	86.	91.	-0.70	95.	268.02	3	0.
1	4.0	1.1000	0.2650	88.	92.	-0.45	94.	269.53	3	0.
2	4.0	1.2000	0.2900	89.	93.	-0.45	94.	270.77	3	0.
3	4.0	1.2000	0.2900	89.	93.	-0.45	94.	272.02	3	0.
4	4.0	1.3000	0.3100	89.	93.	-0.45	95.	273.28	3	0.
5	4.0	1.3000	0.3100	90.	94.	-0.45	94.	274.59	3	0.
6	4.0	1.3000	0.3100	90.	95.	-0.45	95.	275.91	3	0.
7	4.0	1.3000	0.3100	91.	95.	-0.53	94.	277.23	3	0.
8	4.0	1.3000	0.3100	91.	96.	-0.53	95.	278.55	3	0.
9	4.0	1.3500	0.3200	91.	96.	-0.53	94.	279.97	3	0.
10	4.0	1.5000	0.3600	92.	95.	-0.53	95.	281.20	3	0.
11	4.0	1.7000	0.4100	92.	97.	-0.53	94.	282.61	3	0.
12	4.0	1.7000	0.4100	92.	98.	-0.53	95.	284.10	3	0.
13	4.0	1.7000	0.4100	93.	98.	-0.69	95.	285.59	3	0.
14	4.0	1.9000	0.4500	92.	98.	-0.69	95.	287.07	3	0.
15	4.0	1.9000	0.4500	93.	99.	-0.69	95.	288.61	3	0.
16	4.0	1.9000	0.4500	93.	99.	-0.69	95.	290.16	3	0.
17	4.0	1.9000	0.4500	93.	99.	-0.69	95.	291.72	3	0.
18	4.0	1.9000	0.4500	94.	100.	-0.69	95.	293.29	3	0.
FINAL METER VOLUME								294.83		

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 3
TRC PROJECT 1420-E81

PRILL TOWER
COLUMBIA NITROGEN CORP.
SCRUBBER OUTLET
AUGUST 13, 1980 0857 TO 1124

STANDARD CONDITION TEMPERATURE, DEG F	0.6800E 02
STANDARD CONDITION PRESSURE, IN HG	0.2992E 02
TOTAL SAMPLING TIME, MINUTES	0.1440E 03
AVERAGE SQUARE ROOT VELOCITY HEAD, IN H2O EXP .5	0.1271E 01
AVERAGE ORIFICE PRESSURE DROP, IN H2O	0.3893E 00
AVERAGE METER TEMPERATURE, DEG F	0.8907E 02
AVERAGE DUCT STATIC PRESSURE, IN H2O	-0.5956E 00
AVERAGE DUCT TEMPERATURE, DEG F	0.9442E 02
TOTAL SAMPLE VOLUME, DACF	0.5145E 02
TOTAL SAMPLE VOLUME, DSCF	0.4918E 02
WATER VAPOR VOLUME, DSCF	0.2236E 01
MOISTURE CONTENT OF DUCT GAS, PERCENT	0.4349E 01
MOLE FRACTION DRY GAS	0.9565E 00
MOLECULAR WEIGHT - DRY STACK GAS	0.2883E 02
MOLECULAR WEIGHT - STACK GAS	0.2836E 02
AVERAGE STACK PRESSURE, IN HG	0.2967E 02
DUCT VOLUMETRIC FLOW, ACFM	0.5743E 05
DUCT VOLUMETRIC FLOW, DSCFM	0.5187E 05
AVERAGE DUCT VELOCITY, FPM	0.4477E 04
EXCESS AIR, PERCENT	0.1912E 05
AVERAGE DUCT GAS DENSITY, LBS/ACF	0.6950E-01
ISOKINETIC FACTOR, PERCENT	0.9917E 02

EMISSION DATA

	GR/ ACF	GR/ DSCF	LBS/ HR	LBS/ TON
AMMONIA IN H_2O	0.5271E-02	0.5836E-02	0.2595E 01	0.2595E 01
AMMONIA IN H_2SO_4	0.2947E-02	0.3263E-02	0.1451E 01	0.1451E 01
TOTAL AMMONIA	0.8219E-02	0.9099E-02	0.4046E 01	0.4046E 01
AMMONIUM NITRATE - NH_3 - IN H_2O	0.2477E-01	0.2742E-01	0.1219E 02	0.1219E 02
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.1386E-01	0.1534E-01	0.6822E 01	0.6822E 01
TOTAL AMMONIUM NITRATE	0.3863E-01	0.4277E-01	0.1902E 02	0.1902E 02
AMMONIUM NITRATE - NH_3 - IN H_2O	0.3146E-02	0.3483E-02	0.1549E 01	0.1549E 01
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.3146E-02	0.3483E-02	0.1549E 01	0.1549E 01
UNDISSOLVED SOLIDS IN H_2O	0.9126E-03	0.1010E-02	0.4492E 00	0.4492E 00
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.9126E-03	0.1010E-02	0.4492E 00	0.4492E 00

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 3
IRC PROJECT 1430-EB9

PRILL TOWER

COLUMBIA NITROGEN CORP.
SCRUBBER OUTLET
AUGUST 13, 1980 0857 TO 1124

STANDARD CONDITION TEMPERATURE, DEG C	0.2000E 02
STANDARD CONDITION PRESSURE, MM HG	0.7600E 03
TOTAL SAMPLING TIME, MINUTES	0.1440E 03
AVERAGE SQUARE ROOT VELOCITY HEAD, MM H2O EXP.5	0.6405E 01
AVERAGE ORIFICE PRESSURE DROP, MM H2O	0.9988E 01
AVERAGE METER TEMPERATURE, DEG C	0.3171E 02
AVERAGE DUCT STATIC PRESSURE, MM H2O	-0.1513E 02
AVERAGE DUCT TEMPERATURE, DEG C	0.3468E 02
TOTAL SAMPLE VOLUME, DM3	0.1457E 01
TOTAL SAMPLE VOLUME, DNM3	0.1393E 01
WATER VAPOR VOLUME, DNM3	0.6332E-01
AVERAGE STACK GAS PRESSURE, MM HG	0.7535E 03
DUCT VOLUMETRIC FLOW, AM3/M	0.1627E 04
DUCT VOLUMETRIC FLOW, DNM3/M	0.1969E 04
AVERAGE DUCT VELOCITY, M/M	0.1364E 04
AVERAGE DUCT GAS DENSITY, KG/AM3	0.1113E 01

EMISSION DATA

	MG/AM3	MG/DNM3	KG/HR	KG/MT
AMMONIA IN H_2O	0.1206E 02	0.1336E 02	0.1178E 01	0.5190E 01
AMMONIA IN H_2SO_4	0.6745E 01	0.7463E 01	0.6587E 00	0.2902E 01
TOTAL AMMONIA	0.1881E 02	0.2082E 02	0.1837E 01	0.8092E 01
AMMONIUM NITRATE - NH_3 - IN H_2O	0.5668E 02	0.6276E 02	0.5536E 01	0.2439E 02
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.3171E 02	0.3511E 02	0.3097E 01	0.1364E 02
TOTAL AMMONIUM NITRATE	0.8840E 02	0.9787E 02	0.8633E 01	0.3803E 02
AMMONIUM NITRATE - NH_3 - IN H_2O	0.7199E 01	0.7970E 01	0.7030E 00	0.3097E 01
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.7199E 01	0.7970E 01	0.7030E 00	0.3097E 01
UNDISSOLVED SOLIDS IN H_2O	0.2088E 01	0.2312E 01	0.2039E 00	0.8984E 00
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.2088E 01	0.2312E 01	0.2039E 00	0.8984E 00

APPENDIX A.2

PREDRYER/DRYER (PREDRYER INLET, DRYER INLET, OUTLET)

(Concentration Method Mass Flowrate Calculations Only)

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 4
IRC PROJECT 1430-E80

UNIT TESTED	PRILL DRYER
DATE AND TIME OF TEST	AUGUST 14, 1980 1735 TO 1825
SAMPLING LOCATION	INLET
NAME OF FIRM	COLUMBIA NITROGEN CORP.
LOCATION OF FIRM	AUGUSTA GEORGIA
POLLUTANTS SAMPLED	AMMONIA AND AMMONIUM NITRATE

BAROMETRIC PRESSURE, IN HG		29.87
DUCT AREA, SQ FT		15.61
NOZZLE DIAMETER, IN		0.251
PITOT CALIBRATION COEFFICIENTS	1	0.825
	2	0.831
	3	0.846
DRY GAS METER CALIBRATION FACTOR, Y		1.000
FINAL LEAK RATE, CFM		0.004
TONS PER HOUR, PRODUCT		0.000

COMPOSITION OF DUCT GAS, % BY VOLUME DRY BASIS

CARBON DIOXIDE	0.00
OXYGEN	20.80
CARBON MONOXIDE	0.00
NITROGEN	79.20

AMMONIA AND AMMONIUM NITRATE COLLECTED, - MG

	AMMONIA	AMMONIUM NITRATE BASED ON NH_3	AMMONIUM NITRATE BASED ON NH_3	UNDISSOLVED SOLIDS
H2O IMPINGERS	0.5101E 04	0.2403E 05	0.2461E 05	0.0000E 00
H2SO4 IMPINGERS	0.1000E 02	0.4710E 02	0.0000E 00	0.0000E 00
TOTAL	0.5111E 04	0.2405E 05	0.2461E 05	0.0000E 00

AMOUNT OF WATER COLLECTED, GRAMS

IMPINGERS	30.0
SILICA GEL	4.3

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 4
IRC PROJECT 1430-E81

POINT	TIME	VEL HEAD IN H20	ORIFICE PRESS IN H20	METER INLET DEG F	TEMPS EXIT DEG F	DUCT STAT PRESS IN H20	DUCT TEMP DEG F	INITIAL METER VOL CU FT	P R B	CYC ANG
1	1.0	0.3400	1.9000	94.	94.	-1.65	120.	409.10	3	0.
2	1.0	0.2500	1.9000	94.	94.	-1.65	123.	410.23	3	0.
3	1.0	0.3200	1.9000	94.	94.	-1.65	124.	410.83	3	0.
4	1.0	0.2600	1.9000	94.	94.	-1.65	127.	411.75	3	0.
5	1.0	0.2600	1.9000	94.	94.	-1.65	126.	412.18	3	0.
6	1.0	0.3700	1.9000	94.	94.	-1.65	137.	413.14	3	0.
7	1.0	0.4000	1.9000	93.	94.	-1.65	141.	413.62	3	0.
8	1.0	0.3800	1.9000	93.	94.	-1.65	146.	414.00	3	0.
9	1.0	0.4400	1.9000	93.	94.	-1.65	147.	415.21	3	0.
10	1.0	0.4800	1.9000	93.	94.	-1.65	149.	415.71	3	0.
11	1.0	0.5000	1.9000	93.	94.	-1.65	150.	416.68	3	0.
12	1.0	0.5700	1.9000	93.	94.	-1.65	150.	417.29	3	0.
13	1.0	0.6600	1.9000	93.	94.	-1.65	151.	418.11	3	0.
14	1.0	0.6500	1.9000	93.	94.	-1.65	150.	419.59	3	0.
15	1.0	0.6300	1.9000	93.	94.	-1.65	151.	419.35	3	0.
16	1.0	0.7100	1.9000	93.	94.	-1.65	151.	420.07	3	0.
17	1.0	0.7000	1.9000	93.	94.	-1.65	151.	420.90	3	0.
18	1.0	0.5600	1.9000	93.	94.	-1.65	151.	421.36	3	0.
19	1.0	0.5100	1.8500	93.	94.	-1.65	151.	422.10	3	0.
20	1.0	0.5000	1.8500	93.	94.	-1.65	150.	422.76	3	0.
21	1.0	0.4700	1.8500	93.	94.	-1.65	151.	423.57	3	0.
22	1.0	0.3400	1.8500	93.	94.	-1.65	150.	424.21	3	0.
1	1.0	0.5400	1.8500	93.	94.	-1.65	151.	424.96	3	0.
2	1.0	0.5600	1.8500	93.	94.	-1.65	150.	425.51	3	0.
3	1.0	0.5400	1.8500	93.	94.	-1.65	151.	426.21	3	0.
4	1.0	0.5200	1.8500	93.	94.	-1.65	150.	426.98	3	0.
5	1.0	0.5300	1.8500	93.	94.	-1.65	135.	427.78	3	0.
6	1.0	0.5800	1.8500	93.	94.	-1.65	135.	428.49	3	0.
7	1.0	0.6000	1.8500	93.	94.	-1.65	144.	429.00	3	0.
8	1.0	0.6200	1.8500	93.	94.	-1.65	148.	429.86	3	0.
9	1.0	0.6300	1.8500	93.	94.	-1.65	149.	430.39	3	0.
10	1.0	0.6000	1.8500	93.	94.	-1.65	148.	430.96	3	0.
11	1.0	0.5900	1.8500	93.	94.	-1.65	148.	431.64	3	0.
12	1.0	0.6600	1.8500	93.	94.	-1.65	150.	432.48	3	0.
13	1.0	0.6400	1.8500	93.	94.	-1.65	150.	433.27	3	0.
14	1.0	0.6200	1.8500	93.	94.	-1.65	150.	434.00	3	0.
15	1.0	0.5900	1.8500	92.	93.	-1.65	150.	434.60	3	0.
16	1.0	0.5700	1.8500	92.	93.	-1.65	150.	435.37	3	0.
17	1.0	0.5800	1.8500	92.	93.	-1.65	150.	436.14	3	0.
18	1.0	0.5300	1.8500	92.	93.	-1.65	150.	436.78	3	0.
19	1.0	0.5700	1.8500	92.	93.	-1.65	150.	437.45	3	0.
20	1.0	0.4900	1.8500	92.	93.	-1.65	150.	437.96	3	0.
21	1.0	0.4800	1.8500	92.	93.	-1.65	150.	438.69	3	0.
22	1.0	0.4100	1.8500	92.	93.	-1.65	150.	439.30	3	0.
FINAL METER VOLUME								439.93		

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 4
TRC PROJECT 1430-L80

PRILL DRYER

COLUMBIA NITROGEN CORP.
INLET
AUGUST 14, 1980 1735 TO 1825

STANDARD CONDITION TEMPERATURE, DEG F	0.6800E 02
STANDARD CONDITION PRESSURE, IN HG	0.2992E 02
TOTAL SAMPLING TIME, MINUTES	0.4400E 02
AVERAGE SQUARE ROOT VELOCITY HEAD, IN H2O EXP .5	0.7139E 00
AVERAGE ORIFICE PRESSURE DROP, IN H2O	0.1970E 01
AVERAGE METER TEMPERATURE, DEG F	0.9339E 02
AVERAGE DUCT STATIC PRESSURE, IN H2O	-0.1650E 01
AVERAGE DUCT TEMPERATURE, DEG F	0.1456E 03
TOTAL SAMPLE VOLUME, DACF	0.3073E 02
TOTAL SAMPLE VOLUME, DSCF	0.2941E 02
WATER VAPOR VOLUME, DSCF	0.1515E 01
MOISTURE CONTENT OF DUCT GAS, PERCENT	0.5205E 01
MOLE FRACTION DRY GAS	0.9480E 00
MOLECULAR WEIGHT - DRY STACK GAS	0.2983E 02
MOLECULAR WEIGHT - STACK GAS	0.2927E 02
AVERAGE STACK PRESSURE, IN HG	0.2975E 02
DUCT VOLUMETRIC FLOW, ACFM	0.4107E 05
DUCT VOLUMETRIC FLOW, DSCFM	0.3375E 05
AVERAGE DUCT VELOCITY, FPM	0.2631E 04
EXCESS AIR, PERCENT	0.1912E 05
AVERAGE DUCT GAS DENSITY, LBS/ACF	0.6360E-01
ISOKINETIC FACTOR, PERCENT	0.8325E 02

EMISSION DATA

	GR/ ACF	GR/ DSCF	LBS/ HR	LBS/ TON
AMMONIA IN H_2O	0.2200E 01	0.2677E 01	0.7742E 03	0.7742E 03
AMMONIA IN H_2SO_4	0.4312E-02	0.5247E-02	0.1518E 01	0.1518E 01
TOTAL AMMONIA	0.2204E 01	0.2682E 01	0.7757E 03	0.7757E 03
AMMONIUM NITRATE - NH_3 - IN H_2O	0.1035E 02	0.1260E 02	0.3643E 04	0.3643E 04
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.2031E-01	0.2471E-01	0.7148E 01	0.7148E 01
TOTAL AMMONIUM NITRATE	0.1037E 02	0.1262E 02	0.3650E 04	0.3650E 04
AMMONIUM NITRATE - NH_3 - IN H_2O	0.1061E 02	0.1291E 02	0.3736E 04	0.3736E 04
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.1061E 02	0.1291E 02	0.3736E 04	0.3736E 04
UNDISSOLVED SOLIDS IN H_2O	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00

TEST DATA -- | AMMONIA AND AMMONIUM NITRATE -- TEST NO 4
TRC PROJECT 1430-181

PRILL DRYER

COLUMBIA NITROGEN CORP.
INLET
AUGUST 14, 1980 1735 TO 1825

STANDARD CONDITION TEMPERATURE, DEG C	0.2300E 02
STANDARD CONDITION PRESSURE, MM HG	0.7600E 03
TOTAL SAMPLING TIME, MINUTES	0.4400E 02
AVERAGE SQUARE ROOT VELOCITY HEAD, MM H2O EXP.5	0.3598E 01
AVERAGE ORIFICE PRESSURE DROP, MM H2O	0.4751E 02
AVERAGE METER TEMPERATURE, DEG C	0.3413E 02
AVERAGE DUCT STATIC PRESSURE, MM H2O	-0.4191E 02
AVERAGE DUCT TEMPERATURE, DEG C	0.6311E 02
TOTAL SAMPLE VOLUME, DM3	0.8703E 00
TOTAL SAMPLE VOLUME, DNM3	0.8329E 00
WATER VAPOR VOLUME, DNM3	0.4572E-01
AVERAGE STACK GAS PRESSURE, MM HG	0.7556E 03
DUCT VOLUMETRIC FLOW, AM3/M	0.1163E 04
DUCT VOLUMETRIC FLOW, DNM3/M	0.9557E 03
AVERAGE DUCT VELOCITY, M/M	0.8019E 03
AVERAGE DUCT GAS DENSITY, KG/AM3	0.1019E 01

EMISSION DATA

	MG/ AM3	MG/ DNM3	KG/ HR	KG/ MT
AMMONIA IN H_2O	0.5033E 04	0.6125E 04	0.3515E 03	0.1548E 04
AMMONIA IN H_2SO_4	0.2868E 01	0.1201E 02	0.6830E 00	0.3035E 01
TOTAL AMMONIA	0.5043E 04	0.6137E 04	0.3522E 03	0.1551E 04
AMMONIUM NITRATE - NH_3 - IN H_2O	0.2369E 05	0.2882E 05	0.1654E 04	0.7287E 04
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.4648E 02	0.5656E 02	0.3245E 01	0.1430E 02
TOTAL AMMONIUM NITRATE	0.2373E 05	0.2888E 05	0.1657E 04	0.7301E 04
AMMONIUM NITRATE - NH_3 - IN H_2O	0.2429E 05	0.2955E 05	0.1696E 04	0.7471E 04
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.2429E 05	0.2955E 05	0.1696E 04	0.7471E 04
UNDISSOLVED SOLIDS IN H_2O	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 5
TRC PROJECT 1430-E80

UNIT TESTED	PRILL DRYER
DATE AND TIME OF TEST	AUGUST 14, 1980 1450 TO 1539
SAMPLING LOCATION	INLET
NAME OF FIRM	COLUMBIA NITROGEN CORP.
LOCATION OF FIRM	AUGUSTA GEORGIA
POLLUTANTS SAMPLED	AMMONIA AND AMMONIUM NITRATE

BAROMETRIC PRESSURE, IN HG		29.87
DUCT AREA, SQ FT		15.61
NOZZLE DIAMETER, IN		0.261
PITOT CALIBRATION COEFFICIENTS	1	0.825
	2	0.831
	3	0.846
DRY GAS METER CALIBRATION FACTOR, Y		1.000
FINAL LEAK RATE, CFM		0.000
TONS PER HOUR, PRODUCT		0.000

COMPOSITION OF DUCT GAS, % BY VOLUME DRY BASIS

CARBON DIOXIDE	0.00
OXYGEN	20.80
CARBON MONOXIDE	0.00
NITROGEN	79.20

AMMONIA AND AMMONIUM NITRATE COLLECTED, - MG

	AMMONIA	AMMONIUM NITRATE BASED ON NH_3	AMMONIUM NITRATE BASED ON NH_3	UNDISSOLVED SOLIDS
H2O IMPINGERS	0.7116E 04	0.3349E 05	0.3233E 05	0.0000E 00
H2SO4 IMPINGERS	0.1036E 02	0.4880E 02	0.0000E 00	0.0000E 00
TOTAL	0.7126E 04	0.3354E 05	0.3233E 05	0.0000E 00

AMOUNT OF WATER COLLECTED, GRAMS

IMPINGERS	26.0
SILICA GEL	5.2

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 5
TRC PROJECT 1430-E80

POINT	TIME	VEL HEAD IN H20	ORIFICE PRESS IN H20	METER INLET DEG F	TEMPS EXIT DEG F	DUCT STAT PRESS IN H20	DUCT TEMP DEG F	INITIAL METER VOL CU FT	P R B	CYC ANG
1	1.0	0.5000	2.1000	100.	100.	-1.70	103.	345.07	3	0.
2	1.0	0.4400	2.1000	100.	100.	-1.70	109.	346.30	3	0.
3	1.0	0.4500	2.1000	99.	100.	-1.70	114.	347.00	3	0.
4	1.0	0.4400	2.1000	99.	100.	-1.70	126.	347.96	3	0.
5	1.0	0.4500	2.1000	99.	100.	-1.70	132.	348.92	3	0.
6	1.0	0.3800	2.1000	99.	100.	-1.70	135.	349.33	3	0.
7	1.0	0.4000	2.1000	99.	100.	-1.70	136.	350.01	3	0.
8	1.0	0.4300	2.1000	99.	100.	-1.70	136.	350.75	3	0.
9	1.0	0.4500	2.1000	98.	99.	-1.70	145.	351.32	3	0.
10	1.0	0.5000	2.1000	97.	99.	-1.70	148.	352.26	3	0.
11	1.0	0.5300	2.1000	97.	99.	-1.70	148.	352.85	3	0.
12	1.0	0.6400	2.1000	97.	99.	-1.70	148.	354.00	3	0.
13	1.0	0.6600	2.1000	97.	99.	-1.70	148.	354.46	3	0.
14	1.0	0.6800	2.1000	97.	99.	-1.70	148.	355.12	3	0.
15	1.0	0.7300	2.1000	97.	99.	-1.70	149.	355.87	3	0.
16	1.0	0.7000	2.1000	97.	99.	-1.80	149.	356.54	3	0.
17	1.0	0.7000	2.1000	97.	99.	-1.80	149.	357.40	3	0.
18	1.0	0.7100	2.1000	97.	99.	-1.80	149.	358.17	3	0.
19	1.0	0.6900	2.1000	97.	99.	-1.80	149.	358.93	3	0.
20	1.0	0.6800	2.1000	97.	98.	-1.80	149.	359.94	3	0.
21	1.0	0.6500	2.1000	97.	98.	-1.80	149.	360.81	3	0.
22	1.0	0.6200	2.1000	97.	98.	-1.80	149.	361.10	3	0.
1	1.0	0.4600	2.1000	97.	98.	-1.80	138.	362.60	3	0.
2	1.0	0.6400	2.1000	97.	98.	-1.80	139.	362.93	3	0.
3	1.0	0.6000	2.1000	97.	98.	-1.80	139.	363.68	3	0.
4	1.0	0.6300	2.1000	97.	98.	-1.80	135.	364.53	3	0.
5	1.0	0.7200	2.1000	97.	98.	-1.80	135.	365.40	3	0.
6	1.0	0.5200	2.1000	97.	98.	-1.80	136.	365.95	3	0.
7	1.0	0.5200	2.1000	97.	98.	-1.80	138.	366.67	3	0.
8	1.0	0.5200	2.1500	96.	98.	-1.80	137.	367.46	3	0.
9	1.0	0.5500	2.1000	96.	98.	-1.80	145.	368.06	3	0.
10	1.0	0.5400	2.0000	96.	98.	-1.80	147.	369.20	3	0.
11	1.0	0.5800	2.0000	96.	98.	-1.80	149.	369.50	3	0.
12	1.0	0.5800	2.0000	96.	97.	-1.80	149.	370.28	3	0.
13	1.0	0.6000	2.0000	96.	97.	-1.80	149.	371.00	3	0.
14	1.0	0.6200	2.0000	96.	97.	-1.80	149.	372.00	3	0.
15	1.0	0.5800	1.9000	96.	97.	-1.80	149.	372.76	3	0.
16	1.0	0.5900	1.9000	96.	97.	-1.80	149.	373.16	3	0.
17	1.0	0.5600	1.8500	96.	97.	-1.80	149.	374.02	3	0.
18	1.0	0.5500	1.9000	96.	97.	-1.80	149.	374.63	3	0.
19	1.0	0.4100	1.8500	96.	97.	-1.80	149.	375.22	3	0.
20	1.0	0.2800	1.8000	96.	97.	-1.80	149.	376.27	3	0.
21	1.0	0.3100	1.8000	96.	97.	-1.80	149.	376.56	3	0.
22	1.0	0.2400	1.8000	96.	97.	-1.80	149.	377.34	3	0.
FINAL METER VOLUME								377.73		

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 5
TRC PROJECT 1430-E60

PRILL DRYER

COLUMBIA NITROGEN CORP.
INLET
AUGUST 14, 1980 1450 TO 1539

STANDARD CONDITION TEMPERATURE, DEG F	0.6800E 02
STANDARD CONDITION PRESSURE, IN HG	0.2992E 02
TOTAL SAMPLING TIME, MINUTES	0.4400E 02
AVERAGE SQUARE ROOT VELOCITY HEAD, IN H2O EXP .5	0.7340E 00
AVERAGE ORIFICE PRESSURE DROP, IN H2O	0.2044E 01
AVERAGE METER TEMPERATURE, DEG F	0.9773E 02
AVERAGE DUCT STATIC PRESSURE, IN H2O	-0.1768E 01
AVERAGE DUCT TEMPERATURE, DEG F	0.1416E 03
TOTAL SAMPLE VOLUME, DACF	0.3266E 02
TOTAL SAMPLE VOLUME, DSCF	0.3102E 02
WATER VAPOR VOLUME, DSCF	0.1469E 01
MOISTURE CONTENT OF DUCT GAS, PERCENT	0.4520E 01
MOLE FRACTION DRY GAS	0.9548E 00
MOLECULAR WEIGHT - DRY STACK GAS	0.2883E 02
MOLECULAR WEIGHT - STACK GAS	0.2834E 02
AVERAGE STACK PRESSURE, IN HG	0.2974E 02
DUCT VOLUMETRIC FLOW, ACFM	0.4202E 05
DUCT VOLUMETRIC FLOW, DSCFM	0.3500E 05
AVERAGE DUCT VELOCITY, FPM	0.2692E 04
EXCESS AIR, PERCENT	0.1912E 05
AVERAGE DUCT GAS DENSITY, LBS/ACF	0.6417E-01
ISOKINETIC FACTOR, PERCENT	0.8469E 02

EMISSION DATA

	GR/ ACF	GR/ DSCF	LBS/ HR	LBS/ TON
AMMONIA IN H_2O	0.2948E 01	0.3539E 01	0.1062E 04	0.1062E 04
AMMONIA IN H_2SO_4	0.4292E-02	0.5153E-02	0.1546E 01	0.1546E 01
TOTAL AMMONIA	0.2952E 01	0.3544E 01	0.1063E 04	0.1063E 04
AMMONIUM NITRATE - NH_3 - IN H_2O	0.1387E 02	0.1666E 02	0.4996E 04	0.4996E 04
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.2022E-01	0.2427E-01	0.7281E 01	0.7281E 01
TOTAL AMMONIUM NITRATE	0.1389E 02	0.1668E 02	0.5003E 04	0.5003E 04
AMMONIUM NITRATE - NH_3 - IN H_2O	0.1339E 02	0.1608E 02	0.4823E 04	0.4823E 04
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.1339E 02	0.1608E 02	0.4823E 04	0.4823E 04
UNDISSOLVED SOLIDS IN H_2O	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 5
TRC PROJECT 1430-E80

PRILL DRYER
COLUMBIA NITROGEN CORP.
INLET
AUGUST 14, 1980 1450 TO 1539

STANDARD CONDITION TEMPERATURE, DEG C	0.2000E 02
STANDARD CONDITION PRESSURE, MM HG	0.7600E 03
TOTAL SAMPLING TIME, MINUTES	0.4800E 02
AVERAGE SQUARE RROT VELOCITY HEAD, MM H2O EXP.5	0.3700E 01
AVERAGE ORIFICE PRESSURE DROP, MM H2O	0.5193E 02
AVERAGE METER TEMPERATURE, DEG C	0.3652E 02
AVERAGE DUCT STATIC PRESSURE, MM H2O	-0.4491E 02
AVERAGE DUCT TEMPERATURE, DEG C	0.6088E 02
TOTAL SAMPLE VOLUME, DM3	0.9249E 00
TOTAL SAMPLE VOLUME, DNM3	0.8786E 00
WATER VAPOR VOLUME, DNM3	0.4159E-01
AVERAGE STACK GAS PRESSURE, MM HG	0.7554E 03
DUCT VOLUMETRIC FLOW, AM3/M	0.1190E 04
DUCT VOLUMETRIC FLOW, DNM3/M	0.9911E 03
AVERAGE DUCT VELOCITY, M/M	0.8204E 03
AVERAGE DUCT GAS DENSITY, KG/AM3	0.1028E 01

EMISSION DATA

	MG/ AM3	MG/ DNM3	KG/ HR	KG/ MT
AMMONIA IN H_2O	0.6746E 04	0.8099E 04	0.4820E 03	0.2123E 04
AMMONIA IN H_2SO_4	0.9822E 01	0.1179E 02	0.7017E 00	0.3091E 01
TOTAL AMMONIA	0.6756E 04	0.8111E 04	0.4827E 03	0.2126E 04
AMMONIUM NITRATE - NH_3 - IN H_2O	0.3175E 05	0.3812E 05	0.2268E 04	0.9992E 04
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.4627E 02	0.5554E 02	0.3305E 01	0.1456E 02
TOTAL AMMONIUM NITRATE	0.3180E 05	0.3817E 05	0.2272E 04	0.1001E 05
AMMONIUM NITRATE - NH_3 - IN H_2O	0.3065E 05	0.3679E 05	0.2190E 04	0.9646E 04
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.3065E 05	0.3679E 05	0.2190E 04	0.9646E 04
UNDISSOLVED SOLIDS IN H_2O	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 6
IRC PROJECT 1930-260

UNIT TESTED	PRILL DRYER
DATE AND TIME OF TEST	AUGUST 14, 1980 1637 TO 1725
SAMPLING LOCATION	INLET
NAME OF FIRM	COLUMBIA NITROGEN CORP.
LOCATION OF FIRM	AUGUSTA GEORGIA
POLLUTANTS SAMPLED	AMMONIA AND AMMONIUM NITRATE

BAROMETRIC PRESSURE, IN HG		29.87
DUCT AREA, SQ FT		15.61
NOZZLE DIAMETER, IN		0.251
PITOT CALIBRATION COEFFICIENTS	1	0.825
	2	0.831
	3	0.846
DRY GAS METER CALIBRATION FACTOR, Y		1.000
FINAL LEAK RATE, CFM		0.038
TONS PER HOUR, PRODUCT		0.000

COMPOSITION OF DUCT GAS, % BY VOLUME DRY BASIS

CARBON DIOXIDE	0.00
OXYGEN	20.80
CARBON MONOXIDE	0.00
NITROGEN	79.20

AMMONIA AND AMMONIUM NITRATE COLLECTED, - MG

	AMMONIA	AMMONIUM NITRATE BASED ON NH_3	AMMONIUM NITRATE BASED ON NH_3	UNDISSOLVED SOLIDS
H2O IMPINGERS	0.7012E 04	0.3309E 05	0.2871E 05	0.0000E 00
H2SO4 IMPINGERS	0.1040E 02	0.4990E 02	0.0000E 00	0.0000E 00
TOTAL	0.7022E 04	0.3305E 05	0.2871E 05	0.0000E 00

AMOUNT OF WATER COLLECTED, GRAMS

IMPINGERS	24.0
SILICA GEL	4.8

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 6
IRC PROJECT 1430-EBD

POINT	TIME	VEL HEAD IN H2O	ORIFICE PRESS IN H2O	METER INLET DEG F	TEMPS EXIT DEG F	DUCT STAT PRESS IN H2O	DUCT TEMP DEG F	INITIAL METER VOL CU FT	P R B	CYC ANG
1	1.0	0.280	1.9000	96.	96.	-1.70	124.	379.09	3	0.
2	1.0	0.380	1.9000	96.	96.	-1.70	125.	379.20	3	0.
3	1.0	0.420	1.9000	96.	96.	-1.70	126.	380.02	3	0.
4	1.0	0.440	1.9000	96.	96.	-1.70	125.	380.50	3	0.
5	1.0	0.460	1.9000	96.	96.	-1.70	139.	381.08	3	0.
6	1.0	0.530	1.9000	95.	96.	-1.70	143.	381.96	3	0.
7	1.0	0.580	1.9000	95.	96.	-1.70	143.	382.45	3	0.
8	1.0	0.650	1.9000	95.	96.	-1.70	148.	383.16	3	0.
9	1.0	0.700	1.9000	95.	96.	-1.70	149.	383.93	3	0.
10	1.0	0.740	1.9000	95.	96.	-1.70	150.	384.59	3	0.
11	1.0	0.800	1.9000	95.	96.	-1.70	150.	385.41	3	0.
12	1.0	0.640	1.9000	95.	96.	-1.70	150.	386.41	3	0.
13	1.0	0.630	1.9000	95.	96.	-1.70	150.	387.00	3	0.
14	1.0	0.620	1.9000	95.	96.	-1.70	150.	387.55	3	0.
15	1.0	0.580	1.9000	95.	96.	-1.70	150.	388.28	3	0.
16	1.0	0.560	1.8500	95.	96.	-1.70	150.	389.12	3	0.
17	1.0	0.560	1.8500	95.	96.	-1.70	150.	389.65	3	0.
18	1.0	0.550	1.8500	95.	96.	-1.70	150.	390.24	3	0.
19	1.0	0.540	1.8500	95.	96.	-1.70	150.	391.02	3	0.
20	1.0	0.470	1.8500	95.	96.	-1.70	150.	391.84	3	0.
21	1.0	0.500	1.8500	95.	96.	-1.70	150.	392.41	3	0.
22	1.0	0.460	1.8500	95.	96.	-1.70	150.	393.36	3	0.
1	1.0	0.240	1.9000	95.	96.	-1.70	123.	393.49	3	0.
2	1.0	0.260	1.9000	95.	96.	-1.70	124.	394.65	3	0.
3	1.0	0.270	1.9000	95.	96.	-1.70	129.	395.47	3	0.
4	1.0	0.260	1.9000	95.	96.	-1.70	127.	396.08	3	0.
5	1.0	0.300	1.9000	95.	96.	-1.70	134.	396.91	3	0.
6	1.0	0.320	1.9000	95.	96.	-1.70	139.	397.22	3	0.
7	1.0	0.390	1.9000	95.	96.	-1.70	145.	397.95	3	0.
8	1.0	0.420	1.9000	95.	96.	-1.70	147.	398.81	3	0.
9	1.0	0.430	1.9000	95.	96.	-1.70	148.	399.54	3	0.
10	1.0	0.480	1.8500	95.	96.	-1.70	149.	400.43	3	0.
11	1.0	0.450	1.8500	95.	96.	-1.70	150.	400.79	3	0.
12	1.0	0.590	1.8500	95.	96.	-1.70	150.	401.58	3	0.
13	1.0	0.620	1.8500	95.	96.	-1.70	150.	402.26	3	0.
14	1.0	0.660	1.8500	95.	96.	-1.75	150.	402.83	3	0.
15	1.0	0.700	1.8500	95.	96.	-1.75	150.	403.55	3	0.
16	1.0	0.680	1.8500	95.	96.	-1.75	150.	404.51	3	0.
17	1.0	0.660	1.8500	95.	96.	-1.75	150.	405.15	3	0.
18	1.0	0.650	1.8500	95.	96.	-1.75	150.	405.74	3	0.
19	1.0	0.670	1.8500	95.	96.	-1.75	150.	406.40	3	0.
20	1.0	0.530	1.8000	95.	96.	-1.75	150.	407.12	3	0.
21	1.0	0.530	1.8000	95.	96.	-1.75	150.	407.78	3	0.
22	1.0	0.520	1.8000	95.	96.	-1.75	150.	408.44	3	0.

FINAL METER VOLUME 408.91

TEST DATA -- UREA, AMMONIA, FORMALDEHYDE -- TEST NO 6
IRC PROJECT 1430-E80

PRILL DRYER

COLUMBIA NITROGEN CORP.
INLET
AUGUST 14, 1980 1637 TO 1725

STANDARD CONDITION TEMPERATURE, DEG F	0.6900E 02
STANDARD CONDITION PRESSURE, IN HG	0.2992E 02
TOTAL SAMPLING TIME, MINUTES	0.4400E 02
AVERAGE SQUARE ROOT VELOCITY HEAD, IN H2O EXP .5	0.7111E 00
AVERAGE ORIFICE PRESSURE DROP, IN H2O	0.1074E 01
AVERAGE METER TEMPERATURE, DEG F	0.9556E 02
AVERAGE DUCT STATIC PRESSURE, IN H2O	-0.1710E 01
AVERAGE DUCT TEMPERATURE, DEG F	0.1440E 03
TOTAL SAMPLE VOLUME, DACF	0.3087E 02
TOTAL SAMPLE VOLUME, DSCF	0.2942E 02
WATER VAPOR VOLUME, DSCF	0.1356E 01
MOISTURE CONTENT OF DUCT GAS, PERCENT	0.4404E 01
MOLE FRACTION DRY GAS	0.9560E 00
MOLECULAR WEIGHT - DRY STACK GAS	0.2883E 02
MOLECULAR WEIGHT - STACK GAS	0.2835E 02
AVERAGE STACK PRESSURE, IN HG	0.2974E 02
DUCT VOLUMETRIC FLOW, ACFM	0.4087E 05
DUCT VOLUMETRIC FLOW, DSCFM	0.3389E 05
AVERAGE DUCT VELOCITY, FPM	0.2614E 04
EXCESS AIR, PERCENT	0.1912E 05
AVERAGE DUCT GAS DENSITY, LBS/ACF	0.6395E-01
ISOKINETIC FACTOR, PERCENT	0.8295E 02

EMISSION DATA

	GR/ ACF	GR/ DSCF	LBS/ HR	LBS/ TON
AMMONIA IN H_2O	0.3754E 01	0.3677E 01	0.1068E 04	0.1068E 04
AMMONIA IN H_2SO_4	0.4530E-02	0.5454E-02	0.1584E 01	0.1584E 01
TOTAL AMMONIA	0.3759E 01	0.3682E 01	0.1070E 04	0.1070E 04
AMMONIUM NITRATE - NH_3 - IN H_2O	0.1438E 02	0.1731E 02	0.5027E 04	0.5027E 04
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.2130E-01	0.2564E-01	0.7449E 01	0.7449E 01
TOTAL AMMONIUM NITRATE	0.1440E 02	0.1733E 02	0.5035E 04	0.5035E 04
AMMONIUM NITRATE - NH_3 - IN H_2O	0.1250E 02	0.1505E 02	0.4373E 04	0.4373E 04
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.1250E 02	0.1505E 02	0.4373E 04	0.4373E 04
UNDISSOLVED SOLIDS IN H_2O	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 6
IRC PROJECT 1430-187

PRILL DRYER

COLUMBIA NITROGEN CORP.
INLET
AUGUST 14, 1980 1637 TO 1725

STANDARD CONDITION TEMPERATURE, DEG C	0.2000E 02
STANDARD CONDITION PRESSURE, MM HG	0.7600E 03
TOTAL SAMPLING TIME, MINUTES	0.4400E 02
AVERAGE SQUARE ROOT VELOCITY HEAD, MM H2O EXP.5	0.3584E 01
AVERAGE ORIFICE PRESSURE DROP, MM H2O	0.4760E 02
AVERAGE METER TEMPERATURE, DEG C	0.3531E 02
AVERAGE DUCT STATIC PRESSURE, MM H2O	-0.4344E 02
AVERAGE DUCT TEMPERATURE, DEG C	0.6725E 02
TOTAL SAMPLE VOLUME, DM3	0.8742E 00
TOTAL SAMPLE VOLUME, DNM3	0.8333E 00
WATER VAPOR VOLUME, DNM3	0.3839E-01
AVERAGE STACK GAS PRESSURE, MM HG	0.7555E 03
DUCT VOLUMETRIC FLOW, AM3/M	0.1155E 04
DUCT VOLUMETRIC FLOW, DNM3/M	0.9599E 03
AVERAGE DUCT VELOCITY, M/M	0.7966E 03
AVERAGE DUCT GAS DENSITY, KG/AM3	0.1324E 01

EMISSION DATA

	MG/AM3	MG/DNM3	KG/HR	KG/MT
AMMONIA IN H_2O	0.6990E 04	0.8414E 04	0.4849E 03	0.2136E 04
AMMONIA IN H_2SO_4	0.1037E 02	0.1249E 02	0.7192E 00	0.3168E 01
TOTAL AMMONIA	0.7030E 04	0.8427E 04	0.4856E 03	0.2139E 04
AMMONIUM NITRATE - NH_3 - IN H_2O	0.3290E 05	0.3960E 05	0.2282E 04	0.1005E 05
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.4875E 02	0.5869E 02	0.3382E 01	0.1490E 02
TOTAL AMMONIUM NITRATE	0.3295E 05	0.3966E 05	0.2286E 04	0.1007E 05
AMMONIUM NITRATE - NH_3 - IN H_2O	0.2862E 05	0.3445E 05	0.1985E 04	0.8745E 04
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.2862E 05	0.3445E 05	0.1985E 04	0.8745E 04
UNDISSOLVED SOLIDS IN H_2O	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 4
TRC PROJECT 1430-E80

UNIT TESTED	PRILL DRYER
DATE AND TIME OF TEST	AUGUST 14, 1980 1136 TO 1330
SAMPLING LOCATION	PREDRYER INLET
NAME OF FIRM	COLUMBIA NITROGEN CORP.
LOCATION OF FIRM	AUGUSTA GEORGIA
POLLUTANTS SAMPLED	AMMONIA AND AMMONIUM NITRATE

BAROMETRIC PRESSURE, IN HG		29.88
DUCT AREA, SQ FT		12.57
NOZZLE DIAMETER, IN		0.260
PITOT CALIBRATION COEFFICIENTS	1	0.875
	2	0.831
	3	0.846
DRY GAS METER CALIBRATION FACTOR, Y		1.030
FINAL LEAK RATE, CFM		0.000
TONS PER HOUR, PRODUCT		0.000

COMPOSITION OF DUCT GAS, % BY VOLUME DRY BASIS

CARBON DIOXIDE	0.00
OXYGEN	20.80
CARBON MONOXIDE	0.00
NITROGEN	79.20

AMMONIA AND AMMONIUM NITRATE COLLECTED, - MG

	AMMONIA	AMMONIUM NITRATE BASED ON NH_3	AMMONIUM NITRATE BASED ON NH_3	UNDISSOLVED SOLIDS
H2O IMPINGERS	0.2901E 04	0.1365E 05	0.1363E 05	0.0000E 00
H2SO4 IMPINGERS	0.4914E 02	0.2310E 03	0.0000E 00	0.0000E 00
TOTAL	0.2950E 04	0.1388E 05	0.1363E 05	0.0000E 00

AMOUNT OF WATER COLLECTED, GRAMS

IMPINGERS	92.0
SILICA GEL	6.2

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 4
TRC PROJECT 1430-E80

POINT	TIME	VEL HEAD IN H20	ORIFICE PRESS IN H20	METER INLET DEG F	TEMPS EXIT DEG F	DUCT STAT PRESS IN H20	DUCT TEMP DEG F	INITIAL METER VOL CU FT	P R B	CYC ANG
1	1.0	1.1000	3.0000	88.	93.	-3.30	149.	295.45	1	0.
2	1.0	1.1000	3.4000	88.	93.	-3.30	149.	296.55	1	0.
3	1.0	1.4000	3.4000	88.	93.	-3.30	149.	297.50	1	0.
4	1.0	1.4000	3.4000	88.	92.	-3.30	150.	298.47	1	0.
5	1.0	1.5000	3.3000	88.	93.	-3.30	148.	299.43	1	0.
6	1.0	1.5000	3.3000	88.	93.	-3.30	149.	300.38	1	0.
7	1.0	1.6000	3.3000	88.	93.	-3.30	149.	301.34	1	0.
8	1.0	1.4000	3.3000	88.	93.	-3.30	152.	302.29	1	0.
9	1.0	1.5000	3.3000	88.	92.	-3.30	153.	303.36	1	0.
10	1.0	1.4000	3.3000	89.	93.	-3.30	153.	304.22	1	0.
11	1.0	1.4000	3.3000	89.	92.	-3.30	152.	305.18	1	0.
12	1.0	1.3000	3.3000	89.	92.	-3.30	150.	306.12	1	0.
13	1.0	1.2000	3.2000	89.	92.	-3.30	152.	307.07	1	0.
14	1.0	1.2000	3.2000	89.	92.	-3.30	152.	308.02	1	0.
15	1.0	1.1000	3.2000	89.	92.	-3.30	152.	308.96	1	0.
16	1.0	0.9500	3.2000	90.	92.	-3.30	153.	310.00	1	0.
17	1.0	0.8500	3.4000	90.	92.	-3.30	152.	310.90	1	0.
18	1.0	0.7900	3.3000	90.	92.	-3.30	152.	311.87	1	0.
19	1.0	0.7000	3.4000	90.	92.	-3.30	153.	312.81	1	0.
20	1.0	0.6500	3.4000	90.	92.	-3.30	152.	313.76	1	0.
21	1.0	0.5700	3.4000	91.	92.	-3.30	152.	314.73	1	0.
22	1.0	0.5000	3.4000	91.	92.	-3.30	152.	315.72	1	0.
23	1.0	0.4300	3.4000	91.	92.	-3.30	152.	316.65	1	0.
24	1.0	0.4000	3.4000	91.	93.	-3.30	152.	317.62	1	0.
1	1.0	0.6400	3.6000	89.	94.	-2.80	148.	317.62	1	0.
2	1.0	0.6200	3.6000	90.	94.	-2.80	148.	319.60	1	0.
3	1.0	0.7000	3.6000	90.	94.	-2.80	148.	320.61	1	0.
4	1.0	0.8500	3.6000	90.	94.	-2.80	149.	321.61	1	0.
5	1.0	0.9300	3.6000	90.	94.	-2.80	146.	322.61	1	0.
6	1.0	0.9400	3.6000	90.	94.	-2.80	150.	323.61	1	0.
7	1.0	0.9900	3.6000	90.	94.	-2.80	151.	324.60	1	0.
8	1.0	1.0000	3.6000	90.	94.	-2.80	152.	325.60	1	0.
9	1.0	1.1000	3.6000	90.	94.	-2.80	152.	326.60	1	0.
10	1.0	1.2000	3.6000	91.	94.	-2.80	153.	327.60	1	0.
11	1.0	1.2000	3.6000	90.	94.	-2.80	153.	328.60	1	0.
12	1.0	1.2000	3.6000	91.	95.	-2.80	152.	329.60	1	0.
13	1.0	1.2000	3.6000	91.	94.	-2.80	152.	330.60	1	0.
14	1.0	1.3000	3.6000	90.	94.	-2.80	152.	331.57	1	0.
15	1.0	1.2000	3.6000	90.	94.	-2.80	152.	332.57	1	0.
16	1.0	1.3000	3.6000	91.	94.	-2.80	153.	333.57	1	0.
17	1.0	1.3000	3.6000	91.	94.	-2.80	152.	334.56	1	0.
18	1.0	1.4000	3.6000	91.	94.	-2.80	152.	335.56	1	0.
19	1.0	1.3000	3.6000	91.	94.	-2.80	152.	336.56	1	0.
20	1.0	1.4000	3.6000	91.	94.	-2.80	152.	337.55	1	0.
21	1.0	1.3000	3.6000	91.	94.	-2.80	148.	339.55	1	0.
22	1.0	1.3000	3.6000	91.	94.	-2.80	151.	339.55	1	0.
23	1.0	1.3000	3.6000	92.	94.	-2.80	151.	340.55	1	0.
24	1.0	1.1000	3.6000	92.	94.	-2.80	151.	341.54	1	0.

FINAL METER VOLUME 342.50

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 4
TRC PROJECT 1430-E80

PRILL DRYER

COLUMBIA NITROGEN CORP.
PREDRYER INLET
AUGUST 14, 1980 1136 TO 1300

STANDARD CONDITION TEMPERATURE, DEG F	0.6800E 02
STANDARD CONDITION PRESSURE, IN HG	0.2992E 02
TOTAL SAMPLING TIME, MINUTES	0.4800E 02
AVERAGE SQUARE ROOT VELOCITY HEAD, IN H2O EXP .5	0.1036E 01
AVERAGE ORIFICE PRESSURE DROP, IN H2O	0.3456E 01
AVERAGE METER TEMPERATURE, DEG F	0.9153E 02
AVERAGE DUCT STATIC PRESSURE, IN H2O	-0.3050E 01
AVERAGE DUCT TEMPERATURE, DEG F	0.1510E 03
TOTAL SAMPLE VOLUME, DACF	0.4705E 02
TOTAL SAMPLE VOLUME, DSCF	0.4536E 02
WATER VAPOR VOLUME, DSCF	0.2269E 01
MOISTURE CONTENT OF DUCT GAS, PERCENT	0.4763E 01
MOLE FRACTION DRY GAS	0.9524E 00
MOLECULAR WEIGHT - DRY STACK GAS	0.2883E 02
MOLECULAR WEIGHT - STACK GAS	0.2832E 02
AVERAGE STACK PRESSURE, IN HG	0.2966E 02
DUCT VOLUMETRIC FLOW, ACFM	0.4699E 05
DUCT VOLUMETRIC FLOW, DSCFM	0.3833E 05
AVERAGE DUCT VELOCITY, FPM	0.3738E 04
EXCESS AIR, PERCENT	0.1912E 05
AVERAGE DUCT GAS DENSITY, LBS/ACF	0.6294E-01
ISOKINETIC FACTOR, PERCENT	0.8411E 02

EMISSION DATA

	GR/ ACF	GR/ DSCF	LBS/ HR	LBS/ TON
AMMONIA IN H_2O	0.8049E 00	0.9867E 00	3.3242E 03	0.3242E 03
AMMONIA IN H_2SO_4	0.1363E-01	0.1671E-01	0.5491E 01	0.5491E 01
TOTAL AMMONIA	0.8185E 00	0.1003E 01	0.3296E 03	0.3296E 03
AMMONIUM NITRATE - NH_3 - IN H_2O	0.3787E 01	0.4643E 01	0.1525E 04	0.1525E 04
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.6409E-01	0.7857E-01	0.2581E 02	0.2581E 02
TOTAL AMMONIUM NITRATE	0.3851E 01	0.4721E 01	0.1551E 04	0.1551E 04
AMMONIUM NITRATE - NH_3 - IN H_2O	0.3782E 01	0.4636E 01	0.1523E 04	0.1523E 04
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.3782E 01	0.4636E 01	0.1523E 04	0.1523E 04
UNDISSOLVED SOLIDS IN H_2O	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 4
IRC PROJECT 1430-E80

PRILL DRYER

COLUMBIA NITROGEN CORP.
PREDRYER INLET
AUGUST 14, 1980 1136 TO 1300

STANDARD CONDITION TEMPERATURE, DEG C	0.2000E 02
STANDARD CONDITION PRESSURE, MM HG	0.7600E 03
TOTAL SAMPLING TIME, MINUTES	0.4800E 02
AVERAGE SQUARE ROOT VELOCITY HEAD, MM H2O EXP.5	0.5219E 01
AVERAGE ORIFICE PRESSURE DROP, MM H2O	0.8779E 02
AVERAGE METER TEMPERATURE, DEG C	0.3307E 02
AVERAGE DUCT STATIC PRESSURE, MM H2O	-0.7747E 02
AVERAGE DUCT TEMPERATURE, DEG C	0.6612E 02
TOTAL SAMPLE VOLUME, DM3	0.1332E 01
TOTAL SAMPLE VOLUME, DNM3	0.1285E 01
WATER VAPOR VOLUME, DNM3	0.6425E-01
AVERAGE STACK GAS PRESSURE, MM HG	0.7533E 03
DUCT VOLUMETRIC FLOW, AM3/M	0.1331E 04
DUCT VOLUMETRIC FLOW, DNM3/M	0.1085E 04
AVERAGE DUCT VELOCITY, M/M	0.1139E 04
AVERAGE DUCT GAS DENSITY, KG/AM3	0.1008E 01

EMISSION DATA

	MG/AM3	MG/DNM3	KG/HR	KG/MT
AMMONIA IN H_2O	0.1842E 04	0.2258E 04	0.1472E 03	0.6483E 03
AMMONIA IN H_2SO_4	0.3120E 02	0.3825E 02	0.2493E 01	0.1098E 02
TOTAL AMMONIA	0.1873E 04	0.2296E 04	0.1497E 03	0.6593E 03
AMMONIUM NITRATE - NH_3 - IN H_2O	0.8666E 04	0.1062E 05	0.6925E 03	0.3051E 04
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.1467E 03	0.1798E 03	0.1172E 02	0.5162E 02
TOTAL AMMONIUM NITRATE	0.8813E 04	0.1080E 05	0.7042E 03	0.3102E 04
AMMONIUM NITRATE - NH_3 - IN H_2O	0.8654E 04	0.1061E 05	0.6915E 03	0.3046E 04
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.8654E 04	0.1061E 05	0.6915E 03	0.3046E 04
UNDISSOLVED SOLIDS IN H_2O	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 5
TRC PROJECT 1471-5A7

UNIT TESTED	PRILL DRYER
DATE AND TIME OF TEST	AUGUST 14, 1980 1539 TO 1630
SAMPLING LOCATION	PREDRYER INLET
NAME OF FIRM	COLUMBIA NITROGEN CORP.
LOCATION OF FIRM	AUGUSTA GEORGIA
POLLUTANTS SAMPLED	AMMONIA AND AMMONIUM NITRATE

BAROMETRIC PRESSURE, IN HG		29.84
DUCT AREA, SQ FT		12.57
NOZZLE DIAMETER, IN		0.260
PITOT CALIBRATION COEFFICIENTS	1	0.825
	2	0.831
	3	0.846
DRY GAS METER CALIBRATION FACTOR, Y		1.000
FINAL LEAK RATE, CFM		0.002
TONS PER HOUR, PRODUCT		0.000

COMPOSITION OF DUCT GAS, % BY VOLUME DRY BASIS

CARBON DIOXIDE	0.00
OXYGEN	20.80
CARBON MONOXIDE	0.00
NITROGEN	79.20

AMMONIA AND AMMONIUM NITRATE COLLECTED, - MG

	AMMONIA	AMMONIUM NITRATE BASED ON NH_3	AMMONIUM NITRATE BASED ON NH_3	UNDISSOLVED SOLIDS
H2O IMPINGERS	0.3621E 04	0.1704E 05	0.1628E 05	0.0000E 00
H2SO4 IMPINGERS	0.4620E 02	0.2172E 03	0.0000E 00	0.0000E 00
TOTAL	0.3667E 04	0.1726E 05	0.1628E 05	0.0000E 00

AMOUNT OF WATER COLLECTED, GRAMS

IMPINGERS	31.0
SILICA GEL	9.5

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 5
TRC PROJECT 1431-E80

POINT	TIME	VEL HEAD IN H20	ORIFICE PRESS IN H20	METER INLET DEG F	TEMPS EXIT DEG F	DUCT STAT PRESS IN H20	DUCT TEMP DEG F	INITIAL METER VOL CU FT	P R B	CYC ANG
1	1.0	0.6400	4.4000	93.	95.	-2.80	148.	342.62	1	0.
2	1.0	0.6200	4.4000	93.	95.	-2.80	148.	343.74	1	0.
3	1.0	0.7000	4.4000	93.	95.	-2.80	149.	345.87	1	0.
4	1.0	0.8500	4.4000	93.	95.	-2.80	149.	345.98	1	0.
5	1.0	0.9300	4.4000	93.	95.	-2.80	146.	347.08	1	0.
6	1.0	0.9400	4.4000	93.	96.	-2.80	150.	348.19	1	0.
7	1.0	0.9900	4.4000	94.	96.	-2.80	151.	349.30	1	0.
8	1.0	1.0000	4.4000	94.	96.	-2.80	152.	350.40	1	0.
9	1.0	1.1000	4.4000	94.	96.	-2.80	152.	351.51	1	0.
10	1.0	1.2000	4.4000	95.	96.	-2.80	153.	352.62	1	0.
11	1.0	1.2000	4.4000	95.	96.	-2.80	153.	353.72	1	0.
12	1.0	1.2000	4.4000	95.	96.	-2.80	152.	354.82	1	0.
13	1.0	1.2000	4.4000	95.	96.	-2.80	152.	355.92	1	0.
14	1.0	1.3000	4.4000	95.	96.	-2.80	152.	357.02	1	0.
15	1.0	1.2000	4.4000	96.	96.	-2.80	152.	358.16	1	0.
16	1.0	1.3000	4.4000	96.	96.	-2.80	153.	359.28	1	0.
17	1.0	1.3000	4.4000	96.	96.	-2.80	152.	360.33	1	0.
18	1.0	1.4000	4.4000	96.	96.	-2.80	152.	361.43	1	0.
19	1.0	1.3000	4.4000	96.	96.	-2.80	152.	362.53	1	0.
20	1.0	1.4000	4.4000	96.	96.	-2.80	152.	363.63	1	0.
21	1.0	1.3000	4.4000	97.	96.	-2.80	148.	364.73	1	0.
22	1.0	1.3000	4.4000	97.	96.	-2.80	151.	365.83	1	0.
23	1.0	1.3000	4.4000	97.	96.	-2.80	151.	366.93	1	0.
24	1.0	1.1000	4.4000	96.	97.	-2.80	151.	368.03	1	0.
1	1.0	1.1000	4.4000	96.	97.	-3.20	149.	369.40	1	0.
2	1.0	1.1000	4.4000	96.	97.	-3.20	149.	370.53	1	0.
3	1.0	1.4000	4.4000	96.	97.	-3.20	149.	371.63	1	0.
4	1.0	1.4000	4.4000	96.	97.	-3.20	150.	372.72	1	0.
5	1.0	1.5000	4.4000	96.	97.	-3.20	148.	373.93	1	0.
6	1.0	1.5000	4.4000	96.	97.	-3.20	149.	374.92	1	0.
7	1.0	1.6000	4.4000	96.	97.	-3.20	149.	376.02	1	0.
8	1.0	1.4000	4.4000	97.	97.	-3.20	152.	377.12	1	0.
9	1.0	1.5000	4.4000	97.	97.	-3.20	153.	378.22	1	0.
10	1.0	1.4000	4.4000	97.	97.	-3.20	153.	379.31	1	0.
11	1.0	1.4000	4.4000	98.	97.	-3.20	152.	380.41	1	0.
12	1.0	1.3000	4.4000	98.	97.	-3.20	150.	381.51	1	0.
13	1.0	1.2000	4.4000	98.	98.	-3.20	152.	382.59	1	0.
14	1.0	1.2000	4.4000	98.	97.	-3.20	152.	383.68	1	0.
15	1.0	1.1000	4.4000	98.	98.	-3.20	152.	384.78	1	0.
16	1.0	0.9500	4.4000	98.	98.	-3.20	152.	385.88	1	0.
17	1.0	0.8500	4.4000	98.	98.	-3.20	152.	386.97	1	0.
18	1.0	0.7900	4.4000	99.	98.	-3.20	152.	389.08	1	0.
19	1.0	0.7000	4.4000	99.	98.	-3.20	153.	389.16	1	0.
20	1.0	0.6500	4.4000	99.	98.	-3.20	152.	390.27	1	0.
21	1.0	0.5700	4.4000	98.	98.	-3.20	152.	391.37	1	0.
22	1.0	0.5000	4.4000	99.	98.	-3.20	152.	292.46	1	0.
23	1.0	0.4300	4.4000	99.	98.	-3.20	152.	393.56	1	0.
24	1.0	0.4000	4.4000	99.	98.	-3.20	152.	394.66	1	0.

FINAL METER VOLUME 395.74

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 5
TRC PROJECT 1430-E80

PRILL DRYER

COLUMBIA NITROGEN CORP.
PREDRYER INLET
AUGUST 14, 1990 1539 TO 1630

STANDARD CONDITION TEMPERATURE, DEG F	0.6000E 02
STANDARD CONDITION PRESSURE, IN HG	0.2992E 02
TOTAL SAMPLING TIME, MINUTES	0.4800E 02
AVERAGE SQUARE ROOT VELOCITY HEAD, IN H2O EXP .5	0.1036E 01
AVERAGE ORIFICE PRESSURE DROP, IN H2O	0.4403E 01
AVERAGE METER TEMPERATURE, DEG F	0.9644E 02
AVERAGE DUCT STATIC PRESSURE, IN H2O	-0.3000E 01
AVERAGE DUCT TEMPERATURE, DEG F	0.1510E 03
TOTAL SAMPLE VOLUME, DACF	0.5312E 02
TOTAL SAMPLE VOLUME, DSCF	0.5082E 02
WATER VAPOR VOLUME, DSCF	0.1906E 01
MOISTURE CONTENT OF DUCT GAS, PERCENT	0.3616E 01
MOLE FRACTION DRY GAS	0.9638E 00
MOLECULAR WEIGHT - DRY STACK GAS	0.2983E 02
MOLECULAR WEIGHT - STACK GAS	0.2944E 02
AVERAGE STACK PRESSURE, IN HG	0.2962E 02
DUCT VOLUMETRIC FLOW, ACFM	0.4692E 05
DUCT VOLUMETRIC FLOW, DSCFM	0.3868E 05
AVERAGE DUCT VELOCITY, FPM	0.3732E 04
EXCESS AIR, PERCENT	0.1912E 05
AVERAGE DUCT GAS DENSITY, LBS/ACF	0.6314E-01
ISOKINETIC FACTOR, PERCENT	0.9336E 02

EMISSION DATA

	GR/ ACF	GR/ DSCF	LBS/ HR	LBS/ TON
AMMONIA IN H_2O	0.9066E 00	0.1100E 01	0.3645E 03	0.3645E 03
AMMONIA IN H_2SO_4	0.1157E-01	0.1403E-01	0.4651E 01	0.4651E 01
TOTAL AMMONIA	0.9182E 00	0.1114E 01	0.3692E 03	0.3692E 03
AMMONIUM NITRATE - NH_3 - IN H_2O	0.4266E 01	0.5174E 01	0.1716E 04	0.1716E 04
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.5433E-01	0.6589E-01	0.2185E 02	0.2185E 02
TOTAL AMMONIUM NITRATE	0.4321E 01	0.5240E 01	0.1737E 04	0.1737E 04
AMMONIUM NITRATE - NH_3 - IN H_2O	0.4077E 01	0.4944E 01	0.1639E 04	0.1639E 04
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.4077E 01	0.4944E 01	0.1639E 04	0.1639E 04
UNDISSOLVED SOLIDS IN H_2O	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 5
IRC PROJECT 1430-E80

PRILL DRYER

COLUMBIA NITROGEN CORP.
PREDRYER INLET
AUGUST 14, 1980 1539 TO 1630

STANDARD CONDITION TEMPERATURE, DEG C	0.2300E 02
STANDARD CONDITION PRESSURE, MM HG	0.7600E 03
TOTAL SAMPLING TIME, MINUTES	0.4800E 02
AVERAGE SQUARE ROT VELOCITY HEAD, MM H20 EXP.5	0.5219E 01
AVERAGE ORIFICE PRESSURE DROP, MM H20	0.1118E 03
AVERAGE METER TEMPERATURE, DEG C	0.3580E 02
AVERAGE DUCT STATIC PRESSURE, MM H20	-0.7620E 02
AVERAGE DUCT TEMPERATURE, DEG C	0.6611E 02
TOTAL SAMPLE VOLUME, DM3	0.1504E 01
TOTAL SAMPLE VOLUME, DNM3	0.1439E 01
WATER VAPOR VOLUME, DNM3	0.5399E-01
AVERAGE STACK GAS PRESSURE, MM HG	0.7523E 03
DUCT VOLUMETRIC FLOW, AM3/M	0.1329E 04
DUCT VOLUMETRIC FLOW, DNM3/M	0.1096E 04
AVERAGE DUCT VELOCITY, M/M	0.1138E 04
AVERAGE DUCT GAS DENSITY, KG/AM3	0.1011E 01

EMISSION DATA

	MG/ AM3	MG/ DNM3	KG/ HR	KG/ MT
AMMONIA IN H_2O	0.2075E 04	0.2515E 04	0.1655E 03	0.7291E 03
AMMONIA IN H_2SO_4	0.2647E 02	0.3210E 02	0.2112E 01	0.9302E 01
TOTAL AMMONIA	0.2101E 04	0.2548E 04	0.1676E 03	0.7384E 03
AMMONIUM NITRATE - NH_3 - IN H_2O	0.9763E 04	0.1184E 05	0.7788E 03	0.3431E 04
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.1243E 03	0.1508E 03	0.9918E 01	0.4369E 02
TOTAL AMMONIUM NITRATE	0.9887E 04	0.1199E 05	0.7888E 02	0.3475E 04
AMMONIUM NITRATE - NH_3 - IN H_2O	0.9329E 04	0.1131E 05	0.7442E 03	0.3279E 04
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.9329E 04	0.1131E 05	0.7442E 03	0.3279E 04
UNDISSOLVED SOLIDS IN H_2O	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 6
TRC PROJECT 1033-E80

UNIT TESTED	PRILL DRYER
DATE AND TIME OF TEST	AUGUST 14, 1980 1837 TO 1930
SAMPLING LOCATION	PREDRYER INLET
NAME OF FIRM	COLUMBIA NITROGEN CORP.
LOCATION OF FIRM	AUGUSTA GEORGIA
POLLUTANTS SAMPLED	AMMONIA AND AMMONIUM NITRATE

BAROMETRIC PRESSURE, IN HG		29.84
DUCT AREA, SQ FT		12.57
NOZZLE DIAMETER, IN		0.260
PITOT CALIBRATION COEFFICIENTS	1	0.825
	2	0.831
	3	0.846
DRY GAS METER CALIBRATION FACTOR, Y		1.000
FINAL LEAK RATE, CFM		0.002
TONS PER HOUR, PRODUCT		0.300

COMPOSITION OF DUCT GAS, % BY VOLUME DRY BASIS

CARBON DIOXIDE	0.00
OXYGEN	20.80
CARBON MONOXIDE	0.00
NITROGEN	79.20

AMMONIA AND AMMONIUM NITRATE COLLECTED, - MG

	AMMONIA	AMMONIUM NITRATE BASED ON NH_3	AMMONIUM NITRATE BASED ON NH_3	UNDISSOLVED SOLIDS
H2O IMPINGERS	0.3585E 04	0.1687E 05	0.1661E 05	0.0000E 00
H2SO4 IMPINGERS	0.3610E 02	0.1700E 03	0.0000E 00	0.0000E 00
TOTAL	0.3621E 04	0.1704E 05	0.1661E 05	0.0000E 00

AMOUNT OF WATER COLLECTED, GRAMS

IMPINGERS	31.0
SILICA GEL	8.0

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 6
TRC PROJECT 1430-EBJ

POINT	TIME	VEL HEAD IN H20	ORIFICE PRESS IN H20	METER INLET DEG F	TEMPS EXIT DEG F	DUCT STAT PRESS IN H20	DUCT TEMP DEG F	INITIAL METER VOL CU FT	P R R	CYC ANG
1	1.0	0.6400	4.4000	94.	99.	-2.90	148.	395.90	1	0.
2	1.0	0.6200	4.4000	94.	99.	-2.90	148.	397.02	1	0.
3	1.0	0.7900	4.4000	94.	99.	-2.90	148.	398.10	1	0.
4	1.0	0.8500	4.4000	94.	99.	-2.90	149.	399.22	1	0.
5	1.0	0.9300	4.4000	94.	99.	-2.90	146.	400.32	1	0.
6	1.0	0.9400	4.4000	94.	99.	-2.90	150.	401.41	1	0.
7	1.0	0.9900	4.4000	94.	99.	-2.90	151.	402.52	1	0.
8	1.0	1.0000	4.4000	94.	99.	-2.90	152.	403.63	1	0.
9	1.0	1.1000	4.4000	94.	99.	-2.90	152.	404.72	1	0.
10	1.0	1.2000	4.4000	95.	99.	-2.90	153.	405.83	1	0.
11	1.0	1.2000	4.4000	95.	99.	-2.90	153.	406.92	1	0.
12	1.0	1.2000	4.4000	95.	99.	-2.90	152.	403.02	1	0.
13	1.0	1.2000	4.4000	96.	99.	-2.90	152.	409.12	1	0.
14	1.0	1.3000	4.4000	96.	99.	-2.90	152.	410.22	1	0.
15	1.0	1.2000	4.4000	96.	98.	-2.90	152.	411.32	1	0.
16	1.0	1.3000	4.4000	96.	99.	-2.90	153.	412.42	1	0.
17	1.0	1.3000	4.4000	96.	98.	-2.90	152.	413.51	1	0.
18	1.0	1.4000	4.4000	96.	98.	-2.90	152.	414.60	1	0.
19	1.0	1.3000	4.4000	96.	98.	-2.90	152.	415.71	1	0.
20	1.0	1.4000	4.4000	96.	98.	-2.90	152.	416.81	1	0.
21	1.0	1.3000	4.4000	97.	98.	-2.90	148.	417.91	1	0.
22	1.0	1.3000	4.4000	97.	98.	-2.90	151.	419.01	1	0.
23	1.0	1.3000	4.4000	97.	98.	-2.90	151.	420.11	1	0.
24	1.0	1.1000	4.4000	97.	98.	-2.90	151.	421.21	1	0.
1	1.0	1.1000	4.4000	97.	98.	-3.20	149.	422.51	1	0.
2	1.0	1.1000	4.4000	95.	98.	-3.20	149.	423.62	1	0.
3	1.0	1.4000	4.4000	95.	98.	-3.20	149.	424.72	1	0.
4	1.0	1.4000	4.4000	95.	98.	-3.20	150.	425.82	1	0.
5	1.0	1.5000	4.3000	96.	98.	-3.20	148.	426.91	1	0.
6	1.0	1.5000	4.4000	96.	98.	-3.20	149.	428.01	1	0.
7	1.0	1.6000	4.4000	96.	98.	-3.20	149.	429.00	1	0.
8	1.0	1.4000	4.4000	96.	96.	-3.20	152.	430.21	1	0.
9	1.0	1.5000	4.4000	96.	98.	-3.20	153.	431.30	1	0.
10	1.0	1.4000	4.4000	96.	98.	-3.20	153.	432.41	1	0.
11	1.0	1.4000	4.4000	96.	98.	-3.20	152.	433.50	1	0.
12	1.0	1.3000	4.4000	96.	98.	-3.20	153.	434.60	1	0.
13	1.0	1.2000	4.4000	96.	98.	-3.20	152.	435.70	1	0.
14	1.0	1.2000	4.4000	96.	98.	-3.20	152.	436.69	1	0.
15	1.0	1.1000	4.4000	96.	98.	-3.20	152.	437.99	1	0.
16	1.0	0.9500	4.4000	96.	98.	-3.20	152.	439.09	1	0.
17	1.0	0.8500	4.4000	97.	98.	-3.20	152.	440.19	1	0.
18	1.0	0.7900	4.4000	97.	98.	-3.20	152.	441.29	1	0.
19	1.0	0.7000	4.4000	97.	98.	-3.20	153.	442.39	1	0.
20	1.0	0.6500	4.4000	97.	98.	-3.20	152.	443.49	1	0.
21	1.0	0.5700	4.4000	97.	98.	-3.20	152.	444.59	1	0.
22	1.0	0.5000	4.4000	97.	97.	-3.20	152.	445.69	1	0.
23	1.0	0.4300	4.4000	97.	97.	-3.20	152.	446.79	1	0.
24	1.0	0.4000	4.4000	97.	97.	-3.20	152.	447.89	1	0.

FINAL METER VOLUME 448.99

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 6
IRC PROJECT 1930-E80

PRILL DRYER
COLUMBIA NITROGEN CORP.
PREDRYER INLET
AUGUST 14, 1980 1027 TO 1930

STANDARD CONDITION TEMPERATURE, DEG F	0.6900E 02
STANDARD CONDITION PRESSURE, IN HG	0.2992E 02
TOTAL SAMPLING TIME, MINUTES	0.4800E 02
AVERAGE SQUARE ROOT VELOCITY HEAD, IN H2O EXP .5	0.1036E 01
AVERAGE ORIFICE PRESSURE DROP, IN H2O	0.4394E 01
AVERAGE METER TEMPERATURE, DEG F	0.9701E 02
AVERAGE DUCT STATIC PRESSURE, IN H2O	-0.3050E 01
AVERAGE DUCT TEMPERATURE, DEG F	0.1513E 03
TOTAL SAMPLE VOLUME, DACF	0.5309E 02
TOTAL SAMPLE VOLUME, DSCF	0.5073E 02
WATER VAPOR VOLUME, DSCF	0.1836E 01
MOISTURE CONTENT OF DUCT GAS, PERCENT	0.3492E 01
MOLE FRACTION DRY GAS	0.9651E 00
MOLECULAR WEIGHT - DRY STACK GAS	0.2883E 02
MOLECULAR WEIGHT - STACK GAS	0.2845E 02
AVERAGE STACK PRESSURE, IN HG	0.2962E 02
DUCT VOLUMETRIC FLOW, ACFM	0.4691E 05
DUCT VOLUMETRIC FLOW, DSCFM	0.3972E 05
AVERAGE DUCT VELOCITY, FPM	0.3732E 04
EXCESS AIR, PERCENT	0.1912E 05
AVERAGE DUCT GAS DENSITY, LBS/ACF	0.6317E-01
ISOKINETIC FACTOR, PERCENT	0.9312E 02

EMISSION DATA

	GR/ ACF	GR/ DSCF	LBS/ HR	LBS/ TON
AMMONIA IN H_2O	0.9091E 00	0.1093E 01	0.3619E 03	0.3619E 03
AMMONIA IN H_2SO_4	0.9063E-02	0.1090E-01	0.3644E 01	0.3644E 01
TOTAL AMMONIA	0.9091E 00	0.1101E 01	0.3655E 03	0.3655E 03
AMMONIUM NITRATE - NH_3 - IN H_2O	0.4235E 01	0.5131E 01	0.1703E 04	0.1703E 04
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.4268E-01	0.5170E-01	0.1716E 02	0.1716E 02
TOTAL AMMONIUM NITRATE	0.4278E 01	0.5182E 01	0.1720E 04	0.1720E 04
AMMONIUM NITRATE - NH_3 - IN H_2O	0.4171E 01	0.5053E 01	0.1677E 04	0.1677E 04
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.4171E 01	0.5053E 01	0.1677E 04	0.1677E 04
UNDISSOLVED SOLIDS IN H_2O	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 6
IRC PROJECT 1430-E81

PRILL DRYER

COLUMBIA NITROGEN CORP.
PREDRYER INLET
AUGUST 14, 1980 1837 TO 1931

STANDARD CONDITION TEMPERATURE, DEG C	0.2000E 02
STANDARD CONDITION PRESSURE, MM HG	0.7600E 03
TOTAL SAMPLING TIME, MINUTES	0.4800E 02
AVERAGE SQUARE ROOT VELOCITY HEAD, MM H2O EX.5	0.5219E 01
AVERAGE ORIFICE PRESSURE DROP, MM H2O	0.1117E 03
AVERAGE METER TEMPERATURE, DEG C	0.3612E 02
AVERAGE DUCT STATIC PRESSURE, MM H2O	-0.7747E 02
AVERAGE DUCT TEMPERATURE, DEG C	0.6611E 02
TOTAL SAMPLE VOLUME, DM3	0.1504E 01
TOTAL SAMPLE VOLUME, DNM3	0.1437E 01
WATER VAPOR VOLUME, DNM3	0.5199E-01
AVERAGE STACK GAS PRESSURE, MM HG	0.7522E 03
DUCT VOLUMETRIC FLOW, AM3/M	0.1329E 04
DUCT VOLUMETRIC FLOW, DNM3/M	0.1097E 04
AVERAGE DUCT VELOCITY, M/M	0.1137E 04
AVERAGE DUCT GAS DENSITY, KG/AM3	0.1012E 01

EMISSION DATA

	MG/ AM3	MG/ DNM3	KG/ HR	KG/ MT
AMMONIA IN H_2O	0.2060E 04	0.2455E 04	0.1643E 03	0.7237E 03
AMMONIA IN H_2SO_4	0.2074E 02	0.2512E 02	0.1654E 01	0.7288E 01
TOTAL AMMONIA	0.2080E 04	0.2520E 04	0.1659E 03	0.7310E 03
AMMONIUM NITRATE - NH_3 - IN H_2O	0.9692E 04	0.1174E 05	0.7731E 03	0.3406E 04
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.9767E 02	0.1183E 03	0.7790E 01	0.3432E 02
TOTAL AMMONIUM NITRATE	0.9790E 04	0.1186E 05	0.7809E 03	0.3440E 04
AMMONIUM NITRATE - NH_3 - IN H_2O	0.9545E 04	0.1156E 05	0.7613E 03	0.3354E 04
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.9545E 04	0.1156E 05	0.7613E 03	0.3354E 04
UNDISSOLVED SOLIDS IN H_2O	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 4
TRC PROJECT 1430-E80

UNIT TESTED	PRILL DRYER
DATE AND TIME OF TEST	AUGUST 19, 1980 1040 TO 1322
SAMPLING LOCATION	PREDRYER DRYER OUTLET
NAME OF FIRM	COLUMBIA NITROGEN CORP.
LOCATION OF FIRM	AUGUSTA GEORGIA
POLLUTANTS SAMPLED	AMMONIA AND AMMONIUM NITRATE

BAROMETRIC PRESSURE, IN HG		29.82
DUCT AREA, SQ FT		32.76
NOZZLE DIAMETER, IN		0.189
PITOT CALIBRATION COEFFICIENTS	1	0.825
	2	0.831
	3	0.846
DRY GAS METER CALIBRATION FACTOR, Y		1.000
FINAL LEAK RATE, CFM		0.001
TONS PER HOUR, PRODUCT		0.000

COMPOSITION OF DUCT GAS, % BY VOLUME DRY BASIS

CARBON DIOXIDE	0.00
OXYGEN	20.80
CARBON MONOXIDE	0.00
NITROGEN	79.20

AMMONIA AND AMMONIUM NITRATE COLLECTED, - MG

	AMMONIA	AMMONIUM NITRATE BASED ON NH_3	AMMONIUM NITRATE BASED ON NH_3	UNDISSOLVED SOLIDS
H2O IMPINGERS	0.9920E 02	0.4670E 03	0.1510E 03	0.0000E 00
H2SO4 IMPINGERS	0.3940E 02	0.1860E 03	0.0000E 00	0.0000E 00
TOTAL	0.1386E 03	0.6530E 03	0.1510E 03	0.0000E 00

AMOUNT OF WATER COLLECTED, GRAMS

IMPINGERS	48.0
SILICA GEL	7.7

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 4
TRC PROJECT 1430-E80

POINT	TIME	VEL HEAD IN H20	ORIFICE PRESS IN H20	METER INLET DEG F	TEMPS EXIT DEG F	DUCT STAT PRESS IN H20	DUCT TEMP DEG F	INITIAL METER VOL CU FT	P R B	CYC ANG
1	3.0	0.2400	0.3100	89.	87.	-0.21	104.	787.70	2	0.
2	3.0	0.2600	0.3300	89.	87.	-0.21	105.	788.62	2	0.
3	3.0	0.3100	0.4000	89.	87.	-0.21	106.	789.60	2	0.
4	3.0	0.3500	0.4600	89.	87.	-0.21	106.	790.65	2	0.
5	3.0	0.3600	0.4700	89.	87.	-0.21	106.	791.78	2	0.
6	3.0	0.3900	0.5100	89.	87.	-0.21	105.	792.92	2	0.
7	3.0	0.4100	0.5300	89.	87.	-0.21	106.	794.10	2	0.
8	3.0	0.4250	0.5500	89.	88.	-0.21	105.	795.30	2	0.
9	3.0	0.4800	0.6300	89.	88.	-0.21	105.	796.54	2	0.
10	3.0	0.5700	0.7400	90.	88.	-0.33	105.	797.87	2	0.
11	3.0	0.6400	0.8400	90.	88.	-0.33	105.	799.25	2	0.
12	3.0	0.6400	0.8400	90.	88.	-0.33	105.	800.76	2	0.
13	3.0	0.5900	0.7700	90.	88.	-0.33	107.	802.27	2	0.
14	3.0	0.5900	0.7700	91.	88.	-0.33	107.	803.71	2	0.
15	3.0	0.6100	0.8000	91.	88.	-0.33	106.	805.15	2	0.
16	3.0	0.6200	0.8100	91.	89.	-0.35	108.	806.61	2	0.
17	3.0	0.5900	0.7700	91.	89.	-0.35	109.	808.09	2	0.
18	3.0	0.5900	0.7700	91.	89.	-0.35	109.	809.59	2	0.
19	3.0	0.5900	0.7700	91.	89.	-0.35	108.	811.00	2	0.
20	3.0	0.5600	0.7300	91.	89.	-0.35	109.	812.46	2	0.
1	3.0	0.2500	0.3350	94.	91.	-0.21	105.	813.82	2	0.
2	3.0	0.3000	0.4000	94.	91.	-0.21	105.	814.89	2	0.
3	3.0	0.4400	0.5900	94.	91.	-0.21	107.	815.93	2	0.
4	3.0	0.4600	0.6200	94.	91.	-0.21	107.	817.30	2	0.
5	3.0	0.5300	0.7100	94.	91.	-0.27	110.	818.50	2	0.
6	3.0	0.5400	0.7200	94.	91.	-0.27	110.	819.90	2	0.
7	3.0	0.5700	0.7600	94.	91.	-0.27	110.	821.30	2	0.
8	3.0	0.6200	0.8500	94.	91.	-0.27	110.	822.75	2	0.
9	3.0	0.6200	0.8500	94.	91.	-0.27	110.	824.30	2	0.
10	3.0	0.6400	0.8700	95.	92.	-0.27	111.	825.79	2	0.
11	3.0	0.7000	0.9300	96.	93.	-0.43	111.	827.35	2	0.
12	3.0	0.7200	0.9600	96.	93.	-0.43	111.	828.94	2	0.
13	3.0	0.7100	0.9500	96.	93.	-0.43	110.	831.18	2	0.
14	3.0	0.7100	0.9500	96.	93.	-0.43	110.	832.69	2	0.
15	3.0	0.7100	0.9500	96.	94.	-0.43	111.	834.30	2	0.
16	3.0	0.7200	0.9600	96.	94.	-0.45	111.	835.93	2	0.
17	3.0	0.7100	0.9500	96.	94.	-0.45	112.	837.54	2	0.
18	3.0	0.7100	0.9500	96.	94.	-0.45	112.	839.18	2	0.
19	3.0	0.6600	0.8900	96.	95.	-0.37	112.	840.80	2	0.
20	3.0	0.7200	0.9600	96.	95.	-0.37	113.	842.35	2	0.
FINAL METER VOLUME								843.99		

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 4
IRC PROJECT 1430-E80

PRILL DRYER

COLUMBIA NITROGEN CORP.
PREDRYER DRYER OUTLET
AUGUST 14, 1980 1040 TO 1322

STANDARD CONDITION TEMPERATURE, DEG F	0.6800E 02
STANDARD CONDITION PRESSURE, IN HG	0.2992E 02
TOTAL SAMPLING TIME, MINUTES	0.1200E 03
AVERAGE SQUARE ROOT VELOCITY HEAD, IN H2O EXP .5	0.7315E 00
AVERAGE ORIFICE PRESSURE DROP, IN H2O	0.7239E 00
AVERAGE METER TEMPERATURE, DEG F	0.9132E 02
AVERAGE DUCT STATIC PRESSURE, IN H2O	-0.3080E 00
AVERAGE DUCT TEMPERATURE, DEG F	0.1081E 03
TOTAL SAMPLE VOLUME, DACF	0.5629E 02
TOTAL SAMPLE VOLUME, DSCF	0.5382E 02
WATER VAPOR VOLUME, DSCF	0.2622E 01
MOISTURE CONTENT OF DUCT GAS, PERCENT	0.4645E 01
MOLE FRACTION DRY GAS	0.9536E 00
MOLECULAR WEIGHT - DRY STACK GAS	0.2883E 02
MOLECULAR WEIGHT - STACK GAS	0.2833E 02
AVERAGE STACK PRESSURE, IN HG	0.2980E 02
DUCT VOLUMETRIC FLOW, ACFM	0.8382E 05
DUCT VOLUMETRIC FLOW, DSCFM	0.7398E 05
AVERAGE DUCT VELOCITY, FPM	0.2559E 04
EXCESS AIR, PERCENT	0.1912E 05
AVERAGE DUCT GAS DENSITY, LBS/ACF	0.6805E-01
ISOKINETIC FACTOR, PERCENT	0.1020E 03

EMISSION DATA

	GR/ ACF	GR/ DSCF	LBS/ HR	LBS/ TON
AMMONIA IN H_2O	0.2510E-01	0.2844E-01	0.1803E 02	0.1803E 02
AMMONIA IN H_2SO_4	0.9969E-02	0.1129E-01	0.7162E 01	0.7162E 01
TOTAL AMMONIA	0.3507E-01	0.3973E-01	0.2519E 02	0.2519E 02
AMMONIUM NITRATE - NH_3 - IN H_2O	0.1182E 00	0.1339E 00	0.8489E 02	0.8489E 02
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.4706E-01	0.5332E-01	0.3381E 02	0.3381E 02
TOTAL AMMONIUM NITRATE	0.1652E 00	0.1872E 00	0.1187E 03	0.1187E 03
AMMONIUM NITRATE - NH_3 - IN H_2O	0.3821E-01	0.4329E-01	0.2745E 02	0.2745E 02
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.3821E-01	0.4329E-01	0.2745E 02	0.2745E 02
UNDISSOLVED SOLIDS IN H_2O	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 4
TRC PROJECT 1430-E80

PRILL DRYER

COLUMBIA NITROGEN CORP.
PREDRYER DRYER OUTLET
AUGUST 14, 1980 1040 TO 1322

STANDARD CONDITION TEMPERATURE, DEG C	0.2000E 02
STANDARD CONDITION PRESSURE, MM HG	0.7600E 03
TOTAL SAMPLING TIME, MINUTES	0.1200E 03
AVERAGE SQUARE ROOT VELOCITY HEAD, MM H2O EXP.5	0.3687E 01
AVERAGE ORIFICE PRESSURE DROP, MM H2O	0.1839E 02
AVERAGE METER TEMPERATURE, DEG C	0.3296E 02
AVERAGE DUCT STATIC PRESSURE, MM H2O	-0.7823E 01
AVERAGE DUCT TEMPERATURE, DEG C	0.4228E 02
TOTAL SAMPLE VOLUME, DM3	0.1594E 01
TOTAL SAMPLE VOLUME, DNM3	0.1524E 01
WATER VAPOR VOLUME, DNM3	0.7425E-01
AVERAGE STACK GAS PRESSURE, MM HG	0.7569E 03
DUCT VOLUMETRIC FLOW, AM3/M	0.2374E 04
DUCT VOLUMETRIC FLOW, DNM3/M	0.2095E 04
AVERAGE DUCT VELOCITY, M/M	0.7799E 03
AVERAGE DUCT GAS DENSITY, KG/AM3	0.1090E 01

EMISSION DATA

	MG/ AM3	MG/ DNM3	KG/ HR	KG/ MT
AMMONIA IN H_2O	0.5744E 02	0.6509E 02	0.8186E 01	0.3606E 02
AMMONIA IN H_2SO_4	0.2281E 02	0.2585E 02	0.3251E 01	0.1432E 02
TOTAL AMMONIA	0.8025E 02	0.9092E 02	0.1144E 02	0.5039E 02
AMMONIUM NITRATE - NH_3 - IN H_2O	0.2704E 03	0.3064E 03	0.3854E 02	0.1698E 03
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.1077E 03	0.1220E 03	0.1535E 02	0.6762E 02
TOTAL AMMONIUM NITRATE	0.3781E 03	0.4284E 03	0.5389E 02	0.2374E 03
AMMONIUM NITRATE - NH_3 - IN H_2O	0.8743E 02	0.9906E 02	0.1246E 02	0.5490E 02
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.8743E 02	0.9906E 02	0.1246E 02	0.5490E 02
UNDISSOLVED SOLIDS IN H_2O	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00

FS01 STOP 00000 00000003

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 5
TPC PROJECT 1420-EBJ

UNIT TESTED	PRILL DRYER
DATE AND TIME OF TEST	AUGUST 14, 1980 1500 TO 1715
SAMPLING LOCATION	PREDRYER DRYER OUTLET
NAME OF FIRM	COLUMBIA NITROGEN CORP.
LOCATION OF FIRM	AUGUSTA GEORGIA
POLLUTANTS SAMPLED	AMMONIA AND AMMONIUM NITRATE

BAROMETRIC PRESSURE, IN HG		29.85
DUCT AREA, SQ FT		32.76
NOZZLE DIAMETER, IN		0.199
PITOT CALIBRATION COEFFICIENTS	1	0.825
	2	0.831
	3	0.846
DRY GAS METER CALIBRATION FACTOR, Y		1.010
FINAL LEAK RATE, CFM		0.001
TONS PER HOUR, PRODUCT		0.003

COMPOSITION OF DUCT GAS, % BY VOLUME DRY BASIS

CARBON DIOXIDE	0.00
OXYGEN	20.80
CARBON MONOXIDE	0.00
NITROGEN	79.20

AMMONIA AND AMMONIUM NITRATE COLLECTED, - MG

	AMMONIA	AMMONIUM NITRATE BASED ON NH_3	AMMONIUM NITRATE BASED ON NH_3	UNDISSOLVED SOLIDS
H2O IMPINGERS	0.1310E 03	0.6180E 03	0.1400E 03	0.4060E 01
H2SO4 IMPINGERS	0.5940E 02	0.2800E 03	0.0000E 00	0.0000E 00
TOTAL	0.1904E 03	0.8980E 03	0.1400E 03	0.4060E 01

AMOUNT OF WATER COLLECTED, GRAMS

IMPINGERS	50.0
SILICA GEL	7.1

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 5
TRC PROJECT 1470-(81)

POINT	TIME	VEL HEAD IN H20	ORIFICE PRESS IN H20	METER INLET DEG F	TEMPS EXIT DEG F	DUCT STAT PRESS IN H20	DUCT TEMP DEG F	INITIAL METER VOL CU FT	P R B	CYC ANG
1	3.0	0.2300	0.3000	97.	95.	-0.10	111.	844.14	2	0.
2	3.0	0.2300	0.3000	97.	95.	-0.10	111.	845.05	2	0.
3	3.0	0.2800	0.3700	97.	96.	-0.10	111.	845.98	2	0.
4	3.0	0.3200	0.4300	97.	96.	-0.10	111.	847.00	2	0.
5	3.0	0.3200	0.4300	97.	96.	-0.10	111.	848.12	2	0.
6	3.0	0.3500	0.4700	97.	96.	-0.10	111.	849.23	2	0.
7	3.0	0.3700	0.4900	97.	96.	-0.25	111.	850.50	2	0.
8	3.0	0.4100	0.5500	99.	97.	-0.25	110.	851.60	2	0.
9	3.0	0.4600	0.6100	100.	97.	-0.25	110.	852.92	2	0.
10	3.0	0.5500	0.7300	100.	97.	-0.25	110.	854.12	2	0.
11	3.0	0.6200	0.8300	100.	97.	-0.25	110.	855.56	2	0.
12	3.0	0.6300	0.8400	100.	98.	-0.25	109.	957.05	2	0.
13	3.0	0.6200	0.8300	100.	98.	-0.35	109.	859.58	2	0.
14	3.0	0.6000	0.8000	100.	98.	-0.35	110.	860.10	2	0.
15	3.0	0.5800	0.7700	100.	98.	-0.35	110.	861.58	2	0.
16	3.0	0.6000	0.8000	101.	98.	-0.35	110.	863.06	2	0.
17	3.0	0.6000	0.8000	101.	98.	-0.35	109.	864.55	2	0.
18	3.0	0.5800	0.7800	102.	98.	-0.35	109.	866.04	2	0.
19	3.0	0.5500	0.7300	102.	98.	-0.35	109.	867.60	2	0.
20	3.0	0.5200	0.7000	102.	98.	-0.35	109.	869.95	2	0.
1	3.0	0.2800	0.3700	102.	95.	-0.35	107.	870.37	2	0.
2	3.0	0.3600	0.4800	102.	95.	-0.14	106.	871.43	2	0.
3	3.0	0.4100	0.5500	102.	99.	-0.14	106.	872.70	2	0.
4	3.0	0.4300	0.5700	102.	99.	-0.14	107.	873.94	2	0.
5	3.0	0.5000	0.6700	102.	99.	-0.14	108.	875.12	2	0.
6	3.0	0.5000	0.6700	103.	99.	-0.25	107.	876.48	2	0.
7	3.0	0.5500	0.7400	103.	99.	-0.25	107.	877.85	2	0.
8	3.0	0.5900	0.7800	103.	99.	-0.25	107.	879.28	2	0.
9	3.0	0.6400	0.8500	103.	99.	-0.25	107.	880.93	2	0.
10	3.0	0.6600	0.8800	103.	99.	-0.25	106.	882.29	2	0.
11	3.0	0.7000	0.9300	103.	99.	-0.25	106.	883.85	2	0.
12	3.0	0.7000	0.9300	103.	99.	-0.25	106.	885.45	2	0.
13	3.0	0.6900	0.9200	103.	99.	-0.25	106.	887.06	2	0.
14	3.0	0.6900	0.9200	103.	99.	-0.25	106.	888.67	2	0.
15	3.0	0.6900	0.9200	103.	99.	-0.40	106.	890.25	2	0.
16	3.0	0.7000	0.9300	103.	99.	-0.40	106.	891.00	2	0.
17	3.0	0.7200	0.9600	103.	99.	-0.40	106.	893.50	2	0.
18	3.0	0.7400	0.9900	103.	99.	-0.40	107.	895.14	2	0.
19	3.0	0.7400	0.9900	103.	99.	-0.40	107.	896.77	2	0.
20	3.0	0.7600	1.0200	103.	99.	-0.40	107.	898.45	2	0.

FINAL METER VOLUME 900.13

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 5
TRC PROJECT 1430-EM3

PRILL DRYER

COLUMBIA NITROGEN CORP.
PREDRYER DRYER OUTLET
AUGUST 14, 1980 1500 TO 1715

STANDARD CONDITION TEMPERATURE, DEG F	0.6800E 02
STANDARD CONDITION PRESSURE, IN HG	0.2992E 02
TOTAL SAMPLING TIME, MINUTES	0.1200E 03
AVERAGE SQUARE ROOT VELOCITY HEAD, IN H2O EXP .5	0.7241E 00
AVERAGE ORIFICE PRESSURE DROP, IN H2O	0.7157E 00
AVERAGE METER TEMPERATURE, DEG F	0.9951E 02
AVERAGE DUCT STATIC PRESSURE, IN H2O	-0.2615E 00
AVERAGE DUCT TEMPERATURE, DEG F	0.1083E 03
TOTAL SAMPLE VOLUME, DACF	0.5599E 02
TOTAL SAMPLE VOLUME, DSCF	0.5281E 02
WATER VAPOR VOLUME, DSCF	0.2688E 01
MOISTURE CONTENT OF DUCT GAS, PERCENT	0.4843E 01
MOLE FRACTION DRY GAS	0.9516E 00
MOLECULAR WEIGHT - DRY STACK GAS	0.2883E 02
MOLECULAR WEIGHT - STACK GAS	0.2831E 02
AVERAGE STACK PRESSURE, IN HG	0.2983E 02
DUCT VOLUMETRIC FLOW, ACFM	0.8293E 05
DUCT VOLUMETRIC FLOW, DSCFM	0.7310E 05
AVERAGE DUCT VELOCITY, FPM	0.2532E 04
EXCESS AIR, PERCENT	0.1912E 05
AVERAGE DUCT GAS DENSITY, LBS/ACF	0.6805E-01
ISOKINETIC FACTOR, PERCENT	0.1013E 03

EMISSION DATA

	GR/ ACF	GR/ DSCF	LBS/ HR	LBS/ TON
AMMONIA IN H_2O	0.3374E-01	0.3823E-01	0.2398E 02	0.2398E 02
AMMONIA IN H_2SO_4	0.1530E-01	0.1735E-01	0.1087E 02	0.1087E 02
TOTAL AMMONIA	0.4904E-01	0.5564E-01	0.3486E 02	0.3486E 02
AMMONIUM NITRATE - NH_3 - IN H_2O	0.1592E 00	0.1806E 00	0.1131E 03	0.1131E 03
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.7212E-01	0.8182E-01	0.5126E 02	0.5126E 02
TOTAL AMMONIUM NITRATE	0.2313E 00	0.2624E 00	0.1644E 03	0.1644E 03
AMMONIUM NITRATE - NH_3 - IN H_2O	0.3606E-01	0.4091E-01	0.2563E 02	0.2563E 02
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.3606E-01	0.4091E-01	0.2563E 02	0.2563E 02
UNDISSOLVED SOLIDS IN H_2O	0.1046E-02	0.1186E-02	0.7433E 00	0.7433E 00
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.1046E-02	0.1186E-02	0.7433E 00	0.7433E 00

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 5
TRC PROJECT 1930-E87

PRILL DRYER

COLUMBIA NITROGEN CORP.
PREDRYER DRYER OUTLET
AUGUST 14, 1980 1500 TO 1715

STANDARD CONDITION TEMPERATURE, DEG C	0.2000E 02
STANDARD CONDITION PRESSURE, MM HG	0.7600E 03
TOTAL SAMPLING TIME, MINUTES	0.1200E 03
AVERAGE SQUARE ROOT VELOCITY HEAD, MM H2O EXP.5	0.3649E 01
AVERAGE ORIFICE PRESSURE DROP, MM H2O	0.1919E 02
AVERAGE METER TEMPERATURE, DEG C	0.3751E 02
AVERAGE DUCT STATIC PRESSURE, MM H2O	-0.6642E 01
AVERAGE DUCT TEMPERATURE, DEG C	0.4239E 02
TOTAL SAMPLE VOLUME, DM3	0.1586E 01
TOTAL SAMPLE VOLUME, DNM3	0.1495E 01
WATER VAPOR VOLUME, DNM3	0.7612E-01
AVERAGE STACK GAS PRESSURE, MM HG	0.7577E 03
DUCT VOLUMETRIC FLOW, AM3/M	0.2349E 04
DUCT VOLUMETRIC FLOW, DNM3/M	0.2070E 04
AVERAGE DUCT VELOCITY, M/M	0.7716E 03
AVERAGE DUCT GAS DENSITY, KG/AM3	0.1090E 01

EMISSION DATA

	MG/AM3	MG/DNM3	KG/HR	KG/MT
AMMONIA IN H_2O	0.7721E 02	0.8760E 02	0.1089E 02	0.4797E 02
AMMONIA IN H_2SO_4	0.3501E 02	0.3972E 02	0.4937E 01	0.2175E 02
TOTAL AMMONIA	0.1122E 03	0.1273E 03	0.1583E 02	0.6972E 02
AMMONIUM NITRATE - NH_3 - IN H_2O	0.3643E 03	0.4132E 03	0.5137E 02	0.2263E 03
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.1650E 03	0.1872E 03	0.2327E 02	0.1025E 03
TOTAL AMMONIUM NITRATE	0.5293E 03	0.6005E 03	0.7464E 02	0.3288E 03
AMMONIUM NITRATE - NH_3 - IN H_2O	0.8252E 02	0.9361E 02	0.1164E 02	0.5126E 02
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.8252E 02	0.9361E 02	0.1164E 02	0.5126E 02
UNDISSOLVED SOLIDS IN H_2O	0.2393E 01	0.2715E 01	0.3375E 00	0.1487E 01
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.2393E 01	0.2715E 01	0.3375E 00	0.1487E 01

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 6
TRC PROJECT 1430-E80

UNIT TESTED	PRILL DRYER
DATE AND TIME OF TEST	AUGUST 14, 1980 1805 TO 2010
SAMPLING LOCATION	PREDRYER DRYER OUTLET
NAME OF FIRM	COLUMBIA NITROGEN CORP.
LOCATION OF FIRM	AUGUSTA GEORGIA
POLLUTANTS SAMPLED	AMMONIA AND AMMONIUM NITRATE

BAROMETRIC PRESSURE, IN HG		29.80
DUCT AREA, SQ FT		32.76
NOZZLE DIAMETER, IN		0.189
PITOT CALIBRATION COEFFICIENTS	1	0.825
	2	0.831
	3	0.846
DRY GAS METER CALIBRATION FACTOR, Y		1.000
FINAL LEAK RATE, CFM		0.001
TONS PER HOUR, PRODUCT		0.003

COMPOSITION OF DUCT GAS, % BY VOLUME DRY BASIS

CARBON DIOXIDE	0.00
OXYGEN	20.80
CARBON MONOXIDE	0.00
NITROGEN	79.21

AMMONIA AND AMMONIUM NITRATE COLLECTED, - MG

	AMMONIA	AMMONIUM NITRATE BASED ON NH_3	AMMONIUM NITRATE BASED ON NH_3	UNDISSOLVED SOLIDS
H2O IMPINGERS	0.9820E 02	0.4620E 03	0.1590E 03	0.0000E 00
H2SO4 IMPINGERS	0.3490E 02	0.1640E 03	0.0000E 00	0.0000E 00
TOTAL	0.1331E 03	0.6260E 03	0.1590E 03	0.0000E 00

AMOUNT OF WATER COLLECTED, GRAMS

IMPINGERS	90.0
SILICA GEL	7.2

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 6
IRC PROJECT 1930-E80

POINT	TIME	VEL HEAD IN H20	ORIFICE PRESS IN H20	METER INLET DEG F	TEMPS EXIT DEG F	DUCT STAT PRESS IN H20	DUCT TEMP DEG F	INITIAL METER VOL CU FT	P R B	CYC ANG
1	3.0	0.2700	0.3600	100.	97.	-0.24	108.	900.32	2	0.
2	3.0	0.3600	0.4800	100.	97.	-0.24	106.	901.36	2	0.
3	3.0	0.3600	0.4800	100.	97.	-0.24	106.	902.52	2	0.
4	3.0	0.4200	0.5600	100.	97.	-0.24	107.	903.69	2	0.
5	3.0	0.4400	0.5800	100.	97.	-0.24	107.	905.00	2	0.
6	3.0	0.5100	0.6900	100.	97.	-0.24	107.	906.23	2	0.
7	3.0	0.5200	0.7000	100.	97.	-0.24	109.	907.62	2	0.
8	3.0	0.5800	0.7700	100.	97.	-0.24	109.	909.03	2	0.
9	3.0	0.6100	0.8200	100.	97.	-0.24	109.	910.50	2	0.
10	3.0	0.6300	0.8400	101.	98.	-0.24	109.	912.00	2	0.
11	3.0	0.7000	0.9300	101.	98.	-0.40	109.	913.53	2	0.
12	3.0	0.7200	0.9500	101.	98.	-0.40	109.	915.13	2	0.
13	3.0	0.7200	0.9500	101.	98.	-0.40	109.	916.75	2	0.
14	3.0	0.7200	0.9500	101.	98.	-0.40	109.	918.41	2	0.
15	3.0	0.7200	0.9500	101.	98.	-0.40	110.	920.00	2	0.
16	3.0	0.7100	0.9400	101.	98.	-0.42	109.	921.63	2	0.
17	3.0	0.7100	0.9400	101.	98.	-0.42	110.	923.26	2	0.
18	3.0	0.7100	0.9400	101.	98.	-0.42	110.	924.88	2	0.
19	3.0	0.7500	1.0000	101.	98.	-0.42	110.	926.49	2	0.
20	3.0	0.7500	1.0000	101.	98.	-0.42	110.	928.15	2	0.
1	3.0	0.2100	0.2800	101.	98.	-0.42	108.	929.82	2	0.
2	3.0	0.2100	0.2800	101.	98.	-0.42	108.	930.77	2	0.
3	3.0	0.2800	0.3700	101.	98.	-0.12	110.	931.65	2	0.
4	3.0	0.3100	0.4000	101.	98.	-0.12	110.	932.68	2	0.
5	3.0	0.3300	0.4400	101.	98.	-0.12	111.	933.77	2	0.
6	3.0	0.3600	0.4800	101.	98.	-0.12	111.	934.80	2	0.
7	3.0	0.3800	0.5100	101.	98.	-0.17	111.	936.07	2	0.
8	3.0	0.4200	0.5600	101.	98.	-0.17	111.	937.28	2	0.
9	3.0	0.4500	0.6000	101.	98.	-0.17	111.	938.54	2	0.
10	3.0	0.5400	0.7200	101.	98.	-0.17	111.	939.84	2	0.
11	3.0	0.5900	0.8000	101.	98.	-0.17	111.	941.23	2	0.
12	3.0	0.6200	0.8300	101.	98.	-0.31	111.	942.72	2	0.
13	3.0	0.5900	0.8000	101.	98.	-0.31	111.	944.25	2	0.
14	3.0	0.5900	0.8000	101.	98.	-0.31	111.	945.77	2	0.
15	3.0	0.5900	0.8000	101.	98.	-0.31	111.	947.24	2	0.
16	3.0	0.5800	0.7800	101.	98.	-0.31	111.	948.72	2	0.
17	3.0	0.6000	0.8000	101.	98.	-0.31	111.	950.20	2	0.
18	3.0	0.6000	0.8000	101.	98.	-0.31	111.	951.73	2	0.
19	3.0	0.6000	0.8000	101.	98.	-0.34	111.	953.19	2	0.
20	3.0	0.5500	0.7400	101.	98.	-0.34	111.	954.68	2	0.

FINAL METER VOLUME 956.17

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 6
TRC PROJECT 1420-E67

PRILL DRYER

COLUMBIA NITROGEN CORP.
PREDRYER DRYER OUTLET
AUGUST 14, 1980 1805 TO 2013

STANDARD CONDITION TEMPERATURE, DEG F	0.6800E 02
STANDARD CONDITION PRESSURE, IN HG	0.2992E 02
TOTAL SAMPLING TIME, MINUTES	0.1200E 03
AVERAGE SQUARE ROOT VELOCITY HEAD, IN H2O EXP .5	0.7207E 00
AVERAGE ORIFICE PRESSURE DROP, IN H2O	0.7105E 00
AVERAGE METER TEMPERATURE, DEG F	0.9927E 02
AVERAGE DUCT STATIC PRESSURE, IN H2O	-0.2880E 00
AVERAGE DUCT TEMPERATURE, DEG F	0.1096E 03
TOTAL SAMPLE VOLUME, DACF	0.5580E 02
TOTAL SAMPLE VOLUME, DSCF	0.5256E 02
WATER VAPOR VOLUME, DSCF	0.2222E 01
MOISTURE CONTENT OF DUCT GAS, PERCENT	0.4056E 01
MOLE FRACTION DRY GAS	0.9594E 00
MOLECULAR WEIGHT - DRY STACK GAS	0.2883E 02
MOLECULAR WEIGHT - STACK GAS	0.2839E 02
AVERAGE STACK PRESSURE, IN HG	0.2979E 02
DUCT VOLUMETRIC FLOW, ACFM	0.8261E 05
DUCT VOLUMETRIC FLOW, DSCFM	0.7312E 05
AVERAGE DUCT VELOCITY, FPM	0.2522E 04
EXCESS AIR, PERCENT	0.1912E 05
AVERAGE DUCT GAS DENSITY, LBS/ACF	0.6798E-01
ISOKINETIC FACTOR, PERCENT	0.1008E 03

EMISSION DATA

	GR/ ACF	GR/ DSCF	LBS/ HR	LBS/ TON
AMMONIA IN H_2O	0.2552E-01	0.2883E-01	0.1807E 02	0.1807E 02
AMMONIA IN H_2SO_4	0.9069E-02	0.1025E-01	0.6421E 01	0.6421E 01
TOTAL AMMONIA	0.3459E-01	0.3907E-01	0.2449E 02	0.2449E 02
AMMONIUM NITRATE - NH_3 - IN H_2O	0.1201E 00	0.1355E 00	0.8500E 02	0.8500E 02
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.4262E-01	0.4815E-01	0.3017E 02	0.3017E 02
TOTAL AMMONIUM NITRATE	0.1627E 00	0.1839E 00	0.1152E 03	0.1152E 03
AMMONIUM NITRATE - NH_3 - IN H_2O	0.4132E-01	0.4669E-01	0.2925E 02	0.2925E 02
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.4132E-01	0.4669E-01	0.2925E 02	0.2925E 02
UNDISSOLVED SOLIDS IN H_2O	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 6
IRC PROJECT 1477-E87

PRILL DRYER

COLUMBIA NITROGEN CORP.
PREDRYER DRYER OUTLET
AUGUST 14, 1980 1805 TO 2013

STANDARD CONDITION TEMPERATURE, DEG C	0.2003E 02
STANDARD CONDITION PRESSURE, MM HG	0.7600E 03
TOTAL SAMPLING TIME, MINUTES	0.1200E 03
AVERAGE SQUARE ROOT VELOCITY HEAD, MM H2O EXP.5	0.3632E 01
AVERAGE ORIFICE PRESSURE DROP, MM H2O	0.1805E 02
AVERAGE METER TEMPERATURE, DEG C	0.3737E 02
AVERAGE DUCT STATIC PRESSURE, MM H2O	-0.7315E 01
AVERAGE DUCT TEMPERATURE, DEG C	0.4311E 02
TOTAL SAMPLE VOLUME, DM3	0.1583E 01
TOTAL SAMPLE VOLUME, DNM3	0.1489E 01
WATER VAPOR VOLUME, DNM3	0.6292E-01
AVERAGE STACK GAS PRESSURE, MM HG	0.7564E 03
DUCT VOLUMETRIC FLOW, AM3/M	0.2339E 04
DUCT VOLUMETRIC FLOW, DNM3/M	0.2071E 04
AVERAGE DUCT VELOCITY, M/M	0.7686E 03
AVERAGE DUCT GAS DENSITY, KG/AM3	0.1089E 01

EMISSION DATA

	MG/AM3	MG/DNM3	KG/HR	KG/MT
AMMONIA IN H_2O	0.5940E 02	0.6597E 02	0.8203E 01	0.3613E 02
AMMONIA IN H_2SO_4	0.2075E 02	0.2345E 02	0.2915E 01	0.1284E 02
TOTAL AMMONIA	0.7915E 02	0.8942E 02	0.1112E 02	0.4898E 02
AMMONIUM NITRATE - NH_3 - IN H_2O	0.2747E 03	0.3104E 03	0.3859E 02	0.1700E 03
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.9752E 02	0.1102E 03	0.1370E 02	0.6035E 02
TOTAL AMMONIUM NITRATE	0.3723E 03	0.4205E 03	0.5229E 02	0.2303E 03
AMMONIUM NITRATE - NH_3 - IN H_2O	0.9455E 02	0.1068E 03	0.1328E 02	0.5851E 02
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.9455E 02	0.1068E 03	0.1328E 02	0.5851E 02
UNDISSOLVED SOLIDS IN H_2O	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00

APPENDIX A.3

COOLER (INLET, BYPASS)

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 7-
IRC PROJECT 1433-E80

UNIT TESTED	PRILL COOLER
DATE AND TIME OF TEST	AUGUST 15, 1980 1144 TO 1433
SAMPLING LOCATION	SCRUBBER INLET
NAME OF FIRM	COLUMBIA NITROGEN CORP.
LOCATION OF FIRM	AUGUSTA GEORGIA
POLLUTANTS SAMPLED	AMMONIA AND AMMONIUM NITRATE

BAROMETRIC PRESSURE, IN HG		29.92
DUCT AREA, SQ FT		12.31
NOZZLE DIAMETER, IN		0.191
PITOT CALIBRATION COEFFICIENTS	1	0.825
	2	0.831
	3	0.846
DRY GAS METER CALIBRATION FACTOR, Y		1.000
FINAL LEAK RATE, CFM		0.000
TONS PER HOUR, PRODUCT		0.000

COMPOSITION OF DUCT GAS, % BY VOLUME DRY BASIS

CARBON DIOXIDE	0.00
OXYGEN	20.80
CARBON MONOXIDE	0.00
NITROGEN	79.20

AMMONIA AND AMMONIUM NITRATE COLLECTED, - MG

	AMMONIA	AMMONIUM NITRATE BASED ON NH_3	AMMONIUM NITRATE BASED ON NH_3	UNDISSOLVED SOLIDS
H2O IMPINGERS	0.8006E 04	0.3768E 05	0.3462E 05	0.0000E 00
H2SO4 IMPINGERS	0.6200E 01	0.2920E 02	0.0000E 00	0.0000E 00
TOTAL	0.8012E 04	0.3771E 05	0.3462E 05	0.0000E 00

AMOUNT OF WATER COLLECTED, GRAMS

IMPINGERS	51.0
SILICA GEL	15.3

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 7
TRC PROJECT 1420-E81

POINT	TIME	VEL HEAD IN H20	ORIFICE PRESS IN H20	METER INLET DEG F	TEMPS EXIT DEG F	DUCT STAT PRESS IN H20	DUCT TEMP DEG F	INITIAL METER VOL CU FT	P R B	CYC ANG
1	3.0	0.6000	0.9300	87.	88.	-5.50	105.	440.33	3	0.
2	3.0	0.6400	1.0000	88.	88.	-5.50	106.	441.65	3	0.
3	3.0	0.7100	1.1000	88.	88.	-5.50	123.	443.28	3	0.
4	3.0	0.7600	1.2000	89.	89.	-5.50	124.	444.89	3	0.
5	3.0	0.8300	1.3000	89.	89.	-5.50	125.	446.73	3	0.
6	3.0	0.8900	1.3500	89.	89.	-5.50	126.	448.52	3	0.
7	3.0	0.9800	1.5000	89.	89.	-5.50	128.	450.15	3	0.
8	3.0	1.0000	1.5500	89.	89.	-5.50	122.	452.17	3	0.
9	3.0	1.0500	1.6500	89.	90.	-5.50	123.	453.99	3	0.
10	3.0	1.1000	1.7000	89.	89.	-5.50	122.	455.73	3	0.
11	3.0	1.1500	1.8000	89.	90.	-5.50	129.	458.31	3	0.
12	3.0	1.2000	1.8500	90.	90.	-5.50	127.	460.04	3	0.
13	3.0	1.2500	1.9000	90.	90.	-5.50	129.	462.25	3	0.
14	3.0	1.3000	2.0000	90.	90.	-5.50	129.	464.29	3	0.
15	3.0	1.3500	2.1000	90.	90.	-5.50	129.	466.53	3	0.
16	3.0	1.4000	2.1500	90.	90.	-5.50	130.	468.93	3	0.
17	3.0	1.4000	2.1500	91.	90.	-5.50	130.	471.04	3	0.
18	3.0	1.4000	2.1500	90.	90.	-5.50	130.	473.26	3	0.
19	3.0	1.4000	2.1500	90.	90.	-5.50	129.	475.53	3	0.
20	3.0	1.4000	2.1500	91.	90.	-5.50	129.	477.84	3	0.
21	3.0	1.4000	2.1500	91.	90.	-5.50	128.	480.06	3	0.
22	3.0	1.4000	2.1500	91.	91.	-5.50	127.	482.34	3	0.
23	3.0	1.5000	2.3000	91.	91.	-5.50	127.	484.86	3	0.
24	3.0	1.5000	2.3000	91.	91.	-5.50	126.	487.01	3	0.
1	3.0	0.8600	1.3500	92.	92.	-5.50	104.	487.39	3	0.
2	3.0	0.8600	1.3500	92.	92.	-5.50	104.	491.03	3	0.
3	3.0	1.0000	1.7000	92.	92.	-5.50	104.	492.08	3	0.
4	3.0	1.1000	1.7000	92.	92.	-5.50	117.	494.55	3	0.
5	3.0	1.0000	1.5500	92.	92.	-5.50	119.	496.40	3	0.
6	3.0	1.2000	1.8500	92.	92.	-5.50	119.	493.33	3	0.
7	3.0	1.2000	1.8500	92.	92.	-5.50	121.	500.62	3	0.
8	3.0	1.2000	1.8500	92.	92.	-5.50	122.	502.58	3	0.
9	3.0	1.3000	2.0000	92.	92.	-5.50	123.	504.71	3	0.
10	3.0	1.2500	1.9500	93.	92.	-5.50	123.	506.94	3	0.
11	3.0	1.2500	1.9500	93.	92.	-5.50	124.	509.08	3	0.
12	3.0	1.2500	1.9500	93.	92.	-5.50	127.	511.26	3	0.
13	3.0	1.2500	1.9500	93.	92.	-5.50	132.	513.46	3	0.
14	3.0	1.2500	1.9500	93.	93.	-5.50	134.	515.68	3	0.
15	3.0	1.2500	1.9500	93.	94.	-5.50	133.	517.81	3	0.
16	3.0	1.2500	1.9500	93.	94.	-5.50	134.	519.95	3	0.
17	3.0	1.2000	1.8500	93.	94.	-5.50	135.	522.22	3	0.
18	3.0	1.2000	1.8500	93.	94.	-5.50	136.	524.25	3	0.
19	3.0	1.2000	1.8500	93.	94.	-5.50	136.	526.35	3	0.
20	3.0	1.2000	1.8500	93.	94.	-5.50	138.	528.46	3	0.
21	3.0	1.1000	1.7000	93.	94.	-5.50	139.	530.59	3	0.
22	3.0	1.1000	1.7000	93.	94.	-5.50	138.	532.64	3	0.
23	3.0	1.0500	1.6500	94.	94.	-5.50	139.	534.59	3	0.
24	3.0	1.0500	1.6500	94.	94.	-5.50	139.	536.72	3	0.

FINAL METER VOLUME 538.75

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 7
IRC PROJECT 1473-E67

PRILL COOLER

COLUMBIA NITROGEN CORP.
SCRUBBER INLET
AUGUST 15, 1980 1144 TO 1433

STANDARD CONDITION TEMPERATURE, DEG F	0.6800E 02
STANDARD CONDITION PRESSURE, IN HG	0.2992E 02
TOTAL SAMPLING TIME, MINUTES	0.1440E 03
AVERAGE SQUARE ROOT VELOCITY HEAD, IN H2O EXP .5	0.1067E 01
AVERAGE ORIFICE PRESSURE DROP, IN H2O	0.1782E 01
AVERAGE METER TEMPERATURE, DEG F	0.9121E 02
AVERAGE DUCT STATIC PRESSURE, IN H2O	-0.5500E 01
AVERAGE DUCT TEMPERATURE, DEG F	0.1259E 03
TOTAL SAMPLE VOLUME, DACF	0.9872E 02
TOTAL SAMPLE VOLUME, DSCF	0.9498E 02
WATER VAPOR VOLUME, DSCF	0.3121E 01
MOISTURE CONTENT OF DUCT GAS, PERCENT	0.3181E 01
MOLE FRACTION DRY GAS	0.9682E 00
MOLECULAR WEIGHT - DRY STACK GAS	0.2883E 02
MOLECULAR WEIGHT - STACK GAS	0.2849E 02
AVERAGE STACK PRESSURE, IN HG	0.2952E 02
DUCT VOLUMETRIC FLOW, ACFM	0.4759E 05
DUCT VOLUMETRIC FLOW, DSCFM	0.4097E 05
AVERAGE DUCT VELOCITY, FPM	0.3966E 04
EXCESS AIR, PERCENT	0.1912E 05
AVERAGE DUCT GAS DENSITY, LBS/ACF	0.6573E-01
ISOKINETIC FACTOR, PERCENT	0.9967E 02

EMISSION DATA

	GR/ ACF	GR/ DSCF	LBS/ HR	LBS/ TON
AMMONIA IN H_2O	0.1120E 01	0.1301E 01	0.4567E 03	0.4567E 03
AMMONIA IN H_2SO_4	0.3670E-03	0.1007E-02	0.3537E 00	0.3537E 00
TOTAL AMMONIA	0.1120E 01	0.1302E 01	0.4570E 03	0.4570E 03
AMMONIUM NITRATE - NH_3 - IN H_2O	0.5269E 01	0.6121E 01	0.2149E 04	0.2149E 04
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.4083E-02	0.4744E-02	0.1666E 01	0.1666E 01
TOTAL AMMONIUM NITRATE	0.5273E 01	0.6126E 01	0.2151E 04	0.2151E 04
AMMONIUM NITRATE - NH_3 - IN H_2O	0.4842E 01	0.5625E 01	0.1975E 04	0.1975E 04
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.4842E 01	0.5625E 01	0.1975E 04	0.1975E 04
UNDISSOLVED SOLIDS IN H_2O	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 7
IRC PROJECT 1431-E80

PRILL COOLER
COLUMBIA NITROGEN CORP.
SCRUBBER INLET
AUGUST 15, 1980 1144 TO 1433

STANDARD CONDITION TEMPERATURE, DEG C	0.2000E 02
STANDARD CONDITION PRESSURE, MM HG	0.7600E 03
TOTAL SAMPLING TIME, MINUTES	0.1440E 03
AVERAGE SQUARE ROT VELOCITY HEAD, MM H2O EXP.5	0.5377E 01
AVERAGE ORIFICE PRESSURE DROP, MM H2O	0.4526E 02
AVERAGE METER TEMPERATURE, DEG C	0.3289E 02
AVERAGE DUCT STATIC PRESSURE, MM H2O	-0.1397E 03
AVERAGE DUCT TEMPERATURE, DEG C	0.5215E 02
TOTAL SAMPLE VOLUME, DM3	0.2796E 01
TOTAL SAMPLE VOLUME, DNM3	0.2690E 01
WATER VAPOR VOLUME, DNM3	0.8838E-01
AVERAGE STACK GAS PRESSURE, MM HG	0.7497E 03
DUCT VOLUMETRIC FLOW, AM3/M	0.1344E 04
DUCT VOLUMETRIC FLOW, DNM3/M	0.1160E 04
AVERAGE DUCT VELOCITY, M/M	0.1179E 04
AVERAGE DUCT GAS DENSITY, KG/AM3	0.1053E 01

EMISSION DATA

	MG/ AM3	MG/ DNM3	KG/ HR	KG/ MT
AMMONIA IN H_2O	0.2562E 04	0.2975E 04	0.2073E 03	0.9134E 03
AMMONIA IN H_2SO_4	0.1984E 01	0.2305E 01	0.1605E 00	0.7073E 00
TOTAL AMMONIA	0.2564E 04	0.2979E 04	0.2075E 03	0.9141E 03
AMMONIUM NITRATE - NH_3 - IN H_2O	0.1206E 05	0.1401E 05	0.9757E 03	0.4298E 04
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.9394E 01	0.1086E 02	0.7562E 00	0.3331E 01
TOTAL AMMONIUM NITRATE	0.1207E 05	0.1402E 05	0.9765E 03	0.4302E 04
AMMONIUM NITRATE - NH_3 - IN H_2O	0.1108E 05	0.1287E 05	0.8967E 03	0.3950E 04
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.1108E 05	0.1287E 05	0.8967E 03	0.3950E 04
UNDISSOLVED SOLIDS IN H_2O	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST 40 8
IRC PROJECT 1431-EB1

UNIT TESTED	PRILL COOLER
DATE AND TIME OF TEST	81-15-80 1544-1736 8-16-81 0727-0803
SAMPLING LOCATION	SCRUBBER INLET
NAME OF FIRM	COLUMBIA NITROGEN CORP.
LOCATION OF FIRM	AUGUSTA GEORGIA
POLLUTANTS SAMPLED	AMMONIA AND AMMONIUM NITRATE

BAROMETRIC PRESSURE, IN HG		29.92
DUCT AREA, SQ FT		12.31
NOZZLE DIAMETER, IN		0.191
PITOT CALIBRATION COEFFICIENTS	1	0.825
	2	0.831
	3	0.846
DRY GAS METER CALIBRATION FACTOR, Y		1.000
FINAL LEAK RATE, CFM		0.000
TONS PER HOUR, PRODUCT		0.000

COMPOSITION OF DUCT GAS, % BY VOLUME DRY BASIS

CARBON DIOXIDE	0.00
OXYGEN	20.87
CARBON MONOXIDE	0.00
NITROGEN	79.20

AMMONIA AND AMMONIUM NITRATE COLLECTED. - MG

	AMMONIA	AMMONIUM NITRATE BASED ON NH_3	AMMONIUM NITRATE BASED ON NH_3	UNDISSOLVED SOLIDS
H2O IMPINGERS	0.4992E 04	0.2349E 05	0.2374E 05	0.0000E 00
H2SO4 IMPINGERS	0.1060E 02	0.4990E 02	0.0000E 00	0.0000E 00
TOTAL	0.5003E 04	0.2354E 05	0.2374E 05	0.0000E 00

AMOUNT OF WATER COLLECTED, GRAMS

IMPINGERS	51.0
SILICA GEL	15.4

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 8
IRC PROJECT 1[illegible]

POINT	TIME	VEL HEAD IN H20	ORIFICE PRESS IN H20	METER INLET DEG F	TEMPS EXIT DEG F	DUCT STAT PRESS IN H20	DUCT TEMP DEG F	INITIAL METER VOL CU FT	P R B	CYC ANG
1	3.0	0.7100	1.1000	94.	95.	-4.90	101.	539.28	3	0.
2	3.0	0.7000	1.1000	94.	94.	-4.90	103.	541.74	3	0.
3	3.0	0.7300	1.1500	94.	94.	-4.90	121.	542.51	3	0.
4	3.0	0.8300	1.3000	94.	94.	-4.90	122.	544.07	3	0.
5	3.0	0.8600	1.3500	94.	94.	-4.90	120.	545.83	3	0.
6	3.0	0.9400	1.5000	94.	94.	-4.90	123.	547.86	3	0.
7	3.0	1.0500	1.6500	94.	94.	-4.90	124.	549.73	3	0.
8	3.0	1.0500	1.6500	94.	94.	-4.90	125.	551.69	3	0.
9	3.0	1.2000	1.8500	94.	95.	-4.90	125.	553.60	3	0.
10	3.0	1.1500	1.8000	94.	95.	-4.90	126.	555.71	3	0.
11	3.0	1.1500	1.8000	94.	95.	-4.90	127.	557.83	3	0.
12	3.0	1.2000	1.8000	94.	95.	-4.90	129.	559.93	3	0.
13	3.0	1.2500	1.9500	95.	95.	-4.90	134.	562.44	3	0.
14	3.0	1.2000	1.8000	95.	95.	-4.90	134.	564.25	3	0.
15	3.0	1.3000	2.0000	96.	96.	-4.90	138.	566.42	3	0.
16	3.0	1.3000	2.0000	96.	96.	-4.90	138.	568.53	3	0.
17	3.0	1.3000	2.0000	96.	96.	-4.90	140.	570.68	3	0.
18	3.0	1.3000	2.0000	96.	95.	-4.90	140.	572.92	3	0.
19	3.0	1.4000	2.2000	95.	96.	-4.90	140.	575.16	3	0.
20	3.0	1.2500	1.9500	97.	96.	-4.90	140.	577.44	3	0.
21	3.0	1.2500	1.9500	97.	96.	-4.90	140.	579.61	3	0.
22	3.0	1.2500	1.9500	97.	97.	-4.90	141.	582.03	3	0.
23	3.0	1.2000	1.8500	97.	97.	-4.90	142.	584.05	3	0.
24	3.0	1.2000	1.8500	97.	97.	-4.90	140.	586.19	3	0.
1	3.0	0.6500	1.0000	98.	98.	-4.90	116.	589.18	3	0.
2	3.0	0.6500	1.0000	98.	97.	-4.90	121.	589.90	3	0.
3	3.0	0.6500	1.0000	97.	97.	-4.90	128.	591.47	3	0.
4	3.0	0.6900	1.1000	97.	98.	-4.90	126.	593.28	3	0.
5	3.0	0.8800	1.4000	97.	98.	-4.90	128.	594.67	3	0.
6	3.0	0.9000	1.4000	97.	98.	-4.90	130.	596.53	3	0.
7	3.0	0.9400	1.5000	97.	98.	-4.90	131.	598.41	3	0.
8	3.0	1.0000	1.5500	97.	98.	-4.90	133.	600.33	3	0.
9	3.0	1.0000	1.5500	98.	98.	-4.90	134.	602.27	3	0.
10	3.0	1.0500	1.6500	98.	98.	-4.90	134.	604.38	3	0.
11	3.0	1.1000	1.7000	98.	98.	-4.90	126.	606.23	3	0.
12	3.0	1.2000	1.8500	98.	98.	-4.90	119.	608.41	3	0.
13	3.0	1.3000	2.0500	89.	91.	-4.90	132.	610.35	3	0.
14	3.0	1.3000	2.0500	88.	90.	-5.50	131.	612.55	3	0.
15	3.0	1.3500	2.1000	87.	90.	-5.50	130.	614.96	3	0.
16	3.0	1.3500	2.1000	87.	90.	-5.50	130.	617.08	3	0.
17	3.0	1.4000	2.2000	87.	89.	-5.50	130.	619.34	3	0.
18	3.0	1.4000	2.2000	86.	85.	-5.50	129.	621.55	3	0.
19	3.0	1.4000	2.2000	86.	86.	-5.50	129.	624.00	3	0.
20	3.0	1.4000	2.2000	86.	88.	-5.50	128.	626.38	3	0.
21	3.0	1.4500	2.2500	86.	88.	-5.50	123.	629.55	3	0.
22	3.0	1.4500	2.2500	86.	85.	-5.60	128.	631.87	3	0.
23	3.0	1.4500	2.2500	87.	88.	-5.60	126.	633.21	3	0.
24	3.0	1.5000	2.3000	87.	85.	-5.60	126.	635.55	3	0.

FINAL METER VOLUME 637.77

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 8
TRC PROJECT 1477-021

PRILL COOLER

COLUMBIA NITROGEN CORP.
SCRUBBER INLET
81-15-83 1544-1736 8-16-83 0727-0913

STANDARD CONDITION TEMPERATURE, DEG F	0.6800E 02
STANDARD CONDITION PRESSURE, IN HG	0.2992E 02
TOTAL SAMPLING TIME, MINUTES	0.1440E 03
AVERAGE SQUARE ROOT VELOCITY HEAD, IN H2O EXP .5	0.1056E 01
AVERAGE ORIFICE PRESSURE DROP, IN H2O	0.1758E 01
AVERAGE METER TEMPERATURE, DEG F	0.9396E 02
AVERAGE DUCT STATIC PRESSURE, IN H2O	-0.5044E 01
AVERAGE DUCT TEMPERATURE, DEG F	0.1790E 03
TOTAL SAMPLE VOLUME, DACF	0.9863E 02
TOTAL SAMPLE VOLUME, DSCF	0.9447E 02
WATER VAPOR VOLUME, DSCF	0.3125E 01
MOISTURE CONTENT OF DUCT GAS, PERCENT	0.3302E 01
MOLE FRACTION DRY GAS	0.9670E 00
MOLECULAR WEIGHT - DRY STACK GAS	0.2883E 02
MOLECULAR WEIGHT - STACK GAS	0.2849E 02
AVERAGE STACK PRESSURE, IN HG	0.2955E 02
DUCT VOLUMETRIC FLOW, ACFM	0.4720E 05
DUCT VOLUMETRIC FLOW, DSCFM	0.4045E 05
AVERAGE DUCT VELOCITY, FPM	0.3834E 04
EXCESS AIR, PERCENT	0.1912E 05
AVERAGE DUCT GAS DENSITY, LBS/ACF	0.6545E-01
ISOKINETIC FACTOR, PERCENT	0.1004E 03

EMISSION DATA

	GR/ ACF	GR/ DSCF	LBS/ HR	LBS/ TON
AMMONIA IN H_2O	0.6938E 00	0.8153E 00	0.2827E 03	0.2827E 03
AMMONIA IN H_2SO_4	0.1484E-02	0.1731E-02	0.6003E 00	0.6003E 00
TOTAL AMMONIA	0.7013E 00	0.8171E 00	0.2833E 03	0.2833E 03
AMMONIUM NITRATE - NH_3 - IN H_2O	0.3298E 01	0.3837E 01	0.1330E 04	0.1330E 04
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.6995E-02	0.8153E-02	0.2826E 01	0.2826E 01
TOTAL AMMONIUM NITRATE	0.3275E 01	0.3845E 01	0.1333E 04	0.1333E 04
AMMONIUM NITRATE - NH_3 - IN H_2O	0.3323E 01	0.3877E 01	0.1344E 04	0.1344E 04
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.3323E 01	0.3877E 01	0.1344E 04	0.1344E 04
UNDISSOLVED SOLIDS IN H_2O	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 8
IRC PROJECT 1420-080

PRILL COOLER

COLUMBIA NITROGEN CORP.
SCRUBBER INLET
81-15-80 1544-1736 8-15-80 0727-0803

STANDARD CONDITION TEMPERATURE, DEG C	0.2000E 02
STANDARD CONDITION PRESSURE, MM HG	0.7600E 03
TOTAL SAMPLING TIME, MINUTES	0.1440E 03
AVERAGE SQUARE RROT VELOCITY HEAD, MM H2O EXP.5	0.5321E 01
AVERAGE ORIFICE PRESSURE DROP, MM H2O	0.4466E 02
AVERAGE METER TEMPERATURE, DEG C	0.3442E 02
AVERAGE DUCT STATIC PRESSURE, MM H2O	-0.1281E 03
AVERAGE DUCT TEMPERATURE, DEG C	0.5387E 02
TOTAL SAMPLE VOLUME, DM3	0.2795E 01
TOTAL SAMPLE VOLUME, DNM3	0.2575E 01
WATER VAPOR VOLUME, DNM3	0.8851E-01
AVERAGE STACK GAS PRESSURE, MM HG	0.7505E 03
DUCT VOLUMETRIC FLOW, AM3/M	0.1337E 04
DUCT VOLUMETRIC FLOW, DNM3/M	0.1146E 04
AVERAGE DUCT VELOCITY, M/M	0.1169E 04
VVERAGE DUCT GAS DENSITY, KG/AM3	0.1048E 01

EMISSION DATA

	MG/ AM3	MG/ DNM3	KG/ HR	KG/ MT
AMMONIA IN H_2O	0.1599E 04	0.1865E 04	0.1283E 03	0.5654E 03
AMMONIA IN H_2SO_4	0.3395E 01	0.3962E 01	0.2725E 00	0.1201E 01
TOTAL AMMONIA	0.1602E 04	0.1870E 04	0.1286E 03	0.5666E 03
AMMONIUM NITRATE - NH_3 - IN H_2O	0.7525E 04	0.8780E 04	0.6040E 03	0.2661E 04
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.1598E 02	0.1865E 02	0.1283E 01	0.5652E 01
TOTAL AMMONIUM NITRATE	0.7541E 04	0.8799E 04	0.6053E 03	0.2666E 04
AMMONIUM NITRATE - NH_3 - IN H_2O	0.7603E 04	0.8872E 04	0.6102E 03	0.2688E 04
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.7603E 04	0.8872E 04	0.6102E 03	0.2688E 04
UNDISSOLVED SOLIDS IN H_2O	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 9
IRC PROJECT 1470-680

UNIT TESTED	PRILL COOLER
DATE AND TIME OF TEST	AUGUST 16, 1980 0911 TO 1140
SAMPLING LOCATION	SCRUBBER INLET
NAME OF FIRM	COLUMBIA NITROGEN CORP.
LOCATION OF FIRM	AUGUSTA GEORGIA
POLLUTANTS SAMPLED	AMMONIA AND AMMONIUM NITRATE

BAROMETRIC PRESSURE, IN HG		29.85
DUCT AREA, SQ FT		12.31
NOZZLE DIAMETER, IN		0.171
PITOT CALIBRATION COEFFICIENTS	1	0.825
	2	0.831
	3	0.846
DRY GAS METER CALIBRATION FACTOR, Y		1.000
FINAL LEAK RATE, CFM		0.000
TONS PER HOUR, PRODUCT		0.000

COMPOSITION OF DUCT GAS, % BY VOLUME DRY BASIS

CARBON DIOXIDE	0.00
OXYGEN	20.80
CARBON MONOXIDE	0.00
NITROGEN	79.20

AMMONIA AND AMMONIUM NITRATE COLLECTED, - MG

	AMMONIA	AMMONIUM NITRATE BASED ON NH_3	AMMONIUM NITRATE BASED ON NH_3	UNDISSOLVED SOLIDS
H2O IMPINGERS	0.5294E 04	0.2491E 05	0.2603E 05	0.0000E 00
H2SO4 IMPINGERS	0.9560E 01	0.4500E 02	0.0000E 00	0.0000E 00
TOTAL	0.5304E 04	0.2496E 05	0.2603E 05	0.0000E 00

AMOUNT OF WATER COLLECTED, GRAMS

IMPINGERS	62.0
SILICA GEL	14.3

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 9
TRC PROJECT 1480-EA0

POINT	TIME	VEL HEAD IN H20	ORIFICE PRESS IN H20	METER INLET DEG F	TEMPS EXIT DEG F	DUCT STAT PRESS IN H20	DUCT TEMP DEG F	INITIAL METER VOL CU FT	P R R	CYC ANG
1	3.0	0.6400	1.0000	86.	86.	-5.25	104.	637.95	3	0.
2	3.0	0.6400	1.0000	86.	87.	-5.25	105.	639.48	3	0.
3	3.0	0.8700	1.3500	86.	86.	-5.25	111.	641.16	3	0.
4	3.0	0.9700	1.5000	86.	86.	-5.25	111.	642.94	3	0.
5	3.0	1.1000	1.7000	86.	86.	-5.25	112.	645.03	3	0.
6	3.0	1.1000	1.7000	86.	87.	-5.25	114.	646.86	3	0.
7	3.0	1.2000	1.8500	85.	86.	-5.25	117.	648.87	3	0.
8	3.0	1.2000	1.8500	86.	86.	-5.25	119.	650.97	3	0.
9	3.0	1.2000	1.8500	87.	86.	-5.25	121.	653.09	3	0.
10	3.0	1.2500	1.9500	87.	87.	-5.25	123.	655.21	3	0.
11	3.0	1.2500	1.9500	87.	86.	-5.45	124.	657.40	3	0.
12	3.0	1.2000	1.8500	87.	87.	-5.45	125.	659.57	3	0.
13	3.0	1.3000	2.0500	87.	87.	-5.45	132.	661.75	3	0.
14	3.0	1.3000	2.0500	88.	87.	-5.45	134.	663.94	3	0.
15	3.0	1.2500	1.9500	88.	87.	-5.45	134.	666.20	3	0.
16	3.0	1.2500	1.9500	88.	87.	-5.45	134.	668.34	3	0.
17	3.0	1.2500	1.9500	89.	88.	-5.45	135.	670.52	3	0.
18	3.0	1.2500	1.9500	89.	88.	-5.45	136.	672.70	3	0.
19	3.0	1.3000	2.0500	89.	87.	-5.45	135.	674.96	3	0.
20	3.0	1.3000	2.0500	89.	88.	-5.45	136.	677.09	3	0.
21	3.0	1.3000	2.0500	89.	88.	-5.45	136.	679.33	3	0.
22	3.0	1.2500	1.9500	89.	88.	-5.45	136.	681.57	3	0.
23	3.0	1.2500	1.9500	90.	88.	-5.45	136.	683.77	3	0.
24	3.0	1.2500	1.9500	89.	88.	-5.45	136.	685.93	3	0.
1	3.0	0.5400	0.8500	89.	88.	-5.45	108.	689.09	3	0.
2	3.0	0.4600	0.7300	89.	89.	-5.45	108.	689.56	3	0.
3	3.0	0.5900	0.9400	89.	89.	-5.45	123.	691.05	3	0.
4	3.0	0.6300	1.0000	89.	89.	-4.90	128.	693.00	3	0.
5	3.0	0.6900	1.1000	89.	89.	-4.90	126.	694.09	3	0.
6	3.0	0.8300	1.3000	89.	89.	-4.90	126.	695.74	3	0.
7	3.0	0.9000	1.4000	89.	90.	-4.90	128.	697.63	3	0.
8	3.0	0.9600	1.5000	89.	90.	-4.90	131.	699.36	3	0.
9	3.0	0.9800	1.5500	90.	90.	-4.90	131.	701.27	3	0.
10	3.0	1.0000	1.5500	90.	90.	-4.90	132.	703.26	3	0.
11	3.0	1.0000	1.5500	90.	90.	-4.90	131.	705.17	3	0.
12	3.0	1.1500	1.8000	91.	90.	-4.90	133.	707.14	3	0.
13	3.0	1.3000	2.0500	91.	90.	-4.90	133.	710.03	3	0.
14	3.0	1.3500	2.1000	90.	90.	-4.90	133.	711.24	3	0.
15	3.0	1.3500	2.1000	90.	91.	-4.90	134.	712.38	3	0.
16	3.0	1.4000	2.2000	90.	91.	-4.90	132.	714.64	3	0.
17	3.0	1.4000	2.2000	90.	91.	-4.90	133.	715.90	3	0.
18	3.0	1.4000	2.2000	91.	90.	-4.90	131.	719.24	3	0.
19	3.0	1.4500	2.3000	91.	90.	-5.60	129.	721.47	3	0.
20	3.0	1.4500	2.3000	91.	90.	-5.60	130.	723.95	3	0.
21	3.0	1.4500	2.3000	91.	91.	-5.60	129.	726.26	3	0.
22	3.0	1.4500	2.3000	92.	91.	-5.60	129.	728.61	3	0.
23	3.0	1.4500	2.3000	92.	91.	-5.60	127.	731.99	3	0.
24	3.0	1.4500	2.3000	92.	91.	-5.60	126.	733.39	3	0.

FINAL METER VOLUME 735.92

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 9
IRC PROJECT 1420-L60

PRILL COOLER

COLUMBIA NITROGEN CORP.
SCRUBBER INLET
AUGUST 16, 1990 0911 TO 1140

STANDARD CONDITION TEMPERATURE, DEG F	0.6400E 02
STANDARD CONDITION PRESSURE, IN HG	0.2992E 02
TOTAL SAMPLING TIME, MINUTES	0.1440E 03
AVERAGE SQUARE ROOT VELOCITY HEAD, IN H2O EXP .5	0.1056E 01
AVERAGE ORIFICE PRESSURE DROP, IN H2O	0.1779E 01
AVERAGE METER TEMPERATURE, DEG F	0.8966E 02
AVERAGE DUCT STATIC PRESSURE, IN H2O	-0.5255E 01
AVERAGE DUCT TEMPERATURE, DEG F	0.1265E 03
TOTAL SAMPLE VOLUME, DACF	0.9787E 02
TOTAL SAMPLE VOLUME, DSCF	0.9438E 02
WATER VAPOR VOLUME, DSCF	0.3591E 01
MOISTURE CONTENT OF DUCT GAS, PERCENT	0.3666E 01
MOLE FRACTION DRY GAS	0.9633E 00
MOLECULAR WEIGHT - DRY STACK GAS	0.2883E 02
MOLECULAR WEIGHT - STACK GAS	0.2843E 02
AVERAGE STACK PRESSURE, IN HG	0.2946E 02
DUCT VOLUMETRIC FLOW, ACFM	0.4725E 05
DUCT VOLUMETRIC FLOW, DSCFM	0.4035E 05
AVERAGE DUCT VELOCITY, FPM	0.3839E 04
EXCESS AIR, PERCENT	0.1912E 05
AVERAGE DUCT GAS DENSITY, LBS/ACF	0.6542E-01
ISOKINETIC FACTOR, PERCENT	0.1006E 03

EMISSION DATA

	GR/ ACF	GR/ DSCF	LBS/ HR	LBS/ TON
AMMONIA IN H_2O	0.7391E 00	0.8656E 00	0.2993E 03	0.2993E 03
AMMONIA IN H_2SO_4	0.1335E-02	0.1563E-02	0.5405E 00	0.5405E 00
TOTAL AMMONIA	0.7405E 00	0.8671E 00	0.2999E 03	0.2999E 03
AMMONIUM NITRATE - NH_3 - IN H_2O	0.3479E 01	0.4073E 01	0.1409E 04	0.1409E 04
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.6243E-02	0.7357E-02	0.2544E 01	0.2544E 01
TOTAL AMMONIUM NITRATE	0.3485E 01	0.4081E 01	0.1411E 04	0.1411E 04
AMMONIUM NITRATE - NH_3 - IN H_2O	0.3635E 01	0.4257E 01	0.1472E 04	0.1472E 04
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.3635E 01	0.4257E 01	0.1472E 04	0.1472E 04
UNDISSOLVED SOLIDS IN H_2O	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 9
IRC PROJECT 1030-E87

PRILL COOLER

COLUMBIA NITROGEN CORP.
SCRUBBER INLET
AUGUST 16, 1982 0711 TO 1140

STANDARD CONDITION TEMPERATURE, DEG C	0.2000E 02
STANDARD CONDITION PRESSURE, MM HG	0.7600E 03
TOTAL SAMPLING TIME, MINUTES	0.1440E 03
AVERAGE SQUARE PROT VELOCITY HEAD, MM H20 EXP.5	0.5329E 01
AVERAGE ORIFICE PRESSURE DROP, MM H20	0.4517E 02
AVERAGE METER TEMPERATURE, DEG C	0.3148E 02
AVERAGE DUCT STATIC PRESSURE, MM H20	-0.1335E 03
AVERAGE DUCT TEMPERATURE, DEG C	0.5252E 02
TOTAL SAMPLE VOLUME, DM3	0.2772E 01
TOTAL SAMPLE VOLUME, DNM3	0.2673E 01
WATER VAPOR VOLUME, DNM3	0.1017E 00
AVERAGE STACK GAS PRESSURE, MM HG	0.7484E 03
DUCT VOLUMETRIC FLOW, AM3/M	0.1339E 04
DUCT VOLUMETRIC FLOW, DNM3/M	0.1143E 04
AVERAGE DUCT VELOCITY, M/M	0.1170E 04
AVERAGE DUCT GAS DENSITY, KG/AM3	0.1048E 01

EMISSION DATA

	MG/ AM3	MG/ DNM3	KG/ HR	KG/ MT
AMMONIA IN H_2O	0.1691E 04	0.1981E 04	0.1359E 03	0.5986E 03
AMMONIA IN H_2SO_4	0.3054E 01	0.3577E 01	0.2454E 00	0.1081E 01
TOTAL AMMONIA	0.1694E 04	0.1984E 04	0.1361E 03	0.5997E 03
AMMONIUM NITRATE - NH_3 - IN H_2O	0.7960E 04	0.9322E 04	0.6395E 03	0.2817E 04
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.1438E 02	0.1684E 02	0.1155E 01	0.5088E 01
TOTAL AMMONIUM NITRATE	0.7975E 04	0.9339E 04	0.6407E 03	0.2822E 04
AMMONIUM NITRATE - NH_3 - IN H_2O	0.8318E 04	0.9741E 04	0.6683E 03	0.2944E 04
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.8318E 04	0.9741E 04	0.6683E 03	0.2944E 04
UNDISSOLVED SOLIDS IN H_2O	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 1
TRC PROJECT 1430-E80

UNIT TESTED	PRILL COOLER
DATE AND TIME OF TEST	AUGUST 15, 1980 1154 TO 1405
SAMPLING LOCATION	SCRUBBER BYPASS
NAME OF FIRM	COLUMBIA NITROGEN CORP.
LOCATION OF FIRM	AUGUSTA GEORGIA
POLLUTANTS SAMPLED	AMMONIA AND AMMONIUM NITRATE

BAROMETRIC PRESSURE, IN HG		29.92
DUCT AREA, SQ FT		12.57
NOZZLE DIAMETER, IN		0.260
PITOT CALIBRATION COEFFICIENTS	1	0.825
	2	0.831
	3	0.846
DRY GAS METER CALIBRATION FACTOR, Y		1.000
FINAL LEAK RATE, CFM		0.000
TONS PER HOUR, PRODUCT		0.000

COMPOSITION OF DUCT GAS, % BY VOLUME DRY BASIS

CARBON DIOXIDE	0.00
OXYGEN	20.80
CARBON MONOXIDE	0.00
NITROGEN	79.20

AMMONIA AND AMMONIUM NITRATE COLLECTED -MG.

	AMMONIA	AMMONIUM NITRATE BASED ON NH_3	AMMONIUM NITRATE BASED ON NH_3	UNDISSOLVED SOLIDS
H2O IMPINGERS	0.8120E 02	0.3820E 03	0.3560E 03	0.0000E 00
H2SO4 IMPINGERS	0.1000E 02	0.4710E 02	0.0000E 00	0.0000E 00
TOTAL	0.9120E 02	0.4291E 03	0.3560E 03	0.0000E 00

AMOUNT OF WATER COLLECTED, GRAMS

IMPINGERS	29.0
SILICA GEL	12.3

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 7

IRC PROJECT 1430-E80

POINT	TIME	VEL HEAD IN H20	ORIFICE PRESS IN H20	METER INLET DEG F	TEMPS EXIT DEG F	DUCT STAT PRESS IN H20	DUCT TEMP DEG F	INITIAL METER VOL CU FT	P R B	CYC ANG
1	5.0	0.1800	0.9200	88.	90.	-0.19	113.	449.28	1	0.
2	5.0	0.1700	0.8500	88.	90.	-0.19	114.	451.88	1	0.
3	5.0	0.1900	0.9400	88.	90.	-0.19	114.	454.40	1	0.
4	5.0	0.2800	1.4000	88.	90.	-0.19	114.	457.03	1	0.
5	5.0	0.2700	1.3000	88.	91.	-0.19	114.	460.21	1	0.
6	5.0	0.2500	1.2500	88.	91.	-0.19	114.	463.33	1	0.
7	5.0	0.2900	1.4500	88.	91.	-0.19	114.	466.34	1	0.
8	5.0	0.3000	1.5000	89.	91.	-0.19	114.	469.57	1	0.
9	5.0	0.3100	1.5500	89.	91.	-0.19	113.	472.90	1	0.
10	5.0	0.3300	1.6500	89.	92.	-0.19	113.	476.26	1	0.
11	5.0	0.3200	1.6000	89.	92.	-0.19	112.	479.72	1	0.
12	5.0	0.3000	1.5000	89.	92.	-0.19	112.	483.15	1	0.
1	5.0	0.1400	0.7200	89.	93.	-0.21	112.	486.46	1	0.
2	5.0	0.1800	0.9000	89.	92.	-0.21	112.	488.82	1	0.
3	5.0	0.2500	1.2500	89.	92.	-0.21	113.	491.39	1	0.
4	5.0	0.3100	1.5500	89.	93.	-0.21	114.	494.41	1	0.
5	5.0	0.3400	1.7000	90.	93.	-0.21	113.	497.77	1	0.
6	5.0	0.4500	2.2000	90.	93.	-0.21	114.	501.28	1	0.
7	5.0	0.5200	2.5000	90.	93.	-0.21	114.	505.25	1	0.
8	5.0	0.3800	1.8500	90.	93.	-0.21	114.	509.41	1	0.
9	5.0	0.2600	1.3000	90.	94.	-0.21	114.	513.08	1	0.
10	5.0	0.2400	1.2000	90.	94.	-0.21	114.	516.21	1	0.
11	5.0	0.1800	0.9000	91.	94.	-0.21	113.	519.22	1	0.
12	5.0	0.1100	0.5600	91.	94.	-0.21	112.	521.85	1	0.
FINAL METER VOLUME								523.97		

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 7
TRC PROJECT 1430-E80

PRILL COOLER

COLUMBIA NITROGEN CORP.
SCRUBBER BYPASS
AUGUST 15, 1980 1154 TO 1405

STANDARD CONDITION TEMPERATURE, DEG F	0.6800E 02
STANDARD CONDITION PRESSURE, IN HG	0.2992E 02
TOTAL SAMPLING TIME, MINUTES	0.1200E 03
AVERAGE SQUARE ROOT VELOCITY HEAD, IN H2O EXP .5	0.5148E 00
AVERAGE ORIFICE PRESSURE DROP, IN H2O	0.1356E 01
AVERAGE METER TEMPERATURE, DEG F	0.9058E 02
AVERAGE DUCT STATIC PRESSURE, IN H2O	-0.2000E 00
AVERAGE DUCT TEMPERATURE, DEG F	0.1133E 03
TOTAL SAMPLE VOLUME, DACF	0.7469E 02
TOTAL SAMPLE VOLUME, DSCF	0.7187E 02
WATER VAPOR VOLUME, DSCF	0.1944E 01
MOISTURE CONTENT OF DUCT GAS, PERCENT	0.2634E 01
MOLE FRACTION DRY GAS	0.9737E 00
MOLECULAR WEIGHT - DRY STACK GAS	0.2883E 02
MOLECULAR WEIGHT - STACK GAS	0.2855E 02
AVERAGE STACK PRESSURE, IN HG	0.2991E 02
DUCT VOLUMETRIC FLOW, ACFM	0.2244E 05
DUCT VOLUMETRIC FLOW, DSCFM	0.2011E 05
AVERAGE DUCT VELOCITY, FPM	0.1785E 04
EXCESS AIR, PERCENT	0.1912E 05
AVERAGE DUCT GAS DENSITY, LBS/ACF	0.6820E-01
ISOKINETIC FACTOR, PERCENT	0.1016E 03

EMISSION DATA

	GR/ ACF	GR/ DSCF	LBS/ HR	LBS/ TON
AMMONIA IN H_2O	0.1563E-01	0.1743E-01	0.3005E 01	0.3005E 01
AMMONIA IN H_2SO_4	0.1924E-02	0.2147E-02	0.3701E 00	0.3701E 00
TOTAL AMMONIA	0.1755E-01	0.1958E-01	0.3375E 01	0.3375E 01
AMMONIUM NITRATE - NH_3 - IN H_2O	0.7351E-01	0.8202E-01	0.1414E 02	0.1414E 02
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.9063E-02	0.1011E-01	0.1743E 01	0.1743E 01
TOTAL AMMONIUM NITRATE	0.8257E-01	0.9213E-01	0.1588E 02	0.1588E 02
AMMONIUM NITRATE - NH_3 - IN H_2O	0.6850E-01	0.7644E-01	0.1318E 02	0.1318E 02
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.6850E-01	0.7644E-01	0.1318E 02	0.1318E 02
UNDISSOLVED SOLIDS IN H_2O	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 1
TRC PROJECT 1430-E80

PRILL COOLER

COLUMBIA NITROGEN CORP.
SCRUBBER BYPASS
AUGUST 15, 1980 1154 TO 1405

STANDARD CONDITION TEMPERATURE, DEG C	0.2730E 02
STANDARD CONDITION PRESSURE, MM HG	0.7600E 03
TOTAL SAMPLING TIME, MINUTES	0.1200E 03
AVERAGE SQUARE ROOT VELOCITY HEAD, MM H2O EXP.5	0.2594E 01
AVERAGE ORIFICE PRESSURE DROP, MM H2O	0.3448E 02
AVERAGE METER TEMPERATURE, DEG C	0.3255E 02
AVERAGE DUCT STATIC PRESSURE, MM H2O	0.3916E 00
AVERAGE DUCT TEMPERATURE, DEG C	0.4519E 02
TOTAL SAMPLE VOLUME, DM3	0.2115E 01
TOTAL SAMPLE VOLUME, DNM3	0.2035E 01
WATER VAPOR VOLUME, DNM3	0.5505E-01
AVERAGE STACK GAS PRESSURE, MM HG	0.7607E 03
DUCT VOLUMETRIC FLOW, AM3/M	0.6354E 03
DUCT VOLUMETRIC FLOW, DNM3/M	0.5697E 03
AVERAGE DUCT VELOCITY, M/M	0.5943E 03
AVERAGE DUCT GAS DENSITY, KG/AM3	0.1093E 01

EMISSION DATA

	MG/ AM3	MG/ DNM3	KG/ HR	KG/ MT
AMMONIA IN H_2O	0.3578E 02	0.3793E 02	0.1365E 01	0.6012E 01
AMMONIA IN H_2SO_4	0.4406E 01	0.4913E 01	0.1681E 00	0.7404E 00
TOTAL AMMONIA	0.4018E 02	0.4481E 02	0.1533E 01	0.6753E 01
AMMONIUM NITRATE - NH_3 - IN H_2O	0.1633E 03	0.1877E 03	0.6421E 01	0.2828E 02
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.2075E 02	0.2314E 02	0.7917E 00	0.3487E 01
TOTAL AMMONIUM NITRATE	0.1871E 03	0.2109E 03	0.7212E 01	0.3177E 02
AMMONIUM NITRATE - NH_3 - IN H_2O	0.1568E 03	0.1749E 03	0.5984E 01	0.2636E 02
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.1568E 03	0.1749E 03	0.5984E 01	0.2636E 02
UNDISSOLVED SOLIDS IN H_2O	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 6
TRC PROJECT 1430-E80

UNIT TESTED	PRILL COOLER
DATE AND TIME OF TEST	AUGUST 15 1980 1550 TO 1734
SAMPLING LOCATION	SCRUBBER BYPASS
NAME OF FIRM	COLUMBIA NITROGEN CORP.
LOCATION OF FIRM	AUGUSTA GEORGIA
POLLUTANTS SAMPLED	AMMONIA AND AMMONIUM NITRATE

BAROMETRIC PRESSURE. IN HG		29.90
DUCT AREA. SQ FT		12.57
NOZZLE DIAMETER. IN		0.260
PITOT CALIBRATION COEFFICIENTS	1	0.825
	2	0.831
	3	0.846
DRY GAS METER CALIBRATION FACTOR. Y		1.000
FINAL LEAK RATE. CFM		0.030
TONS PER HOUR, PRODUCT		0.000

COMPOSITION OF DUCT GAS. % BY VOLUME DRY BASIS

CARBON DIOXIDE	0.00
OXYGEN	20.80
CARBON MONOXIDE	0.00
NITROGEN	79.20

AMMONIA AND AMMONIUM NITRATE COLLECTED. - MG

	AMMONIA	AMMONIUM NITRATE BASED ON NH_3	AMMONIUM NITRATE BASED ON NH_3	UNDISSOLVED SOLIDS
H2O IMPINGERS	0.7320E 02	0.3440E 03	0.3820E 03	0.0000E 00
H2SO4 IMPINGERS	0.1150E 02	0.5410E 02	0.0000E 00	0.0000E 00
TOTAL	0.8470E 02	0.3981E 03	0.3820E 03	0.0000E 00

AMOUNT OF WATER COLLECTED. GRAMS

IMPINGERS	24.0
SILICA GEL	8.8

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 8
TRC PROJECT 1430-E80

POINT	TIME	VEL HEAD IN H20	ORIFICE PRESS IN H20	METER INLET DEG F	TEMPS EXIT DEG F	DUCT STAT PRESS IN H20	DUCT TEMP DEG F	INITIAL METER VOL CU FT	P R B	CYC ANG
1	5.0	0.2500	1.2500	93.	95.	-0.06	114.	524.12	1	0.
2	5.0	0.2200	1.1000	92.	95.	-0.06	114.	527.20	1	0.
3	5.0	0.4100	2.0000	92.	95.	-0.06	115.	530.08	1	0.
4	5.0	0.3800	1.9000	92.	95.	-0.06	115.	533.80	1	0.
5	5.0	0.4500	2.2000	92.	96.	-0.06	115.	537.54	1	0.
6	5.0	0.1800	0.9200	93.	96.	-0.06	116.	541.48	1	0.
7	5.0	0.1400	0.7200	93.	96.	-0.06	115.	544.10	1	0.
8	5.0	0.3800	1.9000	93.	96.	-0.06	114.	546.53	1	0.
9	5.0	0.3500	1.7500	93.	96.	-0.06	114.	550.19	1	0.
10	5.0	0.3300	1.6500	93.	96.	-0.06	115.	553.80	1	0.
11	5.0	0.2800	1.4000	94.	96.	-0.06	115.	557.32	1	0.
12	5.0	0.2300	1.1500	93.	96.	-0.06	114.	560.55	1	0.
1	5.0	0.2200	1.1000	94.	97.	-0.06	114.	563.49	1	0.
2	5.0	0.2500	1.2500	94.	97.	-0.16	113.	566.39	1	0.
3	5.0	0.2400	1.2000	94.	97.	-0.16	114.	569.43	1	0.
4	5.0	0.1200	0.6200	94.	97.	-0.16	113.	572.43	1	0.
5	5.0	0.1500	0.7500	94.	97.	-0.16	114.	574.69	1	0.
6	5.0	0.1500	0.7500	94.	98.	-0.16	113.	577.08	1	0.
7	5.0	0.1500	0.7500	94.	97.	-0.16	113.	579.62	1	0.
8	5.0	0.1500	0.7500	94.	97.	-0.16	113.	581.86	1	0.
9	2.0	0.1400	0.7200	94.	98.	-0.16	113.	584.27	1	0.
FINAL METER VOLUME								585.21		

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 8
TRC PROJECT 1430-E80

PRILL COOLER

COLUMBIA NITROGEN CORP.
SCRUBBER BYPASS
AUGUST 15 1980 1550 TO 1734

STANDARD CONDITION TEMPERATURE. DEG F	0.6800E 02
STANDARD CONDITION PRESSURE. IN HG	0.2992E 02
TOTAL SAMPLING TIME. MINUTES	0.1020E 03
AVERAGE SQUARE ROOT VELOCITY HEAD. IN H2O EXP .5	0.4864E 00
AVERAGE ORIFICE PRESSURE DROP. IN H2O	0.1230E 01
AVERAGE METER TEMPERATURE. DEG F	0.9481E 02
AVERAGE DUCT STATIC PRESSURE. IN H2O	-0.9810E-01
AVERAGE DUCT TEMPERATURE. DEG F	0.1141E 03
TOTAL SAMPLE VOLUME. DACF	0.6109E 02
TOTAL SAMPLE VOLUME. DSCF	0.5827E 02
WATER VAPOR VOLUME. DSCF	0.1544E 01
MOISTURE CONTENT OF DUCT GAS. PERCENT	0.2581E 01
MOLE FRACTION DRY GAS	0.9742E 00
MOLECULAR WEIGHT - DRY STACK GAS	0.2883E 02
MOLECULAR WEIGHT - STACK GAS	0.2855E 02
AVERAGE STACK PRESSURE. IN HG	0.2989E 02
DUCT VOLUMETRIC FLOW. ACFM	0.2122E 05
DUCT VOLUMETRIC FLOW. DSCFM	0.1900E 05
AVERAGE DUCT VELOCITY. FPM	0.1689E 04
EXCESS AIR. PERCENT	0.1912E 05
AVERAGE DUCT GAS DENSITY. LBS/ACF	0.6809E-01
ISOKINETIC FACTOR. PERCENT	0.1026E 03

EMISSION DATA

	GR/ ACF	GR/ DSCF	LBS/ HR	LBS/ TON
AMMONIA IN H_2O	0.1735E-01	0.1938E-01	0.3156E 01	0.3156E 01
AMMONIA IN H_2SO_4	0.2726E-02	0.3045E-02	0.4958E 00	0.4958E 00
TOTAL AMMONIA	0.2008E-01	0.2243E-01	0.3652E 01	0.3652E 01
AMMONIUM NITRATE - NH_3 - IN H_2O	0.8153E-01	0.9108E-01	0.1483E 02	0.1483E 02
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.1282E-01	0.1432E-01	0.2332E 01	0.2332E 01
TOTAL AMMONIUM NITRATE	0.9436E-01	0.1054E 00	0.1716E 02	0.1716E 02
AMMONIUM NITRATE - NH_3 - IN H_2O	0.9054E-01	0.1011E 00	0.1647E 02	0.1647E 02
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.9054E-01	0.1011E 00	0.1647E 02	0.1647E 02
UNDISSOLVED SOLIDS IN H_2O	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00

TEST DATA -- UREA, AMMONIA, FORMALDEHYDE -- TEST NO 8
TRC PROJECT 1430-E80

PRILL COOLER

COLUMBIA NITROGEN CORP.
SCRUBBER BYPASS
AUGUST 15 1980 1550 TO 1734

STANDARD CONDITION TEMPERATURE, DEG C	0.2903E 02
STANDARD CONDITION PRESSURE, MM HG	0.7600E 03
TOTAL SAMPLING TIME, MINUTES	0.1020E 03
AVERAGE SQUARE ROOT VELOCITY HEAD, MM H2O EXP.5	0.2452E 01
AVERAGE ORIFICE PRESSURE DROP, MM H2O	0.3124E 02
AVERAGE METER TEMPERATURE, DEG C	0.3489E 02
AVERAGE DUCT STATIC PRESSURE, MM H2O	-0.2492E 01
AVERAGE DUCT TEMPERATURE, DEG C	0.4561E 02
TOTAL SAMPLE VOLUME, DM3	0.1730E 01
TOTAL SAMPLE VOLUME, DNM3	0.1650E 01
WATER VAPOR VOLUME, DNM3	0.4372E-01
AVERAGE STACK GAS PRESSURE, MM HG	0.7593E 03
DUCT VOLUMETRIC FLOW, AM3/M	0.6010E 03
DUCT VOLUMETRIC FLOW, DNM3/M	0.5380E 03
AVERAGE DUCT VELOCITY, M/M	0.5146E 03
AVERAGE DUCT GAS DENSITY, KG/AM3	0.1091E 01

EMISSION DATA

	MG/ AM3	MG/ DNM3	KG/ HR	KG/ MT
AMMONIA IN H_2O	0.3970E 02	0.4435E 02	0.1433E 01	0.6312E 01
AMMONIA IN H_2SO_4	0.6238E 01	0.6968E 01	0.2251E 00	0.9916E 00
TOTAL AMMONIA	0.4594E 02	0.5132E 02	0.1658E 01	0.7303E 01
AMMONIUM NITRATE - NH_3 - IN H_2O	0.1866E 03	0.2084E 03	0.6733E 01	0.2966E 02
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.2934E 02	0.3278E 02	0.1059E 01	0.4665E 01
TOTAL AMMONIUM NITRATE	0.2159E 03	0.2412E 03	0.7792E 01	0.3433E 02
AMMONIUM NITRATE - NH_3 - IN H_2O	0.2072E 03	0.2315E 03	0.7477E 01	0.3294E 02
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.2072E 03	0.2315E 03	0.7477E 01	0.3294E 02
UNDISSOLVED SOLIDS IN H_2O	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00

F401 STOP 00000 00000002

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 9
TRC PROJECT 1430-ERM

UNIT TESTED	PRILL COOLER
DATE AND TIME OF TEST	AUGUST 15, 1980 0917 TO 1122
SAMPLING LOCATION	SCRUBBER BYPASS
NAME OF FIRM	COLUMBIA NITROGEN CORP.
LOCATION OF FIRM	AUGUSTA GEORGIA
POLLUTANTS SAMPLED	AMMONIA AND AMMONIUM NITRATE

BAROMETRIC PRESSURE, IN HG		29.89
DUCT AREA, SQ FT		12.57
NOZZLE DIAMETER, IN		0.260
PITOT CALIBRATION COEFFICIENTS	1	0.825
	2	0.831
	3	0.846
DRY GAS METER CALIBRATION FACTOR, Y		1.000
FINAL LEAK RATE, CFM		0.000
TONS PER HOUR, PRODUCT		0.000

COMPOSITION OF DUCT GAS, % BY VOLUME DRY BASIS

CARBON DIOXIDE	0.00
OXYGEN	20.80
CARBON MONOXIDE	0.00
NITROGEN	79.20

AMMONIA AND AMMONIUM NITRATE COLLECTED, - MG

	AMMONIA	AMMONIUM NITRATE BASED ON NH_3	AMMONIUM NITRATE BASED ON NH_3	UNDISSOLVED SOLIDS
H2O IMPINGERS	0.7680E 02	0.3610E 03	0.3670E 03	0.0000E 00
H2SO4 IMPINGERS	0.9800E 01	0.4610E 02	0.0000E 00	0.0000E 00
TOTAL	0.8660E 02	0.4071E 03	0.3670E 03	0.0000E 00

AMOUNT OF WATER COLLECTED, GRAMS

IMPINGERS	32.0
SILICA GEL	5.8

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 9
INC PROJECT 1430-E80

POINT	TIME	VEL HEAD IN H20	ORIFICE PRESS IN H20	METER INLET DEG F	TEMPS EXIT DEG F	DUCT STAT PRESS IN H20	DUCT TEMP DEG F	INITIAL METER VOL CU FT	P R B	CYC ANG
1	5.0	0.210J	1.0000	86.	88.	-0.23	113.	585.38	1	0.
2	5.0	0.260J	1.3000	85.	98.	-0.23	114.	589.15	1	0.
3	5.0	0.300J	1.4500	85.	89.	-0.23	114.	591.18	1	0.
4	5.0	0.340J	1.7000	85.	88.	-0.23	115.	594.42	1	0.
5	5.0	0.210J	1.0000	85.	88.	-0.23	116.	597.90	1	0.
6	5.0	0.240J	1.2000	86.	88.	-0.23	116.	600.71	1	0.
7	5.0	0.210J	1.0000	86.	88.	-0.23	115.	603.54	1	0.
8	5.0	0.210J	1.0000	86.	88.	-0.23	116.	606.38	1	0.
9	5.0	0.190J	0.9500	86.	89.	-0.23	116.	609.12	1	0.
10	5.0	0.190J	0.9500	86.	89.	-0.23	116.	611.74	1	0.
11	5.0	0.160J	0.8000	86.	89.	-0.23	116.	614.39	1	0.
12	5.0	0.130J	0.6700	86.	89.	-0.23	115.	616.83	1	0.
1	5.0	0.120J	0.6200	86.	89.	-0.23	115.	619.08	1	0.
2	5.0	0.160J	0.8200	86.	89.	-0.23	113.	621.25	1	0.
3	5.0	0.280J	1.4000	86.	89.	-0.23	115.	623.70	1	0.
4	5.0	0.320J	1.6000	87.	90.	-0.23	116.	626.94	1	0.
5	5.0	0.330J	1.6500	87.	90.	-0.23	116.	630.24	1	0.
6	5.0	0.320J	1.6000	87.	90.	-0.23	116.	633.71	1	0.
7	5.0	0.320J	1.6000	87.	90.	-0.23	116.	637.14	1	0.
8	5.0	0.340J	1.7000	88.	90.	-0.23	116.	640.55	1	0.
9	5.0	0.330J	1.6500	88.	90.	-0.23	116.	644.05	1	0.
10	5.0	0.300J	1.5000	88.	91.	-0.23	117.	648.23	1	0.
11	5.0	0.250J	1.2500	88.	91.	-0.23	117.	651.53	1	0.
12	5.0	0.230J	1.1500	88.	91.	-0.23	116.	654.60	1	0.
FINAL METER VOLUME								657.51		

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 9
TRC PROJECT [illegible]-[illegible]

PRILL COOLER

COLUMBIA NITROGEN CORP.
SCRUBBER BYPASS
AUGUST 16, 1980 0917 TO 1122

STANDARD CONDITION TEMPERATURE, DEG F	0.6800E 02
STANDARD CONDITION PRESSURE, IN HG	0.2992E 02
TOTAL SAMPLING TIME, MINUTES	0.1200E 03
AVERAGE SQUARE ROOT VELOCITY HEAD, IN H2O EXP .5	0.4928E 00
AVERAGE ORIFICE PRESSURE DROP, IN H2O	0.1232E 01
AVERAGE METER TEMPERATURE, DEG F	0.8779E 02
AVERAGE DUCT STATIC PRESSURE, IN H2O	-0.2300E 00
AVERAGE DUCT TEMPERATURE, DEG F	0.1153E 03
TOTAL SAMPLE VOLUME, DACF	0.7213E 02
TOTAL SAMPLE VOLUME, DSCF	0.6966E 02
WATER VAPOR VOLUME, DSCF	0.1969E 01
MOISTURE CONTENT OF DUCT GAS, PERCENT	0.2747E 01
MOLE FRACTION DRY GAS	0.9725E 00
MOLECULAR WEIGHT - DRY STACK GAS	0.2883E 02
MOLECULAR WEIGHT - STACK GAS	0.2853E 02
AVERAGE STACK PRESSURE, IN HG	0.2987E 02
DUCT VOLUMETRIC FLOW, ACFM	0.2154E 05
DUCT VOLUMETRIC FLOW, DSCFM	0.1919E 05
AVERAGE DUCT VELOCITY, FPM	0.1713E 04
EXCESS AIR, PERCENT	0.1912E 05
AVERAGE DUCT GAS DENSITY, LBS/ACF	0.6786E-01
ISOKINETIC FACTOR, PERCENT	0.1032E 03

EMISSION DATA

	GR/ ACF	GR/ DSCF	LBS/ HR	LBS/ TON
AMMONIA IN H_2O	0.1516E-01	0.1701E-01	0.2798E 01	0.2798E 01
AMMONIA IN H_2SO_4	0.1934E-02	0.2171E-02	0.3571E 00	0.3571E 00
TOTAL AMMONIA	0.1709E-01	0.1919E-01	0.3155E 01	0.3155E 01
AMMONIUM NITRATE - NH_3 - IN H_2O	0.7125E-01	0.7996E-01	0.1315E 02	0.1315E 02
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.9099E-02	0.1021E-01	0.1680E 01	0.1680E 01
TOTAL AMMONIUM NITRATE	0.8035E-01	0.9017E-01	0.1483E 02	0.1483E 02
AMMONIUM NITRATE - NH_3 - IN H_2O	0.7244E-01	0.8129E-01	0.1337E 02	0.1337E 02
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.7244E-01	0.8129E-01	0.1337E 02	0.1337E 02
UNDISSOLVED SOLIDS IN H_2O	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00

TEST DATA -- AMMONIA AND AMMONIUM NITRATE -- TEST NO 9
TRC PROJECT 1471-EE7

PRILL COOLER

COLUMBIA NITROGEN CORP.
SCRUBBER BYPASS
AUGUST 16, 1990 0917 TO 1122

STANDARD CONDITION TEMPERATURE, DEG C	0.2000E 02
STANDARD CONDITION PRESSURE, MM HG	0.7600E 03
TOTAL SAMPLING TIME, MINUTES	0.1200E 03
AVERAGE SQUARE ROOT VELOCITY HEAD, MM H2O EXP.5	0.2484E 01
AVERAGE ORIFICE PRESSURE DROP, MM H2O	0.3128E 02
AVERAGE METER TEMPERATURE, DEG C	0.3100E 02
AVERAGE DUCT STATIC PRESSURE, MM H2O	-0.5842E 01
AVERAGE DUCT TEMPERATURE, DEG C	0.4630E 02
TOTAL SAMPLE VOLUME, DM3	0.2043E 01
TOTAL SAMPLE VOLUME, DNM3	0.1973E 01
WATER VAPOR VOLUME, DNM3	0.5572E-01
AVERAGE STACK GAS PRESSURE, MM HG	0.7588E 03
DUCT VOLUMETRIC FLOW, AM3/M	0.6103E 03
DUCT VOLUMETRIC FLOW, DNM3/M	0.5435E 03
AVERAGE DUCT VELOCITY, M/M	0.5223E 03
AVERAGE DUCT GAS DENSITY, KG/AM3	0.1087E 01

EMISSION DATA

	MG/ AM3	MG/ DNM3	KG/ HR	KG/ MT
AMMONIA IN H_2O	0.3469E 02	0.3893E 02	0.1270E 01	0.5597E 01
AMMONIA IN H_2SO_4	0.4426E 01	0.4967E 01	0.1621E 00	0.7141E 00
TOTAL AMMONIA	0.3911E 02	0.4389E 02	0.1433E 01	0.6311E 01
AMMONIUM NITRATE - NH_3 - IN H_2O	0.1631E 03	0.1830E 03	0.5972E 01	0.2631E 02
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.2082E 02	0.2337E 02	0.7626E 00	0.3359E 01
TOTAL AMMONIUM NITRATE	0.1839E 03	0.2063E 03	0.6734E 01	0.2967E 02
AMMONIUM NITRATE - NH_3 - IN H_2O	0.1658E 03	0.1860E 03	0.6071E 01	0.2674E 02
AMMONIUM NITRATE - NH_3 - IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL AMMONIUM NITRATE - NH_3	0.1658E 03	0.1860E 03	0.6071E 01	0.2674E 02
UNDISSOLVED SOLIDS IN H_2O	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
UNDISSOLVED SOLIDS IN H_2SO_4	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00
TOTAL UNDISSOLVED SOLIDS	0.0000E 00	0.0000E 00	0.0000E 00	0.0000E 00

APPENDIX B

SAMPLE EQUATIONS AND EXAMPLE CALCULATIONS

EMISSION CALCULATION SYMBOLS

La - Allowable leak rate, cfm

Vm_{total} - Total meter sample volume, ft^3

T_{total} - Total sampling time, min

L_p - Final leak rate of sampling train, cfm

Vmc_{total} - Total volume sampled corrected for excessive leakage, ft^3

Y - Dry gas meter calibration factor, dimensionless

T_{std} - Standard temperature, ^oF

$Tm_{avg.}$ - Average dry gas meter temperature, ^oF

P_{bar} - Barometric pressure, "Hg

$\Delta H_{avg.}$ - Average orifice pressure drop, "H_2O

P_{std} - Standard pressure, "Hg

V_I - Volume of liquid collected in impingers, ml

V_{SG} - Volume of liquid collected in silica gel, grams

M_S - Molecular weight of stack gas, lb/lb-mole

$\%CO_2$ - Percent CO_2 by volume (dry basis), %

%CO - Percent CO by volume (dry basis), %

$\%N_2$ - Percent N_2 by volume (dry basis), %

$\%O_2$ - Percent O_2 by volume (dry basis), %

D_{st} - Average duct gas density, lbs/ft^3

Ps_{avg} - Average duct static pressure, "H_2O

Ts_{avg} - Average duct temperature, ^oF

EA - Excess air, %

V_s - Average duct velocity, ft/min

C_p - Pitot tube coefficient, dimensionless

$(\sqrt{\Delta P})avg$ - Average square root of velocity head, $\sqrt{"H_2O}$

A_s - Cross-sectional area of duct, ft^2

EMISSION CALCULATION SYMBOLS (cont'd)

Q - Duct volumetric flow rate, acfm

Q_{std} - Duct volumetric flow rate, corrected to dry standard conditions, dscfm

D_n - Nozzle diameter, inches

F - F factor, DSCF/MM BTU

%H - Percent by weight of hydrogen in fuel

%C - Percent by weight of carbon in fuel

%S - Percent by weight of sulfur in fuel

%N - Percent by weight of nitrogen in fuel

%O - Percent by weight of oxygen in fuel

GCV - Gross calorific value of fuel, BTU/lb.

C - Actual particulate concentration, grains/acf

C_s - Particulate concentration, grains/dscf

ER - Particulate emission rate, lbs/hr

E - Particulate emissions, lbs/MM BTU

C_s @ 12% CO_2 - Particulate concentration, grains/dscf @ 12% CO_2

C_s @ 50% EA - Particulate concentration, grains/dscf @ 50% EA

C_{Lb} - Particulate concentration, lbs/1000 duct gas

C_{Lb} @ 12% CO_2 - Particulate concentration, lbs/1000 lbs @ 12% CO_2

C_{Lb} @ 50% EA - Particulate concentration, lbs/1000 lbs @ 50% EA

M_n - Total particulate collected, mg

TEST NO 1-PT-INLET B

1. Allowable Leak Rate

$La = 0.02$ cfm or $0.04 \frac{V_{m\ total}}{T_{total}}$ which ever is less.

$$\frac{0.04\ V_{m\ total}}{T_{total}} = \frac{0.04 \times 85.74}{144}$$

$La = 0.024$ cfm

2. Correction for Excessive Leak Rate

$Lp = 0.000$ cfm

if Lp > La use V_{mc} total in place of V_m total in all subsequent equations.

$$V_{mc\ total} = V_{m\ total} - (Lp - La)\ T_{total}$$

$V_{mc\ total} =$ $-($ $-$ $)$ $=$ ft^3

3. Volume of Sample Measured by Dry Gas Meter, Corrected to Standard Conditions

$$V_{m\ total\ (std)} = V_{m\ total}\ Y \left(\frac{T_{std} + 460}{T_{m\ avg} + 460}\right) \left[\frac{P_{bar} + \frac{\Delta H\ avg}{13.6}}{P_{std}}\right]$$

$$V_{m\ total\ (std)} = 85.74 \times 1.00 \left(\frac{68 + 460}{98.6 + 460}\right) \left[\frac{29.80 + \frac{1.33}{13.6}}{29.92}\right]$$

$V_{m\ total\ (std)} = 80.98$ dscf

4. Moisture Content of Duct Gas

$$\%\ H_2O = \frac{0.04707\ (V_I + V_{SG})}{V_{m\ total\ (std)} + 0.04707\ (V_I + V_{SG})} \times 100$$

$$\%\ H_2O = \frac{0.04707\ (37 + 12.3)}{80.98 + 0.04707\ (37 + 12.3)} \times 100$$

$\%\ H_2O = 2.79$ %

5. Molecular Weight of Stack Gas

$$Ms = \left[(0.44 \times \%\ CO_2)+(0.28 \times \%\ CO)+(0.28 \times \%\ N_2)+(0.32 \times \%\ O_2)\right]\left(1-\frac{\%\ H_2O}{100}\right)+ 0.18\ (\ \%\ H_2O\ )$$

$$Ms = \left[(0.44 \times \ O\ )+(0.28 \times \ O\ )+(0.28 \times 79.2)+(0.32 \times 20.8)\right]\left(1-\frac{2.79}{100}\right)+ 0.18\ (\ 2.79\ )$$

$$Ms = 28.53 \text{ lb/lb-mole}$$

6. Average Duct Gas Density

$$D_{st} = 0.0458 \times Ms\left(\frac{P_{bar} + \frac{Ps\ avg}{13.6}}{T_{s\ avg} + 460}\right)$$

$$D_{st} = 0.0458 \times 28.53\left(\frac{29.8 + \frac{-1.15}{13.6}}{125.7 + 460}\right)$$

$$D_{st} = 0.066 \text{ lbs/ft}^3$$

7. Excess Air

$$EA = 100\left[\frac{\%\ O_2 - 0.5\ \%\ CO}{0.264\ \%\ N_2 - (\%\ O_2 - 0.5\%\ CO)}\right]$$

$$EA = 100\left[\frac{\ - 0.5 \times}{0.264 \times \ - (\ \ - 0.5 \times\ )}\right]$$

$$EA = \ \ \ \ \ \%$$

8. Average Duct Velocity

$$V_s = 5129.4\ C_p\ (\sqrt{\Delta P})avg\ \sqrt{\frac{T_{s\ avg} + 460}{\left(P_{bar} + \frac{P_{s\ avg}}{13.6}\right)\ Ms}}$$

$$V_s = 5129.4 \times .825 \times 0.87\sqrt{\frac{125.7 + 460}{\left(29.8 + \frac{-1.15}{13.6}\right)28.53}}$$

$$V_s = 3060 \text{ ft/min}$$

9. Duct Volumetric Flow Rate

$$Q = V_s \times A_s$$

$$Q = 3060 \times 5.76$$

$$Q = 17626 \text{ acfm}$$

10. Duct Volumetric Flow Rate, Corrected to Dry Standard Conditions

$$Q_{std} = Q \left(1 - \frac{\% H_2O}{100}\right) \left(\frac{T_{std} + 460}{T_{s\ avg} + 460}\right) \left(\frac{P_{bar} + \frac{P_{s\ avg}}{13.6}}{P_{std}}\right)$$

$$Q_{std} = 17626 \left(1 - \frac{2.79}{100}\right) \left(\frac{68 + 460}{125.7 + 460}\right) \left(\frac{29.8 + \frac{-1.15}{13.6}}{29.92}\right)$$

$$Q_{std} = 15341 \text{ dscfm}$$

11. Isokinetic Factor

$$I = \frac{5.67\ (T_{s\ avg} + 460)(V_{m\ std})}{\left(P_{bar} + \frac{P_{s\ avg}}{13.6}\right) V_s \times T_{total} \left(1 - \frac{\% H_2O}{100}\right) \left(\frac{(Dn)^2 \times 0.7854}{144}\right)}$$

$$I = \frac{5.67\ (125.7 + 460)(80.98)}{\left(29.8 + \frac{-1.15}{13.6}\right) 3060 \times 144 \left(1 - \frac{2.79}{100}\right) \left(\frac{(0.1760)^2 \times 0.7854}{144}\right)}$$

$$I = 100.32\ \%$$

AMMONIA

13. Actual Particulate Concentration

$$C = \frac{0.01543 \times Mn \left(T_{std} + 460\right)\left(P_{bar} + \frac{P_{s\,avg}}{13.6}\right)\left(1 - \frac{\%H_2O}{100}\right)}{Vm_{std} \quad T_{s\,avg} + 460 \quad P_{std}}$$

$$C = \frac{0.01543 \times 95.2 (68 + 460)\left(29.8 + \frac{-1.15}{13.6}\right)\left(1 - \frac{2.79}{100}\right)}{80.98 (125.7 + 460) \quad (29.92)}$$

$C = 0.0158$ grains/acf

14. Particulate Concentration, Corrected to Dry Standard Conditions

$$C_s = 0.01543 \times \frac{Mn}{V_{m\,std}}$$

$$C_s = 0.01543 \times \frac{95.2}{80.98}$$

$C_s = 0.0181$ grains/dscf

15. Particulate Emission Rate

$$ER = 0.008571 \times C_s \times Q_{std}$$

$ER = 0.008571 \times 0.0181 \times 1534$

$ER = 2.38$ lbs/hr.

Ammonium Nitrate Based On Ammonia

13. Actual Particulate Concentration

$$C = \frac{0.01543 \times Mn}{Vm_{std}} \frac{(T_{std} + 460)}{T_{s\,avg} + 460} \left(P_{bar} + \frac{P_{s\,avg}}{13.6}\right)\left(1 - \frac{\%H_2O}{100}\right) \frac{}{P_{std}}$$

$$C = \frac{0.01543 \times 448 (68 + 460)\left(29.8 + \frac{-1.15}{13.6}\right)\left(1 - \frac{2.79}{100}\right)}{80.98 (125.7 + 460)\ (29.92)}$$

$C = 0.0744$ grains/acf

14. Particulate Concentration, Corrected to Dry Standard Conditions

$$C_s = 0.01543 \times \frac{Mn}{V_{m\,std}}$$

$$C_s = 0.01543 \times \frac{448}{80.98}$$

$C_s = 0.0854$ grains/dscf

15. Particulate Emission Rate

$ER = 0.008571 \times C_s \times Q_{std}$

$ER = 0.008571 \times 0.0854 \times 15341$

$ER = 11.23$ lbs/hr.

NITRATE

13. Actual Particulate Concentration

$$C = \frac{0.01543 \times Mn \left(T_{std} + 460\right)\left(P_{bar} + \frac{P_{s\,avg}}{13.6}\right)\left(1 - \frac{\%H_2O}{100}\right)}{Vm_{std} \quad T_{s\,avg} + 460 \quad P_{std}}$$

$$C = \frac{0.01543 \times 63.9 \left(68 + 460\right)\left(29.8 + \frac{-1.15}{13.6}\right)\left(1 - \frac{2.79}{100}\right)}{80.98 \quad (125.7 + 460) \quad (29.92)}$$

$C = 0.0106$ grains/acf

14. Particulate Concentration, Corrected to Dry Standard Conditions

$$C_s = 0.01543 \times \frac{Mn}{V_{m\,std}}$$

$$C_s = 0.01543 \times \frac{63.9}{80.98}$$

$C_s = 0.0122$ grains/dscf

15. Particulate Emission Rate

$$ER = 0.008571 \times C_s \times Q_{std}$$

$ER = 0.008571 \times 0.0122 \times 15341$

$ER = 1.60$ lbs/hr.

AMMONIUM NITRATE BASED ON NITRATE

13. Actual Particulate Concentration

$$C = \frac{0.01543 \times Mn \left(T_{std} + 460\right)\left(P_{bar} + \frac{P_{s\,avg}}{13.6}\right)\left(1 - \frac{\%H_2O}{100}\right)}{Vm_{std}\ T_{s\,avg} + 460\ P_{std}}$$

$$C = \frac{0.01543 \times 82.5 (68 + 460)(29.8 + \frac{-1.45}{13.6})\left(1 - \frac{2.79}{100}\right)}{80.98\ (125.7 + 460)\ (29.92)}$$

C = 0.0137 grains/acf

14. Particulate Concentration, Corrected to Dry Standard Conditions

$$C_s = 0.01543 \times \frac{Mn}{V_{m\,std}}$$

$$C_s = 0.01543 \times \frac{82.5}{80.98}$$

C_s = 0.0157 grains/dscf

15. Particulate Emission Rate

$$ER = 0.008571 \times C_s \times Q_{std}$$

ER = 0.008571 x 0.0157 x 15341

ER = 2.064 lbs/hr.

APPENDIX C

FIELD DATA SHEETS FOR PARTICULATE TESTS

Includes:

C.1 Prill Tower (Inlets, Bypasses, Outlet)
C.2 Predryer/Dryer (Predryer Inlet, Dryer Inlet, Outlet)
C.3 Cooler (Inlet, Bypass)

NOMOGRAPH DATA

PLANT Columbia Nitrogen

DATE August 11, 1980

SAMPLING LOCATION Prill Tower Scrubber Inlet B

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H_2O	$\Delta H_@$	2.11
AVERAGE METER TEMPERATURE (AMBIENT + 20 °F), °F	$T_{m_{avg.}}$	100
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	2.0
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	29.65
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073$ x STACK GAUGE PRESSURE in in. H_2O)	P_s	-1.20
RATIO OF STATIC PRESSURE TO METER PRESSURE	C_P ~~P_s / P_m~~	0.825
AVERAGE STACK TEMPERATURE, °F	$T_{s_{avg.}}$	127
AVERAGE VELOCITY HEAD, in. H_2O	$\Delta p_{avg.}$	0.805
MAXIMUM VELOCITY HEAD, in. H_2O	$\Delta p_{max.}$	1.15
C FACTOR	1.20	
CALCULATED NOZZLE DIAMETER, in.	0.21	
ACTUAL NOZZLE DIAMETER, in.	0.1965	
REFERENCE Δp, in. H_2O	1.09	

EPA (Dur) 234
4-72

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT Columbia Nitrogen
DATE 8/11/80
SAMPLING LOCATION Prill Tower Scrubber Inlet B, A, C (Particulate Only)
INSIDE OF FAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE A) NA
INSIDE OF NEAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE B) _____
STACK I.D., (DISTANCE A - DISTANCE B) 32 ½"
NEAREST UPSTREAM DISTURBANCE _____
NEAREST DOWNSTREAM DISTURBANCE _____
CALCULATOR LAG

SCHEMATIC OF SAMPLING LOCATION

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1, 8 INCH)	DISTANCE B	TRAVERSE POINT LOCATION FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
1	0.011	32.5		No	1.00
2	0.032			Flange	1.04
3	0.055				1.79
4	0.079				2.57
5	0.105				3.41
6	0.132				4.29
7	0.161				5.23
8	0.194				6.31
9	0.230				7.48
10	0.270				8.84
11	0.323				10.50
12	0.398				12.94
13	0.602				19.57
14	0.677				22.00
15	0.728				23.66
16	0.770				25.03
17	0.806				26.20
18	0.839				27.28
19	0.868				28.21
20	0.895				29.09
21	0.921				29.93
22	0.945				30.71
23	0.968				31.46
24	0.989				31.50

EPA (Dur) 232
4/72

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT Columbia Nitrogen
DATE 8/11/80
SAMPLING LOCATION Prill Tower Scrubber Inlets (A, B, C) Velocity Only
INSIDE OF FAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE A) _____
INSIDE OF NEAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE B) _____
STACK I.D., (DISTANCE A - DISTANCE B) ~~32 5~~ = 32½"
NEAREST UPSTREAM DISTURBANCE _____
NEAREST DOWNSTREAM DISTURBANCE _____
CALCULATOR LAG

SCHEMATIC OF SAMPLING LOCATION

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8 INCH)	DISTANCE B	TRAVERSE POINT LOCATION FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5
1	0.018	32.50		No	1.00
2	0.057			Flange	1.85
3	0.099				3.23
4	0.146				4.75
5	0.201				6.53
6	0.269				8.74
7	0.366				11.90
8	0.634				20.61
9	0.731				22.75
10	0.799				25.97
11	0.854				27.76
12	0.901				29.28
13	0.943				30.65
14	0.982				31.50

EPA (Dur) 232
4/72

PRELIMINARY VELOCITY TRAVERSE

PLANT Columbia Nitrogen
DATE August 11, 1980
LOCATION Prill Tower Inlet Scrubber B
STACK I.D. 32½" 5.76
BAROMETRIC PRESSURE, in. Hg 29.65
STACK GAUGE PRESSURE, in. H_2O -1.20
OPERATORS LAC & MAA
Cp 0.825

V_S = 2707.4 ft/min
Q = 15594.6 acfm
Q_{STD} = 13393 dscfm

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	0.100	98
2	0.115	100
3	1.80	108
4	2.50	119
5	3.10	120
6	0.55	120
7	0.620	120
8	0.740	120
9	0.760	120
10	0.830	120
11	0.910	125
12	0.680	128
13	0.760	132
14	1.05	131
15	1.05	131
16	1.15	127
17	1.05	127
18	1.05	134
19	1.05	131
20	0.955	130
21	0.955	128
22	0.825	132
23	0.820	129
24	0.640	127
AVERAGE	~~0.73~~ 0.675	123.2

SCHEMATIC OF TRAVERSE POINT LAYOUT

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	0.50	94
2	0.525	93
3	0.655	110
4	0.635	114
5	0.750	128
6	0.850	135
7	0.865	132
8	0.880	130
9	0.720	130
10	0.805	127
11	0.765	129
12	0.750	129
13	1.00	129
14	1.10	127
15	1.05	129
16	1.15	129
17	1.10	127
18	1.05	128
19	1.10	127
20	1.15	125
21	1.05	124
22	0.950	124
23	0.940	123
24	0.830	123
AVERAGE	~~0.88~~ 0.87	123.6

EPA (Dur) 233
4/72

SAMPLING TASK LOG

Plant Columbia Nitrogen
Date August 12, 1980

Plant Location Augusta, Georgia
Recorded by LAC

Comments	Run	Sampling location (Port)	Pollutant	Clock Time Began	Clock Time Ended	Elapsed Time (min)	Sample Nos.
Began Test No. 1 on Prill Tower	1	South - B	AN	1050			
scrubber inlet B @ South Port						72	
Stopped sampling to change ports (South to East)					1209		
Resumed sampling on East port	1	East - B		1208			
Stopped and finished Test No. 1 Leak check - DEAD					1320	72	
Began Test NO. 2 on Prill Tower scrubber inlet A @ ~~East~~ Port	2	~~East~~ ~~South~~ - A	AN	1530			
Stopped sampling to change ports. (East to South)					1642	72	
Resumed sampling on South Port				1647			
Stopped and finished Test No. 2 Leak check - DEAD					1759	72	

FIELD DATA SHEETS

Firm Name: Columbia Nitrogen
Plant Location: Augusta, GA
Test No.: 1 PT
Sampling Location: Scrubber Inlet B
TRC Project No.: 1430-E80-00
Date: 8/12/80
Tester: LAG + MAA

Pump No.:
Orifice No.: 0-7
Ambient Temp: 90 °F
Bar Press: 29.~~65~~80 "Hg
Probe Ident. No.: 29
Filter Ident. No.: NA
Duct Area: 5.76 ft²

Nozzle No. & Dia.: 1-1 0.1965 in.
Assumed Moisture: 2.0 %
Test Duration: 144 min.
Traverse Point Interval: 3 min.
Probe Heater Setting: 140 °F amps
Filter Temp. Setting: NA
Dry Gas Meter Y: 1.00

Nomograph C Factor: 1.2
Pitot Coefficient: 0.825
Orifice ΔH@: 2.11
Test Start Time: 1050
Test End Time: 1320
Leak Test Start: 0.00 CFM@ -7 "Hg
Leak Test Final: 0.00 CFM@ -13 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_H in °F	T_H Out °F	P_{STACK} in H_2O	T_{STACK} °F	Initial Metric Volume cu. ft.	PROBE	Cyc. Angle ∅	Probe Temp Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. %
5	1	3	0.46	0.79	95	96	A	124	500.08	2		140	38	-4	140	
	2		0.42	0.73	96	96		124	515.21				38	-4	140	
	3		0.46	0.79	96	96		124	527.33				38	-4	140	
	4		0.72	1.25	96	96		124	544.11				46	-5	140	
	5		0.72	1.25	96	97		124	562.11				40	-5	140	
	6		0.80	1.35	97	97	-1.15	124	580.06				40	-5	140	
	7		0.86	1.50	98	96		124	595.57				42	-5	140	
	8		0.86	1.50	96	97		125	614.88				44	-5	140	
	9		0.80	1.35	97	95		124	633.36				44	-5	140	
	10		0.85	1.50	99	97		122	651.13				44	-5	140	
	11		0.66	1.15	99	98		126	670.06				46	-5	140	
	12		0.82	1.40	99	98		128	688.69				48	-5	140	
	13		0.96	1.65	99	98		129	707.33				50	-5	140	
	14		1.00	1.70	99	98		127	725.53				50	-6	140	
	15		1.00	1.70	98	98		123	746.66				50	-6	140	

Probe Wash: _____ Cleaning Patch: _____
Silica Gel: 12.3g H_2O Collected: 37 ml S
Silica Gel Cond.: ____ H_2O Condition: _____

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

FIELD DATA SHEETS

Firm Name: Columbia Nitrogen
Plant Location: Augusta, GA
Test No.: 1 PT
Sampling Location: Rubber Inlet B
TRC Project No.: 1430-E80-00
Date: 8/12/90
Tester: LAG + MAA

Pump No.:
Orifice No.: D-7
Ambient Temp: 90 °F
Bar Press: 29.~~55~~80 "Hg
Probe Ident. No.: 29
Filter Ident. No.: NA
Duct Area: 5.76 ft²

Nozzle No. & Dia.: 1-1-0.1965 in.
Assumed Moisture: 20 %
Test Duration: 144 min.
Traverse Point Interval: 3 min.
Probe Heater Setting: 140 °F amps
Filter Temp. Setting: NA
Dry Gas Meter Y: 1.00

Nomograph C Factor: 1.2
Pitot Coefficient: 0.825
Orifice ΔH_A: 2.11
Test Start Time: 1050
Test End Time: 1320
Leak Test Start: 0.02 CFM@ -7 "Hg
Leak Test Final: 0.00 CFM@ -13 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_H in °F	T_H Out °F	P_{STACK} in H_2O	T_{STACK} °F	Initial Metric Volume cu. ft.	PROBE	Cyc. Angle ϕ	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. %	
S	16	3	1.05	1.80	98	98	-1.15	124	77.04	1			46	-7	140		
	17	6	1.05	1.80	98	98		124	78.73				46	-7	140		
	18		1.00	1.70	98	98		126	80.72				46	-7	140		
	19		0.96	1.65	98	98		129	82.83				46	-7	140		
	20		0.92	1.50	99	98		128	85.04				44	-7	140		
	21		0.96	1.65	99	98		128	86.94				44	-6	140		
	22		0.90	1.50	100	98		125	89.05				44	-6	140		
	23		0.90	1.50	100	98		126	91.34				44	-6	146		
	24		0.84	1.45	100	99		126	92.61				44	-5	140		0902
E	1		0.10	0.17	99	99		120	94.44				38	-2	140		1208
	2		0.10	0.17	99	99		122	95.10				38	-2	140		
	3		0.45	0.78	99	99		122	96.03				38	+2	140		
	4		0.52	0.90	98	99		123	97.48				38	+4	140		
	5		0.52	0.90	98	99		123	99.03				38	-4	140		

Probe Wash: _____ Cleaning Patch: _____
Silica Gel: 12.3g H_2O Collected: 37 mls
Silica Gel Cond.: ____ H_2O Condition: _____

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

3 of 7

FIELD DATA SHEETS

Firm Name: Columbia Nitrogen
Plant Location: Augusta, GA
Test No.: 1 PT
Sampling Location: Scrubber Inlet B
TRC Project No.: 1430-E80-00
Date: 8/12/80
Tester: LAG + MAA

Pump No.:
Orifice No.: D-7
Ambient Temp: 90 °F
Bar Press: 29.80 "Hg
Probe Ident. No.: 29
Filter Ident. No.: NA
Duct Area: 5.76 ft²

Nozzle No. & Dia.: 1-1 0.1965 in.
Assumed Moisture: 2.0 %
Test Duration: 144 min.
Traverse Point Interval: 3 min.
Probe Heater Setting: 140 °F amps
Filter Temp. Setting: NA
Dry Gas Meter Y: 1.00

Nomograph C Factor: 1.2
Pitot Coefficient: 0.825
Orifice ΔH_A: 2.11
Test Start Time: 1050
Test End Time: 1320
Leak Test Start: 0.00 CFM @ -7 "Hg
Leak Test Final: 0.00 CFM @ -13 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_H Out °F	P_{STACK} in H_2O	T_{STACK} °F	Initial Metric Volume cu. ft.	PROBE	Cyc. Angle ϕ	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. %
E	6	3	064	1.10	99	99		121	100.026	1			40	-4	140	
	7		065	1.10	99	99		123	101.170				40	-4	140	
	8		066	1.15	99	99		123	103.428				40	-4	140	
	9		072	1.25	99	99		130	105.506				40	-4	140	
	10		072	1.25	98	99		124	106.677				40	-4	140	
	11		076	1.30	99	99	-1.15	125	108.477				42	-4	140	
	12		062	1.05	99	99		126	110.433				42	-4	140	
	13		076	1.30	100	99		125	112.218				42	-4	140	
	14		094	1.60	100	99		130	113.544				42	-4	140	
	15		096	1.65	100	99		131	115.887				42	-4	140	
	16		098	1.70	101	99		129	117.066				42	-4	140	
	17		100	1.70	101	100		130	119.644				42	-4	140	
	18		100	1.70	101	100		131	121.533				44	-5	140	
	19		100	1.70	102	100		127	123.766				44	-5	140	
	20		094	1.60	102	100		129	125.660				46	-5	140	

Probe Wash: _____ Cleaning Patch: _____
Silica Gel: 12.3 g H₂O Collected: 37 mls
Silica Gel Cond.: ____ H₂O Condition: _____

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

FIELD DATA SHEETS

Firm Name: Columbia Nitrogen
Plant Location: Augusta, GA
Test No.: 1 PT
Sampling Location: Scrubber Inlet B
TNC Project No.: 4430-580-00
Date: 8/22/00
Tester: LAG + MAA

Pump No.:
Orifice No.: 0-7
Ambient Temp: 90 °F
Bar Press: 29.80 "Hg
Probe Ident. No.: 29
Filter Ident. No.: NA
Duct Area: 5.76 ft²

Nozzle No. & Dia.: 1-1 0.1965 in.
Assumed Moisture: 2.0 %
Test Duration: 144 min.
Traverse Point Interval: 3 min.
Probe Heater Setting: 140 °F amps
Filter Temp. Setting: NA
Dry Gas Meter Y: 1.00

Nomograph C Factor: 1.2
Pitot Coefficient: 0.825
Orifice ΔH_A: 2.11
Test Start Time: 1050
Test End Time: 1320
Leak Test Start: 0.00 CFM @ -7 "Hg
Leak Test Final: 0.00 CFM @ -13 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M Out °F	P_{STACK} in H_2O	T_{STACK} °F	Initial Metric Volume cu. ft.	PROBE	Cyc. Angle °	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. %
E	21	3	0.85	1.45	102	101	-1.15	131	127.65	1			46	-5	140	
	22		0.85	1.45	101	100		124	129.54				46	-5	140	
	23		0.78	1.35	101	100		129	131.25				46	-5	140	
↓	24		0.78	1.35	101	100	↓	128	133.03	↓			46	-5	140	1320
									134.82							
			0.81	1.33	78.625		-1.15	125.7	85.74							

Probe Wash:
Cleaning Patch:
Silica Gel: 12.3g
H_2O Collected: 37 mls
Silica Gel Cond.:
H_2O Condition:

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

FIELD DATA SHEETS

Firm Name Columbia Nitrogen
Plant Location Augusta, GA
Test No. 2
Sampling Location Scrubber Inlet A
TRC Project No. 1430-E80-00
Date 8/12/80
Tester LAG + MAA

Pump No.
Orifice No. 0-7
Ambient Temp 90 °F
Bar Press 29.73 "Hg
Probe Ident. No. 29
Filter Ident. No. NA
Duct Area 5.76 ft²

Nozzle No. & Dia. 1-1 0.1965 in.
Assumed Moisture 2.0 %
Test Duration 144 min.
Traverse Point Interval 3 min.
Probe Heater Setting 140 °F amps
Filter Temp. Setting NA
Dry Gas Meter Y 1.00

Nomograph C Factor 1.20
Pitot Coefficient 0.825
Orifice ΔH_A 2.11
Test Start Time 1530
Test End Time 1759
Leak Test Start 0.00 CFM@ -5 "Hg
Leak Test Final 0.00 CFM@ -6 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M Out °F	P_{STACK} in H_2O	T_{STACK} °F	Initial Metric Volume cu. ft.	PROBE	Cyc. Angle ∅	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. %
E	1	3.0	036	062	102	103	-1.30	96	135.07	1			36	-3	137	
	2		060	105	101	103		98	136.64				36	-3	137	
	3		066	115	101	102		119	138.08				36	-3	137	
	4		072	125	100	102		116	139.67				36	-3	137	
	5		072	125	100	102		114	141.29				38	-3	137	
	6		072	125	99	101		122	143.06				38	-3	137	
	7		083	140	99	101		126	144.77				40	-3	137	
	8		085	145	99	101		129	146.61				40	-3	137	
	9		087	150	99	101		127	148.53				40	-3	137	
	10		098	170	98	100		129	150.09				40	-3	137	
	11		098	170	99	100		130	152.44				40	-3	135	
	12		098	170	99	100		129	154.76				40	-3	135	
	13		098	170	99	100		128	156.58				40	-3	136	
	14		110	185	99	100		131	158.86				40	-3	140	
	15		110	185	98	99		131	160.63				40	-3	140	

Probe Wash
Cleaning Patch
Silica Gel 12.5g
H_2O Collected 42mls
Silica Gel Cond.
H_2O Condition

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

FIELD DATA SHEETS

Firm Name: Columbia Nitrogen
Plant Location: Augusta, GA
Test No.: 2
Sampling Location: Scrubber Inlet A
TRC Project No.: 14X0-6881-00
Date: 8/12/80
Tester: LAG & MAA

Pump No.:
Orifice No.: D-7
Ambient Temp: 90 °F
Bar Press: 29.73 "Hg
Probe Ident. No.: 29
Filter Ident. No.: NA
Duct Area: 5.76 ft²

Nozzle No. & Dia.: 1-1 0.196.5 in.
Assumed Moisture: 2.0 %
Test Duration: 144 min.
Traverse Point Interval: 3 min.
Probe Heater Setting: 140 °F amps
Filter Temp. Setting: NA
Dry Gas Meter Y: 1.00

Nomograph C Factor:
Pitot Coefficient: 0.825
Orifice ΔH$_A$: 2.11
Test Start Time: 1530
Test End Time: 1759
Leak Test Start: 0.00 CFM @ -5 "Hg
Leak Test Final: 0.00 CFM @ -6 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_H in °F	T_H Out °F	P_{STACK} in H_2O	T_{STACK} °F	Initial Metric Volume cu. ft.	PROBE	Cyc. Angle °	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. %
E	16	30	100	170	98	99	-130	133	163041	1			40	-4	136	
	17		100	170	98	99		134	164176				40	-3	136	
	18		105	180	98	99		132	166923				40	-3	136	
	19		105	180	98	99		130	168851				40	-3	136	
	20		100	170	98	99		132	170961				40	-3	136	
	21		098	170	98	99		132	173011				40	-4	136	
	22		098	170	98	99		134	175000				40	-4	136	
	23		098	170	98	99		130	177128				42	-4	136	
	24		098	170	98	99		134	179611				42	-4	136	
S	1		034	059	98	99		130	181024				44	-3	136	
	2		044	069	98	98		128	182411				44	-3	136	
	3		044	075	98	98		128	183688				44	-3	136	
	4		050	086	98	97		128	185099				44	-3	136	
	5		058	095	98	97		128	186887				44	-3	136	

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Probe Wash:
Cleaning Patch:
Silica Gel: 12.5g
H_2O Collected: 425ml
Silica Gel Cond.:
H_2O Condition:

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

FIELD DATA SHEETS

Firm Name: Columbia Nitrogen
Plant Location: Augusta, GA
Test No.: 2
Sampling Location: Scrubber Inlet A
TRC Project No.: 1430-E80-00
Date: 8/12/80
Tester: LAG + MAA

Pump No.:
Orifice No.: O-7
Ambient Temp: 90 °F
Bar Press: 29.73 "Hg
Probe Ident. No.: 29
Filter Ident. No.: NA
Duct Area: 5.76 ft²

Nozzle No. & Dia.: 1-1 0.1965 in.
Assumed Moisture: 2.0 %
Test Duration: 144 min.
Traverse Point Interval: 3 min.
Probe Heater Setting: 140°F ~~amps~~
Filter Temp. Setting: NA
Dry Gas Meter Y: 1.00

Nomograph C Factor: 1.20
Pitot Coefficient: 0.825
Orifice ΔH_A: 2.11
Test Start Time: 1530
Test End Time: 1759
Leak Test Start: 0.00 CFM@ -5 "Hg
Leak Test Final: 0.00 CFM@ -6 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M Out °F	P_{STACK} in H_2O	T_{STACK} °F	Initial Metric Volume cu. ft.	PROBE	Cyc. Angle ϕ	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. %
S	6	3	0.66	1.15	97	98	-1.36	126	188.13	1			42	-3	136	
	7		0.66	1.15	97	98		128	189.76				40	-4	134	
	8		0.66	1.15	97	98		129	191.30				40	-4	134	
	9		0.74	1.25	97	98		125	193.06				40	-4	134	
	10		0.80	1.37	97	98		129	194.92				34	-4	134	
	11		0.82	1.40	97	97		124	196.79				34	-4	134	
	12		0.72	1.25	97	97		126	198.63				34	-4	134	
	13		1.00	1.70	97	97		130	200.31				34	-4	135	
	14		1.00	1.70	97	97		131	202.36				34	-4	135	
	15		1.10	1.85	97	97		131	204.24				34	-4	134	
	16		1.05	1.80	97	98		132	206.41				36	-4	134	
	17		1.05	1.80	97	98		133	208.51				36	-4	136	
	18		1.05	1.80	97	97		130	210.62				36	-4	135	
	19		1.05	1.80	97	97		136	212.63				36	-4	135	
	20		1.05	1.80	97	97		130	214.83				36	-4	134	

Probe Wash: _____ Cleaning Patch: _____
Silica Gel: 12.5g H_2O Collected: 42mls
Silica Gel Cond.: ____ H_2O Condition: _____

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

FIELD DATA SHEETS

Firm Name: Columbia Nitrogen
Plant Location: Augusta, GA
Test No.: 2
Sampling Location: Scrubber Inlet A
TRC Project No.: 1430-EBO-00
Date:
Tester: LAG - MAA

Pump No.:
Orifice No.: D-7
Ambient Temp: 90 °F
Bar Press: 29.73 "Hg
Probe Ident. No.: 29
Filter Ident. No.: NA
Duct Area: 5.76 ft²

Nozzle No. & Dia.: 1-1 0.1965 in.
Assumed Moisture: 2.0 %
Test Duration: 144 min.
Traverse Point Interval: 3 min.
Probe Heater Setting: 190 °F mmps
Filter Temp. Setting: NA
Dry Gas Meter Y: 1.00

Nomograph C Factor: 1.20
Pitot Coefficient: 0.825
Orifice ΔH$_A$: 2.11
Test Start Time: 15.30
Test End Time: 17.59
Leak Test Start: 0.00 CFM @ -5 "Hg
Leak Test Final: 0.00 CFM @ -6 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M Out °F	P_{STACK} in H_2O	T_{STACK} °F	Initial Metric Volume cu. ft.	PROBE	Cyc. Angle °	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. X_i
S	21	30	098	1.70	97	98	-1.30	132	217.41	1			36	-4	136	
	22		098	1.70	97	98		135	219.04				36	-4	136	
	23		090	1.55	98	98		135	221.06				36	-4	135	
	24		090	1.55	98	98		135	223.00				36	-4	135	
									224.94							
			0.91	1.46	98.5	-1.3		127.6	89.87							

Probe Wash:
Cleaning Patch:
Silica Gel: 12.5g
H_2O Collected: 4 gms
Silica Gel Cond.:
H_2O Condition:

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

SAMPLIN. .ASK LOG

Plant Columbia Nitrogen
Date 8/13/80

Plant Location Augusta, GA
Recorded by LAG

Comments	Run	Sampling location (Port)	Pollutant	Clock Time Began	Clock Time Ended	Elapsed Time (min)	Sample Nos.
Began Test No. 3 on the A-inlet	3	~~South~~ North - A	AN	0855			
Stopped on ~~South~~ North port to change ports					1007	72	
Changed ports (~~South~~ North to West) Resumed testing		West - A		1014			
Finished Test No. 3 on the west port					1126	72	

FIELD DATA SHEETS

Firm Name: Columbia Nitrogen | Pump No.: | Nozzle No. & Dia.: 1-1 0.1965 in. | Nomograph C Factor: 1.20

Plant Location: Augusta, GA | Orifice No.: D-7 | Assumed Moisture: 2.0 % | Pitot Coefficient: 0.825

Test No.: 3 | Ambient Temp: 94 °F | Test Duration: 144 min. | Orifice ΔH_A: 2.11

Sampling Location: Scrubber Inlet C | Bar Press: 29.75 "Hg | Traverse Point Interval: 3 min. | Test Start Time: 0855

TRC Project No.: 1430-E80-00 | Probe Ident. No.: 29 | Probe Heater Setting: 140 °F amps | Test End Time: 1126

Date: 8/13/80 | Filter Ident. No.: NA | Filter Temp. Setting: NA | Leak Test Start: 0.00 CFM @ -5 "Hg

Tester: LAG + MAA | Duct Area: 5.76 ft² | Dry Gas Meter Y: 1.00 | Leak Test Final: 0.00 CFM @ -7 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M Out °F	P_{STACK} in H_2O	T_{STACK} °F	Initial Metric Volume cu. ft.	PROBE	Cyc. Angle ϕ	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. %
N S	1	3	038	065	84	84		115	225900	1			38	-3	136	
	2		040	069	84	84		116	226340				38	-3	132	
	3		046	115	84	84		117	227733				38	-3	132	
	4		042	105	84	84		121	229936				38	-3	131	
	5		042	105	84	84		122	230000				38	-3	132	
	6		043	105	84	84		121	232552				38	-3	133	
	7		054	093	84	85		120	233994				38	-3	133	
	8		044	125	85	85	-088	119	235858				38	-3	133	
	9		075	130	85	85		117	237226				38	-3	130	
	10		046	130	84	85		118	239007				40	-3	131	
	11		047	135	85	85		118	240933				40	-3	130	
	12		080	140	85	86		119	242575				40	-4	133	
	13		042	105	86	86		123	244457				40	-3	133	
	14		070	120	86	86		122	246111				40	-4	130	
	15		092	155	86	86	-085	123	247811				40	-4	130	

Probe Wash: | Cleaning Patch:

Silica Gel: 13.8g | H_2O Collected: 44

Silica Gel Cond.: | H_2O Condition:

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

FIELD DATA SHEETS

Firm Name: Columbia Nitrogen
Plant Location: Augusta, GA
Test No.: 3
Sampling Location: Scrubber Inlet C
TRC Project No.: 1430-E80-00
Date: 8/13/80
Tester: LAGT MAA

Pump No.:
Orifice No.: O-7
Ambient Temp: 94 °F
Bar Press: 29.75 "Hg
Probe Ident. No.: 29
Filter Ident. No.: NA
Duct Area: 5.76 ft²

Nozzle No. & Dia.: 1-1 0.1965 in.
Assumed Moisture: 2.0 %
Test Duration: 144 min.
Traverse Point Interval: 3 min.
Probe Heater Setting: 140°F amps
Filter Temp. Setting: NA
Dry Gas Meter Y: 1.00

Nomograph C Factor: 1.20
Pitot Coefficient: 0.825
Orifice ΔH_A: 2.11
Test Start Time: 0855
Test End Time: 1126
Leak Test Start: 0.00 CFM@ -5 "Hg
Leak Test Final: 0.00 CFM@ -7 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_H in °F	T_M Out °F	P_{STACK} in H_2O	T_{STACK} °F	Initial Metric Volume cu. ft.	PROBE	Cyc. Angle ϕ	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. %	
N	16	3	0.74	1.27	87	87		122	249.83	1			40	-3	133		
	17		0.76	1.30	87	87		122	251.48				40	-3	132		
	18		0.74	1.27	87	87		124	253.16				40	-3	132		
	19		0.76	1.30	88	87		122	255.49				40	-4	132		
	20		0.76	1.30	88	88	-0.03	124	256.77				42	-3	132		
	21		0.70	1.20	89	88		123	258.24				42	-3	130		
	22		0.72	1.25	89	88		125	260.03				42	-3	130		
	23		0.72	1.25	89	89		124	261.94				42	-3	130		
	24		0.72	1.25	89	89		122	263.71				40	-3	130		1007
W	1		0.49	0.85	90	89		109	265.44				38	-3	132		1014
	2		0.49	0.85	90	89		110	266.78				38	-3	132		
	3		0.60	1.00	91	90		113	268.53				38	-3	133		
	4		0.54	0.93	90	90		116	270.08				38	-3	130		
	5		0.55	0.95	90	90		112	271.43				38	-3	131		

Probe Wash: _____ Cleaning Patch: _____
Silica Gel: 1389 H_2O Collected: 44
Silica Gel Cond.: ____ H_2O Condition: _____

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

FIELD DATA SHEETS

Firm Name: Columbia Nitrogen
Plant Location: Augusta, GA
Test No.: 3
Sampling Location: Scrubber Inlet
TRC Project No.: 1430-E80-00
Date: 8/13/80
Tester: LAG + MAA

Pump No.:
Orifice No.: 0-7
Ambient Temp: 94 °F
Bar Press: 29.75 "Hg
Probe Ident. No.: 29
Filter Ident. No.: NA
Duct Area: 5.76 ft²

Nozzle No. & Dia.: 1-1 0.1965 in.
Assumed Moisture: 2.0 %
Test Duration: 144 min.
Traverse Point Interval: 3 min.
Probe Heater Setting: 140°F amps
Filter Temp. Setting: NA
Dry Gas Meter Y: 1.00

Nomograph C Factor: 1.20
Pitot Coefficient: 0.825
Orifice ΔH_A: 2.11
Test Start Time: 0855
Test End Time: 1126
Leak Test Start: 0.00 CFM @ -5 "Hg
Leak Test Final: 0.00 CFM @ -7 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M Out °F	P_{STACK} in H_2O	T_{STACK} °F	Initial Metric Volume cu. ft.	Probe	Cyc. Angle ϕ	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. $\%_i$
W	6	3	0.55	0.93	90	90	-0.83	117	274296	1			38	-3	130	
	7		0.62	1.05	90	90		116	274833				38	-3	131	
	8		0.68	1.15	90	90		119	276099				38	-3	130	
	9		0.68	1.15	90	90		118	277722				38	-4	131	
	10		0.80	1.37	90	90		113	279555				38	-4	130	
	11		0.77	1.30	90	90		121	281223				38	-4	132	
	12		0.88	1.50	90	90		118	283116				38	-4	132	
	13		0.88	1.50	91	91		121	285113				38	-4	132	
	14		1.00	1.70	91	91		123	286779				40	-4	132	
	15		1.00	1.70	90	91		123	288900				40	-4	130	
	16		1.00	1.70	91	91		130	290996				40	-4	130	
	17		1.05	1.80	91	91		125	292977				40	-4	130	
	18		1.05	1.80	91	91		124	295110				40	-4	130	
	19		1.10	1.85	92	91		120	296885				40	-4	130	
	20	↓	1.10	1.85	92	91		120	299115	↓			40	-4	130	

Probe Wash: _____ Cleaning Patch: _____
Silica Gel: 13.8g H_2O Collected: 44
Silica Gel Cond.: ____ H_2O Condition: _____

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

4c.,

FIELD DATA SHEETS

Firm Name: Columbia Nitrogen
Plant Location: Augusta, GA
Test No.: 3
Sampling Location: Rubber Toilet C
TRC Project No.: 420-E80-00
Date: 8/13/80
Tester: LKS MAA

Pump No.:
Orifice No.: 0-7
Ambient Temp: 94 °F
Bar Press: 29.75 "Hg
Probe Ident. No.: 29
Filter Ident. No.: NA
Duct Area: 5.76 ft²

Nozzle No. & Dia.: 1-1 0.1965 in.
Assumed Moisture: 2.0 %
Test Duration: 144 min.
Traverse Point Interval: 3 min.
Probe Heater Setting: 140°F amps
Filter Temp. Setting: NA
Dry Gas Meter Y: 1.00

Nomograph C Factor: 1.20
Pitot Coefficient: 0.825
Orifice ΔH_A: 2.11
Test Start Time: 0855
Test End Time: 1126
Leak Test Start: 0.00 CFM @ 5 "Hg
Leak Test Final: 0.00 CFM @ 7 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M Out °F	P_{STACK} in H_2O	T_{STACK} °F	Initial Metric Volume cu. ft.	PROBE	Cyc. Angle ϕ	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. %
W	21	30	105	180	92	92	-1.30	125	301166	1			40	-4	131	
(	22	(	105	180	92	92	(	124	303433	(			40	-4	130	
	23		100	170	93	92		125	305455				40	-4	130	
↓	24	↓	100	170	92	92	↓	126	307633	↓			40	-4	130	1126
									309444							
			86		88	e 3	-94	120	835454							

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Probe Wash: ____ Cleaning Patch: ____
Silica Gel: 13.8g H_2O Collected: 44
Silica Gel Cond.: ____ H_2O Condition: ____

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

NOMOGRAPH DATA

PLANT Columbia Nitrogen

DATE August 11, 1980

SAMPLING LOCATION Prill Tower Brinks By-Pass (A, B, + C)

Y = 1.00

Cp = .831

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H_2O	$\Delta H_@$	1.96
AVERAGE METER TEMPERATURE (AMBIENT + 20 °F), °F	$T_{m_{avg.}}$	107
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	~~4~~ 2
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	29.65
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073$ x STACK GAUGE PRESSURE in in. H_2O)	P_s	-.5
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s/P_m	
AVERAGE STACK TEMPERATURE, °F	$T_{s_{avg.}}$	106
AVERAGE VELOCITY HEAD, in. H_2O	$\Delta p_{avg.}$	1.80
MAXIMUM VELOCITY HEAD, in. H_2O	$\Delta p_{max.}$	2.20
C FACTOR	1.~~0~~8	
CALCULATED NOZZLE DIAMETER, in.	.170	
ACTUAL NOZZLE DIAMETER, in.	.1895	
REFERENCE Δp, in. H_2O	1.25	

EPA (Dur) 234
4/72

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT Columbia Nitrogen
DATE 8/11/80
SAMPLING LOCATION Bypass Stack (Particulate Only)
INSIDE OF FAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE A) 59.5
INSIDE OF NEAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE B) 0
STACK I.D., (DISTANCE A - DISTANCE B) 59.5
NEAREST UPSTREAM DISTURBANCE
NEAREST DOWNSTREAM DISTURBANCE
CALCULATOR

SCHEMATIC OF SAMPLING LOCATION

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8 INCH)	DISTANCE B	TRAVERSE POINT LOCATIC FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
1	.014	59.5"	(.83) 1.00	0	Same as col 4
2	.044		2.62		
3	.075		4.46		
4	.109		6.49		
5	.146		8.68		
6	.188		11.19		
7	.236		14.04		
8	.296		17.61		
9	.382		22.73		
10	.618		36.77		
11	.704		41.89		
12	.764		45.47		
13	.812		48.31		
14	.854		50.81		
15	.891		53.01		
16	.925		55.04		
17	.956		56.87		
18	.986	↓	(58.67) 58.50	↓	✓

EPA (Dur) 232
4/72

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT Columbia Nitrogen
DATE 8/11/80
SAMPLING LOCATION Bypass Stacks (A, B, C) Velocity Only
INSIDE OF FAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE A) _____
INSIDE OF NEAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE B) _____
STACK I.D., (DISTANCE A - DISTANCE B) 59.5
NEAREST UPSTREAM DISTURBANCE _____
NEAREST DOWNSTREAM DISTURBANCE _____
CALCULATOR LAG

SCHEMATIC OF SAMPLING LOCATION

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8 INCH)	DISTANCE B	TRAVERSE POINT LOCATION FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
1	0.021	59.5		No	1.25
2	0.067			Flange	3.99
3	0.118				7.02
4	0.177				10.53
5	0.250				14.88
6	0.356				21.18
7	0.644				38.32
8	0.750				44.63
9	0.823				48.97
10	0.882				52.48
11	0.933				55.51
12	0.979				58.25

EPA (Dur) 232
4/72

PRELIMINARY VELOCITY TRAVERSE

PLANT Columbia Nitrogen
DATE August 11, 1980
LOCATION By Pass (Still Tower)
STACK I.D. 59.5 19.31 ✓
BAROMETRIC PRESSURE, in. Hg 29.65
STACK GAUGE PRESSURE, in. H_2O -0.5
OPERATORS JEC & KTK
Cp Pbox #3 .84

V_s = 5909.8 ft/min
Q = 114118 acfm
Q_{STO} = ~~104715~~ 101165 dscfm

SCHEMATIC OF TRAVERSE POINT LAYOUT

P_s = -.5 in H_2O

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	1.95	107
2	2.10	109
3	2.15	109
4	2.10	110
5	2.00	110
6	1.95	109
7	1.85	109
8	1.85	109
9	1.60	106
10	1.60	106
11	1.65	105
12	1.60	105
13	1.55	105
14	1.45	106
15	1.40	105
16	1.30	104
17	1.30	104
18	1.30	105
AVERAGE	1.69	106.8

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	1.90	106
2	2.18	106
3	2.20	106
4	2.15	106
5	2.15	107
6	2.05	107
7	2.00	107
8	1.85	107
9	1.60	107
10	1.35	106
11	1.35	106
12	1.40	106
13	1.40	107
14	1.35	107
15	1.40	107
16	1.40	106
17	1.30	105
18	1.25	105
AVERAGE	1.66	106.3

EPA (Dur) 233
4/72

ΔP = 1.675 T_s = 106.55

SAMPLING TASK LOG

Plant COLUMBIA NITROGEN
Date 8-12-80

Plant Location AUGUSTA GEORGIA
Recorded by JEC

Comments	Run	Sampling location (Port)	Pollutant	Clock Time Began	Clock Time Ended	Elapsed Time (min)	Sample Nos.
BEGAN TEST 1 ON PRILL TOWER							
SCRUBBER BYPASS B		SOUTH - B	NH_4NO_3 & NH_3	1046	1159	72	PT-BP-)
STOPPED SAMPLING TO CHANGE PORTS (SOUTH TO WEST)				1158			
RESUMED TESTING		WEST - B		1212			
FINISHED TEST NO 1 & LEAK CHECK					1324	72	
BEGAN TEST NO 2. ON PRILL TOWER SCRUBBER BYPASS A		West - A		1532			
STOPPED SAMPLING TO CHANGE PORTS (West to South)					1644	72	
RESUMED TESTING		SOUTH-A		1651			
FINISHED TEST NO 2 & LEAK CHECK					1803	72	

FIELD DATA SHEETS

Firm Name Columbia
Plant Location Augusta
Test No. PT - BP - 1
Sampling Location Mill Tower Scrubber Bypass, B
TRC Project No. 1430-E80
Date 8/12/80
Tester JC/KK

Pump No. —
Orifice No. T-2
Ambient Temp 90 °F
Bar Press 29.80 "Hg
Probe Ident. No. 30
Filter Ident. No. —
Duct Area $\left(\frac{59.5}{24}\right)^2 \pi$ 19.31 ft²

Nozzle No. & Dia. 2-1 .1395 in.
Assumed Moisture 2% %
Test Duration 144 min.
Traverse Point Interval 4 min.
Probe Heater Setting 110 amps
Filter Temp. Setting —
Dry Gas Meter Y 1.00

Nomograph C Factor 1.15
Pitot Coefficient .831
Orifice ΔH 1.96
Test Start Time 1045
Test End Time 1324
Leak Test Start .005 CFM@ 6 "Hg
Leak Test Final .005 CFM@ 9 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M Out °F	P_{STACK} in H_2O	T_{STACK} °F	Initial Metric Volume cu. ft.	PROBE	Cyc. Angle ϕ	P.O. ~~Heater Box~~ Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. %
S	1	90	125	184	100	100	-53	104	43293	2	NA	115	54	4.0	114	
	2		125	184	100	100		105	43577			115	54	4.0	117	
	3		130	190	100	100		103	43872			119	54	5.0	112	
	4		145	212	98	100		105	44168			114	54	5.0	112	
	5		150	218	99	102		104	44478			114	58	5.5	114	
	6		170	250	99	102		104	44795			116	60	6.0	117	
	7		176	250	98	102		106	45137			112	60	6.0	115	
	8		170	250	99	103		106	45475			114	60	6.0	115	
	9		155	225	99	104		105	45319			120	58	5.5	117	
	10		170	250	99	104		105	46146			118	58	6.0	113	
	11		210	310	99	104		104	46489			113	58	7.5	113	
	12		210	310	99	104		105	46865			115	58	7.5	116	
	13		215	318	99	104		107	47243			120	58	8.0	122	
	14		215	318	99	104		107	47628			124	56	8.0	117	
V	15		220	320	99	104		107	48007			119	56	8.0	116	

Probe Wash _____ Cleaning Patch _____
Silica Gel 19.9g H_2O Collected 29 mls
Silica Gel Cond. _____ H_2O Condition _____

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

FIELD DATA SHEETS

Firm Name: Columbia
Plant Location: Augusta
Test No.: PT-BP-1
Sampling Location: Pkg Power Bypass B
TRC Project No.: 1430-E80
Date: 10/12/20
Tester: JC/MA

Pump No.: —
Orifice No.: T-2
Ambient Temp: 95 °F
Bar Press: 29.8 "Hg
Probe Ident. No.: 30
Filter Ident. No.: —
Duct Area: 19.31 ft²

Nozzle No. & Dia.: 2-1 .1895 in.
Assumed Moisture: 2 %
Test Duration: 144 min.
Traverse Point Interval: 4 min.
Probe Heater Setting: 120 °F amps
Filter Temp. Setting: —
Dry Gas Meter Y: 1.00

Nomograph C Factor: 185
Pitot Coefficient: .831
Orifice ΔH_A: 1.96
Test Start Time: 1046
Test End Time: 1324
Leak Test Start: .005 CFM @ 6 "Hg
Leak Test Final: .005 CFM @ 9 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_H in °F	T_H Out °F	P_{STACK} in H_2O	T_{STACK} °F	Initial Metric Volume cu. ft.	PROBE	Cyc. Angle °	P.O. Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. %
S	16	4	2.20	3.20	99	104	-.52	106	483.34	2		115	58	8.0	110	
	17		2.20	3.20	100	105		107	487.70			124	58	8.0	120	
↓	18		2.10	3.05	100	105		105	491.54			122	58	8.0	120	
									495.39							
W	1		1.25	1.82	101	106	-.52	105	499.39			115	60	5.0	112	
	2		1.20	1.75	101	106		106	498.25			115	60	5.0	110	
	3		1.25	1.82	101	106		108	501.13			118	60	5.0	112	
	4		1.30	1.90	101	106		110	504.02			124	60	5.0	126	
	5		1.30	1.90	101	106		110	507.00			122	60	5.0	126	
	6		1.45	2.10	101	106		110	510.00			120	60	5.5	124	
	7		1.45	2.10	101	106		109	513.11			117	60	5.5	115	
	8		1.40	2.05	101	106		110	516.37			121	60	5.5	115	
	9		1.40	2.05	101	106		111	519.39			119	60	5.5	123	
	10		1.80	2.60	101	106		109	522.55			119	60	6.5	122	
↓	11		1.70	2.50	102	106		107	525.95	↓		119	60	6.5	122	

Probe Wash: _____ Cleaning Patch: _____
Silica Gel: 19.9g H_2O Collected: 29mls
Silica Gel Cond.: _____ H_2O Condition: _____

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

FIELD DATA SHEETS

Firm Name: Columbia
Plant Location: Augusta
Test No.: FT-BP-1
Sampling Location: Fr. H Tower Bypass 3
TRC Project No.: 1430-E80
Date: 8/12/26
Tester: SC/MA

Pump No.: ~
Orifice No.: T-2
Ambient Temp: 95 °F
Bar Press: 29.8 "Hg
Probe Ident. No.: 30
Filter Ident. No.: -
Duct Area: 19.31 ft²

Nozzle No. & Dia.: 2 in.
Assumed Moisture: 2 %
Test Duration: 144 min.
Traverse Point Interval: 4 min.
Probe Heater Setting: 120 = amps
Filter Temp. Setting: —
Dry Gas Meter Y: 1.---

Nomograph C Factor: 115
Pitot Coefficient: .83
Orifice ΔH$_A$: 1.96
Test Start Time: 1046
Test End Time: 1324
Leak Test Start: .005 CFM@ 6 "Hg
Leak Test Final: .005 CFM@ 4 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M Out °F	P_{STACK} in H_2O	T_{STACK} °F	Initial Metric Volume cu. ft.	PROBE	Cyc. Angle ϕ	P_s Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. %
W	12	4.0	1.30	2.60	102	106	-.52	106	529.54	2		119	62	6.5	120	
	13		1.70	2.75	103	107		107	533.93			121	62	8.0		
	14		2.00	2.95	103	107		107	536.56			124		7.5		
	15		2.10	3.10	103	107		107	540.25			121	62	8.0		
	16		2.00	2.95	103	107		106	544.10			123	62	7.5		
	17		2.00	2.95	103	107		106	547.84			121	62	7.5		
	18		1.95	2.90	103	107		106	551.60			120	62	7.5		
									553.27							
				2.50												
			1.30		102.5	-.5225		106.6	120.34							

Probe Wash: ____ Cleaning Patch: ____
Silica Gel: 19.9g H_2O Collected: 29 mls
Silica Gel Cond.: ____ H_2O Condition: ____

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

(W)

FIELD DATA SHEETS

Firm Name Columbia
Plant Location Augusta
Test No. PT-PP-2
Sampling Location A-11 Tower By-Pass
TRC Project No.
Date 3/12/86
Tester JC/MA

Pump No.
Orifice No. I-2
Ambient Temp 95 °F
Bar Press 29.80 "Hg
Probe Ident. No. 3
Filter Ident. No.
Duct Area 19.31 ft²

Nozzle No. & Dia. #1 .1895 in.
Assumed Moisture 2 %
Test Duration 144 min.
Traverse Point Interval 4 min.
Probe Heater Setting 120 °F amps
Filter Temp. Setting
Dry Gas Meter Y 1.00

Nomograph C Factor 1.15
Pitot Coefficient .84
Orifice ΔH@ 1.96
Test Start Time 1532
Test End Time 1803
Leak Test Start .003 CFM@ 10 "Hg
Leak Test Final .006 CFM@ 8 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M Out °F	P_{STACK} in H_2O	T_{STACK} °F	Initial Metric Volume cu. ft.	PROBE	Cyc. Angle ϕ	P.O. Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. %
W	1	4	1.25	1.84	107	107	-.63	115	55566	✓	N 1	117	54	5.0	125	
	2		1.25	1.84	106	107		115	55585			122	54	5.0	131	
	3		1.60	2.32	107	106		116	56147			124	54	5.5	130	
	4		1.65	2.40	107	106		118	56450			128	54	6.0	132	
	5		1.80	2.65	108	106		115	56805			124	54	6.5	132	
	6		1.85	2.70	107	106		114	57153			125	54	6.5	132	
	7		1.85	2.70	106	107		117	57515			126	54	6.5	132	
	8		1.60	2.65	105	107		114	57875			125	54	6.5	132	
	9		1.70	2.45	105	107		115	58232			124	54	6.0	132	
	10		1.40	2.00	105	107		114	58580			123	55	5.0	132	
	11		1.40	2.00	105	106		114	58932			123	60	5.0	132	
	12		1.60	2.32	106	107		114	59204			123	60	5.0	132	
	13		1.65	2.40	107	106		114	59537			124	60	5.0	132	
	14		1.90	2.73	107	106		114	59367			127	60	17.0	132	
	15	↓	1.90	2.73	107	106	↓	114	66221	✓	↓	126	60	7.0	132	

Probe Wash _____ Cleaning Patch _____
Silica Gel 17.6g H_2O Collected 39 mls
Silica Gel Cond. ____ H_2O Condition _____

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

FIELD DATA SHEETS

Firm Name Columbac
Plant Location Augusta
Test No. PT-BP-2
Sampling Location Drill tower By Pass
TRC Project No.
Date 8/24/89
Tester JC/CA

Pump No.
Orifice No. T-2
Ambient Temp 95 °F
Bar Press 29.80 "Hg
Probe Ident. No. 30
Filter Ident. No. —
Duct Area 19.31 ft²

Nozzle No. & Dia. in.
Assumed Moisture 2% %
Test Duration 144 min.
Traverse Point Interval 4 min.
Probe Heater Setting 1.30 = amps
Filter Temp. Setting —
Dry Gas Meter Y 1.00

Nomograph C Factor 1.15
Pitot Coefficient .831
Orifice ΔH 1.36
Test Start Time 1533
Test End Time 1803
Leak Test Start 003 CFM@ 10 "Hg
Leak Test Final 006 CFM@ 8 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M In °F	T_M Out °F	P_{STACK} in H_2O	T_{STACK} °F	Initial Metric Volume cu. ft.	PROBE	Cyc. Angle °	Meter Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. %
	16	40	175	280	107	106	-.60	114	60590	2	NA	127	60	7.0	132	
	17		175	255	107	106		115	60954			127	60	7.0	132	
	18		155	225	107	106		115	61305			127	60	6.0	132	
									61633							
5	1	40	125	180	107	106	-.60	117	61632			127	60	5.0	134	
	2		115	170	107	106		117	61926			126	62	5.0	134	
	3		150	218	107	106		117	62220			129	62	6.0	134	
	4		150	218	107	106		116	62545			129	62	6.0	134	
	5		170	250	107	106		119	62870			129	60	6.0	134	
	6		170	250	107	106		117	63214			128	60	6.0	134	
	7		170	250	107	106		116	63561			129	52	6.6	134	
	8		165	240	107	106		117	63907			131	52	6.0	134	
	9		160	235	107	106		116	64250			126	52	6.0	134	
	10		125	180	107	106		114	64608			126	52	6.0	134	
	11		130	190	107	106		115	64897			128	50	5.0	134	

Probe Wash
Silica Gel 17.6g
Silica Gel Cond.
Cleaning Patch
H_2O Collected 39mls
H_2O Condition

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

FIELD DATA SHEETS

Firm Name Columbia — Pump No. — — Nozzle No. & Dia. 2-2 .1895 in. — Nomograph C Factor 1.15

Plant Location Augusta — Orifice No. T-2 — Assumed Moisture 2 % — Pitot Coefficient .83

Test No. PT-DP-2 — Ambient Temp 95 °F — Test Duration 144 min. — Orifice ΔH_A 1.76

Sampling Location Drill Tower Bypass A — Bar Press 25.32 "Hg — Traverse Point Interval 4 min. — Test Start Time 1532

TRC Project No. — Probe Ident. No. 36 — Probe Heater Setting 13.5 amps — Test End Time 1803

Date 8/12/80 — Filter Ident. No. — — Filter Temp. Setting — — Leak Test Start .003 CFM @ 10 "Hg

Tester SC/MA — Duct Area 19.31 ft^2 — Dry Gas Meter Y 1.00 — Leak Test Final .008 CFM @ 8 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M Out °F	P_{STACK} in H_2O	T_{STACK} °F	Initial Metric Volume cu. ft.	PROBE	Cyc. Angle ϕ	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. %
	12		1.50	2.15	107	106	-.60	113	651197	2	NA	126	52	6.0	133	
	13		1.50	2.15	107	106		115	655171			126	52	6.0	133	
	14		1.50	2.15	107	106		114	658402			121	52	6.0	135	
	15		1.50	2.15	107	106		111	660162			123	52	6.0	133	
	16		1.50	2.15	108	105		112	663902			130	52	6.0	133	
	17		1.50	2.15	107	106		113	666813			127	52	6.0	135	
	18		1.25	1.80	107	106		113	671323			125	52	6.0	133	
									674127							
			1.25	2.21	106.5		-0.61	115.1	118.61							

Probe Wash — Cleaning Patch —

Silica Gel 17.6g — H_2O Collected 39 mls

Silica Gel Cond. — H_2O Condition —

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

SAMPLING TASK LOG

Plant Columbia Nitrogen
Date 8/13/80

Plant Location Augusta Ga.
Recorded by J. Cameron

Comments	Run	Sampling location (Port)	Pollutant	Clock Time Began	Clock Time Ended	Elapsed Time (min)	Sample Nos.
	3	West	$(NH_4)_2SO_4$	0847	0959	72	PT-BP-3
Pt 16 - broken stopwatch - stayed 6 min on pt. 16 and 3 min on pt 18	"	North	"	1005	1117	72	PT-B-3

FIELD DATA SHEETS

Firm Name: Columbia
Plant Location: Augusta
Test No.: PT-BP-3
Sampling Location: Bypass C
TRC Project No.:
Date: 8/12/80
Tester: SC/MA

Pump No.: —
Orifice No.: T-2
Ambient Temp: 88 °F
Bar Press: 29.75 "Hg
Probe Ident. No.: 30
Filter Ident. No.: —
Duct Area: 19.31 ft²

Nozzle No. & Dia.: 3-1, .1895 in.
Assumed Moisture: 2 %
Test Duration: 144 min.
Traverse Point Interval: 4 min.
Probe Heater Setting: 120°C amps
Filter Temp. Setting: —
Dry Gas Meter Y: 1.00

Nomograph C Factor: 1.
Pitot Coefficient: .831
Orifice ΔH_A: 1.96
Test Start Time: 0847
Test End Time: 1117
Leak Test Start: .002 CFM@ 8 "Hg
Leak Test Final: .002 CFM@ 9 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_H in °F	T_H Out °F	P_{STACK} in H_2O	T_{STACK} °F	Initial Metric Volume cu. ft.	PROBE	Cyc. Angle °	Dry Gas Meter Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. %
W	1	4.0	1.15	1.68	87	87	-.50	98	674.74	2	NA	106	44	5.0	120	
	2		1.15	1.68	87	87		99	677.46			110	44	5.0	124	
	3	1.20	1.75	87	87		98	680.20			109	44	5.0	122	*	
	4	1.25	1.83	87	88		98	683.12			107	44	5.0	115		
	5	1.30	1.90	87	87		99	686.66			107	46	5.0	108		
	6	1.35	2.00	88	88		100	689.25			109	46	5.5	111		
	7	1.40	2.05	88	88		100	692.07			109	46	5.5	110		
	8	1.55	2.25	89	87		100	695.15			109	46	6.0	111		
	9	1.55	2.25	89	87		100	698.38			110	46	6.0	111		
	10	1.65	2.40	88	90		100	701.62			110	46	6.5	111		
	11	1.65	2.40	88	90		100	704.95			110	46	6.5	112		
	12	1.40	2.05	88	90		104	708.30			110	46	6.0	112		
	13	1.35	2.00	88	90		104	711.40			112	46	6.0	114		
	14	1.35	2.00	88	90		105	714.43			114	46	6.0	117		
	15	1.25	1.83	88	90		105	717.52			115	46	6.0	117		

Probe Wash: _____ Cleaning Patch: _____
Silica Gel: 17.6g H_2O Collected: 54mls
Silica Gel Cond.: ____ H_2O Condition: _____

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

FIELD DATA SHEETS

Firm Name: Columbia
Plant Location: Augusta
Test No.: PT-BP-3
Sampling Location: Pall Tower By-Pass Cr
TRC Project No.:
Date: 8/13/91
Tester: JC/DA

Pump No.: —
Orifice No.: T-2
Ambient Temp: 90 °F
Bar Press: 29.75 "Hg
Probe Ident. No.: 50
Filter Ident. No.: —
Duct Area: 59.5 in² 19.31 m²

Nozzle No. & Dia.: 2 .1875 in.
Assumed Moisture: 2 %
Test Duration: 144 min.
Traverse Point Interval: 4 min.
Probe Heater Setting: 130 °F ~~amps~~
Filter Temp. Setting: —
Dry Gas Meter Y: 1.00

Nomograph C Factor: 1.12
Pitot Coefficient: .83
Orifice ΔH_A: 1.76
Test Start Time: 0847
Test End Time: 1117
Leak Test Start: .002 CFM@ 8 "Hg
Leak Test Final: .002 CFM@ 9 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M In °F	T_M Out °F	P_{STACK} in H_2O	T_{STACK} °F	Initial Metric Volume cu. ft.	PROBE	Cyc. Angle	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. %
	16	4 0	1.25	1.83	88	90	-.50	106	720.40	2	N A	115	46	6.0	116	
	17		1.15	1.65	88	90		106	723.40			115	46	6.0	116	
	18		1.15	1.65	88	90		106	726.25			115	46	6.0	116	
									729.01						117	
N	1	40	0.98	1.42	89	92		104	729.01			110	46	5.0	117	
	2		0.98	1.42	87	92		106	731.63			112	46	5.0	117	
	3		1.20	1.72	89	92		106	734.23			115	46	5.0	117	
	4		1.30	1.90	90	93		104	737.05			114	46	6.0	117	
	5		1.30	1.90	90	93		105	740.00			114	46	6.0	117	
	6		1.30	1.96	90	93		106	743.00			115	48	6.0	117	
	7		1.25	1.83	90	93		107	746.00			115	48	6.0	117	
	8		1.10	1.58	90	93		106	748.93			115	48	6.0	119	
	9		1.10	1.58	90	93		106	751.73			115	48	5.0	120	
	10		1.30	1.90	90	93		106	754.51			115	48	6.0	120	
	11		1.50	2.15	90	93		107	757.46			114	48	6.0	120	

Probe Wash: _____ Cleaning Patch: _____
Silica Gel: 17.5g H_2O Collected: 54 mls
Silica Gel Cond.: ____ H_2O Condition: _____

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

FIELD DATA SHEETS

Firm Name Columbia
Plant Location Augusta
Test No. Pt-BP-3
Sampling Location Prill Tower By Pass C
TRC Project No.
Date 8/13/80
Tester JC/MA

Pump No.
Orifice No. T-2
Ambient Temp 90 °F
Bar Press 29.75 "Hg
Probe Ident. No. 50
Filter Ident. No. -
Duct Area 13.31 ft²

Nozzle No. & Dia. 2-1 .1355 in.
Assumed Moisture 2 %
Test Duration 144 min.
Traverse Point Interval 4 min.
Probe Heater Setting 120 amps
Filter Temp. Setting -
Dry Gas Meter Y 1.00

Nomograph C Factor 1.13
Pitot Coefficient .83
Orifice ΔH_A 1.16
Test Start Time 0847
Test End Time 1117
Leak Test Start .002 CFM@ 8 "Hg
Leak Test Final .002 CFM@ 9 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M Out °F	P_{STACK} in H_2O	T_{STACK} °F	Initial Metric Volume cu. ft.	PROBE	Cyc. Angle ∅	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. %
	12	40	180	257	90	93	-50	107	76665	2		117	50	7.0		
	13		195	280	90	93		108	76403			119	50	7.5		
	14		215	310	91	94		109	76765			118	50	8.5		
	15		215	310	91	94		108	77140			118	50	8.5		
	16	60	215	310	91	94		110	77518			119	50	8.5		
	17	40	190	270	91	94		110	78190			119	50	7.5		
	18	20	190	270	91	94		109	78543			119	50	7.5		
									78717							
			1188		89	94	-50	104	11243							

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Probe Wash
Silica Gel 17.5g
Silica Gel Cond.

Cleaning Patch
H_2O Collected 54 mls
H_2O Condition

ORSAT Measurements

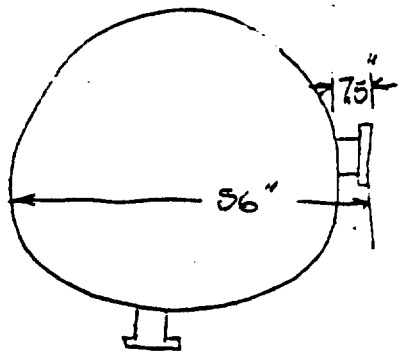
	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT Augusta Georgia (Columbia Nitrogen)
DATE 8/11/80
SAMPLING LOCATION ~~Bricks Etc~~ Prill Tower Outlet
INSIDE OF FAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE A) 56.00"
INSIDE OF NEAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE B) _____
STACK I.D., (DISTANCE A - DISTANCE B) 48.5
NEAREST UPSTREAM DISTURBANCE _____
NEAREST DOWNSTREAM DISTURBANCE _____
CALCULATOR EDA



SCHEMATIC OF SAMPLING LOCATION

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8 INCH)	DISTANCE B	TRAVERSE POINT LOCATION FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
1	0.014	48.5	~~0.679~~ 1.00	7.5"	8.5
2	0.044		2.134		9.634
3	0.075		3.64		11.14
4	0.109		5.29		12.79
5	.146		7.08		14.58
6	.188		9.12		16.62
7	.236		11.45		18.95
8	.296		14.36		21.86
9	.382		18.53		26.03
10	.618		29.97		37.47
11	.704		34.14		41.64
12	.764		37.05		44.55
13	.812		39.38		46.88
14	.854		41.42		48.92
15	.891		43.21		50.71
16	.925		44.86		52.36
17	.956		46.37		53.87
18	.986		47.5		55.00

EPA (Dur) 232
4/72

PRELIMINARY VELOCITY TRAVERSE

PLANT Columbia Nitrogen
DATE August 11, 1980
LOCATION Prill Tower OUTLET
STACK I.D. 48.5" 12.83
BAROMETRIC PRESSURE, in. Hg 29.65
STACK GAUGE PRESSURE, in. H_2O -0.7
OPERATORS EOA & GAG
Cp 0.846
Probe 37

V_s = 5662.6 ft/min
Q = 72651 acfm
Q_{STD} = 64715 dscfm

SCHEMATIC OF TRAVERSE POINT LAYOUT

S

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	.98	90
2	1.10	90
3	1.30	94
4	1.30	95
5	1.30	95
6	1.30	95
7	1.30	95
8	1.20	95
9	1.30	95
10	1.50	95
11	1.70	95
12	1.80	95
13	1.70	95
14	1.75	95
15	1.90	95
16	2.10	96
17	2.10	96
18	2.00	96
AVERAGE	1.52	94.6

W

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	1.1	90
2	1.5	94
3	1.7	95
4	1.75	96
5	1.70	96
6	1.80	96
7	1.6	95
8	1.65	95
9	1.50	96
10	1.50	96
11	1.60	96
12	1.70	97
13	1.90	96
14	1.90	96
15	2.10	96
16	2.10	96
17	2.10	96
18	1.80	96
AVERAGE	1.87	95.4

EPA (Dur) 233
4/72

ΔP 1.61 T 95

SAMPLING TASK LOG

Plant Augusta Georgia Columbia Nitrogen
Date 8/12/80

Plant Location
Recorded by JDA

Comments	Run	Sampling location (Port)	Pollutant	Clock Time Began	Clock Time Ended	Elapsed Time (min)	Sample Nos.
SET UP AND LEAK TESTED AT 0915	1			1			
Ready to go				~~1052~~			
START TEST #1 OUTLET SCRUBBER		PORT WEST		1052	1804	72	
PRILL TOWER							
CHANGE PORTS FORM WEST TO SOUTH		PORT SOUTH		1806	18	72	
DONE WITH TEST #1 SCRUBBER OUTLET							
Start test #2 OUTLET SCRUBBER	2	Port West		1530	1642	72	
change Ports from west to South				1642	1645		
Done with Test #1 Scrubber Outlet				1645	1757	72	

FIELD DATA SHEETS PAGE #1 of 3

Firm Name: Columbia Nitrogen
Plant Location: Augusta Georgia
Test No.: 1 PT
Sampling Location: Scrubber Outlet
TRC Project No.: 1430-EDA-20
Date: 8/12/80
Tester: EDA / GAG

Pump No.: —
Orifice No.: D-8
Ambient Temp: 90 °F
Bar Press: 29.78 "Hg
Probe Ident. No.: 37
Filter Ident. No.: None
Duct Area: 12.83 ft² DIA — 48.5"

Nozzle No. & Dia.: 4-5 0.1255 in.
Assumed Moisture: 4 5.5 %
Test Duration: 144 min.
Traverse Point Interval: 4 min.
Probe Heater Setting: — amps
Filter Temp. Setting: N/A
Dry Gas Meter Y: 1.00

Nomograph C Factor: 1.1
Pitot Coefficient: 0.846
Orifice ΔH@: 1.94
Test Start Time: 1052
Test End Time: 1318
Leak Test Start: 0.000 CFM @ -8 "Hg
Leak Test Final: 0.010 CFM @ -7 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M Out °F	P_{STACK} in H_2O	T_{STACK} °F	Initial Metric Volume cu. ft.	Probe	Cyc. Angle	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	Sample Line O_2 Conc. %
W	1	4	1.3	3.6	93	95	-.64	88	132633	3		NONE	49	1	98	10.3
	2	10	1.5	4.1	92	95		89	134011				49	1	96	10.0
	3	16	1.6	4.4	92	96		95	135544				48	2	105	10.5
	4	17	1.7	4.7	92	96		95	136955				48	2	110	10.6
	5	17	1.7	4.7	93	96		95	138347				48	2	101	10.5
	6	17	1.7	4.7	93	96		94	140044				48	2	101	10.4
	7	17	1.7	4.7	94	97		95	141666				48	2	108	10.5
	8	16	1.6	4.4	93	97		94	143112				48	2	112.5	10.3
	9	15	1.5	4.1	93	97		94	144461				48	2	112	10.5
	10	14	1.4	3.8	93	97		94	146088				48	1	105	10.6
	11	16	1.6	4.4	93	97		93	147466				49	2	111	10.4
	12	17	1.7	4.7	93	97		93	148966				50	2	110	10.4
	13	18	1.8	4.9	92	97		94	150505				50	2	111	10.4
	14	19	1.9	5.2	92	97		95	152072				50	2	111	10.4
	15	20	1.9	5.5	92	97		95	153710				50	2.5	111	10.4

Probe Wash: _____ Cleaning Patch: _____
Silica Gel: 8.3g H_2O Collected: 70 mls
Silica Gel Cond.: ____ H_2O Condition: _____

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

FIELD DATA SHEETS PAGE #2 of 3

Firm Name Columbia Nitrogen | Pump No. — | Nozzle No. & Dia. 4-5 01255 in. | Nomograph C Factor 1.1

Plant Location Augusta Georgia | Orifice No. D-8 | Assumed Moisture 5.5 % | Pitot Coefficient 0.846

Test No. 1 | Ambient Temp 90 °F | Test Duration 144 min. | Orifice ΔH_A 1.94

Sampling Location Scrubber Outlet | Bar Press 29.78 "Hg | Traverse Point Interval 4 min. | Test Start Time 1052

TRC Project No. 430-EEO-20 | Probe Ident. No. 37 | Probe Heater Setting — amps | Test End Time 1318

Date 8/12/20 | Filter Ident. No. None | Filter Temp. Setting N/A | Leak Test Start .000 CFM @ -8 "Hg

Tester EPA | Duct Area 12.83 ft² | Dry Gas Meter Y 1.00 | Leak Test Final 0.010 CFM @ -7 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M Out °F	P_{STACK} in H_2O	T_{STACK} °F	Initial Metric Volume cu. ft.	PROBE	Cyc. Angle #	Sample Line Heater Box Temp. TEMP	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. %
4	W 16	4 0	2 1	0 5 7	9 3	9 7	-6 4	9 4	1 5 5 3 6	8		104	48	3.0	111	
8	17		2 0	0 5 4	9 3	9 7		9 5	1 5 7 0 6			104	48	3.0	110	
12	18		1 7	0 4 7	9 4	9 8		9 5	1 5 8 7 2			104	48	~~3.0~~ 2.5	111	
4									1 6 0 2 8							110.4
20	S 1	4 0	1 1	0 3 0	9 5	9 8	-6 0	9 2	1 6 0 2 8			99	48	2.5	110	110.6
4	2		1 2	0 3 3	9 5	9 9		9 6	1 6 1 5 5			108	48	2.5	115	
12	3		1 3	0 3 6	9 5	9 9		9 5	1 6 2 8 8			106	48	2.5	114	
16	4		1 3	0 3 6	9 5	9 9		9 4	1 6 4 2 6			106	48	2.0	114	
20	5		1 4	0 3 8	9 5	9 9		9 5	1 6 5 6 4			107	50	2.0	113	
24	6		1 3	0 3 6	9 4	9 9		9 5	1 6 7 0 6			107	52	2.0	113	
28	7		1 4	0 3 8	9 4	9 8		9 5	1 6 8 4 5			107	52	2.0	114	
32	8		1 4 0	0 3 8	9 4	9 9		9 4	1 6 9 8 5			108	52	2.0	114	
36	9		1 4 0	0 3 8	9 4	9 8		9 4	1 7 1 2 6			105	52	2.0	111	
40	10		1 5 0	0 4 0	9 4	9 8		9 5	1 7 2 6 7			105	52	~~2.0~~ 2.0	112	
41	11		1 6	0 4 4	9 5	9 8		9 5	1 7 4 1 3			105	54	2.0	112	

0.45

Probe Wash _____ Cleaning Patch _____

Silica Gel 8.3g H_2O Collected 70 mls

Silica Gel Cond. ____ H_2O Condition _____

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

FIELD DATA SHEETS PAGE # 3 of 3

Firm Name: Columbia Nitrogen
Plant Location: Augusta Georgia
Test No.: 1
Sampling Location: Scrubber Outlet
TRC Project No.: 1430-EDA-20
Date: 8/12/80
Tester: EDA

Pump No.: —
Orifice No.: D-8
Ambient Temp: 90 °F
Bar Press: 29.78 "Hg
Probe Ident. No.: 37
Filter Ident. No.: NONE
Duct Area: 12.83 ft²
DIA 48.5 in

Nozzle No. & Dia.: 4-5 0.1255 in.
Assumed Moisture: 5.5 %
Test Duration: 144 min.
Traverse Point Interval: 4 min.
Probe Heater Setting: — amps
Filter Temp. Setting: N/A
Dry Gas Meter Y: 1.00

Nomograph C Factor: 1.1
Pitot Coefficient: 0.846
Orifice ΔH$_A$: 1.94
Test Start Time: 1052
Test End Time: 1318
Leak Test Start: 0.000 CFM @ -8 "Hg
Leak Test Final: 0.010 CFM @ -7 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M Out °F	P_{STACK} in H_2O	T_{STACK} °F	Initial Metric Volume cu. ft.	PROBE	Cyc. Angle °	Sample Line Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. %
48	12	4.0	1.6	0.44	95	99	-.6	95	175653	3		104	54	2.0	112	
52	13		1.8	0.49	95	99		96	177166			106	54	2.0	112	
56	14		1.7	0.465	94	99		95	178175			105	54	2.0	111	
W	15		2.1	0.570	94	98		95	180324			105	54	2.5	110	
4	16		2.15	0.580	94	99		96	182201			106	56	2.5	110	
8	17		2.2	0.60	94	99		95	183733			105	56	2.5	112	
12	18		2.1	0.57	95	99		96	185488			105	56	2.5	111	
									187188	↓						
		1.276		0.45	95.6		-0.62	94.3	54.55							

Probe Wash: ____ Cleaning Patch: ____
Silica Gel: 8.3g H_2O Collected: 70 ml's
Silica Gel Cond.: ____ H_2O Condition: ____

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

FIELD DATA SHEETS PAGE #1 of 3

Firm Name: Columbia Nitrogen | Pump No.: — | Nozzle No. & Dia.: 4-S 0.1255 in. | Nomograph C Factor: 1.10
Plant Location: Augusta Georgia | Orifice No.: D-8 | Assumed Moisture: 5.5 % | Pitot Coefficient: 0.846
Test No.: 2 | Ambient Temp: °F | Test Duration: 144 min. | Orifice ΔH_A: 1.94
Sampling Location: Scrubber Outlet | Bar Press: 29.75 "Hg | Traverse Point Interval: 4 min. | Test Start Time: 1530
TRC Project No.: 1420-000-20 | Probe Ident. No.: 37 | Probe Heater Setting: — amps | Test End Time: 1757
Date: 8/18/80 | Filter Ident. No.: NONE | Filter Temp. Setting: — | Leak Test Start: 0.010 CFM @ -7 "Hg
Tester: EDA/GAG | Duct Area: 12.83 ft² | Dry Gas Meter Y: 1.00 | Leak Test Final: 0.007 CFM @ -6 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M Out °F	P_{STACK} in H_2O	T_{STACK} °F	Initial Metric Volume cu. ft.	PROBE	Cyc. Angle ϕ	SAMPLE LINE Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. %
W	1	4	1.4	.39	102	100	-.73	91	187.344	3		104	48	2.0	114	
	2		1.6	.45	99	102		93	188.771			104	48	2.0	118	
	3		1.7	.48	98	102		93	190.330			106	48	2.0	115	
	4		1.8	.50	98	102		92	191.887			106	50	2.0	114	
	5		1.8	.50	98	102		93	193.466			106	50	2.0	114	
	6		1.7	.48	98	102		94	195.071			107	50	2.0	113	
	7		1.7	.48	98	102		93	196.663			107	52	2.0	113	
	8		1.6	.45	98	102		95	198.20			107	52	2.0	113	
	9		1.5	.42	99	103		95	199.74			107	52	2.0	114	
	10		1.5	.42	99	103		94	201.23			107	54	2.0	111	
	11		1.6	.45	99	103		95	202.71			102	56	2.0	112	
	12		1.7	.48	99	103		95	204.24			102	56	2.0	112	
	13		1.8	.50	99	103		93	205.84			103	56	2.0	113	
	14		2.0	.56	99	102		93	207.46			105	56	2.0	112	
	15		2.0	.56	98	102		93	209.16			105	48	2.0	112	

Probe Wash: | Cleaning Patch:
Silica Gel: 8g | H_2O Collected: 31 mls
Silica Gel Cond.: | H_2O Condition:

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1			20.6		77.4
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

FIELD DATA SHEETS PAGE #2 of 3

Firm Name: Columbia Nitrogen
Plant Location: Augusta Georgia
Test No.: 2
Sampling Location: Scrubber Outlet
TRC Project No.: 1430-EBO-20
Date: 8/12/80
Tester: EDA / GAG

Pump No.: —
Orifice No.: D-8
Ambient Temp: °F
Bar Press: 29.75 "Hg
Probe Ident. No.: 37
Filter Ident. No.: none
Duct Area: 18.87 ft²

Nozzle No. & Dia.: 4-5 .0125 in.
Assumed Moisture: 5.5 %
Test Duration: min.
Traverse Point Interval: 3 min.
Probe Heater Setting: — amps
Filter Temp. Setting: —
Dry Gas Meter Y: 1.00

Nomograph C Factor:
Pitot Coefficient: 0.846
Orifice ΔH_A: 1.94
Test Start Time: 1503
Test End Time: 1537
Leak Test Start: 0.10 CFM @ -7 "Hg
Leak Test Final: 0.007 CFM @ -5 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M Out °F	P_{STACK} in H_2O	T_{STACK} °F	Initial Metric Volume cu. ft.	PROBE	Cyc. Angle °	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. %
W	16	4	21	59	98	102	-.73	93	210873	3		104	48	2.0	111	
	17		20	56	99	103		95	212607			103	48	2.0	112	
	18		18	50	98	103		93	214317			107	48	2.0	110	
									215927							
S	1		11	30	99	103	-.75	93	215922			103	48	2.0	111	.45
	2		12	33	99	103		93	217227			102	48	2.0	120	
	3		12	33	98	103		92	218555			102	49	2.0	114	
	4		13	37	99	103		93	219899			102	49	2.0	116	
	5		13	37	99	103		92	221330			101	51	2.0	116	
	6		14	39	99	103		91	222711			100	52	2.0	114	
	7		13	37	100	104		93	224115			102	52	2.0	116	
	8		13	37	100	104		94	225566			103	52	2.0	116	
	9		15	42	100	103		94	226977			104	50	2.0	116	
	11		16	45	99	102		93	228466			102	50	2.0	113	
	11		165	465	98	102		93	230000			104	50	2.0	112	

Probe Wash: Cleaning Patch:
Silica Gel: 8g H_2O Collected: 31 mls
Silica Gel Cond.: H_2O Condition:

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

FIELD DATA SHEETS PAGE # 3 of 3

Firm Name: Columbia Nitrogen
Plant Location: Augusta, Georgia
Test No.: 2
Sampling Location: Stack Outlet
TRC Project No.: 1430-E80-20
Date: 8/12/80
Tester: EDA / GAG

Pump No.: —
Orifice No.: D-B
Ambient Temp: °F
Bar Press: 29.75 "Hg
Probe Ident. No.: 37
Filter Ident. No.: None
Duct Area: 18.83 ft²

Nozzle No. & Dia.: 4.5 0.1255 in.
Assumed Moisture: 5.5 %
Test Duration: 144 min.
Traverse Point Interval: 9 min.
Probe Heater Setting: — amps
Filter Temp. Setting: —
Dry Gas Meter Y: 1.00

Nomograph C Factor: 1.1
Pitot Coefficient: 0.846
Orifice ΔH_A: 1.91
Test Start Time: 1503
Test End Time: 1757
Leak Test Start: 0.10 CFM @ -7 "Hg
Leak Test Final: 0.005 CFM @ -5 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M Out °F	P_{STACK} in H_2O	T_{STACK} °F	Initial Metric Volume cu. ft.	Probe	Cyc. Angle °	Sample Line Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. %
3	12	4	1.8	0.50	98	102	-.75	94	231563			105	48	2.0	115	
	13		1.8	0.50	98	102		93	233318			102	48	2.0	115	
	14		1.9	0.53	99	103		94	234880			103	48	2.0	115	
	15		2.1	0.59	99	103		93	236441			104	48	2.0	114	
	16		2.0	0.55	99	103		94	238022			104	48	2.0	115	
	17		2.0	0.55	99	103		94	239509			104	48	2.0	114	
	18		2.0	0.55	98	102		92	241061			104	48	2.0	114	
									243281	Y						
			1.28	0.464	100.7		-.74	93.3	55.94							

Probe Wash: ____ Cleaning Patch: ____
Silica Gel: 8g H_2O Collected: 3 lbs
Silica Gel Cond.: ____ H_2O Condition: ____

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

SAMPLIN. TASK LOG

Plant Columbia Nitrogen
Date 8/13/00

Plant Location Augusta Georgia
Recorded by EDA

Comments	Run	Sampling location (Port)	Pollutant	Clock Time Began	Clock Time Ended	Elapsed Time (min)	Sample Nos.
Already to Start testing at 0837							
Start Test #3 on Scrubber Outlet	3	west		0857	1009	72	
Stop P change ports from west to South				1009			
Start up Test #3 on Port South		South		1012	1124	72	
At HALF WAY POINT we did pro form a Pitot tube leak check and they did check ok							
End Test #3 at				1124			

TRC Environmental Consultants, Inc.

FIELD DATA SHEET PAGE #1 of 3

Firm Name Columbia Nitrogen
Plant Location Augusta Georgia
Test Number 3
Sampling Location Scrubber Outlet Prill Tower
TRC Project No. 1430-EPA-20
Date 8/13/20
Tester EPA/GAG

Orifice No. D-8
Ambient Temp. 85 °F
Bar. Press. 29.71 "Hg
Probe Ident. No. 37
Filter Ident. No. none
Duct Area 12.83 ft²
DIA 48.6 in

Nozzle No. & Dia. 4-5 0.1265 in.
Assumed Moisture 6 %
Test Duration 144 min.
Traverse Point Interval 3 min.
Probe Heater Setting °F
Filter Temp. Setting N/A °F
Dry Gas Meter Y 1.00

Nomograph C Factor 0.96
Pitot Coefficient 0.846
Orifice ΔH_A 1.94
Test Start Time 0857
Test Final Time 1124
Leak Test Start 0.000 CFM @ -8 "Hg
Leak Test Final 0.001 CFM @ -7 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	PROBE	Cyc. Angle ϕ	Sample Line Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %
W	1	4.0	1.5	3.6	81	82	-.56	91	243387	3		100	44	1.0	116		
4	2		1.6	3.8	81	83		93	244473			105	44	1.0	117		
4	3		1.6	3.8	81	83		94	246077			107	44	1.0	111		
8	4		1.7	4.1	81	84		94	247145			107	44	1.0	112		
12	5		1.7	4.1	81	84		94	248900			101	45	1.0	111		
16	6		1.7	4.2	81	84		94	250634			105	45	1.0	111		
20	7		1.7	4.1	81	85	-.66	94	251178			108	46	1.0	111		
24	8		1.65	4.0	82	86		95	253233			107	46	1.0	110		
28	9		1.6	3.8	82	86		94	254666			107	46	1.0	109		
32	10		1.5	3.6	83	87		95	256067			107	46	1.0	110		
36	11		1.6	3.8	84	87		95	257447			101	44	1.0	110		
40	12		1.7	4.1	84	88		94	258844			103	44	1.0	111		
44	13		1.8	4.3	84	88	-.69	95	260300			105	44	1.0	110		
48	14		1.9	4.6	84	89		95	261788	Y		103	44	1.0	115		
Average			$\Sigma\sqrt{\Delta P}$														

H_2O Collected 411 ml
SG Condition
SG Weight 665 gm
Total Volume Collected 975 ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2

COMMENTS:

TRC Environmental Consultants, Inc.

FIELD DATA SHEET PAGE #2 of 3

Firm Name Columbia Nitrogen
Plant Location Augusta, Georgia
Test Number 3
Sampling Location Scrubber Outlet / Kill Towers
TRC Project No. 1430-EBN-20
Date 8/13/88
Tester EDA / GNG

Orifice No. D-B
Ambient Temp. 85 °F
Bar. Press. 29.71 "Hg
Probe Ident. No. B7
Filter Ident. No. none
Duct Area ____ ft²

Nozzle No. & Dia. 4-5 0.1255 in.
Assumed Moisture 6 %
Test Duration 144 min.
Traverse Point Interval 3 min.
Probe Heater Setting ____ °F
Filter Temp. Setting N/A °F
Dry Gas Meter Y 1.00

Nomograph C Factor 0.96
Pitot Coefficient 0.846
Orifice ΔH_A 1.94
Test Start Time 0857
Test Final Time 1124
Leak Test Start 0.000 CFM -6 "Hg
Leak Test Final 0.001 CFM -7 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	PROBE	Cyc. Angle β	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %	
W	15	4	20	0.48	84	86	-.69	95	263322	3		106	44	1.0	116			
	16		20	0.48	85	89		94	264488			107	46	1.0	115			
	17		20	0.48	85	89		95	266455			107	46	1.0	116			
	18		18	0.43	86	91	-.70	95	268022			106	46	1.0	115			1009
									269532									
S	1	4	11	0.265	88	92	-.45	94	269532			106	44	1.0	113			1012
	2		12	0.29	89	93		94	270771			106	44	1.0	118			
	3		12	0.29	89	93		94	272202			107	45	1.0	111			
	4		13	0.31	89	93		95	273328			106	44	1.0	113			
	5		13	0.31	90	94		94	274599			106	44	1.0	112			
	6		13	0.31	90	95		95	275841			106	44	1.0	112			
	7		13	0.31	91	95	-.53	94	277223			106	45	1.0	112			
	8		13	0.31	91	96		95	278555			105	45	1.0	110			
	9		13.5	0.32	91	96		94	279871	Y		104	45	1.0	110			
Average			$\Sigma\sqrt{\Delta P}$															

H_2O Collected 41 ml
SG Condition ____
SG Weight 6.5 gm
Total Volume Collected 47.5 ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2

COMMENTS: Did a Pitot tube leak check halfway through with this test. It was o.k.

TRC Environmental Consultants, Inc.

FIELD DATA SHEET

PAGE #3 of 3

Firm Name Columbia Nitrogen
Plant Location Augusta Georgia
Test Number 3
Sampling Location Sulphur Outlet Mill Tower
TRC Project No. 1730-E80-20
Date 8/13/80
Tester EDA KAG

Orifice No. D-8
Ambient Temp. 85 °F
Bar. Press. 29.71 "Hg
Probe Ident. No. 37
Filter Ident. No. None
Duct Area 1 ft²

Nozzle No. & Dia. 4-5 0.1255 in.
Assumed Moisture 6 %
Test Duration 144 min.
Traverse Point Interval 3 min.
Probe Heater Setting °F
Filter Temp. Setting N/A °F
Dry Gas Meter Y 1.00

Nomograph C Factor 0.96
Pitot Coefficient 0.846
Orifice ΔH_A 1.94
Test Start Time 0857
Test Final Time 1124
Leak Test Start 0.000 CFM@ -8 "Hg
Leak Test Final 0.001 CFM@ -7 "Hg

Port	Point	Time Min. (3-5)	Velocity ΔP in H_2O (6-10)	ΔH in H_2O (12-15)	T_M in °F (18-20)	T_M out °F (23-25)	P_{Stack} in H_2O (26-30)	T_{Stack} °F (32-35)	Gas Sample Volume cu. ft. (40-45)	PROBE (50)	Cyc. Angle Ø (52-53)	Sample Line ~~Heater Box~~ Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %
S	10	4	15	036	92	95	-53	95	28120	3		105	45	1.0	110		
	11		17	041	92	97		94	28261			106	48	1.0	112		
	12		17	041	92	98		95	28410			106	46	1.0	112		
	13		17	041	93	98	-68	95	28559			106	46	1.0	111		
	14		19	045	92	98		95	28707			105	46	1.0	110		
	15		19	045	93	99		95	28861			105	46	1.0	110		
	16		19	045	93	99		95	29016			105	48	1.0	110		
	17		19	045	93	99		95	29172			105	48	1.0	111		
	18		19	045	94	100	-69	95	29329			105	48	1.0	111		
									29483								
									5145								
Average			$\Sigma\sqrt{\Delta P}$ 12708	0389	89	.07	-62	94									

H_2O Collected 41 ml
SG Condition
SG Weight 6.5 gm
Total Volume Collected 47.5 ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2

COMMENTS:

APPENDIX C.2

PREDRYER/DRYER (PREDRYER INLET, DRYER INLET, OUTLET)

Columbia

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT NITROGEN
DATE 9/5/80
SAMPLING LOCATION PREDRYER
INSIDE OF FAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE A) _____
INSIDE OF NEAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE B) _____
STACK I.D., (DISTANCE A - DISTANCE B) 48"
NEAREST UPSTREAM DISTURBANCE _____
NEAREST DOWNSTREAM DISTURBANCE _____
CALCULATOR EOA

SCHEMATIC OF SAMPLING LOCATION

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8 INCH)	DISTANCE B	TRAVERSE POINT LOCATION FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
1	1.1	48 in	1.00		
2	3.2		1.54		
3	5.5		2.64		
4	7.9		3.79		
5	10.5		5.04		
6	13.2		6.34		
7	16.1		7.73		
8	19.4		9.31		
9	23.0		11.04		
10	27.0		12.96		
11	32.3		15.50		
12	39.8		19.1		
13	60.2		28.89		
14	67.7		32.49		
15	72.8		34.94		
16	77.0		36.96		
17	80.6		38.69		
18	83.9		40.27		
19	86.8		41.66		
20	89.5		42.96		
21	92.1		44.21		
22	94.5		45.36		
23	96.8		46.46		
24	98.9		~~47~~ 47.00		

EPA (Dur) 232
4/72

PRELIMINARY VELOCITY TRAVERSE

PLANT Columbia Nitrogen
DATE 8/13/80
LOCATION Predryer INLET
STACK I.D. 48 in
BAROMETRIC PRESSURE, in. Hg ~~29.17 29.98~~ 29.80
STACK GAUGE PRESSURE, in. H_2O
OPERATORS EPA /
Cp

SCHEMATIC OF TRAVERSE POINT LAYOUT

B

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1		
2		
3		
4	1.6	144
5	1.6	145
6	1.5	146
7	1.6	146
8	1.5	146
9	1.4	147
10	1.4	148
11	1.3	148
12	1.2	149
13	1.1	149
14	1.1	149
15	.95	149
16	.85	149
17	.76	149
18	.70	149
19	.6	149
20	.6	149
21	.45	149
22	.40	149
23	.40	149
24	.35	149
AVERAGE	0.96	147.9

A

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1		
2		
3		
4	.8	148
5	1.1	148
6	1.2	148
7	1.2	148
8	1.2	149
9	1.3	149
10	1.2	150
11	1.3	150
12	1.2	150
13	1.2	150
14	1.2	150
15	1.3	150
16	1.2	150
17	1.2	150
18	1.3	150
19	1.2	150
20	1.1	150
21	1.1	150
22	1.0	150
23	1.1	150
24	1.1	150
AVERAGE	1.16	149.5

PRELIMINARY VELOCITY TRAVERSE

PLANT COLUMBIA NITROGEN
DATE 8/14/80
LOCATION PREDRYER
STACK I.D. 48 in
BAROMETRIC PRESSURE, in. Hg 29.84
STACK GAUGE PRESSURE, in. H_2O −2.8
OPERATORS EDA / GAG
Cp 0.825

V_S = 3729 ft/min
Q_S = 48,972 acfm
Q_{STD} = 39,940 dscfm

PROBE P-3 PORT B

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	1.1	149
2	1.1	149
3	1.4	149
4	1.4	150
5	1.5	148
6	1.5	149
7	1.6	149
8	1.4	152
9	1.5	153
10	1.4	153
11	1.4	152
12	1.3	150
13	1.2	152
14	1.2	152
15	1.1	152
16	.95	152
17	.85	152
18	.79	152
19	.7	153
20	.65	152
21	.57	152
22	.50	152
23	.43	152
24	.40	152
AVERAGE		

SCHEMATIC OF TRAVERSE POINT LAYOUT

PORT A

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	.64	148
2	.62	148
3	.70	148
4	.85	149
5	.93	146
6	.94	150
7	.99	151
8	1.00	152
9	1.1	152
10	1.2	153
11	1.2	153
12	1.2	152
13	1.2	152
14	1.3	152
15	1.2	152
16	1.3	153
17	1.3	152
18	1.4	152
19	1.3	152
20	1.4	152
21	1.3	148
22	1.3	151
23	1.3	151
24	1.1	151
AVERAGE	TA 1.036	151

EPA (Dur) 233
4/72

SAMPLING TASK LOG

Plant Columbia Nitrogen
Date 8/14/86

Plant Location Augusta Georgia
Recorded by EDA

Comments	Run	Sampling location (Port)	Pollutant	Clock Time Began	Clock Time Ended	Elapsed Time (min)	Sample Nos.
Start Port B at Predryer Inlet	1	B		1186	1200	24	
Finish at 1200 Port B		"		"	1200		
changed Ports		A		1236	1300	24	
Finished Port A at		"			1300		
Start Port A, Test 2 at	2	A		1539	1603	24	
Finish Port A changed to Port B		"		1606	1630	24	
Finish Port B and Finished Port B		B			1630		
Start Test #3 Predryer at Port A	3	A		1837	1901 1603	24	
change Ports from Port A to Port B					1901 1603		
finish Port B and Finished Test #3		B		1906	1930	24	

FIELD DATA SHEETS

PAGE #1 of 4

1-2 02609

Firm Name Columbia Nitrogen — Pump No. — Nozzle No. & Dia. 4-L 0.195 in. — Nomograph C Factor 1.05

Plant Location Augusta Georgia — Orifice No. D-8 — Assumed Moisture 5 % — Pitot Coefficient 0.825

Test No. 4 — Ambient Temp °F — Test Duration 144 min. — Orifice ΔH_A 1.94

Sampling Location Recycle Inlet — Bar Press 29.88 "Hg — Traverse Point Interval 5 min. — Test Start Time 1131

TRC Project No. 1430-E80- — Probe Ident. No. 29 — Probe Heater Setting amps — Test End Time 1300

Date 8/14/80 — Filter Ident. No. None — Filter Temp. Setting — Leak Test Start .004 CFM@ -8 "Hg

Tester EDA/GAG — Duct Area 12.57 ft² — Dry Gas Meter Y 1.00 — Leak Test Final 0 CFM@ "Hg

DIA 48in

Nozzle

1-2

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M In °F	T_M Out °F	P_{STACK} in H_2O	T_{STACK} °F	Initial Metric Volume cu. ft.	PROBE	Cyc. Angle ϕ	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. %
A	#1		1.50	2.10					28 5 5 6							
	2															
	#1	1	1.1	30	98	93	33	149	295451			105	50	5	148	
	#2	1	1.1	34	88	93		149	296550			109	50		148	
	#3	1	1.4	34	88	93		149	297502			112	50		151	
	#4	1	1.4	34	88	92		150	298473			119	50		157	
	#5	1	1.5	33	88	93		148	299483			140	50	6	157	
	#6	1	1.5	33	88	93		149	300382			139	50	16	163	
	#7	1	1.6	33	88	93		149	301347			161	50		173	
	#8	1	1.4	33	88	93		152	302299			156	60		183	
	#9	1	1.5	33	88	92		153	303336			152			191	
	#10	1	1.4	33	89	93		153	304222			161			199	
	#11	1	1.4	33	89	92		152	305188			165			201	
	#12	1	1.3	32	89	92		150	306127			165			193	
	#13	1	1.2	32	89	92		152	307074			153				

Probe Wash — Cleaning Patch

Silica Gel 6.2g — H_2O Collected 42mls

Silica Gel Cond. — H_2O Condition

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

FIELD DATA SHEETS

PAGE # 2 of 4

Firm Name: Columbia Nitrogen	Pump No.:	Nozzle No. & Dia.: 1-2 0.2605		Nomograph C Factor: 1.05	
Plant Location: Augusta Georgia	Orifice No.: D-83	Assumed Moisture: 5 %		Pitot Coefficient: 0.825	
Test No.: 4	Ambient Temp: °F	Test Duration: 144 min.		Orifice ΔH_A: 1.94	
Sampling Location: Prodryer Inlet	Bar Press: 29.66 "Hg	Traverse Point Interval: 5 min.		Test Start Time: 1136	
TRC Project No.: 1450-EBO-20	Probe Ident. No.: 29	Probe Heater Setting: amps		Test End Time: 1300	
Date: 8/14/80	Filter Ident. No.: None	Filter Temp. Setting:		Leak Test Start: 604 CFM@ -6 "Hg	
Tester: EDA / GAG	Duct Area: 12.57 ft²	Dry Gas Meter Y: 1.00		Leak Test Final: 0 CFM@ "Hg	
	P.A. 48 in				

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M Out °F	P_{STACK} in H_2O	T_{STACK} °F	Initial Metric Volume cu. ft.	PROBE	Cyc. Angle °	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. %
	1	10	1.2	3.2	89	92		152	308.62	1		162			189	
	2	5	1.1	3.2	89	92		152	308.96			164			189	
	3		0.95	3.2	90	92		153	310.00			163			188	
	4		0.85	3.4	90	92		152	310.90			162			188	
	5		0.79	3.3	90	92		152	311.87			160			187	
	6		0.70	3.4	90	92		152	312.81			162			187	
	7		0.65	3.4	90	92		152	313.76			162			188	
	8		0.57	3.4	91	92		152	314.73			165				
	9		0.50	3.4	91	92		152	315.72			165			177	
	10		0.43	3.4	91	92		152	316.65			158				
	11		0.40	3.4	91	93		152	317.62			154				
1200																
1236	1	10	0.64	3.6	89	94		148	317.62			160				
	2	5	0.62	3.6	90	94		148	319.60			156			179	
	3		0.70	3.6	90	94		148	320.61			154			172	

Probe Wash: Cleaning Patch:

Silica Gel: 6.2g H_2O Collected: 42mls

Silica Gel Cond.: H_2O Condition:

ORS Measurements

	Time	O_2	CO	N_2
1				
2				
3				

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

FIELD DATA SHEETS

PAGE #3 of 4

Firm Name: Columbia Nitrogen
Plant Location: Augusta Georgia
Test No.: 4
Sampling Location: Reformer Inlet
TRC Project No.: 1450-180-20
Date: 8/14/80
Tester: EDA / GAG

Pump No.:
Orifice No.: D-8
Ambient Temp: °F
Bar Press: 29.68 "Hg
Probe Ident. No.: 29
Filter Ident. No.: NO.1E-
Duct Area: 12.57 ft²

Nozzle No. 6 Dia.: ~~0.615~~ 0.2605 in.
Assumed Moisture: 5 %
Test Duration: 144 min.
Traverse Point Interval: 3 min.
Probe Heater Setting: amps
Filter Temp. Setting:
Dry Gas Meter Y: 1.00

Nomograph C Factor: 1.05
Pitot Coefficient: 0.825
Orifice ΔH$_A$: 1.94
Test Start Time: 1136
Test End Time: 1300
Leak Test Start: 0.001 CFM@ -8 "Hg
Leak Test Final: CFM@ "Hg

Port	Point	3 4 5 Time Min.	9 10 city P H_2O	12 13 14 15 ΔH in H_2O	18 19 20 T_M in °F	23 24 25 T_M Out °F	26 27 28 29 30 P_{STACK} in H_2O	32 33 34 35 T_{STACK} °F	40 41 42 43 44 45 Initial Metric Volume cu. ft.	50 PROBE	52 53 Cyc. Angle ϕ	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. %
	1	1	8 5	3.6	90	94	-2.80	149	32161	i		152		6	170	
	2	3	9 3	3.6	90	94		146	32261	)		156			170	
	3	6	9 4	3.6	90	94		150	32361	(		156			169	
	4	7	9 9	3.6	90	94		151	32460			157			169	
	5	8	10 0	3.6	90	94		152	32560			154			169	
	6	9	11	3.6	90	94		152	32660			155			169	
	7	10	12	3.6	91	94		153	32760			155			168	
	8	11	12	3.6	90	94		153	32860			152			170	
	9	12	12	3.6	91	95		152	32960			154			168	
	10	13	12	3.6	91	94		152	33060			154			168	
	11	14	13	3.6	90	94		152	33157			146			169	
	12	15	12	3.6	90	94		152	33257			150			170	
	13	16	13	3.6	91	94		153	33357			151		6	167	
	14	17	13	3.6	91	94		152	33456			151			166	
	15	18	14	3.6	91	94		152	33556	V		158			166	

Probe Wash: Cleaning Patch:
Silica Gel: 6.2g H_2O Collected: 42mls
Silica Gel Cond.: H_2O Condition:

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

FIELD DATA SHEETS

Firm Name: Columbia Nitrogen
Plant Location: Augusta Georgia
Test No.: 4
Sampling Location: Feed Dryer Inlet
TRC Project No.: 1430-080-20
Date: 8/14/20
Tester: EDA/CAG

Pump No.:
Orifice No.: D-8
Ambient Temp: °F
Bar Press: 29.88 "Hg
Probe Ident. No.: 29
Filter Ident. No.: none
Duct Area: 12.57 ft²

Nozzle No. & Dia.: #1 0.915 in.
Assumed Moisture: 5 %
Test Duration: 144 min.
Traverse Point Interval: 3 min.
Probe Heater Setting: amps
Filter Temp. Setting:
Dry Gas Meter Y: 1.00

Nomograph C Factor: 1.05
Pitot Coefficient: 0.825
Orifice ΔH$_A$: 1.94
Test Start Time: 1136
Test End Time: 1300
Leak Test Start: CFM@ "Hg
Leak Test Final: 0.0 CFM@ "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M Out °F	P_{STACK} in H_2O	T_{STACK} °F	Initial Metric Volume cu. ft.	PROBE	Cyc. Angle °	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. %
	21	1	1.3	3.6	91	94		152	336.556	1		160	50	6	170	
	22		1.4	3.6	91	94		152	337.055			163			175	
	23		1.3	3.6	91	94		148	337.555			161			165	
	24		1.3	3.6	91	94		151	338.055			159			165	
	23		1.3	3.6	92	94		151	340.055			159			160	
	24		1.1	3.6	92	94		151	341.054			159			166	
	1								342.050							
				3.4	6											

91.5 47.05

Probe Wash: Cleaning Patch:
Silica Gel: 6.2g H_2O Collected: 4.2 mls
Silica Gel Cond.: H_2O Condition:

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

TRC Environmental Consultants, Inc.

PAGE 1 of 4

FIELD DATA SHEET

Firm Name: Columbia Nitrogen
Plant Location: Augusta GA
Test Number: 5
Sampling Location: Predryer Inlet / Prill Dryer
TRC Project No.: 1430-E80-20
Date: 8-14-90
Tester: EDA

Orifice No.: D-8
Ambient Temp.: 93 °F
Bar. Press.: 29.84 "Hg
Probe Ident. No.: 29
Filter Ident. No.: None
Duct Area: 12.57 ft²

Nozzle No. & Dia.: 1-2 0.205 in.
Assumed Moisture: 5 %
Test Duration: 45 min.
Traverse Point Interval: 1 min.
Probe Heater Setting: 180 °F
Filter Temp. Setting: 0.4 °F
Dry Gas Meter Y: 1.00

Nomograph C Factor: 1.05
Pitot Coefficient: 0.825
Orifice ΔH_A: 1.94
Test Start Time: 1539
Test Final Time: 1630
Leak Test Start: 0.000 CFM@ -4 "Hg
Leak Test Final: 0.002 CFM@ -10 "Hg

Port	Point	Time Min. (3-5)	Velocity ΔP in H_2O (6-10)	ΔH in H_2O (12-15)	T_M in °F (18-20)	T_M out °F (23-25)	P_{Stack} in H_2O (26-30)	T_{Stack} °F (32-35)	Gas Sample Volume cu. ft. (40-45)	PROBE (50)	Cyc. Angle Ø (52-53)	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %
A	1	10	64	44	93	95	-28	148	34262			157	50	8			
	2		62	44	93	95		148	34374			160					
	3		70	44	93	95		148	34487			160			177		
	4		85	44	93	95		147	34598			164			189		
	5		93	44	93	95		146	34708			165			191		
	6		94	44	93	96		150	34819			157		8.5	191		
	7		97	44	94	96		151	34930			160			193		
	8		100	44	94	96		152	35040			160			193		
	9		110	44	94	96		152	35151			164			193		
	10		120	44	95	96		153	35262			165			194		
	11		120	44	95	96		153	35372			166			192		
	12		120	44	95	96		152	35482			167			186		
	13		120	44	95	96		152	35592			164			184		
	14		130	44	95	96		152	35102			164			187		
Average			$\Sigma\sqrt{\Delta P}$														

H_2O Collected: 31 ml
SG Condition:
SG Weight: 9.5 gm
Total Volume Collected: 40.5 ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2

COMMENTS:

TRC Environmental Consultants, Inc.

FIELD DATA SHEET

Firm Name: Columbia Nitrogen
Plant Location: Augusta Georgia
Test Number: 5
Sampling Location: Predryer Inlet
TRC Project No.: 1431-E80-20
Date: 8/14/80
Tester: EPA

Orifice No.: D-8
Ambient Temp.: 83 °F
Bar. Press.: 29.94 "Hg
Probe Ident. No.: 29
Filter Ident. No.: None
Duct Area: 12.57 ft²

Nozzle No. & Dia.: 1-2 0.2605 in.
Assumed Moisture: [illegible] %
Test Duration: 48 min.
Traverse Point Interval: 1 min.
Probe Heater Setting: [illegible] °F
Filter Temp. Setting: 0.4 °F
Dry Gas Meter Y: 1.00

Nomograph C Factor: 1.05
Pitot Coefficient: 0.825
Orifice ΔH_A: 1.95
Test Start Time: 5:99
Test Final Time: 16:30
Leak Test Start: .000 CFM@ -9 "Hg
Leak Test Final: .002 CFM@ -10 "Hg

Port	Point	Time Min. (3-5)	Velocity ΔP in H_2O (6-10)	ΔH in H_2O (12-15)	T_M in °F (18-20)	T_M out °F (23-25)	P_{Stack} in H_2O (26-30)	T_{Stack} °F (32-35)	Gas Sample Volume cu. ft. (40-45)	PROBE (50)	Cyc. Angle ø (52-53)	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %
A	15	10	12	44	96	96	-28	152	35816			165		8.5	187		
	16		13	44	96	96		153	35913			165			185		
	17		13	44	96	96		152	36033			165			185		
	18		14	44	96	96		152	36143			170			184		
	19		13	44	96	96		152	36253			170			182		
	20		14	44	96	96		152	36363			171			182		
	21		13	44	97	96		148	36473			171			181		
	22		13	44	97	96		151	36583			169			181		
	23		13	44	97	96		151	36693			169			182		
	24		11	44	96	97		151	36803			168			183		
									36910								
B	1		11	44	96	97	-32	149	37146			169	48	9	183		
	2		11	44	96	97		149	37053			170	48		182		
	3		14	44	96	97		[illegible]	37123			171	48		181		
Average			$\Sigma\sqrt{\Delta P}$														

H_2O Collected: 31 ml
SG Condition:
SG Weight: 9.5 gm
Total Volume Collected: 40.5 ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2

COMMENTS:

TRC Environmental Consultants, Inc.

FIELD DATA SHEET

Firm Name Columbia Nitrogen
Plant Location Augusta Ga
Test Number 5
Sampling Location Prebrayer Inlet
TRC Project No. 1830-E80-20
Date 8-14-80
Tester EDG

Orifice No. D-8
Ambient Temp. 83 °F
Bar. Press. 29.83 "Hg
Probe Ident. No. 29
Filter Ident. No. None
Duct Area 12.57 ft²

Nozzle No. & Dia. 1-2 0.2005 in.
Assumed Moisture [illegible] %
Test Duration 48 min.
Traverse Point Interval 1 min.
Probe Heater Setting 160 °F
Filter Temp. Setting [illegible] °F
Dry Gas Meter Y 1.00

Nomograph C Factor 1.05
Pitot Coefficient 0.825
Orifice ΔH_A 1.94
Test Start Time 1530
Test Final Time 1630
Leak Test Start .000 CFM@ -9 "Hg
Leak Test Final .002 CFM@ -10 "Hg

Port	Point	Time Min. (3 4 5)	Velocity ΔP in H_2O (6 7 8 9 10)	ΔH in H_2O (12 13 14 15)	T_M in °F (18 19 20)	T_M out °F (23 24 25)	P_{Stack} in H_2O (26 27 28 29 30)	T_{Stack} °F (32 33 34 35)	Gas Sample Volume cu. ft. (40 41 42 43 44 45)	PROBE (50)	Cyc. Angle ø (52 53)	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %
B	4	10	1.5	4.4	96	97	-3.2	156	37.1	1		164	48	9	173		
	5	[illegible]	1.5	4.4	96	97		148	37.3	[illegible]		160			173		
	6		1.5	4.4	96	97		149	37.4			159			180		
	7		1.6	4.4	96	97		149	37.5			160			179		
	8		1.4	4.4	97	97		152	37.7			163			183		
	9		1.5	4.4	97	97		153	37.8			162			182		
	10		1.4	4.4	97	97		153	37.9			161			182		
	11		1.4	4.4	98	97		152	38.0			162			182		
	12		1.3	4.4	98	97		150	38.1			162			181		
	13		1.2	4.4	98	98		152	38.2			163			181		
	14		1.2	4.4	98	97		152	38.3			162			182		
	15		1.1	4.4	98	98		152	38.4			161			182		
	16		0.95	4.4	98	98		[illegible]	38.5			164			[illegible]		
	17		0.85	4.4	98	98		[illegible]	[illegible]			164			181		
Average			$\Sigma\sqrt{\Delta P}$														

H_2O Collected 3[illegible] ml
SG Condition
SG Weight 9.5 gm
Total Volume Collected 40.5 ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2

COMMENTS:

TRC Environmental Consultants, Inc.

FIELD DATA SHEET

Firm Name: Coldwater
Plant Location: Augusta Ga
Test Number: 5
Sampling Location: Pre Dryer Inlet
TRC Project No.: [illegible]
Date: 8-14-80
Tester: [illegible]

Orifice No.: [illegible]
Ambient Temp.: 83 °F
Bar. Press.: 29.83 "Hg
Probe Ident. No.: [illegible]
Filter Ident. No.: None
Duct Area: [illegible] ft²

Nozzle No. & Dia.: [illegible] in.
Assumed Moisture: 5 %
Test Duration: 48 min.
Traverse Point Interval: 1 min.
Probe Heater Setting: 150 °F
Filter Temp. Setting: N/A °F
Dry Gas Meter Y: 1.00

Nomograph C Factor: 1.05
Pitot Coefficient: 0.825
Orifice ΔH_A: 1.94
Test Start Time: [illegible]
Test Final Time: [illegible]
Leak Test Start: 000 CFM@ -9 "Hg
Leak Test Final: 002 CFM@ -10 "Hg

Port	Point	Time Min. (3-5)	Velocity ΔP in H_2O (6-10)	ΔH in H_2O (12-15)	T_M in °F (18-20)	T_M out °F (23-25)	P_{Stack} in H_2O (26-30)	T_{Stack} °F (32-35)	Gas Sample Volume cu. ft. (40-45)	PROBE (50)	Cyc. Angle ø (52-53)	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %
B	18	[illegible]	[illegible]	44	97	98	-[illegible]	152	[illegible]808								
	19	[illegible]	[illegible]	44	97	98	[illegible]	152	[illegible]916								
	20		[illegible]	44	97	98	[illegible]	152	[illegible]								
	21		[illegible]	[illegible]	97	98		152	[illegible]								
	22		[illegible]	[illegible]	97	98		152	[illegible]								
	23		[illegible]	[illegible]	97	98		152	[illegible]								
	24	[illegible]	[illegible]	[illegible]	97	98	[illegible]	152	[illegible]								
Average			$\Sigma\sqrt{\Delta P}$						[illegible]								

H_2O Collected: 21 ml
SG Condition:
SG Weight: 9.5 gm
Total Volume Collected: 40.5 ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2

COMMENTS:

FIELD DATA SHEETS PAGE 1 OF 4

Firm Name: Columbia Nitrogen — Pump No.: — Nozzle No. & Dia.: 1-2 0.2605 in. — Nomograph C Factor: 1.05

Plant Location: Augusta Georgia — Orifice No.: D-8 — Assumed Moisture: 5 % — Pitot Coefficient: 0.825

Test No.: 3 — Ambient Temp: 99 °F — Test Duration: 48 min. — Orifice ΔH_A: 1.95

Sampling Location: Prodyer Inlet — Bar Press: 29.84 "Hg — Traverse Point Interval: 1 min. — Test Start Time: 1837

TRC Project No.: 1430-E20-20 — Probe Ident. No.: 29 — Probe Heater Setting: 195 ± 10 °F — Test End Time: 1930

Date: 9/4/00 — Filter Ident. No.: NONE — Filter Temp. Setting: N/A — Leak Test Start: 0000 CFM: -9 "Hg

Tester: EDA/GAG — Duct Area: 12.57 ft² — Dry Gas Meter Y: 1.00 — Leak Test Final: .002 CFM: -10 "Hg

DIA 48 in

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M Out °F	P_{STACK} in H_2O	T_{STACK} °F	Initial Metric Volume cu. ft.	PROBE	Cyc. Angle ϕ	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. X_i
A	1	1	.64	4.4	94	99		148	395902	1		158	44	6	191	
	2		.62	4.4	94	99		148	397028			160	44	6	191	
	3		.70	4.4	94	99		148	398102			158	44	6	191	
	4		.85	4.4	94	99		149	399222			158	44	6	191	
	5		.93	4.4	94	99		146	400032			160	44	6	193	
	6		.94	4.4	94	99		150	401141			158	44	6	191	
	7		.99	4.4	94	99		151	402522			160	44	6	191	
	8		1.00	4.4	94	99		152	403633			160	44	6.5	191	
	9		1.1	4.4	94	99		152	404722			160		6.5	193	
	10		1.2	4.4	95	99		153	405833			158		6.5	193	
	11		1.2	4.4	95	99		153	406922			160		6.5	190	
	12		1.2	4.4	95	99		152	408022			164		7.0	192	
	13		1.2	4.4	96	99		152	409122			164		7.0	184	
	14		1.3	4.4	96	99		152	410222			164		7.0	183	
	15		1.2	4.4	96	98		152	411322			165		7.0	184	

Probe Wash: — Cleaning Patch: —

Silica Gel: 8g — H_2O Collected: 31 ml

Silica Gel Cond.: — H_2O Condition: —

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

FIELD DATA SHEETS PAGE 2 OF 4

Firm Name Columbia Nitrogen — Pump No. — Nozzle No. & Dia. 1-2 0.2605 in. — Nomograph C Factor 1.05

Plant Location Augusta Georgia — Orifice No. D-8 — Assumed Moisture 5 % — Pitot Coefficient 0.825

Test No. 8 6 — Ambient Temp 99 °F — Test Duration 48 min. — Orifice ΔH_A 1.94

Sampling Location Reactor Inlet — Bar Press 29.84 "Hg — Traverse Point Interval 1 min. — Test Start Time 1837

TRC Project No. 1430-E80-20 — Probe Ident. No. 29 — Probe Heater Setting 4 amps — Test End Time 1900 1930

Date 8/14/80 — Filter Ident. No. Loose — Filter Temp. Setting N/A — Leak Test Start 0.000 CFM@ -9 "Hg

Tester EDA/GAG — Duct Area 12.57 ft² — Dry Gas Meter Y 1.00 — Leak Test Final .002 CFM@ -10 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_H in °F	T_H Out °F	P_{STACK} in H_2O	T_{STACK} °F	Initial Metric Volume cu. ft.	PROBE	Cyc. Angle °	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. %
A	16	1	1.3	4.4	96	99	-.29	153	412.742	1		165	46	7.0	183	
	17		1.3	4.4	96	98		152	413.351			166	46	7.0	182	
	18		1.4	4.4	96	98		152	413.960			168	46	7.0	183	
	19		1.3	4.4	96	98		152	414.571			169	46	7.5	184	
	20		1.4	4.4	96	98		152	415.181			167	46	7.5	184	
	21		1.3	4.4	97	98		148	415.791			164	46	7.6	175	
	22		1.3	4.4	97	98		151	416.401			161	46	7.5	174	
	23		1.3	4.4	97	98		151	417.011			161	46	7.5	175	
	24		1.1	4.4	97	98		151	417.621			161	46	7.5	174	
									422.231							1901
B	1	1	1.1	4.4	97	98	-.32	149	422.841			161	46	7.5	174	1906
	2		1.1	4.4	95	98		149	423.236			155	46	7.5	176	
	3		1.4	4.4	98	98		149	424.272			159	46	7.0	178	
	4		1.4	4.4	95	98		150	425.282			158	46	7.0	182	
	5		1.5	4.3	96	98		148	426.291			158	46	7.5	182	

1937
24

Probe Wash ____ Cleaning Patch ____

Silica Gel 8g — H_2O Collected 31 mls

Silica Gel Cond. ____ — H_2O Condition ____

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

FIELD DATA SHEETS

PAGE 3 of 4

Firm Name Columbia Nitrogen
Plant Location Augusta Georgia
Test No. B 6
Sampling Location Predryer Inlet
TRC Project No. 1430-E80-20
Date 8/15/80
Tester EDA / GAG

Pump No.
Orifice No. D-8
Ambient Temp 99 °F
Bar Press 29.84 "Hg
Probe Ident. No. 29
Filter Ident. No. none
Duct Area 12.57 ft²

Nozzle No. & Dia. 1-2 0.2605 in.
Assumed Moisture 5 %
Test Duration 48 min.
Traverse Point Interval 1 min.
Probe Heater Setting amps
Filter Temp. Setting N/A
Dry Gas Meter Y 1.00

Nomograph C Factor 1.05
Pitot Coefficient 9825
Orifice ΔH_A 1.94
Test Start Time 1837
Test End Time 1930
Leak Test Start .000 CFM@ -9 "Hg
Leak Test Final .002 CFM@ -10 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M Out °F	P_{STACK} in H_2O	T_{STACK} °F	Initial Metric Volume cu. ft.	PROBE	Cyc. Angle ø	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. %
B	6	1	1.5	4.4	96	98	-3.2	149	428.01	1		161	46	7.5	182	
	7		1.6	4.4	96	98		149	429.10			162	46	7.5	181	
	8		1.4	4.4	96	98		152	430.21			162	46	8.0	181	
	9		1.5	4.4	96	98		153	431.30			167	46	8.0	181	
	10		1.4	4.4	96	98		153	432.41			164	46	8.0	182	
	11		1.4	4.4	96	98		152	433.50			164	46	8.0	182	
	12		1.3	4.4	96	98		150	434.60			166	46	8.0	182	
	13		1.2	4.4	96	98		152	435.70			162	46	8.0	182	
	14		1.2	4.4	96	98		152	436.69			165	46	8.0	177	
	15		1.1	4.4	96	98		152	437.99			164	46	8.0	182	
	16		0.95	4.4	96	98		152	439.09			167	46	8.0	183	
	17		0.85	4.4	97	98		152	440.19			169	46	8.0	181	
	18		0.79	4.4	97	98		152	441.29			169	46	8.0	181	
	19		0.7	4.4	97	98		153	442.39			165	46	8.0	179	
	20		0.65	4.4	97	98		152	443.49			164	47	8.0	181	

1906 24

Loss Power

Probe Wash
Silica Gel 8g
Silica Gel Cond.
Cleaning Patch
H_2O Collected 31 mlD
H_2O Condition

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

FIELD DATA SHEETS PAGE 4 OF 4

Firm Name: Columbia Nitrogen
Plant Location: Augusta Georgia
Test No.: #6
Sampling Location: Reactor Inlet
TRC Project No.: 1430-E80-20
Date: 8/14/80
Tester: EDA/GAG

Pump No.:
Orifice No.: D-B
Ambient Temp: 89 °F
Bar Press: 29.84 "Hg
Probe Ident. No.: 29
Filter Ident. No.: None
Duct Area: 12.57 ft²

Nozzle No. & Dia.: 1-2 0.2605 in.
Assumed Moisture: 5 %
Test Duration: 48 min.
Traverse Point Interval: 1 min.
Probe Heater Setting: amps
Filter Temp. Setting: N/A
Dry Gas Meter Y: 1.00

Nomograph C Factor: 1.05
Pitot Coefficient: 0.825
Orifice ΔH_A: 1.94
Test Start Time:
Test End Time: 1930
Leak Test Start: 0.000 CFM@ -9 "Hg
Leak Test Final: 0.002 CFM@ -10 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_H in °F	T_H Out °F	P_{STACK} in H_2O	T_{STACK} °F	Initial Metric Volume cu. ft.	PROBE	Cyc. Angle ϕ	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. %
B	21	1	57	4.4	97	98	-3.2	152	44459	1		164	47	8.0	180	
	22		50	4.4	97	97		152	44569			165	47	8.0	178	
	23		43	4.4	97	97		152	44679			165	47	8.0	179	
	24	8	40	4.4	97	97		152	44789			166	47	8.0	180	1930
									44899							
			104	4.4	97		3.1	151	53099							

Probe Wash: Cleaning Patch:
Silica Gel: 3g H_2O Collected: 31 mls
Silica Gel Cond.: H_2O Condition:

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

NOMOGRAPH DATA

PLANT Columbia Nitrogen

DATE 8/13/80

SAMPLING LOCATION Dryer Inlet

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H_2O	$\Delta H_@$	2.11
AVERAGE METER TEMPERATURE (AMBIENT + 20 °F), °F	$T_{m_{avg.}}$	100
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	2.0
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	29.75
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073$ x STACK GAUGE PRESSURE in in. H_2O)	P_s	
RATIO OF STATIC PRESSURE TO METER PRESSURE	$\frac{P_s}{P_m}$	0.846
AVERAGE STACK TEMPERATURE, °F	$T_{s_{avg.}}$	145
AVERAGE VELOCITY HEAD, in. H_2O	$\Delta p_{avg.}$	0.56
MAXIMUM VELOCITY HEAD, in. H_2O	$\Delta p_{max.}$	0.60
C FACTOR		1.25
CALCULATED NOZZLE DIAMETER, in.		0.232
ACTUAL NOZZLE DIAMETER, in.		0.1965
REFERENCE Δp, in. H_2O		1.08

EPA (Dur) 234
4/72

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT Columbia Nitrogen
DATE 8/13/80
SAMPLING LOCATION Dryer Inlet
INSIDE OF FAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE A) _____
INSIDE OF NEAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE B) _____
STACK I.D., (DISTANCE A - DISTANCE B) 53 1/2"
NEAREST UPSTREAM DISTURBANCE _____
NEAREST DOWNSTREAM DISTURBANCE _____
CALCULATOR LAG

SCHEMATIC OF SAMPLING LOCATION

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8 INCH)	DISTANCE B	TRAVERSE POINT LOCATION FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
1	0.011	53 1/2"		No	1"
2	0.035			Flange	1.87"
3	0.060				3.21
4	0.087				4.65
5	0.116				6.20
6	0.146				7.81
7	0.180				9.63
8	0.218				11.66
9	0.262				14.02
10	0.315				16.85
11	0.393				21.03
12	0.607				32.47
13	0.685				36.65
14	0.738				39.48
15	0.782				41.84
16	0.820				43.87
17	0.854				45.69
18	0.884				47.29
19	0.913				48.85
20	0.940				50.29
21	0.965				51.63
22	0.989				52.9"

EPA (Dur) 232
4/72

SAMPLIN TASK LOG

Plant Columbia Nitrogen
Date 8/14/80

Plant Location Augusta, GA
Recorded by LAG

Comments	Run	Sampling location (Port)	Pollutant	Clock Time Began	Clock Time Ended	Elapsed Time (min)	Sample Nos.
Started on Dryer Inlet ~~South~~ North port	1	~~South~~ North	AN	1037			
Stopped to unplug nozzle and pitots					1040	3	
Decided to change to 1/4" nozzle (#2-2) and sample for 1 min/point. ΔH is to be wide open. Sampling is to be done isokinetically per Gene Riley. Record ΔP, ΔH, etc. for normal data sheet. ΔH setting will be set at 2.15 for the Dryer Train							
Started sampling again at ~~South~~ North port (Stopped twice to clean ptots)				1120			
Finished on ~~South~~ North port						30	
Started sampling at East port	1	East		1158	1150		
Finished sampling at East port.					1230		
Final Leak Test NG Leak in impingers This test is void							

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT Columbia Nitrogen
DATE 8/13/80
SAMPLING LOCATION Predryer - Dryer ~~Exhaust~~ Outlet
INSIDE OF FAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE A) 77.5
INSIDE OF NEAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE B) 0 1/2"
STACK I.D., (DISTANCE A - DISTANCE B) 77.5
NEAREST UPSTREAM DISTURBANCE
NEAREST DOWNSTREAM DISTURBANCE
CALCULATOR LAG

SCHEMATIC OF SAMPLING LOCATION

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8 INCH)	DISTANCE B	TRAVERSE POINT LOCATION FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
1	0.013	77.5	1.01	~0	same as col. 4
2	0.039		3.02		
3	0.067		5.19		
4	0.097		7.52		
5	0.129		10.00		
6	0.165		12.94		
7	0.204		15.81		
8	0.250		19.38		
9	0.306		23.72		
10	0.388		30.07		
11	0.612		47.43		
12	0.694		53.79		
13	0.750		58.13		
14	0.796		61.69		
15	0.835		64.72		
16	0.871		67.51		
17	0.903		69.98		
18	0.933		72.31		
19	0.961		74.48		
20	0.987	✓	76.49	✓	✓

EPA (Dur) 232
4/72

SAMPLIN. .ASK LOG

Plant Columbia Nitrogen
Date 8/14/86

Plant Location Augusta, GA
Recorded by LAG

Comments	Run	Sampling location (Port)	Pollutant	Clock Time Began	Clock Time Ended	Elapsed Time (min)	Sample Nos.
Started Test No. 2 of the Dryer Inlet	2	~~South~~ North	AN	1450			
Finished on ~~South~~ North port					1512	22	
Resumed testing on the East Port	2	East		1517			
Finished Test No. 2 on the East Port - Leak Test OK					1539	22	
Started Test No. 3 of the Dryer Inlet	3	~~South~~ North	ANI	1637			
Stopped to change ports					1659	22	
Resumed testing	3	East		1703			
Stopped testing on the east port Leak check OK					1725	22	
Started Test No 4 on the Dryer Inlet	4	~~South~~ North	AN				
Stopped to change ports				1735			
Resumed testing	4	East			1757	22	
Stopped testing on the east port - Leak Check OK				1803			
					1825	22	

TRC Environmental Consultants, Inc.

FIELD DATA SHEET

Firm Name: Columbia Nitrogen
Plant Location: Augusta, GA
Test Number: 4R
Sampling Location: Dryer Inlet
TRC Project No.: 1930-E80-20
Date: 8/14/80
Tester: LAG + MAA

Orifice No.: O-7
Ambient Temp.: 95 °F
Bar. Press.: 29.87 "Hg
Probe Ident. No.: 37
Filter Ident. No.: NA
Duct Area: 15.61 ft²

Nozzle No. & Dia.: 2-2 0.2619 in.
Assumed Moisture: 20 %
Test Duration: 44 min.
Traverse Point Interval: 1 min.
Probe Heater Setting: 150 °F
Filter Temp. Setting: NA °F
Dry Gas Meter Y: 1.00

Nomograph C Factor: 1.08
Pitot Coefficient: 0.846
Orifice ΔH_A: 2.11
Test Start Time: 1735
Test Final Time: 1825
Leak Test Start: 0.00 CFM -20 "Hg
Leak Test Final: 0.004 CFM -12 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	PROBE	Cyc. Angle β	#10 Heater Box Temp. PSIG	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %
N S	1	1	0.034	1.90	94	94		120	40.910	S			42	-5	175		
	2		0.025	1.90	94	94		123	41.023				42	-5	167		
	3		0.032	1.90	94	94		124	41.083				42	-5	168		
	4		0.026	1.90	94	94		127	41.175				42	-5	169		
	5		0.030	1.90	94	94		126	41.218			30	40	-5	169		
	6		0.037	1.90	94	94		137	41.314				40	-5	169		
	7		0.040	1.90	93	94		141	41.360				40	-5	169		
	8		0.038	1.90	93	94		146	41.400				40	-5	170		
	9		0.044	1.90	93	94	-1.65	147	41.521				40	-5	170		
	10		0.048	1.90	93	94		149	41.571			30	40	-5	170		
	11		0.035	1.90	93	94		150	41.628				40	-5	170		
	12		0.037	1.90	93	94		150	41.729				40	-5	169		
	13		0.046	1.90	93	94		151	41.811				40	-5	170		
	14		0.045	1.90	93	94		150	41.951	↓			40	-6	170		
Average			$\Sigma\sqrt{\Delta P}$														

H_2O Collected: 30 ml
SG Condition:
SG Weight: 4.3 gm
Total Volume Collected: 34.3 ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2

COMMENTS:

TRC Environmental Consultants, Inc.

FIELD DATA SHEET

Firm Name: Columbia Nitrogen
Plant Location: Augusta, GA
Test Number: 4R
Sampling Location: Dryer Inlet
TRC Project No.: 430-530-20
Date: 8/14/00
Tester: LAGERMAN

Orifice No.: 0-7
Ambient Temp.: 95 °F
Bar. Press.: ____ "Hg
Probe Ident. No.: 37
Filter Ident. No.: NA
Duct Area: 15.61 ft²

Nozzle No. & Dia.: 2-2 0.2614 in.
Assumed Moisture: 2.0 %
Test Duration: 44 min.
Traverse Point Interval: 2 min.
Probe Heater Setting: 150 °F
Filter Temp. Setting: NA °F
Dry Gas Meter Y: 1.00

Nomograph C Factor: 1.08
Pitot Coefficient: 0.946
Orifice ΔH_A: 2.11
Test Start Time: 17:35
Test Final Time: 18:25
Leak Test Start: 0.00 CFM @ -20 "Hg
Leak Test Final: 0.00 CFM @ -12 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	PROBE	Cyc. Angle ∅	#10 Heater Box Temp. PSIG	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %	
S	15	2	0.63	1.90	93	94		151	419.355	B		30	40	-6	170			
	16		0.71	1.90	93	94		151	420.07				40	-6	170			
	17		0.70	1.90	93	94		151	420.90				40	-6	168			
	18		0.56	1.90	93	94		151	421.36				40	-6	169			
	19		0.51	1.85	93	94		151	422.10				40	-6	170			
	20		0.50	1.85	93	94		150	422.76				42	-6	170			
	21		0.47	1.85	93	94		151	423.57				42	-6	169			
	22		0.34	1.85	93	94		150	424.21				42	-6	169			1757
E	1		0.54	1.85	93	94		151	424.86				42	-6	170			1803
	2		0.56	1.85	93	94		150	425.51				42	-6	170			
	3		0.54	1.85	93	94		151	426.81				42	-6	171			
	4		0.52	1.85	93	94		150	426.88				42	-6	170			
	5		0.53	1.85	93	94		135	427.78				42	-6	170			
	6		0.58	1.85	93	94		135	428.49				42	-6	168			
Average			$\Sigma\sqrt{\Delta P}$															

H_2O Collected: 30 ml
SG Condition: ____
SG Weight: 4.3 gm
Total Volume Collected: 34.3 ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2

COMMENTS: ____

TRC Environmental Consultants, Inc.

FIELD DATA SHEET

Firm Name: Columbia Nitrogen
Plant Location: Augusta, Ga.
Test Number: 4R
Sampling Location: Dryer Inlet
TRC Project No.: 430-260
Date: 3-14-80
Tester: LAG & MAA

Orifice No.: D-7
Ambient Temp.: 95 °F
Bar. Press.: 29.87 "Hg
Probe Ident. No.: 37
Filter Ident. No.: NA
Duct Area: 15.61 ft²

Nozzle No. & Dia.: 2-2 0.264 in.
Assumed Moisture: 2.0 %
Test Duration: 44 min.
Traverse Point Interval: 1 min.
Probe Heater Setting: 150 °F
Filter Temp. Setting: NA °F
Dry Gas Meter Y: 1.00

Nomograph C Factor: 1.09
Pitot Coefficient: 0.846
Orifice ΔH_A: 2.11
Test Start Time: 1735
Test Final Time: 1825
Leak Test Start: 0.00 CFM -26 "Hg
Leak Test Final: 0.004 CFM -12 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	PROBE	Cyc. Angle ϕ	#16 Heater Box Temp. °F	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %
E	7	10	060	185	93	94		144	429.00	3			40	-6	168		
	8		062	185	93	94		148	429.86			30	40	-6	167		
	9		063	185	93	94		149	430.39				40	-6	167		
	10		060	185	93	94		148	430.96				40	-6	168		
	11		059	185	93	94	-1.65	148	431.64				40	-6	167		
	12		062	185	93	94		150	432.48				40	-6	167		
	13		064	185	93	94		150	433.27				40	-6	168		
	14		062	185	93	94		150	434.00				40	-6	168		
	15		059	185	92	93		150	434.60				40	-6	167		
	16		057	185	92	93		150	435.37				40	-6	168		
	17		058	185	92	93		150	436.14			30	40	-6	167		
	18		053	185	92	93		150	436.78				40	-6	167		
	19		057	185	92	93		150	437.45				40	-6	168		
	20		049	185	92	93		150	437.96				40	-6	169		
Average			$\Sigma\sqrt{\Delta P}$														

H_2O Collected: 36 ml
SG Condition:
SG Weight: 4.3 gm
Total Volume Collected: 34.3 ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2

COMMENTS:

TRC Environmental Consultants, Inc.

FIELD DATA SHEET

Firm Name: COLUMBIA NITROGEN
Plant Location: AUGUSTA GA
Test Number: 4R
Sampling Location: DRYER INLET
TRC Project No.: 1440-E80-20
Date: 8-14-80
Tester: LAG & MAA

Orifice No.: D-7
Ambient Temp.: 95 °F
Bar. Press.: 29.87 "Hg
Probe Ident. No.: 37
Filter Ident. No.: NA
Duct Area: 15.61 ft²

Nozzle No. & Dia.: 2-2 0.264 in.
Assumed Moisture: 2.0 %
Test Duration: 44 min.
Traverse Point Interval: 1 min.
Probe Heater Setting: 160 °F
Filter Temp. Setting: NA °F
Dry Gas Meter Y: 1.00

Nomograph C Factor: 1.08
Pitot Coefficient: 0.84
Orifice ΔH_A: 2.11
Test Start Time: 17:35
Test Final Time: 18:25
Leak Test Start: 0.00 CFM @ -20 "Hg
Leak Test Final: 0.004 CFM @ -12 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	PROBE	Cyc. Angle	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %
E	21	10	.48	1.85	92	93		150	438.69	37			40	-6	169		
E	22	9	.41	1.85	92	93		150	439.30				40	-6	169		
									439.83								
Average			$\Sigma\sqrt{\Delta P}$ 17.14	1.87	93	.4	-.165	146	30.13								

H_2O Collected: 36 ml
SG Condition:
SG Weight: 43 gm
Total Volume Collected: 34.3 ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2

COMMENTS:

1009

FIELD DATA SHEETS

Firm Name Columbia Nitrogen
Plant Location Augusta, GA
Test No. ~~2~~ 5
Sampling Location Dryer Inlet
TRC Project No. 1430-E80-20
Date 8/14/80
Tester LAG + MAA

Pump No. _____
Orifice No. D-7
Ambient Temp 95 °F
Bar Press 29.87 "Hg
Probe Ident. No. 37
Filter Ident. No. NA
Duct Area 15.61 ft²

Nozzle No. & Dia ~~1-1~~ 2-2 ~~0.1965~~ 0.2614 in.
Assumed Moisture 2.0 %
Test Duration ~~132~~ 44 min.
Traverse Point Interval ~~3~~ 1 min.
Probe Heater Setting 150 °F ~~amps~~
Filter Temp. Setting NA
Dry Gas Meter Y 1.00

Nomograph C Factor 1.08
Pitot Coefficient 0.846
Orifice ΔH_A 2.11
Test Start Time 1450
Test End Time 1539
Leak Test Start 0.00 CFM@ -7 "Hg
Leak Test Final 0.00 CFM@ -12 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_H in °F	T_H Out °F	P_{STACK} in H_2O	T_{STACK} °F	Initial Metric Volume cu. ft.	PROBE	Cyc. Angle ∅	#10 FS/G Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. %
N ~~S~~	1	1.0	050	210	100	100		103	345.073				58	-4	167	
	2		044	210	100	100		109	346.30				54	-4	163	
	3		045	210	99	100		114	347.00			31	50	-4	161	
	4		044	210	99	100		126	347.96				46	-4	160	
	5		045	210	99	100		132	348.42				44	-4	160	
	6		038	210	99	100		135	349.33				40	-4	160	
	7		040	210	99	100		136	350.01				40	-4	160	
	8		043	210	99	100		136	350.75				42	-4	160	
	9		045	210	98	99		145	351.32				42	-4	160	
	10		050	210	97	99		148	352.26				42	-4	159	
	11		053	210	97	99		148	352.85				42	-4	160	
	12		064	210	97	99		148	354.00				46	-4	164	
	13		066	210	97	99		148	354.46				46	-4	164	
	14		068	210	97	99	-1.70	148	355.12			31	46	-4	163	
	15		073	210	97	99		149	355.87				46	-4	163	

Probe Wash _____
Silica Gel 5.2g
Silica Gel Cond. _____

Cleaning Patch _____
H_2O Collected 26 mls
H_2O Condition _____

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

FIELD DATA SHEETS

2-2 0.2614

Firm Name Columbia Nitrogen
Plant Location Augusta, GA
Test No. 225
Sampling Location Dryer Inlet
TRC Project No. 1430-E20-20
Date 8/14/80
Tester LAG + MAA

Pump No.
Orifice No. O-7
Ambient Temp 95 °F
Bar Press 29.87 "Hg
Probe Ident. No. 37
Filter Ident. No. NA
Duct Area 15.61 ft²

Nozzle No. & Dia. #T 0.1465 in.
Assumed Moisture 2.0 %
Test Duration 4244 min.
Traverse Point Interval 3.1 min.
Probe Heater Setting 150 °F amps
Filter Temp. Setting NA
Dry Gas Meter Y 1.00

Nomograph C Factor 1.08
Pitot Coefficient 0.846
Orifice ΔH_A 2.11
Test Start Time 1450
Test End Time 1539
Leak Test Start 0.00 CFM @ 7 "Hg
Leak Test Final 0.00 CFM @ 12 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_H in °F	T_H Out °F	P_{STACK} in H_2O	T_{STACK} °F	Initial Metric Volume cu. ft.	PROBE	Cyc. Angle °	#10 PSIG Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. %	
N 8	16	100	070	2.10	97	99		149	356543				46	-4	163		
	17		070	2.10	97	99		149	357107				46	-4	162		
	18		071	2.10	97	99		149	358117				46	-4	160		
	19		069	2.10	97	99		149	358893				46	-4	162		
	20		068	2.10	97	98		144	359891				46	-4	162		
	21		065	2.10	97	98		144	360811				46	-4	160		
	22		062	2.10	97	98		144	361110				46	-4	161		1510
									361466								
E 1			046	2.10	97	98		138	362660				48	-4	160		1517
	2		064	2.10	97	98		139	363293				48	-4	160		
	3		066	2.10	97	98		139	363688				48	-4	160		
	4		063	2.10	97	98	-1.80	135	364533				46	-4	160		
	5		072	2.10	97	98		135	365440			30	46	-4	160		
	6		055	2.10	97	98		136	365995				46	-4	160		
	7		052	2.10	97	98		138	366607				46	-4	161		

Probe Wash _____ Cleaning Patch _____
Silica Gel 5.2g H_2O Collected 26 mls
Silica Gel Cond. _____ H_2O Condition _____

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

FIELD DATA SHEETS

Firm Name: Columbia Nitrogen
Plant Location: Augusta, GA
Test No.: 2A 5
Sampling Location: Oxyc Inlet
TRC Project No.: 1430-E80-20
Date: 8/14/80
Tester: LAG & MAA

Pump No.:
Orifice No.: O-7
Ambient Temp: 95 °F
Bar Press: 29.87 "Hg
Probe Ident. No.: 37
Filter Ident. No.: NA
Duct Area: 15.61 ft²

Nozzle No. & Dia: 2-2 0.264 in.
Assumed Moisture: 2.0 %
Test Duration: 44 min.
Traverse Point Interval: 5 1 min.
Probe Heater Setting: 150°F amps
Filter Temp. Setting: NA
Dry Gas Meter Y: 1.00

Nomograph C Factor: 1.08
Pitot Coefficient: 0.846
Orifice ΔH$_A$: 2.11
Test Start Time: 1450
Test End Time: 1539
Leak Test Start: 0.00 CFM@ -7 "Hg
Leak Test Final: 0.00 CFM@ -12 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_H in °F	T_M Out °F	P_{STACK} in H_2O	T_{STACK} °F	Initial Metric Volume cu. ft.	PROBE	Cyc. Angle °	#10 SS16 Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. %
E	8	10	050	2.15	96	98		137	366.146	3			44	-4	162	
	9		055	2.10	96	98		145	368.062				44	-4	161	
	10		054	2.00	96	98		147	369.720				48	-4	161	
	11		058	2.00	96	98		149	369.550				48	-4	162	
	12		058	2.00	96	97		149	370.928				48	-4	162	
	13		060	2.00	96	97		149	371.000				48	-4	160	
	14		062	2.00	96	97		149	372.000				48	-4	161	
	15		058	1.90	96	97		149	372.776				48	-4	161	
	16		059	1.90	96	97		149	373.116				48	-5	161	
	17		056	1.85	96	97		149	374.022				48	-5	161	
	18		055	1.90	96	97		149	374.633				48	-5	160	
	19		041	1.85	96	97		149	375.222				48	-5	161	
	20		028	1.80	96	97	-1.80	149	376.027				48	-5	162	
	21		031	1.80	96	97		149	376.556				48	-5	162	
	20		034	1.80	96	97		149	377.334				48	-5	162	
			0.73	2.04	97.7		1.17	141.6	377.73							

Probe Wash: ____ Cleaning Patch: ____
Silica Gel: 5.2 g H_2O Collected: 26 mls
Silica Gel Cond.: ____ H_2O Condition: ____

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

32.66

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

FIELD DATA SHEETS

2-2 0.2614

Firm Name Columbia Nitrogen — Pump No. ____ — Nozzle No. & Dia. #1 0.1865 in. — Nomograph C Factor 1.08

Plant Location Augusta, GA — Orifice No. D-7 — Assumed Moisture 2.0 % — Pitot Coefficient 0.846

Test No. 36 — Ambient Temp 95 °F — Test Duration ~~132~~ 44 min. — Orifice ΔH_A 2.11

Sampling Location Dryer Inlet — Bar Press 29.87 "Hg — Traverse Point Interval 2.1 min. — Test Start Time 1637

TRC Project No. 1430-E80-20 — Probe Ident. No. 37 — Probe Heater Setting 250°F range — Test End Time 1725

Date 8/14/90 — Filter Ident. No. NA — Filter Temp. Setting NA — Leak Test Start 0.00 CFM @ -15 "Hg

Tester LAG + MAA — Duct Area 15.61 ft² — Dry Gas Meter Y 1.00 — Leak Test Final 0.008 CFM @ -10 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M Out °F	P_{STACK} in H_2O	T_{STACK} °F	Initial Metric Volume cu. ft.	PROBE	Cyc. Angle #	#10 PSIG Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. %
N	1	3	0.38	1.90	96	96		124	378.473				50	-3	165	
	2	6	0.38	1.90	96	96		126	379.20				50	-3	167	
	3	9	0.42	1.90	96	96		126	380.02				50	-3	167	
	4	12	0.44	1.90	96	96		125	380.50				48	-4	168	
	5	15	0.46	1.90	96	96		139	381.08				46	-5	168	
	6	18	0.53	1.90	95	96		143	381.86				46	-5	168	
	7	21	0.58	1.90	95	96		143	382.45				48	-6	168	
	8	24	0.65	1.90	95	96		148	383.16				48	-6	168	
	9	27	0.70	1.90	95	96		149	383.93				48	-6	168	
	10	30	0.74	1.90	95	96		150	384.59				48	-6	168	
	11	33	0.80	1.90	95	96		150	385.41			30	48	-6	168	
	12	36	0.64	1.90	95	96		150	386.41				48	-6	169	
	13	39	0.63	1.90	95	96		150	387.00				48	-6	170	
	14	42	0.62	1.90	95	96		150	387.55				48	HKJ	170	
	15	45	0.58	1.90	95	96		150	388.28				48	-6	170	

Probe Wash ____ — Cleaning Patch ____

Silica Gel 4.8 lbs — H_2O Collected 24 mls

Silica Gel Cond. ____ — H_2O Condition ____

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

FIELD DATA SHEETS

Firm Name: Columbia Nitrogen
Plant Location: Augusta, GA
Test No.: B C
Sampling Location: Oxy Tolet
TRC Project No.: 1430-E80-20
Date: 8/14/80
Tester: LAG + MAA

Pump No.:
Orifice No.: 0-7
Ambient Temp: 95 °F
Bar Press: 29.87 "Hg
Probe Ident. No.: 37
Filter Ident. No.: NA
Duct Area: 15.61 ft²

Nozzle No. & Dia.: 2-2 0.2619 in.
Assumed Moisture: 2.0 %
Test Duration: ~~33~~ 44 min.
Traverse Point Interval: 3' 1 min.
Probe Heater Setting: 150°F amps
Filter Temp. Setting: NA
Dry Gas Meter Y: 1.00

Nomograph C Factor: 1.08
Pitot Coefficient: 0.846
Orifice ΔH_A: 2.11
Test Start Time: 1637
Test End Time: 1725
Leak Test Start: 0.00 CFM @ -15 "Hg
Leak Test Final: 0.008 CFM @ -10 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M Out °F	P_{STACK} in H_2O	T_{STACK} °F	Initial Metric Volume cu. ft.	PROBE	Cyc. Angle °	#10 1816 Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. %	
N																	
S	16	30	056	185	95	96		150	389127				48	-6	170		
	17		056	185	95	96		150	389655				48	-6	170		
	18		055	185	95	96		150	390244				48	-6	168		
	19		054	185	95	96		150	391002				48	-6	170		
	20		047	185	95	96		150	391884				48	-6	168		
	21		050	185	95	96	-170	150	392841			30	48	-6	168		
	22		046	185	95	96		150	393336				48	-6	168		
E	1		024	190	95	96		123	393499				48	-6	167		1659
	2		026	190	95	96		124	394655			29	48	-6	167		1703
	3		027	190	95	96		129	395477				48	-6	168		
	4		026	190	95	96		127	396088				48	-6	168		
	5		030	190	95	96		134	396801				48	-6	169		
	6		035	190	95	96		139	397092				48	-6	169		
	7		039	190	95	96		145	397795				48	-6	169		

Probe Wash: _____ Cleaning Patch: _____
Silica Gel: 4.8g H_2O Collected: 24mls
Silica Gel Cond.: ___ H_2O Condition: _____

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

FIELD DATA SHEETS

2-2 0.2614

Firm Name Columbia Nitrogen | Pump No. | Nozzle No. & Dia. #7 0.1765 in. | Nomograph C Factor 1.08

Plant Location Augusta, GA | Orifice No. O-7 | Assumed Moisture 2.0 % | Pitot Coefficient 0.846

Test No. 3 C | Ambient Temp 95 °F | Test Duration ~~120~~ 44 min. | Orifice ΔH_A 2.11

Sampling Location Dryer Inlet | Bar Press 29.87 "Hg | Traverse Point Interval 3 1 min. | Test Start Time 1637

TRC Project No. 1430-E80-20 | Probe Ident. No. 37 | Probe Heater Setting 150 °F amps | Test End Time 1725

Date 8/14/80 | Filter Ident. No. NA | Filter Temp. Setting NA | Leak Test Start 0.02 CFM @ -15 "Hg

Tester LAG & MAA | Duct Area 15.61 ft² | Dry Gas Meter Y 1.00 | Leak Test Final 0.03 CFM @ -10 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_H in °F	T_H Out °F	P_{STACK} in H_2O	T_{STACK} °F	Initial Metric Volume cu. ft.	PROBE	Cyc. Angle ϕ	#/0 PSIG Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. %
E	8		.042	1.90	95	96		147	398.817				46	-6	169	
	9		.043	1.90	95	96		148	399.541				46	-6	169	
	10		.048	1.85	95	96		149	400.433				46	-6	170	
	11		.045	1.85	95	96		150	401.079				46	-6	170	
	12		.054	1.85	95	96		150	401.758				46	-6	170	
	13		.062	1.85	95	96		150	402.226				46	-6	171	
	14		.066	1.85	95	96	-1.75	150	402.823				46	-6	167	
	15		.070	1.85	95	96		150	403.655				48	-6	167	
	16		.068	1.85	95	96		150	404.511			30	48	-6	168	
	17		.066	1.85	95	96		150	405.115				48	-6	168	
	18		.065	1.85	95	96		150	405.714				48	-6	168	
	19		.067	1.85	95	96		150	406.440				48	-6	168	
	20		.053	1.80	95	96		150	407.112				48	-6	168	
	21		.053	1.80	95	96		150	407.778				48	-6	169	
	22		.052	1.80	95	96		150	408.284				48	-6	171	
			.071	1.87	95.6		-1.125	144	408.91	30.87						

Probe Wash _____ Cleaning Patch _____

Silica Gel 4.8g H_2O Collected 2 4mls

Silica Gel Cond. ____ H_2O Condition _____

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

NOMOGRAPH DATA

PLANT Columbia Nitrogen

DATE 8/13/80

SAMPLING LOCATION Predryer Dryer Outlet

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H_2O	$\Delta H_@$	1.90
AVERAGE METER TEMPERATURE (AMBIENT + 20 °F), °F	$T_{m\,avg.}$	100
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	8
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	29.75
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073$ x STACK GAUGE PRESSURE in in. H_2O)	P_s	
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s / P_m	
AVERAGE STACK TEMPERATURE, °F	$T_{s\,avg.}$	106
AVERAGE VELOCITY HEAD, in. H_2O	$\Delta p_{avg.}$	.55
MAXIMUM VELOCITY HEAD, in. H_2O	$\Delta p_{max.}$	.65
C FACTOR	1.02	
CALCULATED NOZZLE DIAMETER, in.	.23	
ACTUAL NOZZLE DIAMETER, in.	.189	
REFERENCE Δp, in. H_2O	1.40	

SAMPLING TASK LOG

Plant Columbia Nitrogen
Date 8/12/80 8-14-80?

Plant Location Augusta
Recorded by J. Canara

Comments	Run	Sampling location (Port)	Pollutant	Clock Time Began	Clock Time Ended	Elapsed Time (min)	Sample Nos.
Predryer-Dryer Outlet	1	North	NH_4NO_3	1040	1140	60	
- delayed test for 42 after							
1st port for inlet testers to							
make-up time.	1	West		1222	1322	60	
	2	North		1500	1600	60	
	2	West		1605	1705	60	
	3	West		1805	1905	60	
	3	North		1910	2010	60	
Lost probe thermocouple - controlled							
temp. manually							

FIELD DATA SHEETS

Firm Name: Columbia
Plant Location: Augusta
Test No.: PPD-0-4
Sampling Location: Prestyer dryer Outlet
TRC Project No.: 1430-E80
Date: 8/14/80
Tester: JC/BK

Pump No.:
Orifice No.: T-2
Ambient Temp: 88 °F
Bar Press: 29.82 "Hg
Probe Ident. No.: 30
Filter Ident. No.: —
Duct ~~Area~~ Dia: 77.5 in ft²

Nozzle No. & Dia.: 2-1 .1895 in.
Assumed Moisture: 8 %
Test Duration: 120 min.
Traverse Point Interval: 3 min.
Probe Heater Setting: 120 amps
Filter Temp. Setting: —
Dry Gas Meter Y: 1.00

Nomograph C Factor: 1.02
Pitot Coefficient: .831
Orifice ΔH_A: 1.96
Test Start Time: 1040
Test End Time: 1322
Leak Test Start: .002 CFM@ 6 "Hg
Leak Test Final: .001 CFM@ 4 "Hg

32.76

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M Out °F	P_{STACK} in H_2O	T_{STACK} °F	Initial Metric Volume cu. ft.	PROBE	Cyc. Angle ∅	P.O ~~Heater Box~~ Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. %
N	1	30	24	31	89	87	-.21	104	78770	2		110	50	2.0	126	
	2		26	33	89	87		105	78862			112	50	2.0	124	
	3		31	40	89	87		106	78960			112	50	2.0	117	
	4		35	46	89	87		106	79065			114	50	2.0	120	
	5		36	47	89	87		106	79178			116	50	2.5	124	
	6		39	51	89	87		105	79292			116	50	2.5	123	
	7		41	53	89	87		106	79410			119	50	2.5	126	
	8		42.5	55	89	88		105	79530			115	50	2.5	125	
	9		48	63	89	88		105	79654			115	40	2.5	125	
	10		57	74	90	88	-.33	105	79787			114	40	3.0	125	
	11		64	84	90	88		105	79925			114	40	3.0	125	
	12		64	84	90	88		105	80076			114	40	3.0	125	
	13		59	77	90	88		107	80227			117	42	2.5	126	
	14		59	77	91	88		107	80371			119	42	2.5	126	
	15		61	80	91	88		106	80515			117	42	2.5	126	

Probe Wash: _____ Cleaning Patch: _____
Silica Gel: 7.75 H_2O Collected: 48 mls
Silica Gel Cond.: _____ H_2O Condition: _____

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

FIELD DATA SHEETS

Firm Name: Columbia
Plant Location: Augusta
Test No.: PDO-0-4
Sampling Location: Predryer-dryer Outlet
TRC Project No.: 1430-E80
Date: 8/14/80
Tester: JL/ISK

Pump No.: —
Orifice No.: T-2
Ambient Temp: 90 °F
Bar Press: 29.82 "Hg
Probe Ident. No.: 30
Filter Ident. No.: —
Duct Area: 32.76 ft²

Nozzle No. & Dia.: 1-1 .1895" in.
Assumed Moisture: 8 %
Test Duration: 120 min.
Traverse Point Interval: 3 min.
Probe Heater Setting: 120 amps
Filter Temp. Setting: —
Dry Gas Meter Y: 1.00

Nomograph C Factor: 1.02
Pitot Coefficient: .831
Orifice ΔH_A: 1.96
Test Start Time: 1040
Test End Time: 1322
Leak Test Start: 1002 CFM@ 6 "Hg
Leak Test Final: 1006 CFM@ 4 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_H in °F	T_H Out °F	P_{STACK} in H_2O	T_{STACK} °F	Initial Metric Volume cu. ft.	PROBE	Cyc. Angle °	P.C. Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. %
N	16		.62	.81	91	89	-.35	108	806.61	2		117	42	2.5	125	
	17		.59	.77	91	89		109	808.09			118	42	2.5	126	
	18		.59	.77	91	89		109	809.54			121	42	2.5	130	
	19		.59	.77	91	89		108	811.00			121	42	2.5	130	
	20		.56	.73	91	89		109	812.46			120	42	2.5	130	
									813.82							
W	1		.25	.335	94	91	-.21	105	813.82			115	48	2.0	122	
	2		.30	.40	94	91		106	814.89			115	48	12.9	122	
	3		.44	.59	94	91		107	815.93			114	48	2.5	123	
	4		.46	.62	94	91		107	817.30			115	48	2.5	123	
	5		.53	.71	94	91	-.27	110	818.50			115	44	2.5	124	
	6		.54	.72	94	91		110	819.90			118	44	2.5	126	
	7		.51	.76	94	91		110	821.30			119	42	2.5	126	
	8		.62	.85	94	91		110	822.75			119	42	3.0	126	
	9		.62	.85	94	91		110	824.30	✓		119	42	3.0	126	

Probe Wash: _____ Cleaning Patch: _____
Silica Gel: 7.7g H_2O Collected: 48 ml
Silica Gel Cond.: ____ H_2O Condition: _____

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

FIELD DATA SHEETS

Firm Name: Columbian | Pump No.: — | Nozzle No. & Dia.: 2-1 .189 in. | Nomograph C Factor: 1.02
Plant Location: Augusta | Orifice No.: T-2 | Assumed Moisture: 8 % | Pitot Coefficient: .35
Test No.: PDD-0-4 | Ambient Temp: 90 °F | Test Duration: 120 min. | Orifice ΔH_A: 1.76
Sampling Location: Precipitator-Dryer Outlet | Bar Press: 29.82 "Hg | Traverse Point Interval: 3 min. | Test Start Time: 1040
TRC Project No.: 1430-E80 | Probe Ident. No.: 30 | Probe Heater Setting: 120° F amps | Test End Time: 1322
Date: 8/14/90 | Filter Ident. No.: — | Filter Temp. Setting: — | Leak Test Start: .002 CFM @ 6 "Hg
Tester: TC/MK | Duct Area: 32.76 ft² | Dry Gas Meter Y: 1.00 | Leak Test Final: .001 CFM @ 4 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_H in °F	T_H Out °F	P_{STACK} in H_2O	T_{STACK} °F	Initial Metric Volume cu. ft.	PROBE	Cyc. Angle °	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. X_i
	10	30	.64	.87	95	92		111	825.779	2		119	42	3.0	128	
	11		.70	.93	96	93	-.43	111	827.355			120	42	3.5	128	
	12		.72	.96	96	93		111	828.944			120	42	3.5	128	
	13		.71	.95	96	93		110	831.118			120	42	3.5	128	
	14		.71	.95	96	93		111	832.649			120	42	3.5	123	
	15		.71	.95	96	94		111	834.330			121	42	3.5	121	
	16		.72	.96	96	94	-.45	111	835.933			121	42	3.5	121	
	17		.71	.95	96	94		112	837.554			121	42	3.5	121	
	18		.71	.95	96	94		112	839.118			121	42	3.5	121	
	19		.66	.89	96	95	-.37	112	840.808			121	42	3.0	121	
	30	✓	.72	.96	96	95		113	842.355			121	42	3.0	121	
									843.999							
			.73	.12	91.3		-.33	108	56.029							

Probe Wash: _____ Cleaning Patch: _____
Silica Gel: 7.7g H_2O Collected: 48 mls
Silica Gel Cond.: ____ H_2O Condition: _____

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

FIELD DATA SHEETS

Firm Name Columbia | Pump No. | Nozzle No. & Dia. A-1 .187 in. | Nomograph C Factor 1.02

Plant Location Augusta | Orifice No. T-2 | Assumed Moisture 8% | Pitot Coefficient .831

Test No. PDD-0-5 | Ambient Temp 97 °F | Test Duration 120 min. | Orifice ΔH_A 1.96

Sampling Location Predryer Dryer Outlet | Bar Press 29.85 "Hg | Traverse Point Interval 3 min. | Test Start Time 1500

TRC Project No. | Probe Ident. No. 30 | Probe Heater Setting 120 amps | Test End Time

Date 3/14/20 | Filter Ident. No. — | Filter Temp. Setting — | Leak Test Start 1001 CFM@ 5 "Hg

Tester JC/VK | Duct Area 27.5 32.76 ft² | Dry Gas Meter Y 1.00 | Leak Test Final 1001 CFM@ 4 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M In °F	T_M Out °F	P_{STACK} in H_2O	T_{STACK} °F	Initial Metric Volume cu. ft.	PROBE	Cyc. Angle °	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. %
N	1	3	2.3	3.0	97	95	-1.0	111	844.14	2	22½	114	62	1.0	120	
	2		2.3	3.0	97	95		111	845.05			116	60	1.0	122	
	3		2.2	3.7	97	96		111	845.98			119	60	1.5	122	
	4		3.2	4.3	97	96		111	847.00			120	56	1.5	122	
	5		3.2	4.3	97	96		111	848.12			120	56	1.5	122	
	6		3.5	4.7	97	96		111	849.23			122	56	2.0	122	
	7		3.7	4.9	97	96	-2.5	111	850.50			122	56	2.0	122	
	8		4.1	5.5	99	97		110	851.60			123	56	12.01	121	
	9		4.6	6.1	100	97		110	852.82			123	56	2.0	122	
	10		5.5	7.3	100	97		110	854.12			123	56	2.5	122	
	11		6.2	8.3	100	97		110	855.56			121	56	2.5	121	
	12		6.3	8.4	100	98		109	857.05			123	56	2.5	120	
	13		6.2	8.3	100	98	-3.5	109	858.58			119	54	2.5	119	
	14		6.0	8.0	100	98		110	860.10			117	50	[illegible]	115	
	15		5.8	7.7	100	98		110	861.58			117	50	2.0	115	

.716 | 108.3

Probe Wash | Cleaning Patch

Silica Gel 7.1g | H_2O Collected 50mls

Silica Gel Cond. | H_2O Condition

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

FIELD DATA SHEETS

Firm Name: Columbia | Pump No.: | Nozzle No. & Dia.: 2-1 .181 in. | Nomograph C Factor: 1.02

Plant Location: Augusta | Orifice No.: T-2 | Assumed Moisture: 8 % | Pitot Coefficient: .851

Test No.: PPD-0-5 | Ambient Temp: 97 °F | Test Duration: 120 min. | Orifice ΔH_A: 1.96

Sampling Location: Prowler-Ager Outlet | Bar Press: 29.85 "Hg | Traverse Point Interval: 3 min. | Test Start Time: 1500

TRC Project No.: | Probe Ident. No.: 30 | Probe Heater Setting: 120 °F mpe | Test End Time:

Date: 8/14/30 | Filter Ident. No.: - | Filter Temp. Setting: - | Leak Test Start: .001 CFM@ 5 "Hg

Tester: JC/KR | Duct Area: ft² | Dry Gas Meter Y: 1.00 | Leak Test Final: .00 | CFM@ 4 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_H in °F	T_H Out °F	P_{STACK} in H_2O	T_{STACK} °F	Initial Metric Volume cu. ft.	PROBE	Cyc. Angle ϕ	P.C. Meter Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. X_1
N	16	3.0	.60	.80	101	98		110	863.06	2		125	50	2.0	119	
	17		.60	.80	101	98	-.35	109	864.55			125	42	2.0	119	
	18		.58	.78	102	98		109	866.04			118	40	2.0	119	
	19		.55	.73	102	98		109	867.60			119	40	2.0	119	
	20		.52	.70	102	98		109	868.95			118	40	2.0	119	
									870.37							
W	1		.28	.37	102	99		107	270.37			115	40	1.0	117	
	2		.36	.48	102	99	-.14	106	871.43			115	40	1.5	115	
	3		.41	.55	102	99		106	872.70			115	40	1.5	113	
	4		.43	.57	102	99		107	873.84			116	40	1.5	112	
	5		.50	.67	102	99		108	875.12			116	40	2.0	112	
	6		.50	.67	103	99	-.25	107	876.48			116	40	2.0	113	
	7		.55	.74	103	99		107	877.53			121	40	2.0	113	
	8		.59	.78	103	99		107	879.28			115	38	2.5	115	
	9		.64	.85	103	99		107	880.83			115	38	2.5	114	

Probe Wash: | Cleaning Patch:

Silica Gel: 7.1g | H_2O Collected: 50mls

Silica Gel Cond.: | H_2O Condition:

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

FIELD DATA SHEETS

Firm Name Columbia
Plant Location Augusta
Test No. PDD-0-5
Sampling Location
TRC Project No.
Date 8/14/80
Tester JC/KK

Pump No.
Orifice No. T-2
Ambient Temp 96 °F
Bar Press 25.85 "Hg
Probe Ident. No. 30
Filter Ident. No. —
Duct Area ft²

Nozzle No. & Dia. 2-1 .185 in.
Assumed Moisture 8 %
Test Duration 120 min.
Traverse Point Interval 3 min.
Probe Heater Setting 120 amps
Filter Temp. Setting —
Dry Gas Meter Y 1.00

Nomograph C Factor 1.02
Pitot Coefficient .831
Orifice ΔH_A 1.96
Test Start Time 1500
Test End Time
Leak Test Start .001 CFM@ 5 "Hg
Leak Test Final .001 CFM@ 4 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M Out °F	P_{STACK} in H_2O	T_{STACK} °F	Initial Metric Volume cu. ft.	PROBE	Cyc. Angle ∅	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. %
W	10	30	66	88	103	99		106	88229	2		114	38	2.5	119	
	11		70	93	103	97		106	88385			120	38	3.0	124	
	12		70	93	103	99		106	88545			120	38	3.0	124	
	13		69	92	103	99		106	88706			115	38	3.0	120	
	14		69	92	103	99		106	88867			115	38	3.0	120	
	15		69	92	103	99	-40	106	89025			113	38	3.0	120	
	16		70	93	103	99		106	89100			114	38	3.0	120	
	17		72	96	103	99		106	89350			111	38	3.0	120	
	18		74	99	103	99		107	89514			120	38	3.0	120	
	19		74	99	103	99		107	89677			120	38	3.0	120	
	20		76	102	103	99		107	89845			120	38	3.0	120	
									90013							
			0724	.716	97.5				5599							

99.5 -.26

Probe Wash
Silica Gel 7.1g
Silica Gel Cond.
Cleaning Patch
H_2O Collected 50mls
H_2O Condition

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

FIELD DATA SHEETS

Firm Name Columbia
Plant Location Augusta
Test No. PDD-G-36
Sampling Location Predryer-dryer Outlet
TRC Project No.
Date 8/14/80
Tester JC/KK

Pump No.
Orifice No. T-2
Ambient Temp 95 °F
Bar Press 29.80 "Hg
Probe Ident. No. 30
Filter Ident. No. —
Duct ~~Area~~ dia. 17.5 in 3206 ft²

Nozzle No. & Dia. 2-1 .189 in.
Assumed Moisture 8 %
Test Duration 120 min.
Traverse Point Interval 3 min.
Probe Heater Setting 120 amps
Filter Temp. Setting —
Dry Gas Meter Y 1.00

Nomograph C Factor 1.02
Pitot Coefficient .831
Orifice ΔH_A 1.96
Test Start Time 1805
Test End Time 2010
Leak Test Start .001 CFM@ 6 "Hg
Leak Test Final .001 CFM@ .1 "Hg

Port	Point	Time Min. (3 4 5)	Velocity ΔP in H_2O (6 7 8 9 10)	ΔH in H_2O (12 13 14 15)	T_M in °F (18 19 20)	T_M Out °F (23 24 25)	P_{STACK} in H_2O (26 27 28 29 30)	T_{STACK} °F (32 33 34 35)	Initial Metric Volume cu. ft. (40 41 42 43 44 45)	PROBE (50)	Cyc. Angle ∅ (52 53)	P.a ~~Heater Box~~ Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. %
W	1	30	27	36	100	97		108	90032	2	NA	113	40	1.0	120	
	2		36	48	100	97		106	90136			113	40	1.5	120	
	3		36	48	100	97		106	90252			115	40	1.5	120	
	4		42	56	100	97		107	90369			119	40	2.0	125	
	5		44	58	100	97		107	90500			124	40	3.0	125	
	6		51	69	100	97	-24	107	90623			122	40	3.0	126	
	7		52	70	100	97		109	90762			121	40	3.0	126	
	8		58	77	100	97		109	90903			120	40	3.01	126	
	9		61	82	100	97		109	91050			126	40	3.0	128	
	10		63	84	101	98		109	91200			126	40	3.0	120	
	11		70	93	101	98	-40	109	91353			120	40	3.5		
	12		72	95	101	98		109	91513			116	40	3.5		
	13		72	95	101	98		109	91675			126	40	3.5		
	14		72	95	101	98		109	91841			128	40	3.5		
	15		72	95	101	98		110	92000			118	40	3.5		

Probe Wash
Cleaning Patch
Silica Gel [illegible] 7.2
H_2O Collected 40 mls
Silica Gel Cond.
H_2O Condition

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

FIELD DATA SHEETS

Firm Name Columbia | Pump No. | Nozzle No. & Dia. A-1 .187 in. | Nomograph C Factor 1.02

Plant Location Augusta | Orifice No. T-2 | Assumed Moisture 8 % | Pitot Coefficient .831

Test No. PDD-0-6 | Ambient Temp 95 °F | Test Duration 120 min. | Orifice ΔH_A 1.96

Sampling Location Preheater-Dryer Outlet | Stat Press 29.80 "Hg | Traverse Point Interval 3 min. | Test Start Time 1805

TRC Project No. | Probe Ident. No. 30 | Probe Heater Setting 120 amps | Test End Time 2010

Date 8/14/80 | Filter Ident. No. — | Filter Temp. Setting | Leak Test Start .001 CFM@ 6 "Hg

Tester JC/SK | Duct Area (dia) 27.5 in 32.6 ft² | Dry Gas Meter Y 1.00 | Leak Test Final .001 CFM@ 4 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_H in °F	T_H Out °F	P_{STACK} in H_2O	T_{STACK} °F	Initial Metric Volume cu. ft.	PROBE	Cyc. Angle ϕ	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. X_i
W	16	30	71	94	101	98	-42	109	921632			115	40	3.5	120	
	17		71	94	101	98		110	923265			126	40	3.5		
	18		71	94	101	98		110	924898			126	40	3.5		
	19		75	100	101	98		110	926531			117	40	3.5		
	20		75	100	101	98		110	928164			119	40	3.5		
									929782							
N	1		21	28	101	98		108	929782			114	40	1.0		
	2		21	28	101	98		108	930777			125	40	1.0		
	3		28	37	101	98	-12	110	931665			124	40	1.0		
	4		31	40	101	98		110	932668			120	40	2.0		
	5		33	44	101	98		111	933777			116	40	2.0		
	6		36	48	101	98		111	934880			130	40	2.0		
	7		38	51	101	98	-17	111	936007			131	40	2.0		
	8		42	56	101	98		111	937228			122	40	2.0		
	9	↓	45	60	101	97		111	938554	↓		116	40	2.5	↓	

Probe Wash | Cleaning Patch

Silica Gel 7.2g | H_2O Collected 40mls

Silica Gel Cond. | H_2O Condition

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

FIELD DATA SHEETS

Firm Name Columbia
Plant Location Augusta
Test No. PDD-0-[illegible]6
Sampling Location Predryer-Dryer Outlet
TRC Project No.
Date 6/14/86
Tester JC / KK

Pump No. —
Orifice No. T-2
Ambient Temp 95 °F
Bar Press 29.80 "Hg
Probe Ident. No. 30
Filter Ident. No.
Duct Area ft²

Nozzle No. & Dia. 2-1 .189 in.
Assumed Moisture 8 %
Test Duration 120 min.
Traverse Point Interval 3 min.
Probe Heater Setting 120 amps
Filter Temp. Setting —
Dry Gas Meter Y 1.00

Nomograph C Factor 1.02
Pitot Coefficient .831
Orifice ΔH 1.96
Test Start Time 1805
Test End Time 2010
Leak Test Start .001 CFM@ 6 "Hg
Leak Test Final .001 CFM@ 9 "Hg

Port	Point	Time Min. (3 4 5)	Velocity ΔP in H_2O (6 7 8 9 10)	ΔH in H_2O (12 13 14 15)	T_M in °F (18 19 20)	T_M Out °F (23 24 25)	P_{STACK} in H_2O (26 27 28 29 30)	T_{STACK} °F (32 33 34 35)	Initial Metric Volume cu. ft. (40 41 42 43 44 45)	PROBE (50)	Cyc. Angle ∅ (52 53)	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 Conc. %
N	10	30	54	72	101	98	-17	111	93984	2	NA	127	40	2.5	120	
	11		59	80	101	98		111	94123			129	40	2.5		
	12		62	83	101	98	-31	111	94272			124	40	3.0		
	13		59	80	101	98		111	94425			117	40	3.0		
	14		59	80	101	98		111	94577			120	40	3.0		
	15		59	80	101	98		111	94724			129	40	3.0		
	16		58	78	101	98		111	94872			130	40	3.0		
	17		60	80	101	98		111	95020			124	40	3.0		
	18		60	80	101	98		111	95173			119	40	3.0		
	19		60	80	101	98	-34	111	95319			124	40	3.0		
	20		55	74	101	98		111	95468			120	40	3.0		
									95612							
			0.72	0.71		99.3	-.29	109.6	55.86							

Probe Wash
Silica Gel 7.2g
Silica Gel Cond.

Cleaning Patch
H_2O Collected 40mls
H_2O Condition

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample Triplicate Analysis

CO_2	O_2	CO	N_2

APPENDIX C.3

COOLER (INLET, BYPASS)

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT Columbia Nitrogen
DATE 8/15/00
SAMPLING LOCATION Prill Cooler Inlet
INSIDE OF FAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE A) _____
INSIDE OF NEAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE B) _____
STACK I.D., (DISTANCE A - DISTANCE B) 47 1/2"
NEAREST UPSTREAM DISTURBANCE _____
NEAREST DOWNSTREAM DISTURBANCE _____
CALCULATOR LAG

SCHEMATIC OF SAMPLING LOCATION

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8 INCH)	DISTANCE B	TRAVERSE POINT LOCATION FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
1	0.011	47 1/2"	See last	No Flange	1.60
2	0.032		column		1.52
3	0.055				2.61
4	0.079				3.75
5	0.105				4.99
6	0.132				6.27
7	0.161				7.65
8	0.194				9.23
9	0.230				10.93
10	0.272				12.92
11	0.323				15.34
12	0.398				18.91
13	0.602				28.60
14	0.677				32.16
15	0.728				34.58
16	0.770				36.58
17	0.806				38.29
18	0.839				39.85
19	0.868				41.23
20	0.895				42.51
21	0.921				43.75
22	0.945				44.89
23	0.968				45.98
24	0.989				46.50

EPA (Dur) 232
4/72

PRELIMINARY VELOCITY TRAVERSE

PLANT Columbia Nitrogen
DATE 8/15/80
LOCATION Prill Cooler Scrubber Inlet
STACK I.D. 47 1/2"
BAROMETRIC PRESSURE, in. Hg 29.92
STACK GAUGE PRESSURE, in. H_2O -5.50
OPERATORS LAG & MAA
Cp 0.846

V_S = 3879
Q_S = 47747
Q_{STD} = 41019

North

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	0.43	90
2	0.44	90
3	1.05	117
4	1.05	119
5	1.10	120
6	1.20	120
7	1.25	122
8	1.20	123
9	1.25	124
10	1.30	124
11	1.30	124
12	1.30	126
13	1.35	126
14	1.30	133
15	1.30	133
16	1.30	135
17	1.30	136
18	1.30	135
19	1.30	137
20	1.30	137
21	1.30	137
22	1.25	137
23	1.20	137
24	1.20	137
AVERAGE	1.16	126

SCHEMATIC OF TRAVERSE POINT LAYOUT

West

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	0.56	104
2	0.58	103
3	0.73	126
4	0.66	129
5	0.86	131
6	0.88	128
7	1.00	129
8	1.05	130
9	1.05	130
10	1.10	130
11	1.10	130
12	1.20	133
13	1.35	129
14	1.35	129
15	1.41	131
16	1.40	131
17	1.40	131
18	1.50	131
19	1.50	131
20	1.50	131
21	1.50	131
22	1.45	130
23	1.40	130
24	1.40	130
AVERAGE	1.14	128

$\sqrt{\Delta P}$ = 1.07 T_S = 127

EPA (Dur) 233
4/72

F_{AP} = 1.08

SAMPLING TASK LOG

Plant Columbia Nitrogen
Date 8/15/00

Plant Location Augusta, GA
Recorded by LAG

Comments	Run	Sampling location (Port)	Pollutant	Clock Time Began	Clock Time Ended	Elapsed Time (min)	Sample Nos.
Began Test No. 1 on the Prill Cooler Scrubber Inlet	1	West	AN	1144			
Stopped testing on the west port to change to the south port	1	~~South~~ West			1256	72	
Resumed testing on the south port	1	South		1258			
Stopped sampling at Point No. 2 due to plogged sample line. Heavy particulate					1303	5	
Resumed sampling at Point No. 2 South port				1326			
Finished sampling on the south port	1				1433	67	
Began Test No. 2 on the Prill Cooler Scrubber Inlet	2	South	AN	1544			
Stopped sampling on the South port to change to the West Port	2				1656	~~72~~ 72	
Resumed Test No. 2 on the West port	2	West		1700			
Stopped sampling on point No. 12 due to process shut down - Elevater brake. Stopped test for 8/15 will continue on 8/16					1736	36	

TRC Environmental Consultants, Inc.

FIELD DATA SHEET

Firm Name: Columbia Nitrogen
Plant Location: Augusta, GA
Test Number: 7
Sampling Location: Prill Cooler Scrubber Inlet
TRC Project No.: 1430-880-20
Date: 8/15/80
Tester: LAG & MAA

Orifice No.: 0-7
Ambient Temp.: 90 °F
Bar. Press.: 29.92 "Hg
Probe Ident. No.: 37
Filter Ident. No.: NA
Duct Area: 12.31 ft²

Nozzle No. & Dia.: 3-1 0.1914 in.
Assumed Moisture: 2.0 %
Test Duration: 144 min.
Traverse Point Interval: 3 min.
Probe Heater Setting: 150 °F
Filter Temp. Setting: NA °F
Dry Gas Meter Y: 1.00

Nomograph C Factor: 1.20
Pitot Coefficient: 0.846
Orifice ΔH_A: 2.11
Test Start Time: 1144
Test Final Time: 1433
Leak Test Start: 0.00 CFM@ -5 "Hg
Leak Test Final: 0.00 CFM@ -7 "Hg

Port	Point	Time Min. (3-5)	Velocity ΔP in H_2O (6-10)	ΔH in H_2O (12-15)	T_M in °F (18-20)	T_M out °F (23-25)	P_{Stack} in H_2O (26-30)	T_{Stack} °F (32-35)	Gas Sample Volume cu. ft. (40-45)	PROBE (50)	Cyc. Angle ø (52-53)	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %
W	1	30	060	093	87	88	-550	105	44003	7			50	-3	164		
	2		064	100	88	88		106	44165				50	-3	165		
	3		071	110	88	88		123	44328				50	-3	164		
	4		076	120	89	89		124	44489				50	-3	164		
	5		083	130	89	89		125	44673				50	-3	164		
	6		089	135	89	89		126	44852				50	-3	163		
	7		098	150	89	89		128	45015				50	-3	163		
	8		100	155	89	89		122	45217				50	-3	163		
	9		105	165	89	90	-550	123	45399				50	-3	163		
	10		110	170	89	89		122	45573				50	-3	163		
	11		115	180	89	90		128	45831				50	-3	163		
	12		120	185	90	90		127	46004				50	-3	163		
	13		125	190	90	90		129	46225				50	-3	163		
	14		130	200	90	90		129	46429				50	-3	163		
Average			$\Sigma\sqrt{\Delta P}$														

H_2O Collected: 53 - 2 ml
SG Condition:
SG Weight: 15.3 gm
Total Volume Collected: 66.3 ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2

COMMENTS: SUBTRACT 2 ml from water gain. Water was added to bring to unplug the sample line

TRC Environmental Consultants, Inc.

FIELD DATA SHEET

Firm Name: Columbia Nitrogen
Plant Location: Augusta, GA
Test Number: 7
Sampling Location: Prill Cooler Scrubber Inlet
TRC Project No.: 1430-E80-20
Date: 8/15/80
Tester: LAG + MAA

Orifice No.: D-7
Ambient Temp.: 90 °F
Bar. Press.: 29.92 "Hg
Probe Ident. No.: 37
Filter Ident. No.: NA
Duct Area: 12.31 ft²

Nozzle No. & Dia.: 3-1 0.1914 in.
Assumed Moisture: 2.0 %
Test Duration: 144 min.
Traverse Point Interval: 3 min.
Probe Heater Setting: 150 °F
Filter Temp. Setting: NA °F
Dry Gas Meter Y: 1.00

Nomograph C Factor: 1.20
Pitot Coefficient: 0.846
Orifice ΔH_A: 2.11
Test Start Time: 1144
Test Final Time: 1433
Leak Test Start: 0.00 CFM@ -5 "Hg
Leak Test Final: 0.00 CFM@ -7 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	PROBE	Cyc. Angle ø	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %	
W	15	30	135	210	90	90	-550	129	46653				50	-4	163			
	16		140	215	90	90		130	46893				50	-4	163			
	17		140	215	91	90		130	47104				50	-4	163			
	18		140	215	90	90		130	47326				50	-4	163			
	19		140	215	90	90		129	47553				50	-4	163			
	20		140	215	91	90		129	47784				50	-4	162			
	21		140	215	91	90		128	48006				50	-5	163			
	22		140	215	91	91		127	48234				50	-5	163			
	23		150	230	91	91		127	48486				50	-5	163			
	24		150	230	91	91		126	48701				50	-5	163			1256
S	1		086	135	92	92		104	48939				50	-6	163			1258
	2		086	135	92	92		104	49103				50	-6	163			1326
	3		100	170	92	92		104	49208				50	-6	163			
Average			$\Sigma\sqrt{\Delta P}$															

H_2O Collected: 53-2 ml
SG Condition:
SG Weight: 15.3 gm
Total Volume Collected: 66.3 ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2

COMMENTS:
49208 1325
491.44 1303
.64 minus this

Clog in sample line - High loadings. Cleaned out and collected

TRC Environmental Consultants, Inc.

FIELD DATA SHEET

Firm Name: Columbia Nitrogen
Plant Location: Augusta, GA
Test Number: 7
Sampling Location: Prill Cooler Scrubber Inlet
TRC Project No.: A30-EB0-20
Date: 8/15/20
Tester: LAGE MAA

Orifice No.: D-7
Ambient Temp.: 90 °F
Bar. Press.: 29.92 "Hg
Probe Ident. No.: 37
Filter Ident. No.: NA
Duct Area: 12.31 ft²

Nozzle No. & Dia.: 3-1 0.1914 in.
Assumed Moisture: 2.0 %
Test Duration: 144 min.
Traverse Point Interval: 3 min.
Probe Heater Setting: 150 °F
Filter Temp. Setting: NA °F
Dry Gas Meter Y: 1.00

Nomograph C Factor: 1.20
Pitot Coefficient: 0.846
Orifice ΔH_A: 2.11
Test Start Time: 1144
Test Final Time: 1433
Leak Test Start: 0.00 CFM @ -5 "Hg
Leak Test Final: 0.00 CFM @ -7 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	PROBE	Cyc. Angle ϕ	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %
5	4	30	1.10	1.70	92	92	-.55	117	491.657				50	-4	162		
	5		1.20	1.55	92	92		119	496.40				50	-4	162		
	6		1.20	1.85	92	92		119	498.33				50	-4	162		
	7		1.20	1.85	92	92		121	500.62				50	-4	162		
	8		1.20	1.85	92	92		122	502.58				50	-4	162		
	9		1.30	2.00	92	92		123	504.71				50	-4	162		
	10		1.25	1.95	93	92		123	506.94				50	-4	162		
	11		1.25	1.95	93	92		124	509.08				50	-4	162		
	12		1.25	1.95	93	92		127	511.26				50	-4	161		
	13		1.25	1.95	93	92		132	513.46				50	-4	162		
	14		1.25	1.95	93	93		134	515.68				50	-4	162		
	15		1.25	1.95	93	94		133	517.83				50	-4	162		
	16		1.25	1.95	93	94	-.55	134	519.95				50	-4	162		
	17		1.20	1.85	93	94		135	522.22				50	-4	162		
Average			$\Sigma\sqrt{\Delta P}$														

H_2O Collected: 53-2 ml
SG Condition:
SG Weight: 15.3 gm
Total Volume Collected: 66.3 ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	(1)	N_2

COMMENTS:

TRC Environmental Consultants, Inc.

FIELD DATA SHEET

Firm Name: Columbia Nitrogen
Plant Location: August, GA
Test Number: 7
Sampling Location: Prill Cooler Scrubber Inlet
TRC Project No.: 1430-E00-20
Date: 8/15/00
Tester: LAG / MAA

Orifice No.: 0-7
Ambient Temp.: 90 °F
Bar. Press.: 29.92 "Hg
Probe Ident. No.: 37
Filter Ident. No.: NA
Duct Area: 12.31 ft²

Nozzle No. & Dia.: 3-1 0.1914 in.
Assumed Moisture: 2.0 %
Test Duration: 144 min.
Traverse Point Interval: 3 min.
Probe Heater Setting: 150 °F
Filter Temp. Setting: NA °F
Dry Gas Meter Y: 1.00

Nomograph C Factor: 1.20
Pitot Coefficient: 0.846
Orifice ΔH_A: 2.11
Test Start Time: 1144
Test Final Time: 1433
Leak Test Start: 0.00 CFM -5 "Hg
Leak Test Final: 0.00 CFM -7 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	PROBE	Cyc. Angle ∅	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %
5	18	30	1.20	1.85	93	94	-.50	136	524.255				58	-5	162		
	19	1	1.20	1.85	93	94		136	526.355				50	-5	161		
	20		1.20	1.85	93	94		138	528.456				50	-5	161		
	21		1.10	1.70	93	94		139	530.559				50	-5	162		
	22		1.10	1.70	93	94		138	532.664				50	-5	162		
	23		1.05	1.65	94	94		139	534.758				50	-5	162		
	24		1.05	1.65	94	94		139	536.872				50	-5	162		1433
									538.975								
Average			$\Sigma\sqrt{\Delta P}$ 10.7	1.78	91	91	-.55	136	98.08								

H_2O Collected: 53.2 ml
SG Condition:
SG Weight: 16.3 gm
Total Volume Collected: 66.3 ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2

COMMENTS:

TRC Environmental Consultants, Inc.

FIELD DATA SHEET

Firm Name: Columbia Nitrogen
Plant Location: Augusta, GA
Test Number: 8
Sampling Location: Prill Cooler Scrubber Inlet
TRC Project No.: 1436-F80-20
Date: 8/15/80
Tester: LAG + MAA

Orifice No.: 0-7
Ambient Temp.: 94 °F
Bar. Press.: 29.92 "Hg
Probe Ident. No.: 37
Filter Ident. No.: NA
Duct Area: ~~13.21~~ 12.31 ft²

Nozzle No. & Dia.: 3-1 0.1914 in.
Assumed Moisture: 2.0 %
Test Duration: 144 min.
Traverse Point Interval: 3 min.
Probe Heater Setting: 150 °F
Filter Temp. Setting: NA °F
Dry Gas Meter Y: 1.00

Nomograph C Factor: 1.20
Pitot Coefficient: 0.846
Orifice ΔH_A: 2.11
Test Start Time: 1544 8/15
Test Final Time: 0853 8/16
Leak Test Start: 0.00 CFM @ -5 "Hg
Leak Test Final: 0.00 CFM @ -8 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	PROBE	Cyc. Angle ϕ	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %
S	1	3	0.71	1.10	94	95	-.10	106	539.08	T			51	-3	165		
	2		0.76	1.10	94	94		100	540.74				51	-3	165		
	3		0.73	1.15	94	94		121	542.51				51	-3	164		
	4		0.83	1.30	94	94		128	544.07				51	-4	164		
	5		0.86	1.35	94	94		120	545.83				51	-4	163		
	6		0.94	1.50	94	94		123	547.86				51	-4	163		
	7		1.05	1.65	94	94		124	549.73				51	-4	163		
	8		1.05	1.65	94	94		125	551.69				51	-4	164		
	9		1.26	1.85	94	95		125	553.60				50	-4	162		
	10		1.15	1.80	94	95		126	555.71				50	-4	162		
	11		1.15	1.80	94	95		127	557.83				50	-4	162		
	12		1.20	1.80	94	95		129	559.93				50	-4	162		
	13		1.25	1.95	95	95		138	562.44				48	-4	162		
	14		1.26	1.80	95	95	||	138	564.25				48	-4	162		
Average			$\Sigma\sqrt{\Delta P}$														

H_2O Collected: Sludge ml
SG Condition:
SG Weight: 15.4 gm
Total Volume Collected: 66.4 ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2

COMMENTS: See page 3 of 4 for volume correction

TRC Environmental Consultants, Inc.

FIELD DATA SHEET

Firm Name: Columbia Nitrogen
Plant Location: Augusta, GA
Test Number: 8
Sampling Location: Prill Cooler Inlet (scrubber)
TRC Project No.: 1430-E80-20
Date: 8/15/80
Tester: LAG + MAA

Orifice No.: D-7
Ambient Temp.: 95 °F
Bar. Press.: 29.92 "Hg
Probe Ident. No.: 37
Filter Ident. No.: NA
Duct Area: ~~13.21~~ 12.31 ft²

Nozzle No. & Dia.: 3-1 0.1914 in.
Assumed Moisture: 2.0 %
Test Duration: 144 min.
Traverse Point Interval: 3 min.
Probe Heater Setting: 150°F °F
Filter Temp. Setting: NA °F
Dry Gas Meter Y: 1.00

Nomograph C Factor: 1.20
Pitot Coefficient: 0.846
Orifice ΔH_A: 2.11
Test Start Time: 1544 8/15
Test Final Time: 0803 8/16
Leak Test Start: 0.00 CFM@ -5 "Hg
Leak Test Final: 0.00 CFM@ -8 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	PROBE	Cyc. Angle ø	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %	
S	15	30	130	200	96	96	-4.90	138	566.42	3			48	-4	160			
	16		130	200	96	96		138	568.53				48	-5	161			
	17		130	200	96	96		140	570.68				48	-4	162			
	18		130	200	96	95		140	572.92				48	-4	162			
	19		140	220	95	96		140	575.16				48	-6	160			
	20		125	195	97	96		140	577.44				48	-6	160			
	21		125	195	97	96		140	579.61				48	-6	161			
	22		125	195	97	97		141	582.03				48	-6	161			
	23		120	185	97	97		142	584.05				48	-6	161			
	24		120	185	97	97		140	586.19				48	-6	161			1656
W.	1		065	100	98	98		116	588.18				48	-6	161			1700
	2		065	100	98	97		121	589.90				48	-3	161			
	3		065	100	97	97		128	591.47				48	-3	160			
Average			$\Sigma\sqrt{\Delta P}$															

H_2O Collected: 5 [illegible] ml
SG Condition:
SG Weight: 15.4 gm
Total Volume Collected: 66.4 ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2

COMMENTS:

TRC Environmental Consultants, Inc.

FIELD DATA SHEET

Firm Name: Columbia Nitrogen
Plant Location: Augusta, GA
Test Number: 8
Sampling Location: Pill Cooler Scrubber Inlet
TRC Project No.: 1430-E80-20
Date: 8/15/00 & 8/16/00
Tester: LAG & MAA

Orifice No.: 0-7
Ambient Temp.: 95 °F
Bar. Press.: 29.92 "Hg
Probe Ident. No.: 37
Filter Ident. No.: NA
Duct Area: 13.21 ft²

Nozzle No. & Dia.: 3-1 0.1914 in.
Assumed Moisture: 2.0 %
Test Duration: 144 min.
Traverse Point Interval: 3 min.
Probe Heater Setting: 150 °F
Filter Temp. Setting: NA °F
Dry Gas Meter Y: 1.00

Nomograph C Factor: 1.20
Pitot Coefficient: 0.846
Orifice ΔH_A: 2.11
Test Start Time: 1544 8/15
Test Final Time: 0803 8/16
Leak Test Start: 0.00 CFM: -5 "Hg
Leak Test Final: 0.00 CFM: -8 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	PROBE	Cyc. Angle ϕ	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %
W	4	3	0.69	1.10	97	98	-.490	126	593.288	3			48	-3	160		
	5		0.88	1.40	97	98		128	594.667				48	-4	161		
	6		0.90	1.40	97	98		130	596.553				48	-4	161		
	7		0.94	1.50	97	98		131	598.441				48	-5	161		
	8		1.00	1.55	97	98		133	600.033				48	-5	161		
	9		1.00	1.55	98	98		134	602.227				48	-5	160		
	10		1.05	1.65	98	98		134	604.388				48	-5	161		
	11		1.10	1.70	98	98		136	606.223				48	-5	160		
	12		1.20	1.85	98	98		119	608.441				48	-6	161		1736*
	13		1.35	2.05	89	91		132	610.035				52	-6	166		8/16 0727
	14		1.30	2.05	88	90	-.550	131	611.365				51	-6	164		
	15		1.35	2.10	87	90		130	614.866				51	-6	164		
	16		1.35	2.10	87	90		130	617.008				50	-6	165		
	17		1.40	2.20	87	89		130	619.134				50	-6	165		
Average			$\Sigma\sqrt{\Delta P}$														

*Process problems shut down train

H_2O Collected: 5 leaks ml
SG Condition:
SG Weight: 15.4 gm
Total Volume Collected: 11.4 ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2

COMMENTS: 610.48
610.35
.13 subtract this amount leak test

TRC Environmental Consultants, Inc.

FIELD DATA SHEET

Firm Name: Columbia Nitrogen
Plant Location: Augusta, GA
Test Number: 8
Sampling Location: Prill Cooler Scrubber Inlet
TRC Project No.: 1430-E80-20
Date: 8/15/80 - 8/16/80
Tester: LAG - MAA

Orifice No.: D-7
Ambient Temp.: 94 °F
Bar. Press.: 29.90 "Hg
Probe Ident. No.: 37
Filter Ident. No.: NA
Duct Area: ~~13.21~~ 12.51 ft²

Nozzle No. & Dia.: 3-1 0.1914 in.
Assumed Moisture: 2.0 %
Test Duration: 144 min.
Traverse Point Interval: 3 min.
Probe Heater Setting: 150 °F
Filter Temp. Setting: NA °F
Dry Gas Meter Y: 1.00

Nomograph C Factor: 1.20
Pitot Coefficient: 0.846
Orifice ΔH_A: 2.11
Test Start Time: 1544 8/15
Test Final Time: 0803 8/16
Leak Test Start: 0.00 CFM@ -5 "Hg
Leak Test Final: 0.00 CFM@ -8 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	PROBE	Cyc. Angle ø	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %
W	18	30	140	220	86	89	-5.50	129	621.657				50	-6	164		
	19		140	220	86	88		129	624.00				52	-6	164		
	20		140	220	86	88		128	626.38				52	-6	164		
	21		145	225	86	88		128	628.55				52	-6	150		
	22		145	225	86	88	-5.60	128	630.87				52	-6	150		
	23		145	225	87	88		126	633.21				52	-6	142		
	24		150	230	87	88		126	635.55				52	-6	143		0803
									637.77								
Average			$\Sigma\sqrt{\Delta P}$ 1.00	176	94	94	-53	129									

H_2O Collected: [illegible] ml
SG Condition:
SG Weight: 15.9 gm
Total Volume Collected: 66.9 ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2

COMMENTS:

SAMPLIN. TASK LOG

Plant Columbia Nitrogen
Date 8/16/00

Plant Location Augusta, GA
Recorded by LAG

Comments	Run	Sampling location (Port)	Pollutant	Clock Time Began	Clock Time Ended	Elapsed Time (min)	Sample Nos.
Resumed sampling on the Prill Cooler Scrubber Inlet Test No. 2 - west port, Point 13	2	West	AN	0727			
Stopped sampling on the west port Finished Test No. 2 - Leak Check OK	2				0803	36	
Started Test No. 3 on the Prill Cooler Scrubber Inlet - South port	3	South	AN	0911			
Finished the south port and moved to the west port	3				1023	72	
Started sampling on west port	3	West		1026			
Stopped sampling after point 13 due to plugged sample line					1105	39	
Resumed sampling at 14th point				1107			
Stopped sampling on west port Finished Test No. 3 Leak Check OK					1140	33	

TRC Environmental Consultants, Inc.

FIELD DATA SH.

Firm Name: Columbia Nitrogen
Plant Location: Augusta, GA
Test Number: 9
Sampling Location: Prill Cooler Scrubber Inlet
TRC Project No.: 1430-280-20
Date: 8/16/80
Tester: LAG / MAA

Orifice No.: D-7
Ambient Temp.: 95 °F
Bar. Press.: 29.85 "Hg
Probe Ident. No.: 37
Filter Ident. No.: NA
Duct Area: ~~13.21~~ 12.31 ft²

Nozzle No. & Dia.: 3-1 0.1914 in.
Assumed Moisture: 2.0 %
Test Duration: 144 min.
Traverse Point Interval: 3 min.
Probe Heater Setting: 140 °F
Filter Temp. Setting: NA °F
Dry Gas Meter Y: 1.00

Nomograph C Factor: 1.23
Pitot Coefficient: 0.846
Orifice ΔH_A: 2.11
Test Start Time: 0911
Test Final Time: 1140
Leak Test Start: 0.00 CFM -7 "Hg
Leak Test Final: 0.00 CFM -8 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	PROBE	Cyc. Angle	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %
S	1	3	0.64	1.00	86	86	-.25	104	637.957	T			48	-3	140		
/	2		0.64	1.00	86	87		105	639.488	/			40	-3	141		
	3		0.87	1.35	86	86	-.525	111	641.116				38	-4	141		
	4		0.97	1.50	86	86	-1	111	642.994				36	-4	141		
	5		1.10	1.70	86	86		112	645.03				36	-5	141		
	6		1.10	1.70	86	87		114	646.886				36	-5	134		
	7		1.20	1.85	86	86		117	648.877				36	-5	134		
	8		1.20	1.85	86	86		119	650.977				36	-5	134		
	9		1.20	1.85	87	86		121	653.09				36	-5	135		
	10		1.25	1.95	87	87		123	655.211				38	-5	134		
	11		1.25	1.95	87	86	-.575	124	657.40				36	-5	135		
	12		1.20	1.85	87	87		125	659.557				36	-5	135		
	13		1.30	2.05	87	87		132	661.75				40	-6	134		
	14		1.30	2.05	88	87		134	663.974				38	-6	145		
Average			$\Sigma\sqrt{\Delta P}$ 16.6	1.77													

H_2O Collected: 62 ml
SG Condition:
SG Weight: 14.3 gm
Total Volume Collected: 76.3 ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2

COMMENTS: See page 3 of 4 for sample volume correction

TRC Environmental Consultants, Inc.

FIELD DATA SH.

Firm Name Columbia Nitrogen
Plant Location Augusta, GA
Test Number 9
Sampling Location Prill Cooler Inlet
TRC Project No. 1430-E80-30
Date 8/16/80
Tester LAG & MAA

Orifice No. D-7
Ambient Temp. 95 °F
Bar. Press. 29.85 "Hg
Probe Ident. No. 37
Filter Ident. No. NA
Duct Area ~~13.21~~ 12.31 ft²

Nozzle No. & Dia. 3-1 0.1914 in.
Assumed Moisture 2.0 %
Test Duration 144 min.
Traverse Point Interval 3 min.
Probe Heater Setting 170 °F
Filter Temp. Setting NA °F
Dry Gas Meter Y 1.00

Nomograph C Factor 1.20
Pitot Coefficient 0.846
Orifice ΔH_A 2.11
Test Start Time 0911
Test Final Time 1140
Leak Test Start 0.00 CFM -7 "Hg
Leak Test Final 0.00 CFM -8 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	PROBE	Cyc. Angle ø	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %	
S	15	30	1.25	1.95	88	87	-.54	134	666.200				38	-6	142			
	16	1	1.35	1.95	88	87		134	668.337				38	-6	147			
	17	1	1.25	1.95	89	88		135	670.552				38	-6	145			
	18	1	1.25	1.95	89	88	-.545	136	672.770				38	-6	146			
	19	1	1.30	2.05	89	87		135	674.886				38	-6	145			
	20	1	1.30	2.05	89	88		136	677.009				38	-6	145			
	21	1	1.30	2.05	89	88		136	679.133				38	-6	145			
	22	1	1.25	1.95	89	88		136	681.167				38	-6	146			
	23	1	1.25	1.95	90	88		136	683.377				38	-6	146			
	24	1	1.25	1.95	89	88		136	685.493				38	-6	146			1023
W	1	0	0.54	0.85	89	88		108	688.099				38	-3	146			1026
	2	0	0.46	0.73	89	89		108	689.556				38	-3	146			
	3	0	0.59	0.94	89	89		123	691.015				38	-3	146			
Average			$\Sigma\sqrt{\Delta P}$															

H_2O Collected 62 ml
SG Condition
SG Weight 14.3 gm
Total Volume Collected 76.3 ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2

COMMENTS: See page 3 of 4 for sample volume correction

TRC Environmental Consultants, Inc.

FIELD DATA SH.

Firm Name Columbia Nitrogen
Plant Location Augusta, GA
Test Number 9
Sampling Location Prill Cooler Scrubber Inlet
TRC Project No. 1430-E80-26
Date 8/16/90
Tester LAGT MAA

Orifice No. D-7
Ambient Temp. 95 °F
Bar. Press. 29.85 "Hg
Probe Ident. No. 37
Filter Ident. No. NA
Duct Area 62.31 ft²

Nozzle No. & Dia. 3-1 0.1914 in.
Assumed Moisture 2.0 %
Test Duration 144 min.
Traverse Point Interval 3 min.
Probe Heater Setting 140 °F
Filter Temp. Setting NA °F
Dry Gas Meter Y 1.00

Nomograph C Factor 1.20
Pitot Coefficient 0.846
Orifice ΔH_A 2.11
Test Start Time 0911
Test Final Time 1140
Leak Test Start 0.00 CFM @ -7 "Hg
Leak Test Final 0.00 CFM @ -8 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	PROBE	Cyc. Angle ∅	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %
W	4	3	0.63	1.00	89	89	-4.90	128	693.003				38	~~-4~~ -7	146		
	5	6	0.69	1.10	89	89		126	694.099				38	-5	146		
	6	9	0.73	1.30	89	89		126	695.774				38	-5	146		
	7	12	0.79	1.40	89	90		128	697.663				38	-5	146		
	8	15	0.86	1.50	89	90		131	699.436				38	-5	146		
	9	18	0.98	1.55	90	90		131	701.127				38	-5	146		
	10	21	1.00	1.55	90	90		132	703.266				38	-5	146		
	11	24	1.00	1.55	90	90		131	705.117				38	-5	146		
	12	27	1.15	1.80	91	90		133	707.144				38	-5	146		
	13	30	1.30	2.05	91	90		133	710.033				38	-5	146		
	14	33	1.35	2.10	90	90		133	710.944				38	-5	146		
	15	36	1.35	2.10	90	91		134	713.838				38	-6	146		
	16	39	1.40	2.26	90	91		132	716.464				38	-6	146		
	17	42	1.40	2.20	90	91		130	719.090				38	-7	146		
Average			$\Sigma\sqrt{\Delta P}$														

* 2 min delay.

H_2O Collected 62 ml
SG Condition
SG Weight 14.3 gm
Total Volume Collected 76.3 ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2

COMMENTS: * Point 13 sample line clogged. Added 10 ml of H_2O to dissolve particulate. Subtract 10 ml from total water gain

TRC Environmental Consultants, Inc.

FIELD DATA SH.

Firm Name: Columbia Nitrogen
Plant Location: Augusta, GA
Test Number: 9
Sampling Location: Prill Cooler Scrubber Inlet
TRC Project No.: 1436-E80-20
Date: 8/16/00
Tester: LAGE MAA

Orifice No.: D-7
Ambient Temp.: 95 °F
Bar. Press.: 29.85 "Hg
Probe Ident. No.: 37
Filter Ident. No.: NA
Duct Area: 12.31 ft²

Nozzle No. & Dia.: 3-1 0.194 in.
Assumed Moisture: 2.0 %
Test Duration: 144 min.
Traverse Point Interval: 3 min.
Probe Heater Setting: 140 °F
Filter Temp. Setting: NA °F
Dry Gas Meter Y: 1.00

Nomograph C Factor: 1.20
Pitot Coefficient: 0.846
Orifice ΔH_A: 2.11
Test Start Time: 0911
Test Final Time: 1140
Leak Test Start: 0.00 CFM @ -7 "Hg
Leak Test Final: 0.00 CFM @ -8 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	PROBE	Cyc. Angle β	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %
W	18	30	1.40	2.20	91	90	-4.90	131	719.247				38	-7	146		
	19		1.45	2.30	91	90	-5.60	129	723.147				38	-7	146		
	20		1.45	2.30	91	90		130	727.395				38	-7	146		
	21		1.45	2.30	91	91		129	731.626				38	-7	146		
	22		1.45	2.30	92	91		129	735.861				38	-7	146		
	23		1.45	2.30	92	91		127	740.099				38	-7	139		
	24		1.45	2.3	92	91		126	744.339				38	-7	137		
									748.582								
Average			$\Sigma\sqrt{\Delta P}$ 1.06	1.77	91.89		-5.33	1.27	97.89								

1140

H_2O Collected: 62 ml
SG Condition:
SG Weight: 141.3 gm
Total Volume Collected: 76.3 ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2

COMMENTS:

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT Columbia Nitrogen
DATE 9/15/00
SAMPLING LOCATION BYPASS
INSIDE OF FAR WALL TO
OUTSIDE OF NIPPLE. (DISTANCE A)
INSIDE OF NEAR WALL TO
OUTSIDE OF NIPPLE. (DISTANCE B)
STACK I.D., (DISTANCE A - DISTANCE B) 48
NEAREST UPSTREAM DISTURBANCE
NEAREST DOWNSTREAM DISTURBANCE
CALCULATOR EDA

SCHEMATIC OF SAMPLING LOCATION

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8 INCH)	DISTANCE B	TRAVERSE POINT LOCATION FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5
1	~~.021~~	48	~~1.01~~	No flange	~~7.01~~
2	~~.067~~		~~3.23~~		~~3.22~~
3	.118		~~5.66~~		~~5.06~~
4	.177		~~8.50~~		~~8.50~~
5	.25		12.00		12.00
6	.356		17.09		17.09
7	.644		~~30.91~~		~~30.91~~
8	.75		36.00		~~36.00~~
9	.823		39.50		39.50
10	.882		~~42.34~~		~~42.34~~
11	~~.933~~		~~44.78~~		~~44.78~~
12	~~.979~~		46.99		~~46.99~~
1	.044		2.11		2.11
2	.146		7.01		7.01
3	.296		14.21		14.21
4	.704		33.79		33.79
5	.854		40.99		40.99
6	.956		45.89		45.89

EPA (Dur) 232
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SAMPLIN TASK LOG

Plant Columbia Nitrogen
Date 8/15/90

Plant Location August Georgia
Recorded by EPA

Comments	Run	Sampling location (Port)	Pollutant	Clock Time Began	Clock Time Ended	Elapsed Time (min)	Sample Nos.
START Test #1 on Prill Cooler Bypass Port 1	1	1		1157	1257	60	
END PORT 1 change to port 2							
START PORT 2				~~1257~~	1257		
Pitot tube are acting funny Pulled Probe		2		1300	1335	35	
Blow lines locked OK Started Back UP				~~1335~~			
End Test 1 on port 2 Bypass	1			1340	1405	25	

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FIELD DATA SH

PAGE *1 of 2

Firm Name: Columbia Nitrogen
Plant Location: Augusta, Georgia
Test Number: 1
Sampling Location: Prill Coolers Bypass
TRC Project No.: 1430-EBD-20
Date: 8/15/80
Tester: EDA / GAG

Orifice No.: D-8
Ambient Temp.: 90 °F
Bar. Press.: 29.92 "Hg
Probe Ident. No.: 29
Filter Ident. No.: none
Duct Area: 12.57 ft²
DIA: 48in

Nozzle No. & Dia.: 9-2 0.2601 in.
Assumed Moisture: 5 %
Test Duration: 120 min.
Traverse Point Interval: 5 min.
Probe Heater Setting: 124 ± 5 °F
Filter Temp. Setting: N/A °F
Dry Gas Meter Y: 1.00

Nomograph C Factor: 1.08
Pitot Coefficient: 0.825
Orifice ΔH_A: 1.94
Test Start Time: 1157
Test Final Time: 1405
Leak Test Start: 0.000 CFM @ -9 "Hg
Leak Test Final: 0.00 CFM @ ___ "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	PROBE	Cyc. Angle	Sample Line Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %
1	1	5	0.18	0.92	88	90	-0.19	113	442982			115	52	1.0	128		
	2		0.17	0.85	88	90		114	451888			116	52	1.0	118		
	3		0.19	0.94	88	90		114	454400			127	52	1.0	136		
	4		0.28	1.40	88	90		114	457103			122	52	2.0	125		
	5		0.27	1.30	88	91		114	460211			122	46	1.0	125		
	6		0.25	1.25	88	91		114	463333			122	46	1.0	124		
	6		0.29	1.45	88	91		114	466634			121	46	2.0	124		
	5		0.30	1.50	89	91		114	469957			123	46	2.0	127		
	4		0.31	1.55	89	91		113	472910			123	46	2.0	127		
	3		0.33	1.65	89	92		113	476266			123	46	2.5	130		
	2		0.32	1.60	89	92		112	479725			124	46	2.5	126		
	1		0.30	1.50	89	92		112	483155			122	46	2.5	126		
									486466								
2	1	5	0.14	0.72	89	93		112	486466	V		125	46	1.0	126		
Average			$\Sigma\sqrt{\Delta P}$														

H_2O Collected: 29 ml
SG Condition: ___
SG Weight: 12.3 gm
Total Volume Collected: 41.3 ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2

COMMENTS: *need water cooling

TRC Environmental Consultants, Inc.

FIELD DATA . T
PAGE #2 of 2

Firm Name Columbia Nitrogen
Plant Location Augusta Georgia
Test Number 7
Sampling Location Pall Cooler Bypass
TRC Project No. 1430-E80-20
Date 8/15/80
Tester EDA/GAG

Orifice No. D-8
Ambient Temp. 90 °F
Bar. Press. 29.92 "Hg
Probe Ident. No. 29
Filter Ident. No. none
Duct Area 12.57 ft²
Dia 48in

Nozzle No. & Dia. 4-2 0.2601 in.
Assumed Moisture 5 %
Test Duration 120 min.
Traverse Point Interval 5 min.
Probe Heater Setting 124 ± 5 °F
Filter Temp. Setting N/A °F
Dry Gas Meter Y 1.00

Nomograph C Factor 1.08
Pitot Coefficient 0.825
Orifice ΔH_A 1.94
Test Start Time 1157
Test Final Time 1405
Leak Test Start 0.000 CFM@ -9 "Hg
Leak Test Final 0.00 CFM@ "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	PROBE	Cyc. Angle ø	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %
2	2	5	018	090	89	92	-21	112	48882			121	46	1.0	126		
	3		025	125	89	92		113	49139			121	46	1.5	126		
	4		031	155	89	93		114	49441			121	46	2.0	126		
	5		034	170	90	93		113	49777			121	46	2.5	126		
	6		045	220	90	93		114	50128			120	46	2.5	126		
	6		052	250	90	93		114	50525			121	46	2.5	126		
	5		038	185	90	93		114	50941			121	46	3.0	126		
	4		026	130	90	94		114	51308			122	46	3.0	126		
	3		024	120	90	94		114	51621			122	47	2.5	126		
	2		018	090	91	94		113	51922			122	46	2.0	126		
	1		11	056	91	94		112	52185			121	46	2.0	126		
									52397								
									2469								
Average			$\Sigma\sqrt{\Delta P}$ 516	136	90	.58	-20	113									

1335
1340

H_2O Collected 29 ml
SG Condition
SG Weight 12.3 gm
Total Volume Collected 41.3 ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2

COMMENTS: At Point 6 the Pitot tubes acted funny pulled Probe out and checked them OK.

SAMPLING TASK LOG

Plant Columbia Nitrogen
Date 8/15/80

Plant Location Augusta Georgia
Recorded by EDA

Comments	Run	Sampling location (Port)	Pollutant	Clock Time Began	Clock Time Ended	Elapsed Time (min)	Sample Nos.
Start Test #2 on Port 2 on Prill Cooler Bypass	2	2		1550	1650	60	
					1650		
End of Port 2 Change to Port 1	2	1		1654	1734	42	
Start Port 1 on Prill Cooler Bypass							
Shut down Plant Problem the elevator Broke down				‡	1734		
End of test also leak checked at 0.000 cfm at -8 in vacuum							
last point was run for 2 min							

TRC Environmental Consultants, Inc.

FIELD DATA SHEET

PAGE 2 of 1

Firm Name Columbia Nitrogen
Plant Location Augusta Georgia
Test Number 8
Sampling Location Pell Prill Cooler Bypass
TRC Project No. 1430-E80-20
Date 8/15/80
Tester EPA

Orifice No. D-8
Ambient Temp. 95 °F
Bar. Press. 29.7 "Hg
Probe Ident. No. 29
Filter Ident. No. none
Duct Area 12.57 ft²
DIA 48 in

Nozzle No. & Dia. 4-2 0.2601 in.
Assumed Moisture 5 %
Test Duration ~~120~~ 102 min.
Traverse Point Interval 5 min.
Probe Heater Setting 124 ± 5 °F
Filter Temp. Setting N/A °F
Dry Gas Meter Y 1.00

Nomograph C Factor 1.08
Pitot Coefficient ~~1.94~~ 0.825
Orifice ΔH_A 194
Test Start Time 1550
Test Final Time 1734
Leak Test Start 0.002 CFM@ -9 "Hg
Leak Test Final 0.000 CFM@ "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	PROBE	Cyc. Angle Ø	SAMPLE LINE ~~Heater~~ Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %
2	1	50	025	125	93	95	-06	114	52412			125	60	3.0	130		
	2		022	110	92	95		114	52720			126	52	3.0	131		
	3		041	200	92	95		115	53008			126	52	2.5	131		
	4		038	190	92	95		115	53380			126	50	2.5	130		
	5		045	220	92	96		115	53754			127	50	2.5	129		
	6		018	092	93	96		116	54148			128	50	2.0	129		
	6		014	072	93	96		115	54410			126	50	2.0	129		
	5		038	190	93	96		114	54653			125	50	2.0	129		
	4		035	175	93	96		114	55019			125	50	3.0	129		
	3		033	165	93	96		115	55380			126	50	3.5	129		
	2		028	140	94	96		115	55732			125	50	3.0	128		
	1		023	115	93	96		114	56055			124	50		128		
									56349								
	1		022	110	94	97		114	56349			120	50	3.0	128		
Average			$\Sigma\sqrt{\Delta P}$														

1650
1654

H_2O Collected [illegible] ml
SG Condition
SG Weight 8.8 gm
Total Volume Collected 32.8 ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2

COMMENTS:

TRC Environmental Consultants, Inc.

FIELD DATA SHEET

PAGE 2092

Firm Name: Columbia Nitrogen
Plant Location: Augusta Georgia
Test Number: 8
Sampling Location: Mill Cooler Bypass
TRC Project No.: 1430-E80-20
Date: 8/5/80
Tester: EDA/GAG

Orifice No.: D-8
Ambient Temp.: 95 °F
Bar. Press.: 29.9 "Hg
Probe Ident. No.: 29
Filter Ident. No.: none
Duct Area: 12.57 ft²
Dia: 48 in

Nozzle No. & Dia.: 4-2 02601 in.
Assumed Moisture: 5 %
Test Duration: 120 min.
Traverse Point Interval: 5 min.
Probe Heater Setting: 124 ±5 °F
Filter Temp. Setting: N/A °F
Dry Gas Meter Y: 1.00

Nomograph C Factor: 1.08
Pitot Coefficient: 0.825
Orifice ΔH_A: 1.94
Test Start Time: 1550
Test Final Time: 1734
Leak Test Start: 0.002 CFM @ -9 "Hg
Leak Test Final: 0.000 CFM @ "Hg

Port	Point	Time Min. (3-5)	Velocity ΔP in H_2O (6-10)	ΔH in H_2O (12-15)	T_M in °F (18-20)	T_M out °F (23-25)	P_{Stack} in H_2O (26-30)	T_{Stack} °F (32-35)	Gas Sample Volume cu. ft. (40-45)	PROBE (50)	Cyc. Angle ø (52-53)	SAMPLE LINE ~~Heater Box~~ Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %
	2	5	25	125	94	97	-.16	113	56639	1		124	50	3.0	128		
	3		24	120	94	97		114	56943			124	50	3.0	127		
	4		12	062	94	97		113	57243			125	50	2.0	128		
	5		.15	075	94	97		114	57469			125	40	2.5	128		
	6		.15	075	94	98		113	57708			123	40	2.0	128		
	6		.15	075	94	97		113	57962			123	40	2.0	128		
	5		.15	075	94	97		113	58186			123	40	2.0	128		
	4	2	.14	072	94	98		113	58427			124	40	2.0	128		
	3								58521								
	2																
	1																
									6109								
Average			$\Sigma\sqrt{\Delta P}$ 49	123	93	96	-.11	114									

1734

H_2O Collected: 24 min ml
SG Condition:
SG Weight: 8.3 g gm
Total Volume Collected: 32.8 ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2

COMMENTS:

SAMPLING TASK LOG

Plant Columbia Nitrogen
Date 8/16/00

Plant Location Augusta Georgia
Recorded by EDA

Comments	Run	Sampling location (Port)	Pollutant	Clock Time Began	Clock Time Ended	Elapsed Time (min)	Sample Nos.
START Test #3 Prill Cooler Bypass	3	1		0917	1017	60	
Change Sram Port 1 to Port 2		1			1017		
Start Port 2		2		1022	1122	60	
END Test #3 Prill Cooler					1122		

TRC Environmental Consultants, Inc.

FIELD DATA SHEET
PAGE #1092

Firm Name Columbia Nitrogen
Plant Location Augusta Georgia
Test Number 3 9
Sampling Location Prill Cooler Bypass
TRC Project No. 1430-E80-20
Date 8/16/80
Tester EDA / GAG

Orifice No. D-8
Ambient Temp. 86 °F
Bar. Press. 29.89 "Hg
Probe Ident. No. 27
Filter Ident. No. none
Duct Area 12.57 ft²
DIA 48 in

Nozzle No. & Dia. 4-2 0.2601 in.
Assumed Moisture 3 %
Test Duration 120 min.
Traverse Point Interval 5 min.
Probe Heater Setting 124 ± 10 °F
Filter Temp. Setting none °F
Dry Gas Meter Y 1.00

Nomograph C Factor 1.08
Pitot Coefficient 0.825
Orifice ΔH_A 1.94
Test Start Time 0917
Test Final Time 1122
Leak Test Start 0.000 CFM@ -8 "Hg
Leak Test Final 0.000 CFM@ "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	PROBE	Cyc. Angle ∅	SAMPLE LINE ~~Heater Box~~ Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %
1	1	5	021	100	86	88	-23	110	58538			117	50	2.0	131		
	2		026	130	85	88		114	58815			120	50	3.0	132		
	3		030	145	85	88		114	59118			120	48	3.0	119		
	4		034	170	85	88		115	59442			120	48	3.5	116		
	5		021	100	85	88		116	59790			125	48	2.0 ~~3.0~~	129		
	6		024	120	86	88		116	60071			124	48	2.5	129		
	6		021	100	86	88		115	60364			128	49	2.0	128		
	5		021	100	86	88		116	60638			126	46	2.0	127		
	4		019	095	86	89		116	60912			125	46	2.0	128		
	3		019	095	86	89		116	61174			125	46	2.0	128		
	2		016	0800	86	89		116	61439			125	46	2.0	129		
	1		013	067	86	89		115	61683			125	46	1.0	129		
								115	61908			~~125~~					
2	1		012	062	86	89	-23	115	61908			125	46	1.0	129		
Average			$\Sigma\sqrt{\Delta P}$														

1017
1022

H_2O Collected 32 ml
SG Condition
SG Weight 9.8 gm
Total Volume Collected 41.8 ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2

COMMENTS:

TRC Environmental Consultants, Inc.

FIELD DATA SHEET

PAGE 2 of 2

Firm Name Columbia Nitrogen
Plant Location [illegible]
Test Number 3 9
Sampling Location Pill Cooler BYPASS
TRC Project No. 1430-E80-20
Date 8-16-80
Tester EDA / GAG

Orifice No. D-8
Ambient Temp. 86 °F
Bar. Press. 29.89 "Hg
Probe Ident. No. 27
Filter Ident. No. none
Duct Area 12.57 ft²
DIA 48in

Nozzle No. & Dia. 4-2 0.2601 in.
Assumed Moisture 3 %
Test Duration 120 min.
Traverse Point Interval 5 min.
Probe Heater Setting 124 ± 10 °F
Filter Temp. Setting none °F
Dry Gas Meter Y 1.00

Nomograph C Factor 1.08
Pitot Coefficient 0.825
Orifice ΔH_A 1.94
Test Start Time 0917
Test Final Time 1122
Leak Test Start 0.000 CFM@ -8 "Hg
Leak Test Final 0.000 CFM@ "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	PROBE	Cyc. Angle ø	SAMPLE LINE ~~Heater Box~~ Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %
2	2	5	016	082	86	89	-23	113	62125	1		123	46	1.0	129		
	3		028	140	86	89		115	62370			124	46	2.0	129		
	4		032	160	87	90		116	62684			124	46	3.0	129		
	5		033	165	87	90		116	63024			125	47	3.5	129		
	6		032	160	87	90		116	63371			125	47	3.5	128		
	6		032	160	87	90		116	63714			126	47	3.5	128		
	5		034	170	88	90		116	64055			126	47	3.5	128		
	4		033	165	88	90		116	64405			125	47	3.5	128		
	3		03	150	88	91		117	64823			125	47	3.0	129		
	2		025	125	88	91		117	65153			125	47	3.0	128		
	1		023	115	88	91		116	65460			125	47	3.0	128		
									65751	V							
									7213								
Average			$\Sigma\sqrt{\Delta P}$ 49	123	86	89	-23	115									

88.

H_2O Collected 32 ml
SG Condition
SG Weight 9.8 gm
Total Volume Collected 41.8 ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2

COMMENTS:

APPENDIX D

SAMPLING LOGS

Includes:

D.1 Daily Summary Log
D.2 Field Notebooks

APPENDIX D.1

DAILY SUMMARY LOGS

TABLE D-1

DAILY SUMMARY LOG FOR AMMONIA AND AMMONIUM NITRATE TESTING AT THE PRILL TOWER ON AUGUST 12, 1980 AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

CLOCK TIME	PARTICULATE TESTS			STACK VISIBLE EMISSIONS		SCRUBBER LIQUOR		PRESSURE DROP	AMBIENT TEMPERATURE	RELATIVE HUMIDITY
	INLET	BYPASS	OUTLET	BYPASS	OUTLET	TEMP (°F)	pH	(INCHES H_2O) Inlet B	(°F)	%
1000									85	69.5
1046		Test 1 Began			Observations Started					
1049				Observations Started						
1050	Test 1 began									
1052			Test 1 Began							
1100						91	4.40	1.8	87	63.5
1130						92	3.88	1.6	89	57.5
1158		Test stopped to Change Ports								
1200						92	3.95	1.6	91	52.5
1202	Test Stopped to Change Ports									
1204			Test Stopped to Change Ports Testing Resumed							
1206										
1208	Testing Resumed									
1212		Resumed Testing								
1230						93	3.65	1.6	92	50
1246					Observations Finished					
1249				Observation Finished						
1300						92	4.42	1.6	93	46.5
1318			Test 1 Finished							
1320	Test 1 Finished									
1324		Finished Test 1								
1520				Observations Started	Observations Started					
1530	Test 2 Began		Test 2 Began			93	5.88	1.4	95	43.5
1532		Test 2 began								
1600						94	5.70	1.4	95	43.5
1630						92	4.75	1.6	96	44
1642	Testing Stopped to Change Ports		Testing Stopped to Change Ports							
1644		Testing Stopped to Change Ports								
1645			Testing Resumed							
1647	Testing Resumed									
1651		Testing Resumed								
1700						92	5.22	1.6	94	47
1719				Observations Stopped	Observations Stopped					
1730						93	5.70	1.6	95	43.5
1757			Finised Test 2							
1759	Finished Test 2									
1800						92	4.92	1.4	94	44
1803		Test 2 Finished								

TABLE D-2

DAILY SUMMARY LOG FOR AMMONIA AND AMMONIUM NITRATE TESTING AT THE PRILL TOWER
ON AUGUST 13, 1980 AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

CLOCK TIME	PARTICULATE TESTS			STACK VISIBLE EMISSIONS		SCRUBBER LIQUOR		PRESSURE DROP (INCHES H_2O)		AMBIENT TEMPERATURE	RELATIVE HUMIDITY
	INLET	BYPASS	OUTLET	BYPASS	OUTLET	TEMP (°F)	pH	C Inlet	A Inlet	(°F)	%
0847		Began Test 3									
0855	Began Test 3										
0857			Began Test 3		Observations Started						
0900						90	4.22	1.0	1.0	82	72
0930						89.5	3.72	1.0	1.0	82	74
0952				Observations Started							
0959		Testing Stopped to Change Ports									
1000						91.5	3.88	1.0	1.0	84	73
1005		Resumed Testing									
1007	Stopped Test to Change Ports										
1009			Stopped Test to Change Ports								
1010			Resumed Testing								
1014	Resumed Testing										
1030						92	4.05	1.0	1.0	86	66
1057					Observations Finished						
1100						92	3.50	1.0	1.0	87	63.5
1177		Finished Test 3									
1124			Finished Test 3								
1126	Finished Test 3										
1130								1.0	1.0	89	57.5
1152				Observations Finished							

TABLE D-1

DAILY SUMMARY LOG FOR AMMONIA AND AMMONIUM NITRATE TESTING AT THE DRYER/PREDRYER ON AUGUST 14, 1980 AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

CLOCKTIME	PARTICULATE TESTS			STACK VISIBLE EMISSIONS		SCRUBBER LIQUOR		AMBIENT TEMPERATURE	RELATIVE HUMIDITY
	DRYER INLET	PREDRYER INLET	PREDRYER-DRYER OUTLET	DRYER OUTLET	BAGGING OPR. OUTLET	TEMP (°F)	pH	(°F)	%
1014					Observations Started				
1030						100	6.45	87	66.5
1037	Began Test 4								
1040	Stopped Test to Clear Nozzle		Began Test 4						
1100						96	6.45	89	61
1105				Observations Started					
1108					Observations Stopped				
1120	Resumed Testing								
1123					Observations Continued				
1130						98	6.25	90	58
1136		Began Test 4							
1140			Test Stopped to Change Port						
1150	Test Stopped to Change Ports								
1156					Observations Stopped				
1158	Testing Resumed								
1200		Test Stopped to Change Ports				102	6.20		
1222			Resumed Testing					93	53.5
1230	Finished Test 4 - Leak Check Failed-Test Invalid					104	6.12	93	53.5
1235					Observations Continued				
1236		Resumed Testing							
1300		Finished Test 4						95	49.5
1304				Observations Stopped					
1322			Finished Test 4						
1330								96	47
1401					Observations Finished				

TABLE D-3 (Continued)

DAILY SUMMARY LOG FOR AMMONIA AND AMMONIUM NITRATE TESTING AT THE DRYER/PREDRYER
ON AUGUST 14, 1980 AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

CLOCKTIME	PARTICULATE TESTS			STACK VISIBLE EMISSIONS		SCRUBBER LIQUOR		AMBIENT TEMPERATURE	RELATIVE HUMIDITY
	DRYER INLET	PREDRYER INLET	PREDRYER-DRYER OUTLET	DRYER OUTLET	BAGGING OPR. OUTLET	TEMP (°F)	pH	(°F)	%
1450	Began Test 5								
1500			Began Test 5						
1510				Observations Continued		106	6.15	96	42
1512	Test Stopped to Change Ports								
1517	Testing Resumed								
1530									
1539	Finished Test 5	Began Test 5				104	6.55	97	39.5
1600			Stopped Test to Change Ports			103	6.58	93	48.5
1603		Test Stopped to Change Ports							
1605			Testing Resumed						
1606		Testing Resumed							
1630		Finished Test 5							
1637	Began Test 6					104	6.55	95	43.5
1659	Stopped Test to Change Ports								
1700									
1703	Testing Resumed					102	6.58	94	42
1705			Finished Test 5						
1725	Finished Test 6								
1730									
1735	Began Test 4R					102	6.40	93	50.5
1757	Test Stopped to Change Ports								
1800									
1803	Resumed Testing					103	6.32	93	50.5
1805			Began Test 6						
1825	Finished Test 4R								
1830									
1837		Began Test 6				103	6.38	92	53
1900									
1901		Test Stopped To Change Ports				103	6.32	92	53
1905			Test Stopped to Change Ports						
1906		Testing Resumed							
1910			Testing Resumed	Observations Finished					
1930		Test 6 Finished				103	6.32	92	53
2000						103	6.32	92	53
2010			Finished Test 6						

TABLE D-4

DAILY SUMMARY LOG FOR AMMONIA AND AMMONIUM NITRATE TESTING AT THE PRILL COOLER ON AUGUST 15, 1980 AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

CLOCKTIME	PARTICULATE TESTS			STACK VISIBLE EMISSIONS		AMBIENT TEMPERATURE (°F)	RELATIVE HUMIDITY %
	INLET	BYPASS	OUTLET	OUTLET	BYPASS		
1100			Began Test 7	Observations Began	Observations Began	84	76
1130			↓	↓	↓	86	70
1144	Began Test 7						
1157	↓	Began Test 7					
1200		↓	Stopped Test to Change Ports		Observations Stopped		
1210					Observations Continued	86	73
1212			Testing Resumed		↓		
1230			↓			87	70
1256	Test Stopped to Change Ports						
1257		Test Stopped to Change Ports					
1258	Testing Resumed						
1259	↓			Observations Finished		90	61
1300		Testing Resumed					
1303	Test Stopped due to Plugged Sample Line	↓					
1310					Observations Stopped		
1312			Finished Test 7				
1326	Testing Resumed						
1330	↓					96	61
1335		Testing Stopped to Plugged Sample Line					
1340		Testing Resumed					
1400		↓				91	58.5
1405		Finished Test 7					
1410			Began Test 8				
1430			↓			91	58.5
1433	Finished Test 7						
1500						91	58.5
1510			Testing Stopped to Change Ports				

TABLE D-4 (Continued)

DAILY SUMMARY LOG FOR AMMONIA AND AMMONIUM NITRATE TESTING AT THE PRILL COOLER
ON AUGUST 15, 1980 AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

CLOCK TIME	PARTICULATE TESTS			STACK VISIBLE EMISSIONS		AMBIENT TEMPERATURE (°F)	RELATIVE HUMIDITY %
	INLET	BYPASS	OUTLET	OUTLET	BYPASS		
1515			Testing Resumed				
1530			↓			91	58.5
1544	Began Test 8						
1545	↓				Observations Continued		
1550		Began Test 8			↓		
1600		↓				90	61
1615			Finished Test 8				
1630						89	61
1644					Observations Finished		
1650		Test Stopped to Change Ports					
1654		Testing Resumed					
1656	Test Stopped to Change Ports	↓					
1700	Testing Resumed					89	61
1730	↓					87	66.5
1734		Finished Test 8					
1736	Testing Stopped for the day at Point 12 due to Process Breakdown						

TABLE D-5

DAILY SUMMARY LOG FOR AMMONIA AND AMMONIUM NITRATE TESTING AT THE PRILL COOLER
ON AUGUST 16, 1980 AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

CLOCK TIME	PARTICULATE TESTS			STACK VISIBLE EMISSIONS	SCRUBBER LIQUOR		PRESSURE DROP	AMBIENT TEMPERATURE	RELATIVE HUMIDITY
	INLET	BYPASS	OUTLET		TEMP (°F)	pH	(INCHES H_2O)	(°F)	%
0727	Test 8 Resumed								
0803	Finished Test 8								
0900									
0911	Began Test 9							78	91
0917	↓	Began Test 9							
0920	↓	↓	Began Test 9						
0930	↓	↓	↓						
1017	↓	Test Stopped to Change Ports	↓					79	87
1020	↓		Test Stopped to Change Ports						
1022	↓	Testing Resumed							
1023	Test Stopped to Change Ports	↓	Testing Resumed						
1026	Testing Resumed	↓	↓						
1030	↓	↓	↓						
1100	↓	↓	↓					85	69.5
1105	Test Stopped due to Plugged Line	↓	↓					85	73
1107	Test Resumed	↓	↓						
1122	↓	Finished Test 9	↓						
1123	↓		Finished Test 9						
1130	↓								
1140	Finished Test 9							85	73
1200								87	66

TABLE 3-1

SUMMARY OF VOLUMETRIC FLOWRATE MEASUREMENTS AT THE PRILL TOWER INLETS AND BYPASSES AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

PRILL TOWER INLETS

Run Number	Run 1				Run 2			Run 3			
Location	Inlet A		Inlet C		Inlet B	Inlet C		Inlet A		Inlet B	
Date	8-12-80	8-12-80	8-12-80	8-12-80	8-12-80	8-12-80	8-12-80	8-13-80	8-13-80	8-13-80	8-13-80
Time	Before	After	Before	After	After	Before	After	Before	After	Before	After
Average Static Pressure (inches H_2O)	-1.15	-1.15	-1.02	-1.05	-1.15	-1.05	-1.15	-1.10	-1.20	-1.00	-0.90
Average Square Root ΔP	0.917	0.874	0.884	0.920	0.884	0.920	0.883	0.90	0.930	0.840	0.810
Average Stack Temperature (^oF)	125.6	132.7	123.1	128.2	133.1	128.2	130.8	120.0	129.0	122.0	130.0
Velocity (FPM)	3246	3140	3122	3265	3152	3265	3142	3204	3336	2995	2907
Flow Rate (ACFM)	18695	18087	17981	18805	18153	18805	18097	18452	19217	17249	16745
Flow Rate (DSCFM)	16261	15527	15805	16272	15552	16258	15566	16088	16495	14992	14360

PRILL TOWER BYPASSES

Run Number	Run 1				Run 2			Run 3			
Location	Inlet A		Inlet C		Inlet B	Inlet C		Inlet A		Inlet B	
Date	8-12-80	8-12-80	8-12-80	8-12-80	8-12-80	8-12-80	8-12-80	8-13-80	8-13-80	8-13-80	8-13-80
Time	Before	After	Before	After	After	Before	After	Before	After	Before	After
Average Static Pressure (inches H_2O)	-0.200	-0.225	-0.320	-0.275	-0.245	-0.320	-0.235	-0.150	-0.165	-0.125	-0.075
Average Square Root ΔP	1.14	1.13	1.09	1.11	1.20	1.11	1.12	1.15	1.14	1.19	1.18
Average Stack Temperature (^oF)	109.8	115.1	116.3	106.6	115.1	116.3	117.4	97.0	107.0	97.4	110.0
Velocity (FPM)	4003	3955	3852	3887	4239	3925	3945	3972	3972	4094	4122
Flow Rate (ACFM)	77295	76366	74374	75053	81845	75794	76172	76694	76708	79054	79600
Flow Rate (DSCFM)	69836	68294	66353	68187	72919	67371	67593	67129	68784	72087	70976

APPENDIX D.2

FIELD NOTEBOOKS

1 MTG 8AM P_{BAR} 29.96" HG 8/12/80

clay bagger may be out of commission
Mike Fogel from State of Georgia will be in today
want to do prill cooler outlet - we'll discuss it later today
probably 3rd & 4th week for hi-density prill tests
TP-3 MRT cooler full set
TP-4 MRT predryer prelim particle size
air flows on inlets as expected to be similar
Radian wants on test numbers
clock time - control room
250 feet high - prill tower
prill cooler exit - doors must be kept shut
data from prill ~~tower~~ cooler exit must be sent to Col Nit
Who must submit data & report to Georgia within 45 days
will give C-N just summary tables
bag warehouse - must have ~~key~~ VEO signed in with jack ott
OSHA sheets are in supervisors office in control room

Passed & Understood by me, Date Invented by Date

From Page No. _____

8/12/80 PRILL TOWER - TEST 1 B BYPASS & INLET

TIME	DB °F	WB °F	SCRUBBER RECIRC TEMP, °F	ΔP "H₂O
1000	85	77	91	
1050	test start			
1100	87	77	91	1.8
1130	89	77	92	1.6
1200	91	62.5 77	92	1.6
1230	92	50 77	93	1.6
1300	93	49.5 77	92	1.6

TEST 2 A BYPASS & INLET P_{BAR} = 29.74" on tower

1530	95	77	93	1.4
1600	95	77	94	1.4
1630	96	44 78	92	1.6
1700	94	47 77	92	1.6
1730	95	43.5 77	93	1.6
1800	94	44 76	92	1.4

B inlet reads (none taken at A)

		% K	% K	% H_2O
~~Test~~	inlet	100.2		2.8
	outlet	104.8		6.7
	bypass	97.8		2.0

essed & Understood by me, | Date | Invented by | Date

TITLE Columbia Nitrogen

Project No. 1437-E80

Book No.

From Page No.

OPERATING PARAMETERS

T-1 B BYPASS & INLET

BRINKS

LIQUOR PN #5	EVAP FLOW #6 GPM	ΔP UPPER #15	ΔP LOWER #16	TIME
4.0	0.25	12.1	1.36	1100
3.2	0.25	12.2	1.36	1130
	Change reading to feed pressure gage ↓			
3.2	52	12.3	1.36	1200
3.0	52	12.4	1.36	1230
3.0	53	12.5	1.36	1300

T-2 A BYPASS & INLET

~~1523~~	B			
~~3.8~~	53	12.7	1.38	1530
~~3.6~~	53	12.9	1.38	16.00
~~3.4~~	53	12.8	1.38	1690
3.4	53	12.8	1.38	~~1633~~ 1700
3.6	52	12.9	1.36	1730
~~3.4~~	53	12.9	1.36	1800

Data recorded for Radian

To Page No.

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by	

Project No. 1430-E50
Book No. _____ TITLE Columbia Nitrogen

8/13/80

Page No. _____

check Peabody scrubber for inlet & outlet ΔP taps
read ~~B~~ A & C static ΔP's must be between since we missed A yesterday
predryer area : CNC will put in fans

NEO :

need 2 bagging lines on for valid VE - Lawson will check by 1PM

~~Let~~ Coster may ~~be~~ have to be read in the morning

we'll be taking some process data for Radian in dryer/predryer

To Page No: _____

essed & Understood by me,	Date	Invented by	Date
		Recorded by	

n Page No.

start 0850 0855

TIME	DB °F	WB °F	SCRUBBER TEMP °F	ΔP CINLET "H₂O	ΔP AINLET "H₂O
0900	~~89~~ 82	75	90	1.0	1.0
0930	82	74 75.5	89.5	~~0.5~~ 1.0	1.0
1000	~~86~~ 84	79	91.5	~~0.5~~ 1.0	1.0
1030	86	77	92	~~0.5~~ 1.0	1.0
1100	87	77	92	1.0	1.0
1130	89	77	~~92~~	1.0	1.0

~~TIME~~ SCRUBBER READINGS FOR RADIAN

TIME	FEED PRESSURE	#15	#16
0900	52	12.1	1.36
0930	52	12.2	1.35
1000	52	12.35	1.36
1030	52	12.1	1.36
1100	52	12.3	1.34
1130	5	12.5	1.34

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OPERATING VARIABLES

#13A	#13B	#12(A) %	#10	TIME

(1) % of Full Scale 100% = 43 GPM AN specgrav 1.210

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8/13/80

prill dryer scrubber sump samples

TEC take samples, do pH & T & hold until other results are approved by Gene Riley - pH and T will not be put into report.

- Carl Sass - shift supervisor? for AN said we may do above but CN (he says) will not allow use or publication of these data. It was a surprise to him that we had been doing this on the Brinks

- pressure taps

Leigh & Gene discussed taps on cooler & dryer w Lawson on last visit. ~~Lawson~~ Lawson said he would have them put in when we arrived. Sass says at this time we cannot have these data & no parts will be put in for any reason

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can't start dryer tests until at least 10:30
can start bagging VE at 9AM for 2-3 hours
make sure Rich Lawson gives us a pass to get the truck out on Sunday
no fans can be placed near predryer
only data Rich needs before we leave
1. data sheets & lab analysis results

compliance test
1. prill tower emissions - Brinks outlet
3-bypasses
2. dryer outlet
3. cooler Ducon outlet - add'l scope to be bypass paid for by CNC

The state will accept EPA Method # 18
report - our standard compliance report w/ OK test & documentation
4 copies of report

check on price ASAP

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E Columbia Nitrogen

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1

Page No. TEST #1

8/14/80

10	12	13A	13B	TIME
30	21	160	160	1038
31				1100
30	20	160	160	1130
31	20	160	160	1200
30	22	160	170	1230
31	21	160	170	1300
31	25	160	170	1330

DB	WB	SCRUBBER T	TIME
87	78	100	1035
89	78	96	1100
90	78	98	1130
93	79	102	1200
93	79	104	1230
95	79	104	1300
96	79	104	1330

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n Page No. TEST 2

10	12	13A	13B	TIME
	50	160	170	1500
	50	160	165	1530
	40	160	170	1600
	42	160	170	1630
	~~42~~ 31	160	170	1700
	30	160	165	1830
	30	160	165	1900
	30	160	170	1930
	30	160	170	2000

DB °F		WB °F	SCRUBBER TEMP °F	TIME
76	43	77	106	1500
97	39.5	77	104	1530
93	48.5	77	103	1600
95	43.5	77	104	1630
~~94~~	49	78	102	1700 1730
~~93~~	50.5	78	~~103~~ 104	1830 1800
~~93~~ 92	50.5	78	103	1900
	53			
92	53	78	103	1930
12	53	78	103	2000
92	53	78	103	

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LE Columbia Nitrogen

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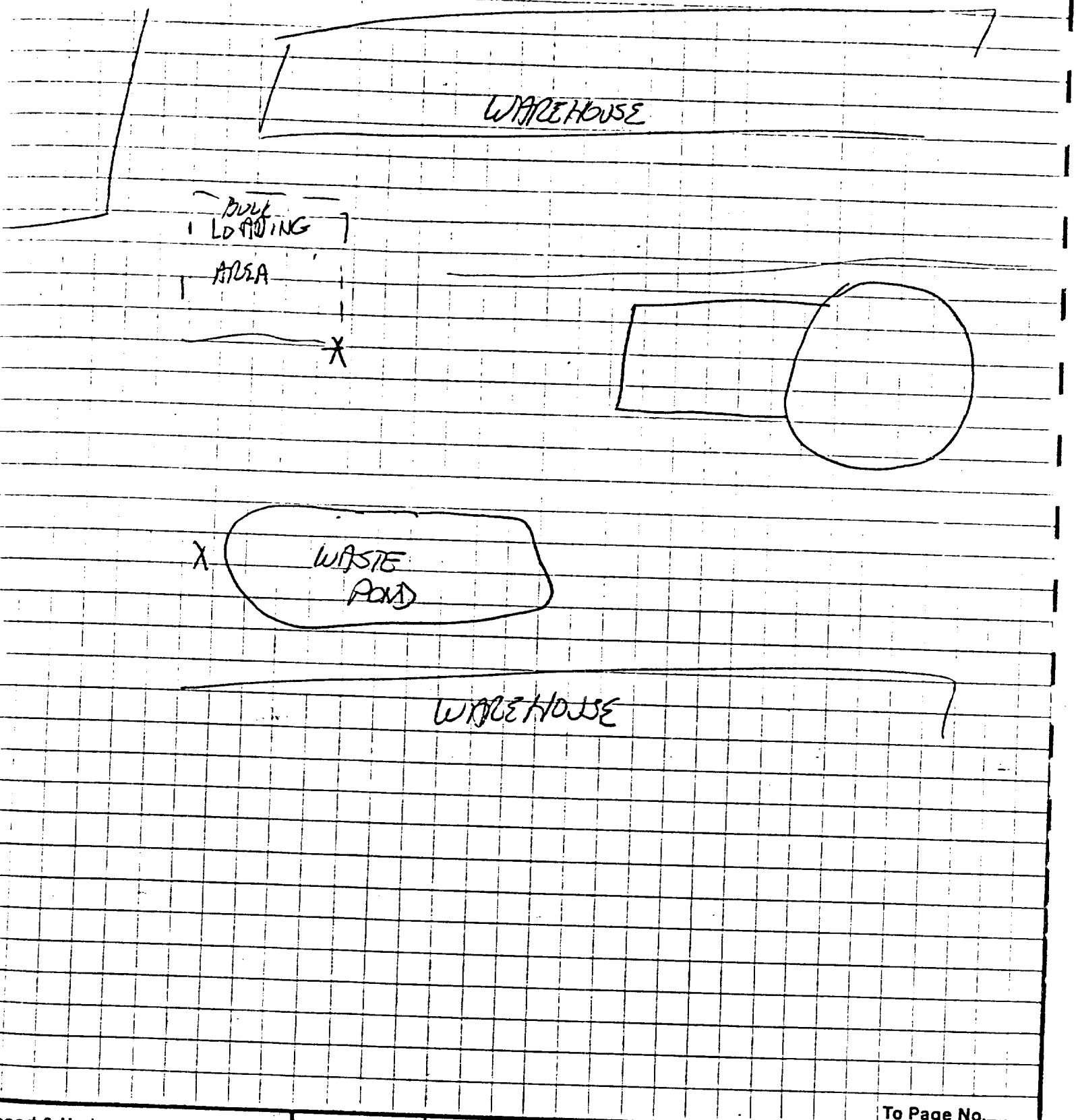

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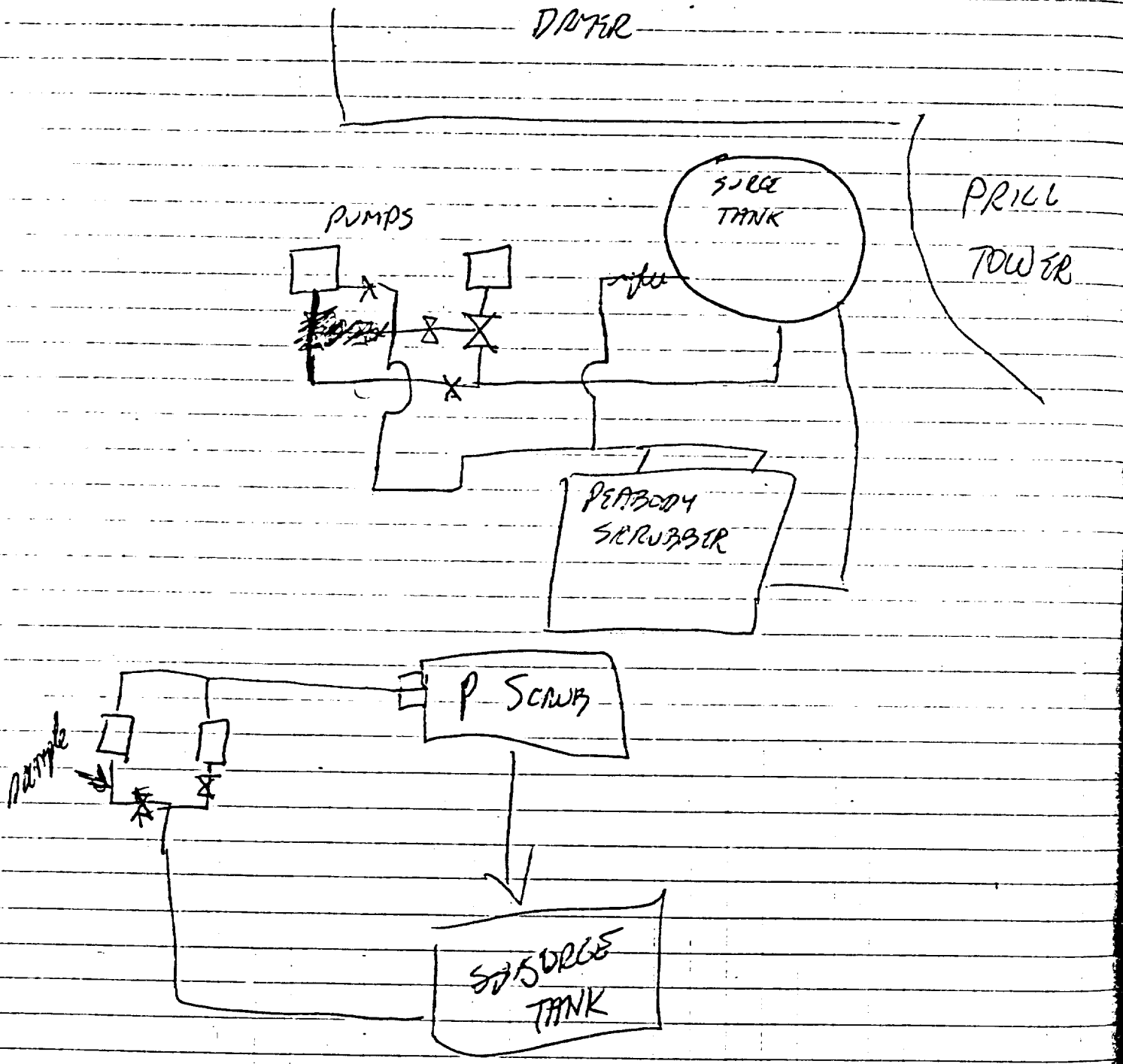
From Page No. 8/5

PRILL DRYER SCRUBBER PLUMBING SET LAYOUT



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8/15 PRILL DRYER

TIME	DB °F		WB °F
1100	84	76	78
1130	86	70 8	78
1200	86	73	79
1230	87	70 8	79
1300	90	[illegible]	79
1330	90	61	79
1400	91	58.52	79
1430	91	[illegible]	79
1500	91	[illegible]	79
1530	91	[illegible]	79
1600	90	61	79
1630	89	61	78
1700	89	61	78
1730	87	[illegible]	78

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om Page No. 2/14

	DB	WB
0900	78	76
0930	79	76
1000	83	77
1030	85	77
1100	85	78
1130	85	78
1200	87	79

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TLE Columbia Nitrogen

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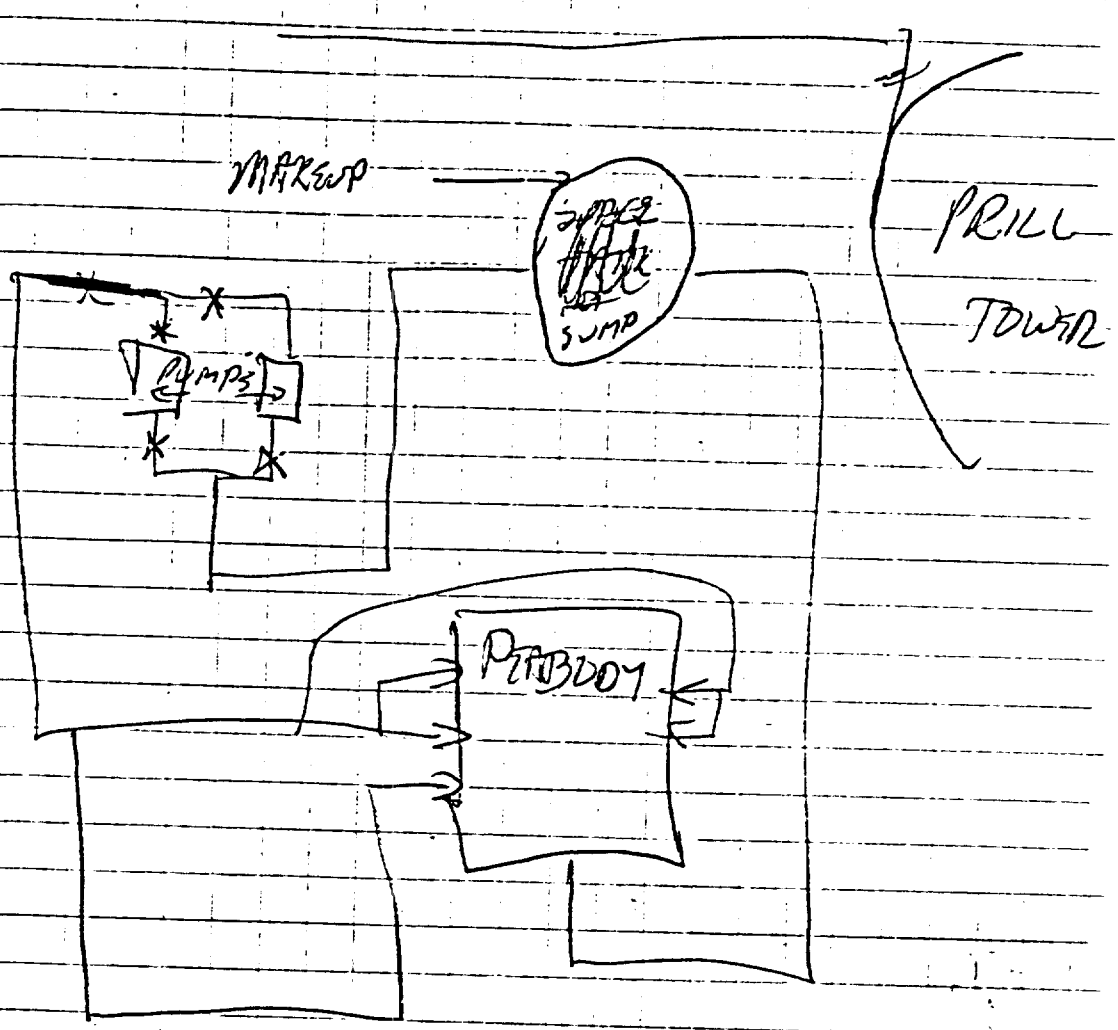

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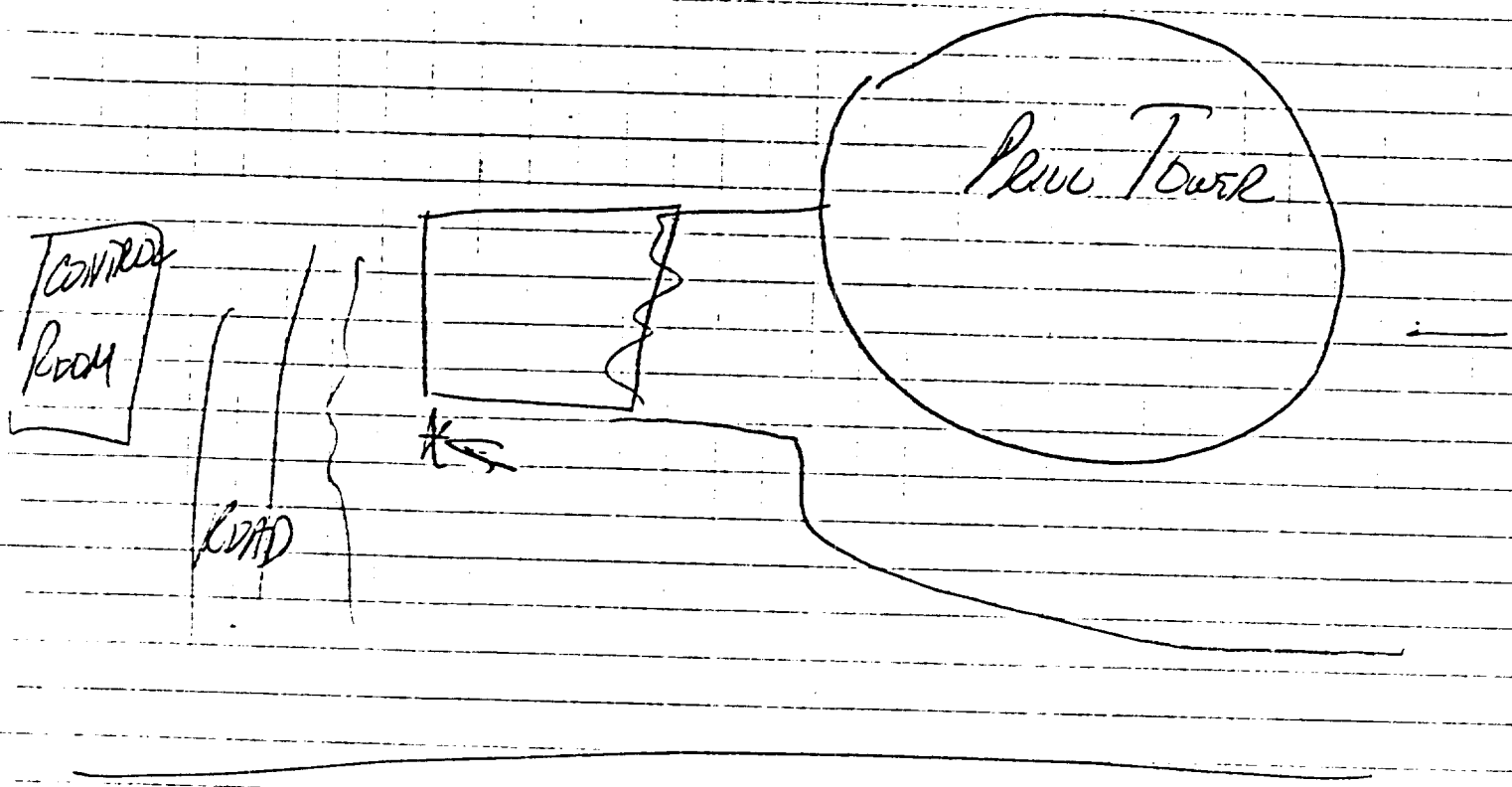
PRILL COOLER WR/DB HOTTS LOC



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Project No. 1430-E80-20

Book No.

From Page No.

August 11, 1980

Arrived at plant safely.

Met w/ various plant personnel to go over safety + security.

Set up Chem Lab and train on top of the Prill Tower.

Will run tests tomorrow

LAG

August 12, 1980

Ran Test No. 1 on Prill Tower Scrubber Inlet B. Test ran successful w/ no problems. Leak check fine.

Ran Test No. 2 on Prill Tower Scrubber Inlet A. Again test was successful. One problem occured in that Scrubber Δ were not taken on Inlet A. Told Ge, Riley. We will have to monitor them on 8/13/80.

LAG

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From Page No. 6

Ran Test No. 3 on Drill Tower Scrubber Inlet C. Test went OK. We monitored the ΔP on Inlet A seeing that we missed them on 8/12/00.

Brake equipment down on Drill Tow and moved to Dryer Inlet.

Set equipment up and did all preliminary work. Came down to set up nomagraph and pick a nozzle.

Nomagraph called for 0.232. Our nozzles range from 0.1965" to 0.2605". If I use 0.2605" it will require pulling a ΔH across the orifice of 3.5" H2O o greater. If I go w/ the 0.1965" I may have problems pulling the required 60 cu. Will use the 0.1965" the higher sized nozzle may cause the pump to overheat pulling the higher ΔH.

LAG

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August 13, 1980

Dryer Inlet Preliminary Traverse

ΔP	Temp (°F)
~~0.06~~	
0.15	
~~0.06~~	
0.40	110
0.34	142
0.43	144
0.44	148
0.53	148
0.56	149
0.56	149
0.49	149

$$\frac{\pi D^2}{4} = \frac{\pi \left(\frac{53.5}{12}\right)^2}{4}$$

$$= 15.61$$

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August 14, 1980

Set up on dryer inlet location, Scaffolding was fine, it should be a nice location.

Did a rough preliminary traverse of just the East port. Due to the high loadings the pitots would plug on a full traverse. So there were only spot points taken. Aveage $\Delta P = 0.56$ with a maximum of 0.64. Set up nomagraph to find the proper nozzle diameter.

Adjusted nomograph to get the prop nozzle size. 0.1965"

Started @ first test on the Dryer Inlet Test # 4. After sampling the first point both the nozzle and pitots were completely plugged w/ particulate. Shut d the train and notified Gene Riley.

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After talking w/ Gene, Ed came down w/ the same problem on the Predryer inlet. After discussing the matter we decided to go with a larger nozzle and run the pumps wide open. The nozzle size I had to use was 0.0600". I mentioned to Gene that my pump wouldn't be able to sample isokinetically since my pump wouldn't be able to pull the proper ΔH. He acknowledged the fact and said to proceed as planned. If we couldn't sample isokinetically - so be it. Replaced the nozzle and unplugged the pitots and resumed sampling. We sampled at each point for 1 minute. This would extend the period in which the pitots would be in the stack longer per point. The pitots wouldn't clog after each point. You might be able

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from Page No. 10

to sample at a few more points before clogging occurred. Mark and I decided to clean the pitots out ~~to~~ after each port chan. Finished Test No. 4 on the Dryer inlet or Ran the final leak check - poor, something was wide open. Tore down the train and found that the base of impinger #2 had pulled away and wasn't connected to the top. Test # 4 had to be voided.

Started testing over again on the Dryer Inlet.

Tests 4R, 5, and 6 were complete w/ no problems. Pitots clogged periodically and had to be blown out. This created hardly any problem. Finished testing on the Dryer inlet in 1 day.

LAG
8/14/80

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AUGUST 15, 1980

Moved equipment from Dryer inlet to Pr. 11 Cooler inlet.

Set up train and took all preliminary data.

Looks like heavy loadings on this location as well.

Set up to do Test No. 7 Ran into a problem after changing ports. A clog was noticed in the sample line. 2 ml of H_2O was added to dissolve the plug, continued sampling w/ no problems Finished Test No. 7 OK - Leak check OK -

Turned around and started on Test No. 8. Test proceeded w/ no problems. At 1736 we shut down due to a process problem (elevator brake).

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Decided to terminate testing for today. We would seal the train components up properly and finish the Test No. 8 Saturday morning.

LAG

8/15/00

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August 16, 1980

Arrived early and resumed testing on the Drill Cooler Inlet Test No. 0. Finished test with no problems Leak check OK.

Set up to do Test No. 9

Only problem w/ Test No. 9 was that the sample line plugged again. 10 ml of H_2O had to be added to dissolve the particulate. Clogged dissolved and testing resumed.

Final Test OK

LAG

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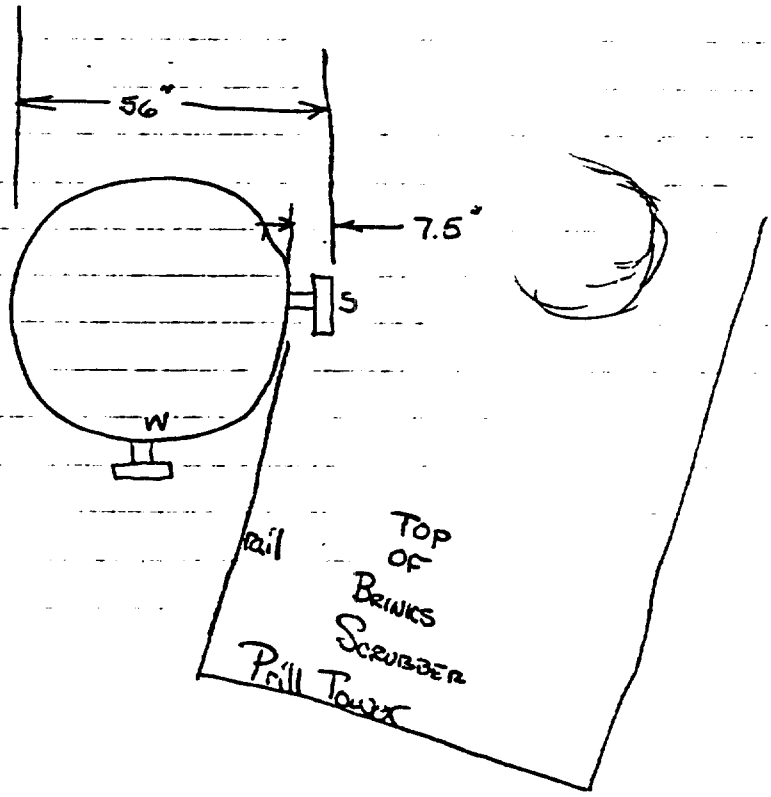
From Page No. 1 8/11/80



Did a preliminary traverse with Probe 37 at 1500 - 1530 set a nomograph, picked a 14-5 nozzle of size of 0.1255 in

Average ΔP = 1.61 in H_2O
Average T_s = 95 °F

Basicly took ~~everything~~ up the stack and got ready to go.

EDA 8/11/80

8/12/80

SET UP FOR TEST #1 and did a leak check on system
All ready to go at 0915

Start Test #1 at 1052
Done with port west at 1204
Start back up at 1206
Done with port South at 1318 Did leak check
Clean up and hold down

EDA 8/12/80

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8/13/80 set and ready to go at 0835
leak checked at 0.000 cfm at -8 in

8/14/80 set and ready to test at 0845
have to wait until 1035 to start to test
started to test and had a problem, nozzle plugging
So we switch to nozzle 1-2 and ran with the pump full ope
Start the port B at 11:36 and finished at 1200
Switch port and ran port A at 1236 and finished at 1300
did a leak check and passed

Pulled the probe apart and the probe was all white with
Ammonia Nitrate inside it.

Hold everything down to be cleaned for the next test to start.

The reason why we went to 1 min a point was on Gene Riley's O.K.

IDA

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8/14/80

SET UP FOR TEST #2 on Predryer Inlet at 1530
START Test #2 at 1539 on Port A
Change Ports for Test #2 at 1603
Start Port #B at 1606
End Test #2 on Predryer Inlet at 1630
Breakdown and back to lab for cleanup

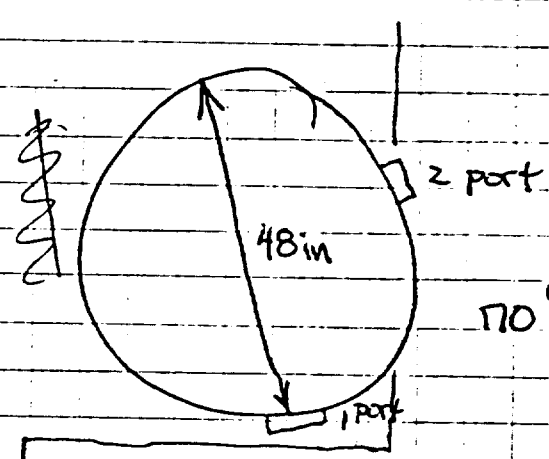
EDA

8/14/80

Set up for Test #3 on Predryer Inlet at 1800
SEART Test #3 at 1837 start on Port A
Change Ports for test #3 at 1901
Start Port #B at 1906
End Test #3 at 1930
on This Test like NO 1 and 2 we just used a fixed rate of 4.4 in H_2O ΔH

EDA

8/15/80 Set up on Prill cooler Bypass



no flange

Using a nozzle 4-2 0.2601 This will let me run at 1 to 2" of H_2O on the ΔH.

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8/15/80 Test #1 Prill Cooler Bypass
in setting up and moving we lost one of the sample lines found it later laying on the ground outside the far end of the building

Start Test #1 at 1157 on Port 1 on Prill Cooler Bypass
End Port 1 change to Port 2 at 1257
- Start Port 2 1300
- had to stop at 1335 because the Pitot tobe are acting funny

Pulled Probe out and Blow lines looked ok Started Backup 1340

End Test 1 on port 2 Bypass 1405

EDA

Test #2 Prill Cooler Bypass

Start Test #2 on Port 2 1550
End of Port 2 Change to Port 1 ~~1654~~ 1650
Start Port 1 at ~~1735~~ 1654
Shut down Plant Problem. The prill 1734
Elevator Broke down

End of Test and also leak checked at 0.000 cfm at -8 in vacuum

EDA

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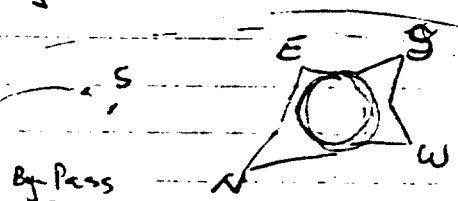
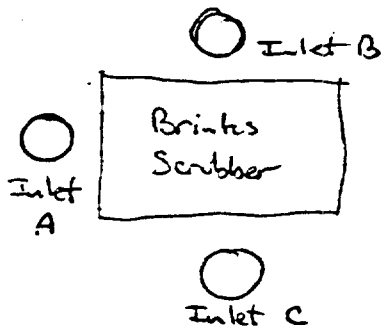
Notes From Prill tower By-Pass-A

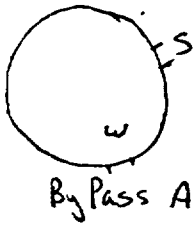
8/18/80 - Mon

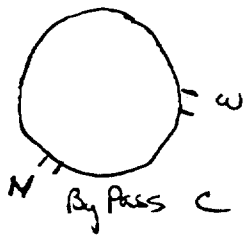
Clean-up evaluation

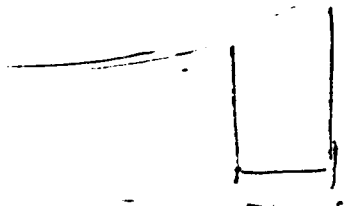
Set-up and Preliminary traverse











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Probe 30 - C_p - .831
Nozzle 2-1 - .1895

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8/12/80

Test 1+2 on fill tower

6/13/80 Test 3 on fill tower

Changed Nomograph on pt. 4 - $T_m = 80$

$T_s = 100$

Corr. = 1.12

$\Delta P_{ref} = 1.26$

North port, pt. 16 - was 6 min

" " " 18 - was 2 min

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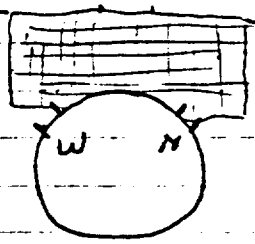
8/13/30 Set up on Pill cooler outlet

Building



Preliminary traverse

Port	ft.	DP	T°
N	1	26	105
	2	27	106
	3	28	106
	4	30	106
	5	33	106
	6	35	107
	7	38	106
	8	43	106
	9	50	106
	10	58	107
	11	63	107
	12	65	107
	13	65	107
	14	63	107
	15	60	107
	16	58	107
	17	58	106
	18	58	107
	19	56	106
	20	54	106

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8/14/80

Start test on dryer outlet at 1040
finished 1ST port at 1140 — (24.76 cf on 1ST traverse)

Nomograph data

$T_m = 95$
$\%\ H_2O = 8$
$\Delta H@ = 1.96$
$C_p = .83$
$T_s = 110$
$\Delta P_{std} = 1.40$

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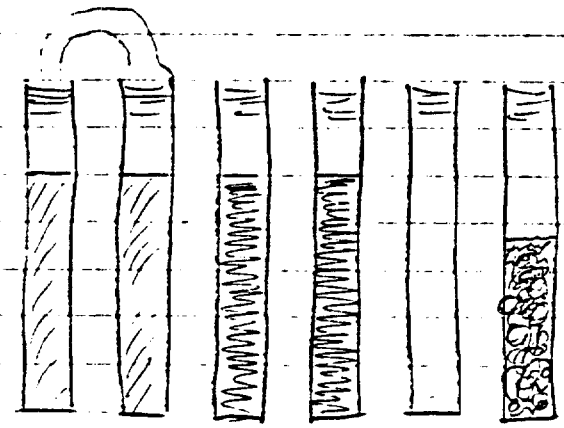
8-11-80



1,2 100ml DI H_2O

3,4 100ml 1N H_2SO_4

5 Empty

6 200g Silica Gel

Impinger# 1 2 3 4 5 6

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8-11-80

Inlet
H_2O Blank

Final Wt 198mls
~~Initial Wt~~ 200mls
~~Δ Wt~~

8-11-80

Test #		Location	Liquid Identity	Final Wt	Initial Wt	Δ Wt	Comm
Blank	~~Prill Tower~~	Inlet	H_2O	198mls	200mls	2mls	
Blank	~~Prill Tower~~	Inlet	H_2SO_4	195mls	200mls	5mls	
Blank	~~Prill Tower~~	Inlet	SilicaGel	200g	200g	0	
Blank	~~Prill Tower~~	Bypass ~~Inlet~~	H_2O	198mls	200mls	2mls	Did not before r
Blank		Bypass	H_2SO_4	200mls	200mls	0	2 jars u
Blank		Bypass	SilicaGel	200g	200g	0	
Blank		Outlet	H_2O	172mls	200mls	28mls	spillage when mea
Blank		Outlet	H_2SO_4	195mls	200ml	5ml	2 jars
Blank		Outlet	SilicaGel	200g	200g	0	
			8-12-80				
1	Prill Tower	Inlet	H_2O	236mls	200mls	36ml	
1	Prill Tower	Inlet	H_2SO_4	201ml	200mls	1 ml	
1	Prill Tower	Inlet	SilicaGel	212.3g	200g	12.3g	Total

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st	Site	Location	Sample	Final Wt	Initial Wt	Δ Wt	Comments / Total
1	~~Bypass~~ Prill Tower Bypass	Bypass	H_2O	230mls	200mls	30ml	
1	Prill Tower	Bypass	H_2SO_4	~~200mls~~ 199mls	200mls	-1ml	
1	Prill Tower	Bypass	Silica Gel	219.9g	200g	19.9g	Total 48.9
1	Prill Tower	Outlet	H_2O	277mls	200mls	77mls	
1	Prill Tower	Outlet	H_2SO_4	193mls	200mls	-7mls	
1	Prill Tower	Outlet	Silica Gel	208.3g	200g	8.3g	Total 78.3
2	Prill Tower	Inlet	H_2O	238 mls	200 mls	38 mls	
2	Prill Tower	Inlet	H_2SO_4	204 mls	200 mls	4 mls	
2	Prill Tower	Inlet	Silica Gel	212.5 ~~grds~~ g	200 ~~mls~~ g	12.5 g	Total 54.5
2	Prill Tower	Bypass	H_2O	239 mls	200mls	39 mls	
2	Prill Tower	Bypass	H_2SO_4	~~200 mls~~ 200 mls	200 mls	0mls	
2	Prill Tower	Bypass	Silica Gel	~~39 mls~~ 217.6 g	200 g	17.6 g	Total 56.6
2	Prill Tower	Outlet	H_2O	241 mls	200mls	41 mls	
2	Prill Tower	Outlet	H_2SO_4	190 mls	200mls	-10 mls	
2	Prill Tower	Outlet	Silica Gel	208 g	200g	8 g	Total 89

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Test	Site	Location	Liquid Identity	Final Wt/vol	Initial Wt/vol	Δ Wt/vol	Comment
3	Prill Tower	Inlet	H_2O	241 mls	200 mls	41 mls	
3	Prill Tower	Inlet	H_2SO_4	203 mls	200 mls	3 mls	
3	Prill Tower	Inlet	Silica Gel	213.8 g	200 g	13.8 g	Total 57.8
3	Prill Tower	By Pass	H_2O	253 mls	200 mls	53 mls	
3	Prill Tower	By Pass	H_2SO_4	201 mls	200 mls	1 mls	
3	Prill Tower	By Pass	Silica Gel	217.5 g	200 g	17.5 g	Total 71.5 g
3	Prill Tower	Outlet	H_2O	246 mls 195 mls	200 ~~195~~ mls	46 mls	
3	Prill Tower	Outlet	H_2SO_4	~~200 mls~~	200 mls	-5 mls	
3	Prill Tower	Outlet	Silica Gel	206.5 g ~~46 mls~~	200 g	6.5 g	Total 47.5 g
4	Prill Dryer	Pre-Dryer	H_2O	228 ml	200 ml	28 ml	
4	Prill Dryer	Pre-Dryer	H_2SO_4	214 ml	200 ml	14 ml	
4	Prill Dryer	Pre-Dryer	Silica Gel	223.8 g	217.6 g	6.2 ml	Total 48.2
4	Prill Dryer	Outlet	H_2O	258 ml	200 ml	58 ml	
4	Prill Dryer	Outlet	H_2SO_4	190 ml	200 ml	-10 ml	
4	Prill Dryer	Outlet	Silica Gel	207.7 g	200 g	7.7 g	Total 55.7

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Test	Site	Location	Sample	Final wt/vol	Initial wt/vol	Δ Wt/vol	Comments
4R	Prill Dryer	Dryer	H_2O	230 ml	200 ml	30 ml	
4R	Prill Dryer	Dryer	H_2SO_4	200 ml	200 ml	0 ml	
4R	Prill Dryer	Dryer	Silica Gel	204.3 g	200 g	4.3 g	Total 34.3
5	Prill Dryer	Dryer	H_2O	227 ml	200 ml	27 ml	
5	Prill Dryer	Dryer	H_2SO_4	199 ml	200 ml	-1 ml	
5	Prill Dryer	Dryer	Silica Gel	205.2 g	200 ml	5.2 g	Total 31.2
5	Prill Dryer	Pre-Dryer	H_2O	230 ml	200 ml	30 ml	
5	Prill Dryer	Pre-Dryer	H_2SO_4	201 ml	200 ml	1 ml	
5	Prill Dryer	Pre-Dryer	Silica Gel	209.5 g	200 g	9.5	Total 40.5
5	Prill Dryer	Outlet	H_2O	260 ml	200 ml	60 ml	
5	Prill Dryer	Outlet	H_2SO_4	190 ml	200 ml	-10 ml	
5	Prill Dryer	Outlet	Silica Gel	207.1 g	200 g	7.1 g	Total 57.1
6	Prill Dryer	Dryer	H_2O	294 ml *	200 ml	94 ml	
6	Prill Dryer	Dryer	H_2SO_4	130 ml	200 ml	-70 ml	
6	Prill Dryer	Dryer	Silica Gel	204.8 g	200 g	4.8 g	Total 28.8

* 2nd impinger (H_2O) had excess volume. 3rd impinger (H_2SO_4) had low volume. Acidic pH recorded in H_2O sample jar.

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Test	Site	Location	Sample	Final wt/vol	Initial wt/vol	Δ wt/vol	Comments
6	Prill Dryer	Pre-Dryer	H_2O	233 ml	200ml	33 ml	
6	Prill Dryer	Pre-Dryer	H_2SO_4	198 ml	200ml	-2 ml	
6	Prill Dryer	Pre-Dryer	Silica Gel	208 g	200g	8g	Total 39.0
6	Prill Dryer	Outlet	H_2O	245 ml	200ml	45 ml	
6	Prill Dryer	Outlet	H_2SO_4	195 ml	200 ml	-5 ml	
6	Prill Dryer	Outlet	Silica Gel	207.2g	200g	7.2g	Total 47.2
7	Prill Cooler	Inlet	H_2O	340mls	200mls	140mls	*acid in 2nd impinger
7	Prill Cooler	Inlet	H_2SO_4	113mls	200ml	-87ml	
7	Prill Cooler	Inlet	Silica Gel	215.3g	200g	15.3g	silica gel retreived from 5th impinger Total 68.3
7	Prill Cooler	Bypass	H_2O	225ml	200ml	25ml	
7	Prill Cooler	Bypass	H_2SO_4				
7	Prill Cooler	Bypass	Silica Gel				Total
7	Prill Cooler	Outlet	H_2O				
7	Prill Cooler	Outlet	H_2SO_4				
7	Prill Cooler	Outlet	Silica Gel				Total

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TEST	SITE	LOCATION	SAMPLE	FINAL VOL/WT	INITIAL VOL/WT	Δ VOL/WT	COMMENTS
7	PRILL COOLER	INLET	H_2O	340mls	200mls	140mls	acid in 2nd impinge
7	PRILL COOLER	INLET	H_2SO_4	113mls	200 mls	-87mls	
7	PRILL COOLER	INLET	SILICA GEL	215.3g	200g	15.3g	↑ SILICA GEL RETRIEVED FROM 5TH IMPINGER TOTAL 68.3
7	PRILL COOLER	BYPASS	H_2O	225mls	200mls	25mls	
7	PRILL COOLER	BYPASS	H_2SO_4	204mls	200mls	4mls	
7	PRILL COOLER	BYPASS	SILICA GEL	212.3 g	200g	12.3g	TOTAL 41.3
7	PRILL COOLER	OUTLET	H_2O	248 mls	200mls	48 mls	
7	PRILL COOLER	OUTLET	H_2SO_4	197 mls	200 mls	-3 mls	
7	PRILL COOLER	OUTLET	SILICA GEL	209.4g	200g	9.4	TOTAL 54.4
8	PRILL COOLER	INLET	H_2O	249mls	200mls	49mls	
8	PRILL COOLER	INLET	H_2SO_4	202mls	200mls	2 mls	
8	PRILL COOLER	INLET	SILICA GEL	215.4g	200g	15.4g	TOTAL 66.4
8	PRILL COOLER	BYPASS	H_2O	224mls	200mls	24mls	
8	PRILL COOLER	BYPASS	H_2SO_4	200mls	200mls	0mls	
8	PRILL COOLER	BYPASS	SILICA GEL	208.8mls	200g	8.8g	TOTAL 32.8
8	PRILL COOLER	OUTLET	H_2O	245mls	200mls	45mls	
8	PRILL COOLER	OUTLET	H_2SO_4	190mls	200mls	-10mls	

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Test	Site	Location	Sample	Final Vol/Wt	Initial Vol/Wt	Δ Vol/Wt	Comments
8	Prill Cooler	Outlet	Silica Gel	207.5 g	200 g	7.5 g	Total 42.5
9	Prill Cooler	Inlet	H_2O	263 mls	200 mls	63 mls	
7	Prill Cooler	Inlet	H_2SO_4	199 mls	200 mls	-1 mls	
7	Prill Cooler	Inlet	Silica Gel	214.3 g	200 g	14.3 g	Total 76.3
9	Prill Cooler	By Pass	H_2O	233 mls	200 mls	33 mls	
7	Prill Cooler	By Pass	H_2SO_4	199 mls	200 mls	-1 ml	
9	Prill Cooler	By Pass	Silica Gel	209.8 g	200 g	9.8 g	Total 41.8
9	Prill Cooler	Outlet	H_2O	246 mls	200 mls	46 mls	
9	Prill Cooler	Outlet	H_2SO_4	195 mls	200 mls	-5 mls	
9	Prill Cooler	Outlet	Silica Gel	208.3 g	200 g	8.3 g	Total 49.3

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APPENDIX E

PARTICLE SIZE TESTS

Includes:

E.1 HCSS Computer Data Reduction Results
E.2 Sample Calculations
E.3 Field Data Sheets
E.4 Ammonium Nitrate Analysis Data
E.5 Sampling Logs
E.6 Sampling Train Calibration Data

APPENDIX E.1

HCSS COMPUTER DATA REDUCTION RESULTS

INPUT DATA FOR FILE RUN1
TEST DATE - 8/12/80
PROJECT # - 4468L-37
TEST SITE - COL. NIT. CORP. AUGUSTA GA
RUN ID - RUN 1 PRILL COOLER UNC. EXH. TP4

% WATER= 2
% CARBON DIOXIDE= 0
% CARBON MONOXIDE= 0
% OXYGEN= 20.9

ANDERSEN HIGH CAPACITY IMPACTOR

STACK TEMPERATURE=	118.0 DEGREES F.	SAMPLING TIME=	60.0 MIN.
BAR. PRESSURE=	29.90 INCHES HG	PRESSURE DROP=	0.00 INCHES HG
STATIC PRESSURE=	0.21 INCHES H2O	SAMPLER TEMP. =	118.0 DEGREES F.
AVE. DELTA P=	0.29 INCHES H2O	PARTICLE DENS=	1
PITOT COEFF.=	.84	METER VOL.=	35.890 CUBIC FEET
METER TEMP.=	118.4 DEGREES F.	DELTA H=	1.28 INCHES H2O
PROBE DIA.=	0.250 INCHES		

CALCULATED RESULTS

SAMPLE VOL.-DRY STD.=	32.829 CU. FT.	DRY MOLECULAR WT.=	28.84
SAMPLE VOL.-WET STD.=	33.499 CU. FT.	WET MOLECULAR WT.=	28.62
STACK VELOCITY=	1889.8 FT./MIN.	% ISOKINETIC=	94.9
NOZZLE VELOCITY=	1793.9 FT./MIN.	SAMPLING RATE-ACTUAL=	0.612 CU. FT/MIN
LOADING=	0.03514 GRAIN/SCF	WEIGHT CORRECTION=	0.220 MG.
LOADING(DRY)=	0.03586 GRAIN/SCF	MASS COLLECTED=	76.280 MG.

STAGE #	1	2	CYCLONE	FILTER
FINAL WT (MG)	65.10	6.18	2.70	3.18
TARE WT (MG)	0.00	0.00	0.00	0.00
NET WT (MG) CORRECTED	64.88	5.96	2.48	2.96
FRACTION % OF TOTAL	85.06	7.81	3.25	3.88
CUM. % WITH FILTER	85.06	92.87	96.12	100.00
FRACTION % WITHOUT FILTER	88.49	8.13	3.38	
CUM. % WITHOUT FILTER	88.49	96.62	100.00	
D50 SIZE (MICRONS)	9.95	5.52	1.21	<1.21
DM/DLOG (GRAINS/SCF)		0.01074	0.00173	
GEO MEAN (MICRONS)		7.41	2.58	<2.58
PARTICLE COUNT		1.8D+05	8.3D+04	

INPUT DATA FOR FILE RUN2
TEST DATE - 8/12/80
PROJECT # - 4468L-37
TEST SITE - COL. NIT. CORP. AUGUSTA,GA
RUN ID - RUN 2 PRILL COOLER UNC. EXH. TP4

% WATER= 2
% CARBON DIOXIDE= 0
% CARBON MONOXIDE= 0
% OXYGEN= 20.9

ANDERSEN HIGH CAPACITY IMPACTOR

STACK TEMPERATURE=	118.0 DEGREES F.	SAMPLING TIME=	60.0 MIN.
BAR. PRESSURE=	29.76 INCHES HG	PRESSURE DROP=	0.00 INCHES HG
STATIC PRESSURE=	0.21 INCHES H2O	SAMPLER TEMP. =	118.0 DEGREES F.
AVE. DELTA P=	0.29 INCHES H2O	PARTICLE DENS=	1
PITOT COEFF.=	.84	METER VOL.=	38.580 CUBIC FEET
METER TEMP.=	110.1 DEGREES F.	DELTA H=	1.34 INCHES H2O
PROBE DIA.=	0.250 INCHES		

CALCULATED RESULTS

SAMPLE VOL.-DRY STD.=	35.641 CU. FT.	DRY MOLECULAR WT.=	28.84
SAMPLE VOL.-WET STD.=	36.369 CU. FT.	WET MOLECULAR WT.=	28.62
STACK VELOCITY=	1894.2 FT./MIN.	% ISOKINETIC=	103.3
NOZZLE VELOCITY=	1956.8 FT./MIN.	SAMPLING RATE-ACTUAL=	0.667 CU. FT/MI..
LOADING=	0.02314 GRAIN/SCF	WEIGHT CORRECTION=	0.160 MG.
LOADING(DRY)=	0.02361 GRAIN/SCF	MASS COLLECTED=	54.530 MG.

STAGE #	1	2	CYCLONE	FILTER
FINAL WT (MG)	45.10	6.24	1.50	2.33
TARE WT (MG)	0.00	0.00	0.00	0.00
NET WT (MG) CORRECTED	44.94	6.08	1.34	2.17
FRACTION % OF TOTAL	82.41	11.15	2.46	3.98
CUM. % WITH FILTER	82.41	93.56	96.02	100.00
FRACTION % WITHOUT FILTER	85.83	11.61	2.56	
CUM. % WITHOUT FILTER	85.83	97.44	100.00	
D50 SIZE (MICRONS)	9.64	5.28	1.12	<1.12
DM/DLOG (GRAINS/SCF)		0.00988	0.00084	
GEO MEAN (MICRONS)		7.13	2.43	<2.43
PARTICLE COUNT		1.7D+05	4.3D+04	

INPUT DATA FOR FILE RUN3
TEST DATE - 8/13/80
PROJECT # - 4468L-37
TEST SITE - COL. NIT. CORP. AUGUSTA,GA
RUN ID - RUN 3 PRILL COOLER UNC. EXH. TP4

% WATER= 2
% CARBON DIOXIDE= 0
% CARBON MONOXIDE= 0
% OXYGEN= 20.9

ANDERSEN HIGH CAPACITY IMPACTOR

STACK TEMPERATURE=	118.0 DEGREES F.	SAMPLING TIME=	60.0 MIN.
BAR. PRESSURE=	29.87 INCHES HG	PRESSURE DROP=	0.00 INCHES HG
STATIC PRESSURE=	0.21 INCHES H2O	SAMPLER TEMP. =	118.0 DEGREES F.
AVE. DELTA P=	0.29 INCHES H2O	PARTICLE DENS=	1
PITOT COEFF.=	.84	METER VOL.=	37.690 CUBIC FEET
METER TEMP.=	92.6 DEGREES F.	DELTA H=	1.32 INCHES H2O
PROBE DIA.=	0.250 INCHES		

CALCULATED RESULTS

SAMPLE VOL.-DRY STD.=	36.053 CU. FT.	DRY MOLECULAR WT.=	28.84
SAMPLE VOL.-WET STD.=	36.788 CU. FT.	WET MOLECULAR WT.=	28.62
STACK VELOCITY=	1907.2 FT./MIN.	% ISOKINETIC=	103.4
NOZZLE VELOCITY=	1972.1 FT./MIN.	SAMPLING RATE-ACTUAL=	0.672 CU. FT/MIN
LOADING=	0.06070 GRAIN/SCF	WEIGHT CORRECTION=	0.160 MG.
LOADING(DRY)=	0.06194 GRAIN/SCF	MASS COLLECTED=	144.700 MG.

STAGE #	1	2	CYCLONE	FILTER
FINAL WT (MG)	131.25	9.45	2.46	2.18
TARE WT (MG)	0.00	0.00	0.00	0.00
NET WT (MG) CORRECTED	131.09	9.29	2.30	2.02
FRACTION % OF TOTAL	90.59	6.42	1.59	1.40
CUM. % WITH FILTER	90.59	97.01	98.60	100.00
FRACTION % WITHOUT FILTER	91.88	6.51	1.61	
CUM. % WITHOUT FILTER	91.88	98.39	100.00	
D50 SIZE (MICRONS)	9.61	5.26	1.11	<1.11
DM/DLOG (GRAINS/SCF)		0.01490	0.00143	
GEO MEAN (MICRONS)		7.11	2.42	<2.42
PARTICLE COUNT		2.6D+05	7.3D+04	

INPUT DATA FOR FILE RUN4
TEST DATE - 8/13/80
PROJECT # - 4468L-37
TEST SITE - COL. NIT. CORP. AUGUSTA,GA
RUN ID - RUN 1 PRILL COOLER SCRUBBER IN TP3

% WATER= 2
% CARBON DIOXIDE= 0
% CARBON MONOXIDE= 0
% OXYGEN= 20.9

ANDERSEN HIGH CAPACITY IMPACTOR

STACK TEMPERATURE= 130.0 DEGREES F.
BAR. PRESSURE= 29.87 INCHES HG
STATIC PRESSURE= 0.44 INCHES H20
AVE. DELTA P= 1.05 INCHES H20
PITOT COEFF.= .84
METER TEMP.= 100.9 DEGREES F.
PROBE DIA.= 0.187 INCHES

SAMPLING TIME= 60.0 MIN.
PRESSURE DROP= 0.00 INCHES HG
SAMPLER TEMP. = 130.0 DEGREES F.
PARTICLE DENS= 1
METER VOL.= 39.380 CUBIC FEET
DELTA H= 1.45 INCHES H20

CALCULATED RESULTS

SAMPLE VOL.-DRY STD.= 37.124 CU. FT.
SAMPLE VOL.-WET STD.= 37.882 CU. FT.
STACK VELOCITY= 3665.5 FT./MIN.
NOZZLE VELOCITY= 3702.7 FT./MIN.
LOADING= 4.06436 GRAIN/SCF
LOADING(DRY)= 4.14731 GRAIN/SCF

DRY MOLECULAR WT.= 28.84
WET MOLECULAR WT.= 28.62
% ISOKINETIC= 101.0
SAMPLING RATE-ACTUAL= 0.706 CU. FT/MI
WEIGHT CORRECTION= 0.230 MG.
MASS COLLECTED= 9976.750 MG.

STAGE #	1	2	CYCLONE	FILTER
FINAL WT (MG)	9186.00	784.00	6.27	1.40
TARE WT (MG)	0.00	0.00	0.00	0.00
NET WT (MG) CORRECTED	9185.77	783.77	6.04	1.17
FRACTION % OF TOTAL	92.07	7.86	0.06	0.01
CUM. % WITH FILTER	92.07	99.93	99.99	100.00
FRACTION % WITHOUT FILTER	92.08	7.86	0.06	
CUM. % WITHOUT FILTER	92.08	99.94	100.00	
D50 SIZE (MICRONS)	9.49	5.17	1.10	<1.10
DM/DLOG (GRAINS/SCF)		1.20810	0.00365	
GEO MEAN (MICRONS)		7.00	2.38	<2.38
PARTICLE COUNT		2.1D+07	1.9D+05	

INPUT DATA FOR FILE RUN5
TEST DATE - 8/13/80
PROJECT # - 4468L-37
TEST SITE - COL. NIT. CORP. AUGUSTA,GA
RUN ID - RUN 2 PRILL COOLER SCRUBBER IN TP3

% WATER= 2
% CARBON DIOXIDE= 0
% CARBON MONOXIDE= 0
% OXYGEN= 20.9

ANDERSEN HIGH CAPACITY IMPACTOR

STACK TEMPERATURE= 130.0 DEGREES F.
BAR. PRESSURE= 29.87 INCHES HG
STATIC PRESSURE= 0.44 INCHES H20
AVE. DELTA P= 1.05 INCHES H20
PITOT COEFF.= .84
METER TEMP.= 104.0 DEGREES F.
PROBE DIA.= 0.187 INCHES

SAMPLING TIME= 60.0 MIN.
PRESSURE DROP= 0.00 INCHES HG
SAMPLER TEMP. = 130.0 DEGREES F.
PARTICLE DENS= 1
METER VOL.= 39.550 CUBIC FEET
DELTA H= 1.43 INCHES H20

CALCULATED RESULTS

SAMPLE VOL.-DRY STD.= 37.082 CU. FT.
SAMPLE VOL.-WET STD.= 37.838 CU. FT.
STACK VELOCITY= 3665.5 FT./MIN.
NOZZLE VELOCITY= 3698.4 FT./MIN.
LOADING= 3.55405 GRAIN/SCF
LOADING(DRY)= 3.62658 GRAIN/SCF

DRY MOLECULAR WT.= 28.84
WET MOLECULAR WT.= 28.62
% ISOKINETIC= 100.9
SAMPLING RATE-ACTUAL= 0.705 CU. FT/MIN
WEIGHT CORRECTION= 0.230 MG.
MASS COLLECTED= 8714.080 MG.

STAGE #	1	2	CYCLONE	FILTER
FINAL WT (MG)	8372.00	337.20	4.47	1.33
TARE WT (MG)	0.00	0.00	0.00	0.00
NET WT (MG) CORRECTED	8371.77	336.97	4.24	1.10
FRACTION % OF TOTAL	96.07	3.87	0.05	0.01
CUM. % WITH FILTER	96.07	99.94	99.99	100.00
FRACTION % WITHOUT FILTER	96.08	3.87	0.05	
CUM. % WITHOUT FILTER	96.08	99.95	100.00	
D50 SIZE (MICRONS)	9.50	5.17	1.10	<1.10
DM/DLOG (GRAINS/SCF)		0.52000	0.00257	
GEO MEAN (MICRONS)		7.01	2.38	<2.38
PARTICLE COUNT		9.2D+06	1.3D+05	

INPUT DATA FOR FILE RUN6
TEST DATE - 8/13/80
PROJECT # - 4468L-37
TEST SITE - COL. NIT. CORP. AUGUSTA,GA
RUN ID - RUN 3 PRILL COOLER SCRUBBER IN TP3

% WATER= 2
% CARBON DIOXIDE= 0
% CARBON MONOXIDE= 0
% OXYGEN= 20.9

ANDERSEN HIGH CAPACITY IMPACTOR

STACK TEMPERATURE=	130.0 DEGREES F.	SAMPLING TIME=	45.0 MIN.
BAR. PRESSURE=	29.87 INCHES HG	PRESSURE DROP=	0.00 INCHES HG
STATIC PRESSURE=	0.44 INCHES H20	SAMPLER TEMP. =	130.0 DEGREES F.
AVE. DELTA P=	1.05 INCHES H20	PARTICLE DENS=	1
PITOT COEFF.=	.84	METER VOL.=	29.505 CUBIC FEET
METER TEMP.=	103.4 DEGREES F.	DELTA H=	1.44 INCHES H20
PROBE DIA.=	0.187 INCHES		

CALCULATED RESULTS

SAMPLE VOL.-DRY STD.=	27.692 CU. FT.	DRY MOLECULAR WT.=	28.84
SAMPLE VOL.-WET STD.=	28.257 CU. FT.	WET MOLECULAR WT.=	28.62
STACK VELOCITY=	3665.5 FT./MIN.	% ISOKINETIC=	100.5
NOZZLE VELOCITY=	3682.6 FT./MIN.	SAMPLING RATE-ACTUAL=	0.702 CU. FT/MI
LOADING=	3.94612 GRAIN/SCF	WEIGHT CORRECTION=	0.250 MG.
LOADING(DRY)=	4.02665 GRAIN/SCF	MASS COLLECTED=	7225.470 MG.

STAGE #	1	2	CYCLONE	FILTER
FINAL WT (MG)	6714.00	503.40	4.97	4.10
TARE WT (MG)	0.00	0.00	0.00	0.00
NET WT (MG) CORRECTED	6713.75	503.15	4.72	3.85
FRACTION % OF TOTAL	92.92	6.96	0.07	0.05
CUM. % WITH FILTER	92.92	99.88	99.95	100.00
FRACTION % WITHOUT FILTER	92.97	6.97	0.07	
CUM. % WITHOUT FILTER	92.97	99.93	100.00	
D50 SIZE (MICRONS)	9.52	5.18	1.10	<1.10
DM/DLOG (GRAINS/SCF)		1.03975	0.00383	
GEO MEAN (MICRONS)		7.02	2.39	<2.39
PARTICLE COUNT		1.8D+07	2.0D+05	

INPUT DATA FOR FILE RUN7
TEST DATE - 8/14/80
PROJECT # - 4468L-37
TEST SITE - COL. NIT. CORP. AUGUSTA,GA
RUN ID - RUN 1 PRILL TOWER IN. B. TP1

% WATER= 2
% CARBON DIOXIDE= 0
% CARBON MONOXIDE= 0
% OXYGEN= 20.9

ANDERSEN HIGH CAPACITY IMPACTOR

STACK TEMPERATURE= 127.0 DEGREES F.
BAR. PRESSURE= 29.87 INCHES HG
STATIC PRESSURE= -0.90 INCHES H20
AVE. DELTA P= 0.70 INCHES H20
PITOT COEFF.= .84
METER TEMP.= 93.2 DEGREES F.
PROBE DIA.= 0.187 INCHES

SAMPLING TIME= 60.0 MIN.
PRESSURE DROP= 0.00 INCHES HG
SAMPLER TEMP. = 127.0 DEGREES F.
PARTICLE DENS= 1
METER VOL.= 31.590 CUBIC FEET
DELTA H= 0.93 INCHES H20

CALCULATED RESULTS

SAMPLE VOL.-DRY STD.= 30.159 CU. FT.
SAMPLE VOL.-WET STD.= 30.774 CU. FT.
STACK VELOCITY= 2990.2 FT./MIN.
NOZZLE VELOCITY= 3002.6 FT./MIN.
LOADING= 0.01045 GRAIN/SCF
LOADING(DRY)= 0.01066 GRAIN/SCF

DRY MOLECULAR WT.= 28.84
WET MOLECULAR WT.= 28.62
% ISOKINETIC= 100.4
SAMPLING RATE-ACTUAL= 0.573 CU. FT/MIN
WEIGHT CORRECTION= 0.250 MG.
MASS COLLECTED= 20.830 MG.

STAGE #	1	2	CYCLONE	FILTER
FINAL WT (MG)	3.47	1.74	8.30	8.32
TARE WT (MG)	0.00	0.00	0.00	0.00
NET WT (MG) CORRECTED	3.22	1.49	8.05	8.07
FRACTION % OF TOTAL	15.46	7.15	38.65	38.74
CUM. % WITH FILTER	15.46	22.61	61.26	100.00
FRACTION % WITHOUT FILTER	25.24	11.68	63.09	
CUM. % WITHOUT FILTER	25.24	36.91	100.00	
D50 SIZE (MICRONS)	10.25	5.74	1.30	<1.30
DM/DLOG (GRAINS/SCF)		0.00297	0.00626	
GEO MEAN (MICRONS)		7.67	2.73	<2.73
PARTICLE COUNT		4.8D+04	2.8D+05	

INPUT DATA FOR FILE RUN9
TEST DATE - 8/14/80
PROJECT # - 4468L-37
TEST SITE - COL. NIT. CORP. AUGUSTA,GA
RUN ID - RUN 1 PRILL TOWER IN. A TP2

% WATER= 2
% CARBON DIOXIDE= 0
% CARBON MONOXIDE= 0
% OXYGEN= 20.9

ANDERSEN HIGH CAPACITY IMPACTOR

STACK TEMPERATURE= 126.0 DEGREES F.
BAR. PRESSURE= 29.84 INCHES HG
STATIC PRESSURE= -1.20 INCHES H2O
AVE. DELTA P= 0.88 INCHES H2O
PITOT COEFF.= .84
METER TEMP.= 104.5 DEGREES F.
PROBE DIA.= 0.187 INCHES

SAMPLING TIME= 90.0 MIN.
PRESSURE DROP= 0.00 INCHES HG
SAMPLER TEMP. = 126.0 DEGREES F.
PARTICLE DENS= 1
METER VOL.= 53.598 CUBIC FEET
DELTA H= 1.19 INCHES H2O

CALCULATED RESULTS

SAMPLE VOL.-DRY STD.= 50.125 CU. FT.
SAMPLE VOL.-WET STD.= 51.148 CU. FT.
STACK VELOCITY= 3343.2 FT./MIN.
NOZZLE VELOCITY= 3327.1 FT./MIN.
LOADING= 0.03705 GRAIN/SCF
LOADING(DRY)= 0.03780 GRAIN/SCF

DRY MOLECULAR WT.= 28.84
WET MOLECULAR WT.= 28.62
% ISOKINETIC= 99.5
SAMPLING RATE-ACTUAL= 0.635 CU. FT/MI
WEIGHT CORRECTION= 0.190 MG.
MASS COLLECTED= 122.780 MG.

STAGE #	1	2	CYCLONE	FILTER
FINAL WT (MG)	10.44	1.84	42.75	68.51
TARE WT (MG)	0.00	0.00	0.00	0.00
NET WT (MG) CORRECTED	10.25	1.65	42.56	68.32
FRACTION % OF TOTAL	8.35	1.34	34.66	55.64
CUM. % WITH FILTER	8.35	9.69	44.36	100.00
FRACTION % WITHOUT FILTER	18.82	3.03	78.15	
CUM. % WITHOUT FILTER	18.82	21.85	100.00	
D50 SIZE (MICRONS)	9.86	5.44	1.19	<1.19
DM/DLOG (GRAINS/SCF)		0.00193	0.01943	
GEO MEAN (MICRONS)		7.32	2.54	<2.54
PARTICLE COUNT		3.3D+04	9.5D+05	

INPUT DATA FOR FILE RUN15
TEST DATE - 8/16/80
PROJECT # - 4468L-37
TEST SITE - COL. NIT. CORP. AUGUSTA,GA
RUN ID - RUN 1 PRILL TOWER IN. C. TP3

% WATER= 2
% CARBON DIOXIDE= 0
% CARBON MONOXIDE= 0
% OXYGEN= 20.9

ANDERSEN HIGH CAPACITY IMPACTOR

STACK TEMPERATURE= 133.0 DEGREES F.
BAR. PRESSURE= 29.88 INCHES HG
STATIC PRESSURE= -1.15 INCHES H20
AVE. DELTA P= 0.79 INCHES H20
PITOT COEFF.= .84
METER TEMP.= 96.0 DEGREES F.
PROBE DIA.= 0.187 INCHES

SAMPLING TIME= 60.0 MIN.
PRESSURE DROP= 0.00 INCHES HG
SAMPLER TEMP. = 133.0 DEGREES F.
PARTICLE DENS= 1
METER VOL.= 33.490 CUBIC FEET
DELTA H= 1.03 INCHES H20

CALCULATED RESULTS

SAMPLE VOL.-DRY STD.= 31.829 CU. FT.
SAMPLE VOL.-WET STD.= 32.478 CU. FT.
STACK VELOCITY= 3183.1 FT./MIN.
NOZZLE VELOCITY= 3202.1 FT./MIN.
LOADING= 0.00767 GRAIN/SCF
LOADING(DRY)= 0.00783 GRAIN/SCF

DRY MOLECULAR WT.= 28.84
WET MOLECULAR WT.= 28.62
% ISOKINETIC= 100.6
SAMPLING RATE-ACTUAL= 0.611 CU. FT/MIN
WEIGHT CORRECTION= 0.230 MG.
MASS COLLECTED= 16.150 MG.

STAGE #	1	2	CYCLONE	FILTER
FINAL WT (MG)	1.67	0.56	4.98	9.86
TARE WT (MG)	0.00	0.00	0.00	0.00
NET WT (MG) CORRECTED	1.44	0.33	4.75	9.63
FRACTION % OF TOTAL	8.92	2.04	29.41	59.63
CUM. % WITH FILTER	8.92	10.96	40.37	100.00
FRACTION % WITHOUT FILTER	22.09	5.06	72.85	
CUM. % WITHOUT FILTER	22.09	27.15	100.00	
D50 SIZE (MICRONS)	10.04	5.57	1.25	<1.25
DM/DLOG (GRAINS/SCF)		0.00061	0.00347	
GEO MEAN (MICRONS)		7.48	2.64	<2.64
PARTICLE COUNT		1.0D+04	1.6D+05	

INPUT DATA FOR FILE RUN12
TEST DATE - 8/15/80
PROJECT # - 4468L-37
TEST SITE - COL. NIT. CORP. AUGUSTA,GA
RUN ID - RUN 1 BYPASS STACK A TP7

% WATER= 2
% CARBON DIOXIDE= 0
% CARBON MONOXIDE= 0
% OXYGEN= 20.9

ANDERSEN HIGH CAPACITY IMPACTOR

STACK TEMPERATURE=	97.0 DEGREES F.	SAMPLING TIME=	165.0 MIN.
BAR. PRESSURE=	29.89 INCHES HG	PRESSURE DROP=	0.00 INCHES HG
STATIC PRESSURE=	-0.15 INCHES H20	SAMPLER TEMP. =	97.0 DEGREES F.
AVE. DELTA P=	1.30 INCHES H20	PARTICLE DENS=	1
PITOT COEFF.=	.84	METER VOL.=	121.805 CUBIC FEET
METER TEMP.=	104.3 DEGREES F.	DELTA H=	1.82 INCHES H20
PROBE DIA.=	0.187 INCHES		

CALCULATED RESULTS

SAMPLE VOL.-DRY STD.=	114.313 CU. FT.	DRY MOLECULAR WT.=	28.84
SAMPLE VOL.-WET STD.=	116.646 CU. FT.	WET MOLECULAR WT.=	28.62
STACK VELOCITY=	3964.4 FT./MIN.	% ISOKINETIC=	98.8
NOZZLE VELOCITY=	3917.1 FT./MIN.	SAMPLING RATE-ACTUAL=	0.747 CU. FT/MI.
LOADING=	0.00624 GRAIN/SCF	WEIGHT CORRECTION=	0.240 MG.
LOADING(DRY)=	0.00637 GRAIN/SCF	MASS COLLECTED=	47.170 MG.

STAGE #	1	2	CYCLONE	FILTER
FINAL WT (MG)	17.10	1.89	21.17	7.97
TARE WT (MG)	0.00	0.00	0.00	0.00
NET WT (MG) CORRECTED	16.86	1.65	20.93	7.73
FRACTION % OF TOTAL	35.74	3.50	44.37	16.39
CUM. % WITH FILTER	35.74	39.24	83.61	100.00
FRACTION % WITHOUT FILTER	42.75	4.18	53.07	
CUM. % WITHOUT FILTER	42.75	46.93	100.00	
D50 SIZE (MICRONS)	9.06	4.93	0.96	<0.96
DM/DLOG (GRAINS/SCF)		0.00083	0.00389	
GEO MEAN (MICRONS)		6.68	2.17	<2.17
PARTICLE COUNT		1.5D+04	2.2D+05	

INPUT DATA FOR FILE RUN8
TEST DATE - 8/14/80
PROJECT # - 4468L-37
TEST SITE - COL. NIT. CORP. AUGUSTA,GA
RUN ID - RUN 1 BYPASS STACK B TP5

% WATER=	2
% CARBON DIOXIDE=	0
% CARBON MONOXIDE=	0
% OXYGEN=	20.9

ANDERSEN HIGH CAPACITY IMPACTOR

STACK TEMPERATURE=	110.0 DEGREES F.	SAMPLING TIME=	180.0 MIN.
BAR. PRESSURE=	29.90 INCHES HG	PRESSURE DROP=	0.00 INCHES HG
STATIC PRESSURE=	-0.08 INCHES H2O	SAMPLER TEMP. =	110.0 DEGREES F.
AVE. DELTA P=	1.40 INCHES H2O	PARTICLE DENS=	1
PITOT COEFF.=	.84	METER VOL.=	137.595 CUBIC FEET
METER TEMP.=	107.4 DEGREES F.	DELTA H=	1.97 INCHES H2O
PROBE DIA.=	0.187 INCHES		

CALCULATED RESULTS

SAMPLE VOL.-DRY STD.=	128.523 CU. FT.	DRY MOLECULAR WT.=	28.84
SAMPLE VOL.-WET STD.=	131.146 CU. FT.	WET MOLECULAR WT.=	28.62
STACK VELOCITY=	4160.8 FT./MIN.	% ISOKINETIC=	99.2
NOZZLE VELOCITY=	4129.1 FT./MIN.	SAMPLING RATE-ACTUAL=	0.788 CU. FT/MIN
LOADING=	0.00633 GRAIN/SCF	WEIGHT CORRECTION=	0.190 MG.
LOADING(DRY)=	0.00646 GRAIN/SCF	MASS COLLECTED=	53.800 MG.

STAGE #	1	2	CYCLONE	FILTER
FINAL WT (MG)	16.76	3.28	24.14	10.38
TARE WT (MG)	0.00	0.00	0.00	0.00
NET WT (MG) CORRECTED	16.57	3.09	23.95	10.19
FRACTION % OF TOTAL	30.80	5.74	44.52	18.94
CUM. % WITH FILTER	30.80	36.54	81.06	100.00
FRACTION % WITHOUT FILTER	38.00	7.09	54.92	
CUM. % WITHOUT FILTER	38.00	45.08	100.00	
D50 SIZE (MICRONS)	8.88	4.83	0.95	<0.95
DM/DLOG (GRAINS/SCF)		0.00138	0.00398	
GEO MEAN (MICRONS)		6.55	2.14	<2.14
PARTICLE COUNT		2.6D+04	2.3D+05	

INPUT DATA FOR FILE RUN10
TEST DATE - 8/15/80
PROJECT # - 4468L-37
TEST SITE - COL. NIT. CORP. AUGUSTA,GA
RUN ID - RUN 1 BYPASS STACK C TP6

% WATER= 2
% CARBON DIOXIDE= 0
% CARBON MONOXIDE= 0
% OXYGEN= 20.9

ANDERSEN HIGH CAPACITY IMPACTOR

STACK TEMPERATURE= 116.0 DEGREES F.
BAR. PRESSURE= 29.92 INCHES HG
STATIC PRESSURE= -0.24 INCHES H20
AVE. DELTA P= 1.25 INCHES H20
PITOT COEFF.= .84
METER TEMP.= 98.8 DEGREES F.
PROBE DIA.= 0.187 INCHES

SAMPLING TIME= 180.0 MIN.
PRESSURE DROP= 0.00 INCHES HG
SAMPLER TEMP. = 116.0 DEGREES F.
PARTICLE DENS= 1
METER VOL.= 128.170 CUBIC FEET
DELTA H= 1.70 INCHES H20

CALCULATED RESULTS

SAMPLE VOL.-DRY STD.= 121.565 CU. FT.
SAMPLE VOL.-WET STD.= 124.046 CU. FT.
STACK VELOCITY= 3951.6 FT./MIN.
NOZZLE VELOCITY= 3945.6 FT./MIN.
LOADING= 0.00499 GRAIN/SCF
LOADING(DRY)= 0.00509 GRAIN/SCF

DRY MOLECULAR WT.= 28.84
WET MOLECULAR WT.= 28.62
% ISOKINETIC= 99.8
SAMPLING RATE-ACTUAL= 0.753 CU. FT/MI.
WEIGHT CORRECTION= 0.200 MG.
MASS COLLECTED= 40.070 MG.

STAGE #	1	2	CYCLONE	FILTER
FINAL WT (MG)	11.83	1.38	16.24	11.42
TARE WT (MG)	0.00	0.00	0.00	0.00
NET WT (MG) CORRECTED	11.63	1.18	16.04	11.22
FRACTION % OF TOTAL	29.02	2.94	40.03	28.00
CUM. % WITH FILTER	29.02	31.97	72.00	100.00
FRACTION % WITHOUT FILTER	40.31	4.09	55.60	
CUM. % WITHOUT FILTER	40.31	44.40	100.00	
D50 SIZE (MICRONS)	9.12	4.96	1.00	<1.00
DM/DLOG (GRAINS/SCF)		0.00056	0.00287	
GEO MEAN (MICRONS)		6.73	2.23	<2.23
PARTICLE COUNT		1.0D+04	1.6D+05	

INPUT DATA FOR FILE RUN11
TEST DATE - 8/15/80
PROJECT # - 4468L-37
TEST SITE - COL. NIT. CORP. AUGUSTA,GA
RUN ID - RUN 1 DRYER EXHAUST TP2

% WATER= 2
% CARBON DIOXIDE= 0
% CARBON MONOXIDE= 0
% OXYGEN= 20.9

ANDERSEN HIGH CAPACITY IMPACTOR

STACK TEMPERATURE=	149.0 DEGREES F.	SAMPLING TIME=	31.5 MIN.
BAR. PRESSURE=	29.92 INCHES HG	PRESSURE DROP=	0.00 INCHES HG
STATIC PRESSURE=	-1.77 INCHES H20	SAMPLER TEMP. =	149.0 DEGREES F.
AVE. DELTA P=	0.73 INCHES H20	PARTICLE DENS=	1
PITOT COEFF.=	.84	METER VOL.=	16.600 CUBIC FEET
METER TEMP.=	95.4 DEGREES F.	DELTA H=	0.82 INCHES H20
PROBE DIA.=	0.187 INCHES		

CALCULATED RESULTS

SAMPLE VOL.-DRY STD.=	15.807 CU. FT.	DRY MOLECULAR WT.=	28.84
SAMPLE VOL.-WET STD.=	16.129 CU. FT.	WET MOLECULAR WT.=	28.62
STACK VELOCITY=	3111.0 FT./MIN.	% ISOKINETIC=	100.0
NOZZLE VELOCITY=	3111.3 FT./MIN.	SAMPLING RATE-ACTUAL=	0.593 CU. FT/MIN
LOADING=	10.47491 GRAIN/SCF	WEIGHT CORRECTION=	0.200 MG.
LOADING(DRY)=	10.68868 GRAIN/SCF	MASS COLLECTED=	10947.890 MG.

STAGE #	1	2	CYCLONE	FILTER
FINAL WT (MG)	10236.00	598.00	20.69	94.00
TARE WT (MG)	0.00	0.00	0.00	0.00
NET WT (MG) CORRECTED	10235.80	597.80	20.49	93.80
FRACTION % OF TOTAL	93.50	5.46	0.19	0.86
CUM. % WITH FILTER	93.50	98.96	99.14	100.00
FRACTION % WITHOUT FILTER	94.30	5.51	0.19	
CUM. % WITHOUT FILTER	94.30	99.81	100.00	
D50 SIZE (MICRONS)	10.24	5.70	1.32	<1.32
DM/DLOG (GRAINS/SCF)		2.25058	0.03085	
GEO MEAN (MICRONS)		7.64	2.74	<2.74
PARTICLE COUNT		3.6D+07	1.4D+06	

INPUT DATA FOR FILE RUN13
TEST DATE - 8/15/80
PROJECT # - 4468L-37
TEST SITE - COL. NIT. CORP. AUGUSTA,GA
RUN ID - RUN 2 DRYER EXHAUST TP2

% WATER= 2
% CARBON DIOXIDE= 0
% CARBON MONOXIDE= 0
% OXYGEN= 20.9

ANDERSEN HIGH CAPACITY IMPACTOR

STACK TEMPERATURE= 148.0 DEGREES F.
BAR. PRESSURE= 29.92 INCHES HG
STATIC PRESSURE= -1.77 INCHES H20
AVE. DELTA P= 0.53 INCHES H20
PITOT COEFF.= .84
METER TEMP.= 100.5 DEGREES F.
PROBE DIA.= 0.187 INCHES

SAMPLING TIME= 15.0 MIN.
PRESSURE DROP= 0.00 INCHES HG
SAMPLER TEMP. = 148.0 DEGREES F.
PARTICLE DENS= 1
METER VOL.= 6.900 CUBIC FEET
DELTA H= 0.52 INCHES H20

CALCULATED RESULTS

SAMPLE VOL.-DRY STD.= 6.506 CU. FT.
SAMPLE VOL.-WET STD.= 6.638 CU. FT.
STACK VELOCITY= 2648.6 FT./MIN.
NOZZLE VELOCITY= 2684.7 FT./MIN.
LOADING= 2.78383 GRAIN/SCF
LOADING(DRY)= 2.84065 GRAIN/SCF

DRY MOLECULAR WT.= 28.84
WET MOLECULAR WT.= 28.62
% ISOKINETIC= 101.4
SAMPLING RATE-ACTUAL= 0.512 CU. FT/MI
WEIGHT CORRECTION= 0.240 MG.
MASS COLLECTED= 1197.490 MG.

STAGE #	1	2	CYCLONE	FILTER
FINAL WT (MG)	1145.00	39.34	2.22	11.89
TARE WT (MG)	0.00	0.00	0.00	0.00
NET WT (MG) CORRECTED	1144.76	39.10	1.98	11.65
FRACTION % OF TOTAL	95.60	3.27	0.17	0.97
CUM. % WITH FILTER	95.60	98.86	99.03	100.00
FRACTION % WITHOUT FILTER	96.54	3.30	0.17	
CUM. % WITHOUT FILTER	96.54	99.83	100.00	
D50 SIZE (MICRONS)	10.82	6.14	1.49	<1.49
DM/DLOG (GRAINS/SCF)		0.36950	0.00748	
GEO MEAN (MICRONS)		8.15	3.02	<3.02
PARTICLE COUNT		5.6D+06	3.1D+05	

INPUT DATA FOR FILE RUN14
TEST DATE - 8/15/80
PROJECT # - 4468L-37
TEST SITE - COL. NIT. CORP. AUGUSTA,GA
RUN ID - RUN 3 DRYER EXHAUST TP2

% WATER= 2
% CARBON DIOXIDE= 0
% CARBON MONOXIDE= 0
% OXYGEN= 20.9

ANDERSEN HIGH CAPACITY IMPACTOR

STACK TEMPERATURE=	136.0 DEGREES F.	SAMPLING TIME=	45.0 MIN.
BAR. PRESSURE=	29.92 INCHES HG	PRESSURE DROP=	0.00 INCHES HG
STATIC PRESSURE=	-1.77 INCHES H20	SAMPLER TEMP. =	136.0 DEGREES F.
AVE. DELTA P=	0.43 INCHES H20	PARTICLE DENS=	1
PITOT COEFF.=	.84	METER VOL.=	33.579 CUBIC FEET
METER TEMP.=	107.3 DEGREES F.	DELTA H=	1.70 INCHES H20
PROBE DIA.=	0.250 INCHES		

CALCULATED RESULTS

SAMPLE VOL.-DRY STD.=	31.371 CU. FT.	DRY MOLECULAR WT.=	28.84
SAMPLE VOL.-WET STD.=	32.011 CU. FT.	WET MOLECULAR WT.=	28.62
STACK VELOCITY=	2362.0 FT./MIN.	% ISOKINETIC=	100.2
NOZZLE VELOCITY=	2366.8 FT./MIN.	SAMPLING RATE-ACTUAL=	0.807 CU. FT/MIN
LOADING=	2.18968 GRAIN/SCF	WEIGHT CORRECTION=	0.230 MG.
LOADING(DRY)=	2.23436 GRAIN/SCF	MASS COLLECTED=	4541.990 MG.

STAGE #	1	2	CYCLONE	FILTER
FINAL WT (MG)	4373.00	146.80	11.47	11.64
TARE WT (MG)	0.00	0.00	0.00	0.00
NET WT (MG) CORRECTED	4372.77	146.57	11.24	11.41
FRACTION % OF TOTAL	96.27	3.23	0.25	0.25
CUM. % WITH FILTER	96.27	99.50	99.75	100.00
FRACTION % WITHOUT FILTER	96.52	3.24	0.25	
CUM. % WITHOUT FILTER	96.52	99.75	100.00	
D50 SIZE (MICRONS)	8.91	4.84	1.00	<1.00
DM/DLOG (GRAINS/SCF)		0.26707	0.00790	
GEO MEAN (MICRONS)		6.57	2.20	<2.20
PARTICLE COUNT		5.0D+06	4.4D+05	

INPUT DATA FOR FILE RUN16
TEST DATE - 8/16/80
PROJECT # - 4468L-37
TEST SITE - COL. NIT. CORP. AUGUSTA,GA
RUN ID - RUN 1 PREDRYER EXHAUST TP1

% WATER= 2
% CARBON DIOXIDE= 0
% CARBON MONOXIDE= 0
% OXYGEN= 20.9

ANDERSEN HIGH CAPACITY IMPACTOR

STACK TEMPERATURE= 153.0 DEGREES F.
BAR. PRESSURE= 29.88 INCHES HG
STATIC PRESSURE= -2.80 INCHES H20
AVE. DELTA P= 1.30 INCHES H20
PITOT COEFF.= .84
METER TEMP.= 95.8 DEGREES F.
PROBE DIA.= 0.187 INCHES

SAMPLING TIME= 15.5 MIN.
PRESSURE DROP= 0.00 INCHES HG
SAMPLER TEMP. = 153.0 DEGREES F.
PARTICLE DENS= 1
METER VOL.= 10.860 CUBIC FEET
DELTA H= 1.49 INCHES H20

CALCULATED RESULTS

SAMPLE VOL.-DRY STD.= 10.337 CU. FT.
SAMPLE VOL.-WET STD.= 10.548 CU. FT.
STACK VELOCITY= 4173.3 FT./MIN.
NOZZLE VELOCITY= 4178.3 FT./MIN.
LOADING= 1.86251 GRAIN/SCF
LOADING(DRY)= 1.90052 GRAIN/SCF

DRY MOLECULAR WT.= 28.84
WET MOLECULAR WT.= 28.62
% ISOKINETIC= 100.1
SAMPLING RATE-ACTUAL= 0.797 CU. FT/MI
WEIGHT CORRECTION= 0.190 MG.
MASS COLLECTED= 1272.970 MG.

STAGE #	1	2	CYCLONE	FILTER
FINAL WT (MG)	1176.00	69.60	5.53	22.60
TARE WT (MG)	0.00	0.00	0.00	0.00
NET WT (MG) CORRECTED	1175.81	69.41	5.34	22.41
FRACTION % OF TOTAL	92.37	5.45	0.42	1.76
CUM. % WITH FILTER	92.37	97.82	98.24	100.00
FRACTION % WITHOUT FILTER	94.02	5.55	0.43	
CUM. % WITHOUT FILTER	94.02	99.57	100.00	
D50 SIZE (MICRONS)	9.04	4.92	1.05	<1.05
DM/DLOG (GRAINS/SCF)		0.38371	0.01167	
GEO MEAN (MICRONS)		6.67	2.28	<2.28
PARTICLE COUNT		7.1D+06	6.3D+05	

INPUT DATA FOR FILE RUN17
TEST DATE - 8/16/80
PROJECT # - 4468L-37
TEST SITE - COL. NIT. CORP. AUGUSTA,GA
RUN ID - RUN 2 PREDRYER EXHAUST TP1

% WATER= 2
% CARBON DIOXIDE= 0
% CARBON MONOXIDE= 0
% OXYGEN= 20.9

ANDERSEN HIGH CAPACITY IMPACTOR

STACK TEMPERATURE= 152.0 DEGREES F.
BAR. PRESSURE= 29.88 INCHES HG
STATIC PRESSURE= -2.80 INCHES H20
AVE. DELTA P= 1.20 INCHES H20
PITOT COEFF.= .84
METER TEMP.= 101.3 DEGREES F.
PROBE DIA.= 0.187 INCHES

SAMPLING TIME= 15.3 MIN.
PRESSURE DROP= 0.00 INCHES HG
SAMPLER TEMP. = 152.0 DEGREES F.
PARTICLE DENS= 1
METER VOL.= 10.500 CUBIC FEET
DELTA H= 1.45 INCHES H20

CALCULATED RESULTS

SAMPLE VOL.-DRY STD.= 9.895 CU. FT.
SAMPLE VOL.-WET STD.= 10.097 CU. FT.
STACK VELOCITY= 4006.3 FT./MIN.
NOZZLE VELOCITY= 4045.5 FT./MIN.
LOADING= 2.87521 GRAIN/SCF
LOADING(DRY)= 2.93389 GRAIN/SCF

DRY MOLECULAR WT.= 28.84
WET MOLECULAR WT.= 28.62
% ISOKINETIC= 101.0
SAMPLING RATE-ACTUAL= 0.772 CU. FT/MIN
WEIGHT CORRECTION= 0.190 MG.
MASS COLLECTED= 1881.180 MG.

STAGE #	1	2	CYCLONE	FILTER
FINAL WT (MG)	1764.00	98.40	9.26	10.28
TARE WT (MG)	0.00	0.00	0.00	0.00
NET WT (MG) CORRECTED	1763.81	98.21	9.07	10.09
FRACTION % OF TOTAL	93.76	5.22	0.48	0.54
CUM. % WITH FILTER	93.76	98.98	99.46	100.00
FRACTION % WITHOUT FILTER	94.27	5.25	0.48	
CUM. % WITHOUT FILTER	94.27	99.52	100.00	
D50 SIZE (MICRONS)	9.19	5.00	1.08	<1.08
DM/DLOG (GRAINS/SCF)		0.56730	0.02080	
GEO MEAN (MICRONS)		6.78	2.32	<2.32
PARTICLE COUNT		1.0D+07	1.1D+06	

INPUT DATA FOR FILE RUN18
TEST DATE - 8/16/80
PROJECT # - 4468L-37
TEST SITE - COL. NIT. CORP. AUGUSTA,GA
RUN ID - RUN 3 PREDRYER EXHAUST TP1

% WATER= 2
% CARBON DIOXIDE= 0
% CARBON MONOXIDE= 0
% OXYGEN= 20.9

ANDERSEN HIGH CAPACITY IMPACTOR

STACK TEMPERATURE= 152.0 DEGREES F.
BAR. PRESSURE= 29.88 INCHES HG
STATIC PRESSURE= -2.80 INCHES H20
AVE. DELTA P= 1.10 INCHES H20
PITOT COEFF.= .84
METER TEMP.= 108.6 DEGREES F.
PROBE DIA.= 0.187 INCHES

SAMPLING TIME= 15.0 MIN.
PRESSURE DROP= 0.00 INCHES HG
SAMPLER TEMP. = 152.0 DEGREES F.
PARTICLE DENS= 1.
METER VOL.= 9.920 CUBIC FEET
DELTA H= 1.31 INCHES H20

CALCULATED RESULTS

SAMPLE VOL.-DRY STD.= 9.225 CU. FT.
SAMPLE VOL.-WET STD.= 9.414 CU. FT.
STACK VELOCITY= 3835.7 FT./MIN.
NOZZLE VELOCITY= 3847.1 FT./MIN.
LOADING= 2.06674 GRAIN/SCF
LOADING(DRY)= 2.10892 GRAIN/SCF

DRY MOLECULAR WT.= 28.84
WET MOLECULAR WT.= 28.62
% ISOKINETIC= 100.3
SAMPLING RATE-ACTUAL= 0.734 CU. FT/MIN
WEIGHT CORRECTION= 0.160 MG.
MASS COLLECTED= 1260.690 MG.

STAGE #	1	2	CYCLONE	FILTER
FINAL WT (MG)	1139.00	109.70	6.38	6.25
TARE WT (MG)	0.00	0.00	0.00	0.00
NET WT (MG) CORRECTED	1138.84	109.54	6.22	6.09
FRACTION % OF TOTAL	90.33	8.69	0.49	0.48
CUM. % WITH FILTER	90.33	99.02	99.52	100.00
FRACTION % WITHOUT FILTER	90.77	8.73	0.50	
CUM. % WITHOUT FILTER	90.77	99.50	100.00	
D50 SIZE (MICRONS)	9.42	5.13	1.12	<1.12
DM/DLOG (GRAINS/SCF)		0.67893	0.01544	
GEO MEAN (MICRONS)		6.95	2.40	<2.40
PARTICLE COUNT		1.2D+07	8.0D+05	

APPENDIX E.2

SAMPLE CALCULATIONS

A-2-1 - CALCULATIONS

AVERAGE DRY GAS METER TEMPERATURE

Average dry gas meter temperature and average orifice pressure drop. See data sheets.

DRY GAS VOLUME

Correct the sample volume measured by the dry gas meter to standard conditions (70°F, 29.92 in. Hg) by using the equation below:

$$V_{m_{std}} = V_m \left[\frac{T_{STD}}{T_m}\right] \quad \frac{P_{bar} + \frac{\Delta H}{13.6}}{P_{STD}} =$$

$$\left[17.71 \frac{^\circ R}{\text{in. Hg}}\right] \quad V_m \quad \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m}$$

VOLUME OF WATER VAPOR

$$V_{w_{std}} = V_{lc}\left[\frac{\rho_{H_2O}}{M_{H_2O}}\right]\left[\frac{RT_{STD}}{P_{STD}}\right] = \left[0.0474 \frac{\text{cu. ft.}}{\text{ml.}}\right] V_{lc}$$

MOISTURE CONTENT

$$B_{wo} = \frac{V_{w_{std}}}{V_{m_{std}} + V_{w_{std}}}$$

STACK GAS VELOCITY

$$V_s = K_p C_p \quad (\sqrt{dP})_{avg} \quad \left(\frac{T_s}{P_s M_s}\right)^{\frac{1}{2}}$$

VOLUMETRIC FLOW RATE

$$Q_s = 60 \quad (1-B_{wo}) \quad V_s A \left(\frac{T_{std}}{T_s}\right) \quad \left(\frac{P_s}{P_{std}}\right)$$

TOTAL PARTICULATE WEIGHT

Determine the total particulate catch from the sum of the weights from the analysis.

CONCENTRATION IN GRAINS PER STANDARD CUBIC FOOT

$$C_s' = 0.0154 \quad \frac{gr.}{mg.} \quad \left[\frac{M_n}{V_{m_{std}}}\right]$$

EMISSION RATE IN POUNDS/HOUR

$$G = (0.000143 \ \frac{lbs.}{gr.}) \quad (60 \ \frac{min.}{hr.}) \quad C_s' \ Q_s$$

PERCENT ISOKINETIC

$$I = \frac{T_s \left[\left(\frac{V_{lc} \quad (\rho H_2 0) \quad R}{M_{H_2O}}\right) + \frac{V_m}{T_m}\left(P_{bar} + \frac{\Delta H}{13.6}\right)\right]}{\Theta V_s P_s A_n} \times 100$$

$$= \frac{1.667 \ \frac{min.}{sec.} \left[\left(0.00267 \ \frac{in.Hg\text{-}cu.ft.}{ml.\text{-}^oR}\right) V_{lc} + \frac{Vm}{Tm}\left(P_{bar} + \frac{\Delta H}{13.6}\right)\right] T_s}{\Theta V_s P_s A_n}$$

ACCEPTABLE RESULTS

If $90\% \leq I \leq 100\%$, the results are acceptable. Otherwise, reject the results and repeat the test.

A-2-2 - IMPACTOR DATA REDUCTION

Calculate the weight gain for each container.

1. Add the weight gain fron containers #1 and 4 to determine weight catch for stage 1.

2. Add the weight gain from containers #2 and 5 to determine the weight catch for stage 2.

3. Add the weight catch from containers #3 and 6 to determine the weight catch for the cyclone.

4. Add the weight catch from containers #7 and 8 to determine the weight catch for the backup filter.

Add the weight gains for the four stages to obtain the total particulate collected.

Divide the amount collected in an individual stage by the total amount collected to determine the percentage of the total collected in each stage.

Starting with stage 4 (backup filter) compute the cumulative percent less than the staged size range. The cumulative percent less than the stage 4 size is by definition zero. The cumulative percent less than stage 3 (the cyclone) is equal to the percent caught in stage 4. The cumulative percent less than stage 2 is the sum of the percent caught on stage 3 and the percent caught on stage 4. The cumulative percent less than stage 1 is the sum of the percents caught on stages 4, 3, and 2.

Particle densities should be considered as 1.0 gm/cm^3 and the particles should be considered as spherical so that the particle sized can be reported as equivalent aerodynamic diameters.

With gas flow rate at stack conditions and stack temperature, determine the d_{50} (50% Effective Cut Off Diameter) for each stage.

Pilot the results on log probability graph paper with the particle diameter (d_{50}) as the ordinate and the cumulative percent less than the stated size range by weight as the absicca.

Assuming a log-normal particle size distribution, the particle size geometric standard deviation σg is given by:

$$\sigma_g = \frac{84.13\% \text{ diameter}}{15.87\% \text{ diameter}} \quad \frac{1}{2}$$

Generally, the particle size information should be presented in graphical form rather than merely reporting the mass mean diameter and the standard geometric deviation.

A-2-3 - THEORY OF OPERATION

Impactors separate particles by differences in inertia. In classical flat plate cascade impactors, the collection efficiency of a given impaction stage can be characterized by:

$$\eta = f\ (STK,\ {}^{S}/D_j,\ Re_j)$$

where:

STK = Stokes Number = The ratio of the particle stopping distance to some characteristic dimension of the impactor. The characteristic dimension in impaction theory is the radius of the jet, R_j. Thus,

$$STK = \frac{2\rho_p\ r^2\ CV_o}{\mu 9\ R_j}$$

where:

ρ_p = Particle Density

r = Particle Radius

C = Slip Correction Factor

V_o = Gas Velocity

μ = Gas Viscosity

S/D_j = Aspect Ratio = Ratio of the distance from the jet exist to the impaction surface to the jet diameter. The Aspect Ratio is a second order parameter and for ratios of between 1 to 5 the change in collection efficiency is not significant.

Rej = Reynolds Number = A dimensionless parameter related to the turbulence in the fluid flow field.

$$Re_j = \frac{\rho_g\ V_o\ D_j}{\mu}$$

where:

ρ_g = Gas Density

V_o = Gas Velocity

D_j = Jet Diameter

μ = Gas Viscosity

The jet Reynolds number is also a second order parameter and for Reynolds numbers tween 500 and 3000 the change in collection efficiency is not significant.

The collection characteristics of a cascade impactor are normally given by:

$$D_{p50} = \left(\frac{9\ \mu\ STK_{50}\ D_j}{C\ \rho_p\ V_o} \right)^{\frac{1}{2}}$$

D_{p50} = 50% Effective Cut off Diameter of Particle, cm

μ = Gas Viscosity, poise for air, $\mu = 63 + 0.40\ T\ (°K) \times 10^{-6}$

STK_{50} = Dimensionless Stoken Number for 50% Efficiency

D_j = Jet Diameter, cm

ρ_p = Particle Density, g/cc
If ρp is assumed to be 1.0 g/cc, then the resultant D_{p50} is referred to as the Aerodynamic Diameter.

If the actual particle density is used in the above equation, the resultant D_{p50} is referred to as the Stokes Diameter.

V_o = Gas Velocity in Jet, cm/sec

C_o = Slip Correction Factor

$$= 1 + \frac{2\lambda}{D_p}\ (1.257)$$

APPENDIX E.3

FIELD DATA SHEETS

MIDWEST RESEARCH INSTITUTE

Particle Sizing - Andersen

RUN All Tests

MRI Project Number 4466-L37
Field Dates 8-11 to 8-16-80
Plant Columbia Nitrogen Corp.
Sampling Location All locations
Sampling Date

FIELD CREW

Crew Chief M. Hansen

Testing Engineer
1 G. Cobb
2
3

Engr. Technician
1
2
3

Lab Technician
1 K. Wilcox
2 T. Walker
3

Process Engineer
1
2

Other
1
2

MRI - Form PO (10/72)

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Columbia Nitrogen Corporation
DATE 8-12-80
SAMPLING TIME (24-hr CLOCK) N/A.
SAMPLING LOCATION All locations
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS GRAB) N/A
ANALYTICAL METHOD N/A
AMBIENT TEMPERATURE N/A
OPERATOR N/A

COMMENTS:

Assumed ambient air

RUN / GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2							0.0	44/100	0.0
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)							21.0	32/100	6.72
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)							0.0	28/100	0.0
N_2 (NET IS 100 MINUS ACTUAL CO READING)							79.0	28/100	22.12
								TOTAL	28.84

EPA (Dur) 230
4-72

MIDWEST RESEARCH INSTITUTE

Run Number All Runs

Date 8-11 thru 8-16-80

PRELIMINARY MOISTURE DETERMINATION

Recorded by GC.

Assisted by _____

NOTE: Same as Run No. _____

A. Condensor and/or Silica Gel Method

Barometric Pressure, P_B = _____ in. Hg

☐ Barometer Location _____

Reading Time _____ by _____

☐ Elevation _____

	Clock Time	Dry Gas Meter Reading(cf)	Flowmeter Setting	Dry Gas Meter Temp (°F)	Impinger Water Volume (ml)
Final					
Initial					
Difference		Vm =			Wc =

Tube No.	Weight (Grams)		
	Final	Initial	Difference
Total Moisture Adsorbed:			Wa =

Meter Pressure, $P_B \approx Pm$ = _____ in. Hg

Average Meter Temperature, Tm = _____ °F

Total Weight of Moisture Collected, Wc + Wa = Wm = _____ gm

$$\text{Moisture Content} = \frac{100}{1 + \left[375 \frac{Pm\,Vm}{(Tm+460)\,Wm}\right]} = \text{_____ \% by Volume}$$

B. Wet/Dry Bulb Method

Dry Bulb Temperature = _____ °F

Wet Bulb Temperature = _____ °F

Moisture Content (from Ref. Table) = _____ % by Volume

C. Predetermined Value

% Moisture 2% Basis Assumed

MIDWEST RESEARCH INSTITUTE

Particle Sizing - Andersen

RUN One

MRI Project Number 4468-L(37)
Field Dates 8-11 thru 8-16-80
Plant Columbia Nitrogen Corp.
Sampling Location Fluidized Bed Cooler (TP4)
Sampling Date 8-12-80 Prill cooler uncontrolled E phaust

FIELD CREW

Crew Chief K. Wilcox

Testing Engineer 1 G. Cobb
2 M. Hansen
3

Engr. Technician 1
2
3

Lab Technician 1 T. Walker
2
3

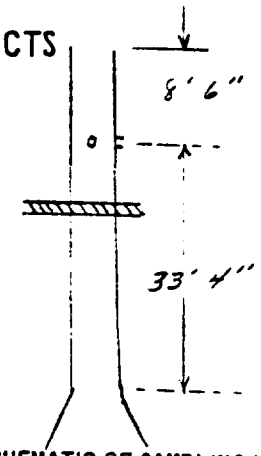
Process Engineer 1
2

Other 1
2

MRI - Form PO (10/72)

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT Columbia Nitrogen Corp
DATE 8-12-80
SAMPLING LOCATION Fluidized Bed Cooler TP4 Prill cooler conv. Exh
INSIDE OF FAR WALL TO
OUTSIDE OF NIPPLE. (DISTANCE A) N/A
INSIDE OF NEAR WALL TO
OUTSIDE OF NIPPLE. (DISTANCE B) N/A
STACK I.D.. (DISTANCE A - DISTANCE B) 48"
NEAREST UPSTREAM DISTURBANCE 8.33
NEAREST DOWNSTREAM DISTURBANCE 2.125
CALCULATOR G. Cobb

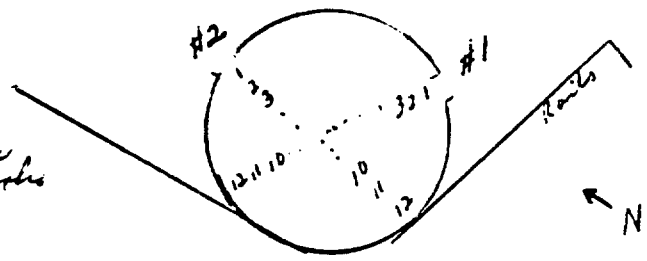


SCHEMATIC OF SAMPLING LOCATION

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1 8 INCH)	DISTANCE B	TRAVERSE POINT LOCATION FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
1	.021	48"	1"	N/A	1"
2	.067		3 1/4"		3 1/4"
3	.118		5 2/3"		5 2/3"
4	.177		8 1/2"		8 1/2"
5	.25		12"		12"
6	.356		17"		17"
7	.644		30 5/8"		30 5/8"
8	.75		36"		36"
9	.823		39 1/2"		39 1/2"
10	.882		42 1/3"		42 1/3"
11	.933		44 3/4"		44 3/4"
12	.979		47"		47"

PRELIMINARY VELOCITY TRAVERSE

PLANT Columbia Nitrogen Corperation
DATE 8-12-80
LOCATION Fluidized Bed Cooler TPH
STACK I.D. 48" Prill Cooler exhaust
BAROMETRIC PRESSURE, in. Hg 29.90
STACK GAUGE PRESSURE, in. H_2O .21
OPERATORS Hansen, Cobb



SCHEMATIC OF TRAVERSE POINT LAYOUT

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1-1	.23	117
2	.295	116
3	.31	117
4	.31	117
5	.31	117
6	.31	117
7	.31	117
8	.31	117
9	.30	117
10	.29	117
11	.26	117
12	.18	115
2-1	.27	115
2	.32	117
3	.31	118
4	.33	118
5	.32	118
6	.32	120
7	.31	119
8	.29	118
9	.29	118
10	.27	118
11	.22	118
12	.18	115
AVERAGE	.285	117.2

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
AVERAGE		

ANDERSEN SAMPLING CALCULATIONS

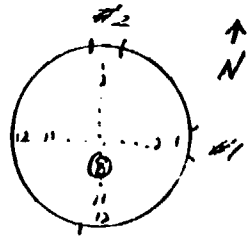
Plant Columbia Nitrogen Corp. Date 8-12-80
Sampling Location Fluidized Bed Cooler TP4 Initial GC
Test No. One Prill cooler Unc. Fdr.

Velocity head at sampling location, in. H_2O	ΔPs	.29
Stack temperature at sample point, °F	Ts	118
Barometric pressure, in. Hg	Pb	29.9
Static pressure in stack, in. Hg (Pb) $\pm$ (0.074 x gage pressure, in. H_2O)	Ps	29.88
Percent moisture in gas stream by volume	% H_2O	2
Mole fraction, dry gas $\frac{100 - \% H_2O}{100}$	Mf	.98
Molecular wt. dry stack gas, lb/lb-mole (% CO_2 x 0.44) + (% O_2 x 0.32) + (% N_2 + % CO x 0.28)	Md	28.84
Molecular wt. stack gas, lb/lb-mole (Md) (Mf) + 18(1 - Mf)	Ms	28.62
Stack velocity, fpm $5{,}128.8\ (Cp)\left(\sqrt{\Delta Ps}\right)\sqrt{\frac{Ts + 460}{Ps \times Ms}}$	Vs	1907
Calculated nozzle diameter, in. $24\sqrt{\frac{Fs/Vs}{\pi}}$, where Fs = 0.5 to 0.75 ft^3/min	D_{n_c}	.23 to .27
Actual nozzle diameter, in.	D_{n_a}	.25
Assumed meter temperature, °F	Tm	100
Isokinetic sample rate, stack conditions, ft^3/min $Vs\ (0.00694)\ (\pi)\left(\frac{Dn_a}{2}\right)^2$	Fs	.650
Calculated meter flow rate, ft^3/min $Fs\left(\frac{Tm+460}{Ts+460}\right)\left(\frac{Ps}{Pb}\right)(Mf)$	Fm	.617

FIELD DATA - ANDERSEN

PLANT Columbia Nitrogen Corp
DATE 8-12-80
P.C. unit 4th SAMPLING LOCATION Fluidized Bed Cooler 704
SAMPLE TYPE HCSS - Andersen
RUN NUMBER ON2
OPERATOR G Cobb + M Hanson
AMBIENT TEMPERATURE 90
BAROMETRIC PRESSURE 29.90
STATIC PRESSURE, (P_s) -.47
Filter Set N/A

Leak CK: Inital at 15" Hg, CFM 0.0
Final at 3" Hg, CFM 0.0



SCHEMATIC OF TRAVERSE POINT LAYOUT with Dimensions

Calculated ACFM (desired)	.617
Probe Tip Diameter	.25
CO_2	0
O_2	21
CO	0
N_2	79
% H_2O	2%

TRAVERSE POINT NUMBER	SAMPLING TIME, min / CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3		VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O		STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE		PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F
		Desired	Actual		DESIRED	ACTUAL		INLET ($T_{m\,in}$), °F	OUTLET ($T_{m\,out}$), °F			
N/2-8	0 14:15	868.76										
	5 14:20	871.85	871.87	.29	1.2	1.3	118	101	101	3	N/A	73
	10 14:25	874.93	874.98			1.3		109	102	3		61
	15 14:30	878.02	878.09			1.25		115	104	3		60
	20 14:35	881.10	881.22			1.25		124	106	3		62
	25 14:40	884.19	884.27			1.2		129	108	3		62
a	30 14:45	887.27	887.38			1.25		133	111	3		62
	35 ~~14:50~~	890.36	889.94			1.25		128	113	3		62
a	40 ~~14:55~~	893.44	893.31			1.3		131	115	3		60
	45 ~~15:~~	896.53	895.16			1.3		135	116	3		60
	50	899.61	898.40			1.3		130	117	3		62
	55	902.70	901.65			1.3		136	118	3		61
a	60	905.78	904.65			1.3		140	120	3		61
		Vm = 35.89			ΔH = 1.275			T_m = 118.42				

COMMENTS: a) Problem Thermal Overide Switch Pump Shutdown

EPA (Dur) 235
4 72

ISOKINETIC PERFORMANCE WORKSHEET

Plant Columbia Nitrogen Corp
Sampling Location Fluidized Bed Cooler TP4 P.C. Unc. Exh.
Test Number Dave

Date 8-12-80
Initial ee

Isokinetic equation:

$$\% I = \frac{1{,}039(Ts_{avg}+460)(Vm_{std})}{Vs(\theta)(Ps)(Mf)(Dn^2)}$$

Average stack temperature, °F	Ts_{avg}	118
Meter volume (std), $\frac{17.64(Vm)\left(Pb+\frac{\Delta H_{avg}}{13.6}\right)}{Tm+460}$ Vm = 35.89 ΔH = 1.275 Tm = 118.42	Vm_{std}	32.83
Mole fraction dry gas, $\frac{100-\% H_2O}{100}$	Mf	.98
Molecular wt. dry stack gas, lb/lb-mole $(\%CO_2 \times 0.44) + (\%O_2 \times 0.32) + (\%N_2 + \%CO \times 0.28)$	Md	28.84
Molecular wt. stack gas, lb/lb-mole $(Md)(Mf) + 18(1 - Mf)$	Ms	28.62
Static pressure in stack, absolute, in. Hg $(Pb) \pm (0.074 \times$ stack gage pressure, in $H_2O)$	Ps	29.88
Stack velocity, fpm $5{,}128.8\,(Cp)\left(\sqrt{\Delta Ps_{avg}}\right)\sqrt{\frac{Ts+460}{Ps \times Ms}}$	Vs	1907
Total sample time, minutes	θ	60
Nozzle diameter, inches	Dn	.25
$\frac{1{,}039\,(118 + 460)(32.83)}{(1907)(60)(29.88)(.98)(.25^2)}$	% I	94.15

PARTICULATE SAMPLE RECOVERY AND INTEGRITY

Plant Columbia Nitrogen Corp.
Sample Location Fluidized Bed Cooler TP4
Sample Box No. 1 P.C. inc. ext.
Sample Type NH_4NO_3

Run No. 1
Sample Date 8/12/80
Recovery Date 8/12/80
Cleanup Person DW

Filter No. NONE
Sample No.
Sample Material Description NH_4NO_3

MOISTURE AND/OR SAMPLE

Impinger Sequence	1	2	3	4	5
Impinger Type[a]	M	S	M	M	M
Impinger Solution	H_2O	H_2O	H_2SO_4	—	SiO_2
Final Volume (wt)[b]	110ml	100ml	100ml	—	765.0g
Initial Volume (wt)[b]	100ml	100ml	100ml	—	758.6g
Net Volume (wt)[b]	10ml	0	0	—	7g
Sample No.(s)	04	04	-	-	-

Combined impinger contents, Sample No. 04
Liquid Level Marked ✓ Container(s) Sealed ✓
Description of Impinger Solution CLEAR
Total Moisture, gm 17

SILICA GEL

Silica Gel
Color BLUE

[a] S = Greenburg-Smith standard, M = Modified, O = Other
[b] Indicate value in units, ml or gm

RECOVERED SAMPLE

Probe Rinse: Sample No. 04
Liquid Level Marked ✓
Sealed ✓

Impinger Rinse: Sample No. 04
Liquid Level Marked ✓
Sealed ✓

Water Blank: Sample No. 05
Liquid Level Marked ✓

Dry Catch: Sample No.
Description
Sealed

Acetone Blank: Sample No.
Liquid Level Marked
Sealed

Filter Blank: Sample No.
Sealed

Sample Disposition
Carrier HANSEN - CABB - Date Shipped: 8/16/80
Remarks:

Date of laboratory custody
Personnel accepting custody
Remarks: H_2SO_4 = 1N

Seal(s) broken by
Date broken

MIDWEST RESEARCH INSTITUTE

Particle Sizing- Andersen

RUN Two

MRI Project Number 4468-L(37)
Field Dates 8-11 thru 8-16-80
Plant Columbia Nitrogen Corporation
Sampling Location Fluidized Bed Cooler (TP4) prill cooler uncontrolled exhaust
Sampling Date 8-12-80

FIELD CREW

Crew Chief K. W. Icox

Testing Engineer
1 M. Hansen
2 B. Cobb
3

Engr. Technician
1
2
3

Lab Technician
1 T. Walker
2
3

Process Engineer
1
2

Other
1
2

ANDERSEN SAMPLING CALCULATIONS

Plant Columbia Nitrogen Corp
Sampling Location Fluidized Bed Cooler TP4, P.C. unc. eth.
Test No. TWD

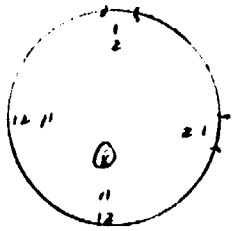
Date 8-12-80
Initial M.H

Velocity head at sampling location, in. H_2O	ΔPs	.29
Stack temperature at sample point, °F	Ts	118
Barometric pressure, in. Hg	Pb	29.76
Static pressure in stack, in. Hg (Pb) $\pm$ (0.074 x gage pressure, in. H_2O)	Ps	29.74
Percent moisture in gas stream by volume	% H_2O	2
Mole fraction, dry gas $\frac{100 - \% H_2O}{100}$	Mf	.98
Molecular wt. dry stack gas, lb/lb-mole (% CO_2 x 0.44) + (% O_2 x 0.32) + (% N_2 + % CO x 0.28)	Md	28.84
Molecular wt. stack gas, lb/lb-mole (Md) (Mf) + 18(1 - Mf)	Ms	28.62
Stack velocity, fpm $5{,}128.8\ (Cp)\left(\sqrt{\Delta Ps}\right)\sqrt{\frac{Ts + 460}{Ps \times Ms}}$	Vs	1912
Calculated nozzle diameter, in. $24\sqrt{\frac{Fs/Vs}{\pi}}$, where Fs = 0.5 to 0.75 ft^3/min	D_{n_c}	.22 to .27
Actual nozzle diameter, in.	D_{n_a}	.25
Assumed meter temperature, °F	Tm	~~115~~ MDH 120
Isokinetic sample rate, stack conditions, ft^3/min $Vs\ (0.00694)\ (\pi)\left(\frac{Dn_a}{2}\right)^2$	Fs	.651
Calculated meter flow rate, ft^3/min $Fs\left(\frac{Tm+460}{Ts+460}\right)\left(\frac{Ps}{Pb}\right)(Mf)$	Fm	.640

FIELD DATA - ANDERSEN

PLANT Columbia Nitrogen Corp
DATE 8-12-83
P.C. incr. eph SAMPLING LOCATION Final Dil. Duct Inlet TP4
SAMPLE TYPE MM5-Andersen
RUN NUMBER Type
OPERATOR E. Cobb
AMBIENT TEMPERATURE 105
BAROMETRIC PRESSURE 29.76
STATIC PRESSURE, (P_s) -.21
Filter Set N/A

Leak CK: Inital at 15" Hg, CFM 0.0
Final at 4 Hg, CFM 0.0



SCHEMATIC OF TRAVERSE POINT LAYOUT with Dimensions

Calculated ACFM (desired)	.641
Probe Tip Diameter	.25"
CO_2	0
O_2	21
CO	0
N_2	79
% H_2O	27.

TRAVERSE POINT NUMBER	SAMPLING TIME, min / CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3 906.86		VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O		STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE		PUMP VACUUM, in Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F
		Desired	Actual		DESIRED	ACTUAL		INLET ($T_{m\,in}$), °F	OUTLET ($T_{m\,out}$), °F			
1/2-8	0 17:40	905.15										
	5 17:45	910.01	909.97	.29	1.4	1.4	118	105	106	3	N/A	68
	10 17:50	913.21	913.28		1.4	1.4		109	106	4		—
	15 17:55	916.42	916.68			1.45		112	107	4		63
	20 18:00	919.62	919.95			1.4		113	108	4		65
	25 18:05	922.83	922.42			1.2		113	108	3		68
	30 1810	926.03	926.06			1.3		114	108	3		66
	35 1815	929.24	929.34			1.35		114	108	4		65
	40 1820	932.44	932.47			1.3		114	108	3		64
	45 1825	935.65	935.59			1.25		114	108	3		64
	50 1830	938.85	938.76			1.3		114	108	3		64
	55 1835	942.06	942.06			1.35		114	108	3.5		64
	60 1840	945.26	945.38			1.35		115	109	3.5		64
			V_m = 38.58		ΔH = 1.338			TM = 110.13				

COMMENTS:

ISOKINETIC PERFORMANCE WORKSHEET

Plant Columbia Nitrogen Corp.
Sampling Location Fluidized Bed Cooler TP4
Test Number TWO P.C. are eph.

Date 8-12-80
Initial [illegible]

Isokinetic equation:

$$\% I = \frac{1{,}039(Ts_{avg}+460)(Vm_{std})}{Vs(\theta)(Ps)(Mf)(Dn^2)}$$

Average stack temperature, °F	Ts_{avg}	118
Meter volume (std), $\frac{17.64(Vm)\left(Pb+\frac{\Delta H_{avg}}{13.6}\right)}{Tm+460}$	Vm_{std}	35.64
Mole fraction dry gas, $\frac{100-\%\ H_2O}{100}$	Mf	.98
Molecular wt. dry stack gas, lb/lb-mole $(\%CO_2 \times 0.44) + (\%O_2 \times 0.32) + (\%N_2 + \%CO \times 0.28)$	Md	28.84
Molecular wt. stack gas, lb/lb-mole $(Md)(Mf) + 18(1 - Mf)$	Ms	28.62
Static pressure in stack, absolute, in. Hg $(Pb) \pm (0.074 \times$ stack gage pressure, in $H_2O)$	Ps	29.74
Stack velocity, fpm $5{,}128.8\ (Cp)\left(\sqrt{\Delta Ps_{avg}}\right)\sqrt{\frac{Ts+460}{Ps \times Ms}}$	Vs	1912
Total sample time, minutes	θ	60
Nozzle diameter, inches	Dn	.25
$\frac{1{,}039\ (118 + 460)(35.64)}{(1912)(60)(29.74)(.98)(.25^2)}$	% I	102.4

PARTICULATE SAMPLE RECOVERY AND INTEGRITY

Plant COLUMBIA NITROGEN CORP
Sample Location HUIDIZED BED COOLER TP4
Sample Box No. 1 P.C. unc. eph.
Sample Type NH_4NO_3

Run No. 2
Sample Date 2/12/80
Recovery Date
Cleanup Person [illegible]

Filter No.
Sample No.
Sample Material Description

MOISTURE AND/OR SAMPLE

Impinger Sequence	1	2	3	4	5
Impinger Type a/	M	S	M	M	M
Impinger Solution	H_2O	H_2O	H_2SO_4	—	SiO_2
Final Volume (wt) b/	100 ml	100 ml	101 ml		771.5 g
Initial Volume (wt) b/	100 ml	100 ml	100 ml	—	765.0 g
Net Volume (wt) b/	6 ml	0	1 ml	—	6.5 g
Sample No.(s)	09	09			

Combined impinger contents, Sample No.
Liquid Level Marked ✓ Container(s) Sealed ✓
Description of Impinger Solution CLEAR
Total Moisture, gm 13.5

SILICA GEL

Silica Gel
Color

a/ S = Greenburg-Smith standard, M = Modified, O = Other
b/ Indicate value in units, ml or gm

RECOVERED SAMPLE

Probe Rinse: Sample No. 09
Liquid Level Marked ✓
Sealed ✓

Impinger Rinse: Sample No. 09
Liquid Level Marked ✓
Sealed ✓

Water Blank: Sample No.
Liquid Level Marked

Dry Catch: Sample No.
Description
Sealed

Acetone Blank: Sample No.
Liquid Level Marked
Sealed

Filter Blank: Sample No.
Sealed

Sample Disposition
Carrier HANSEN-COBB Date Shipped: 8/16/80
Remarks:

Date of laboratory custody
Personnel accepting custody
Remarks:

Seal(s) broken by
Date broken

MIDWEST RESEARCH INSTITUTE

Particle Sizing — Andersen

RUN Three

MRI Project Number 4468-L(37)
Field Dates 8-11- thru 8-16-80
Plant Columbia Nitrogen Corporation
Sampling Location Fluidized Bed Cooler (TP4) Drill cooler uncontrolled exhaust
Sampling Date 8-13-80

FIELD CREW

Crew Chief		K. Wilcox
Testing Engineer	1	G. Cobb
	2	M. Hansen
	3	
Engr. Technician	1	
	2	
	3	
Lab Technician	1	T. Walker
	2	
	3	
Process Engineer	1	
	2	
Other	1	
	2	

ANDERSEN SAMPLING CALCULATIONS

Plant Columbia Nitrogen Corp
Sampling Location Fluidized Bed Cooler TP4 P.C. unc. exh.
Test No. Three

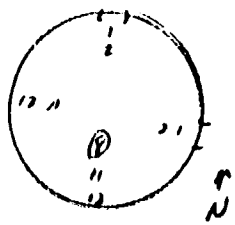
Date 8-13-80
Initial M.H.

Velocity head at sampling location, in. H_2O	ΔPs	.29
Stack temperature at sample point, °F	Ts	118
Barometric pressure, in. Hg	Pb	29.87
Static pressure in stack, in. Hg (Pb) $\pm$ (0.074 x gage pressure, in. H_2O)	Ps	29.85
Percent moisture in gas stream by volume	% H_2O	2
Mole fraction, dry gas $\frac{100 - \% H_2O}{100}$	Mf	.98
Molecular wt. dry stack gas, lb/lb-mole (% CO_2 x 0.44) + (% O_2 x 0.32) + (% N_2 + % CO x 0.28)	Md	28.84
Molecular wt. stack gas, lb/lb-mole (Md) (Mf) + 18(1 - Mf)	Ms	28.62
Stack velocity, fpm $5{,}128.8\ (Cp)\left(\sqrt{\Delta Ps}\right)\sqrt{\frac{Ts + 460}{Ps \times Ms}}$	Vs	1908
Calculated nozzle diameter, in. $24\sqrt{\frac{Fs/Vs}{\pi}}$, where Fs = 0.5 to 0.75 ft^3/min	D_{n_c}	.23 to .27
Actual nozzle diameter, in.	D_{n_a}	.25
Assumed meter temperature, °F	Tm	110
Isokinetic sample rate, stack conditions, ft^3/min $Vs\ (0.00694)\ (\pi)\left(\frac{Dn_a}{2}\right)^2$	Fs	.650
Calculated meter flow rate, ft^3/min $Fs\left(\frac{Tm+460}{Ts+460}\right)\left(\frac{Ps}{Pb}\right)(Mf)$	Fm	.628

FIELD DATA - ANDERSEN

PLANT Colyn Limestone Corp
DATE 9/13/80
SAMPLING LOCATION Kiln Stack
SAMPLE TYPE Mass - Andersen
RUN NUMBER Three
OPERATOR Hansen, Cobb
AMBIENT TEMPERATURE ~~90-97~~ 84°F
BAROMETRIC PRESSURE 29.87
STATIC PRESSURE, (P_s) -.21
Filter Set NA

Leak CK: Inital at 15" Hg, CFM 0.015
Final at 3" Hg, CFM 0.019



SCHEMATIC OF TRAVERSE POINT LAYOUT with Dimensions

Calculated ACFM (desired) .628
Probe Tip Diameter .25
CO_2 0
O_2 21
CO 0
N_2 79
% H_2O 2%

TRAVERSE POINT NUMBER	SAMPLING TIME, min / CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3 952.54 Desired	Actual	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\,in}$), °F	OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F
N/2-8	0 / 0850											
	5 / 0855	955.68	955.69	.29	1.3	1.3	118	89	89	3	N/A	—
	10 / 0900	958.82	958.78			1.3		91	89	3		73
	15 / 0905	961.96	962.00			1.3		93	89	3		75
	20 / 0910	965.10	965.09			1.3		94	90	3		70
	25 / 0915	968.24	968.20			1.3		95	90	2.5		67
	30 / 0920	971.38	971.34			1.35		95	92	3		66
	35 / 0925	974.52	974.52			1.35		95	92	3		65
	40 / 0930	977.66	977.71			1.35		96	92	2.5		64
	45 / 0935	980.80	980.89			1.35		96	92	2.5		64
	50 / 0940	983.94	984.06			1.35		96	92	2.5		65
	55 / 0945	987.08	987.16			1.3		96	92	2.5		65
	60 / 0950	990.22	990.23			1.3		96	92	2.5		65
		V_m = 37.69			ΔH = 1.324			T_m = 92.630 °C				

COMMENTS

ISOKINETIC PERFORMANCE WORKSHEET

Plant Columbia Wilsonville Corp Date 8-13-80
Sampling Location Fluidized Bed Cooler TPH Initial B.C.
Test Number Three P.C. unc. exh.

Isokinetic equation:

$$\% I = \frac{1{,}039(Ts_{avg}+460)(Vm_{std})}{Vs(\theta)(Ps)(Mf)(Dn^2)}$$

Average stack temperature, °F	Ts_{avg}	118
Meter volume (std), $\frac{17.64(Vm)\left(Pb+\frac{\Delta H_{avg}}{13.6}\right)}{Tm+460}$ ΔH = 1.321, Pb = 29.87, TM = 92.63 °C, Vm = 37.69	Vm_{std}	36.05
Mole fraction dry gas, $\frac{100-\% H_2O}{100}$	Mf	.98
Molecular wt. dry stack gas, lb/lb-mole $(\%CO_2 \times 0.44) + (\%O_2 \times 0.32) + (\%N_2 + \%CO \times 0.28)$	Md	28.84
Molecular wt. stack gas, lb/lb-mole (Md) (Mf) + 18(1 - Mf)	Ms	28.62
Static pressure in stack, absolute, in. Hg (Pb) ± (0.074 x stack gage pressure, in H_2O)	Ps	29.85
Stack velocity, fpm $5{,}128.8\ (Cp)\left(\sqrt{\Delta Ps_{avg}}\right)\sqrt{\frac{Ts+460}{Ps \times Ms}}$ ΔP = .29, Cp = .84	Vs	1908
Total sample time, minutes	θ	60
Nozzle diameter, inches	Dn	.25
$\frac{1{,}039\ (118 + 460)(36.05)}{(1908)(60)(29.85)(.98)(.25^2)}$	% I	103.4

PARTICULATE SAMPLE RECOVERY AND INTEGRITY

Plant COLUMBIA NITROGEN CORP
Sample Location FLUIDIZED BED COOLER TP4
Sample Box No. 2
Sample Type NH_4NO_3

Run No. #3
Sample Date 8/13
Recovery Date 8/13
Cleanup Person JLJ

Filter No. ____
Sample No. ____
Sample Material Description ____

MOISTURE AND/OR SAMPLE

Impinger Sequence	1	2	3	4	5
Impinger Type[a]	M	S	M	M	M
Impinger Solution	H_2O	H_2O	H_2SO_4	—	SiO_2
Final Volume (wt)[b]	108ml	101ml	100ml	—	728g
Initial Volume (wt)[b]	100ml	100ml	100ml	—	719.1g
Net Volume (wt)[b]	8ml	1ml	—	—	9.0g
Sample No.(s)	14	14	—	—	—

Combined impinger contents, Sample No. ____
Liquid Level Marked ✓ Container(s) Sealed ✓
Description of Impinger Solution CLEAR
Total Moisture, gm 18.0

SILICA GEL

Silica Gel
Color 1/3 CLEAR to LIGHT BLUE

a/ S = Greenburg-Smith standard, M = Modified, O = Other ____
b/ Indicate value in units, ml or gm

RECOVERED SAMPLE

Probe Rinse: Sample No. 14; Liquid Level Marked ✓; Sealed ✓
Impinger Rinse: Sample No. 14; Liquid Level Marked ____; Sealed ✓
Water Blank: Sample No. ✓; Liquid Level Marked ____

Dry Catch: Sample No. ____; Description ____; Sealed ____
Acetone Blank: Sample No. ____; Liquid Level Marked ____; Sealed ____
Filter Blank: Sample No. ____; Sealed ____

Sample Disposition ____
Carrier HANSEN-COBB; Date Shipped: 8/16/80
Remarks: ____

Date of laboratory custody ____; Seal(s) broken by ____
Personnel accepting custody ____; Date broken ____
Remarks: H_2SO_4 = 1N

MIDWEST RESEARCH INSTITUTE

Particle Sizing - Andersen

RUN ~~Four~~ One

MRI Project Number 4416-237
Field Dates 8-11 thru 8-16-80
Plant Columbia Nitrogen Corp.
Sampling Location Fluidized Bed Cooler (TP3) - mill cooler downstream inlet
Sampling Date 8-13-80

FIELD CREW

Crew Chief K Wilcox

Testing Engineer
1 M. Hanson
2 C. Cobb
3

Engr. Technician
1
2
3

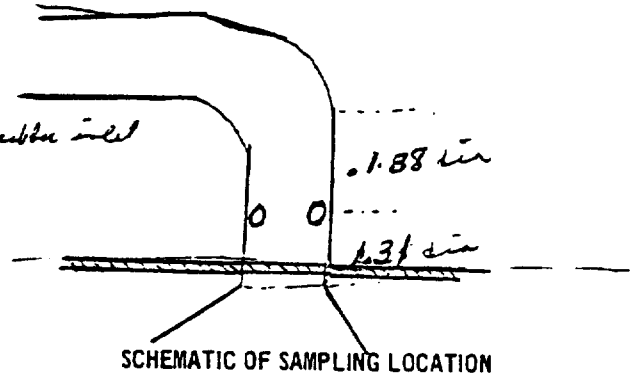
Lab Technician
1 T. Walker
2
3

Process Engineer
1
2

Other
1
2

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT Columbia Nitrogen Corporation
DATE 8-13-80
SAMPLING LOCATION Fluidized Bed Cooler (FP3)
INSIDE OF FAR WALL TO OUTSIDE OF NIPPLE, (DISTANCE A) 48" Prill cooler scrubber inlet
INSIDE OF NEAR WALL TO OUTSIDE OF NIPPLE, (DISTANCE B) N/A
STACK I.D., (DISTANCE A - DISTANCE B) N/A
NEAREST UPSTREAM DISTURBANCE ~~2.25~~ 1.31
NEAREST DOWNSTREAM DISTURBANCE ~~1.31~~ 1.88 dc
CALCULATOR AO

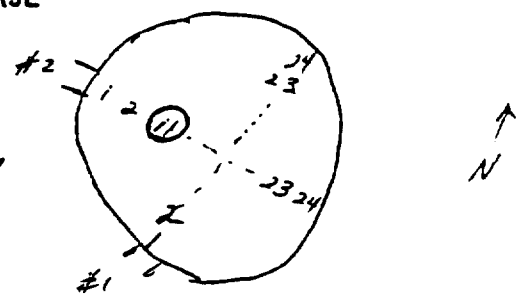


SCHEMATIC OF SAMPLING LOCATION

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1 8 INCH)	DISTANCE B	TRAVERSE POINT LOCATION FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
24	98.9	48	47 1/2	N/A	47 1/2
23	96.8		46 1/2		46 1/2
22	94.5		45 3/8		45 3/8
21	92.1		44 1/4		44 1/4
20	89.5		43		43
19	86.8		41 5/8		41 5/8
18	83.9		40 1/8		40 1/8
17	80.6		38 5/8		38 5/8
16	77		37		37
15	72.6		34 7/8		34 7/8
14	67.7		32 1/2		32 1/2
13	60.2		28 7/8		28 7/8
12	39.8		19 1/8		19 1/8
11	32.3		15 1/2		15 1/2
10	27.2		13 1/8		13 1/8
9	23		11		11
8	19.4		9 3/8		9 3/8
7	16.1		7 3/4		7 3/4
6	13.2		6 3/8		6 3/8
5	10.5		5		5
4	7.9		3 7/8		3 7/8
3	5.5		2 5/8		2 5/8
2	3.2		1 5/8		1 5/8
1	1.1		1/2		1/2

PRELIMINARY VELOCITY TRAVERSE

PLANT Columbia Nitrogen Corp.
DATE 8-13-80
LOCATION Fluidized Bed Cooler (TP3)
STACK I.D. 48" pull cooler scrubber inlet
BAROMETRIC PRESSURE, in. Hg 29.84
STACK GAUGE PRESSURE, in. H_2O .44
OPERATORS Hansen, Cobb



SCHEMATIC OF TRAVERSE POINT LAYOUT

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1-24	1.5	128
23	1.5	129
22	1.45	129
21	1.45	132
20	1.4	133
19	1.4	136
18	1.15	134
17	1.1	134
16	1.05	137
15	.98	137
14	.85	137
13	.83	139
12	.82	139
11	.83	138
10	.80	138
9	.80	137
8	.78	137
7	.77	136
6	.78	134
5	.77	135
4	.79	133
3	.85	133
2	1.45	133
1	1.45	130
AVERAGE		
	25.55	3228

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
2-24	.76	135
23	.87	140
22	.87	142
21	.85	142
20	.83	140
19	.83	140
18	.84	140
17	.86	140
16	.89	140
15	.89	140
14	.95	138
13	.97	138
12	.96	133
11	1.05	130
10	1.05	128
9	1.05	126
8	1.1	126
7	1.15	126
6	1.1	126
5	1.1	126
4	1.75	123
3	1.05	124
2	.87	123
1	.87	123
AVERAGE	1.022	134
	49.06	6420

EPA (Dur) 233
4 72

ANDERSEN SAMPLING CALCULATIONS

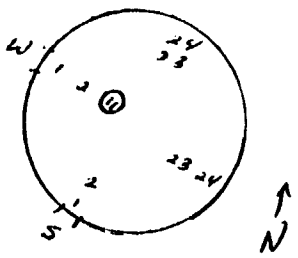
Plant Columbia Nitrogen Corp Date 8-13-80
Sampling Location Fluidized Bed Cooler TP3 1 mil cooler scrubber inlet Initial G.C. & M.H.
Test No. ~~Two~~ ONE

Velocity head at sampling location, in. H_2O	ΔPs	1.05
Stack temperature at sample point, °F	Ts	130
Barometric pressure, in. Hg	Pb	29.87
Static pressure in stack, in. Hg (Pb) $\pm$ (0.074 x gage pressure, in. H_2O)	Ps	29.90
Percent moisture in gas stream by volume	% H_2O	2
Mole fraction, dry gas $\frac{100 - \% H_2O}{100}$	Mf	.98
Molecular wt. dry stack gas, lb/lb-mole (% CO_2 x 0.44) + (% O_2 x 0.32) + (% N_2 + % CO x 0.28)	Md	28.84
Molecular wt. stack gas, lb/lb-mole (Md) (Mf) + 18(1 - Mf)	Ms	28.62
Stack velocity, fpm $5{,}128.8\ (Cp)\left(\sqrt{\Delta Ps}\right)\sqrt{\frac{Ts + 460}{Ps \times Ms}}$	Vs	~~3665.6~~ 3666
Calculated nozzle diameter, in. $24\sqrt{\frac{Fs/Vs}{\pi}}$, where Fs = 0.5 to 0.75 ft^3/min	D_{n_c}	.158 .193
Actual nozzle diameter, in.	D_{n_a}	.187
Assumed meter temperature, °F	Tm	105
Isokinetic sample rate, stack conditions, ft^3/min $Vs\ (0.00694)\ (\pi)\left(\frac{Dn_a}{2}\right)^2$	Fs	.699
Calculated meter flow rate, ft^3/min $Fs\left(\frac{Tm+460}{Ts+460}\right)\left(\frac{Ps}{Pb}\right)(Mf)$	Fm	.657

FIELD DATA - ANDERSEN

PLANT Columbia Nitrogen Corp
DATE 8-13-80
SAMPLING LOCATION Fluidized Bed Cooler TP3
PC scrubber inlet
SAMPLE TYPE HCSS - Andersen
RUN NUMBER ~~[illegible]~~ One
OPERATOR Hansen, Cobb
AMBIENT TEMPERATURE 94
BAROMETRIC PRESSURE 29.87
STATIC PRESSURE, (P_s) .44
Filter Set NA

Leak CK: Inital at 15" Hg, CFM 0.0
Final at 3" Hg, CFM 0.0



SCHEMATIC OF TRAVERSE POINT LAYOUT with Dimensions

Calculated ACFM (desired)	.657
Probe Tip Diameter	.187
CO_2	0
O_2	21
CO	0
N_2	79
% H_2O	2%

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3 992.90 Desired	Actual	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\,in}$), °F	OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F
	0	1350											
W/2-11	5	1355	996.19	996.10	1.05	1.5	1.5	130	96	96	3	N/A	74
	10	1400	999.48	999.46			1.50		100	98	3		63
	15	1405	1,002.76	1002.81			1.5		102	98	3		64
	20	1410	1,006.05	1006.09			1.45		103	99	3		64
	25	1415	1,009.33	1009.37			1.45		103	99	3		65
	30	1420	1,012.62	1012.65			1.45		103	99	3		65
	35	1425	1,015.90	1015.93			1.45		104	100	3		65
	40	1430	1,019.19	1019.20			1.45		104	100	3		66
	45	1435	1,022.47	1022.49			1.45		104	100	3		66
	50	1440	1,025.76	1025.77			1.4		104	100	3		66
	55	1445	1,029.04	1029.02			1.4		104	100	3		67
	60	1450	1,032.33	1032.28			1.4		105	101	3		67
			V_m =	39.38		ΔH =	1.45		T_m =	100.92			

COMMENTS:

EPA (Dur) 235
4 72

ISOKINETIC PERFORMANCE WORKSHEET

Plant Columbia Nitrogen Corp. Date 8-13-90
Sampling Location Fluidized Bed Cooler TP3 Initial AC
Test Number ~~Test One~~ pull under scrubber inlet

Isokinetic equation:

$$\% I = \frac{1{,}039(Ts_{avg}+460)(Vm_{std})}{Vs(\theta)(Ps)(Mf)(Dn^2)}$$

Average stack temperature, °F	Ts_{avg}	130
Meter volume (std), $\frac{17.64(Vm)\left(Pb+\frac{\Delta H_{avg}}{13.6}\right)}{Tm+460}$ $\Delta H = 1.45$ $Pb = 29.87$ $Tm = 100.92$ $Vm = 39.38$	Vm_{std}	37.12
Mole fraction dry gas, $\frac{100-\% H_2O}{100}$	Mf	.98
Molecular wt. dry stack gas, lb/lb-mole $(\%CO_2 \times 0.44) + (\%O_2 \times 0.32) + (\%N_2 + \%CO \times 0.28)$	Md	28.84
Molecular wt. stack gas, lb/lb-mole $(Md)(Mf) + 18(1 - Mf)$	Ms	28.62
Static pressure in stack, absolute, in. Hg $(Pb) \pm (0.074 \times$ stack gage pressure, in $H_2O)$	Ps	29.90
Stack velocity, fpm $5{,}128.8\ (Cp)\left(\sqrt{\Delta Ps_{avg}}\right)\sqrt{\frac{Ts+460}{Ps \times Ms}}$ $\Delta P = 1.05$ $C_p = .84$	Vs	3666
Total sample time, minutes	θ	60
Nozzle diameter, inches	Dn	.187
$\frac{1{,}039\ (130 + 460)(37.12)}{(3666)(60)(29.9)(.98)(.1872)}$	% I	101

PARTICULATE SAMPLE RECOVERY AND INTEGRITY

Plant COLUMBIA NITROGEN CORP
Sample Location FLUIDIZED BED COOLER TP3
Sample Box No. 3 Prill cooler scrubber inlet
Sample Type NH_4NO_3

Run No. 4
Sample Date 8/13/80
Recovery Date 8/13/80
Cleanup Person [illegible]

Filter No.
Sample No.
Sample Material Description

MOISTURE AND/OR SAMPLE

Impinger Sequence	1	2	3	4	5
Impinger Type a/	M	S	M	M	M
Impinger Solution	H_2O	H_2O	H_2SO_4	—	SiO_2
Final Volume (wt) b/	107 ml	101 ml	100 ml		884.2
Initial Volume (wt) b/	100 ml	100 ml	100 ml	--	676 g
Net Volume (wt) b/					
Sample No.(s)	18	18			

Combined impinger contents, Sample No.
Liquid Level Marked ✓ Container(s) Sealed ✓
Description of Impinger Solution CLEAR
Total Moisture, gm

SILICA GEL

Silica Gel
Color LIGHT TO MEDIUM DARK BLUE

a/ S = Greenburg-Smith standard, M = Modified, O = Other
b/ Indicate value in units, ml or gm

RECOVERED SAMPLE

Probe Rinse: Sample No. 18
Liquid Level Marked ✓
Sealed ✓

Impinger Rinse: Sample No. 18
Liquid Level Marked ✓
Sealed ✓

Water Blank: Sample No.
Liquid Level Marked

Dry Catch: Sample No.
Description
Sealed

Acetone Blank: Sample No.
Liquid Level Marked
Sealed

Filter Blank: Sample No.
Sealed

Sample Disposition
Carrier HANSEN-COBB Date Shipped: 8/16/80
Remarks:

Date of laboratory custody
Personnel accepting custody
Remarks: H_2SO_4 1S 1N

Seal(s) broken by
Date broken

MIDWEST RESEARCH INSTITUTE

Particle Sizing - Andersen

RUN ~~One~~ 2

MRI Project Number 4468-L37
Field Dates 8-11 to 8-16-80
Plant Columbia Nitrogen Corp
Sampling Location Fluidized Bed Cooler (FP3) prior cooler scrubber inlet
Sampling Date 8-13-80

FIELD CREW

Crew Chief K Wilcox

Testing Engineer 1 R Cobb
2 M Hanson
3

Engr. Technician 1
2
3

Lab Technician 1 T Walker
2
3

Process Engineer 1
2

Other 1
2

ANDERSEN SAMPLING CALCULATIONS

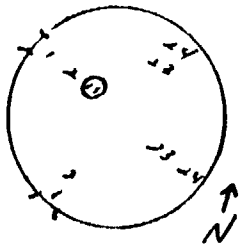
Plant Columbia Nitrogen Corp. Date 8-13-80
Sampling Location Fluidized Bed Cooler (TP3) Initial MDH
Test No. 2 pull cooler suction line

Velocity head at sampling location, in. H_2O	ΔPs	1.05
Stack temperature at sample point, °F	Ts	130
Barometric pressure, in. Hg	Pb	~~29.92~~ MDH 29.87
Static pressure in stack, in. Hg (Pb) ± (0.074 x gage pressure, in. H_2O)	Ps	29.90
Percent moisture in gas stream by volume	% H_2O	2
Mole fraction, dry gas $\frac{100 - \% H_2O}{100}$	Mf	.98
Molecular wt. dry stack gas, lb/lb-mole (% CO_2 x 0.44) + (% O_2 x 0.32) + (% N_2 + % CO x 0.28)	Md	28.84
Molecular wt. stack gas, lb/lb-mole (Md) (Mf) + 18(1 - Mf)	Ms	28.62
Stack velocity, fpm $5{,}128.8\ (Cp)\left(\sqrt{\Delta Ps}\right)\sqrt{\frac{Ts + 460}{Ps \times Ms}}$	Vs	3666
Calculated nozzle diameter, in. $24\sqrt{\frac{Fs/Vs}{\pi}}$, where Fs = 0.5 to 0.75 ft^3/min	D_{n_c}	.158 .193
Actual nozzle diameter, in.	D_{n_a}	.187
Assumed meter temperature, °F	Tm	105
Isokinetic sample rate, stack conditions, ft^3/min $Vs\ (0.00694)\ (\pi)\left(\frac{Dn_a}{2}\right)^2$	Fs	.699
Calculated meter flow rate, ft^3/min $Fs\left(\frac{Tm+460}{Ts+460}\right)\left(\frac{Ps}{Pb}\right)$ (Mf)	Fm	.657

FIELD DATA - ANDERSEN

PLANT Columbia W. Virginia Corp.
DATE 8-13-80
A.C. Scrubber SAMPLING LOCATION Elmsford Bell Creek, WV
SAMPLE TYPE Hess - Anderson
RUN NUMBER ~~One~~ 2
OPERATOR C. Cobb
AMBIENT TEMPERATURE 100
BAROMETRIC PRESSURE 29.92 29.87 MOH
STATIC PRESSURE, (P_s) ~~-22~~ -44 MOH
Filter Set N/A

Leak CK: Inital at 15" Hg, CFM .101
Final at 5" Hg, CFM .1005



SCHEMATIC OF TRAVERSE POINT LAYOUT with Dimensions

Calculated ACFM (desired)	.657
Probe Tip Diameter	.187
CO_2	0
O_2	21
CO	0
N_2	79
% H_2O	2%

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3 32.90 Desired	GAS METER READING (V_m), ft^3 32.90 Actual	VELOCITY HEAD (ΔP_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\,in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F
	0	1615											
2-11	5	1620	36.19	—	1.05	1.45	1.45	130	100	100	4	N/A	66
	10	1625	39.47	39.75			1.4		104	101	4		66
	15	1630	42.76	42.73			1.15		104	101	3		70
	20	1635	46.04	46.00			1.4		105	101	4		70
	25	1640	49.33	49.12			1.45		106	102	4		70
	30	1645	52.61	52.53			1.5		107	102	4		72
	35	1650	55.90	55.79			1.45		107	102	4		73
	40	1655	59.18	59.15			1.45		108	102	5		66
	45	1700	62.47	62.36			1.5		108	103	5		66
	50	1705	65.75	65.75			1.5		108	102	5		65
	55	1710	69.04	69.13			1.5		108	103	5		65
	60	1715	72.32	72.45			1.45		108	103	5		65
			V_m =	39.55		ΔH =	1.43		T_m =	103.96			

COMMENTS:

ISOKINETIC PERFORMANCE WORKSHEET

Plant Columbia Nitrogen Corp Date 8-13-80
Sampling Location Fluidized Bed Cooler TP3 - Initial G.C. + M.H.
Test Number ~~[illegible]~~ 2 pull cooler scrubber outlet

Isokinetic equation:

$$\% I = \frac{1{,}039(Ts_{avg}+460)(Vm_{std})}{Vs(\theta)(Ps)(Mf)(Dn^2)}$$

Average stack temperature, °F	Ts_{avg}	130	
Meter volume (std), $\frac{17.64(Vm)\left(Pb+\frac{\Delta H_{avg}}{13.6}\right)}{Tm+460}$	Vm_{std}	~~39.38~~	MDH 37.08
Mole fraction dry gas, $\frac{100-\% H_2O}{100}$	Mf	.98	
Molecular wt. dry stack gas, lb/lb-mole $(\%CO_2 \times 0.44) + (\%O_2 \times 0.32) + (\%N_2 + \%CO \times 0.28)$	Md	28.84	
Molecular wt. stack gas, lb/lb-mole $(Md)(Mf) + 18(1 - Mf)$	Ms	28.62	
Static pressure in stack, absolute, in. Hg $(Pb) \pm (0.074 \times$ stack gage pressure, in $H_2O)$	Ps	29.90	
Stack velocity, fpm $5{,}128.8\ (Cp)\left(\sqrt{\Delta Ps_{avg}}\right)\sqrt{\frac{Ts+460}{Ps \times Ms}}$ $\Delta P = 1.05$, $cp = .84$	Vs	3666	
Total sample time, minutes	θ	60	
Nozzle diameter, inches	Dn	.187	
$\frac{1{,}039\ (130 + 460)(\cancel{39.38}\ 37.08)}{(3666)(60)(29.9)(.98)(.187^2)}$	% I	~~107.1~~	100.85

PARTICULATE SAMPLE RECOVERY AND INTEGRITY

Plant COLUMBIA NITROGEN CORP
Sample Location FLUIDIZED BED COOLER TP3 post cooler scrubber inlet
Sample Box No. 4
Sample Type NH4NO3

Run No. #5
Sample Date 8/13/80
Recovery Date 8/14/80
Cleanup Person DLD

Filter No.
Sample No.
Sample Material Description

MOISTURE AND/OR SAMPLE

Impinger Sequence	1	2	3	4	5
Impinger Type a/	M	S	M	M	M
Impinger Solution	H2O	H2O	H2SO4	—	SiO2
Final Volume (wt) b/	105ml	101ml	97ml	—	647.1g
Initial Volume (wt) b/	100ml	100ml	100ml	—	624.1g
Net Volume (wt) b/					
Sample No.(s)	23	23			

Combined impinger contents, Sample No.
Liquid Level Marked ✓ Container(s) Sealed ✓
Description of Impinger Solution CLEAR
Total Moisture, gm

SILICA GEL

Silica Gel
Color 1/3 LIGHT BLUE + CLEAR

a/ S = Greenburg-Smith standard, M = Modified, O = Other
b/ Indicate value in units, ml or gm

RECOVERED SAMPLE

Probe Rinse: Sample No. 23 ✓
Liquid Level Marked ✓
Sealed ✓

Impinger Rinse: Sample No. 23 ✓
Liquid Level Marked ✓
Sealed ✓

Water Blank: Sample No.
Liquid Level Marked

Dry Catch: Sample No.
Description
Sealed

Acetone Blank: Sample No.
Liquid Level Marked
Sealed

Filter Blank: Sample No.
Sealed

Sample Disposition
Carrier HANSON - COBB Date Shipped: 8/16/80
Remarks:

Date of laboratory custody
Personnel accepting custody
Remarks: H2SO4 IS 1N

Seal(s) broken by
Date broken

MIDWEST RESEARCH INSTITUTE

Particle Sizing – Andersen

RUN three

MRI Project Number 4468-L37
Field Dates 8-11 to 8-16-80
Plant Columbia Nitrogen Corp
Sampling Location Fluidized Bed Cooler (TPS) pull cooler scrubber inlet
Sampling Date 8-13-80

FIELD CREW

Crew Chief K. Wilcox

Testing Engineer
1 A. Cobb
2 M. Hansen
3

Engr. Technician
1
2
3

Lab Technician
1 T. Walker
2
3

Process Engineer
1
2

Other
1
2

ANDERSEN SAMPLING CALCULATIONS

Plant Columbia Nitrogen Corp Date 8-13-80
Sampling Location Fluidized Bed Cooler TP3 Initial [illegible]
Test No. three prill cooler sampling inlet

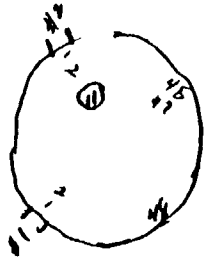
Velocity head at sampling location, in. H_2O	ΔPs	1.05
Stack temperature at sample point, °F	Ts	130
Barometric pressure, in. Hg	Pb	29.87
Static pressure in stack, in. Hg (Pb) $\pm$ (0.074 x gage pressure, in. H_2O)	Ps	29.9
Percent moisture in gas stream by volume	% H_2O	2
Mole fraction, dry gas $\frac{100 - \% H_2O}{100}$	Mf	.98
Molecular wt. dry stack gas, lb/lb-mole (% CO_2 x 0.44) + (% O_2 x 0.32) + (% N_2 + % CO x 0.28)	Md	28.84
Molecular wt. stack gas, lb/lb-mole (Md) (Mf) + 18(1 - Mf)	Ms	28.62
Stack velocity, fpm $5{,}128.8\ (Cp)\left(\sqrt{\Delta Ps}\right)\sqrt{\frac{Ts + 460}{Ps \times Ms}}$	Vs	3666
Calculated nozzle diameter, in. $24\sqrt{\frac{Fs/Vs}{\pi}}$, where Fs = 0.5 to 0.75 ft^3/min	D_{n_c}	.158 to .193
Actual nozzle diameter, in.	D_{n_a}	.187
Assumed meter temperature, °F	Tm	105
Isokinetic sample rate, stack conditions, ft^3/min $Vs\ (0.00694)\ (\pi)\left(\frac{Dn_a}{2}\right)^2$	Fs	.699
Calculated meter flow rate, ft^3/min $Fs\left(\frac{Tm+460}{Ts+460}\right)\left(\frac{Ps}{Pb}\right)(Mf)$	Fm	.657

FIELD DATA - ANDERSEN

PC Schmidt

PLANT Columbia Nitrogen Corp
DATE
SAMPLING LOCATION Fluidized Bed Cooler #3
SAMPLE TYPE MM5 - Andersen
RUN NUMBER Three
OPERATOR G Cobb
AMBIENT TEMPERATURE 100
BAROMETRIC PRESSURE 29.87
STATIC PRESSURE, (P_s) .44
Filter Set N/A

Leak CK: Inital at 15" Hg, CFM 0.0
Final at ___ Hg, CFM 0.0



SCHEMATIC OF TRAVERSE POINT LAYOUT with Dimensions

N

Calculated ACFM (desired)	.657
Probe Tip Diameter	.187
CO_2	0
O_2	21
CO	0
N_2	79
% H_2O	2%

TRAVERSE POINT NUMBER	SAMPLING TIME, min / CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3		VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O		STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE		PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F
		Desired	Actual		DESIRED	ACTUAL		INLET ($T_{m\,in}$), °F	OUTLET ($T_{m\,out}$), °F			
	0 / 1820	72.665										
2-11	5 / 1825	75.95	75.94	1.05	1.45	1.45	130	101	101	4	N/A	70
	10 / 1830	79.24	79.26		~~1.45~~	1.45		103	102	4		67
	15 / 1835	82.52	82.58			1.45		105	101	4		70
	20 / 1840	82.81	85.90			1.45		106	102	4		67
	25 / 1845	89.09	89.16			1.45		106	101	4		66
	30 / 1850	92.38	92.38			1.4		107	101	4		66
	35 / 1855	95.66	95.59			1.4		107	101	4		66
	40 / 1900	98.95	98.83			1.45		107	101	4		66
	45 / 1905	102.23	102.17			1.45		107	102	4		67
		V_m = 29.505			ΔH = ~~1.485~~ 1.439			Tm = 103.39				

COMMENTS

EPA (Dur) 235
4 72

ISOKINETIC PERFORMANCE WORKSHEET

Plant Columbia Nitrogen Corp
Sampling Location Fluidized Bed Cooler TP3 Pull cooler screw inlet
Test Number Three

Date 8-13-80
Initial B.C

Isokinetic equation:

$$\% I = \frac{1{,}039(Ts_{avg}+460)(Vm_{std})}{Vs(\theta)(Ps)(Mf)(Dn^2)}$$

Average stack temperature, °F	Ts_{avg}	130
Meter volume (std), $\frac{17.64(Vm)\left(Pb+\frac{\Delta H_{avg}}{13.6}\right)}{Tm+460}$ $\Delta H = 1.439$ $Pb = 29.87$ $Tm = 103.39$ $Vm = 29.505$	Vm_{std}	27.69
Mole fraction dry gas, $\frac{100-\% H_2O}{100}$	Mf	.98
Molecular wt. dry stack gas, lb/lb-mole $(\%CO_2 \times 0.44) + (\%O_2 \times 0.32) + (\%N_2 + \%CO \times 0.28)$	Md	28.84
Molecular wt. stack gas, lb/lb-mole $(Md)(Mf) + 18(1 - Mf)$	Ms	28.62
Static pressure in stack, absolute, in. Hg $(Pb) \pm (0.074 \times$ stack gage pressure, in $H_2O)$	Ps	29.9
Stack velocity, fpm $5{,}128.8\ (Cp)\left(\sqrt{\Delta Ps_{avg}}\right)\sqrt{\frac{Ts+460}{Ps \times Ms}}$ $\Delta P = 1.05$ $C_p = .84$	Vs	3666
Total sample time, minutes	θ	~~60~~ 45
Nozzle diameter, inches	Dn	.187
$\frac{1{,}039\ (130 + 460)(27.69)}{(3666)(.45)(29.9)(.98)(.187^2)}$	% I	100.42

PARTICULATE SAMPLE RECOVERY AND INTEGRITY

Plant COLUMBIA NITROGEN CORP
Sample Location FLUIDIZED BED COOLER TP3
Sample Box No. 1 pill cooler scrubber inlet
Sample Type NH_4NO_3

Run No. 6
Sample Date 8/13/80
Recovery Date 8/14/80
Cleanup Person DW

Filter No.
Sample No.
Sample Material Description

MOISTURE AND/OR SAMPLE

Impinger Sequence	1	2	3	4	5
Impinger Type a/	M	S	M	M	M
Impinger Solution	H_2O	H_2O	H_2SO_4	—	SiO_2
Final Volume (wt) b/	105 ml	100	100 ml	—	697.5
Initial Volume (wt) b/	100 ml	100 ml	100 ml	—	690.6 g
Net Volume (wt) b/					
Sample No.(s)	27	27			

Combined impinger contents, Sample No.
Liquid Level Marked ✓ Container(s) Sealed ✓
Description of Impinger Solution CLEAR
Total Moisture, gm ~~6.9g~~ 11.9g

SILICA GEL

Silica Gel
Color 1/5 LIGHT BLUE

a/ S = Greenburg-Smith standard, M = Modified, O = Other
b/ Indicate value in units, ml or gm

RECOVERED SAMPLE

Probe Rinse: Sample No. 27
Liquid Level Marked ✓
Sealed ✓

Impinger Rinse: Sample No. 27
Liquid Level Marked ✓
Sealed ✓

Water Blank: Sample No.
Liquid Level Marked

Dry Catch: Sample No.
Description
Sealed

Acetone Blank: Sample No.
Liquid Level Marked
Sealed

Filter Blank: Sample No.
Sealed

Sample Disposition
Carrier HANSEN-COBB
Date Shipped: 8/16/80
Remarks:

Date of laboratory custody
Personnel accepting custody
Seal(s) broken by
Date broken
Remarks:

MIDWEST RESEARCH INSTITUTE

Particle Sizing - Andersen

RUN One

MRI Project Number 4468-L37
Field Dates 8-11 thru 8-16-80
Plant Columbian Chemicals Corp.
Sampling Location Drill Train Exit A (TP2)
Sampling Date 8-14-80

FIELD CREW

Crew Chief M. Hansen

Testing Engineer 1 M. Hansen
2
3

Engr. Technician 1 C. Clk
2
3

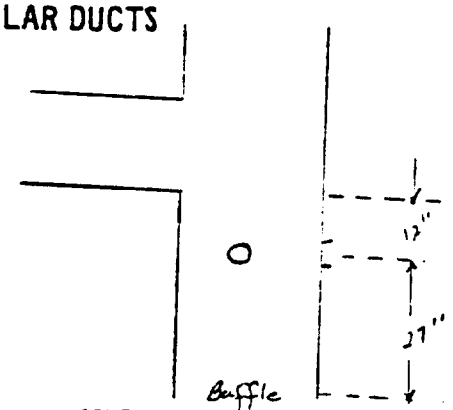
Lab Technician 1 K. Wilson
2 T. Walker
3

Process Engineer 1
2

Other 1
2

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT Columbia Nitrogen Corp.
DATE 8-14-80
SAMPLING LOCATION Prill Tower Inlet A
INSIDE OF FAR WALL TO
OUTSIDE OF NIPPLE. (DISTANCE A) N/A
INSIDE OF NEAR WALL TO
OUTSIDE OF NIPPLE. (DISTANCE B) N/A
STACK I.D.. (DISTANCE A - DISTANCE B) 32.5
NEAREST UPSTREAM DISTURBANCE 27"
NEAREST DOWNSTREAM DISTURBANCE 13
CALCULATOR G.R.

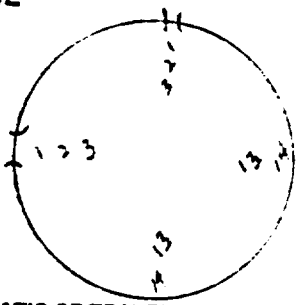


SCHEMATIC OF SAMPLING LOCATION

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1 8 INCH)	DISTANCE B	TRAVERSE POINT LOCATION FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
1	.018	32.5	1"	N/A	1"
2	.057		1.85"		1.85"
3	.099		3.23"		3.23"
4	.146		4.75"		4.75"
5	.201		6.53"		6.53"
6	.269		8.74"		8.74"
7	.366		11.9"		11.9"
8	.634		20.61"		20.61"
9	.731		23.75"		23.75"
10	.799		25.97"		25.97"
11	.854		27.76"		27.76"
12	.901		29.28"		29.28"
13	.943		30.65"		30.65"
14	.982		31.5"		31.5"

PRELIMINARY VELOCITY TRAVERSE

PLANT Columbia Nitrogen Corp.
DATE 8-13-80
LOCATION Inlet - A
STACK I.D. 32½
BAROMETRIC PRESSURE, in. Hg 29.71
STACK GAUGE PRESSURE, in. H_2O -1.20
OPERATORS (TRC) MAA + KTK



SCHEMATIC OF TRAVERSE POINT LAYOUT

Port South - A

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	.480	118
2	.645	116
3	.725	123
4	.830	128
5	1.04	132
6	1.05	128
7	.900	137
8	1.05	137
9	1.10	137
10	1.02	137
11	1.05	135
12	.950	134
13	.950	134
14	.825	132
AVERAGE	0.891	130

Port East - A

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	.600	120
2	.525	118
3	.500	123
4	.875	126
5	.930	126
6	.950	126
7	.975	129
8	.925	131
9	975	132
10	.940	132
11	.950	132
12	.910	132
13	.950	134
14	.680	133
AVERAGE	0.842	129

0.867
129

EPA (Dur) 233
4/72

ANDERSEN SAMPLING CALCULATIONS

Plant Columbia Nitrogen Corp
Sampling Location Prill Tower Inlet A
Test No. One
East Port

Date 8-14-80
Initial M.H

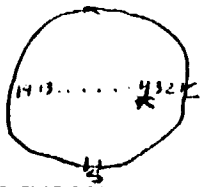
Velocity head at sampling location, in. H_2O	ΔPs	.875
Stack temperature at sample point, °F	Ts	126
Barometric pressure, in. Hg	Pb	29.84
Static pressure in stack, in. Hg (Pb) $\pm$ (0.074 x gage pressure, in. H_2O) -1.20	Ps	29.93
Percent moisture in gas stream by volume	% H_2O	2
Mole fraction, dry gas $\frac{100 - \% H_2O}{100}$	Mf	.98
Molecular wt. dry stack gas, lb/lb-mole (% CO_2 x 0.44) + (% O_2 x 0.32) + (% N_2 + % CO x 0.28)	Md	28.84
Molecular wt. stack gas, lb/lb-mole (Md) (Mf) + 18(1 - Mf)	Ms	28.62
Stack velocity, fpm $5{,}128.8\ (Cp)\left(\sqrt{\Delta Ps}\right)\sqrt{\frac{Ts + 460}{Ps \times Ms}}$	Vs	3333
Calculated nozzle diameter, in. $24\sqrt{\frac{Fs/Vs}{\pi}}$, where Fs = 0.5 to 0.75 ft^3/min	D_{n_c}	.166 .203
Actual nozzle diameter, in.	D_{n_a}	.187
Assumed meter temperature, °F	Tm	100
Isokinetic sample rate, stack conditions, ft^3/min $Vs\ (0.00694)\ (\pi)\left(\frac{Dn_a}{2}\right)^2$	Fs	.635
Calculated meter flow rate, ft^3/min $Fs\left(\frac{Tm+460}{Ts+460}\right)\left(\frac{Ps}{Pb}\right)(Mf)$	Fm	.596

FIELD DATA - ANDERSEN

PLANT Columbia Nitrogen
DATE 8-14-80
SAMPLING LOCATION Prill Tower Inlet A (TP2)
SAMPLE TYPE Particle Size
RUN NUMBER One
OPERATOR Hansen
AMBIENT TEMPERATURE 90
BAROMETRIC PRESSURE 29.84
STATIC PRESSURE, (P_s) -1.20
Filter Set NA

East Port

Leak CK: Inital at 15" Hg, CFM 0.0
Final at 35" Hg, CFM 0.0



SCHEMATIC OF TRAVERSE POINT LAYOUT with Dimensions

Calculated ACFM (desired)	.596
Probe Tip Diameter	.187
CO_2	0
O_2	21
CO	0
N_2	79
% H_2O	2

TRAVERSE POINT NUMBER	SAMPLING TIME, min / CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3		VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O		STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE		PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F
		Desired	Actual		DESIRED	ACTUAL		INLET ($T_{m\,in}$), °F	OUTLET ($T_{m\,out}$), °F			
1-4	0 / 1710	274.89	276.53									
	5 / 1715	279.51	—	.875	.98	—	126	95	94	3	NA	65
	10 / 1720	282.49	281.83			1.35		99	95	3		65
	15 / 1725	285.47	284.94			1.20		103	96	3.5		65
	20 / 1730	288.45	288.05			1.50		105	97	3.5		69
	25 / 1735	291.43	291.42			1.5		108	98	3		68
	30 / 1740	294.41	294.56			1.1		108	99	2.5		68
	35 / 1745	297.39	297.42			1.1		108	100	2.5		69
	40 / 1750	300.37	300.25			1.1		108	100	2.5		69
	45 / 1755	303.35	303.19			1.1		109	101	2.5		69
	50 / 1800	306.33	306.15			1.15		110	102	3.0		65
	55 / 1805	309.31	309.14			1.15		111	103	2.75		65
	60 / 1810	312.29	312.19			1.15		111	104	3		65
	65 / 1815	315.27	315.28			1.2		112	104	3		65
	70 / 1820	318.25	318.39			1.15		112	105	3		66
	75 / 1825	321.23	321.22			1.1		111	105	3		66
	80 / 1830	324.21	324.09			1.1		111	105	3		67
	85 / 1835	327.19	327.10			1.15		111	105	3		68
	90 / 1840	330.17	330.13			1.15		111	105	3		68
		~~333.15~~ /										
		~~330.13~~										
		~~334.11~~	V_m =	53.588		ΔH = 1.19			T_m = 104.5			
		~~342.09~~										
		~~345.07~~										

COMMENTS:

EPA (Dur) 235
4 72

ISOKINETIC PERFORMANCE WORKSHEET

Plant Columbia Nitrogen Corp.
Sampling Location Coal Tower Inlet A TP2
Test Number One

Date 8-14-80
Initial CC

Isokinetic equation:

$$\% I = \frac{1{,}039(Ts_{avg}+460)(Vm_{std})}{Vs(\theta)(Ps)(Mf)(Dn^2)}$$

Average stack temperature, °F	Ts_{avg}	126
Meter volume (std), $\frac{17.64(Vm)\left(Pb+\frac{\Delta H_{avg}}{13.6}\right)}{Tm+460}$ $\Delta H = 1.19$ $Pb = 29.84$ $Tm = 104.5$ $Vm = 53.55E$	Vm_{std}	50.12
Mole fraction dry gas, $\frac{100-\% H_2O}{100}$	Mf	.96
Molecular wt. dry stack gas, lb/lb-mole $(\%CO_2 \times 0.44) + (\%O_2 \times 0.32) + (\%N_2 + \%CO \times 0.28)$	Md	28.84
Molecular wt. stack gas, lb/lb-mole $(Md)(Mf) + 18(1 - Mf)$	Ms	28.62
Static pressure in stack, absolute, in. Hg (Pb) ± (0.074 x stack gage pressure, in H_2O)	Ps	29.93
Stack velocity, fpm $\Delta P = .875$ $5{,}128.8\ (Cp)\left(\sqrt{\Delta Ps_{avg}}\right)\sqrt{\frac{Ts+460}{PsxMs}}$	Vs	~~4030~~ 3333
Total sample time, minutes	θ	90
Nozzle diameter, inches	Dn	.187
$\frac{1{,}039\ (126 + 460)(50.12)}{(\text{~~4030~~ } 3333)(90)(29.93)(.96)(.187^2)}$	% I	99.18

PARTICULATE SAMPLE RECOVERY AND INTEGRITY

Plant COLUMBIA NITROGEN CORP
Sample Location PRILL TOWER INLET A, TP2
Sample Box No. 4
Sample Type NH_4NO_3

Run No. 9
Sample Date 8/14
Recovery Date 8/14
Cleanup Person DW

Filter No.
Sample No.
Sample Material Description

MOISTURE AND/OR SAMPLE

Impinger Sequence	1	2	3	4	5
Impinger Type[a]	M	S	M	M	M
Impinger Solution	H_2O	H_2O	H_2SO_4	—	SiO_2
Final Volume (wt)[b]	—	—	—	—	—
Initial Volume (wt)[b]	100ml	100ml	100.0	—	769.5g
Net Volume (wt)[b]					
Sample No.(s)	41	41			

Combined impinger contents, Sample No. 41
Liquid Level Marked ✓ Container(s) Sealed ✓
Description of Impinger Solution CLEAR
Total Moisture, gm

SILICA GEL

Silica Gel
Color LIGHT BLUE

[a] S = Greenburg-Smith standard, M = Modified, O = Other
[b] Indicate value in units, ml or gm

RECOVERED SAMPLE

Probe Rinse: Sample No. 41
Liquid Level Marked ✓
Sealed ✓

Impinger Rinse: Sample No. 41
Liquid Level Marked ✓
Sealed ✓

Water Blank: Sample No.
Liquid Level Marked

Dry Catch: Sample No.
Description
Sealed

Acetone Blank: Sample No.
Liquid Level Marked
Sealed

Filter Blank: Sample No.
Sealed

Sample Disposition
Carrier HANSEN-GBB Date Shipped: 8/16/80
Remarks:

Date of laboratory custody
Personnel accepting custody
Remarks:

Seal(s) broken by
Date broken

MIDWEST RESEARCH INSTITUTE

Particle Sizing - Andersen

RUN One

MRI Project Number 4468-L(37)
Field Dates 8-11 thru 8-16-80
Plant Columbia Nitrogen Corp.
Sampling Location Prill Tower Inlet B (TP1)
Sampling Date 8-14-80

FIELD CREW

Crew Chief K. Wilcox

Testing Engineer
1 Mark Hansen
2 George Cobb
3

Engr. Technician
1
2
3

Lab Technician
1 Tom Walker
2
3

Process Engineer
1
2

Other
1
2

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT Columbia Nitrogen Corp.
DATE 8-14-80
SAMPLING LOCATION Prill Tower Inlet B (TP1)
INSIDE OF FAR WALL TO
OUTSIDE OF NIPPLE. (DISTANCE A) N/A
INSIDE OF NEAR WALL TO
OUTSIDE OF NIPPLE. (DISTANCE B) N/A
STACK I.D.. (DISTANCE A - DISTANCE B) 325
NEAREST UPSTREAM DISTURBANCE
NEAREST DOWNSTREAM DISTURBANCE
CALCULATOR

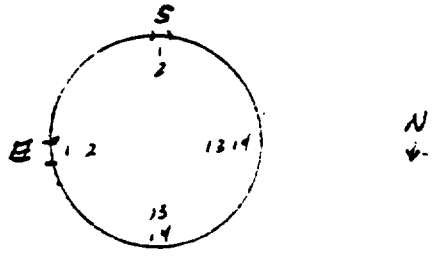
SCHEMATIC OF SAMPLING LOCATION

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1 8 INCH)	DISTANCE B	TRAVERSE POINT LOCATION FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
		used Prill Tower Inlet A			
			Measurements and		
			Schematic		

EPA (Dur) 232
4/72

PRELIMINARY VELOCITY TRAVERSE

PLANT Columbia Nitrogen Corp.
DATE 8-13-80 1125-1130
LOCATION Inlet - B
STACK I.D. 32½
BAROMETRIC PRESSURE, in. Hg 29.71
STACK GAUGE PRESSURE, in. H_2O -.900
OPERATORS (TRC) MAA & KTK



SCHEMATIC OF TRAVERSE POINT LAYOUT

Port South - B

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	.345	118
2	.425	120
3	.575	124
4	.700	127
5	.775	128
6	.875	131
7	.600	130
8	.780	131
9	.840	133
10	.775	134
11	.750	133
12	.630	135
13	.545	136
14	.345	134
AVERAGE	0.63	129.6

Port East - B

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	.450	114
2	.625	116
3	.660	124
4	.775	126
5	.745	129
6	.620	129
7	.850	134
8	.875	134
9	.800	136
10	.850	134
11	.825	132
12	.750	134
13	.575	137
14	.450	137
AVERAGE	0.693	129.7

.662
129.6

ANDERSEN SAMPLING CALCULATIONS

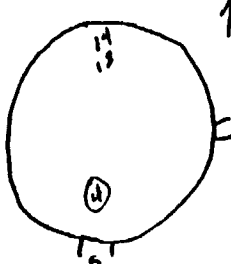
Plant Columbia Nitrogen Corp. Date 8-14-80
Sampling Location Prill Tower Inlet B (TP1) Initial MDH, G.C.
Test No. One

Velocity head at sampling location, in. H_2O	ΔPs	.7
Stack temperature at sample point, °F	Ts	127
Barometric pressure, in. Hg	Pb	29.87
Static pressure in stack, in. Hg (Pb) ± (0.074 x gage pressure, in. H_2O) sp: -.9	Ps	29.94
Percent moisture in gas stream by volume	% H_2O	2
Mole fraction, dry gas $\frac{100 - \% H_2O}{100}$	Mf	.98
Molecular wt. dry stack gas, lb/lb-mole (% CO_2 x 0.44) + (% O_2 x 0.32) + (% N_2 + % CO x 0.28)	Md	28.84
Molecular wt. stack gas, lb/lb-mole (Md) (Mf) + 18(1 - Mf)	Ms	28.62
Stack velocity, fpm $5{,}128.8\ (Cp)\ (\sqrt{\Delta Ps})\ \sqrt{\frac{Ts + 460}{Ps \times Ms}}$	Vs	~~3080~~ MDH 2983
Calculated nozzle diameter, in. $24\sqrt{\frac{Fs/Vs}{\pi}}$, where Fs = 0.5 to 0.75 ft^3/min	D_{n_c}	~~.175~~ .215
Actual nozzle diameter, in.	D_{n_a}	.187
Assumed meter temperature, °F	Tm	90
Isokinetic sample rate, stack conditions, ft^3/min $Vs\ (0.00694)\ (\pi)\left(\frac{Dn_a}{2}\right)^2$	Fs	~~.579~~ MDH .564
Calculated meter flow rate, ft^3/min $Fs\left(\frac{Tm+460}{Ts+460}\right)\left(\frac{Ps}{Pb}\right)(Mf)$	Fm	~~.533~~ .524

FIELD DATA - ANDERSEN

PLANT Columbia Nitrogen Corp.
DATE 8-14-80
SAMPLING LOCATION Pill Tower Inlet B (PB)
SAMPLE TYPE Particle Size
RUN NUMBER One
OPERATOR Cobb, Hansen
AMBIENT TEMPERATURE 83
BAROMETRIC PRESSURE 29.87
STATIC PRESSURE, (P_s) -.90
Filter Set NA

Leak CK: Inital at 15" Hg, CFM 0.0
Final at 3" Hg, CFM 0.0



SCHEMATIC OF TRAVERSE POINT LAYOUT with Dimensions

Calculated ACFM (desired)	.524
Probe Tip Diameter	.187
CO_2	0
O_2	21
CO	0
N_2	79
% H_2O	3

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3		VELOCITY HEAD (ΔP_s), in H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O		STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE		PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F
			103.10						INLET ($T_{m\,in}$), °F	OUTLET ($T_{m\,out}$), °F			
	0	~~9:50~~	Desired	Actual		DESIRED	ACTUAL						
1-H	5	9:55	105.72	105.66	.7	.95	.95	127	83	83	3	NA	69
	10	10:00	108.34	108.34			.95		87	83	3		65
	15	10:05	110.96	111.00			.95		92	85	3		65
	20	10:10	113.58	113.68			.95		94	85	3		66
	25	10:15	116.20	116.34			.94		97	87	3		66
	30	10:20	118.82	118.99			.94		98	88	3		66
	35	10:25	121.44	—			.94		99	90	3		66
	40	10:30	124.06	124.24		.9	.91		100	90	3		67
	45	10:35	126.68	126.82			.89		102	92	3		67
	50	10:40	129.30	129.45			.89		104	94	3		68
	55	10:45	131.92	~~131.82~~			.89		106	85	3		68
	60	10:50	134.54	134.69			.9		106	96	3		68
			V_m = 31.59			ΔH = .925			T_m = 93.17				

COMMENTS

A-116

EPA (Dur) 235
4 72

ISOKINETIC PERFORMANCE WORKSHEET

Plant Columbia Nitrogen Corp. Date 8-14-80
Sampling Location Prill Tower Inlet B (TP1) Initial D.C.
Test Number One

Isokinetic equation:

$$\% I = \frac{1{,}039(Ts_{avg}+460)(Vm_{std})}{Vs(\theta)(Ps)(Mf)(Dn^2)}$$

Average stack temperature, °F	Ts_{avg}	127
Meter volume (std), $\frac{17.64(Vm)\left(Pb+\frac{\Delta H_{avg}}{13.6}\right)}{Tm+460}$ $\Delta H = .925$ $Vm = 31.59$ $T_m = 93.17$ $P_b = 29.87$	Vm_{std}	30.16
Mole fraction dry gas, $\frac{100-\%\ H_2O}{100}$	Mf	.98
Molecular wt. dry stack gas, lb/lb-mole $(\%CO_2 \times 0.44) + (\%O_2 \times 0.32) + (\%N_2 + \%CO \times 0.28)$	Md	28.84
Molecular wt. stack gas, lb/lb-mole (Md) (Mf) + 18(1 - Mf)	Ms	28.62
Static pressure in stack, absolute, in. Hg (Pb) ± (0.074 x stack gage pressure, in H_2O)	Ps	29.94
Stack velocity, fpm $5{,}128.8\ (Cp)\left(\sqrt{\Delta Ps_{avg}}\right)\sqrt{\frac{Ts+460}{Ps \times Ms}}$	Vs	2983
Total sample time, minutes	θ	60
Nozzle diameter, inches	Dn	.187
$\frac{1{,}039\ (127 + 460)(30.16)}{(2983)(60)(29.94)(.98)(.187^2)}$	% I	100.17

PARTICULATE SAMPLE RECOVERY AND INTEGRITY

Plant COLUMBIA NITROGEN CORP
Sample Location PRILL TOWER INLET B TP1
Sample Box No. 2
Sample Type NH_4NO_3

Run No. 7
Sample Date 8/14
Recovery Date 8/14
Cleanup Person DLW

Filter No.
Sample No.
Sample Material Description

MOISTURE AND/OR SAMPLE

Impinger Sequence	1	2	3	4	5
Impinger Type[a]	M	S	M	M	M
Impinger Solution	H_2O	H_2O	H_2SO_4	—	SiO_2
Final Volume (wt)[b]	115 ml	104 ml	96 gm		
Initial Volume (wt)[b]	100 ml	100 ml	100 ml	—	70.7 g
Net Volume (wt)[b]					
Sample No.(s)	32	32			

Combined impinger contents, Sample No.
Liquid Level Marked ✓ Container(s) Sealed ✓
Description of Impinger Solution CLEAR
Total Moisture, gm

SILICA GEL

Silica Gel Color LIGHT BLUE

[a] S = Greenburg-Smith standard, M = Modified, O = Other
[b] Indicate value in units, ml or gm

RECOVERED SAMPLE

Probe Rinse: Sample No. 32
Liquid Level Marked ✓
Sealed ✓

Impinger Rinse: Sample No. 32
Liquid Level Marked ✓
Sealed ✓

Water Blank: Sample No.
Liquid Level Marked

Dry Catch: Sample No.
Description
Sealed

Acetone Blank: Sample No.
Liquid Level Marked
Sealed

Filter Blank: Sample No.
Sealed

Sample Disposition
Carrier LANSEN-CABB Date Shipped: 8/16/80
Remarks:

Date of laboratory custody
Personnel accepting custody
Remarks:

Seal(s) broken by
Date broken

MIDWEST RESEARCH INSTITUTE

Particle Sizing - Andersen

RUN one

MRI Project Number 4468-L(37)
Field Dates 8-11 thru 8-16-80
Plant Columbia Nitrogen
Sampling Location Prill Tower Inlet C (TP3)
Sampling Date 8-16-80

FIELD CREW

Crew Chief Ken Wilcox

Testing Engineer 1 Mark Hansen
2
3

Engr. Technician 1
2
3

Lab Technician 1 Tom Walker
2
3

Process Engineer 1
2

Other 1
2

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

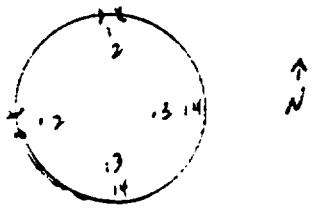
PLANT Columbia Nitrogen Corp
DATE 8-16-80
SAMPLING LOCATION Prill Tower Inlet
INSIDE OF FAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE A) N/A
INSIDE OF NEAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE B) N/A
STACK I.D., (DISTANCE A - DISTANCE B) 32.5
NEAREST UPSTREAM DISTURBANCE
NEAREST DOWNSTREAM DISTURBANCE
CALCULATOR

SCHEMATIC OF SAMPLING LOCATION

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8 INCH)	DISTANCE B	TRAVERSE POINT LOCATION FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
	Same	as	for Inlet A	Prill Tower	
		and	schematic		

PRELIMINARY VELOCITY TRAVERSE

PLANT Columbia Nitrogen Corp
DATE 5-12-80 1720-1730
LOCATION Inlet - C
STACK I.D. 32.5
BAROMETRIC PRESSURE, in. Hg 29.75
STACK GAUGE PRESSURE, in. H_2O -1.15
OPERATORS (TAC) MAA & KTK



SCHEMATIC OF TRAVERSE POINT LAYOUT

Port west - C

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	.385	107
2	.475	108
3	.545	115
4	.590	121
5	.600	124
6	.775	129
7	.850	131
8	.875	132
9	1.05	134
10	1.00	135
11	1.03	137
12	.950	140
13	.765	142
14	.740	138
AVERAGE	0.766	128

Port North - C

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	.340	125
2	.450	121
3	.515	124
4	.550	127
5	.785	133
6	.775	136
7	.905	137
8	.975	136
9	1.05	137
10	1.20	138
11	1.08	138
12	1.06	141
13	975	137
14	.795	137
AVERAGE	0.795	133.5

0.781
130.75

ANDERSEN SAMPLING CALCULATIONS

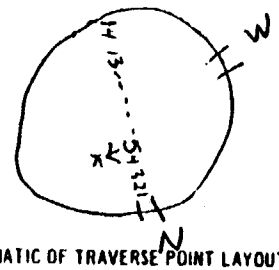
Plant Columbia Nitrogen Corp. Date 8-16-80
Sampling Location Prill Tower Inlet C (JP3) Initial MOH
Test No. One
North Port, Point 1-5

Velocity head at sampling location, in. H_2O	ΔPs	.785
Stack temperature at sample point, °F	Ts	133
Barometric pressure, in. Hg	Pb	29.89
Static pressure in stack, in. Hg (Pb) ± (0.074 x gage pressure, in. H_2O) -1.15	Ps	29.97
Percent moisture in gas stream by volume	% H_2O	2
Mole fraction, dry gas $\frac{100 - \% H_2O}{100}$	Mf	.98
Molecular wt. dry stack gas, lb/lb-mole (% CO_2 x 0.44) + (% O_2 x 0.32) + (% N_2 + % CO x 0.28)	Md	28.84
Molecular wt. stack gas, lb/lb-mole (Md) (Mf) + 18(1 - Mf)	Ms	28.62
Stack velocity, fpm $5{,}128.8\ (Cp)\left(\sqrt{\Delta Ps}\right)\sqrt{\frac{Ts + 460}{Ps \times Ms}}$	Vs	3174
Calculated nozzle diameter, in. $24\sqrt{\frac{Fs/Vs}{\pi}}$, where Fs = 0.5 to 0.75 ft^3/min	D_{n_c}	.170 .208
Actual nozzle diameter, in.	D_{n_a}	.187
Assumed meter temperature, °F	Tm	95
Isokinetic sample rate, stack conditions, ft^3/min $Vs\ (0.00694)\ (\pi)\left(\frac{Dn_a}{2}\right)^2$	Fs	.605
Calculated meter flow rate, ft^3/min $Fs\left(\frac{Tm+460}{Ts+460}\right)\left(\frac{Ps}{Pb}\right)(Mf)$	Fm	.557

FIELD DATA - ANDERSEN

PLANT Columbia Nitrogen Corp.
DATE 8-16-80
SAMPLING LOCATION Prill Tower Inlet C, TP6
SAMPLE TYPE Particle Size
RUN NUMBER One
OPERATOR Hansen
AMBIENT TEMPERATURE 82°F
BAROMETRIC PRESSURE 29.58
STATIC PRESSURE, (P_s) -1.15
Filter Set NA

Leak CK: Inital at 15" Hg, CFM 0.0
Final at 2.5" Hg, CFM 0.0



SCHEMATIC OF TRAVERSE POINT LAYOUT with Dimensions

Calculated ACFM (desired)	.557
Probe Tip Diameter	.187
CO_2	0
O_2	21
CO	0
N_2	79
% H_2O	2

TRAVERSE POINT NUMBER	SAMPLING TIME, min / CLOCK TIME (24 hr CLOCK)		GAS METER READING (V_m), ft^3		VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O		STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE		PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F
			587.75		.785			133	INLET ($T_{m\,in}$), °F	OUTLET ($T_{m\,out}$), °F		NA	
	0	0855	Desired	Actual		DESIRED	ACTUAL						
1-5	5	0900	590.54	590.53		1.1	1.1		86	84	2.5		59
	10	0905	593.32	593.36			1.05		92	85	2.5		61
	15	0910	596.11	596.12			1.05		95	86	2.5		62
	20	0915	598.89	598.95			1.05		98	87	2.5		62
	25	0920	601.68	601.73			1.05		100	89	2.5		62
	30	0925	604.46	604.54			1.05		103	90	2.5		63
	35	0930	607.25	607.33			1.05		104	92	2.5		63
	40	0935	610.03	610.12			1.0		104	92	2.0		63
	45	0940	612.82	612.89			1.0		106	94	2.0		63
	50	0945	615.60	615.68			1.0		108	95	2.0		63
	55	0950	618.39	618.47			1.0		109	97	2.0		64
	60	0455	621.17	621.24			.97		110	98	2.0		64
			V_m =	33.49			ΔH =	1.031	T_m	=96			

COMMENTS:

EPA (Dun) 235
4 72

ISOKINETIC PERFORMANCE WORKSHEET

Plant Columbia Nitrogen Corp. Date 8-16-80
Sampling Location Prill Tower Inlet C (TP6) Initial MDH
Test Number One
North port, 1-5
Isokinetic equation:

$$\% I = \frac{1{,}039(Ts_{avg}+460)(Vm_{std})}{Vs(\theta)(Ps)(Mf)(Dn^2)}$$

Average stack temperature, °F	Ts_{avg}	133
Meter volume (std), $\frac{17.64(Vm)\left(Pb+\frac{\Delta H_{avg}}{13.6}\right)}{Tm+460}$ $Tm = 96$ $\Delta H = 1.031$ $V_m = 33.49$	Vm_{std}	31.829
Mole fraction dry gas, $\frac{100-\%\ H_2O}{100}$	Mf	.98
Molecular wt. dry stack gas, lb/lb-mole $(\%CO_2 \times 0.44) + (\%O_2 \times 0.32) + (\%N_2 + \%CO \times 0.28)$	Md	28.84
Molecular wt. stack gas, lb/lb-mole (Md) (Mf) + 18(1 - Mf)	Ms	28.62
Static pressure in stack, absolute, in. Hg (Pb) ± (0.074 x stack gage pressure, in H_2O)	Ps	29.97
Stack velocity, fpm $5{,}128.8\ (Cp)\left(\sqrt{\Delta Ps_{avg}}\right)\sqrt{\frac{Ts+460}{PsxMs}}$	Vs	3174
Total sample time, minutes	θ	60
Nozzle diameter, inches	Dn	.187
$\frac{1{,}039\ (133 + 460)(31.829)}{(3174)(60)(29.97)(.98)(.187^2)}$	% I	100.26

PARTICULATE SAMPLE RECOVERY AND INTEGRITY

Plant COLUMBIA NITROGEN CORP
Sample Location MILL TRUCK INLET C TP3
Sample Box No. 2
Sample Type NH_4NO_3

Run No. 15
Sample Date 8/16/80
Recovery Date 8/16/80
Cleanup Person DLJ

Filter No.
Sample No.
Sample Material Description

MOISTURE AND/OR SAMPLE

Impinger Sequence	1	2	3	4	5
Impinger Type a/	M	S	M	M	M
Impinger Solution	H_2O	H_2O	H_2O	—	SiO_2
Final Volume (wt) b/	—	—	—	—	—
Initial Volume (wt) b/	112.0	112.0	100.0	—	—
Net Volume (wt) b/					
Sample No.(s)	68	68			

Combined impinger contents, Sample No.
Liquid Level Marked ✓ Container(s) Sealed ✓
Description of Impinger Solution CLEAR
Total Moisture, gm

SILICA GEL

Silica Gel
Color LIGHT BLUE

a/ S = Greenburg-Smith standard, M = Modified, O = Other
b/ Indicate value in units, ml or gm

RECOVERED SAMPLE

Probe Rinse: Sample No. 68
Liquid Level Marked ✓
Sealed ✓

Impinger Rinse: Sample No. 68
Liquid Level Marked ✓
Sealed ✓

Water Blank: Sample No.
Liquid Level Marked

Dry Catch: Sample No.
Description
Sealed

Acetone Blank: Sample No.
Liquid Level Marked
Sealed

Filter Blank: Sample No.
Sealed

Sample Disposition
Carrier HANSEN - GOBB
Date Shipped: 8/16/80
Remarks:

Date of laboratory custody
Personnel accepting custody
Seal(s) broken by
Date broken
Remarks: IMPACTOR # 34

MIDWEST RESEARCH INSTITUTE

Particle Sizing - Andersen

RUN 011

MRI Project Number 4468-237
Field Dates 8-11 thru 8-16-80
Plant Columbian Iron Corp.
Sampling Location Bypass stack A
Sampling Date 8/14-80

FIELD CREW

Crew Chief M. Hanson

Testing Engineer 1 M. Hanson
2
3

Engr. Technician 1
2
3

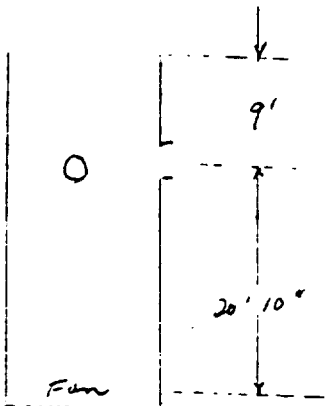
Lab Technician 1 T. Walker
2 K. Wolcott
3

Process Engineer 1
2

Other 1
2

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT Columbian Nitrogen Corp
DATE 8-15-80
SAMPLING LOCATION Prill Tower Bypass-A
INSIDE OF FAR WALL TO
OUTSIDE OF NIPPLE. (DISTANCE A) N/A
INSIDE OF NEAR WALL TO
OUTSIDE OF NIPPLE. (DISTANCE B) N/A
STACK I.D.. (DISTANCE A - DISTANCE B) 59½"
NEAREST UPSTREAM DISTURBANCE 20'10"
NEAREST DOWNSTREAM DISTURBANCE 9'
CALCULATOR

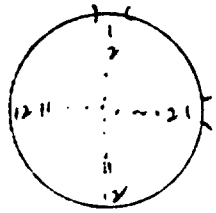


SCHEMATIC OF SAMPLING LOCATION

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1 8 INCH)	DISTANCE B	TRAVERSE POINT LOCATION FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
1	.021	59½"	1.24	N/A.	1.24
2	.067		3.97		3.97
3	.118		6.99		6.99
4	.177		10.49		10.49
5	.250		14.81		14.81
6	.356		21.1		21.1
7	.644		38.16		38.16
8	.750		44.43		44.43
9	.823		48.76		48.76
10	.882		52.26		52.26
11	.933		55.28		55.28
12	.979		58		58

PRELIMINARY VELOCITY TRAVERSE

PLANT Columbia Nitrogen Corp
DATE 8-13-80 0830 - 0902
LOCATION A - Bypass
STACK I.D. 59 1/4
BAROMETRIC PRESSURE, in. Hg 29.71
STACK GAUGE PRESSURE, in. H_2O -1.50
OPERATORS (TRC) MAA - KTK



SCHEMATIC OF TRAVERSE POINT LAYOUT

Port South A

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	1.375	97
2	1.475	98
3	1.625	97
4	1.60	98
5	1.65	99
6	1.55	100
7	1.08	96
8	1.10	101
9	1.15	96
10	1.175	97
11	1.175	96
12	1.08	96
AVERAGE	1.336	97.58

Port West - A

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	1.20	97
2	1.50	97
3	1.625	97
4	1.50	96
5	1.35	97
6	1.30	97
7	1.10	93
8	1.25	94
9	1.30	95
10	1.35	97
11	1.30	97
12	1.08	98
AVERAGE	1.321	96.42

1.329
97

EPA (Dur) 233
4/72

ANDERSEN SAMPLING CALCULATIONS

Plant Columbia Nitrogen Corp. Date 8-15-80
Sampling Location Bypass Stack A (TP7) Initial MDH
Test No. One
West Port 1-6

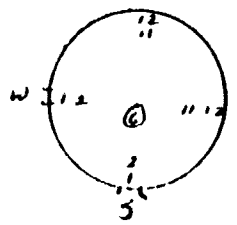
Velocity head at sampling location, in. H_2O	ΔPs	1.30
Stack temperature at sample point, °F	Ts	97
Barometric pressure, in. Hg	Pb	29.89
Static pressure in stack, in. Hg (Pb) $\pm$ (0.074 x gage pressure, in. H_2O) -.150	Ps	29.90
Percent moisture in gas stream by volume	% H_2O	2
Mole fraction, dry gas $\frac{100 - \% H_2O}{100}$	Mf	.98
Molecular wt. dry stack gas, lb/lb-mole (% CO_2 x 0.44) + (% O_2 x 0.32) + (% N_2 + % CO x 0.28)	Md	28.84
Molecular wt. stack gas, lb/lb-mole (Md) (Mf) + 18(1 - Mf)	Ms	28.62
Stack velocity, fpm $5{,}128.8\ (Cp)\left(\sqrt{\Delta Ps}\right)\sqrt{\frac{Ts + 460}{Ps \times Ms}}$	Vs	3963
Calculated nozzle diameter, in. $24\sqrt{\frac{Fs/Vs}{\pi}}$, where Fs = 0.5 to 0.75 ft^3/min	D_{n_c}	.152 .186
Actual nozzle diameter, in.	D_{n_a}	.187
Assumed meter temperature, °F	Tm	95
Isokinetic sample rate, stack conditions, ft^3/min $Vs\ (0.00694)\ (\pi)\left(\frac{Dn_a}{2}\right)^2$	Fs	.755
Calculated meter flow rate, ft^3/min $Fs\left(\frac{Tm+460}{Ts+460}\right)\left(\frac{Ps}{Pb}\right)(Mf)$	Fm	.737

FIELD DATA - ANDERSEN

South Port
TP 7

PLANT Columbia Nitrogen Corp.
DATE 8-15-80
SAMPLING LOCATION Bypass Stack A
SAMPLE TYPE Particle Size
RUN NUMBER One
OPERATOR Hansen
AMBIENT TEMPERATURE 87°F
BAROMETRIC PRESSURE 29.89
STATIC PRESSURE, (P_s) ~~NO~~ -.150
Filter Set NA

Leak CK: Inital at 15" Hg, CFM 0.0
Final at 4" Hg, CFM 0.0



SCHEMATIC OF TRAVERSE POINT LAYOUT with Dimensions

Calculated ACFM (desired)	.737
Probe Tip Diameter	.187
CO_2	0
O_2	21
CO	0
N_2	79
% H_2O	2

TRAVERSE POINT NUMBER	SAMPLING TIME, min / CLOCK TIME (24 hr CLOCK)		GAS METER READING (V_m), ft³		VELOCITY HEAD (Δp_s), in H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O		STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE		PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F
	0	1450	462.65		1.30	DESIRED	ACTUAL	97	INLET ($T_{m\,in}$), °F	OUTLET ($T_{m\,out}$), °F		NA	
1-6	5	1455	466.34	466.12		1.7	1.7		92	89	4		70
	10	1500	470.02	469.87			1.7		96	90	4		69
	15	1505	473.71	473.28			1.75		100	91	4		70
	20	1510	477.39	477.03			1.8		102	92	4		70
	25	1515	481.08	480.74			1.8		103	93	4		70
	30	1520	484.76	484.36			1.85		105	94	4		70
	35	1525	488.45	488.19			1.85		106	96	4		68
	40	1530	492.13	491.85			1.9		106	96	4		65
	45	1535	495.82	495.61			1.9		106	97	4		64
	50	1540	499.51	499.41			1.95		106	97	4		64
	55	1545	503.19	503.20			1.9		107	98	4		66
	60	1550	506.88	506.98			1.85		107	99	3.5		65
	65	1555	510.56	510.64			1.85		106	99	3.5		65
	70	1600	514.25	514.36			1.85		106	99	3.5		66
	75	1605	517.93	517.95			1.85		109	100	3.5		66
	80	1610	521.62	521.70			1.85		109	100	3.5		65
	85	1615	525.30	525.41			1.85		110	101	3.5		66
	90	1620	528.99	529.07			1.80		109	102	3.5		67
	95	1625	532.67	532.75			1.8		109	102	3.5		66
	100	1630	536.36	536.39			1.8		111	103	3.5		66
	105	1635	540.04	540.10			1.8		113	104	3.5		66
	110	1640	543.72	543.70			1.8		114	105	3.5		66
	115	1645	547.41	547.37			1.8		114	105	3.5		67

COMMENTS

EPA (Dun 235
4 72

TRAVERSE POINT NUMBER	SAMPLING TIME min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m) ft³ Desired	GAS METER READING (V_m) ft³ Actual	VELOCITY HEAD (Δp_s) in H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH) in H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH) in H_2O ACTUAL	STACK TEMPERATURE (T_s) °F	DRY GAS METER TEMPERATURE INLET ($T_{m\,in}$) °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\,out}$) °F	PUMP VACUUM in Hg	SAMPLE BOX TEMPERATURE °F	IMPINGER TEMPERATURE °F
					1.30			97				N/A	
1-6	120	1650	551.10	551.07		1.7	1.8		114	106	3.5		66
	125	1655	554.78	554.83			1.85		113	106	3.5		64
	130	1700	558.41	558.52			1.85		114	107	3.5		64
	135	1705	562.15	562.24			1.85		112	106	3.5		64
	140	1710	565.84	565.96			1.85		113	106	3.5		64
	145	1715	569.52	569.64			1.8		113	106	3.5		64
	150	1720	573.21	573.29			1.8		112	106	3.5		65
	155	1725	576.89	576.96			1.8		111	106	3.25		63
	160	1730	580.58	580.59			1.75		112	106	3.25		63
a/	165	1735	584.26	584.455			1.75		113	106	3.25		63
	170		587.95										
	175		591.63										
	180		595.32										
				V_{in} = 121.805			ΔH = 1.81			T_{in} = 104.33			

Run Number One

Date 8-15-80

Sampling Location TP7

Bypass Stack A

Point No. 1-6

South Point

Comments: a/ Process problems. Shut down early.

EPA (Dun) 236
4 72

ISOKINETIC PERFORMANCE WORKSHEET

Plant Columbia Hospital Corp.
Sampling Location Bypass Stack A
Test Number One

Date 8-15-88
Initial CC

Isokinetic equation:

$$\% I = \frac{1,039(Ts_{avg}+460)(Vm_{std})}{Vs(\theta)(Ps)(Mf)(Dn^2)}$$

Average stack temperature, °F	Ts_{avg}	97
Meter volume (std), $\frac{17.64(Vm)\left(Pb+\frac{\Delta H_{avg}}{13.6}\right)}{Tm+460}$ ΔH = 1.52, Vm = 121.865, Tm = 104.33, Pb = 29.89	Vm_{std}	114.31
Mole fraction dry gas, $\frac{100-\% H_2O}{100}$	Mf	.98
Molecular wt. dry stack gas, lb/lb-mole $(\%CO_2 \times 0.44) + (\%O_2 \times 0.32) + (\%N_2 + \%CO \times 0.28)$	Md	28.84
Molecular wt. stack gas, lb/lb-mole (Md) (Mf) + 18(1 - Mf)	Ms	28.62
Static pressure in stack, absolute, in. Hg (Pb) ± (0.074 x stack gage pressure, in H_2O)	Ps	29.90
Stack velocity, fpm $5,128.8\ (Cp)\left(\sqrt{\Delta Ps_{avg}}\right)\sqrt{\frac{Ts+460}{Ps \times Ms}}$ Δp = 1.3	Vs	3963
Total sample time, minutes	θ	165
Nozzle diameter, inches	Dn	.187
$\frac{1,039\ (97 + 460)(114.31)}{(3963)(165)(29.90)(.98)(.187^2)}$	% I	98.73

PARTICULATE SAMPLE RECOVERY AND INTEGRITY

Plant COLUMBIA NITROGEN CORP
Sample Location BYPASS STACK A TP7
Sample Box No. 3
Sample Type NH_4NO_3

Run No. 12
Sample Date 8/15
Recovery Date 8/15
Cleanup Person JW

Filter No.
Sample No.
Sample Material Description

MOISTURE AND/OR SAMPLE

Impinger Sequence	1	2	3	4	5
Impinger Type[a]	M	S	M	M	M
Impinger Solution	H_2O	H_2O	H_2SO_4	—	SiO_2
Final Volume (wt)[b]	100				
Initial Volume (wt)[b]	100.0	100.0	100.5	—	—
Net Volume (wt)[b]					
Sample No.(s)	54	54			

Combined impinger contents, Sample No.
Liquid Level Marked ✓ Container(s) Sealed ✓
Description of Impinger Solution CLEAR
Total Moisture, gm

SILICA GEL

Silica Gel Color LIGHT BLUE

[a] S = Greenburg-Smith standard, M = Modified, O = Other
[b] Indicate value in units, ml or gm

RECOVERED SAMPLE

Probe Rinse: Sample No. 54
Liquid Level Marked ✓
Sealed ✓

Impinger Rinse: Sample No. 54
Liquid Level Marked ✓
Sealed ✓

Water Blank: Sample No.
Liquid Level Marked

Dry Catch: Sample No.
Description
Sealed

Acetone Blank: Sample No.
Liquid Level Marked
Sealed

Filter Blank: Sample No.
Sealed

Sample Disposition
Carrier HANSEN-CORP Date Shipped: 8/16/80
Remarks:

Date of laboratory custody
Personnel accepting custody
Remarks: IMPINGER 3 15

Seal(s) broken by
Date broken

MIDWEST RESEARCH INSTITUTE

Particle Sizing - Andersen

RUN ONC

MRI Project Number 4468-L
Field Dates 8-11 Thru 8-16-80
Plant Columbian Nitrogen Corp.
Sampling Location Bypass B-West Port (TP5)
Sampling Date 8-14-80

FIELD CREW

Crew Chief M. Hansen

Testing Engineer 1 C. Cobb
2
3

Engr. Technician 1
2
3

Lab Technician 1 K. W. Cook
2 T. Wilken
3

Process Engineer 1
2

Other 1
2

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

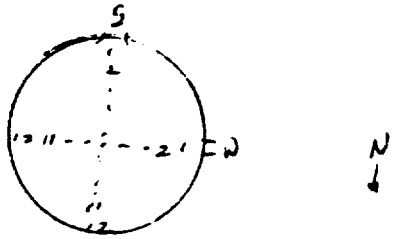
PLANT Columbia Nitrogen Corp.
DATE 8-14-80
SAMPLING LOCATION Bill Towers Bypass-B
INSIDE OF FAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE A) N/A
INSIDE OF NEAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE B) N/A
STACK I.D., (DISTANCE A - DISTANCE B) 59 ¼"
NEAREST UPSTREAM DISTURBANCE 20'10"
NEAREST DOWNSTREAM DISTURBANCE 9'
CALCULATOR

SCHEMATIC OF SAMPLING LOCATION

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1 8 INCH)	DISTANCE B	TRAVERSE POINT LOCATION FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
	Same	measurements and		Schematic	
		as Bypass A			

PRELIMINARY VELOCITY TRAVERSE

PLANT Columbia N. Oregon
DATE 8-13-80 1130-1140
LOCATION Bypass B
STACK I.D. 59½
BAROMETRIC PRESSURE, in. Hg 29.71
STACK GAUGE PRESSURE, in. H_2O -.075
OPERATORS (TRC) MAA + KJK



SCHEMATIC OF TRAVERSE POINT LAYOUT

Port South - B

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	1.10	112
2	1.35	115
3	1.45	111
4	1.50	111
5	1.40	110
6	1.25	109
7	1.30	107
8	1.30	110
9	1.35	107
10	1.55	109
11	1.65	113
12	1.45	112
AVERAGE	1.36	110.5

1.39
110

Port West - B

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	1.3	112
2	1.3	111
3	1.35	111
4	1.25	107
5	1.15	109
6	1.09	112
7	1.25	111
8	1.50	110
9	1.70	110
10	1.85	108
11	1.70	108
12	1.45	111
AVERAGE	1.4	110

ANDERSEN SAMPLING CALCULATIONS

Plant _____ Date 8-14-80

Sampling Location Bypass Stack B (TP5) Initial _____

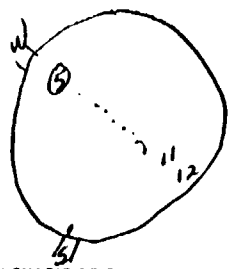
Test No. One

West ~~South~~ Port

Velocity head at sampling location, in. H_2O	ΔPs	~~1.329~~ 1.40 MDH
Stack temperature at sample point, °F	Ts	110
Barometric pressure, in. Hg	Pb	29.90
Static pressure in stack, in. Hg (Pb) ± (0.074 x gage pressure, in. H_2O) $P_s = -.075$	Ps	29.91
Percent moisture in gas stream by volume	% H_2O	2
Mole fraction, dry gas $\frac{100 - \% H_2O}{100}$	Mf	.98
Molecular wt. dry stack gas, lb/lb-mole (% CO_2 x 0.44) + (% O_2 x 0.32) + (% N_2 + % CO x 0.28)	Md	28.84
Molecular wt. stack gas, lb/lb-mole (Md) (Mf) + 18(1 - Mf)	Ms	28.62
Stack velocity, fpm $5{,}128.8\ (Cp)\ (\sqrt{\Delta Ps})\ \sqrt{\frac{Ts + 460}{Ps \times Ms}}$	Vs	4160
Calculated nozzle diameter, in. $24\sqrt{\frac{Fs/Vs}{\pi}}$, where Fs = 0.5 to 0.75 ft^3/min	D_{n_c}	.148 .182
Actual nozzle diameter, in.	D_{n_a}	.187
Assumed meter temperature, °F	Tm	100
Isokinetic sample rate, stack conditions, ft^3/min $Vs\ (0.00694)\ (\pi)\left(\frac{Dn_a}{2}\right)^2$	Fs	.793
Calculated meter flow rate, ft^3/min $Fs\left(\frac{Tm+460}{Ts+460}\right)\left(\frac{Ps}{Pb}\right)(Mf)$	Fm	.764

FIELD DATA - ANDERSEN

PLANT Co Lumbia N. Irrigation Corp.
DATE 8-14-80
SAMPLING LOCATION Bypass B-West Port (TPS)
SAMPLE TYPE HCSS - Andersen
RUN NUMBER One
OPERATOR A Cobb
AMBIENT TEMPERATURE 90
BAROMETRIC PRESSURE 29.90
STATIC PRESSURE, (P_s) -.075
Filter Set N/A



SCHEMATIC OF TRAVERSE POINT LAYOUT with Dimensions

Calculated ACFM (desired)	.764
Probe Tip Diameter	.187
CO_2	0
O_2	21
CO	0
N_2	72
% H_2O	2%

Leak CK: Inital at 15" Hg, CFM 0.0
Final at 5" Hg, CFM 0.0

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3 136.845 Desired	Actual	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\,in}$), °F	OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F
	0	1215											
1-5	5	1220	140.67	—	1.4	1.9	1.9	110	104	93	5	N/A	68
	10	1225	144.49	144.22			1.9		104	93	5		70
	15	1230	148.31	147.98			1.85		109	94	5		70
	20	1235	152.13	151.64			1.85		111	96	5		69
	25	1240	155.95	155.25			2.1		112	97	5		70
	30	1245	159.77	159.42			2.2		112	98	5		71
	35	1250	163.59	163.54			2.2		113	98	5		72
	40	1255	167.41	167.41			2.0		115	99	5		70
	45	1300	171.23	171.27			2.0		115	100	4		68
	50	1305	175.05	175.13			2.0		115	100	4		69
	55	1310 / 1320	178.87	178.77			1.95		114	101	4		69
	60	1325	182.69	182.62			2.0		105	99	4		70
	65	1330	186.51	186.47			2.0		110	99	4		67
	70	1335	190.33	190.33			2.0		111	99	4		68
	75	1340	194.15	194.16			2.0		113	101	4		68
	80	1345	197.97	198.03			2.0		113	101	4		68
	85	1350	201.79	201.93			2.0		113	101	4		68
	90	1355	205.61	205.66			1.95		114	103	4		68
	95	1400	209.43	209.48			1.95		114	102	4		69
	100	1405	213.25	213.30			1.95		115	102	4		68
	105	1410	217.07	217.22			1.95		114	102	4		68
	110	1415	220.89	221.01			1.95		115	103	4		68
	115	1420	224.71	224.74			1.9		114	102	4		69

COMMENTS: a) Power Outage Restart 11:20

EPA (Dur) 235
4 72

TRAVERSE POINT NUMBER	SAMPLING TIME min / CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m) ft³		VELOCITY HEAD (Δp_s) in H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH) in H_2O		STACK TEMPERATURE (T_s) °F	DRY GAS METER TEMPERATURE		PUMP VACUUM in Hg	SAMPLE BOX TEMPERATURE °F	IMPINGER TEMPERATURE °F
		Desired 224.74	Actual 224.74		DESIRED	ACTUAL		INLET ($T_{m\,in}$) °F	OUTLET ($T_{m\,out}$) °F			
	115 / 1420											
1-5	120 / 1425	228.53	228.54	1.4	1.9	1.95	110	107	102	4	N/A	68
	125 / 1430	232.35	232.34			1.95		116	103	4		68
	130 / 1435	236.17	236.14			1.95		116	103	4		68
	135 / 1440	239.99	239.94			1.95		116	104	4		68
	140 / 1445	243.81	243.74			1.95		118	104	4		70
	145 / 1450	247.63	247.56			1.95		119	105	4		68
	150 / 1455	251.45	251.34			1.95		118	105	4		67
	155 / 1500	255.27	255.24			1.95		117	105	4		68
	160 / 1505	259.09	259.09			1.95		118	105	4		68
	165 / 1510	262.91	262.91			1.95		118	105	4		68
	170 / 1515	266.78	266.76			1.95		117	105	4		68
	175 / 1520	270.58	270.59			1.95		117	105	4		69
	180 / 1525	274.34	274.44			1.95		118	105	4		70
		V_m = 137.595			ΔH = 1.97			T_m = 107.4				

A-142

Run Number One

Date 8-14-80

Sampling Location Bypass B

Comments:

EPA (Dur) 236
4 72

ISOKINETIC PERFORMANCE WORKSHEET

Plant Columbia Hydrogen
Sampling Location Bypass R - West Port
Test Number One TP5

Date 8-14-80
Initial GC

Isokinetic equation:

$$\% I = \frac{1{,}039(Ts_{avg}+460)(Vm_{std})}{Vs(\theta)(Ps)(Mf)(Dn^2)}$$

Average stack temperature, °F	Ts_{avg}	110
Meter volume (std), $\frac{17.64(Vm)\left(Pb+\frac{\Delta H_{avg}}{13.6}\right)}{Tm+460}$ Vm = 137.595, ΔH = 1.97, Tm = 107.4, Pb = 29.9	Vm_{std}	128.52
Mole fraction dry gas, $\frac{100-\% H_2O}{100}$	Mf	.98
Molecular wt. dry stack gas, lb/lb-mole $(\%CO_2 \times 0.44) + (\%O_2 \times 0.32) + (\%N_2 + \%CO \times 0.28)$	Md	28.84
Molecular wt. stack gas, lb/lb-mole $(Md)(Mf) + 18(1 - Mf)$	Ms	28.62
Static pressure in stack, absolute, in. Hg $(Pb) \pm (0.074 \times$ stack gage pressure, in $H_2O)$	Ps	29.91
Stack velocity, fpm $5{,}128.8\ (Cp)\left(\sqrt{\Delta Ps_{avg}}\right)\sqrt{\frac{Ts+460}{Ps \times Ms}}$ ΔP = 1.4	Vs	4160
Total sample time, minutes	θ	180
Nozzle diameter, inches	Dn	.187
$\frac{1{,}039\ (110 + 460)(128.52)}{(4160)(180)(29.91)(.98)(.187^2)}$	% I	99.19

PARTICULATE SAMPLE RECOVERY AND INTEGRITY

Plant COLUMBIA NITROGEN CORP
Sample Location BYPASS STACK B TP5
Sample Box No. 3
Sample Type NH_4NO_3

Run No. 8
Sample Date 8/14/80
Recovery Date 8/14/80
Cleanup Person DW

Filter No.
Sample No.
Sample Material Description

MOISTURE AND/OR SAMPLE

Impinger Sequence	1	2	3	4	5
Impinger Type a/	M	S	M	M	M
Impinger Solution	H_2O	H_2O	H_2SO_4	—	SiO_2
Final Volume (wt) b/	134ml	108	100ml	—	~~[illegible]~~ 705.7g
Initial Volume (wt) b/	100ml	100ml	100ml	—	684.2g
Net Volume (wt) b/	34ml	8ml	0		21.5g
Sample No.(s)	36	36			

Combined impinger contents, Sample No.
Liquid Level Marked ✓ Container(s) Sealed ✓
Description of Impinger Solution CLEAR
Total Moisture, gm 63.5g

SILICA GEL

Silica Gel
Color

a/ S = Greenburg-Smith standard, M = Modified, O = Other
b/ Indicate value in units, ml or gm

RECOVERED SAMPLE

Probe Rinse: Sample No. 36
Liquid Level Marked ✓
Sealed ✓

Impinger Rinse: Sample No. 36
Liquid Level Marked ✓
Sealed ✓

Water Blank: Sample No.
Liquid Level Marked

Dry Catch: Sample No.
Description
Sealed

Acetone Blank: Sample No.
Liquid Level Marked
Sealed

Filter Blank: Sample No.
Sealed

Sample Disposition
Carrier HANSEN-COBB
Date Shipped: 8/16/80
Remarks:

Date of laboratory custody
Personnel accepting custody
Remarks: H_2SO_4=1 N IMPINGER # 3,4
~~* DID NOT TAKE [illegible]~~

Seal(s) broken by
Date broken

MIDWEST RESEARCH INSTITUTE

Particle Sizing - Andersen

RUN one

MRI Project Number 4468-L(37)
Field Dates 8-11 Thru 8-16-80
Plant Columbia Nitrogen Corp
Sampling Location Bypass Stack C (CTP6)
Sampling Date 8-15-80

FIELD CREW

Crew Chief: Ken Wilcox

Testing Engineer: 1 Mark Hansen; 2; 3

Engr. Technician: 1; 2; 3

Lab Technician: 1 Tom Walker; 2; 3

Process Engineer: 1; 2

Other: 1; 2

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT Columbia Nitrogen Corp.
DATE 8-15-80
SAMPLING LOCATION Prill Tower Bypass C
INSIDE OF FAR WALL TO
OUTSIDE OF NIPPLE. (DISTANCE A) N/A
INSIDE OF NEAR WALL TO
OUTSIDE OF NIPPLE. (DISTANCE B) N/A
STACK I.D.. (DISTANCE A - DISTANCE B) 59½"
NEAREST UPSTREAM DISTURBANCE 20' 10"
NEAREST DOWNSTREAM DISTURBANCE 9'
CALCULATOR

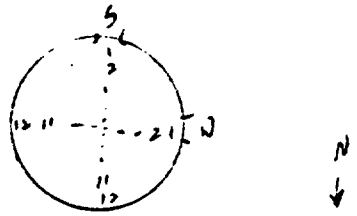
SCHEMATIC OF SAMPLING LOCATION

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1 8 INCH)	DISTANCE B	TRAVERSE POINT LOCATION FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
	Same as		Bypass A		

EPA (Duri 232
4 72

PRELIMINARY VELOCITY TRAVERSE

PLANT Columbia Nitrogen Corp.
DATE 8-12-80 1730 - 1742
LOCATION Bypass - C
STACK I.D. 59½
BAROMETRIC PRESSURE, in. Hg 29.75
STACK GAUGE PRESSURE, in. H_2O -2.35
OPERATORS TRC) MAA + KTK



SCHEMATIC OF TRAVERSE POINT LAYOUT

Port South - C

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	1.05	116
2	1.25	115
3	1.25	116
4	1.15	115
5	1.04	115
6	.930	114
7	1.50	118
8	1.55	116
9	1.75	117
10	1.75	120
11	1.70	119
12	1.45	120
AVERAGE	1.35	116.75

1.265
116.9

Port West - C

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	.850	119
2	1.08	118
3	1.25	117
4	1.30	117
5	1.35	117
6	1.20	115
7	1.40	122
8	1.30	116
9	1.25	120
10	1.15	121
11	1.10	119
12	1.00	116
AVERAGE	1.18	118.08

ANDERSEN SAMPLING CALCULATIONS

Plant Columbia Nitrogen Corp. Date 8-15-80
Sampling Location Bypass Stack C (TP6) Initial MDH
Test No. One
South port 1-3

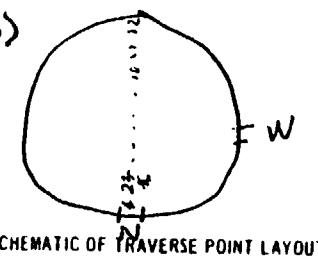
Velocity head at sampling location, in. H_2O	ΔPs	1.25
Stack temperature at sample point, °F	Ts	116
Barometric pressure, in. Hg	Pb	29.92
Static pressure in stack, in. Hg (Pb) $\pm$ (0.074 x gage pressure, in. H_2O) $-.235$	Ps	29.94
Percent moisture in gas stream by volume	% H_2O	2
Mole fraction, dry gas $\frac{100 - \% H_2O}{100}$	Mf	.98
Molecular wt. dry stack gas, lb/lb-mole (% CO_2 x 0.44) + (% O_2 x 0.32) + (% N_2 + % CO x 0.28)	Md	28.84
Molecular wt. stack gas, lb/lb-mole (Md) (Mf) + 18(1 - Mf)	Ms	28.62
Stack velocity, fpm $5{,}128.8\ (Cp)\ (\sqrt{\Delta Ps})\ \sqrt{\frac{Ts + 460}{Ps \times Ms}}$	Vs	3949
Calculated nozzle diameter, in. $24\sqrt{\frac{Fs/Vs}{\pi}}$, where Fs = 0.5 to 0.75 ft^3/min	D_{n_c}	.152 .187
Actual nozzle diameter, in.	D_{n_a}	.187
Assumed meter temperature, °F	Tm	95
Isokinetic sample rate, stack conditions, ft^3/min $Vs\ (0.00694)\ (\pi)\left(\frac{Dn_a}{2}\right)^2$	Fs	.753
Calculated meter flow rate, ft^3/min $Fs\left(\frac{Tm+460}{Ts+460}\right)\left(\frac{Ps}{Pb}\right)(Mf)$	Fm	.712

FIELD DATA - ANDERSEN

North port 1-3

PLANT Columbia Nitrogen Corp.
DATE 8-15-80
SAMPLING LOCATION Bypass Stack C (TP6)
SAMPLE TYPE Particle Size
RUN NUMBER One
OPERATOR Hansen
AMBIENT TEMPERATURE 77°F
BAROMETRIC PRESSURE 29.92
STATIC PRESSURE, (P_s) -.235
Filter Set NA

Leak CK: Inital at 15" Hg, CFM .005
Final at 4" Hg, CFM 0.0



SCHEMATIC OF TRAVERSE POINT LAYOUT with Dimensions

Calculated ACFM (desired) .712
Probe Tip Diameter .187
CO_2 0
O_2 21
CO 0
N_2 79
% H_2O 2

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft³ 332.85 Desired	Actual	VELOCITY HEAD (Δp_s), in. H_2O 1.25	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F 116	DRY GAS METER TEMPERATURE INLET ($T_{m\,in}$), °F	OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F NA	IMPINGER TEMPERATURE, °F
	0	0915											
1-3	5	0920	336.41	336.26		1.7	1.65		86	80	4		70
	10	0925	339.97	339.79			1.7		90	81	4		70
	15	0930	343.53	343.42			1.7		96	83	4		64
	20	0935	347.09	346.87			1.7		99	85	4		63
	25	0940	350.65	350.45			1.75		103	88	4		62
	30	0945	354.21	354.09			1.8		105	89	4		62
	35	0950	357.77	357.73			1.8		107	91	4		62
	40	0955	361.33	361.37			1.75		109	93	4		62
	45	1000	364.89	365.03			1.75		111	95	4		62
	50	1005	368.45	368.63			1.75		112	96	3.5		62
	55	1010	372.01	372.24			1.7		114	98	3.5		62
	60	1015	375.57	375.77			1.7		113	99	3.5		63
	65	1020	379.13	379.37			1.7		114	101	3.5		63
	70	1025	382.69	382.94			1.7		113	101	3.5		61
	75	1030	386.25	386.44			1.65		111	101	3.25		62
	80	1035	389.81	389.99			1.6		107	101	3		63
	85	1040	393.37	393.47			1.6		104	99	3		63
	90	1045	396.93	396.94			1.6		102	98	3		63
	95	1050	400.49	400.39			1.6		102	97	3		64
	100	1055	404.05	403.88			1.6		100	96	3		64
	105	1100	407.61	407.37			1.65		99	95	3		65
	110	1105	411.17	410.87			1.65		100	94	3.5		65
	115	1110	414.73	414.39			1.7		100	94	3.5		65

COMMENTS: A rafter here north rather than south

EPA (Dur) 235
4 72

TRAVERSE POINT NUMBER	SAMPLING TIME min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m) ft³ Desired	GAS METER READING (V_m) ft³ Actual	VELOCITY HEAD (Δp_s) in H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH) in H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH) in H_2O ACTUAL	STACK TEMPERATURE (T_s) °F	DRY GAS METER TEMPERATURE INLET ($T_{m\,in}$) °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\,out}$) °F	PUMP VACUUM in Hg	SAMPLE BOX TEMPERATURE °F	IMPINGER TEMPERATURE °F
					1.25			116				NA	
1-3	120	1115	418.29	417.94		1.7	1.7		100	93	3.5		65
	125	1120	421.85	421.55			1.7		100	93	3.5		66
	130	1125	425.41	425.16			1.70		100	93	3.5		66
	135	1130	428.97	428.77			1.75		102	93	4		66
	140	1135	432.53	432.33			1.75		103	94	4		66
	145	1140	436.09	436.03			1.8		106	95	4		66
	150	1145	439.65	439.65			1.75		103	95	4		65
	155	1150	443.21	443.28			1.75		102	95	4		63
	160	1155	446.77	446.91			1.75		103	95	4		63
	165	1200	450.33	450.49			1.7		103	95	4		63
	170	1205	453.89	354.02			1.7		103	95	3.75		63
	175	1210	457.45	457.52			1.65		104	96	3.75		64
	180	1215	461.01	461.02			1.65		104	96	3.75		64
			Vm =	128.17			ΔH_{avg} =	1.699		$T_{m\,avg}$ =	98.79		

A-150

Run Number One

Date 8-15-80

Sampling Location Bypass Stack C (TP6) ~~South~~ North Port

Comments:

EPA (Dun) 236
4 72

ISOKINETIC PERFORMANCE WORKSHEET

Plant Columbia Nitrogen Corp. Date 8-15-80
Sampling Location Prill Tower Bypass Stack C Initial MOH
Test Number One (TP6)

Isokinetic equation:

$$\% I = \frac{1{,}039(Ts_{avg}+460)(Vm_{std})}{Vs(\theta)(Ps)(Mf)(Dn^2)}$$

Average stack temperature, °F	Ts_{avg}	116
Meter volume (std), $\frac{17.64(Vm)\left(Pb+\frac{\Delta H_{avg}}{13.6}\right)}{Tm+460}$ $\Delta H = 1.699$ $V_m = 123.17$ $T_m = 98.79$	Vm_{std}	121.56
Mole fraction dry gas, $\frac{100-\%\ H_2O}{100}$	Mf	.98
Molecular wt. dry stack gas, lb/lb-mole $(\%CO_2 \times 0.44) + (\%O_2 \times 0.32) + (\%N_2 + \%CO \times 0.28)$	Md	28.84
Molecular wt. stack gas, lb/lb-mole (Md) (Mf) + 18(1 - Mf)	Ms	28.62
Static pressure in stack, absolute, in. Hg (Pb) ± (0.074 x stack gage pressure, in H_2O)	Ps	29.94
Stack velocity, fpm ΔPs 1.25 $5{,}128.8\ (Cp)\left(\sqrt{\Delta Ps_{avg}}\right)\sqrt{\frac{Ts+460}{PsxMs}}$	Vs	3949
Total sample time, minutes	θ	180
Nozzle diameter, inches	Dn	.187
$\frac{1{,}039\ (116 + 460)(121.56)}{(3949)(180)(29.94)(.98)(.187^2)}$	% I	99.75

PARTICULATE SAMPLE RECOVERY AND INTEGRITY

Plant COLUMBIA NITROGEN CORP
Sample Location AUGUSTA, GA BYPASS STACK
Sample Box No. #7 TP6
Sample Type NH4NO3

Run No. 10
Sample Date 8/15
Recovery Date 8/15
Cleanup Person CWJ

Filter No.
Sample No.
Sample Material Description

MOISTURE AND/OR SAMPLE

Impinger Sequence	1	2	3	4	5
Impinger Type[a]	M	S	M	M	M
Impinger Solution	H_2O	H_2O	H_2SO_4	—	SiO_2
Final Volume (wt)[b]	—	—	—	—	—
Initial Volume (wt)[b]	100g	100g	100g	—	69.7g
Net Volume (wt)[b]					
Sample No.(s)	45	45			

Combined impinger contents, Sample No.
Liquid Level Marked ✓ Container(s) Sealed ✓
Description of Impinger Solution CLEAR
Total Moisture, gm

SILICA GEL

Silica Gel
Color LIGHT BLUE

[a] S = Greenburg-Smith standard, M = Modified, O = Other
[b] Indicate value in units, ml or gm

RECOVERED SAMPLE

Probe Rinse: Sample No. 45
Liquid Level Marked ✓
Sealed ✓

Impinger Rinse: Sample No. 45
Liquid Level Marked ✓
Sealed ✓

Water Blank: Sample No.
Liquid Level Marked

Dry Catch: Sample No.
Description
Sealed

Acetone Blank: Sample No.
Liquid Level Marked
Sealed

Filter Blank: Sample No.
Sealed

Sample Disposition
Carrier LANFEN Date Shipped: 8/16/80
Remarks:

Date of laboratory custody
Personnel accepting custody
Remarks: WATER 35

Seal(s) broken by
Date broken

MIDWEST RESEARCH INSTITUTE

Particle Sizing - Andersen

RUN One

MRI Project Number 4468-237
Field Dates 8-11 thru 8-16-80
Plant Columbia Dietzen
Sampling Location Dryer ~~Outlet~~ IP2
Sampling Date 8-15-80

FIELD CREW

Crew Chief M. Hansen

Testing Engineer 1 P. Cobb
2
3

Engr. Technician 1
2
3

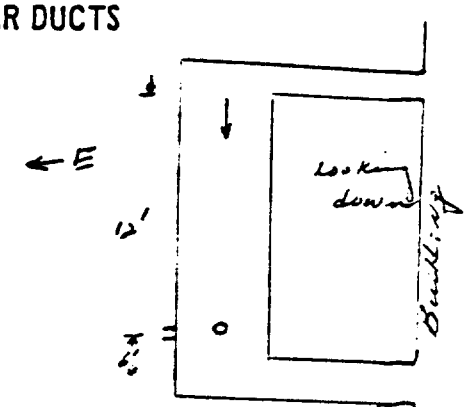
Lab Technician 1 T. Wilkes
2 K. Wilcox
3

Process Engineer 1
2

Other 1
2

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT Columbia Nitrogen Corp
DATE 8/13/80
SAMPLING LOCATION Baghouse Inlet
INSIDE OF FAR WALL TO
OUTSIDE OF NIPPLE. (DISTANCE A) N/A
INSIDE OF NEAR WALL TO
OUTSIDE OF NIPPLE. (DISTANCE B) N/A
STACK I.D.. (DISTANCE A - DISTANCE B) 53 1/2"
NEAREST UPSTREAM DISTURBANCE 12'
NEAREST DOWNSTREAM DISTURBANCE 6'
CALCULATOR (TRC) LAC



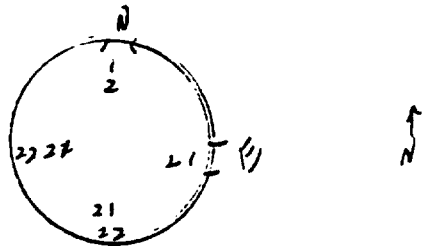
SCHEMATIC OF SAMPLING LOCATION

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1 8 INCH)	DISTANCE B	TRAVERSE POINT LOCATION FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
1	0.011	53 1/2"		N/A	1"
2	.035				1.87
3	.060				3.21
4	.087				4.65
5	.116				6.20
6	.146				7.81
7	.180				9.63
8	.218				11.66
9	.262				14.02
10	.315				16.85
11	.393				21.03
12	.607				32.47
13	.685				36.65
14	.738				39.48
15	.782				41.84
16	.820				43.87
17	.854				45.69
18	.884				47.29
19	.913				48.85
20	.940				50.29
21	.965				51.63
22	.989				52.50

EPA (Durl 232
4 72

PRELIMINARY VELOCITY TRAVERSE

PLANT Columbia Nitrogen Corp.
DATE 8-14-80
LOCATION
STACK I.D.
BAROMETRIC PRESSURE, in. Hg
STACK GAUGE PRESSURE, in. H_2O
OPERATORS



SCHEMATIC OF TRAVERSE POINT LAYOUT

East Port

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	.46	138
2	.64	139
3	.60	139
4	.63	135
5	.72	135
6	.52	136
7	.52	138
8	.52	137
9	.55	145
10	.54	147
11	.58	149
12	.58	149
13	.60	149
14	.62	149
15	.58	149
16	.59	149
17	.56	149
18	.55	149
19	.41	149
20	.28	149
21	.31	149
22	.24	149
AVERAGE		

South (North) Port

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	.50	103
2	.44	109
3	.45	114
4	.44	126
5	.45	132
6	.38	135
7	.40	136
8	.43	136
9	.45	145
10	.50	146
11	.53	148
12	.64	148
13	.66	148
14	.68	148
15	.73	149
16	.70	149
17	.70	149
18	.71	149
19	.69	149
20	.68	144
21	.65	144
22	.62	144
AVERAGE	.73	141.6

ANDERSEN SAMPLING CALCULATIONS

Plant Columbia Nitrogen
Sampling Location Dryer Inlet
Test No. One

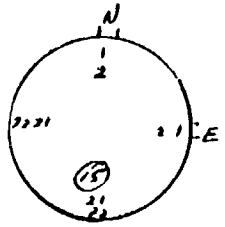
Date 8-15-80
Initial AC

Velocity head at sampling location, in. H_2O	ΔPs	.73
Stack temperature at sample point, °F	Ts	149
Barometric pressure, in. Hg	Pb	29.92
Static pressure in stack, in. Hg (Pb) ± (0.074 x gage pressure, in. H_2O) — SP = -1.77	Ps	30.05
Percent moisture in gas stream by volume	% H_2O	2
Mole fraction, dry gas $\frac{100 - \% H_2O}{100}$	Mf	.98
Molecular wt. dry stack gas, lb/lb-mole (% CO_2 x 0.44) + (% O_2 x 0.32) + (% N_2 + % CO x 0.28)	Md	28.84
Molecular wt. stack gas, lb/lb-mole (Md) (Mf) + 18(1 - Mf)	Ms	28.62
Stack velocity, fpm — Cp = .84 $5,128.8\ (Cp)\left(\sqrt{\Delta Ps}\right)\sqrt{\frac{Ts + 460}{Ps \times Ms}}$	Vs	3097
Calculated nozzle diameter, in. $24\sqrt{\frac{Fs/Vs}{\pi}}$, where Fs = 0.5 to 0.75 ft^3/min	D_{n_c}	.172 .210
Actual nozzle diameter, in.	D_{n_a}	.187
Assumed meter temperature, °F	Tm	95
Isokinetic sample rate, stack conditions, ft^3/min $Vs\ (0.00694)\ (\pi)\left(\frac{Dn_a}{2}\right)^2$	Fs	.590
Calculated meter flow rate, ft^3/min $Fs\left(\frac{Tm+460}{Ts+460}\right)\left(\frac{Ps}{Pb}\right)(Mf)$	Fm	.529

FIELD DATA - ANDERSEN

PLANT Columbia Nitrogen Corp.
DATE 8-15-80
SAMPLING LOCATION Dryer Inlet
SAMPLE TYPE NCSS - Anderson
RUN NUMBER One
OPERATOR G. Cobb
AMBIENT TEMPERATURE 80
BAROMETRIC PRESSURE 29.92
STATIC PRESSURE, (P_s) -1.77
Filter Set N/A

Leak CK: Inital at 15" Hg, CFM 0.05
Final at 5" Hg, CFM 0.0



SCHEMATIC OF TRAVERSE POINT LAYOUT with Dimensions

Calculated ACFM (desired) .529
Probe Tip Diameter .187
CO_2 0
O_2 21
CO 0
N_2 79
% H_2O 2%

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3 912.20 Desired	Actual	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\,in}$), °F	OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F
	0	11:25											
S-15	5	11:30	914.85	915.1	.73	.82	.84	149	92	88	4	N/A	74
	10	11:35	917.49	917.83			.84		95	89	5		66
	15	11:40	920.14	920.60			.82		99	90	5		66
	20	11:45	922.78	923.08			.81		102	92	5		66
	25	11:50	925.43	925.7			.82		103	93	5		66
	31.5	11:56.5	928.07	928.8			.81		106	96	4		66
						ΔH =	.823		T_m =	95.4			
			V_m = 16.6										

COMMENTS: a) South is actually North

EPA (Dur) 235
4 72

ISOKINETIC PERFORMANCE WORKSHEET

Plant Columbia Nitrogen Corp. Date 8-15-80
Sampling Location Dryer Inlet Initial CC
Test Number One

Isokinetic equation:

$$\% I = \frac{1{,}039(Ts_{avg}+460)(Vm_{std})}{Vs(\theta)(Ps)(Mf)(Dn^2)}$$

Average stack temperature, °F	Ts_{avg}	149
Meter volume (std), $\frac{17.64(Vm)\left(Pb+\frac{\Delta H_{avg}}{13.6}\right)}{Tm+460}$ $\Delta H = .823$ $\theta = 34.92$ $Tm = 95.4$ $Vm = 16.6$	Vm_{std}	15.81
Mole fraction dry gas, $\frac{100-\%\ H_2O}{100}$	Mf	.98
Molecular wt. dry stack gas, lb/lb-mole $(\%CO_2 \times 0.44) + (\%O_2 \times 0.32) + (\%N_2 + \%CO \times 0.28)$	Md	28.84
Molecular wt. stack gas, lb/lb-mole (Md) (Mf) + 18(1 - Mf)	Ms	28.62
Static pressure in stack, absolute, in. Hg (Pb) ± (0.074 x stack gage pressure, in H_2O)	Ps	30.05
Stack velocity, fpm $5{,}128.8\ (Cp)\left(\sqrt{\Delta Ps_{avg}}\right)\sqrt{\frac{Ts+460}{Ps \times Ms}}$	Vs	3097
Total sample time, minutes	θ	31.5
Nozzle diameter, inches	Dn	.187
$\frac{1{,}039\ (149 + 460)(15.81)}{(3097)(31.5)(30.05)(.98)(.187^2)}$	% I	99.57

PARTICULATE SAMPLE RECOVERY AND INTEGRITY

Plant COLUMBIA NITROGEN CORP
Sample Location DRYER EXHAUST TP2
Sample Box No. 2
Sample Type NH_4NO_3

Run No. 11
Sample Date 8/15
Recovery Date 8/15
Cleanup Person DW

Filter No.
Sample No.
Sample Material Description

MOISTURE AND/OR SAMPLE

Impinger Sequence	1	2	3	4	5
Impinger Type[a]	M	S	M	M	M
Impinger Solution	H_2O	H_2O	H_2SO_4	—	SiO_2
Final Volume (wt)[b]					
Initial Volume (wt)[b]	100 ml	100 ml	100 ml	—	—
Net Volume (wt)[b]					
Sample No.(s)	50	50			

Combined impinger contents, Sample No.
Liquid Level Marked ✓ Container(s) Sealed ✓
Description of Impinger Solution CLEAR
Total Moisture, gm

SILICA GEL

Silica Gel Color LIGHT BLUE

a/ S = Greenburg-Smith standard, M = Modified, O = Other
b/ Indicate value in units, ml or gm

RECOVERED SAMPLE

Probe Rinse: Sample No. 50
Liquid Level Marked ✓
Sealed ✓

Impinger Rinse: Sample No. 50
Liquid Level Marked ✓
Sealed ✓

Water Blank: Sample No.
Liquid Level Marked

Dry Catch: Sample No.
Description
Sealed

Acetone Blank: Sample No.
Liquid Level Marked
Sealed

Filter Blank: Sample No.
Sealed

Sample Disposition
Carrier HANSEN-GBB Date Shipped: 8/16/80
Remarks:

Date of laboratory custody
Personnel accepting custody
Remarks: IMPINGER 3M4

Seal(s) broken by
Date broken

MIDWEST RESEARCH INSTITUTE

Particle Sizing - Andersen

RUN Two

MRI Project Number 4468-L37
Field Dates
Plant Columbia Nitrogen Corp.
Sampling Location Dryer Inlet
Sampling Date 8-12-80

FIELD CREW

Crew Chief M. Hansen

Testing Engineer 1 G. Cobb
2
3

Engr. Technician 1
2
3

Lab Technician 1 T. Walker
2 K. W. Cox
3

Process Engineer 1
2

Other 1
2

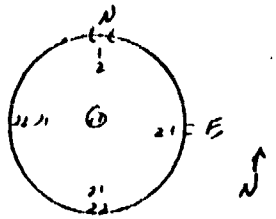
ANDERSEN SAMPLING CALCULATIONS

Plant Columbia Nitrogen Corp. Date 8-15-70
Sampling Location Dryer Inlet Initial G.C.
Test No. Test

Velocity head at sampling location, in. H_2O	ΔPs	.53
Stack temperature at sample point, °F	Ts	148
Barometric pressure, in. Hg	Pb	29.92
Static pressure in stack, in. Hg (Pb) $\pm$ (0.074 x gage pressure, in. H_2O)	Ps	30.05
Percent moisture in gas stream by volume	% H_2O	.2
Mole fraction, dry gas $\frac{100 - \% H_2O}{100}$	Mf	.98
Molecular wt. dry stack gas, lb/lb-mole (% CO_2 x 0.44) + (% O_2 x 0.32) + (% N_2 + % CO x 0.28)	Md	28.84
Molecular wt. stack gas, lb/lb-mole (Md) (Mf) + 18(1 - Mf)	Ms	28.62
Stack velocity, fpm $5{,}128.8\ (Cp)\ (\sqrt{\Delta Ps})\ \sqrt{\frac{Ts + 460}{Ps \times Ms}}$	Vs	2637
Calculated nozzle diameter, in. $24\sqrt{\frac{Fs/Vs}{\pi}}$, where Fs = 0.5 to 0.75 ft^3/min	D_{n_c}	.186 to
Actual nozzle diameter, in.	D_{n_a}	.187
Assumed meter temperature, °F	Tm	105
Isokinetic sample rate, stack conditions, ft^3/min $Vs\ (0.00694)\ (\pi)\left(\frac{Dn_a}{2}\right)^2$	Fs	.502
Calculated meter flow rate, ft^3/min $Fs\left(\frac{Tm+460}{Ts+460}\right)\left(\frac{Ps}{Pb}\right)$ (Mf)	Fm	.459

FIELD DATA - ANDERSEN

PLANT Columbia U. Oxygen Corp.
DATE 8-15-80
SAMPLING LOCATION Dryer Outlet
SAMPLE TYPE HCSS Hardenson
RUN NUMBER Two
OPERATOR G.C.
AMBIENT TEMPERATURE 90
BAROMETRIC PRESSURE 29.92
STATIC PRESSURE, (P_s) -1.77
Filter Set N/A



SCHEMATIC OF TRAVERSE POINT LAYOUT

Calculated ACFM (desired) .459
Probe Tip Diameter .187
CO_2 0
O_2 21
CO 0
N_2 79
% H_2O 2%

Leak CK: Inital at 15" Hg, CFM 0.015
Final at 5" Hg, CFM ~~0.175~~ 0.017 with Dimensions

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3 931.8 Desired	Actual	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\,in}$), °F	OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F
	0	1440											
a) S-11	3	1443	933.18	—	.53	.52	.52	148	100	98	5	N/A	66
	6	1446	934.56	934.61			.52		101	98	5		65
	9	1449	935.93	935.92			.52		103	98	5		65
	12	1452	937.31	937.25	—		.52		104	99	5		65
	15	1455	938.69	938.20			.52		105	99	5		65
	~~12~~	1458	~~940.065~~										
	14	1501	a										
	16	1504											
			Vm = 6.9			ΔH =	.52		T_m =	100.5			

COMMENTS: a) actually North port.

EPA (Dur) 235
4 72

ISOKINETIC PERFORMANCE WORKSHEET

Plant Columbia Nitrogen Corp.
Sampling Location Digester Unit
Test Number Test 1

Date 8-15-80
Initial G.C

Isokinetic equation:

$$\% I = \frac{1{,}039(Ts_{avg}+460)(Vm_{std})}{Vs(\theta)(Ps)(Mf)(Dn^2)}$$

Average stack temperature, °F	Ts_{avg}	148
Meter volume (std), $\frac{17.64(Vm)\left(Pb+\frac{\Delta H_{avg}}{13.6}\right)}{Tm+460}$ Pb = 29.92, ΔH = .52, Tm = 100.5, Vm = 6.9	Vm_{std}	6.51
Mole fraction dry gas, $\frac{100-\%\ H_2O}{100}$	Mf	.96
Molecular wt. dry stack gas, lb/lb-mole $(\%CO_2 \times 0.44) + (\%O_2 \times 0.32) + (\%N_2 + \%CO \times 0.28)$	Md	28.84
Molecular wt. stack gas, lb/lb-mole (Md) (Mf) + 18(1 - Mf)	Ms	28.62
Static pressure in stack, absolute, in. Hg (Pb) ± (0.074 x stack gage pressure, in H_2O)	Ps	30.05
Stack velocity, fpm $5{,}128.8\ (Cp)\left(\sqrt{\Delta Ps_{avg}}\right)\sqrt{\frac{Ts+460}{PsxMs}}$ ΔP = .53	Vs	2637
Total sample time, minutes	θ	15
Nozzle diameter, inches	Dn	.187
$\frac{1{,}039\ (148 + 460)(6.51)}{(2637)(15)(30.05)(.98)(.187^2)}$	% I	101

PARTICULATE SAMPLE RECOVERY AND INTEGRITY

Plant COLUMBIA NITROGEN CORP
Sample Location DRYER EXHAUST TP2
Sample Box No. 4
Sample Type NH_4NO_3

Run No. 13
Sample Date 8/15
Recovery Date 8/15
Cleanup Person JW

Filter No.
Sample No.
Sample Material Description

MOISTURE AND/OR SAMPLE

Impinger Sequence	1	2	3	4	5
Impinger Type a/	M	S	M	M	M
Impinger Solution	H_2O	H_2O	H_2SO_4	-	SiO_2
Final Volume (wt) b/					
Initial Volume (wt) b/	100	100	100	-	-
Net Volume (wt) b/					
Sample No.(s)	59	59			

Combined impinger contents, Sample No.
Liquid Level Marked ✓ Container(s) Sealed ✓
Description of Impinger Solution CLR
Total Moisture, gm

SILICA GEL

Silica Gel
Color LIGHT BLUE

a/ S = Greenburg-Smith standard, M = Modified, O = Other
b/ Indicate value in units, ml or gm

RECOVERED SAMPLE

Probe Rinse: Sample No. 59
Liquid Level Marked ✓
Sealed ✓

Impinger Rinse: Sample No. 59
Liquid Level Marked ✓
Sealed ✓

Water Blank: Sample No.
Liquid Level Marked

Dry Catch: Sample No.
Description
Sealed

Acetone Blank: Sample No.
Liquid Level Marked
Sealed

Filter Blank: Sample No.
Sealed

Sample Disposition
Carrier HABEN GBB Date Shipped: 8/16/80
Remarks:

Date of laboratory custody
Personnel accepting custody
Seal(s) broken by
Date broken
Remarks: ENLY A 15 MIN RUN

MIDWEST RESEARCH INSTITUTE

Particle Sizing - Andersen

RUN Three

MRI Project Number 4468L-37
Field Dates 8-11 thru 8-16-80
Plant Columbia Nitrogen Corp.
Sampling Location Dryer Inlet
Sampling Date 9-15-80

FIELD CREW

Crew Chief		M. Hansen
Testing Engineer	1	E. Cobb
	2	E
	3	
Engr. Technician	1	
	2	
	3	
Lab Technician	1	T. Walker
	2	K. Wilcox
	3	
Process Engineer	1	
	2	
Other	1	
	2	

MRI - Form PO (10/72)

ANDERSEN SAMPLING CALCULATIONS

Plant Columbia Nitrogen Corp.
Sampling Location Dryer Inlet
Test No. Three

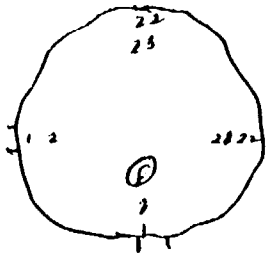
Date 8-15-80
Initial G.E.

Velocity head at sampling location, in. H_2O	ΔPs	.43
Stack temperature at sample point, °F	Ts	136
Barometric pressure, in. Hg	Pb	29.92
Static pressure in stack, in. Hg (Pb) ± (0.074 x gage pressure, in. H_2O)	Ps	30.05
Percent moisture in gas stream by volume	% H_2O	2%
Mole fraction, dry gas $\frac{100 - \% H_2O}{100}$	Mf	.98
Molecular wt. dry stack gas, lb/lb-mole (% CO_2 x 0.44) + (% O_2 x 0.32) + (% N_2 + % CO x 0.28)	Md	28.84
Molecular wt. stack gas, lb/lb-mole (Md) (Mf) + 18(1 - Mf)	Ms	28.62
Stack velocity, fpm $5{,}128.8\ (Cp)\left(\sqrt{\Delta Ps}\right)\sqrt{\frac{Ts + 460}{Ps \times Ms}}$	Vs	2352
Calculated nozzle diameter, in. $24\sqrt{\frac{Fs/Vs}{\pi}}$, where Fs = 0.5 to 0.75 ft^3/min	D_{n_c}	.197 to .241
Actual nozzle diameter, in.	D_{n_a}	.25
Assumed meter temperature, °F	Tm	105
Isokinetic sample rate, stack conditions, ft^3/min $Vs\ (0.00694)\ (\pi)\left(\frac{Dn_a}{2}\right)^2$	Fs	.801
Calculated meter flow rate, ft^3/min $Fs\left(\frac{Tm+460}{Ts+460}\right)\left(\frac{Ps}{Pb}\right)(Mf)$	Fm	.747

FIELD DATA - ANDERSEN

PLANT Columbia Nitrogen Corp.
DATE 8-15-80
SAMPLING LOCATION Dryer Inlet
SAMPLE TYPE HCSS - Andersen
RUN NUMBER Three
OPERATOR G.C. + K.W.
AMBIENT TEMPERATURE 95
BAROMETRIC PRESSURE 29.92
STATIC PRESSURE, (P_s) -1.27
Filter Set N/A

Leak CK: Inital at 15" Hg, CFM 0.0
Final at 6.5" Hg, CFM 0.0



SCHEMATIC OF TRAVERSE POINT LAYOUT with Dimensions

Building

N

Calculated ACFM (desired)	.747
Probe Tip Diameter	.25
CO_2	0
O_2	21
CO	0
N_2	79
% H_2O	2%

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3 941.501 Desired	Actual	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\,in}$), °F	OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F
	0	16.45											
S-8	5	1650	945.24	945.13	.43	1.6	1.6	136	99	95	6	N/A	65
	10	1655	948.98	948.79			1.7		105	95	6		65
	15	1700	952.71	952.55			1.75		111	97	6		65
	20	1705	956.45	956.35			1.75		116	99	6		67
	25	1710	960.18	960.15			1.75		117	100	6.5		67
	30	1715	963.92	963.88			1.7		117	102	6.5		67
	35	1720	967.65	967.59			1.65		119	103	6.5		67
	40	1725	971.39	971.33			1.7		122	105	6.5		69
	45	1730	975.12	975.06			1.7		123	107	6.4		70
			V_m =	33.579		ΔH = 1.7			T_m = 107.3				

COMMENTS: (a) actually north

EPA (Dur) 235
4 72

ISOKINETIC PERFORMANCE WORKSHEET

Plant Columbia W. Trojan
Sampling Location Dayne Inlet
Test Number Three

Date 8-15-80
Initial B.S.

Isokinetic equation:

$$\% I = \frac{1{,}039(Ts_{avg}+460)(Vm_{std})}{Vs(\theta)(Ps)(Mf)(Dn^2)}$$

Average stack temperature, °F	Ts_{avg}	136
Meter volume (std), $\frac{17.64(Vm)\left(Pb+\frac{\Delta H_{avg}}{13.6}\right)}{Tm+460}$ Pb = 29.92, ΔH = 1.7, Tm = 107.3, Vm = 33.579	Vm_{std}	31.37
Mole fraction dry gas, $\frac{100-\% H_2O}{100}$	Mf	.98
Molecular wt. dry stack gas, lb/lb-mole $(\%CO_2 \times 0.44) + (\%O_2 \times 0.32) + (\%N_2 + \%CO \times 0.28)$	Md	28.84
Molecular wt. stack gas, lb/lb-mole (Md) (Mf) + 18(1 - Mf)	Ms	28.62
Static pressure in stack, absolute, in. Hg (Pb) ± (0.074 x stack gage pressure, in H_2O)	Ps	30.05
Stack velocity, fpm $5{,}128.8\ (Cp)\left(\sqrt{\Delta Ps_{avg}}\right)\sqrt{\frac{Ts+460}{PsxMs}}$ ΔP = .43	Vs	2352
Total sample time, minutes	θ	45
Nozzle diameter, inches	Dn	.25
$\frac{1{,}039\ (136 + 460)(31.37)}{(2352)(45)(30.05)(.98)(.25^2)}$	% I	99.72

PARTICULATE SAMPLE RECOVERY AND INTEGRITY

Plant COLUMBIA NITROGEN CORP
Sample Location DRYER EXHAUST #2
Sample Box No.
Sample Type NH_4NO_3

Run No. 14
Sample Date 8/5
Recovery Date 8/5
Cleanup Person [illegible]

Filter No.
Sample No.
Sample Material Description

MOISTURE AND/OR SAMPLE

Impinger Sequence	1	2	3	4	5
Impinger Type a/	M	S	M	M	M
Impinger Solution	H_2O	H_2O	H_2SO_4	—	SiO_2
Final Volume (wt) b/					
Initial Volume (wt) b/	100ml	100ml	100ml	—	—
Net Volume (wt) b/					
Sample No.(s)	63	63			

Combined impinger contents, Sample No.
Liquid Level Marked ✓ Container(s) Sealed ✓
Description of Impinger Solution CLEAR
Total Moisture, gm

SILICA GEL

Silica Gel
Color LIGHT BLUE

a/ S = Greenburg-Smith standard, M = Modified, O = Other
b/ Indicate value in units, ml or gm

RECOVERED SAMPLE

Probe Rinse: Sample No. 63
Liquid Level Marked ✓
Sealed ✓

Impinger Rinse: Sample No. 63
Liquid Level Marked ✓
Sealed ✓

Water Blank: Sample No.
Liquid Level Marked

Dry Catch: Sample No.
Description
Sealed

Acetone Blank: Sample No.
Liquid Level Marked
Sealed

Filter Blank: Sample No.
Sealed

Sample Disposition
Carrier HANSEN - GOBS
Date Shipped: 8/16/80
Remarks:

Date of laboratory custody
Personnel accepting custody
Remarks: METER 314

Seal(s) broken by
Date broken

MIDWEST RESEARCH INSTITUTE

Particle Sizing - Andersen

RUN One

MRI Project Number 4468-137
Field Dates 8-11 thru 8-16-80
Plant Columbia Nitrogen Corp.
Sampling Location Precipitator Inlet
Sampling Date 8-16-80

FIELD CREW

Crew Chief M. Hansen

Testing Engineer 1 G Dodd
2
3

Engr. Technician 1
2
3

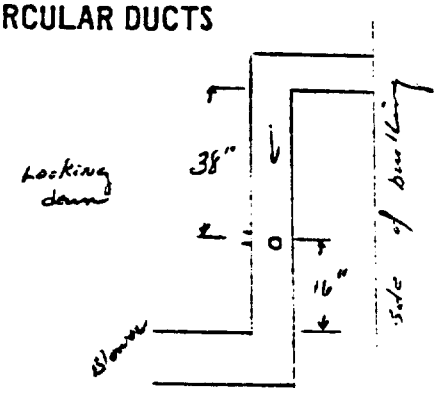
Lab Technician 1 T. Walker
2 K. Wilcox
3

Process Engineer 1
2

Other 1
2

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT Columbia Nitrogen Corp.
DATE 8-13-80
SAMPLING LOCATION Predryer
INSIDE OF FAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE A) _____
INSIDE OF NEAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE B) _____
STACK I.D., (DISTANCE A - DISTANCE B) 48"
NEAREST UPSTREAM DISTURBANCE _____
NEAREST DOWNSTREAM DISTURBANCE _____
CALCULATOR TRC

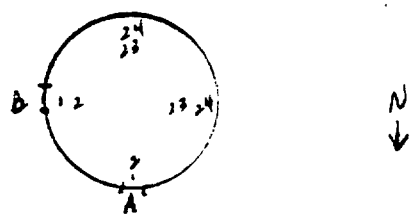


SCHEMATIC OF SAMPLING LOCATION

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8 INCH)	DISTANCE B	TRAVERSE POINT LOCATION FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
1	.011	48"	1.00	N/A	1.00
2	.032		1.54		1.54
3	.055		2.64		2.64
4	.074		3.79		3.79
5	.105		5.04		5.04
6	.132		6.34		6.34
7	.161		7.73		7.73
8	.194		9.31		9.31
9	.230		11.04		11.04
10	.270		12.96		12.96
11	.323		15.50		15.50
12	.348		19.1		19.1
13	.602		28.89		28.89
14	.677		32.49		32.49
15	.728		34.94		34.94
16	.770		36.96		36.96
17	.806		38.69		38.69
18	.839		40.27		40.27
19	.868		41.66		41.66
20	.895		42.96		42.96
21	.921		44.21		44.21
22	.945		45.36		45.36
23	.968		46.46		46.46
24	.989		47.00		47.00

PRELIMINARY VELOCITY TRAVERSE

PLANT Columbia Nitrogen Corp
DATE 8-14-80
LOCATION Pledmon
STACK I.D. 48"
BAROMETRIC PRESSURE, in. Hg
STACK GAUGE PRESSURE, in. H_2O -2.8
OPERATORS (TRC) EDA / CAP



SCHEMATIC OF TRAVERSE POINT LAYOUT

Port B

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	1.1	149
2	1.1	149
3	1.4	149
4	1.4	150
5	1.5	148
6	1.5	148
7	1.6	148
8	1.4	152
9	1.5	153
10	1.4	153
11	1.4	152
12	1.3	150
13	1.2	152
14	1.2	152
15	1.1	152
16	.95	152
17	.85	152
18	.79	152
19	.7	153
20	.65	152
21	.57	152
22	.50	152
23	.43	152
24	.40	152
AVERAGE		

Port A

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	.64	148
2	.62	148
3	.70	148
4	.85	149
5	.93	146
6	.94	150
7	.99	151
8	1.00	152
9	1.1	152
10	1.2	153
11	1.2	153
12	1.2	152
13	1.2	152
14	1.3	152
15	1.2	152
16	1.3	153
17	1.3	152
18	1.4	152
19	1.3	152
20	1.4	152
21	1.3	148
22	1.3	151
23	1.3	151
24	1.1	151
AVERAGE	1.036	151

EPA (Dur) 233
4 72

ANDERSEN SAMPLING CALCULATIONS

Plant Columbia Nitrogen Corp
Sampling Location Bridge Inlet
Test No. Case

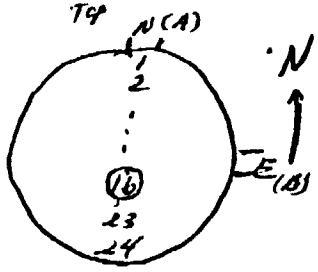
Date 7-16-80
Initial JC

Velocity head at sampling location, in. H_2O	ΔPs	1.3
Stack temperature at sample point, °F	Ts	153
Barometric pressure, in. Hg	Pb	29.88
Static pressure in stack, in. Hg (Pb) ± (0.074 x gage pressure, in. H_2O) $Sp = -2.8$	Ps	30.09
Percent moisture in gas stream by volume	% H_2O	2%
Mole fraction, dry gas $\frac{100 - \% H_2O}{100}$	Mf	.98
Molecular wt. dry stack gas, lb/lb-mole (% CO_2 x 0.44) + (% O_2 x 0.32) + (% N_2 + % CO x 0.28)	Md	28.84
Molecular wt. stack gas, lb/lb-mole (Md) (Mf) + 18(1 - Mf)	Ms	28.62
Stack velocity, fpm $5{,}128.8\ (Cp)\left(\sqrt{\Delta Ps}\right)\sqrt{\frac{Ts + 460}{Ps \times Ms}}$ *	Vs	4144
Calculated nozzle diameter, in. $24\sqrt{\frac{Fs/Vs}{\pi}}$, where Fs = 0.5 to 0.75 ft^3/min	D_{n_c}	.148 .192
Actual nozzle diameter, in.	D_{n_a}	.187
Assumed meter temperature, °F	Tm	95
Isokinetic sample rate, stack conditions, ft^3/min Vs (0.00694) $(\pi)\left(\frac{Dn_a}{2}\right)^2$	Fs	.79
Calculated meter flow rate, ft^3/min Fs $\left(\frac{Tm+460}{Ts+460}\right)\left(\frac{Ps}{Pb}\right)$ (Mf)	Fm	.706

FIELD DATA - ANDERSEN

PLANT Columbia Nitrogen Corp.
DATE 9-16-80
SAMPLING LOCATION Preheater Inlet
SAMPLE TYPE HCSS - Andersen
RUN NUMBER One (#4)
OPERATOR F.C.
AMBIENT TEMPERATURE 85
BAROMETRIC PRESSURE 27.88
STATIC PRESSURE, (P_s) - 2.8
Filter Set N/A

Leak CK: Inital at 15" Hg, CFM 0.01
Final at 8" Hg, CFM 0.01



SCHEMATIC OF TRAVERSE POINT LAYOUT with Dimensions

Calculated ACFM (desired)	.706
Probe Tip Diameter	.187
CO_2	0
O_2	21
CO	0
N_2	79
% H_2O	2%

TRAVERSE POINT NUMBER	SAMPLING TIME, min / CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3		VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O		STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE		PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F
		Desired	Actual		DESIRED	ACTUAL		INLET ($T_{m\,in}$), °F	OUTLET ($T_{m\,out}$), °F			
	0 / 9:50	478.40										
A-16	3 / 9:53	980.52	—	1.3	1.4	1.5	153	94	89	8	N/A	60
	6 / 9:56	982.66	982.55			1.4		96	88	8		60
	9 / 9:59	984.75	984.65			1.5		102	89	8		60
	12 / 10:02	986.87	986.76			1.5		106	90	8		60
	15.5 / 10:05.5	988.99	989.26			1.55		110	92	8		60
		Vm =	10.86		ΔH =	1.49		Tm = 95.8				

COMMENTS:

EPA (Durl 235
1 72

ISOKINETIC PERFORMANCE WORKSHEET

Plant Columbia Dioxin
Sampling Location Predryer Inlet
Test Number One

Date 8-16-80
Initial D.C.

Isokinetic equation:

$$\% I = \frac{1{,}039(Ts_{avg}+460)(Vm_{std})}{Vs(\theta)(Ps)(Mf)(Dn^2)}$$

Average stack temperature, °F	Ts_{avg}	153
Meter volume (std), $\frac{17.64(Vm)\left(Pb+\frac{\Delta H_{avg}}{13.6}\right)}{Tm+460}$ $\Delta H = 1.49$ $Vm = 10.86$ $Tm = 95.8$ $Pb = 29.88$	Vm_{std}	10.34
Mole fraction dry gas, $\frac{100-\%\ H_2O}{100}$	Mf	.98
Molecular wt. dry stack gas, lb/lb-mole $(\%CO_2 \times 0.44) + (\%O_2 \times 0.32) + (\%N_2 + \%CO \times 0.28)$	Md	28.84
Molecular wt. stack gas, lb/lb-mole (Md) (Mf) + 18(1 - Mf)	Ms	28.62
Static pressure in stack, absolute, in. Hg (Pb) ± (0.074 x stack gage pressure, in H_2O)	Ps	30.09
Stack velocity, fpm $\Delta P = 1.3$ $5{,}128.8\ (Cp)\left(\sqrt{\Delta Ps_{avg}}\right)\sqrt{\frac{Ts+460}{Ps \times Ms}}$	Vs	4144
Total sample time, minutes	θ	15.5
Nozzle diameter, inches	Dn	.187
$\frac{1{,}039\ (153 + 460)(10.34)}{(4144)(15.5)(30.09)(.98)(.187^2)}$	% I	99.43

PARTICULATE SAMPLE RECOVERY AND INTEGRITY

Plant COLUMBIA NITROGEN CORP
Sample Location PREDRYER EXHAUST TP1
Sample Box No. 4
Sample Type NH_4NO_3

Run No. 16
Sample Date 8/16/80
Recovery Date 8/16/80
Cleanup Person DLC

Filter No.
Sample No.
Sample Material Description

MOISTURE AND/OR SAMPLE

Impinger Sequence	1	2	3	4	5
Impinger Type[a]	M	S	M	M	M
Impinger Solution	H_2O	H_2O	H_2SO_4	—	SiO_2
Final Volume (wt)[b]	—	—	—	—	—
Initial Volume (wt)[b]	100 ml	100 ml	100 ml	—	—
Net Volume (wt)[b]	—	—	—	—	—
Sample No.(s)	72	72	—	—	—

Combined impinger contents, Sample No. —
Liquid Level Marked ✓ Container(s) Sealed ✓
Description of Impinger Solution CLEAR
Total Moisture, gm —

SILICA GEL

Silica Gel Color LIGHT BLUE

[a] S = Greenburg-Smith standard, M = Modified, O = Other —
[b] Indicate value in units, ml or gm

RECOVERED SAMPLE

Probe Rinse: Sample No. 72
Liquid Level Marked ✓
Sealed ✓

Impinger Rinse: Sample No. 72
Liquid Level Marked ✓
Sealed ✓

Water Blank: Sample No. —
Liquid Level Marked —

Dry Catch: Sample No. —
Description —
Sealed —

Acetone Blank: Sample No. —
Liquid Level Marked —
Sealed —

Filter Blank: Sample No. —
Sealed —

Sample Disposition
Carrier HANSEN-GBB
Remarks:
Date Shipped: 8/16/80

Date of laboratory custody —
Personnel accepting custody —
Remarks: INSPECTOR #315

Seal(s) broken by —
Date broken —

MIDWEST RESEARCH INSTITUTE

Particle Sizing - Andersen

RUN Two

MRI Project Number 4468-L37
Field Dates 8-11 thru 8-16-80
Plant Columbia Nitrogen Corp.
Sampling Location Predinger Inlet
Sampling Date 8-15-80

FIELD CREW

Crew Chief M. Hansen

Testing Engineer
1 F. Cobb
2
3

Engr. Technician
1
2
3

Lab Technician
1 T. Walker
2 K. Wilcox
3

Process Engineer
1
2

Other
1
2

ANDERSEN SAMPLING CALCULATIONS

Plant Columbia Nitrogen Corp
Sampling Location Cyclone Inlet
Test No. Two

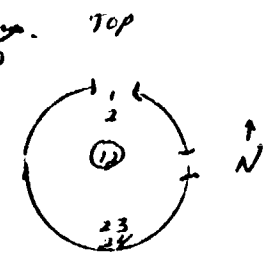
Date 8-16-80
Initial H C

Velocity head at sampling location, in. H_2O	ΔPs	1.2
Stack temperature at sample point, °F	Ts	152
Barometric pressure, in. Hg	Pb	29.88
Static pressure in stack, in. Hg (Pb) ± (0.074 x gage pressure, in. H_2O)	Ps	30.09
Percent moisture in gas stream by volume	% H_2O	2 %
Mole fraction, dry gas $\frac{100 - \% H_2O}{100}$	Mf	.98
Molecular wt. dry stack gas, lb/lb-mole (% CO_2 x 0.44) + (% O_2 x 0.32) + (% N_2 + % CO x 0.28)	Md	28.84
Molecular wt. stack gas, lb/lb-mole (Md) (Mf) + 18(1 - Mf)	Ms	28.62
Stack velocity, fpm $5{,}128.8\ (Cp)\left(\sqrt{\Delta Ps}\right)\sqrt{\frac{Ts + 460}{Ps \times Ms}}$	Vs	3978
Calculated nozzle diameter, in. $24\sqrt{\frac{Fs/Vs}{\pi}}$, where Fs = 0.5 to 0.75 ft^3/min	D_{n_c}	.151 to .186
Actual nozzle diameter, in.	D_{n_a}	.187
Assumed meter temperature, °F	Tm	100
Isokinetic sample rate, stack conditions, ft^3/min $Vs\ (0.00694)\ (\pi)\left(\frac{Dn_a}{2}\right)^2$	Fs	.758
Calculated meter flow rate, ft^3/min $Fs\left(\frac{Tm+460}{Ts+460}\right)\left(\frac{Ps}{Pb}\right)(Mf)$	Fm	.684

FIELD DATA - ANDERSEN

PLANT Bridgeport Columbia N. Gorge Corp.
DATE ~~Columbia N. Gorge Corp~~ 8-16-80
SAMPLING LOCATION Bridgeport Inlet
SAMPLE TYPE HCSS - Andersen
RUN NUMBER Two
OPERATOR GC
AMBIENT TEMPERATURE
BAROMETRIC PRESSURE 29.88
STATIC PRESSURE, (P_s) -2.8
Filter Set N/A

Leak CK: Inital at 15" Hg, CFM .005
Final at 5" Hg, CFM 0.0



SCHEMATIC OF TRAVERSE POINT LAYOUT with Dimensions

Calculated ACFM (desired)	.684
Probe Tip Diameter	.187
CO_2	0
O_2	21
CO	0
N_2	79
% H_2O	2%

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3 990.60 Desired	Actual	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\,in}$), °F	OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F
	0	12:15											
A-17	3	12:18	992.65	992.67	1.2	1.45	1.5	152	98	96	5	N/A	75
	6	12:21	994.10	—			1.5		102	96	5		68
	9	12:24	996.76	996.84			1.45		107	97	5		66
	12	12:27	998.81	998.87			1.4		110	97	4.5		66
	15¼	12:30¼	1000.86	1001.1			1.4		112	98	4.5		66
			V_M = 10.50			ΔH = 1.45			T_m = 101.3				

COMMENTS:

EPA (Dur) 235
4 72

ISOKINETIC PERFORMANCE WORKSHEET

Plant Columbia Nitrogen Corp
Sampling Location Fertilizer Unit
Test Number Two

Date 8-16-80
Initial MC.

Isokinetic equation:

$$\% I = \frac{1{,}039(Ts_{avg}+460)(Vm_{std})}{Vs(\theta)(Ps)(Mf)(Dn^2)}$$

Average stack temperature, °F	Ts_{avg}	152
Meter volume (std), $\frac{17.64(Vm)\left(Pb+\frac{\Delta H_{avg}}{13.6}\right)}{Tm+460}$ $V_m = 10.50$ $\Delta H = 1.45$ $T_m = 101.3$	Vm_{std}	9.895
Mole fraction dry gas, $\frac{100-\%\ H_2O}{100}$	Mf	.98
Molecular wt. dry stack gas, lb/lb-mole $(\%CO_2 \times 0.44) + (\%O_2 \times 0.32) + (\%N_2 + \%CO \times 0.28)$	Md	28.84
Molecular wt. stack gas, lb/lb-mole (Md) (Mf) + 18(1 - Mf)	Ms	28.62
Static pressure in stack, absolute, in. Hg (Pb) ± (0.074 x stack gage pressure, in H_2O)	Ps	30.09
Stack velocity, fpm $5{,}128.8\ (Cp)\left(\sqrt{\Delta Ps_{avg}}\right)\sqrt{\frac{Ts+460}{Ps \times Ms}}$	Vs	3978
Total sample time, minutes	θ	15
Nozzle diameter, inches	Dn	.187
$\frac{1{,}039\ (152 + 460)(9.895)}{(3978)(15)(30.09)(.98)(.187^2)}$	% I	102.26

PARTICULATE SAMPLE RECOVERY AND INTEGRITY

Plant COLUMBIA NITROGEN CORP
Sample Location PRE DRYER EXHAUST TP1
Sample Box No.
Sample Type NH_4NO_3

Run No. 17
Sample Date 8/16/80
Recovery Date 8/16/80
Cleanup Person GWS

Filter No.
Sample No.
Sample Material Description

MOISTURE AND/OR SAMPLE

Impinger Sequence	1	2	3	4	5
Impinger Type[a]	M	S	M	M	M
Impinger Solution	H_2O	H_2O	H_2SO_4	—	SiO_2
Final Volume (wt)[b]					
Initial Volume (wt)[b]	100 ml	100 ml	100 ml	—	—
Net Volume (wt)[b]					
Sample No.(s)	77	77			

Combined impinger contents, Sample No.
Liquid Level Marked ✓ Container(s) Sealed ✓
Description of Impinger Solution CLEAR
Total Moisture, gm

SILICA GEL

Silica Gel Color LIGHT BLUE

[a] S = Greenburg-Smith standard, M = Modified, O = Other
[b] Indicate value in units, ml or gm

RECOVERED SAMPLE

Probe Rinse: Sample No. 77
Liquid Level Marked ✓
Sealed ✓

Impinger Rinse: Sample No. 77
Liquid Level Marked ✓
Sealed ✓

Water Blank: Sample No.
Liquid Level Marked

Dry Catch: Sample No.
Description
Sealed

Acetone Blank: Sample No.
Liquid Level Marked
Sealed

Filter Blank: Sample No.
Sealed

Sample Disposition
Carrier HANSEN-USS Date Shipped: 8/16/80
Remarks:

Date of laboratory custody
Personnel accepting custody
Remarks:

Seal(s) broken by
Date broken

MIDWEST RESEARCH INSTITUTE

Particle Sizing - Andersen

RUN Three

MRI Project Number 4468-L37
Field Dates 8-11 thru 8-16-80
Plant Columbia Nitrogen Corp
Sampling Location Prediger Inlet
Sampling Date 8-16-80

FIELD CREW

Crew Chief M. Hansen

Testing Engineer 1 R. Cobb
2
3

Engr. Technician 1
2
3

Lab Technician 1 K. Wilcox
2 T. Walker
3

Process Engineer 1
2

Other 1
2

ANDERSEN SAMPLING CALCULATIONS

Plant Columbia Nitrogen Corp.
Sampling Location Predryer Inlet
Test No. three

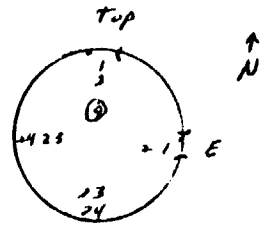
Date 8-16-80
Initial A.C.

Velocity head at sampling location, in. H_2O	ΔPs	1.1
Stack temperature at sample point, °F	Ts	152
Barometric pressure, in. Hg	Pb	29.88
Static pressure in stack, in. Hg (Pb) $\pm$ (0.074 x gage pressure, in. H_2O)	Ps	30.09
Percent moisture in gas stream by volume	% H_2O	22
Mole fraction, dry gas $\frac{100 - \% H_2O}{100}$	Mf	.98
Molecular wt. dry stack gas, lb/lb-mole (% CO_2 x 0.44) + (% O_2 x 0.32) + (% N_2 + % CO x 0.28)	Md	28.84
Molecular wt. stack gas, lb/lb-mole (Md) (Mf) + 18(1 - Mf)	Ms	28.62
Stack velocity, fpm $5{,}128.8\ (Cp)\left(\sqrt{\Delta Ps}\right)\sqrt{\frac{Ts + 460}{Ps \times Ms}}$	Vs	3809
Calculated nozzle diameter, in. $24\sqrt{\frac{Fs/Vs}{\pi}}$, where Fs = 0.5 to 0.75 ft^3/min	D_{n_c}	.154 .189
Actual nozzle diameter, in.	D_{n_a}	.187
Assumed meter temperature, °F	Tm	100
Isokinetic sample rate, stack conditions, ft^3/min $Vs\ (0.00694)\ (\pi)\left(\frac{Dn_a}{2}\right)^2$	Fs	.726
Calculated meter flow rate, ft^3/min $Fs\left(\frac{Tm+460}{Ts+460}\right)\left(\frac{Ps}{Pb}\right)(Mf)$	Fm	.656

FIELD DATA - ANDERSEN

PLANT Columbia Hydrogen Corp.
DATE 8-10-80
SAMPLING LOCATION Prodryer Inlet
SAMPLE TYPE HCSS - Andersen
RUN NUMBER Three
OPERATOR GC.
AMBIENT TEMPERATURE 95
BAROMETRIC PRESSURE 29.88
STATIC PRESSURE, (P_s) -2.8
Filter Set N/A

Leak CK: Inital at 15" Hg, CFM .01
Final at 5" Hg, CFM 0.0



SCHEMATIC OF TRAVERSE POINT LAYOUT with Dimensions

Calculated ACFM (desired)	.656
Probe Tip Diameter	.187
CO_2	0
O_2	21
CO	0
N_2	79
% H_2O	2%

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3 2.2 Desired	Actual	VELOCITY HEAD (Δp_s), in H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\,in}$), °F	OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F
	0	12:55											
A-9	3	12:58	4.18	4.25	1.1	1.35	1.35	152	106	102	5	N/A	73
	6	13:01	6.15	6.23			1.3		110	103	5		60
	9	1304	8.13	8.18			1.3		115	104	5		60
	12	1307	10.11	—			1.3		117	104	5		60
	15	1310	12.09	12.12			1.3		120	105	5		60
			V_M =	9.92			ΔH =	1.31		T_m =	108.6		

COMMENTS:

EPA (Dur) 235
4 72

ISOKINETIC PERFORMANCE WORKSHEET

Plant Columbia Nitrogen Corp
Sampling Location Prodryer Inlet
Test Number three

Date 8-16-80
Initial F. E.

Isokinetic equation:

$$\% I = \frac{1{,}039(Ts_{avg}+460)(Vm_{std})}{Vs(\theta)(Ps)(Mf)(Dn^2)}$$

Average stack temperature, °F	Ts_{avg}	152
Meter volume (std), $\frac{17.64(Vm)\left(Pb+\frac{\Delta H_{avg}}{13.6}\right)}{Tm+460}$ $\Delta H = 1.31$ $T_m = 103.0$ $D_n = 9.92$	Vm_{std}	9.225
Mole fraction dry gas, $\frac{100-\%\ H_2O}{100}$	Mf	.98
Molecular wt. dry stack gas, lb/lb-mole $(\%CO_2 \times 0.44) + (\%O_2 \times 0.32) + (\%N_2 + \%CO \times 0.28)$	Md	28.84
Molecular wt. stack gas, lb/lb-mole $(Md)(Mf) + 18(1 - Mf)$	Ms	28.62
Static pressure in stack, absolute, in. Hg $(Pb) \pm (0.074 \times$ stack gage pressure, in $H_2O)$	Ps	30.09
Stack velocity, fpm $5{,}128.8\ (Cp)\left(\sqrt{\Delta Ps_{avg}}\right)\sqrt{\frac{Ts+460}{Ps \times Ms}}$	Vs	3809
Total sample time, minutes	θ	15
Nozzle diameter, inches	Dn	.187
$\frac{1{,}039\ (152 + 460)(9.225)}{(3809)(15)(30.09)(.98)(.187^2)}$	% I	99.56

PARTICULATE SAMPLE RECOVERY AND INTEGRITY

Plant COLUMBIA NITROGEN CORP
Sample Location PRECIPITATOR EXHAUST
Sample Box No. 3
Sample Type NH_4NO_3

Run No. 1E
Sample Date 8/15/80
Recovery Date 8/16/80
Cleanup Person DW

Filter No.
Sample No.
Sample Material Description

MOISTURE AND/OR SAMPLE

Impinger Sequence	1	2	3	4	5
Impinger Type[a]	M	S	M	M	M
Impinger Solution	H_2O	H_2O	H_2SO_4	—	Silica
Final Volume (wt)[b]					
Initial Volume (wt)[b]	100 ml	100 ml	100 ml	—	—
Net Volume (wt)[b]					
Sample No.(s)	81	81			

Combined impinger contents, Sample No.
Liquid Level Marked ✓ Container(s) Sealed ✓
Description of Impinger Solution CLEAR
Total Moisture, gm

SILICA GEL

Silica Gel
Color LIGHT BLUE

[a] S = Greenburg-Smith standard, M = Modified, O = Other
[b] Indicate value in units, ml or gm

RECOVERED SAMPLE

Probe Rinse: Sample No. 81
Liquid Level Marked ✓
Sealed ✓

Impinger Rinse: Sample No. 81
Liquid Level Marked ✓
Sealed ✓

Water Blank: Sample No.
Liquid Level Marked

Dry Catch: Sample No.
Description
Sealed

Acetone Blank: Sample No.
Liquid Level Marked
Sealed

Filter Blank: Sample No.
Sealed

Sample Disposition
Carrier HANSEN-CRBS Date Shipped: 8/16/80
Remarks:

Date of laboratory custody
Personnel accepting custody
Remarks:

Seal(s) broken by
Date broken

APPENDIX E.4

AMMONIUM NITRATE ANALYSIS DATA

TABLE B-1-1. COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

Sample No.	Sample I.D.	Aliquot analyzed (ml)	Sample volume (ml)	Dilution	Average mv	µg/ml NO_3^- in aliquot analyzed	Total mg NO_3^- per stage	Total mg NO_3^- per run*
01	UNC. P.C. EX. TP4 R-1, S-1	100	255	-	127.85	255.3	65.1	
02	UNC. P.C. EX. TP4 R-1, S-2	100	260	-	186.7	23.75	6.18	76.28
03	UNC. P.C. EX. TP4 R-1, S-3	100	500	-	233.2	5.44	2.7	
04	UNC. P.C. EX. TP4 R-1, S-4	100	1,000	-	236.55	3.18	3.18	
06	UNC. P.C. EX. TP4 R-2, S-1	100	350	-	144.3	128.8	45.1	
07	UNC. P.C. EX. TP4 R-2, S-2	100	300	-	189.5	20.8	6.24	54.53
08	UNC. P.C. EX. TP4 R-2, S-3	100	300	-	224.3	5.1	1.5	
09	UNC. P.C. EX. TP4 R-2, S-4	100	750	-	236.6	3.1	2.33	
11	UNC. P.C. EX. TP4 R-3, S-1	100	300	-	102.7	437.5	131.25	
12	UNC. P.C. EX. TP4 R-3, S-2	100	300	-	167.1	31.5	9.45	144.7
13	UNC. P.C. EX. TP4 R-3, S-3	100	300	-	200.0	8.21	2.46	
14	UNC. P.C. EX. TP4 R-3, S-4	100	750	-	225.5	2.90	2.18	
15	P.C.S.C. IN. TP3, R-11, S-1	100	350	500	154.6	52.49	9,186	
16	P.C.S.C. IN. TP3, R-11, S-2	100	300	250	200.3	10.45	784	9,976.75
17	P.C.S.C. IN. TP3, R-11, S-3	100	300	-	183.3	20.90	6.27	
18	P.C.S.C. IN. TP3, R-11, S-4	100	750	-	242.7	1.86	1.40	
20	P.C.S.C. IN. TP3, R-2, S-1	100	300	500	159.2	55.81	8,372	
21	P.C.S.C. IN. TP3, R-2, S-2	100	300	200	215.5	5.62	337.2	8,714
22	P.C.S.C. IN. TP3, R-2, S-3	100	300	-	191.6	14.90	4.47	
23	P.C.S.C. IN. TP3, R-2, S-4	100	750	-	248.1	1.77	1.33	
24	P.C.S.C. IN. TP3, R-3, S-1	100	300	200	146.1	111.9	6,714	
25	P.C.S.C. IN. TP3, R-3, S-2	100	300	100	192.8	16.78	503.4	7,225.5
26	P.C.S.C. IN. TP3, R-3, S-3	100	300	-	193.1	16.58	4.97	
27	P.C.S.C. IN. TP3, R-3, S-4	100	750	-	220.7	5.4	4.1	

* Corrected for blanks.

TABLE B-1-2. COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

Sample No.	Sample I.D.	Aliquot analyzed (ml)	Sample volume (ml)	Dilution	Average mv	µg/ml NO_3^- in aliquot analyzed	Total mg NO_3^- per stage	Total mg NO_3^- per run*
38	P.T. IN. A, TP2, R-9, S-1	100	100	-	146.8	104.36	10.44	
39	P.T. IN. A, TP2, R-9, S-2	100	150	-	199.5	12.26	1.84	122.8
40	P.T. IN. A, TP2, R-9, S-3	100	100	-	112.1	427.46	42.75	
41	P.T. IN. A, TP2, R-9, S-4	100	500	-	140.1	137.01	68.51	
29	P.T. IN. B, TP1, R-7, S-1	100	175	-	188.7	19.82	3.47	
30	P.T. IN. B, TP1, R-7, S-2	100	200	-	208.9	8.72	1.74	20.83
31	P.T. IN. B, TP1, R-7, S-3	100	110	-	155.8	75.45	8.30	
32	P.T. IN. B, TP1, R-7, S-4	100	510	-	193.5	16.31	8.32	
65	P.T. IN. C, TP3, R-15, S-1	100	300	-	218.4	5.57	1.67	
66	P.T. IN. C, TP3, R-15, S-2	100	250	-	241.0	2.22	0.56	16.15
67	P.T. IN. C, TP3, R-15, S-3	100	350	-	193.1	14.23	4.98	
68	P.T. IN. C, TP3, R-15, S-4	100	800	-	196.7	12.32	9.86	
51	BY. ST. A, TP7, R-12, S-1	100	180	-	149.4	94.9	17.1	
52	BY. ST. A, TP7, R-12, S-1	100	150	-	199.4	12.59	1.89	47.17
53	BY. ST. A, TP7, R-12, S-1	100	200	-	146.7	105.84	21.17	
54	BY. ST. A, TP7, R-12, S-1	100	850	-	206.7	9.38	7.97	
33	BY. ST. B, TP5, R-8, S-1	100	150	-	143.3	111.75	16.76	
34	BY. ST. B, TP5, R-8, S-2	100	150	-	183.5	21.88	3.28	53.8
35	BY. ST. B, TP5, R-8, S-3	100	160	-	135.9	150.88	24.14	
36	BY. ST. B, TP5, R-8, S-4	100	500	-	184.8	20.75	10.38	
42	BY. ST. C, TP6, R-10, S-1	100	150	-	153.7	78.84	11.83	
43	BY. ST. C, TP6, R-10, S-2	100	150	-	206.5	9.22	1.38	40.1
44	BY. ST. C, TP6, R-10, S-3	100	150	-	145.9	108.24	16.24	
45	BY. ST. C, TP6, R-10, S-4	100	500	-	184.2	22.83	11.42	

* Corrected for Blanks

TABLE B-1-3. COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

Sample No.	Sample I.D.	Aliquot analyzed (ml)	Sample volume (ml)	Dilution	Average mv	µg/ml NO_3^- in aliquot analyzed	Total mg NO_3^- per stage	Total mg NO_3^- per run*
47	DR. EX. TP2, R-11, S-1	100	150	200	116.7	341.2	10,236	
48	DR. EX. TP2, R-11, S-2	100	100	100	159.4	59.76	598	10,948
49	DR. EX. TP2, R-11, S-3	100	150	-	138.9	137.94	20.69	
50	DR. EX. TP2, R-11, S-4	100	700	-	139.55	134.33	94.0	
56	DR. EX. TP2, R-2, S-1	100	175	100	158.6	65.45	1,145	
57	DR. EX. TP2, R-2, S-2	100	100	-	114.2	393.4	3,934	1,197.5
58	DR. EX. TP2, R-2, S-3	100	150	-	195.4	14.80	2.22	
59	DR. EX. TP2, R-2, S-4	100	700	-	192.0	16.98	11.98	
60	DR. EX. TP2, R-3, S-1	100	200	200	145.9	109.32	4,373	
61	DR. EX. TP2, R-3, S-2	100	250	40	195.6	14.68	146.8	4,542
62	DR. EX. TP2, R-3, S-3	100	150	-	154.0	76.44	11.47	
63	DR. EX. TP2, R-3, S-4	100	900	-	197.7	12.93	11.64	
69	PREDR. EX. TP1, R-1, S-1	100	200	200	175.3	29.40	1,176	
70	PREDR. EX. TP1, R-1, S-2	100	200	-	114.5	348.1	69.6	1,273
71	PREDR. EX. TP1, R-1, S-3	100	200	-	176.8	27.66	5.53	
72	PREDR. EX. TP1, R-1, S-4	100	700	-	173.0	32.28	22.60	
74	PREDR. EX. TP1, R-2, S-1	100	350	200	180.5	25.20	1,764	
75	PREDR. EX. TP1, R-2, S-2	100	300	-	117.7	328.13	98.4	1,881
76	PREDR. EX. TP1, R-2, S-3	100	350	-	179.3	26.46	9.26	
77	PREDR. EX. TP1, R-2, S-4	100	700	-	193.7	14.69	10.28	
78	PREDR. EX. TP1, R-3, S-1	100	350	200	191.2	16.27	1,139	
79	PREDR. EX. TP1, R-3, S-2	100	250	-	110.6	438.6	109.7	1,261
80	PREDR. EX. TP1, R-3, S-3	100	250	-	180.2	25.51	6.38	
81	PREDR. EX. TP1, R-3, S-4	100	600	-	202.1	10.42	6.25	

* Corrected for blanks.

Project No. Date of Work: 8-14-80 PM Work Performed by:

Title or Purpose: Sample Analysis Continued From:

Sample #/ ~~Stage~~	Sample vol	mV	Conc.* mg/ml	Total NO_3^- mg
29	175 ml	411	0.0119	2.08
~~30~~	~~200 ml~~			
30	200 ml	433	0.00476	0.925
31	110 ml	381	0.0420	4.62
~~32~~	~~510 ml~~			
32	510 ml	417	0.00930	4.74

* using calibration curve p.11

A-5 – 370 mV – calibration curve has shifted

VOID

Continued To:

Entered By:

Date:

Disclosed To And Understood By Me:

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Date:

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Project No. Date of Work: Work Performed by:

Title or Purpose: Calibration Curve #6 Continued From:

Stock Solution c = 1.007 mg NO_3^-/ml
(see p. 1)

#	Vol Stock	Final Vol	Calc Conc mg NO_3^-/ml
1	2	250	
2	2	100	
3	5	100	
4	10	100	
5	15	100	
6	30	100	
7	0		

Continued To: Disclosed To And Understood By Me:

Entered By: Date:

Date: Date:

Project No. 4468137 Date of Work: 9/2/80 Work Performed by: YLW

Title or Purpose: DETERMINATION OF NO_3^- USING A SPECIFIC ION ELECTRODE Continued From:

DATE 9/2/80

PREPARED PRESERVATIVE SOLN AS FOLLOWS:

(1) DISSOLVE 15.5g of BORIC ACID IN ~200ml of BOILING DISTILLED DEIONIZED H_2O
(2) TRANSFER TO A 250ml VOL. FLASK AND DILUTE TO MARK

PREPARED IONIC STRENGTH ADJUSTOR (ISA) AS FOLLOWS

(1) DISSOLVE 26.4g of AMMONIUM SULFATE $((NH_4)_2SO_4)$ IN ~50ml DISTILLED DEIONIZED H_2O.
(2) TRANSFER TO A 100ml VOL. FLASK AND DILUTE TO MARK

EQUIPMENT USED:

- CORNING pH METER, MODEL 12 (MEL #7559)
- ORION NITRATE ION ELECTRODE MODEL 93-07

9/3/80 - PREPARED REFERENCE ELECTRODE FILLING SOLN. AS FOLLOWS:

(1) ADD 2ml of ISA to 100ml VOL. FLASK
(2) DILUTE TO MARK
(3) RINSE AND FILL OUTER CHAMBER of REFERENCE ELECTRODE

Continued To: Disclosed To And Understood By Me:

Entered By: Date:

Date: Date:

Project No: 4468-37 Date of Work: 9/3/80 Work Performed by: YW

Title or Purpose: DETERMINATION OF NO_3^- (SIE) Continued From: p.19

9/3/80

SUPPLIES NEEDED: - 100ml VOL. FLASKS (10)
- 150ml BEAKERS (10-15)
- H_3BO_3
- NH_4NO_3
- $(NH_4)_2SO_4$
- STIRRING BARS (6)
- MAGNETIC STIRRER (1)
- SPECIFIC ION ELECTRODE EQUIPMENT AS DESCRIBED ON p.19

PROCEDURE:

AFTER FILLING REFERENCE ELECTRODE WITH SOLUTION, SUBMERSE BOTH ELECTRODES IN A SOLUTION OF D.D. H_2O* AND 2ml of ISA. STIR WITH MAGNETIC STIRRER UNTIL AND STEADY READING IS OBTAINED. (AS LONG AS 2 HRS.)

PREPARE STANDARD SOLUTIONS: 1 mg/ml NH_4NO_3**

(1) WEIGH 1.290g of NH_4NO_3 AND TRANSFER TO A 1l VOL. FLASK
(2) DISSOLVE AND DILUTE TO MARK

CONT. →

* DEIONIZED, DISTILLED ** ACTUALLY 1mg/ml of NITRATE

Continued To:

Entered By:

Date:

Disclosed To And Understood By Me:

Date:

Date:

Project No. 446137 Date of Work: 9/3/80 Work Performed by: JW

Title or Purpose: SAME Continued From: p 20

PREPARATION OF CALIBRATION STD.:

(1) ADD 0.0, 1.0, 5.0, 10.0, 15.0, 20.0, 25.0 mℓ OF STD. NH_4NO_3 SOLN. TO A SERIES OF SEVEN 100mℓ FLASKS
(2) ADD 2mℓ of ISA
(3) ADD 2mℓ of BORIC ACID
(4) DILUTE TO MARK

CALIBRATION CURVE:

(1) WHEN VOLT METER IS WARMED UP AND STABLE POUR THE CONTENTS of THE 100mℓ FLASKS INTO 150mℓ BEAKERS
(2) WARSH ELECTRODES AND SUBMERSE INTO CALIBRATION STD. (WHILING STIRRING)
(3) RECORD STABLE READING
(4) REPEAT WITH ALL SEVEN CALIBRATION STD.
(5) THEN REPEAT AGAIN IN REVERSE ORDER

NOTE: CALIBRATION CURVE SHOULD BE CHECKED ~ EVERY HOUR, AND CHANGES MADE ACCORDINGLY

Continued To: Disclosed To And Understood By Me:

Entered By: Date:

Date: Date:

Project No. Date of Work: Work Performed by:

Title or Purpose: Continued From:

ANALYSIS PROCEDURE: (USE 150mL BEAKERS)

(1) TAKE 3 100mL ALIQUOTS FROM SAMPLE CONTAINER. (USE 2 100mL ALIQUOTS IF NECESSARY)
(2) ADD 2mL OF IONIC STRENGTH ADJUSTER (ISA) TO EACH 100mL SAMPLE
(3) IF NO BORIC ACID HAS BEEN ADDED TO THE SAMPLES IN THE FIELD ADD 2mL of BORIC ACID TO EACH 100mL SAMPLE ALSO
(4) DROP IN STIRRING BAR, MAKE SURE ELECTRODES HAVE BEEN RINSED THEN PLACE THEM IN BEAKER. (TIP OF ELECTRODE SHOULD BE ~3cm FROM TOP OF WATER)

Continued To:

Entered By:

Date:

Disclosed To And Understood By Me:

Date:

Date:

Project No. 4468L37 Date of Work: 9/4/80 Work Performed by: SW

Title or Purpose: SAME Continued From: p23

PREPARED CALIBRATION STD.S AND CALIBRATION CURVE AS ON P. 23. DATA WAS ENTERED INTO A STATISTICAL PROGRAMS PACKAGE (UPDATED 3/80) ON A RADIO SHACK TRS-80 COMPUTER. MILLIVOLT READING WAS ON A LINEAR SCALE VS CONCENTRATION ON LOG SCALE.

CALIBRATION CURVE #1
9/4/80

wt. of NH_4NO_3 USED to MAKE STANDARDS = 1.28712 g

9/4/80
CALIBRATION Curve #1

mV	µg/ml NO_3^-	
207.9	9.974	POINT # 1
168.8	49.87	POINT # 2
151.35	99.74	POINT # 3
141.1	149.6	POINT # 4
133.8	199.48	POINT # 5
128.2	249.35	POINT # 6

#	X	Y	TRANSFORM X	TRANSFORM Y	Y RES.
1	207.9	9.974	207.9	2.29998	-.011961
2	168.8	49.87	168.8	3.90942	.0135241
3	151.35	99.74	151.35	4.60257	8.44431E-03
4	141.1	149.6	141.1	5.00797	1.8549E-04
5	133.8	199.48	133.8	5.29571	-6.67095E-03
6	128.2	249.35	128.2	5.51886	-9.52578E-03

THE SLOPE OF THE LINE IS -.0403568
THE INTERCEPT IS 10.7821
THE INDEX OF DETERMINATION IS .999892
THE VARIANCE ABOUT THE REGRESSION IS 1.8271E-04
THE STANDARD DEVIATION OF Y IS .01209

Continued To:

Entered By:

Date:

Disclosed To And Understood By Me:

Date:

Date:

Project No. Date of Work: Work Performed by:

Title or Purpose: Continued From:

CALIBRATION CURVE #2

wt of NH_4NO_3 =

1.28712 g DISSOLVED IN ONE LITER

9/14/80
CALIBRATION CURVE #2

mv	Mg/ml NO_3^-	
265.55	9.974	POINT # 1
166.95	49.87	POINT # 2
149.5	99.74	POINT # 3
139.15	149.6	POINT # 4
131.8	199.48	POINT # 5
126.25	249.35	POINT # 6

#	X	Y	TRANSFORM X	TRANSFORM Y	Y RES
1	265.55	9.974	265.55	2.25998	-.017023
2	166.95	49.87	166.95	3.90842	.027265
3	149.5	99.74	149.5	4.60257	.012174
4	139.15	149.6	139.15	5.00797	-5.697E-04
5	131.8	199.48	131.8	5.29571	-.010715
6	126.25	249.35	126.25	5.51886	-.012387

THE SLOPE OF THE LINE IS -.040521
THE INTERCEPT IS 10.6484
THE INDEX OF DETERMINATION IS .999787
THE VARIANCE ABOUT THE REGRESSION IS 3.73663E-04
THE STANDARD DEVIATION OF Y IS .017428

Continued To: Disclosed To And Understood By Me:

Entered By: Date:

Date: Date:

Project No. 4480-37 Date of Work: 9/4/80 Work Performed by: SM. 9/4/80

Title or Purpose: SAME Continued From: 26

Sample No.	Calibration Curve No.	mv Reading No. 1	mv Reading No. 2	mv Reading No. 3	Average mv Reading	* Identification	SAMPLE vol. AND/OR Dilution	µg/ml NO_3^-	mg NO_3^- Total
01	1 ~~32~~	127.7	128.0		127.85	F.B.C. TP4, R-1, S-1	255ml	25.3	6.5.1
02	1 ~~32~~	186.7	186.7		186.7	" " " S-2	260ml	23.75	6.18
03	1 ~~32~~	223.4	223.0		223.2	" " " S-3	500ml	5.44	2.7
04	1 ~~32~~	236.5	236.6		236.55	" " " S-4	1000ml	3.18	3.18
	2	155.1	155.4		155.25	AUDIT # 05266	2ml-500ml	77.84	19.49
	2	183.6	183.5		183.55	" # 03247	2ml-500ml	24.75	6.19
	2	87.5	87.4		87.45	" # 04285	5ml-1000ml	121.8	243.4
	2	1996	1995		190.55	" # 01249	2ml-1000ml	18.64	9.32
	2	162.6	162.5		162.55	" # 02250	1ml-100ml	57.98	57.98
05	2	266.0	267.0		266.5	BLANK, RUN 1	250ml	0.86	0.22

NOTE: (1) FLUIDIZED BED COOLER TP4 WAS CHANGED TO UNCONTROLLED PRILL TOWER EXHAUST TP4 FOR FINAL REPORT.

(2) FLUIDIZED BED COOLER TP3 WAS CHANGED TO PRILL TOWER SCRUBBER INLET TP3 FOR FINAL REPORT.

* F.B.C. = FLUIDIZED BED COOLER

Continued To:

Disclosed To And Understood By Me:

Entered By: Date:

Date: Date:

Project No. Date of Work: Work Performed by:

Title or Purpose: Continued From:

CALIBRATION CURVE #3

wt. of NH_4NO_3 = 1.28712 g

CALIBRATION CURVE #3 9/5/80

207.15	9.975	POINT # 1
168.6	49.88	POINT # 2
150.95	99.75	POINT # 3
140.6	149.63	POINT # 4
133.2	199.5	POINT # 5
127.5	249.38	POINT # 6

#	X	Y	TRANSFORM X	TRANSFORM Y	Y RES.
1	207.15	9.975	207.15	2.30038	-.0203772
2	168.6	49.88	168.6	3.90962	.0328894
3	150.95	99.75	150.95	4.60267	.0134025
4	140.6	149.63	140.6	5.00817	1.07002E-03
5	133.2	199.5	133.2	5.29581	-.0100217
6	127.5	249.38	127.5	5.51898	-.0169673

THE SLOPE OF THE LINE IS -.0403702

THE INTERCEPT IS 10.6831

THE INDEX OF DETERMINATION IS .999708

Continued To:

Entered By:

Date:

Disclosed To And Understood By Me:

Date:

Date:

Project No. 144837 Date of Work: 9/5/80 Work Performed by: [illegible]

Title or Purpose: SOME Continued From: p 28

Sample No.	Calibration Curve No.	mv Reading No. 1	mv Reading No. 2	mv Reading No. 3	Average mv Reading	Identification	SAMPLE VOLUME AND/OR Dilution	µg/ml NO_3^-	mg NO_3 Total
06	3	144.4	144.2		144.3	F.B.C, TP4, R-2, S-1	350ml	128.8	45.1
07	3	189.5	189.4		189.5	" " " S-2	300ml	20.8	6.24
08	3	224.3	224.2		224.3	" " " S-3	300ml	5.1	1.5
09	3	237.0	236.6	236.2	236.6	" " " S-4	750ml	3.1	2.33

SEE NOTE ON PAGE 27.

Continued To: Disclosed To And Understood By Me:

Entered By: Date:

Date: Date:

Project No. 4468L-37 Date of Work: 9/8/80 Work Performed by: YW

Title or Purpose: NO_3 SIE Continued From: p29

(1) CHANGED REFERENCE ELECTRODE SOLN (p.19)

(2) PREPARED CALIBRATION STDS. (p.23)

(3) PREPARED NEW ISA SOLN. (p.19) USING 20.8g of AMMONIUM SULFATE - THEREFORE DISSOLVING IN 7818 ml of H_2O

CALIBRATION STD. MADE WITH 1.2828 g of NH_4NO_3 IN 1 liter (p.21)

#4 CAL. CURVE
9/8/80

194.65	3.94	POINT # 1	
156.65	49.71	POINT # 2	
139.65	99.42	POINT # 3	
129.15	149.13	POINT # 4	
121.65	198.84	POINT # 5	
115.65	248.55	POINT # 6	

#	X	Y	TRANSFORM X	TRANSFORM Y	Y RES
1	194.65	3.94	194.65	2.29657	-.0477123
2	156.65	49.71	156.65	3.98621	.0070718
3	139.65	99.42	139.65	4.59935	.0279999
4	129.15	149.13	129.15	5.00462	4.477E-03
5	121.65	198.84	121.65	5.2925	-.0142553
6	115.65	248.55	115.65	5.51564	-.0280795

THE SLOPE OF THE LINE IS -.0486559
THE INTERCEPT IS 10.2759
THE INDEX OF DETERMINATION IS .999444
THE VARIANCE ABOUT THE REGRESSION IS 9.928895E-04
THE STANDARD DEVIATION OF Y IS .0282979

Continued To:

Entered By:

Date:

Disclosed To And Understood By Me:

Date:

Date:

Project No. 4468-37 Date of Work: 9/8/80 Work Performed by: DW

Title or Purpose: NO_3^- SIE Continued From: p29 30

Sample No.	Calibration Curve No.	mv Reading No. 1	mv Reading No. 2	mv Reading No. 3	Average mv Reading	Identification	SAMPLE VOLUME AND/OR Dilution	µg/ml NO_3^-	mg NO_3^- TOTAL
10	4	261.9	262.5		262.2	BLANK, R-2,3	250ml	0.65	0.16
11	4	102.7	102.7		102.7	F.B.C. TP4, R-3, S-1	300ml	437.5	131.25
12	4	167.1	167.1		167.1	F.B.C. TP4, R-3, S-2	300ml	31.5	9.45
13	4	200.0	200.0		200.0	" " " S-3	300ml	8.21	2.46
14	4	225.5	225.5		225.5	" " " S-4	750ml	2.90	2.18
15	4	154.6	154.5		154.6	F.B.C. TP3, R-4, S-1	350ml	52.49	9186
↳	↳	↳	↳		↳	↳ "	1ml to 500ml		
16	5	~~215.6~~				F.B.C. TP3, R-4, S-2	300ml	10.45	784
↳	↳	↳				↳ " " "	~~1ml to 50ml~~		
↳	↳	200.3	200.3		200.3	↳ " " "	1ml to 250		
17	5	182.9	183.6		183.3	F.B.C. TP3, R-4 S-3	300ml	20.90	6.27
18	5	243.1	242.3		242.7	" " " S-4	750ml	1.86	1.40
19	5	263.7	264.9		264.3	BLANK RUN 435	300ml	0.77	0.23
20	5					F.B.C. TP3, R-5, S-1	300ml	5581	8372
"	"	159.4	158.9		159.2	" " " "	1ml to 500ml		
21						" " " S-2	300ml	5.62	337.2
"	"	215.6	215.3		215.5	" " " "	1ml to 200ml		
22	5	191.2	192.0		191.6	" " " S-3	300ml	14.90	4.47

SEE NOTE ON PAGE 27

Continued To:

Disclosed To And Understood By Me:

Entered By:

Date:

Date:

Date:

Project No. 4468-37 Date of Work: 9/8/80 Work Performed by: YW

Title or Purpose: NO_3^- SLE Continued From: p31

#5 CAL. CURVE
9/8/80

SAME STDS AS #4 RAN LATER IN DAY

281.1	9.94	POINT # 1	
162.7	49.71	POINT # 2	
145.35	99.42	POINT # 3	
135.15	149.13	POINT # 4	
127.85	198.84	POINT # 5	
122.15	248.55	POINT # 6	

#	X	Y	TRANSFORM X	TRANSFORM Y	Y RES.
1	281.1	9.94	281.1	2.29557	-.017334
2	162.7	49.71	162.7	1.98621	.0283331
3	145.35	99.42	145.35	4.59935	.0126648
4	135.15	149.13	135.15	5.00482	2.39674E-03
5	127.85	198.84	127.85	5.2925	-7.63978E-03
6	122.15	248.55	122.15	5.51594	.01665

THE SLOPE OF THE LINE IS -.0449673

THE INTERCEPT IS 10.5122

THE INDEX OF DETERMINATION IS .999786

THE VARIANCE ABOUT THE REGRESSION IS 1.62637E-04

THE STANDARD DEVIATION OF Y IS .0174023

Continued To:

Disclosed To And Understood By Me:

Entered By:

Date:

Date:

Date:

Project No. 4482-37 Date of Work: 9/9/80 Work Performed by: YW

Title or Purpose: NO_3^- SIE Continued From: p.32

(1) PREPARED CALIBRATION STD. AS ON (p.23)

(2) PREPARED NEW $(NH_4)_2SO_4$ SOLN. (ISA) p.19
26.4g DISSOLVED TO 100ml H_2O

CALIBRATION CURVE #6

9/9/80

205.2	9.98	POINT # 1
166.7	49.87	POINT # 2
149.1	99.75	POINT # 3
138.8	149.63	POINT # 4
131.8	199.5	POINT # 5
126.1	249.38	POINT # 6

#	X	Y	TRANSFORM X	TRANSFORM Y	Y RES.
1	205.2	9.98	205.2	2.30058	-.0156527
2	166.7	49.87	166.7	3.90942	.028842
3	149.1	99.75	149.1	4.60267	6.96182E-03
4	138.8	149.63	138.8	5.00817	-6.05202E-03
5	131.8	199.5	131.8	5.29581	-2.82955E-03
6	126.1	249.38	126.1	5.51898	-.0112696

THE SLOPE OF THE LINE IS -.0406323
THE INTERCEPT IS 10.654
THE INDEX OF DETERMINATION IS .999822
THE VARIANCE ABOUT THE REGRESSION IS 3.24242E-04
THE STANDARD DEVIATION OF Y IS .0161057

CALIBRATION CURVE PREPARED FROM STD. SOLN CONTAINING 1.2871 g of NH_4NO_3

Continued To: Disclosed To And Understood By Me:

Entered By: Date:

Date: Date:

Project No. 4468-37 Date of Work: 9/9/80 Work Performed by: YW

Title or Purpose: NO_3^- SIE Continued From: p33

CALIBRATION CURVE #7

202.5
163.8
146.4
136
128.9
123.2

9.97
49.87
99.75
149.63
199.5
249.38

POINT # 1
POINT # 2
POINT # 3
POINT # 4
POINT # 5
POINT # 6

#	X	Y	TRANSFORM X	TRANSFORM Y	Y RES.
1	202.5	9.97	202.5	2.29958	-.0151787
2	163.8	49.87	163.8	3.90942	.0247269
3	146.4	99.75	146.4	4.60267	.0121126
4	136	149.63	136	5.00817	-4.28247E-03
5	128.9	199.5	128.9	5.29581	-4.65822E-03
6	123.2	249.38	123.2	5.51898	-.0127244

THE SLOPE OF THE LINE IS -.0405667
THE INTERCEPT IS 10.5295
THE INDEX OF DETERMINATION IS .999832
THE VARIANCE ABOUT THE REGRESSION IS 2.97619E-04
THE STANDARD DEVIATION OF Y IS .0154303

CALIBRATION CURVE DERIVED FROM RUNNING EXACT SAME STDS. AS IN CAL. CURVE #6 LATER THE SAME DAY

Continued To:

Entered By:

Date:

Disclosed To And Understood By Me:

Date:

Date:

Project No. 4482-37 Date of Work: 9/9/80 Work Performed by: DW

Title or Purpose: NO_3^- SIB Continued From: p.34

Sample No.	Calibration Curve No.	mv Reading No. 1	mv Reading No. 2	mv Reading No. 3	Average mv Reading	Identification	SAMPLE VOLUME AND/OR Dilution	$\mu g/ml\ NO_3^-$	mg NO_3^- Total
23	6	248.1	248.1		248.1	F.B.C. TP3, R-5, S-4	750ml	1.77	1.33
24	6	—	—			F.B.C. TP3, R-6, S-1	300ml	111.9	67.14
↳	↳	-	-				~~Extracted~~		
↳	↳	146.0	146.2		146.1	↳ ↳	5ml to 120ml		
25	6	—	—			F.B.C. TP3, R-6, S-2	300ml	16.78	503.4
↳	↳	192.9	192.7		192.8	" " " "	5ml to 50ml		
26	6	193.2	193.0		193.1	" " " S-3	300ml	16.58	4.97
27	6	220.8	220.6		220.7	" " " S-4	750ml	5.4	4.1
28	6	266.1	267.1		266.6	BLANK RUN 637	300ml	0.84	0.25
29	6	188.7			188.7	P.T.I.*B, TP1, R-7, S-1	175ml	19.82	3.47
30	6	208.8	209.0		208.9	P.T.I. B, TP1, R-7, S-2	200ml	8.72	1.74
31	6	155.8			155.8	" " " " S-3	110ml	75.45	8.30
32	6	193.8	193.2		193.5	" " " " S-4	510ml	16.31	8.32
33	7	143.3			143.3	BY. ST. B, TP5, R-8, S-1	150ml	111.75	16.76
34	7	183.5			183.5	" " " " " S-2	150ml	21.88	3.28
35	7	135.9			135.9	" " " " " S-3	160ml	150.88	24.14
36	7	184.3	185.2		184.8	" " " " " S-4	500ml	20.75	10.38
37	7	265.9	267.1		266.5	BLANK, R-859	250ml	0.75	0.19

* PELL TOWER INLET
** BYPASS STACK

Continued To:

Entered By:

Date:

Disclosed To And Understood By Me:

Date:

SEE NOTE ON PAGE 27

Project No. 4462-37 Date of Work: 9/10/80 Work Performed by: YL

Title or Purpose: NO_3^- SLE Continued From: p35

CALIBRATION CURVE # 8

204.4	9.94	POINT # 1
165.4	49.71	POINT # 2
148.3	99.42	POINT # 3
138	149.13	POINT # 4
130.9	198.84	POINT # 5
125.1	248.55	POINT # 6

#	X	Y	TRANSFORM X	TRANSFORM Y	Y RES.
1	204.4	9.94	204.4	2.29657	-.0106621
2	165.4	49.71	165.4	3.90621	.014195
3	148.3	99.42	148.3	4.59935	.0124764
4	138	149.13	138	5.00482	-6.03676E-04
5	130.9	198.84	130.9	5.2925	-1.43337E-03
6	125.1	248.55	125.1	5.51564	-.0139747

THE SLOPE OF THE LINE IS -.0406355
THE INTERCEPT IS 10.6131
THE INDEX OF DETERMINATION IS .999912
THE VARIANCE ABOUT THE REGRESSION IS 1.67137E-04
THE STANDARD DEVIATION OF Y IS .0115633

CALIBRATION STDS MADE FROM STANDARD SOLN of NH_4NO_3 CONTAINING 1.2828g

Continued To:

Disclosed To And Understood By Me:

Entered By:

Date:

Date:

Date:

Project No. 4468-37 Date of Work: 9/10/80 Work Performed by: VW

Title or Purpose: NO_3^- SIE Continued From: D36

(1) PREPARED CALIBRATION STDS AS ON p.23

(2) PREPARED NEW $(NH_4)_2SO_4$ SOLN. (1SA) p.19

Sample No.	Calibration Curve No.	mv Reading No. 1	mv Reading No. 2	mv Reading No. 3	Average mv Reading	Identification	Sample Volume Any.D/OR Dilution	µg/ml NO_3^-	mg NO_3^- Total
38	8	146.8			146.8	P.T.I. A, R-9, S-1 (TP2)	100ml	104.36	10.44
39	8	199.5			199.5	P.T.I. A, TP2, R-9, S-2	150ml	13.26	1.84
40	8	112.1			112.1	" " " " S-3	100ml	427.46	42.75
41	8	141.5	141.2	137.5	140.1	" " " " S-4	500ml	137.01	68.51
42	8	153.7			153.7	BY. ST. C, TP6, R-10, S-1	150ml	78.84	11.83
43	8	206.5			206.5	" " " " S-2	150ml	9.22	1.38
44	8	145.9			145.9	" " " " S-3	150ml	108.24	16.24
45	8	183.7	184.2	184.6	184.2	" " " " S-4	500ml	22.83	11.42
46	9	270.1	270.1		270.1	BLANK RUN 10,11	300ml	0.65	0.20
47	9	116.8	—			DR. EX* TP2, R-11, S-1	150ml	341.2	102.36
↳	↳	116.8	116.6		116.7	" " " " "	5ml to 100ml		
48	9	—	—	—	—	" " " " S-2	100ml	59.76	5.98
↳	↳	159.6	159.2		159.4	" " " " "	5ml to 500ml		
49	9	138.9			138.9	" " " " S-3	150ml	137.46	20.62
50	9	138.2	140.9		~~139.55~~	" " " " S-4	700ml	~~0.45~~	~~0.32~~
50	"	"	"		139.55	" " " " "	"	134.33	94.0

* DRYER EXHAUST

Project No. 4682-37 Date of Work: 9/10/80 Work Performed by: YW

Title or Purpose: NO_3^- SIB Continued From: P37

CAL. CURVE #9

203
164.5
147.1
137
130.1
123.9

9.94
49.71
99.42
149.13
198.84
248.55

POINT # 1
POINT # 2
POINT # 3
POINT # 4
POINT # 5
POINT # 6

#	X	Y	TRANSFORM X	TRANSFORM Y	Y RES.
1	203	9.94	203	2.29657	-.0149441
2	164.5	49.71	164.5	3.90621	.023881
3	147.1	99.42	147.1	4.59935	7.10201E-03
4	137	149.13	137	5.00482	4.83513E-04
5	130.1	198.84	130.1	5.2925	6.6433E-03
6	123.9	248.55	123.9	5.51564	-.0231752

THE SLOPE OF THE LINE IS -.0408004
THE INTERCEPT IS 10.594
THE INDEX OF DETERMINATION IS .999796
THE VARIANCE ABOUT THE REGRESSION IS 3.56381E-04
THE STANDARD DEVIATION OF Y IS .016885

SAME AS #8, RAN LATER IN DAY

Continued To: Disclosed To And Understood By Me:

Entered By: Date:

Date: Date:

Project No. 4468-37 Date of Work: 9/11/80 Work Performed by: YW

Title or Purpose: NO_3^- SLE Continued From: p 41

CALIBRATION CURVE #10

204.9
165.7
148.5
138.2
130.8
125.2

9.97
49.87
99.75
149.63
199.5
249.38

POINT # 1
POINT # 2
POINT # 3
POINT # 4
POINT # 5
POINT # 6

#	X	Y	TRANSFORM X	TRANSFORM Y	Y RES.
1	204.9	9.97	204.9	2.29958	-.0114107
2	165.7	49.87	165.7	3.90942	.014966
3	148.5	99.75	148.5	4.60267	.0134287
4	138.2	149.63	138.2	5.00817	2.86484E-03
5	130.8	199.5	130.8	5.29581	-8.40569E-03
6	125.2	249.38	125.2	5.51898	-.0114512

THE SLOPE OF THE LINE IS -.0403945
THE INTERCEPT IS 10.5878
THE INDEX OF DETERMINATION IS .999893
THE VARIANCE ABOUT THE REGRESSION IS 1.86127E-04
THE STANDARD DEVIATION OF Y IS .0122025

CALIBRATION CURVE #11

203.8
164.9
147.9
137.5
130.4
124.4

9.95
49.87
99.75
149.63
199.5
249.38

POINT # 1
POINT # 2
POINT # 3
POINT # 4
POINT # 5
POINT # 6

#	X	Y	TRANSFORM X	TRANSFORM Y	Y RES.
1	203.8	9.95	203.8	2.29757	-.0137672
2	164.9	49.87	164.9	3.90942	.0162306
3	147.9	99.75	147.9	4.60267	.0181813
4	137.5	149.63	137.5	5.00817	7.70092E-04
5	130.4	199.5	130.4	5.29581	-2.99931E-04
6	124.4	249.38	124.4	5.51898	-.0211229

THE SLOPE OF THE LINE IS -.0406645
THE INTERCEPT IS 10.5988
THE INDEX OF DETERMINATION IS .999819
THE VARIANCE ABOUT THE REGRESSION IS 3.07598E-04
THE STANDARD DEVIATION OF Y IS .0156869

Cont
Ente
Date

BOTH CURVES (10 & 11) WERE MADE WITH STD. SOLN of 1.2876g NH_4NO_3

Project No. 4461-37 Date of Work: 9/11/80 Work Performed by: YW

Title or Purpose: NO_3^- SIE Continued From: p39

(1) PREPARED 100ml of ISA SOLN.
(2) PREPARED STANDARDS, USING 1.2871g SOLN of NH_4NO_3 (1 LITER)

Sample No.	Calibration Curve No.	mv Reading No. 1	mv Reading No. 2	mv Reading No. 3	Average mv Reading	Identification	Sample Volume and/or Dilution	$\mu g/ml\ NO_3^-$	mg NO_3^- TOTAL
51	10	149.4			149.4	BY. ST. A, TP7, R-12, S-1	180ml	94.9	17.1
52	10	199.4			199.4	" " " " " S-2	150ml	12.59	1.89
53	10	146.7	146.6		146.7	" " " " " S-3	200ml	105.84	21.17
54	10	206.6	206.8		206.7	" " " " " S-4	850ml	9.38	7.97
55	10	266.9	267.7		267.3	RUN 12&13 BLANK	300ml	0.81	0.24
56	10	—	—			DR. EX. TP2, R-13, S-1	175ml	65.45	11.45
↳	↳	158.4	158.7		158.6	" " " " "	5ml to 500ml		
57	10	114.2			114.2	" " " " S-2	100ml	393.4	39.34
58	10	195.4			195.4	" " " " S-3	150ml	14.80	2.22
59	10	192.6	191.4		192.0	" " " " S-4	700ml	16.98	11.89
60	10	—	—			DR. EX. TP2, RUN-14, S-1	200ml	109.32	43.73
↳	↳	145.4	146.4		145.9	" " " " "	5ml to 100ml		
61	10	—	—			" " " " S-2	250ml	14.68	14.68
↳	↳	195.7	195.4		195.6	" " " " "	5ml to 200ml		
62	11	154.0			154.0	DR. EX. TP2, R-14, S-3	150ml	76.44	11.47
63	11	197.8	197.6	197.6	197.7	" " " " S-4	900ml	12.93	11.64
64	11	266.6	268.0		267.3	BLANK RUN 14&15	300ml	0.76	0.23
65	11	219.0	217.6	218.7	218.4	P.T.I. CTP3, R-15, S-1	300ml	5.57	1.67
66	11	241.0	241.0		241.0	" C " " S-2	250ml	2.22	0.56

Project No. 4482-37 Date of Work: 9/12/80 Work Performed by: YW

Title or Purpose: NO_3 SLE Continued From: 041

BOTH CURVES 12 & 13 WERE MADE WITH A STD. SOLN OF NH_4NO_3 CONTAINING 1.2828g NH_4NO_3

CAL. CURVE #12

```
 201.3                9.94                POINT # 1
 163.4                49.71               POINT # 2
 145.8                99.42               POINT # 3
 135.5                149.13              POINT # 4
 128                  198.84              POINT # 5
 122.1                248.55              POINT # 6
 #     X              Y     TRANSFORM X   TRANSFORM Y  Y RES.
 1     201.3          9.94        201.3      2.29657   -.0275526
 2     163.4          49.71       163.4      3.90621    .0414791
 3     145.8          99.42       145.8      4.59935    .0191994
 4     135.5          149.13      135.5      5.00482    5.97715E-03
 5     128            198.84      128        5.2925    -.0112104
 6     122.1          248.55      122.1      5.51564   -.0278969
THE SLOPE OF THE LINE IS -.0406493
THE INTERCEPT IS  10.5068
THE INDEX OF DETERMINATION IS  .999466
THE VARIANCE ABOUT THE REGRESSION IS  9.46979E-04
THE STANDARD DEVIATION OF Y IS  .0275242
```

CAL CURVE #13

```
 202.8                9.94                POINT # 1
 164.7                49.71               POINT # 2
 147.1                99.42               POINT # 3
 136.9                149.13              POINT # 4
 129.9                198.84              POINT # 5
 124.1                248.55              POINT # 6
 #     X              Y     TRANSFORM X   TRANSFORM Y  Y RES.
 1     202.8          9.94        202.8      2.29657   -.0187731
 2     164.7          49.71       164.7      3.90621    .0336914
 3     147.1          99.42       147.1      4.59935    7.51448E-03
 4     136.9          149.13      136.9      5.00482   -3.90196E-03
 5     129.9          198.84      129.9      5.2925    -2.31504E-03
 6     124.1          248.55      124.1      5.51564   -.0162206
THE SLOPE OF THE LINE IS -.0408707
THE INTERCEPT IS  10.6039
THE INDEX OF DETERMINATION IS  .999739
THE VARIANCE ABOUT THE REGRESSION IS  4.56925E-04
THE STANDARD DEVIATION OF Y IS  .0191191
```

Date: Date:

Project No. 4468-37 Date of Work: 9/12/80 Work Performed by: YW

Title or Purpose: NO_3^- SIE Continued From: p42

Sample No.	Calibration Curve No.	mv Reading No. 1	mv Reading No. 2	mv Reading No. 3	Average mv Reading	Identification	SAMPLE VOLUME AND/OR Dilution	µg/ml NO_3^-	mg NO_3^- Total
67	12	193.4	193.0	193.0	193.1	P.T.I CTP3, R-15, S-3	350 ml	14.23	4.98
68	12	197.1	196.4	196.5	196.7	" " " " S-4	800 ml	12.32	9.86
69	12	~~175.6~~				PREDR.* EX. TP1, R-16, S-1	200 ml	29.40	11.76
↳	↳	175.6	175.1	175.2	175.3	" " " " "	5 ml to 100 ml		
70	12	114.4	114.5		114.5	" " " " S-2	200 ml	348.1	69.6
71	12	176.9	176.6		176.8	" " " " S-3	200 ml	27.66	5.53
72	12	173.1	172.8		173.0	" " " R-16, S-4	700 ml	32.28	22.60
73	12	265.0	265.4		265.2	BLANK RUN 16317	250 ml	0.76	0.19
74	13					PREDR. EX. TP1, R-17, S-1	350 ml	25.20	17.64
↳	↳	180.6	180.5	180.4	180.5	" " " " "	5 ml to 100 ml		
75	13	117.7	117.6		117.7	" " " " S-2	300 ml	328.3	98.4
76	13	179.5	179.0		179.3	" " " " S-3	350 ml	26.46	9.26
77	13	193.6	193.7		193.7	" " " " S-4	700 ml	14.69	10.28
78	13	~~191.3~~				" " " R-18, S-1	350 ml	16.27	11.39
↳	↳	191.3	191.0		191.2	" " " " "	5 ml to 100 ml		
79	13	110.7	110.5		110.6	" " " " S-2	250 ml	438.6	109.7
80	13	180.3	180.0		180.2	" " " " S-3	250 ml	25.51	6.38
81	13	202.0	202.1		202.1	" " " " S-4	600 ml	10.42	6.25
82	13	270.0	270.0		270.0	BLANK RUN 18	250 ml	0.65	0.16
	13	152.5			152.5	AUDIT # 05266	2 ml to 500 ml	79.13	19.78
	13	180.9			180.9	" 03247	2 ml to 500 ml	24.79	6.19
	13	85.3			85.3	04285	5 ml to 1000 ml	1233.5	246.7
	13	159.9			159.9	02250	1 ml to 1000 ml	58.48	58.48
	13	188.5			188.5	01249	2 ml to 1000 ml	18.17	9.09

* PREDRYER EXHAUST

Entered By: Date:

Date: Date:

Project No. 4468L-37 Date of Work: 9/15/80 Work Performed by: DLO

Title or Purpose: NO_3^- SIE Continued From: p43

CALCULATIONS:

THE SLOPE AND Y INTERCEPT OF EACH CALIBRATION CURVE WAS DETERMINED AS DESCRIBED ON PAGE 25. SLOPE AND INTERCEPT WERE THEN ENTERED INTO SMALL PROGRAM SHOWN ON ~~THIS~~ PAGE 45 FOR EACH CURVE. THE AVERAGE MILLIVOLT READING FOR THE SAMPLE ANALYZED WAS ENTERED INTO PROGRAM GIVING MICROGRAMS PER MILLILITER NO_3^- IN ALIQUOT ANALYZED. THESE ALIQUOTS WERE DILUTED IN SOME CASES, THEREFORE TO OBTAIN TOTAL MILLIGRAMS IN A ~~THIS~~ PARTICULAR STAGE OF THE HCSS, IT IS NECESSARY TO MULTIPLY BY DILUTION FACTORS (IF ANY) AND SAMPLE VOLUMES.

→ EXPLANATION of SAMPLE VOLUME AND/or DILUTION COLUMN ON PRECEEDING DATA SHEETS IS AS FOLLOWS: IF ONE VOLUME APPEARS IN A SPACE / THAT IS THE ORIGINAL SAMPLE VOLUME OF THAT SAMPLE, IF TWO VOLUMES APPEAR IN THE SPACE DIRECTLY BELOW THE ORIGINAL SAMPLE VOLUME (EX. 2ml to 1000ml) THIS MEANS THAT 2ml of THE ORIGINAL SAMPLE VOLUME WAS TAKEN AND DILUTED TO 1000ml. (OR A 500X DILUTION FACTOR)

→ EXPLANATION of $\mu g/ml\ NO_3^-$ COLUMN: THIS IS THE NUMBER OF MICROGRAMS PER MILLILITER NO_3^- CONTAINED IN THE ANALYZED ALIQUOT OF A PARTICULAR SAMPLE. THIS IS NOT THE TOTAL PER STAGE

→ mg NO_3^- TOTAL = TOTAL AMOUNT OF NO_3^- IN A STAGE OF THE HCSS IN MILLIGRAMS

$$mg\ NO_3^-\ TOTAL = \frac{\mu g\ NO_3^-}{ml} \times DILUTION \times SAMPLE\ VOLUME\ (ml) \times \frac{1\ mg}{1000\ \mu g}$$

Continued To:

Entered By:

Date:

Disclosed To And Understood By Me:

Date:

Date:

Project No. 44682-37 Date of Work: 9/15/80 Work Performed by: DW

Title or Purpose: NO3 SITE Continued From: p44

5 INPUT ENTER INTERCEPT, SLOPE (A,B
8 LPRINT A,B
19 INPUT X
29 LPRINT A,B,R^2(A+B*X)
35 PRINT A,B,R^2(A+B*X)
38 GOTO 19

RADIO SHACK TRS 80

CAL. CURVE #1

	INTERCEPT A = 1.952 mV	SLOPE B = .0497593 μg/ml NO_3^-
C1	137.55	159.111
C2	196.7	22.7477
C3	221.2	5.44371
C4	236.55	3.17624

CAL. CURVE #2

C5220	10.6464	- .0445511
C5246	155.15	77.3419
C3247	183.55	24.7527
C4285	97.45	1215.79
C1249	139.55	18.6393
C2250	152.75	57.3794
C5	266.5	.853806

CAL. CURVE #3

	10.6831	- .0493782
C6	144.3	128.725
C7	165.5	28.7583
C8	224.3	5.694
C9	226.6	3.18033

Contin
Entere
Date:

CAL CURVE #4

	10.2763	- .0498559
10	262.2	.64633
11	182.7	437.466
12	167.1	21.4966
13	260	8.24382
14	225.5	2.85764
15	154.6	52.4577

CAL CURVE #5

	10.5122	- .0497675
16	208.3	13.4466
17	183.3	28.8951
18	142.7	1.85588
19	134.3	.765811
20	159.3	55.3134
21	215.5	5.52265
22	191.5	14.5968
[illegible]	[illegible]	[illegible]

CAL CURVE #6

	10.654	- .0496223
23	248.1	1.7728
24	146.1	111.992
25	152.5	16.7784
26	193.1	16.5751
27	228.7	3.49829
28	266.6	.836465
29	186.7	19.8159
30	268.9	8.72256
31	155.8	75.4513
32	192.5	16.3879

CAL CURVE #7

	10.5295	- .0495667
33	145.3	111.753
34	182.5	21.8786
35	135.9	158.88
36	184.8	28.7847
37	266.5	.754622

CAL CURVE #8

	10.6121	- .0496359
38	146.8	104.356
39	159.5	12.2397
40	112.1	427.46
41	148.1	137.812
42	152.7	78.8463
43	186.5	9.22456
44	145.9	108.243
45	184.2	22.9292

CAL. CURVE #9

	10.554	- .0498624
46	178.1	.652244
47	115.7	341.245
48	159.4	59.7648
49	178.9	127.341
50	159.55	1.34433

CAL. CURVE #10

	10.7878	- .0491945
51	149.4	34.9837
52	159.4	12.933
53	146.7	105.84
54	206.7	3.37356
55	267.2	.618963
56	156.6	55.4463
57	114.2	393.369
58	155.4	14.8813
59	192	16.9983
60	145.9	109.316
61	155.6	14.6822

CAL. CURVE #11

	10.5988	- .0496545
62	154	76.437
63	197.7	12.9284
64	267.3	.762754
65	218.4	5.87159
66	241	2.22259

By Me:
Date:
Date:

CAL. CURVE #12

	10.5968	- .0496497
67	193.1	14.2594
68	156.7	12.3193
69	173.3	23.3995
70	114.5	348.669
71	176.8	27.6624
72	173	32.2587
73	155.2	.769732

CAL CURVE #13

	10.6009	- .0495787
74	138.5	15.1974
75	147.7	328.122
76	173.3	23.494
77	153.7	14.6512
78	191.2	15.3715
79	149.6	438.666
80	188.2	25.5992
81	182.1	18.4221
82	270	.649737
C5246	152.5	79.4224
C3247	198.9	24.7588
C4285	98.2	1221.52
[illegible]	10.9803	- .0498787
C2250	159.9	58.4795
C1249	188.5	18.17

APPENDIX E.5

SAMPLING LOGS

SAMPLE IDENTIFICATION LOG

Plant COLUMBIA NITROGEN CORP.
Location CONTROL ROOM
MRI Project No. 4468L-37

Collected and Recorded by TOM WALKER
MRI Technical Record Book No. 80-205
Page 1 of 4

MRI No.	Date	Run No.	Sample Description	VOLUME	Remarks
01	8/12/80	1	HCSS, 1st STAGE, FLUIDIZED BED COOLER TP4	255 ml	
02	8/12	1	" 2nd STAGE, "	260 ml	
03	8/12	1	" 3rd STAGE, "	500 ml	
04	8/12	1	" 4th STAGE, "	100 ml	PROBE + 1st & 2nd IMPINGER
05	8/12	1	BLANK	250	
06	8/13	2	HCSS, 1st STAGE, FLUIDIZED BED COOLER TP4	350	
07	8/13	2	" 2nd STAGE, "	300	
08	8/13	2	" 3rd STAGE, "	300	
09	8/13	2	" 4th STAGE, "	750	PROBE + 1st & 2nd IMPINGER
10	8/13	2,3	BLANK	250 ml	
11	8/13	3	HCSS, 1st STAGE, FLUIDIZED BED COOLER TP4	300	
12	8/13	3	" 2nd STAGE, " "	300	
13	8/13	3	3rd STAGE, " "	300	
14	8/13	3	" 4th STAGE, " "	750	PROBE & 1st & 2nd IMPINGER
15	8/13	4	HCSS, 1st STAGE, FLUIDIZED BED COOLER TP3	350	
16	8/13	4	" 2nd STAGE, "	300	
17	8/13	4	" 3rd STAGE, "	300	
18	8/13	4	" 4th STAGE, "	750	PROBE + 1st & 2nd IMPINGER
19	8/13	4,5	BLANK	300	
20	8/14	5	HCSS, 1st STAGE, FLUIDIZED BED COOLER TP3	300	
21	8/14	5	" 2nd STAGE, " "	300	
22	8/14	5	" 3rd STAGE, " "	300	
23	8/14	5	" 4th STAGE, " "	750	PROBE + 1st & 2nd IMPINGER
24	8/14	6	HCSS, 1st STAGE, FLUIDIZED BED COOLER TP3	300	

SAMPLE IDENTIFICATION LOG

Plant COLUMBIA NITROGEN CORP
Location AUGUSTA, GA
MRI Project No. 4468L-37

Collected and Recorded by DLO
MRI Technical Record Book No. 80-205
Page 2 of 4

MRI No.	Date	Run No.	Sample Description	VOLUME	Remarks
25	8/14	6	HCSS, 2nd STAGE, FLUIDIZED BED TP3	300	
26	8/14	6	" 3rd STAGE, " "	300	
27	8/14	6	" 4th STAGE, FLUIDIZED BED TP3	750	PROBE & 1ST & 2ND IMPINGERS
28	8/14	6,7	BLANK	300	
29	8/14	7	HCSS, 1st STAGE, PRILL TOWER INLET B TP1	175	
30	8/14	7	" 2nd STAGE "	200	
31	8/14	7	" 3rd STAGE "	110	
32	8/14	7	" 4th STAGE "	510	PROBE & 1ST & 2ND STAGE
33	8/14	8	HCSS, 1st STAGE, BYPASS STACK B, TP5		
34	8/14	8	" 2nd STAGE, " "		
35	8/14	8	" 3rd STAGE " "		
36	8/14	8	" 4th STAGE " "		PROBE & 1ST & 2ND STAGE
37	8/14	8,9	BLANK		
38	8/14	9	HCSS, 1st STAGE, PRILL TOWER INLET A TP2		
39	8/14	9	" 2nd STAGE "		
40	8/14	9	" 3rd STAGE		
41	8/14	9	" 4th STAGE		PROBE & 1ST & 2ND STAGE
42	8/15	10	HCSS, 1ST STAGE BYPASS STACK C TP6		
43	8/15	10	" 2nd STAGE "		
44	8/15	10	" 3rd STAGE "		
45	8/15	10	" 4th STAGE "		PROBE & 1ST & 2ND IMPINGER
46	8/15	10,11	BLANK		
47	8/15	11	HCSS, 1ST STAGE, DRYER EXHAUST		
48	8/15	11	2nd STAGE " TP2		

SAMPLE IDENTIFICATION LOG

Plant COLUMBIA NITROGEN CORP
Location AUGUSTA, GA
MRI Project No. 4468J-37

Collected and Recorded by TOM WALKER
MRI Technical Record Book No. 80-205
Page 3 of 4

MRI No.	Date	Run No.	Sample Description	Remarks
49	8/15	11	HCSS, 3rd STAGE, DRYER EXHAUST TP2	
50	8/15	11	" 4th STAGE "	PROBE, 1st & 2nd IMPINGER
51	8/15	12	HCSS, 1st STAGE, BYPASS STACK ATP7	
52	8/15	12	" 2nd STAGE "	
53	8/15	12	" 3rd STAGE "	
54	8/15	12	" 4th STAGE "	PROBE, 1st & 2nd IMPINGER
55	8/15	12,13	BLANK	
56	8/15	13	HCSS, STAGE 1, DRYER EXHAUST TP2	
57	8/15	13	" STAGE 2, "	
58	8/15	13	" STAGE 3 "	
59	8/15	13	" STAGE 4 "	PROBE, 1st & 2nd IMPINGER
60	8/15	14	HCSS, STAGE 1, DRYER EXHAUST TP2	
61	8/15	14	" STAGE 2, "	
62	8/15	14	" STAGE 3, "	
63	8/15	14	" STAGE 4, "	PROBE, 1st & 2nd STAGE
64	8/15	15 14	BLANK	
65	8/16	15	HCSS, 1st STAGE, PRIMARY DRYER INLET TP3	
66	8/16	15	" 2nd STAGE "	
67	8/16	15	" 3rd STAGE "	
68	8/16	15	" 4th STAGE "	
69	8/16	16	HCSS, 1st STAGE, PRE DRYER EXHAUST TP1	
70	8/16	16	" 2nd STAGE "	
71	8/16	16	" 3rd STAGE "	
72	8/16	16	" 4th STAGE "	

SAMPLE IDENTIFICATION LOG

Plant COLUMBIA NITROGEN CORP
Location AUGUSTA, GA
MRI Project No. 4468L-37

Collected and Recorded by YLD
MRI Technical Record Book No. 80-205
Page 4 of 4

MRI No.	Date	Run No.	Sample Description	Remarks
73	8/16	1617	BLANK	
74	8/16	17	HCSS, 1ST STAGE PRE DRYER EXHAUST TP1	
75	8/16	17	" 2ND STAGE "	
76	8/16	17	" 3RD STAGE "	
77	8/16	17	" 4TH STAGE "	PROBE & 1ST & 2ND IMPINGER
78	8/16	18	HCSS, 1ST STAGE PRE DRYER EXHAUST TP1	
79	8/16	18	" 2ND STAGE "	
80	8/16	18	" 3RD STAGE "	
81	8/16	18	" 4TH STAGE "	PROBE & 1ST & 2ND IMPINGER
82	8/16	18	BLANK	

SAMPLING TASK LOG

Plant Col. Nit. Corp.
Date 8-12-80 and 8-13-80
Project No. 4468 - L87

Plant Location Augusta, Ga.
Recorded by [illegible]

Comments	Run	Sampling Location (Port)	Pollutant	Clock Time Began	Clock Time Ended	Elapsed Time (min)	Sample Nos.
Prill Cooler Uncontrolled Exhaust	1	North port point 8	Particulate	14:15	—	—	01
8-12-80							02
							03
							04
8-12-80	2		Particulate	1740	1840	60	06
							07
							08
							09
8-13-80	3		Particulate	0850	0950	60	11
							12
							13
							14
Blanks. 8-12-80	1						05
Blank 8-13-80	2+3						010

SAMPLE HANDLING LOG

Project Number 4468-L37

Source Identification P.C. Unc. Stack

Test Run Number 1

Pollutant(s) in Sample Particulate

Task	Date	Time	Personnel	Remarks
Sampling	8-12-80	14:15-		
Probe Technician			Hansen	
Meter Technician			Cobb	Trouble with thermostat switch
Other				in console pump.
Transport of Train to Cleanup Site		—	Cobb/Hansen	
Train Disassembly	8-12-80	17:00	Wilcox/Walker	
Train Cleanout	8-12-80	17:00	Wilcox/Walker	
Packing and Storage	8-16-80	12:00-17:00	Wilcox/Walker	
Shipment to Analysis Site	8-22-80	—	Cobb/Hansen	
Lab Analysis	9-4-80	—	Walker	
Write Up	9-9-80	—	Cobb	

SAMPLE HANDLING LOG

Project Number 4468-137

Source Identification P.C. Unc. Stack

Test Run Number 2

Pollutant(s) in Sample Particulate

Task	Date	Time	Personnel	Remarks
Sampling	8-12-80	12:40-18:40		
Probe Technician			Hansen/Cobb	
Meter Technician			Cobb/Hansen	
Other				
Transport of Train to Cleanup Site	8-12-80	18:40-18:00	Cobb/Hansen	
Train Disassembly	8-12,13-80	—	Wilcox/Walker	
Train Cleanout	8-12,13-80	—	Wilcox/Walker	
Packing and Storage	8-16-80	12:00-17:00	Wilcox/Walker	
Shipment to Analysis Site	8-21,22-80	—	Cobb/Hansen	
Lab Analysis	9-5-80	—	Walker	
Write Up	9-9/14,80	—	Cobb	

SAMPLE HANDLING LOG

Project Number 4466-137

Source Identification P.C. Unit Stack

Test Run Number 3

Pollutant(s) in Sample Particulate

Task	Date	Time	Personnel	Remarks
Sampling	8-13-80	0850-0950		
Probe Technician			Cobb/Hansen	
Meter Technician			Hansen/Cobb	
Other				
Transport of Train to Cleanup Site	8-13-80	0950-1010	Cobb/Hansen	
Train Disassembly	8-13-80	1010	Wilcox/Walker	
Train Cleanout	8-13-80	16:00	Wilcox/Walker	
Packing and Storage	8-16-80	12:00-17:00	Wilcox/Walker	
Shipment to Analysis Site	8-21,22,80	—	Cobb/Hansen	
Lab Analysis	9-8-80	—	Walker	
Write Up	9-9/16-80	—	Cobb	

SAMPLING TASK LOG

Plant Columbia Nitrogen Corp.
Date 8-13-80
Project No. 4418-137

Plant Location Augusta, Ga.
Recorded by TCC-Teb

Comments	Run	Sampling Location (Port)	Pollutant	Clock Time Began	Clock Time Ended	Elapsed Time (min)	Sample Nos.
Cyclone Scrubber Inlet	1	west port, point 11	Particulate	1350	1450	60	15
8-13-80							16
							17
							18
8-13-80	2		Particulate	1615	1715	60	20
							21
							22
							23
8-13-80	3		Particulate	1820	1905	45	24
							25
							26
							27
Blank	1,2						19
Blank	3						28

SAMPLE HANDLING LOG

Project Number 4468-L37

Source Identification P.C. Scrub. Inlet

Test Run Number 1

Pollutant(s) in Sample Particulates

Task	Date	Time	Personnel	Remarks
Sampling	8-13-80	13:50-14:50		
Probe Technician			Cobb	
Meter Technician			Hansen	
Other				
Transport of Train to Cleanup Site	8-13-80	14:50-15:10	Cobb / Hansen	
Train Disassembly	8-13-80	15:10	Walker/Wilcox	
Train Cleanout	8-13-80	→ 18:20	Walker/Wilcox	
Packing and Storage	8-16-80	12:00-17:00	Walker/Wilcox	
Shipment to Analysis Site	8-21,22-80		Cobb / Hansen	
Lab Analysis	9-8-80	—	Walker	
Write Up	9-9/16-80	—	Cobb	

SAMPLE HANDLING LOG

Project Number 4468-637

Source Identification PC Scrubber Inlet

Test Run Number 2

Pollutant(s) in Sample Particulates

Task	Date	Time	Personnel	Remarks
Sampling	8-13-80	11:15-17:15		
Probe Technician			Cobb/Hansen	
Meter Technician			Cobb/Hansen	
Other				
Transport of Train to Cleanup Site	8-13-80	17:15-17:35	Cobb/Hansen	
Train Disassembly	8-13-80	17:35	Wilcox/Walker	
Train Cleanout		18:00	Wilcox/Walker	
Packing and Storage	8-16-80	12:00-17:00	Wilcox/Walker	
Shipment to Analysis Site	8-21,22-80	—	Cobb/Hansen	
Lab Analysis	9-8-80	—	Walker	
Write Up	9-9/16-80	—	Cobb	

SAMPLE HANDLING LOG

Project Number 4468-L 37

Source Identification P.C. Semb Inlet

Test Run Number 3

Pollutant(s) in Sample Particulate

Task	Date	Time	Personnel	Remarks
Sampling	8-13-80	18:20-19:05		
Probe Technician			Hansen Cobb	
Meter Technician			Hansen	
Other				
Transport of Train to Cleanup Site	8-13-80	19:05-19:25	Cobb / Hansen	
Train Disassembly	8-13-80	1925	Walker / Wilcox	
Train Cleanout		20:25	Walker / Wilcox	
Packing and Storage	8-16-80	17:00-17:00	Walker / Wilcox	
Shipment to Analysis Site	8-21,22-80	—	Cobb / Hansen	
Lab Analysis	9-9-80	—	Walker	
Write Up	9-9/16-80	—	Cobb	

SAMPLING TASK LOG

Plant Columbia Nitrogen Corp. Plant Location Augusta, Ga.
Date 8-14-80 and 8-16-80 Recorded by W. Cobb
Project No. 4468 L-37

Comments	Run	Sampling Location (Port)	Pollutant	Clock Time Began	Clock Time Ended	Elapsed Time (min)	Sample Nos.
Spill Tower Inlet A	1	east port, point 4	Particulate	1710	1840	90	38
8-14-80							39
							40
							41
Spill Tower Inlet B	1	south port, point 4	Particulate	950	1050	60	29
8-14-80							30
							31
							32
Spill Tower Inlet C	1	north port, point 5	Particulate	0855	0955	60	65
8-16-80							66
							67
							68
Blank	A						37
Blank	B						28
Blank	C						64

SAMPLE HANDLING LOG

Project Number 4468-L37

Source Identification P.T. Inlet A

Test Run Number 1

Pollutant(s) in Sample Particulates

Task	Date	Time	Personnel	Remarks
Sampling	8-14-80	1210-1840		
Probe Technician			Cobb	
Meter Technician			Hansen	
Other				
Transport of Train to Cleanup Site	8-14-80	1840-1900	Cobb / Hansen	
Train Disassembly	8-15-80	0900-1030	Walker / Wilcox	
Train Cleanout			Walker / Wilcox	
Packing and Storage	8-16-80	1200-1700	Walker / Wilcox	
Shipment to Analysis Site	8-21,22-80	—	Cobb / Hansen	
Lab Analysis	9-10-80	—	Walker	
Write Up	9-24-80	—	Cobb	

SAMPLE HANDLING LOG

Project Number 4468 - 237

Source Identification P.T. Inlet B

Test Run Number 1

Pollutant(s) in Sample Particulates

Task	Date	Time	Personnel	Remarks
Sampling	8-14-80	5:50-10:50		
Probe Technician			Willie Hansen	
Meter Technician			Cobb	
Other				
Transport of Train to Cleanup Site	8-14-80	10:50-11:16	Cobb	
Train Disassembly	8-14-80	11:50	Wilcox/Walker	
Train Cleanout		1630	Wilcox/Walker	
Packing and Storage	8-16-80	1200-1700	Wilcox/Walker	
Shipment to Analysis Site	8-21,22-80	—	Cobb/Hansen	
Lab Analysis	9-2-80	—	Walker	
Write Up	09/11/80	—	Cobb	

SAMPLE HANDLING LOG

Project Number 4468-L37

Source Identification PT. Inl. to C

Test Run Number 1

Pollutant(s) in Sample Particulate

Task	Date	Time	Personnel	Remarks
Sampling	8-16-80	955-955		
Probe Technician			Hansen/Wilcox	
Meter Technician			Hansen	
Other				
Transport of Train to Cleanup Site	8-16-80 ~~955-1015~~	955-1015	Cobb / Hansen	
Train Disassembly	8-16-80	1015	Wilcox / Walker	
Train Cleanout		→ 1200	Wilcox / Walker	
Packing and Storage	8-16-80	1200 - 1700	Wilcox / Walker	
Shipment to Analysis Site	8-21,22-80	—	Cobb / Hansen	
Lab Analysis	9-11,12-80	—	Walker	
Write Up	9-9/11-80	—	Cobb	

SAMPLING TASK LOG

Plant Columbia Nitrogen Corp
Date 8-15-80 and 8-16-80
Project No. 4486-137

Plant Location Augusta, Ga.
Recorded by H Cole

Comments	Run	Sampling Location (Port)	Pollutant	Clock Time Began	Clock Time Ended	Elapsed Time (min)	Sample Nos.
Prill Tower Bypass A 8-15-80	1	outpat point 6	Particulate	1450	1735	165	51
							52
							53
							54
Prill Tower Bypass B 8-16-80	1	outpat point 5	Particulate	1215	1525	180	33
							34
							35
							36
Prill Tower Bypass C 8-15-80	1	outpat point 3	Particulate	0915	1215	180	42
							43
							44
							45
Blank	A						55
Blank	B						46
Blank	C						37

SAMPLE HANDLING LOG

Project Number 446-137

Source Identification P.T. Bypass A

Test Run Number 1

Pollutant(s) in Sample Particulate

Task	Date	Time	Personnel	Remarks
Sampling	8-15-80	1450-1735		
Probe Technician			Walker	
Meter Technician			Hansen	
Other				
Transport of Train to Cleanup Site	8-15-80	1735-1800	Hansen/Walker	
Train Disassembly	8-15-80	1800	Wilcox/Walker	
Train Cleanout		1800	Wilcox/Walker	
Packing and Storage	8-16-80	1200-1800	Wilcox/Walker	
Shipment to Analysis Site	8-21,22-80	—	Cobb/Hansen	
Lab Analysis	9-11-80	—	Walker	
Write Up	9-9/11-80	—	Cobb	

SAMPLE HANDLING LOG

Project Number 4466-137

Source Identification PT. Bypass B

Test Run Number 1

Pollutant(s) in Sample Particulate

Task	Date	Time	Personnel	Remarks
Sampling	8-14-80	1215-1525		
Probe Technician			Hansen	
Meter Technician			Cobb	
Other				
Transport of Train to Cleanup Site	8-14-80	1525-1600		
Train Disassembly	8-14-80	1600	Wilcop/Walker	
Train Cleanout		1700	Wilcop/Walker	
Packing and Storage	8-16-80	1200-1700	Wilcop/Walker	
Shipment to Analysis Site	8-21,22-80	—	Cobb/Hansen	
Lab Analysis	9-9-80	—	Walker	
Write Up	9-9/16-80	—	Cobb	

SAMPLE HANDLING LOG

Project Number 4468-37

Source Identification P.T. Bypass C

Test Run Number 1

Pollutant(s) in Sample Particulate

Task	Date	Time	Personnel	Remarks
Sampling	8-15-80	0915-1215		
Probe Technician			Walker	
Meter Technician			Hansen	
Other				
Transport of Train to Cleanup Site	8-15-80	1215-1240	Walker/Hansen	
Train Disassembly	8-15-80	1740	Wilcox/Walker	
Train Cleanout		1450	Wilcox/Walker	
Packing and Storage	8-16-80	1200-1700	Wilcox/Walker	
Shipment to Analysis Site	8-21,22-80	—	Cobb/Hansen	
Lab Analysis	9-10-80	—	Walker	
Write Up	9-4/11-80	—	Cobb	

SAMPLING TASK LOG

Plant Columbia Nitrogen Corp.
Date 8-15-80
Project No. 4468.2-32

Plant Location Augusta Ga.
Recorded by H Cobb

Comments	Run	Sampling Location (Port)	Pollutant	Clock Time Began	Clock Time Ended	Elapsed Time (min)	Sample Nos.
Oxygen Outlet	1	northpot, point 15	Particulate	1125	1156.5	31.5	47
8-15-80							48
							49
							15
8-15-80	2	northpot, point 11	Particulate	1440	1455 1504	15	56
							57
							58
							59
8-15-80	3	northpot, point 8	Particulate	1145	1730	45	60
							61
							62
							63
Blank	1						46
	2						55
	3						64

SAMPLE HANDLING LOG

Project Number 4468L-37

Source Identification Dryer Outlet

Test Run Number 1

Pollutant(s) in Sample Particulate

Task	Date	Time	Personnel	Remarks
Sampling	8-15-80	1125-1156.5		
Probe Technician			Dilcof	
Meter Technician			Cobb	
Other				
Transport of Train to Cleanup Site	8-15-80	1200-1220	Cobb/Walker	
Train Disassembly	8-15-80	1220	Wilcof/Walker	
Train Cleanout		1440	Wilcof/Walker	
Packing and Storage	8-16-80	1200-1700	Wilcof/Walker	
Shipment to Analysis Site	8-22-80	—	Cobb/Hamm	
Lab Analysis	9-10-80	—	D. Ellers	
Write Up	9-9/11-80	—	Cobb	

SAMPLE HANDLING LOG

Project Number 4468-137

Source Identification Dryer Outlet

Test Run Number 2

Pollutant(s) in Sample Particulate

Task	Date	Time	Personnel	Remarks
Sampling	9-15-80	1440-1455		
Probe Technician			Walker	
Meter Technician			Cobb	
Other				
Transport of Train to Cleanup Site	9-15-80	1500-1520	Cobb/Walker	
Train Disassembly	8-15-80	1520	Wilcox/Walker	
Train Cleanout		1630	Wilcox/Walker	
Packing and Storage	9-16-80	1200-1700	Wilcox/Walker	
Shipment to Analysis Site	9-21,22-80	—	Cobb/Hamm	
Lab Analysis	9-11-80	—	Walker	
Write Up	9-9/16-80	—	Cobb	

SAMPLE HANDLING LOG

Project Number 4468-137

Source Identification Dryer Outlet

Test Run Number 3

Pollutant(s) in Sample Particulate

Task	Date	Time	Personnel	Remarks
Sampling	8-15-80	1645-1730		
Probe Technician			Walker	
Meter Technician			Cobb	
Other				
Transport of Train to Cleanup Site	8-15-80	1730-1750	Walker/Cobb	
Train Disassembly	8-16-80	0800 to 0900	Wilcox/Walker	
Train Cleanout			Wilcox/Walker	
Packing and Storage	8-16-80	1200-1300	Wilcox/Walker	
Shipment to Analysis Site	8-21,22-80	—	Harmon/Cobb	
Lab Analysis	9-11-80	—	Walker	
Write Up	9-9/14-80	—	Cobb	

SAMPLING TASK LOG

Plant Columbia Nitrogen Corp
Date 8-16-80
Project No. 4468-L37

Plant Location Augusta Ga
Recorded by [illegible]

Comments	Run	Sampling Location (Port)	Pollutant	Clock Time Began	Clock Time Ended	Elapsed Time (min)	Sample Nos.
Predryer Exhaust	1	north port point 16	Particulate	950	1005.5	15.5	69
8-16-80							70
							71
							72
8-16-80	2	north port point 12	Particulate	1215	1230¼	15.25	74
							75
							76
							77
8-16-80	3	north port point 9	Particulate	1255	1310	15	78
							79
							80
							81
Blanks	1						73
	2						73
	3						82

SAMPLE HANDLING LOG

Project Number 4468-437

Source Identification Rodgers Exhaust

Test Run Number 1

Pollutant(s) in Sample Particulate

Task	Date	Time	Personnel	Remarks
Sampling	8-16-80	950-1005.5		
Probe Technician			Walker	
Meter Technician			Cobb	
Other				
Transport of Train to Cleanup Site	8-16-80	1015-1030	Walker/Cobb	
Train Disassembly	8-16-80	1030	Wilcox/Walker	
Train Cleanout		→ 1200	Wilcox/Walker	
Packing and Storage	8-16-80	1200-1700	Wilcox/Walker	
Shipment to Analysis Site	8-21,22-80	—	Hansen/Cobb	
Lab Analysis	9-12-80	—	Walker	
Write Up	9-9/16-80	—	Cobb	

SAMPLE HANDLING LOG

Project Number 4468-L37

Source Identification Producer Exhaust

Test Run Number 2

Pollutant(s) in Sample Particulate

Task	Date	Time	Personnel	Remarks
Sampling	8-16-80	1215-1230¼		
Probe Technician			Wilcox	
Meter Technician			Cobb	
Other				
Transport of Train to Cleanup Site	8-16-80	1230-~~1240~~ 1235	Wilcox/Cobb	
Train Disassembly	8-16-80	~~1240~~ 1235	Wilcox/Walker	
Train Cleanout		1250	Wilcox/Walker	
Packing and Storage	8-16-80	1250-1700	Wilcox/Walker	
Shipment to Analysis Site	8-21-22-80	—	Hansen/Cobb	
Lab Analysis	9-12-80	—	Walker	
Write Up	9-7/16-80	—	Cobb	

SAMPLE HANDLING LOG

Project Number 4468-L37

Source Identification Pradeyer Exhaust

Test Run Number 3

Pollutant(s) in Sample Particulate

Task	Date	Time	Personnel	Remarks
Sampling	8-16-80	1255-1310		
Probe Technician			Walker	
Meter Technician			Cobb	
Other				
Transport of Train to Cleanup Site	8-16-80	1310-1325	Walker / Cobb	
Train Disassembly	8-16-80	1325	Walker / Wilcox	
Train Cleanout		1400	Walker / Wilcox	
Packing and Storage	8-16-80	1400 1700	Walker / Wilcox	
Shipment to Analysis Site	8-21,22-80	—	Cobb / Hansen	
Lab Analysis	9-12-80	—	Walker	
Write Up	9-9/16-80	—	Cobb	

APPENDIX E.6

SAMPLING TRAIN CALIBRATION DATA

CONSOLE NO. 2 DATE 9-8-80 INITIAL RCS

BAROMETRIC PRESSURE 739.37 mm = 29.11
742.4 mm @ 24°C
-3.02 @ 740

Time M	Time S	Man. Inches H_2O	CFd	CFw	ITd	OTd	Tw	Dw
7	40.0	1.4		0	85	72	68.6	-5.7
				1	90	74	68.6	-5.7
		Finish 637,680		2	91	74	68.6	-5.7
		Start 632.776		3	92	75	68.6	-5.7
7.667 m		Total ~~5.104~~ 4.992		4	93	75	68.6	-5.7
				5	94	76	68.6	-5.7
			Averages		90.8	74.3	68.6	-5.7
7	38.9	1.4		0	85	76	68.7	-5.7
				1	88	77	68.7	-5.7
7.648		Finish 647,655		2	89	78	68.9	-5.7
		Start 642.708		3	91	78	68.9	-5.7
		Total 4.947		4	93	78	68.9	-5.7
				5	93	78	68.9	-5.7
			Averages		89.8	77.5	68.83	-5.7
7	42.2	1.4		0	88	77	68.9	-5.7
				1	92	78	68.9	-5.7
		Finish 652.649		2	93	79	68.9	-5.7
		Start 647.702		3	94	79	68.9	-5.7
7.703		Total 4.947		4	95	79	68.9	-5.7
				5	96	80	68.9	-5.7
			Averages		93.0	78.7	68.8	-5.7
				0				
				2				
				4				
		Finish		6				
		Start		8				
		Total		10				
			Averages					

POSTTEST METER CALIBRATION DATA FORM (English units)

Test numbers _____

Date 9-8-80 Meter box number 2 Plant Columbia Nitrogen

Barometric pressure, P_b = 29.11 in. Hg Dry gas meter number ~~[illegible]~~ Pretest Y 1.012 @ 2" ΔH

Wet Meter Static Press. In. H_2O D_m	Orifice manometer setting, (ΔH), in H_2O	Gas volume wet test meter (V_w), * ft^3	Gas volume dry gas meter (V_d), ft^3	Temperature: Wet test meter (t_w), °F	Temperature: Dry gas meter Inlet (t_{d_i}), °F	Temperature: Dry gas meter Outlet (t_{d_o}), °F	Temperature: Dry gas meter Average (t_d)[a], °F	Time (θ), min	Vacuum setting, in. Hg	Y_i	$Y_i = \frac{V_w P_b (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$	$\Delta H@_i$
			4.992							1.010		
-5.7	1.4	~~4.928~~	~~5.104~~	68.6	90.8	74.3	82.6	7.667	5	~~1.020~~		1.930
-5.7	1.4	~~4.928~~	4.947	68.83	89.8	77.5	83.65	7.648	5	1.020		1.911
-5.7	1.4	~~4.928~~	4.947	68.9	93.0	78.7	85.83	7.703	5	1.024		1.934
										Y= 1.018		1.925

[a] If there is only one therometer on the dry gas meter, record the temperature under t_d.

where

V_w = Gas volume passing through the wet test meter, ft^3.

V_d = Gas volume passing through the dry test meter, ft^3.

t_w = Temperature of the gas in the wet test meter, °F.

t_{d_i} = Temperature of the inlet gas of the dry test meter, °F.

t_{d_o} = Temperature of the outlet gas of the dry test meter, °F.

t_d = Average temperature of the gas in the dry test meter, obtained by the average of t_{d_i} and t_{d_o}, °F.

ΔH = Pressure differential across orifice, in H_2O.

Y_i = Ratio of accuracy of wet test meter to dry test meter for each run.

Y = Average ratio of accuracy of wet test meter to dry test meter for all three runs.
Tolerance = Pretest Y ±0.05Y

P_b = Barometric pressure, in. Hg.

R = Time of calibration run, min.

* $V_w = \left[P_b + (D_m/13.6)\right] \times$ Indicated Wet Volume

CALIBRATION-ORIFICE AND METER

ΔH and ΔY

Console No. 6
Operator RCS

Date 5-19-80

Use This Sample to Test Program Once, After Loading

1.0	86	28.90	75.3	9.1	5	Answer 1.90
Man. Orifice	OT_d	P_b	T_w	t	CF_w	ΔH
0.5						
1.0						
4.0						
6.0						
2.0	74.5	29.067	70.7	13.023	10	1.906

$$\Delta H@ = \frac{.0371(\Delta H)}{P_b(OT_d+460)}\left[\frac{(T_w+460)\,t}{CF_w}\right]^2$$

Use This Sample to Test Program Once, After Loading

1.0	28.90	5.13	75.3	97	66	28.90	5	Answer 1.00
Man. Orifice	P_b	CF_d	T_w	IT_d	OT_d	P_b	CF_w	ΔY
0.5								
1.0								
4.0								
6.0								
2.0	29.067	10.232	70.7	90.5	74.5	29.067	10	0.994

$$\Delta Y = \frac{(CF_w)(P_b)(Td_{avg}+460)}{CF_d\left(P_b+\frac{\Delta H}{13.6}\right)(T_w+460)}$$

Tolerances

ΔY	0.99	1.00	1.01
ΔH	1.6	1.84	2.1

CONSOLE NO. 6 DATE 5-19-80 INITIAL RCS

BAROMETRIC PRESSURE 29.067

Time M	Time S	Man. Inches H_2O	CFd	CFw	ITd	OTd	Tw
				0			
				1			
		Finish		2			
		Start		3			
		Total		4			
				5			
			Averages				
				0			
				1			
				2			
		Finish		3			
		Start		4			
		Total		5			
			Averages				
792.15 sec		2.0		0	82	72	70.7
				2	86	73	70.7
				4	89	74	70.7
13,023 min		Finish 910.632		6	92	75	70.7
		Start 900.400		8	96	76	70.7
		Total 10.232		10	98	77	70.7
					90.5	74.5	70.7
			Averages		82.5		
				0			
				2			
				4			
		Finish		6			
		Start		8			
		Total		10			
			Averages				

POSTTEST METER CALIBRATION DATA FORM (English units)

Test numbers _____

Date 9-5-80 Meter box number 6 Plant Columbia Nitrogen

Barometric pressure, P_b = 29.13 in. Hg Dry gas meter number _____ Pretest Y 0.994 @ 2" ΔH

Wet Meter Static Press. In. H2O Dm	Orifice manometer setting, (ΔH), in H_2O	Gas volume wet test meter (V_w), ft^3 *	Gas volume dry gas meter (V_d), ft^3	Temperature: Wet test meter (t_w), °F	Temperature: Dry gas meter Inlet (t_{d_i}), °F	Temperature: Dry gas meter Outlet (t_{d_o}), °F	Temperature: Dry gas meter Average[a] (t_d), °F	Time (Θ), min	Vacuum setting, in. Hg	Y_i	$Y_i = \frac{V_w P_b (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$	ΔHe i
-5.6	1.20	~~4.929~~	5.052	69.97	91.5	77.5	84.5	8.362	8	.999	$\frac{4.929 \times 29.13 (84.5+460)}{5.052 \times (29.13+1.2/13.6)(69.97+460)}$	1.964
-5.6	1.20	~~4.929~~	5.067	70.00	93.5	79.8	86.7	8.398	8	1.000		1.973
-5.6	1.20	~~4.929~~	5.085	70.00	97.1	81.8	89.75	8.398	8	1.002		1.965
										Y= 1.000		1.967

[a] If there is only one therometer on the dry gas meter, record the temperature under t_d.

where

V_w = Gas volume passing through the wet test meter, ft^3.

V_d = Gas volume passing through the dry test meter, ft^3.

t_w = Temperature of the gas in the wet test meter, °F.

t_{d_i} = Temperature of the inlet gas of the dry test meter, °F.

t_{d_o} = Temperature of the outlet gas of the dry test meter, °F.

t_d = Average temperature of the gas in the dry test meter, obtained by the average of t_{d_i} and t_{d_o}, °F.

ΔH = Pressure differential across orifice, in H_2O.

Y_i = Ratio of accuracy of wet test meter to dry test meter for each run.

Y = Average ratio of accuracy of wet test meter to dry test meter for all three runs.
Tolerance = Pretest Y ±0.05Y

P_b = Barometric pressure, in. Hg.

R = Time of calibration run, min.

* V_w = [Pb + (Dm/13.6)] × Indicated Wet Volume

NOZZLE DIAMETER AND IDENTIFICATION FOR ANDERSON MODEL HCSS HIGH GRAIN LOADING IMPACTOR NUMBER 314 (MRI #9061) AND 315 (MRI #9060)

Nozzle Number	1	2	3	Average Diameter
314-1	.128	.129	.128	.128
314-2	.187	.187	.186	.187
314-3	.251	.251	.251	.251
314-4	.313	.314	.314	.314
314-5	.376	.377	.374	.376
314-6	.501	.503	.504	.503
315-1	.134	.133	.134	.134
315-2	.185	.187	.186	.186
315-3	.251	.250	.250	.250
315-4	.316	.315	.315	.315
315-5	.375	.375	.377	.376
315-6	.498	.499	.499	.499

All Measurements In Inches

United States
Environmental Protection
Agency

Office of Air, Noise, and Radiation
Office of Air Quality Planning and Standards
Research Triangle Park NC 27711

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Penalty for Private Use
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Research Triangle Park NC 27711

EMB Report 80-NHF-16b
January 1981

Air

EPA

Ammonium Nitrate

Emission Test Report Columbia Nitrogen Corporation Augusta, Georgia

PE-R-474
V. 3

PROCESS EMISSIONS TESTS
AT THE COLUMBIA NITROGEN CORPORATION
AMMONIUM NITRATE PLANT
IN AUGUSTA, GEORGIA
DURING LOW DENSITY AMMONIUM NITRATE PRODUCTION

Appendices F through R

APPENDIX

F VISIBLE EMISSIONS
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- F.2 EPA Method 9 Guidelines
- F.3 Prill Tower Field Data Sheets
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P PROCESS OPERATIONS LOG

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APPENDIX F

VISIBLE EMISSIONS

Includes:

F.1 Observer Certification Certificates
F.2 EPA Method 9 Guidelines
F.3 Prill Tower Field Data Sheets
F.4 Predryer/Dryer Field Data Sheets
F.5 Cooler Field Data Sheets
F.6 Coating Baghouse and Bagging Baghouse Field Data Sheets

APPENDIX F.1

OBSERVER CERTIFICATION CERTIFICATES

COLORADO

DEPARTMENT OF HEALTH

This Certifies that RANDALL L. KAUFFMAN

has satisfactorily completed a course in observing and recording the density of smoke and is qualified to determine and grade visible emissions in terms of opacity.

Division Director

Valid until 1/8/81

Coordinator

COLORADO

DEPARTMENT OF HEALTH

This Certifies that JAMES R. NEDRY

has satisfactorily completed a course in observing and recording the density of smoke and is qualified to determine and grade visible emissions in terms of opacity.

Division Director

Valid until 10/8/80

Coordinator

APPENDIX F.2

EPA METHOD 9 GUIDELINES

METHOD 9—VISUAL DETERMINATION OF THE OPACITY OF EMISSIONS FROM STATIONARY SOURCES

Many stationary sources discharge visible emissions into the atmosphere; these emissions are usually in the shape of a plume. This method involves the determination of plume opacity by qualified observers. The method includes procedures for the training and certification of observers, and procedures to be used in the field for determination of plume opacity. The appearance of a plume as viewed by an observer depends upon a number of variables, some of which may be controllable and some of which may not be controllable in the field. Variables which can be controlled to an extent to which they no longer exert a significant influence upon plume appearance include: Angle of the observer with respect to the plume; angle of the observer with respect to the sun; point of observation of attached and detached steam plume; and angle of the observer with respect to a plume emitted from a rectangular stack with a large length to width ratio. The method includes specific criteria applicable to these variables.

Other variables which may not be controllable in the field are luminescence and color contrast between the plume and the background against which the plume is viewed. These variables exert an influence upon the appearance of a plume as viewed by an observer, and can affect the ability of the observer to accurately assign opacity values to the observed plume. Studies of the theory of plume opacity and field studies have demonstrated that a plume is most visible and presents the greatest apparent opacity when viewed against a contrasting background. It follows from this, and is confirmed by field trials, that the opacity of a plume, viewed under conditions where a contrasting background is present can be assigned with the greatest degree of accuracy. However, the potential for a positive error is also the greatest when a plume is viewed under such contrasting conditions. Under conditions presenting a less contrasting background, the apparent opacity of a plume is less and approaches zero as the color and luminescence contrast decrease toward zero. As a result, significant negative bias and negative errors can be made when a plume is viewed under less contrasting conditions. A negative bias decreases rather than increases the possibility that a plant operator will be cited for a violation of opacity standards due to observer error.

Studies have been undertaken to determine the magnitude of positive errors which can be made by qualified observers while reading plumes under contrasting conditions and using the procedures set forth in this method. The results of these studies (field trials) which involve a total of 769 sets of 25 readings each are as follows:

(1) For black plumes (133 sets at a smoke generator), 100 percent of the sets were read with a positive error[1] of less than 7.5 percent opacity; 99 percent were read with a positive error of less than 5 percent opacity.

(2) For white plumes (170 sets at a smoke generator, 168 sets at a coal-fired power plant, 298 sets at a sulfuric acid plant), 99 percent of the sets were read with a positive error of less than 7.5 percent opacity; 95 percent were read with a positive error of less than 5 percent opacity.

The positive observational error associated with an average of twenty-five readings is therefore established. The accuracy of the method must be taken into account when determining possible violations of applicable opacity standards.

[1] For a set, positive error = average opacity determined by observers' 25 observations — average opacity determined from transmissometer's 25 recordings.

1. *Principle and applicability.*

1.1 Principle. The opacity of emissions from stationary sources is determined visually by a qualified observer.

1.2 Applicability. This method is applicable for the determination of the opacity of emissions from stationary sources pursuant to § 60.11(b) and for qualifying observers for visually determining opacity of emissions.

2. *Procedures.* The observer qualified in accordance with paragraph 3 of this method shall use the following procedures for visually determining the opacity of emissions:

2.1 Position. The qualified observer shall stand at a distance sufficient to provide a clear view of the emissions with the sun oriented in the 140° sector to his back. Consistent with maintaining the above requirement, the observer shall, as much as possible, make his observations from a position such that his line of vision is approximately perpendicular to the plume direction, and when observing opacity of emissions from rectangular outlets (e.g. roof monitors, open baghouses, noncircular stacks), approximately perpendicular to the longer axis of the outlet. The observer's line of sight should not include more than one plume at a time when multiple stacks are involved, and in any case the observer should make his observations with his line of sight perpendicular to the longer axis of such a set of multiple stacks (e.g. stub stacks on baghouses).

2.2 Field records. The observer shall record the name of the plant, emission location, type facility, observer's name and affiliation, and the date on a field data sheet (Figure 9–1). The time, estimated distance to the emission location, approximate wind direction, estimated wind speed, description of the sky condition (presence and color of clouds), and plume background are recorded on a field data sheet at the time opacity readings are initiated and completed.

2.3 Observations. Opacity observations shall be made at the point of greatest opacity in that portion of the plume where condensed water vapor is not present. The observer shall not look continuously at the plume, but instead shall observe the plume momentarily at 15-second intervals.

2.3.1 Attached steam plumes. When condensed water vapor is present within the plume as it emerges from the emission outlet, opacity observations shall be made beyond the point in the plume at which condensed water vapor is no longer visible. The observer shall record the approximate distance from the emission outlet to the point in the plume at which the observations are made.

2.3.2 Detached steam plume. When water vapor in the plume condenses and becomes visible at a distinct distance from the emission outlet, the opacity of emissions should be evaluated at the emission outlet prior to the condensation of water vapor and the formation of the steam plume.

2.4 Recording observations. Opacity observations shall be recorded to the nearest 5 percent at 15-second intervals on an observational record sheet. (See Figure 9-2 for an example.) A minimum of 24 observations shall be recorded. Each momentary observation recorded shall be deemed to represent the average opacity of emissions for a 15-second period.

2.5 Data Reduction. Opacity shall be determined as an average of 24 consecutive observations recorded at 15-second intervals. Divide the observations recorded on the record sheet into sets of 24 consecutive observations. A set is composed of any 24 consecutive observations. Sets need not be consecutive in time and in no case shall two sets overlap. For each set of 24 observations, calculate the average by summing the opacity of the 24 observations and dividing this sum by 24. If an applicable standard specifies an averaging time requiring more than 24 observations, calculate the average for all observations made during the specified time period. Record the average opacity on a record sheet. (See Figure 9-1 for an example.)

3. *Qualifications and testing.*

3.1 Certification requirements. To receive certification as a qualified observer, a candidate must be tested and demonstrate the ability to assign opacity readings in 5 percent increments to 25 different black plumes and 25 different white plumes, with an error not to exceed 15 percent opacity on any one reading and an average error not to exceed 7.5 percent opacity in each category. Candidates shall be tested according to the procedures described in paragraph 3.2. Smoke generators used pursuant to paragraph 3.2 shall be equipped with a smoke meter which meets the requirements of paragraph 3.3.

The certification shall be valid for a period of 6 months, at which time the qualification procedure must be repeated by any observer in order to retain certification.

3.2 Certification procedure. The certification test consists of showing the candidate a complete run of 50 plumes—25 black plumes and 25 white plumes—generated by a smoke generator. Plumes within each set of 25 black and 25 white runs shall be presented in random order. The candidate assigns an opacity value to each plume and records his observation on a suitable form. At the completion of each run of 50 readings, the score of the candidate is determined. If a candidate fails to qualify, the complete run of 50 readings must be repeated in any retest. The smoke test may be administered as part of a smoke school or training program, and may be preceded by training or familiarization runs of the smoke generator during which candidates are shown black and white plumes of known opacity.

3.3 Smoke generator specifications. Any smoke generator used for the purposes of paragraph 3.2 shall be equipped with a smoke meter installed to measure opacity across the diameter of the smoke generator stack. The smoke meter output shall display in-stack opacity based upon a pathlength equal to the stack exit diameter, on a full 0 to 100 percent chart recorder scale. The smoke meter optical design and performance shall meet the specifications shown in Table 9-1. The smoke meter shall be calibrated as prescribed in paragraph 3.3.1 prior to the conduct of each smoke reading test. At the completion of each test, the zero and span drift shall be checked and if the drift exceeds ±1 percent opacity, the condition shall be corrected prior to conducting any subsequent test runs. The smoke meter shall be demonstrated, at the time of installation, to meet the specifications listed in Table 9-1. This demonstration shall be repeated following any subsequent repair or replacement of the photocell or associated electronic circuitry including the chart recorder or output meter, or every 6 months, whichever occurs first.

TABLE 9-1—SMOKE METER DESIGN AND PERFORMANCE SPECIFICATIONS

Parameter:	*Specification*
a. Light source	Incandescent lamp operated at nominal rated voltage.
b. Spectral response of photocell.	Photopic (daylight spectral response of the human eye—reference 4.3).
c. Angle of view	15° maximum total angle.
d. Angle of projection.	15° maximum total angle.
e. Calibration error.	±3% opacity, maximum.
f. Zero and span drift.	±1% opacity, 30 minutes.
g. Response time	≤5 seconds.

3.3.1 Calibration. The smoke meter is calibrated after allowing a minimum of 30 minutes warmup by alternately producing simulated opacity of 0 percent and 100 percent. When stable response at 0 percent or 100 percent is noted, the smoke meter is adjusted to produce an output of 0 percent or 100 percent, as appropriate. This calibration shall be repeated until stable 0 percent and 100 percent readings are produced without adjustment. Simulated 0 percent and 100 percent opacity values may be produced by alternately switching the power to the light source on and off while the smoke generator is not producing smoke.

3.3.2 Smoke meter evaluation. The smoke meter design and performance are to be evaluated as follows:

3.3.2.1 Light source. Verify from manufacturer's data and from voltage measurements made at the lamp, as installed, that the lamp is operated within ±5 percent of the nominal rated voltage.

3.3.2.2 Spectral response of photocell. Verify from manufacturer's data that the photocell has a photopic response; i.e., the spectral sensitivity of the cell shall closely approximate the standard spectral-luminosity curve for photopic vision which is referenced in (b) of Table 9-1.

3.3.2.3 Angle of view. Check construction geometry to ensure that the total angle of view of the smoke plume, as seen by the photocell, does not exceed 15°. The total angle of view may be calculated from: $\theta = 2 \tan^{-1} d/2L$, where θ = total angle of view; d = the sum of the photocell diameter + the diameter of the limiting aperture; and L = the distance from the photocell to the limiting aperture. The limiting aperture is the point in the path between the photocell and the smoke plume where the angle of view is most restricted. In smoke generator smoke meters this is normally an orifice plate.

3.3.2.4 Angle of projection. Check construction geometry to ensure that the total angle of projection of the lamp on the smoke plume does not exceed 15°. The total angle of projection may be calculated from: $\theta = 2 \tan^{-1} d/2L$, where θ = total angle of projection; d = the sum of the length of the lamp filament + the diameter of the limiting aperture; and L = the distance from the lamp to the limiting aperture.

3.3.2.5 Calibration error. Using neutral-density filters of known opacity, check the error between the actual response and the theoretical linear response of the smoke meter. This check is accomplished by first calibrating the smoke meter according to 3.3.1 and then inserting a series of three neutral-density filters of nominal opacity of 20, 50, and 75 percent in the smoke meter pathlength. Filters calibarted within ±2 percent shall be used. Care should be taken when inserting the filters to prevent stray light from affecting the meter. Make a total of five nonconsecutive readings for each filter. The maximum error on any one reading shall be 3 percent opacity.

3.3.2.6 Zero and span drift. Determine the zero and span drift by calibrating and operating the smoke generator in a normal manner over a 1-hour period. The drift is measured by checking the zero and span at the end of this period.

3.3.2.7 Response time. Determine the response time by producing the series of five simulated 0 percent and 100 percent opacity values and observing the time required to reach stable response. Opacity values of 0 percent and 100 percent may be simulated by alternately switching the power to the light source off and on while the smoke generator is not operating.

4. *References.*

4.1 Air Pollution Control District Rules and Regulations, Los Angeles County Air Pollution Control District, Regulation IV, Prohibitions, Rule 50.

4.2 Weisburd, Melvin I., Field Operations and Enforcement Manual for Air, U.S. Environmental Protection Agency, Research Triangle Park, N.C., APTD-1100, August 1972, pp. 4.1-4.36..

4.3 Condon, E. U., and Odishaw, H., Handbook of Physics, McGraw-Hill Co., N.Y., N.Y., 1958, Table 3.1, p. 6-52.

FIGURE 9-1
RECORD OF VISUAL DETERMINATION OF OPACITY

PAGE___of___

COMPANY_____
LOCATION_____
TEST NUMBER_____
DATE_____
TYPE FACILITY_____
CONTROL DEVICE_____

HOURS OF OBSERVATION_____
OBSERVER_____
OBSERVER CERTIFICATION DATE_____
OBSERVER AFFILIATION_____
POINT OF EMISSIONS_____
HEIGHT OF DISCHARGE POINT_____

	Initial			Final
CLOCK TIME				
OBSERVER LOCATION Distance to Discharge				
Direction from Discharge				
Height of Observation Point				
BACKGROUND DESCRIPTION				
WEATHER CONDITIONS Wind Direction				
Wind Speed				
Ambient Temperature				
SKY CONDITIONS (clear, overcast, % clouds, etc.)				
PLUME DESCRIPTION Color				
Distance Visible				
OTHER INFORMATION				

SUMMARY OF AVERAGE OPACITY

Set Number	Time	Opacity	
	Start--End	Sum	Average

Readings ranged from ___ to ___ % opacity

The source was/was not in compliance with ___ at the time evaluation was made.

FIGURE 9-2 OBSERVATION RECORD PAGE ___ OF ___

COMPANY _____ OBSERVER _____
LOCATION _____ TYPE FACILITY _____
TEST NUMBER _____ POINT OF EMISSIONS _____
DATE _____

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
	0							
	1							
	2							
	3							
	4							
	5							
	6							
	7							
	8							
	9							
	10							
	11							
	12							
	13							
	14							
	15							
	16							
	17							
	18							
	19							
	20							
	21							
	22							
	23							
	24							
	25							
	26							
	27							
	28							
	29							

FIGURE 9-2 OBSERVATION RECORD (Continued) PAGE ___ OF ___

COMPANY _____ OBSERVER _____
LOCATION _____ TYPE FACILITY _____
TEST NUMBER _____ POINT OF EMISSIONS _____
DATE _____

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
	30							
	31							
	32							
	33							
	34							
	35							
	36							
	37							
	38							
	39							
	40							
	41							
	42							
	43							
	44							
	45							
	46							
	47							
	48							
	49							
	50							
	51							
	52							
	53							
	54							
	55							
	56							
	57							
	58							
	59							

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APPENDIX F.3

PRILL TOWER FIELD DATA SHEETS

SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant AMMONIUM NITRATE Date 8-12-80

Company Name COLUMBIA NITROGEN Hours of Observation 1046-1146

Plant Address AUGUSTA GEORGIA Observer R. KAUFFMAN
Randall L. Kauffman

Type of Discharge (STACK) OTHER _____

Discharge Location OUTLET - PRILL TOWER

Height of Point of Discharge 280' FROM GROUND

Observer's Location:

Distance to Discharge Point 30'

Height of Observation Point 8' (272' FROM GROUND)

Direction from Discharge Point NE

Background Description BLUE SKY

Weather: Clear Overcast (Partly Cloudy) Other _____ Color _____

Wind Direction W-SW Wind Velocity 5 mi/hr

Plume Description:

Detached: Yes No NO PLUME VISIBLE

Color: Black White Other _____

Plume Dispersion Behavior: Looping Coning Fanning

Lofting Fumigating Other _____

Estimated Distance Plume Visible _____

Summary of Observations:

Opacity	Aggregate Time @ Opacity	Opacity	Aggregate Time @ Opacity
0	min. sec.	55	
5		60	
10		65	
15		70	
20		75	
25		80	
30		85	
35		90	
40		95	
45		100	
50			

RECORD OF VISIBLE EMISSIONS

Company Name: COLUMBIA NITROGEN
Plant Address: AUGUSTA, GEORGIA
Stack Location: OUTLET - PRILL TOWER
Weather Conditions: PARTLY CLOUDY

Date: 8-12-80
Observer: R. KAUFFMAN
Observer's Location: 30' NE OF OUTLET

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
1046						
	00	0	0	0	0	BLUE SKY BACKGROUND
1047	01	0	0	0	0	NO PLUME VISIBLE
	02	0	0	0	0	
	03	0	0	0	0	
1050	04	0	0	0	0	WIND - W/SW 10MPH
	05	0	0	0	0	
	06	0	0	0	0	
	07	0	0	0	0	
	08	0	0	0	0	
1055	09	0	0	0	0	
	10	0	0	0	0	
	11	0	0	0	0	
	12	0	0	0	0	
	13	0	0	0	0	
1100	14	0	0	0	0	
	15	0	0	0	0	
	16	0	0	0	0	
	17	0	0	0	0	
	18	0	0	0	0	
1105	19	0	0	0	0	
	20	0	0	0	0	
	21	0	0	0	0	
	22	0	0	0	0	
	23	0	0	0	0	
1110	24	0	0	0	0	
	25	0	0	0	0	
	26	0	0	0	0	
	27	0	0	0	0	
	28	0	0	0	0	
1115	29	0	0	0	0	
1116	30	0	0	0	0	
	31	0	0	0	0	
	32	0	0	0	0	
1120	33	0	0	0	0	CLOUDS MOVING IN
	34	0	0	0	0	BACKGROUND BECOMING
	35	0	0	0	0	OVERCAST
	36	0	0	0	0	
	37	0	0	0	0	BLUE SKY HERE
1125	38	0	0	0	0	
	39	0	0	0	0	
	40	0	0	0	0	
	41	0	0	0	0	
	42	0	0	0	0	
1130	43	0	0	0	0	
	44	0	0	0	0	
	45	0	0	0	0	
	46	0	0	0	0	
	47	0	0	0	0	
1135	48	0	0	0	0	
	49	0	0	0	0	
	50	0	0	0	0	
	51	0	0	0	0	
	52	0	0	0	0	
1140	53	0	0	0	0	
	54	0	0	0	0	
	55	0	0	0	0	
	56	0	0	0	0	
	57	0	0	0	0	
1145	58	0	0	0	0	
1146	59	0	0	0	0	

Comments:

SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant Ammonium NITRATE Date 8-12-80

Company Name COLUMBIA NITROGEN Hours of Observation 1147-1240

Plant Address AUGUSTA, GEORGIA Observer R. KAUFFMAN
Randall L. Kauffman

Type of Discharge (STACK) OTHER _____

Discharge Location OUTLET - PRILL TOWER

Height of Point of Discharge 280' FROM GROUND

Observer's Location:

Distance to Discharge Point 30'

Height of Observation Point 8'

Direction from Discharge Point NE

Background Description BLUE SKY

Weather: Clear Overcast (Partly Cloudy) Other _____ Color _____

Wind Direction W/SW - 10-15 Wind Velocity _____ mi/hr

Plume Description:

Detached: Yes No NO PLUME VISIBLE

Color: Black White Other _____

Plume Dispersion Behavior: Looping Coning Fanning

Lofting Fumigating Other _____

Estimated Distance Plume Visible _____

Summary of Observations:

Opacity	Aggregate Time @ Opacity	Opacity	Aggregate Time @ Opacity
	min. sec.		
0		55	
5		60	
10		65	
15		70	
20		75	
25		80	
30		85	
35		90	
40		95	
45		100	
50			

RECORD OF VISIBLE EMISSIONS

Company Name: COLUMBIA NITROGEN
Plant Address: AUGUSTA, GEORGIA
Stack Location: OUTLET - PRILL TOWER
Weather Conditions: PARTLY CLOUDY

Date: 8-12-80
Observer: R. KAUFFMAN - Randall L. Kauffman
Observer's Location: 30' NE OF OUTLET

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
1147	00	0	0	0	0	BLUE SKY BACKGROUND
	01	0	0	0	0	
	02	0	0	0	0	
1150	03	0	0	0	0	
	04	0	0	0	0	
	05	0	0	0	0	
	06	0	0	0	0	
	07	0	0	0	0	
1155	08	0	0	0	0	
	09	0	0	0	0	
	10	0	0	0	0	
	11	0	0	0	0	
	12	0	0	0	0	
1200	13	0	0	0	0	
	14	0	0	0	0	
	15	0	0	0	0	
	16	0	0	0	0	
	17	0	0	0	0	
1205	18	0	0	0	0	BLUE SKY
	19	0	0	0	0	
	20	0	0	0	0	
	21	0	0	0	0	
	22	0	0	0	0	
1210	23	0	0	0	0	
	24	0	0	0	0	
	25	0	0	0	0	
	26	0	0	0	0	
	27	0	0	0	0	
	28	0	0	0	0	
1216	29	0	0	0	0	

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
~~1217~~						
1217	30	0	0	0	0	WIND W/SW - 15 MPH
	31	0	0	0	0	
	32	0	0	0	0	
1220	33	0	0	0	0	
	34	0	0	0	0	
	35	0	0	0	0	
	36	0	0	0	0	
	37	0	0	0	0	
1225	38	0	0	0	0	
	39	0	0	0	0	
	40	0	0	0	0	
	41	0	0	0	0	
	42	0	0	0	0	
1230	43	0	0	0	0	BLUE SKY W/SOME
	44	0	0	0	0	CLOUDS IN BACKGROUND
	45	0	0	0	0	
	46	0	0	0	0	
	47	0	0	0	0	
1235	48	0	0	0	0	
	49	0	0	0	0	
	50	0	0	0	0	
	51	0	0	0	0	
	52	0	0	0	0	
1240	53	0	0	0	0	
	54	0	0	0	0	
	55	0	0	0	0	
	56	0	0	0	0	
	57	0	0	0	0	
	58	0	0	0	0	
1246	59	0	0	0	0	

Comments:

SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant Ammonium NITRATE Date 8-12-80

Company Name COLUMBIA NITROGEN Hours of Observation 1520-1619

Plant Address AUGUSTA, GEORGIA Observer R E KAUFFMAN
Randall L. Kauffman

Type of Discharge (STACK) OTHER _____

Discharge Location OUTLET - PRILL TOWER

Height of Point of Discharge 280' FROM GROUND

Observer's Location:

Distance to Discharge Point 50'

Height of Observation Point 280' FROM GROUND 30' FROM OBSERVER

Direction from Discharge Point NW

Background Description BLUE W/SOME WHITE CLOUDS

Weather: Clear Overcast (Partly Cloudy) Other _____ Color _____

Wind Direction W-SW Wind Velocity 15 mi/hr

Plume Description:

Detached: Yes No NO PLUME VISIBLE

Color: Black White Other _____

Plume Dispersion Behavior: Looping Coning Fanning

Lofting Fumigating Other _____

Estimated Distance Plume Visible _____

Summary of Observations:

Opacity	Aggregate Time @ Opacity	Opacity	Aggregate Time @ Opacity
0	min. sec.	55	
5		60	
10		65	
15		70	
20		75	
25		80	
30		85	
35		90	
40		95	
45		100	
50			

RECORD OF VISIBLE EMISSIONS

Company Name: COLUMBIA NITROGEN
Plant Address: AUGUSTA, GEORGIA
Stack Location: OUTLET-PRILL TOWER
Weather Conditions: PARTLY CLOUDY

Date: 8-12-80
Observer: L KAUFFMAN Kendall L. Kauffman
Observer's Location: NW FROM OUTLET

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
-						SKY BLUE w/SOME
1520	00	0	0	0	0	WHITE CLOUDS
	01	0	0	0	0	
	02	0	0	0	0	
	03	0	0	0	0	
	04	0	0	0	0	
1525	05	0	0	0	0	
	06	0	0	0	0	
	07	0	0	0	0	
	08	0	0	0	0	
	09	0	0	0	0	
1530	10	0	0	0	0	
	11	0	0	0	0	
	12	0	0	0	0	
	13	0	0	0	0	BLUE BACKGROUND
	14	0	0	0	0	
1535	15	0	0	0	0	
	16	0	0	0	0	
	17	0	0	0	0	
	18	0	0	0	0	
	19	0	0	0	0	
1540	20	0	0	0	0	
	21	0	0	0	0	
	22	0	0	0	0	WHITE BACKGROUND
	23	0	0	0	0	
	24	0	0	0	0	
1545	25	0	0	0	0	
	26	0	0	0	0	
	27	0	0	0	0	
	28	0	0	0	0	
1549	29	0	0	0	0	

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
1550	30	0	0	0	0	LIGHT GREY BACKGROUND
	31	0	0	0	0	
	32	0	0	0	0	
	33	0	0	0	0	
	34	0	0	0	0	
1555	35	0	0	0	0	
	36	0	0	0	0	
	37	0	0	0	0	
	38	0	0	0	0	
	39	0	0	0	0	
1600	40	0	0	0	0	
	41	0	0	0	0	BLUE BACKGROUND
	42	0	0	0	0	
	43	0	0	0	0	
	44	0	0	0	0	
1605	45	0	0	0	0	
	46	0	0	0	0	
	47	0	0	0	0	
	48	0	0	0	0	
	49	0	0	0	0	
1610	50	0	0	0	0	
	51	0	0	0	0	
	52	0	0	0	0	
	53	0	0	0	0	
	54	0	0	0	0	
1615	55	0	0	0	0	
	56	0	0	0	0	
	57	0	0	0	0	
	58	0	0	0	0	
1619	59	0	0	0	0	

Comments:

SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant AMMONIUM NITRATE Date 8-12-80

Company Name COLUMBIA NITROGEN Hours of Observation 1620-1719

Plant Address AUGUSTA, GEORGIA Observer R. E. KAUFFMAN

Type of Discharge (STACK) OTHER _____

Discharge Location OUTLET - PRILL TOWER

Height of Point of Discharge 280' FROM GROUND

Observer's Location:

Distance to Discharge Point 50

Height of Observation Point 240' FROM GROUND

Direction from Discharge Point NW

Background Description BLUE W/SOME WHITE CLOUDS

Weather: Clear Overcast (Partly Cloudy) Other _____ Color _____

Wind Direction W-SW Wind Velocity 15 mi/hr

Plume Description:

Detached: Yes No NO PLUME VISIBLE

Color: Black White Other _____

Plume Dispersion Behavior: Looping Coning Fanning

Lofting Fumigating Other _____

Estimated Distance Plume Visible _____

Summary of Observations:

Opacity	Aggregate Time @ Opacity	Opacity	Aggregate Time @ Opacity
0	min. sec.	55	
5		60	
10		65	
15		70	
20		75	
25		80	
30		85	
35		90	
40		95	
45		100	
50			

RECORD OF VISIBLE EMISSIONS

Company Name: COLUMBIA NITROGEN
Plant Address: AUGUSTA GEORGIA
Stack Location: OUTLET - PRILL TOWER
Weather Conditions: PARTLY CLOUDY

Date: 8-12-80
Observer: K. KAUFFMAN - Randall L. Kauffman
Observer's Location: NW FROM OUTLET

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
1620	00	0	0	0	0	BLUE SKY BACKGROUND
	01	0	0	0	0	
	02	0	0	0	0	
	03	0	0	0	0	
	04	0	0	0	0	
1625	05	0	0	0	0	
	06	0	0	0	0	
	07	0	0	0	0	
	08	0	0	0	0	
	09	0	0	0	0	
1630	10	0	0	0	0	
	11	0	0	0	0	
	12	0	0	0	0	
	13	0	0	0	0	
	14	0	0	0	0	
1635	15	0	0	0	0	
	16	0	0	0	0	
	17	0	0	0	0	
	18	0	0	0	0	
	19	0	0	0	0	
1640	20	0	0	0	0	
	21	0	0	0	0	
	22	0	0	0	0	
	23	0	0	0	0	
	24	0	0	0	0	
1645	25	0	0	0	0	
	26	0	0	0	0	
	27	0	0	0	0	
	28	0	0	0	0	
1649	29	0	0	0	0	

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
1650	30	0	0	0	0	BLUE SKY BACKGROUND
	31	0	0	0	0	
	32	0	0	0	0	
	33	0	0	0	0	
	34	0	0	0	0	
1655	35	0	0	0	0	
	36	0	0	0	0	
	37	0	0	0	0	
	38	0	0	0	0	
	39	0	0	0	0	
1700	40	0	0	0	0	
	41	0	0	0	0	
	42	0	0	0	0	
	43	0	0	0	0	
	44	0	0	0	0	
1705	45	0	0	0	0	
	46	0	0	0	0	
	47	0	0	0	0	
	48	0	0	0	0	
	49	0	0	0	0	
1710	50	0	0	0	0	
	51	0	0	0	0	
	52	0	0	0	0	
	53	0	0	0	0	
	54	0	0	0	0	
1715	55	0	0	0	0	
	56	0	0	0	0	
	57	0	0	0	0	
	58	0	0	0	0	
1719	59	0	0	0	0	

Comments:

SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant Ammonium Nitrate Date 8-12-80

Company Name Columbia Nitrogen Corp Hours of Observation 10:49-11:47

Plant Address Augusta Ga. Observer Jim Nedry

Type of Discharge (STACK) OTHER _____

Discharge Location Bypass "B"

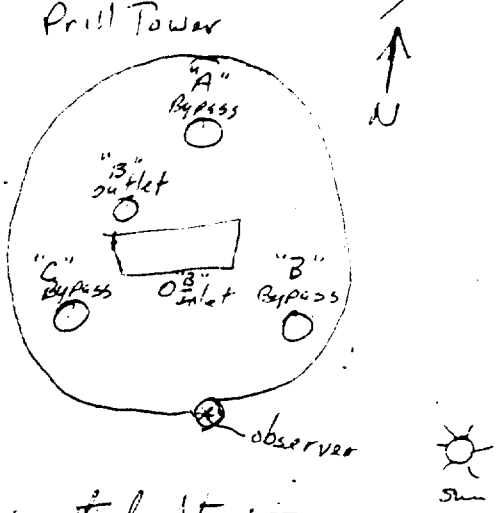
Height of Point of Discharge 265'

Observer's Location:

Distance to Discharge Point 15'

Height of Observation Point ~~250'~~ 250'

Direction from Discharge Point S



Background Description Blue sky and gray metal structures

Weather: Clear Overcast (Partly Cloudy) Other _____ Color _____

Wind Direction SW Wind Velocity 0-5 mi/hr

Plume Description:

Detached: Yes No

Color: Black (White) Other _____

Plume Dispersion Behavior: Looping (Coning) Fanning

Lofting Fumigating Other _____

Estimated Distance Plume Visible 30ft

Summary of Observations:

Opacity	Aggregate Time @ Opacity	Opacity	Aggregate Time @ Opacity
0	min. sec.	55	
5		60	
10		65	
15		70	
20		75	
25		80	
30		85	
35		90	
40		95	
45		100	
50			

RECORD OF VISIBLE EMISSIONS

Company Name: Columbia Nitrogen Corp Date: 8-12-80
Plant Address: Augusta Ga Observer: Jim Nedry
Stack Location: Prill tower "B" Bypass Observer's Location: Prill tower
Weather Conditions: partly Cloudy

TIME 10:49

HR	MIN	SECONDS 00	15	30	45	COMMENTS
10:49	00	10	5	5	10	
	01	10	10	10	5	
	02	5	5	5	5	
	03	5	10	10	10	
	04	10	10	10	10	
	05	10	5	5	5	
	06	10	10	5	5	
	07	5	5	10	10	
	08	10	5	5	5	
	09	5	10	10	10	
	10	10	10	10	10	
	11	5	5	5	5	
	12	5	5	10	5	
	13	5	10	10	10	
	14	10	5	5	5	
	15	5	5	5	10	
	16	5	5	10	5	
	17	10	10	5	10	
	18	10	10	5	5	
	19	5	5	5	5	
	20	5	5	0	5	
	21	5	5	5	5	
	22	10	5	5	5	
	23	5	10	5	5	
	24	5	10	5	10	
	25	5	10	10	10	
	26	10	10	5	5	
	27	5	5	10	10	
	28	10	10	5	5	
	29	5	5	0	5	

TIME 11:19

HR	MIN	SECONDS 00	15	30	45	COMMENTS
						Wind now from W
11:19	30	5	5	5	5	0-5 mph
	31	5	5	5	5	
	32	5	5	5	5	
	33	5	5	5	5	
	34	5	0	5	5	
	35	5	5	5	5	
	36	5	5	5	0	
	37	5	5	5	5	
	38	5	5	5	5	
	39	5	10	10	10	
	40	5	10	10	5	
	41	5	5	5	5	
	42	5	10	10	5	
	43	10	10	10	10	
	44	5	5	10	5	
	45	5	5	5	5	
	46	5	5	5	5	
	47	5	5	10	10	
	48	5	5	10	5	
	49	5	5	5	10	
	50	5	5	5	5	
	51	5	5	5	10	
	52	10	5	5	10	
	53	5	5	5	10	
	54	5	10	10	10	
	55	10	10	10	10	
	56	10	5	10	10	
	57	10	10	10	5	
	58	5	10	10	10	
11:48	59	5	5	5	5	

Comments:

B

SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant Ammonium Nitrate Date 8-12-80

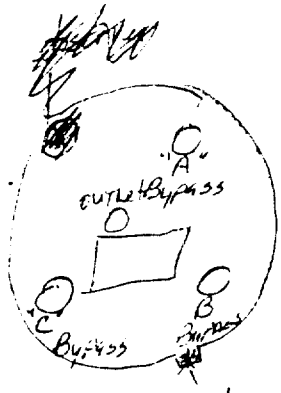
Company Name Columbia Nitrogen Corp Hours of Observation 11:49 12:49

Plant Address Augusta Ga. Observer Jim Nedry

Type of Discharge (STACK) OTHER _____

Discharge Location Pall tower "B" Bypass

Height of Point of Discharge 265'



Observer's Location:

Distance to Discharge Point 15'

Height of Observation Point 250'

Direction from Discharge Point S

Background Description Blue sky and gray metal structure

Weather: Clear Overcast (Partly Cloudy) Other _____ Color _____

Wind Direction W Wind Velocity 3-10 mi/hr

Plume Description:

Detached: Yes No

Color: Black (White) Other _____

Plume Dispersion Behavior: Looping (Coning) Fanning

Lofting Fumigating Other _____

Estimated Distance Plume Visible 25'

Summary of Observations:

Opacity	Aggregate Time @ Opacity		Opacity	Aggregate Time @ Opacity
	min.	sec.		
0			55	
5			60	
10			65	
15			70	
20			75	
25			80	
30			85	
35			90	
40			95	
45			100	
50				

RECORD OF VISIBLE EMISSIONS

Company Name: Columbia Nitrogen Corp Date: 8-12-80
Plant Address: Augusta Ga Observer: Jim Nedry
Stack Location: Prill tower "B" Bypass Observer's Location: Prill tower
Weather Conditions: Partly Cloudy

TIME 11:49

HR	MIN	SECONDS				COMMENTS
		00	15	30	45	
11:49	00	10	5	5	5	
	01	5	5	10	10	
	02	5	10	5	5	
	03	5	5	5	10	
	04	10	10	10	5	
	05	10	5	5	10	
	06	10	5	5	5	
	07	5	5	5	10	
	08	10	5	5	5	
	09	5	5	5	5	
	10	5	10	10	5	
	11	5	5	5	10	
	12	10	10	5	5	
	13	5	10	5	5	
	14	0	5	5	5	
	15	5	10	5	5	
	16	5	10	5	5	
	17	5	5	10	5	
	18	5	5	5	5	
	19	10	5	5	5	
	20	10	10	10	10	
	21	5	5	10	10	
	22	5	5	5	5	
	23	5	0	5	10	
	24	10	10	5	5	
	25	10	5	10	5	
	26	5	5	5	5	
	27	5	5	5	5	
	28	10	5	5	5	
12:18	29	5	5	10	5	

TIME 12:19

HR	MIN	SECONDS				COMMENTS
		00	15	30	45	
12:19	30	5	5	10	5	
	31	5	5	5	5	
	32	5	0	5	5	
	33	5	5	10	5	
	34	5	5	5	5	
	35	5	5	5	5	
	36	5	5	5	10	
	37	5	5	5	5	
	38	0	5	5	5	
	39	10	5	10	5	
	40	5	5	5	5	
	41	5	5	5	5	
	42	5	10	10	10	
	43	5	10	10	5	
	44	5	5	5	10	
	45	5	5	5	5	
	46	10	5	5	5	
	47	5	10	5	5	
	48	5	5	10	5	
	49	5	5	10	5	
	50	10	5	5	5	
	51	10	10	10	10	
	52	5	10	5	10	
	53	5	5	5	5	
	54	5	5	5	5	
	55	5	5	5	5	
	56	10	10	10	5	
	57	5	5	5	5	
	58	5	5	5	5	
12:48	59	5	5	5	5	

Comments:

SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant Ammonium Nitrate Date 8-12-80

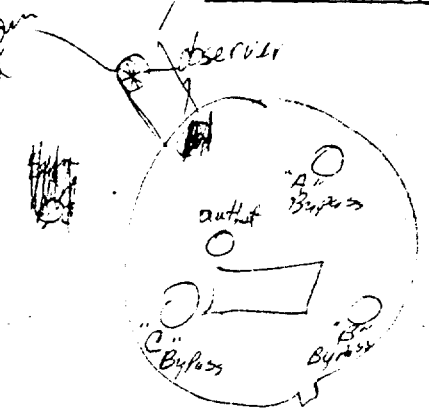
Company Name Columbia Nitrogen Corp Hours of Observation 15:20 - 16:20

Plant Address Augusta Ga Observer Jim Neary

Type of Discharge (STACK) OTHER _____

Discharge Location "A" Bypass

Height of Point of Discharge 265'



Observer's Location:

Distance to Discharge Point 25'

Height of Observation Point 250'

Direction from Discharge Point W

Background Description Gray metal structure

Weather: Clear Overcast (Partly Cloudy) Other _____ Color _____

Wind Direction W - [redacted] Wind Velocity 3-10 mi/hr

Plume Description:

Detached: Yes No

Color: Black (White) Other _____

Plume Dispersion Behavior: Looping (Coning) Fanning

Lofting Fumigating Other _____

Estimated Distance Plume Visible 40'

Summary of Observations:

Opacity	Aggregate Time @ Opacity	Opacity	Aggregate Time @ Opacity
0	min. sec.	55	
5		60	
10		65	
15		70	
20		75	
25		80	
30		85	
35		90	
40		95	
45		100	
50			

RECORD OF VISIBLE EMISSIONS

Company Name: Columbia Nitrogen
Plant Address: Augusta Ga
Stack Location: Prill Tower "A" Bypass
Weather Conditions: partly Cloudy

Date: 8-12-80
Observer: Jim Nedry
Observer's Location: W of Stack

TIME 15:20

HR	MIN	SECONDS				COMMENTS
		00	15	30	45	
1520	00	10	10	10	10	
	01	10	10	10	10	
	02	10	5	10	10	
	03	10	5	10	5	
	04	5	5	10	5	
	05	5	10	5	10	
	06	5	5	5	5	
	07	5	5	5	10	
	08	10	10	5	5	
	09	5	10	10	5	
	10	10	10	10	10	
	11	10	5	10	5	
	12	10	10	10	10	
	13	5	5	10	5	
	14	10	5	5	5	
	15	5	10	10	5	
	16	10	5	10	10	
	17	10	5	5	5	
	18	5	10	10	5	
	19	5	5	5	5	
	20	5	5	5	5	
	21	10	10	10	5	
	22	5	5	10	10	
	23	10	5	5	5	
	24	5	5	5	5	
	25	5	5	5	10	
	26	5	10	5	5	
	27	10	5	5	5	
	28	5	10	10	5	
1549	29	5	10	5	10	

TIME 15:52

HR	MIN	SECONDS				COMMENTS
		00	15	30	45	
1550	30	10	5	5	5	
	31	5	10	5	10	
	32	5	5	10	5	
	33	5	5	5	5	
	34	5	10	5	5	
	35	5	10	5	5	
	36	5	5	5	5	
	37	5	5	5	5	
	38	5	10	10	5	
	39	10	5	5	5	
	40	10	10	10	5	
	41	5	10	5	5	
	42	5	5	5	5	
	43	5	5	5	5	
	44	5	10	5	5	
	45	5	5	5	5	
	46	5	5	5	5	
	47	5	5	5	5	
	48	5	5	5	5	
	49	5	5	5	5	
	50	5	5	5	10	
	51	10	5	5	5	
	52	10	5	5	5	
	53	5	5	5	5	
	54	5	5	5	5	
	55	5	5	5	5	
	56	5	10	10	5	
	57	5	5	5	5	
	58	5	5	5	5	
1619	59	5	5	5	5	

Comments:

SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant Ammonium Nitrate Date 8-12-80

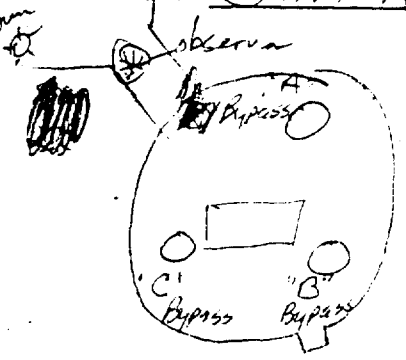
Company Name Columbia Nitrogen Corp Hours of Observation 16:20 - 17:20

Plant Address Augusta Ga. Observer Jim Nesby

Type of Discharge (STACK) OTHER _____

Discharge Location Prill tower "A" Bypass

Height of Point of Discharge 265'



Observer's Location:

Distance to Discharge Point 25'

Height of Observation Point 250'

Direction from Discharge Point W

Background Description Gray metal structure

Weather: Clear Overcast (Partly Cloudy) Other _____ Color _____

Wind Direction W Wind Velocity 3-10 mi/hr

Plume Description:

Detached: Yes No

Color: Black (White) Other _____

Plume Dispersion Behavior: Looping (Coning) Fanning

Lofting Fumigating Other _____

Estimated Distance Plume Visible 30'

Summary of Observations:

Opacity	Aggregate Time @ Opacity		Opacity	Aggregate Time @ Opacity
	min.	sec.		
0			55	
5			60	
10			65	
15			70	
20			75	
25			80	
30			85	
35			90	
40			95	
45			100	
50				

RECORD OF VISIBLE EMISSIONS

Company Name: Columbia Nitrogen Corp Date: 8-12-80
Plant Address: Augusta Ga Observer: Jim Nedry
Stack Location: "A" Bypass Observer's Location: W of Stack on Bull tower
Weather Conditions: Partly Cloudy

TIME 16:20						COMMENTS	TIME 16:50						COMMENTS
HR	MIN	SECONDS					HR	MIN	SECONDS				
		00	15	30	45				00	15	30	45	
16:20	00	5	10	5	5		16:50	30	5	5	5	5	
	01	10	5	5	10			31	5	5	5	5	
	02	5	5	5	5			32	5	5	5	5	
	03	5	10	5	5			33	5	5	5	5	
	04	5	5	10	5			34	5	5	5	5	
	05	5	5	10	5			35	5	5	5	5	
	06	5	5	5	5			36	5	5	5	5	
	07	5	5	10	5			37	5	5	5	5	
	08	5	5	10	10			38	5	5	5	5	
	09	10	10	10	10			39	5	5	5	5	
	10	10	10	10	5			40	5	5	5	5	
	11	10	10	5	5			41	5	5	5	5	
	12	5	10	5	5			42	5	5	5	5	
	13	10	10	5	5			43	5	5	5	5	
	14	5	5	5	5			44	5	5	5	5	
	15	5	5	5	5			45	5	5	5	5	
	16	5	5	5	5			46	5	5	5	5	
	17	5	10	10	5			47	5	5	5	5	
	18	5	5	5	5			48	5	5	5	5	
	19	5	5	10	5			49	5	5	5	5	
	20	5	5	5	5			50	5	5	5	5	
	21	5	5	10	10			51	5	5	5	5	
	22	5	5	5	5			52	5	5	5	5	
	23	5	5	5	5			53	5	5	5	5	
	24	5	5	5	5			54	5	5	6	5	
	25	5	5	5	5			55	5	5	5	5	
	26	5	5	5	5			56	5	5	5	5	
	27	5	5	5	5			57	5	5	5	5	
	28	5	5	5	5			58	5	5	5	5	
16:49	29	5	5	5	5		18:19	59	5	5	5	5	

Comments:

SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant Ammonium Nitrate

Date 8-13-80

Company Name Columbia Nitrate Corp

Hours of Observation 0952-1051

Plant Address Augusta Ga

Observer ~~[illegible]~~ R. KAUFFMAN Randall R. Kauffman

Type of Discharge STACK OTHER _____

Discharge Location Prill Tower "C" Bypass

Height of Point of Discharge 265'

Observer's Location:

Distance to Discharge Point 35'

Height of Observation Point 250'

Direction from Discharge Point SE

Background Description BLUE SKY

Weather: Clear Overcast Partly Cloudy Other HAZE Color _____

Wind Direction w/sw Wind Velocity 3-5 mi/hr

Plume Description:

Detached: Yes No

Color: Black ~~White~~ Other 5% 2 or 3% AT MOST

NO PLUME VISIBLE WITH BLUE BACKGROUND UP CLOSE THERE IS A WHITE PLUME BUT LESS THAN

Plume Dispersion Behavior: Looping ~~Coning~~ Fanning

Lofting Fumigating Other _____

Estimated Distance Plume Visible _____

Summary of Observations:

Opacity	Aggregate Time @ Opacity	Opacity	Aggregate Time @ Opacity
0	min. sec.	55	
5		60	
10		65	
15		70	
20		75	
25		80	
30		85	
35		90	
40		95	
45		100	
50			

RECORD OF VISIBLE EMISSIONS

Company Name: Columbia Nitrogen Corp Date: 8-13-80
Plant Address: Augusta Ga Observer: ~~[illegible]~~ R. KAUFFMAN
Stack Location: Prill Tower "C" Bypass Observer's Location: 35' SE OF BYPASS STACK
Weather Conditions: BLUE SKY W/THICK HAZE Randall L. Kauffman

HR	MIN	SECONDS 00	15	30	45	COMMENTS	HR	MIN	SECONDS 00	15	30	45	COMMENTS
0952	00	0	0	0	0	BLUE BACKGROUND	1022	30	0	0	0	0	BLUE BACKGROUND
	01	0	0	0	0			31	0	0	0	0	WIND W/SW 3-5 MPH
	02	0	0	0	0			32	0	0	0	0	
0955	03	0	0	0	0		1025	33	0	0	0	0	
	04	0	0	0	0			34	0	0	0	0	
	05	0	0	0	0			35	0	0	0	0	
	06	0	0	0	0			36	0	0	0	0	
	07	0	0	0	0			37	0	0	0	0	
1000	08	0	0	0	0		1030	38	0	0	0	0	
	09	0	0	0	0			39	0	0	0	0	
	10	0	0	0	0			40	0	0	0	0	
	11	0	0	0	0			41	0	0	0	0	
	12	0	0	0	0			42	0	0	0	0	
1005	13	0	0	0	0		1035	43	0	0	0	0	
	14	0	0	0	0			44	0	0	0	0	
	15	0	0	0	0			45	0	0	0	0	
	16	0	0	0	0			46	0	0	0	0	
	17	0	0	0	0			47	0	0	0	0	
1010	18	0	0	0	0		1040	48	0	0	0	0	
	19	0	0	0	0			49	0	0	0	0	
	20	0	0	0	0			50	0	0	0	0	
	21	0	0	0	0			51	0	0	0	0	
	22	0	0	0	0			52	0	0	0	0	
1015	23	0	0	0	0		1045	53	0	0	0	0	
	24	0	0	0	0			54	0	0	0	0	
	25	0	0	0	0			55	0	0	0	0	
	26	0	0	0	0			56	0	0	0	0	
	27	0	0	0	0			57	0	0	0	0	
1020	28	0	0	0	0		1050	58	0	0	0	0	
	29	0	0	0	0		1051	59	0	0	0	0	

Comments:

NO PLUME VISIBLE WITH BLUE BACKGROUND
UP CLOSE THERE IS A WHITE PLUME BUT LESS ~~[illegible]~~ THAN 5%
2 or 3% at most

SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant Ammonium Nitrate Date 5-13-80

Company Name Columbia Nitrogen Corp Hours of Observation _____

Plant Address Augusta Ga Observer ~~T~~ ~~A~~ R. KAUFFMAN / Randall L. Kauffman

Type of Discharge (STACK) OTHER _____

Discharge Location Fill Tower "C" Bypass

Height of Point of Discharge 265'

Observer's Location:

Distance to Discharge Point _____

Height of Observation Point 250'

Direction from Discharge Point E

Background Description _____

Weather: Clear Overcast Partly Cloudy Other HAZE Color _____

Wind Direction _____ Wind Velocity _____ mi/hr

Plume Description:

Detached: Yes No

Color: Black (White) Other NO PLUME VISIBLE WITH BLUE BACKGROUND UP CLOSE THERE IS A WHITE PLUME BUT LESS THAN 5% 2 to 3% AT MOST

Plume Dispersion Behavior: Looping (Coning) Fanning

Lofting Fumigating Other _____

Estimated Distance Plume Visible _____

Summary of Observations:

Opacity	Aggregate Time @ Opacity	Opacity	Aggregate Time @ Opacity
0	min. sec.	55	
5		60	
10		65	
15		70	
20		75	
25		80	
30		85	
35		90	
40		95	
45		100	
50			

RECORD OF VISIBLE EMISSIONS

Company Name: Columbia Nitrogen Corp Date: 8-13-80
Plant Address: Augusta Ga Observer: ~~T Hartley~~ R. KAUFFMAN
Stack Location: Prill Tower "C" Bypass Observer's Location: 35' SE OF BYPASS STACK
Weather Conditions: BLUE SKY w/ HAZE

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
1052	00	0	0	0	0	BLUE BACKGROUND
	01	0	0	0	0	WIND W/SW - 5MPH
	02	0	0	0	0	
1055	03	0	0	0	0	
	04	0	0	0	0	
	05	0	0	0	0	
	06	0	0	0	0	
	07	0	0	0	0	
1100	08	0	0	0	0	
	09	0	0	0	0	
	10	0	0	0	0	
	11	0	0	0	0	
	12	0	0	0	0	
1105	13	0	0	0	0	
	14	0	0	0	0	WIND E/SE 5MPH
	15	0	0	0	0	
	16	0	0	0	0	
	17	0	0	0	0	
1110	18	0	0	0	0	
	19	0	0	0	0	
	20	0	0	0	0	
	21	0	0	0	0	
	22	0	0	0	0	
1115	23	0	0	0	0	
	24	0	0	0	0	
	25	0	0	0	0	
	26	0	0	0	0	
	27	0	0	0	0	
1120	28	0	0	0	0	
	29	0	0	0	0	

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
1122	30	0	0	0	0	BLUE BACKGROUND
	31	0	0	0	0	WIND SE 5MPH
	32	0	0	0	0	
1125	33	0	0	0	0	WHITE HAZE
	34	0	0	0	0	BACKGROUND
	35	0	0	0	0	
	36	0	0	0	0	
	37	0	0	0	0	
1130	38	0	0	0	0	
	39	0	0	0	0	
	40	0	0	0	0	
	41	0	0	0	0	
	42	0	0	0	0	
1135	43	0	0	0	0	
	44	0	0	0	0	
	45	0	0	0	0	
	46	0	0	0	0	
	47	0	0	0	0	
1140	48	0	0	0	0	WIND SE 5MPH
	49	0	0	0	0	
	50	0	0	0	0	
	51	0	0	0	0	
	52	0	0	0	0	
1145	53	0	0	0	0	
	54	0	0	0	0	
	55	0	0	0	0	
	56	0	0	0	0	
	57	0	0	0	0	
	58	0	0	0	0	
1151	59	0	0	0	0	

Comments:
NO PLUME VISIBLE WITH BLUE BACKGROUND
UP CLOSE THERE IS A WHITE PLUME BUT LESS THAN 5%
2 to 3% at most

SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant AMMONIUM NITRATE Date 8-13-80

Company Name COLUMBIA NITROGEN Hours of Observation 0857-1457

Plant Address AUGUSTA, GEORGIA Observer R. KAUFFMAN
Randall L. Kauffman

Type of Discharge (STACK) OTHER _____

Discharge Location OUTLET - PRILL TOWER

Height of Point of Discharge 280' FROM GROUND

Observer's Location:

Distance to Discharge Point 30'

Height of Observation Point 8'

Direction from Discharge Point NE OF STACK

Background Description BLUE SKY

Weather: Clear Overcast Partly Cloudy Other SOME HAZE Color _____

Wind Direction E-SE Wind Velocity 3-5 mi/hr

Plume Description:

Detached: Yes No NO PLUME VISIBLE

Color: Black White Other _____

Plume Dispersion Behavior: Looping Coning Fanning

Lofting Fumigating Other _____

Estimated Distance Plume Visible _____

Summary of Observations:

Opacity	Aggregate Time @ Opacity	Opacity	Aggregate Time @ Opacity
0	min. sec.	55	
5		60	
10		65	
15		70	
20		75	
25		80	
30		85	
35		90	
40		95	
45		100	
50			

RECORD OF VISIBLE EMISSIONS

Company Name: COLUMBIA NITROGEN
Plant Address: AUGUSTA, GEORGIA
Stack Location: OUTLET - PAUL TOWER
Weather Conditions: CLEAR w/ SOME HAZE BLUE BACKGROUND

Date: 8-13-80
Observer: R. KAUFFMAN - Randall R. Kauffman
Observer's Location: 30' NE OF OUTLET STACK

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
0857	00	0	0	0	0	BLUE BACKGROUND
	01	0	0	0	0	
	02	0	0	0	0	
0900	03	0	0	0	0	
	04	0	0	0	0	
	05	0	0	0	0	
	06	0	0	0	0	
	07	0	0	0	0	
0905	08	0	0	0	0	
	09	0	0	0	0	
	10	0	0	0	0	
	11	0	0	0	0	
	12	0	0	0	0	
0910	13	0	0	0	0	
	14	0	0	0	0	
	15	0	0	0	0	
	16	0	0	0	0	
	17	0	0	0	0	
0915	18	0	0	0	0	
	19	0	0	0	0	
	20	0	0	0	0	
	21	0	0	0	0	
	22	0	0	0	0	
0920	23	0	0	0	0	
	24	0	0	0	0	
	25	0	0	0	0	
	26	0	0	0	0	
	27	0	0	0	0	
0925	28	0	0	0	0	
	29	0	0	0	0	

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
0927	30	0	0	0	0	BLUE BACKGROUND
	31	0	0	0	0	WIND E/SE 3-5 mph
	32	0	0	0	0	
0930	33	0	0	0	0	
	34	0	0	0	0	
	35	0	0	0	0	
	36	0	0	0	0	
	37	0	0	0	0	
0935	38	0	0	0	0	
	39	0	0	0	0	
	40	0	0	0	0	
	41	0	0	0	0	
	42	0	0	0	0	
0940	43	0	0	0	0	
	44	0	0	0	0	
	45	0	0	0	0	
	46	0	0	0	0	
	47	0	0	0	0	
0945	48	0	0	0	0	
	49	0	0	0	0	
	50	0	0	0	0	
	51	0	0	0	0	- Jim Nedry
	52	0	0	0	0	
0950	53	0	0	0	0	
	54	0	0	0	0	
	55	0	0	0	0	
	56	0	0	0	0	
	57	0	0	0	0	
	58	0	0	0	0	
0956	59	0	0	0	0	

Comments: Observations made by Jim Nedry
Starting at 09:48

SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant Ammonium Nitrate Date 8-13-80

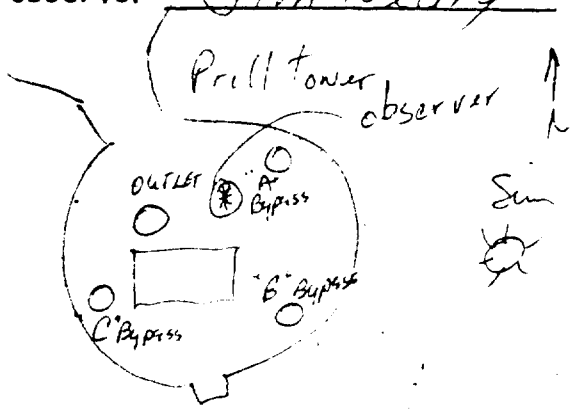
Company Name Columbia Nitrogen Corp Hours of Observation 9:57-10:57

Plant Address Augusta Ga Observer Tim Nedry

Type of Discharge (STACK) OTHER _____

Discharge Location Prill Tower Outlet

Height of Point of Discharge 280'



Observer's Location:

Distance to Discharge Point 30'

Height of Observation Point 8'

Direction from Discharge Point NE

Background Description Hazey blue Sky

Weather: Clear Overcast Partly Cloudy Other Hazey Color _____

Wind Direction E Wind Velocity 0-3 mi/hr

Plume Description:

Detached: Yes No

Color: Black White Other _____

Plume Dispersion Behavior: Looping Coning Fanning

Lofting Fumigating Other _____

Estimated Distance Plume Visible _____

Summary of Observations:

Opacity	Aggregate Time @ Opacity	Opacity	Aggregate Time @ Opacity
0	min. sec.	55	
5		60	
10		65	
15		70	
20		75	
25		80	
30		85	
35		90	
40		95	
45		100	
50			

RECORD OF VISIBLE EMISSIONS

Company Name: Columbia Nitrogen
Plant Address: Augusta Ga
Stack Location: Prill Tower outlet
Weather Conditions: Clear with haze

Date: 8-13-80
Observer: Jim Nedry
Observer's Location:

TIME 09:57 COMMENTS

HR	MIN	SECONDS 00	15	30	45
09:57	00	0	0	0	0
	01	0	0	0	0
	02	0	0	0	0
	03	0	0	0	0
	04	0	0	0	0
	05	0	0	0	0
	06	0	0	0	0
	07	0	0	0	0
	08	0	0	0	0
	09	0	0	0	0
	10	0	0	0	0
	11	0	0	0	0
	12	0	0	0	0
	13	0	0	0	0
	14	0	0	0	0
	15	0	0	0	0
	16	0	0	0	0
	17	0	0	0	0
	18	0	0	0	0
	19	0	0	0	0
	20	0	0	0	0
	21	0	0	0	0
	22	0	0	0	0
	23	0	0	0	0
	24	0	0	0	0
	25	0	0	0	0
	26	0	0	0	0
	27	0	0	0	0
	28	0	0	0	0
10:26	29	0	0	0	0

TIME 10:27 COMMENTS

HR	MIN	SECONDS 00	15	30	45
10:27	30	0	0	0	0
	31	0	0	0	0
	32	0	0	0	0
	33	0	0	0	0
	34	0	0	0	0
	35	0	0	0	0
	36	0	0	0	0
	37	0	0	0	0
	38	0	0	0	0
	39	0	0	0	0
	40	0	0	0	0
	41	0	0	0	0
	42	0	0	0	0
	43	0	0	0	0
	44	0	0	0	0
	45	0	0	0	0
	46	0	0	0	0
	47	0	0	0	0
	48	0	0	0	0
	49	0	0	0	0
	50	0	0	0	0
	51	0	0	0	0
	52	0	0	0	0
	53	0	0	0	0
	54	0	0	0	0
	55	0	0	0	0
	56	0	0	0	0
	57	0	0	0	0
	58	0	0	0	0
10:56	59	0	0	0	0

Comments:

APPENDIX F.4

PREDRYER/DRYER FIELD DATA SHEETS

SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant Ammonium Nitrate Date 8-13-80

Company Name Columbia Nitrogen Corp Hours of Observation 1105-1205

Plant Address Augusta Ga. Observer Jim Nedry

Type of Discharge (STACK) OTHER _____

Discharge Location Dryer outlet

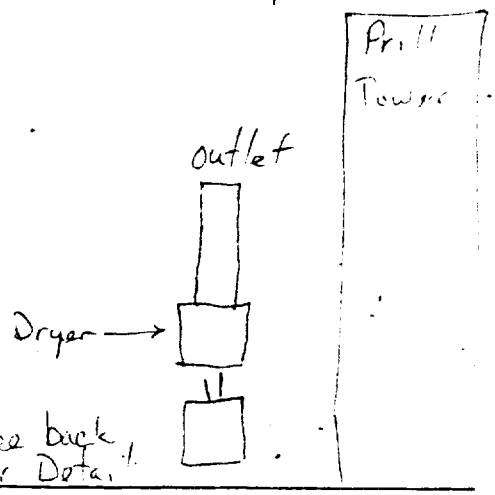
Height of Point of Discharge 100'

Observer's Location:

Distance to Discharge Point 125'

Height of Observation Point 0'

Direction from Discharge Point S ~~E~~



Background Description Blue Sky

Weather: (Clear) Overcast Partly Cloudy Other _____ Color _____

Wind Direction E Wind Velocity 0-3 mi/hr

Plume Description:

Detached: Yes No

Color: Black White Other _____

Plume Dispersion Behavior: Looping Coning Fanning

Lofting Fumigating Other _____

Estimated Distance Plume Visible _____

Summary of Observations:

Opacity	Aggregate Time @ Opacity	Opacity	Aggregate Time @ Opacity
0	min. sec.	55	
5		60	
10		65	
15		70	
20		75	
25		80	
30		85	
35		90	
40		95	
45		100	
50			

RECORD OF VISIBLE EMISSIONS

Company Name: Columbia Nitrogen
Plant Address: Augusta Ga.
Stack Location: Dryer outlet
Weather Conditions: Clear

Date: 8-13-80
Observer: Jim Nedry
Observer's Location: ~~75~~ 125' SE of Stack

TIME 11:05 COMMENTS

HR	MIN	SECONDS 00	15	30	45
BL					
11:05	00				
	01				
	02				
	03				
	04				
	05				
	06				
	07				
	08				
	09				
	10				
	11				
	12				
	13				
	14				
	15				
	16				
	17				
	18				
	19				
	20				
	21				
	22				
	23				
	24				
	25				
	26				
	27				
	28				
11:34	29				

TIME 11:35 COMMENTS

HR	MIN	SECONDS 00	15	30	45
11:35	30				
	31				
	32				
	33				
	34				
	35				
	36				
	37				
	38				
	39				
	40				
	41				
	42				
	43				
	44				
	45				
	46				
	47				
	48				
	49				
	50				
	51				
	52				
	53				
	54				
	55				
	56				
	57				
	58				
12:04	59				

Comments: With the gray background of the prill tower, a discharge of 5% can be seen. This discharge cannot be seen from the selected observation point with blue sky background. This site was selected at this time to comply with method 9 sun requirements

SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant Ammonium Nitrate Date 8-13-80

Company Name Columbia Nitrogen Corp Hours of Observation 1205-1305

Plant Address Augusta Ga. Observer Jim Nedry

Type of Discharge (STACK) OTHER _____

Discharge Location Dryer outlet

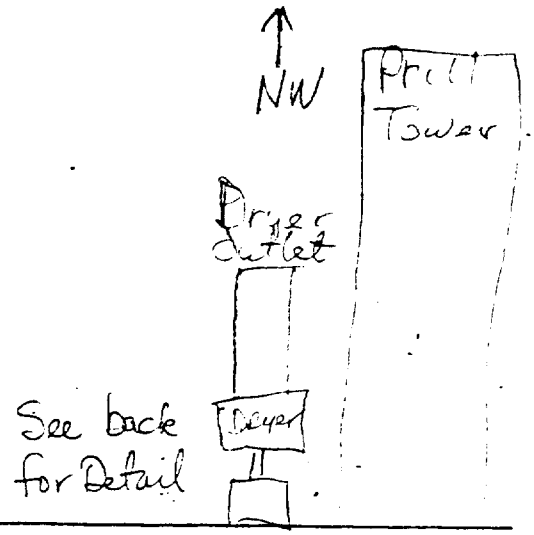
Height of Point of Discharge 100'

Observer's Location:

Distance to Discharge Point 125'

Height of Observation Point 0'

Direction from Discharge Point SE



See back for Detail

Background Description Blue Sky

Weather: (Clear) Overcast Partly Cloudy Other _____ Color _____

Wind Direction E Wind Velocity 0-3 mi/hr

Plume Description:

Detached: Yes No

Color: Black White Other _____

Plume Dispersion Behavior: Looping Coning Fanning

Lofting Fumigating Other _____

Estimated Distance Plume Visible _____

Summary of Observations:

Opacity	Aggregate Time @ Opacity	Opacity	Aggregate Time @ Opacity
0	min. sec.	55	
5		60	
10		65	
15		70	
20		75	
25		80	
30		85	
35		90	
40		95	
45		100	
50			

RECORD OF VISIBLE EMISSIONS

Company Name: Columbia Nitrogen
Plant Address: Augusta Ga
Stack Location: Dryer outlet
Weather Conditions: Clear

Date: 8-13-80
Observer: Jim Nedry
Observer's Location: 75' SE of Stack

TIME 12:05 COMMENTS

HR	MIN	SECONDS 00	15	30	45
12:05	00	0	0	0	0
	01	0	0	0	0
	02	0	0	0	0
	03	0	0	0	0
	04	0	0	0	0
	05	0	0	0	0
	06	0	0	0	0
	07	0	0	0	0
	08	0	0	0	0
	09	0	0	0	0
	10	0	0	0	0
	11	0	0	0	0
	12	0	0	0	0
	13	0	0	0	0
	14	0	0	0	0
	15	0	0	0	0
	16	0	0	0	0
	17	0	0	0	0
	18	0	0	0	0
	19	0	0	0	0
	20	0	0	0	0
	21	0	0	0	0
	22	0	0	0	0
	23	0	0	0	0
	24	0	0	0	0
	25	0	0	0	0
	26	0	0	0	0
	27	0	0	0	0
	28	0	0	0	0
12:34	29	0	0	0	0

TIME 12:35 COMMENTS

HR	MIN	SECONDS 00	15	30	45
12:35	30	0	0	0	0
	31	0	0	0	0
	32	0	0	0	0
	33	0	0	0	0
	34	0	0	0	0
	35	0	0	0	0
	36	0	0	0	0
	37	0	0	0	0
	38	0	0	0	0
	39	0	0	0	0
	40	0	0	0	0
	41	0	0	0	0
	42	0	0	0	0
	43	0	0	0	0
	44	0	0	0	0
	45	0	0	0	0
	46	0	0	0	0
	47	0	0	0	0
	48	0	0	0	0
	49	0	0	0	0
	50	0	0	0	0
	51	0	0	0	0
	52	0	0	0	0
	53	0	0	0	0
	54	0	0	0	0
	55	0	0	0	0
	56	0	0	0	0
	57	0	0	0	0
	58	0	0	0	0
13:04	59	0	0	0	0

Comments: With the gray background of the prill tower, a discharge of <5% can be seen. This discharge cannot be seen from the selected observation pt with blue sky background. This site was selected to comply with Method 9 sun requirements

SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant AMMONIUM NITRATE Date 8-14-80

Company Name COLUMBIA NITROGEN Hours of Observation 1510 - 1609

Plant Address AUGUSTA, GEORGIA Observer R. KAUFFMAN
Randall L. Kauffman

Type of Discharge (STACK) OTHER _____

Discharge Location OUTLET - DRYER STACK

Height of Point of Discharge 100' FROM GROUND

Observer's Location:

Distance to Discharge Point 125'

Height of Observation Point [redacted]' GROUND

Direction from Discharge Point SOUTH

Background Description BLUE SKY - WHITE CLOUDS - PRILL TOWER

Weather: Clear Overcast (Partly Cloudy) Other _____ Color _____

Wind Direction SE Wind Velocity 5-7 mi/hr

Plume Description:

NO PLUME VISIBLE

Detached: Yes No

Color: Black White Other _____

Plume Dispersion Behavior: Looping Coning Fanning

Lofting Fumigating Other _____

Estimated Distance Plume Visible _____

Summary of Observations:

Opacity	Aggregate Time @ Opacity	Opacity	Aggregate Time @ Opacity
0	min. sec.	55	
5		60	
10		65	
15		70	
20		75	
25		80	
30		85	
35		90	
40		95	
45		100	
50			

RECORD OF VISIBLE EMISSIONS

Company Name: COLUMBIA NITROGEN
Plant Address: AUGUSTA, GEORGIA
Stack Location: OUTLET - DRYER STACK
Weather Conditions: PARTLY CLOUDY

Date: 8-14-80
Observer: R. HUFFMAN Kendall L. Huffman
Observer's Location: 125' S. OF STACK

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
1510	00	0	0	0	0	PARTLY CLOUDY
	01	0	0	0	0	BLUE BACKGROUND
	02	0	0	0	0	WIND - SE 5-7 mph
	03	0	0	0	0	
	04	0	0	0	0	
1515	05	0	0	0	0	
	06	0	0	0	0	
	07	0	0	0	0	
	08	0	0	0	0	
	09	0	0	0	0	
1520	10	0	0	0	0	
	11	0	0	0	0	
	12	0	0	0	0	
	13	0	0	0	0	
	14	0	0	0	0	
1525	15	0	0	0	0	
	16	0	0	0	0	
	17	0	0	0	0	
	18	0	0	0	0	WHITE BACKGROUND
	19	0	0	0	0	
1530	20 5	0	0	0	0	
	21	0	0	0	0	
	22	0	0	0	0	
	23	0	0	0	0	
	24	0	0	0	0	
1535	25 10	0	0	0	0	
	26	0	0	0	0	
	27	0	0	0	0	
	28	0	0	0	0	
1539	29 14	0	0	0	0	

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
						PARTLY CLOUDY
1540	30	0	0	0	0	WIND - 5-7 MPH
	31	0	0	0	0	
	32	0	0	0	0	USING PRILL TOWER
	33	0	0	0	0	FOR BACKGROUND, IT
	34	0	0	0	0	IS BETTER THAN
1545	35	0	0	0	0	WHITE CLOUDS
	36	0	0	0	0	
	37	0	0	0	0	
	38	0	0	0	0	
	39	0	0	0	0	
1550	40	0	0	0	0	SUN BEHIND
	41	0	0	0	0	CLOUD COVER
	42	0	0	0	0	
	43	0	0	0	0	
	44	0	0	0	0	
1555	45	0	0	0	0	
	46	0	0	0	0	
	47	0	0	0	0	
	48	0	0	0	0	
	49	0	0	0	0	
1600	50 5	0	0	0	0	
	51	0	0	0	0	
	52	0	0	0	0	
	53	0	0	0	0	
	54	0	0	0	0	
1605	55 10	0	0	0	0	
	56	0	0	0	0	
	57	0	0	0	0	
	58	0	0	0	0	
1609	59 14	0	0	0	0	

Comments:

SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant AMMONIUM NITRATE Date 8-14-80

Company Name COLUMBIA NITROGEN Hours of Observation 1613 - 1729

Plant Address AUGUSTA, GEORGIA Observer R. KAUFFMAN
Kendall L. Kauffman

Type of Discharge (STACK) OTHER _____

Discharge Location OUTLET - DRYER STACK

Height of Point of Discharge 100' FROM GROUND

Observer's Location:

Distance to Discharge Point 125'

Height of Observation Point ~~100'~~ GROUND

Direction from Discharge Point SOUTH

Background Description WHITE CLOUDS - BUT - I AM USING PRILL TOWER FOR BACKGROUND

Weather: Clear Overcast (Partly Cloudy) Other _____ Color _____

Wind Direction SE Wind Velocity 5 mi/hr

Plume Description:

Detached: Yes No NO PLUME VISIBLE

Color: Black White Other _____

Plume Dispersion Behavior: Looping Coning Fanning

Lofting Fumigating Other _____

Estimated Distance Plume Visible _____

Summary of Observations:

Opacity	Aggregate Time @ Opacity	Opacity	Aggregate Time @ Opacity
0	min. sec.	55	
5		60	
10		65	
15		70	
20		75	
25		80	
30		85	
35		90	
40		95	
45		100	
50			

RECORD OF VISIBLE EMISSIONS

Company Name: COLUMBIA NITROGEN
Plant Address: AUGUSTA, GEORGIA
Stack Location: OUTLET - DRYER STACK
Weather Conditions: PARTLY CLOUDY

Date: 8-14-80
Observer: K. KAUFFMAN Kendall K. Kauffman
Observer's Location: 125' S. OF STACK

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
1610	00	0	0	0	0	PARTLY CLOUDY
	01	0	0	0	0	DRILL TOWER
	02	0	0	0	0	FOR BACKGROUND
	03	0	0	0	0	WIND - SE 5 MPH
	04	0	0	0	0	
1615	05	0	0	0	0	SUN BEHIND CLOUDS
	06	0	0	0	0	
	07	0	0	0	0	
	08	0	0	0	0	
	09	0	0	0	0	
1620	10	0	0	0	0	
	11	0	0	0	0	
	12	0	0	0	0	
	13	0	0	0	0	
	14	0	0	0	0	
1625	15	0	0	0	0	
	16	0	0	0	0	
	17	0	0	0	0	
	18	0	0	0	0	
	19	0	0	0	0	
1630	20	0	0	0	0	
	21	0	0	0	0	
	22	0	0	0	0	
	23	0	0	0	0	
	24	0	0	0	0	
1635	25	0	0	0	0	
	26	0	0	0	0	
	27	0	0	0	0	
	28	0	0	0	0	
1639	29	0	0	0	0	

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
1640	30	0	0	0	0	OVERCAST
	31	0	0	0	0	WIND SE - 5 MPH
	32	0	0	0	0	USING DRILL TOWER
	33	0	0	0	0	FOR BACKGROUND
	34	0	0	0	0	
1645	35	0	0	0	0	
	36	0	0	0	0	
	37	0	0	0	0	
	38	0	0	0	0	
	39	0	0	0	0	
1650	40	0	0	0	0	
	41	0	0	0	0	
	42	0	0	0	0	
	43	0	0	0	0	
	44	0	0	0	0	
1655	45	0	0	0	0	
	46	0	0	0	0	
	47	0	0	0	0	
	48	0	0	0	0	
	49	0	0	0	0	
1700	50	0	0	0	0	
	51	0	0	0	0	
	52	0	0	0	0	
	53	0	0	0	0	
	54	0	0	0	0	
1705	55	0	0	0	0	
	56	0	0	0	0	
	57	0	0	0	0	
	58	0	0	0	0	
1709	59	0	0	0	0	

Comments:

SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant Ammonium Nitrate

Date 8-14-80

Company Name Columbia Nitrogen

Hours of Observation 1810-1909

Plant Address Augusta "Ga

Observer R. Kauffman
Randall L. Kauffman

Type of Discharge STACK OTHER _____

Discharge Location Dryer Outlet

Height of Point of Discharge 100'

Observer's Location:

Distance to Discharge Point 125'

Height of Observation Point 0'

Direction from Discharge Point S

Background Description USING PRILL TOWER FOR BACK GROUND

Weather: Clear Overcast Partly Cloudy Other _____ Color _____

Wind Direction SE Wind Velocity 3-5 mi/hr

Plume Description:

Detached: Yes No NO PLUME VISIBLE

Color: Black White Other _____

Plume Dispersion Behavior: Looping Coning Fanning

Lofting Fumigating Other _____

Estimated Distance Plume Visible _____

Summary of Observations:

Opacity	Aggregate Time @ Opacity	Opacity	Aggregate Time @ Opacity
0	min. sec.	55	
5		60	
10		65	
15		70	
20		75	
25		80	
30		85	
35		90	
40		95	
45		100	
50			

RECORD OF VISIBLE EMISSIONS

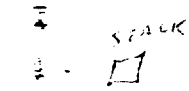
Company Name: Columbia Nitrogen
Plant Address: Augusta Ga
Stack Location: Dryer Outlet
Weather Conditions: OVERCAST

Date: 8-14-80
Observer: R. SAUFFMAN Randall L. Sauffman
Observer's Location: 125' S. of Stack

HR	MIN	TIME SECONDS 00	15	30	45	COMMENTS
1810	00	0	0	0	0	USING PRILL TOWER
	01	0	0	0	0	FOR BACK GROUND
	02	0	0	0	0	WIND - SE - 5MPH
	03	0	0	0	0	
	04	0	0	0	0	SUN IS BEHIND
1815	05	0	0	0	0	CLOUDS
	06	0	0	0	0	
	07	0	0	0	0	
	08	0	0	0	0	
	09	0	0	0	0	
1820	10	0	0	0	0	
	11	0	0	0	0	
	12	0	0	0	0	
	13	0	0	0	0	
	14	0	0	0	0	
1825	15	0	0	0	0	
	16	0	0	0	0	
	17	0	0	0	0	
	18	0	0	0	0	
	19	0	0	0	0	
1830	20	0	0	0	0	
	21	0	0	0	0	
	22	0	0	0	0	
	23	0	0	0	0	
	24	0	0	0	0	
1835	25	0	0	0	0	
	26	0	0	0	0	
	27	0	0	0	0	
	28	0	0	0	0	
1839	29	0	0	0	0	

HR	MIN	TIME SECONDS 00	15	30	45	COMMENTS
1840	30	0	0	0	0	SUN IS BEHIND CLOUD
	31	0	0	0	0	WIND SE - 5MPH
	32	0	0	0	0	
	33	0	0	0	0	USING PRILL TOWER
	34	0	0	0	0	FOR BACKGROUND
1845	35	0	0	0	0	
	36	0	0	0	0	
	37	0	0	0	0	
	38	0	0	0	0	
	39	0	0	0	0	
1850	40	0	0	0	0	
	41	0	0	0	0	
	42	0	0	0	0	
	43	0	0	0	0	
	44	0	0	0	0	
1855	45	0	0	0	0	
	46	0	0	0	0	
	47	0	0	0	0	
	48	0	0	0	0	
	49	0	0	0	0	
1900	50	0	0	0	0	
	51	0	0	0	0	
	52	0	0	0	0	
	53	0	0	0	0	
	54	0	0	0	0	
1905	55	0	0	0	0	
	56	0	0	0	0	
	57	0	0	0	0	
	58	0	0	0	0	
1909	59	0	0	0	0	

Comments:



Y OBSERVER
SUN BEHIND CLOUDS
1810 SR1
1900 SRS - Same Place

SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant AMMONIUM NITRATE

Date 2-14-80

Company Name COLUMBIA NITROGEN

Hours of Observation 17:10-18:10

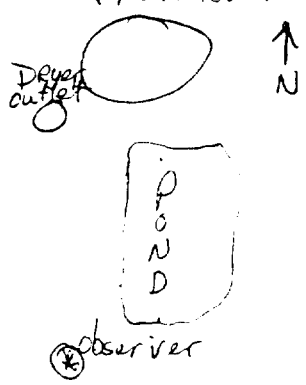
Plant Address AUGUSTA, GEORGIA

Observer Jim Nedry

Type of Discharge (STACK) OTHER _____

Discharge Location OUTLET-DRYER STACK

Height of Point of Discharge 150'



Observer's Location:

Distance to Discharge Point 125'

Height of Observation Point ~~150'~~ GROUND

Direction from Discharge Point SOUTH

Background Description OVERCAST - USING PRILL TOWER FOR BACKGROUND

Weather: Clear (Overcast) Partly Cloudy Other _____ Color _____

Wind Direction SE Wind Velocity 5 mi/hr

Plume Description:

NO PLUME VISIBLE

Detached: Yes No

Color: Black (White) Other _____

Plume Dispersion Behavior: Looping Coning Fanning

Lofting Fumigating Other _____

Estimated Distance Plume Visible _____

Summary of Observations:

Opacity	Aggregate Time @ Opacity	Opacity	Aggregate Time @ Opacity
0	4 min. sec.	55	
5		60	
10		65	
15		70	
20		75	
25		80	
30		85	
35		90	
40		95	
45		100	
50			

RECORD OF VISIBLE EMISSIONS

Company Name: COLUMBIA NITROGEN Date: 8-14-90
Plant Address: AUGUSTA, GEORGIA Observer: Jim Nadry
Stack Location: OUTLET - DRYER STACK Observer's Location: 125' S. OF STACK
Weather Conditions: OVERCAST

TIME						COMMENTS	TIME						COMMENTS
HR	MIN	SECONDS					HR	MIN	SECONDS				
		00	15	30	45				00	15	30	45	
1710	00	0	0	0	0		1740	30	0	0	0	0	
	01	0	0	0	0			31	0	0	5	5	
	02	0	0	0	0			32	5	5	5	0	
	03	0	0	0	0			33	0	0	0	0	
	04	0	0	0	0			34	0	0	5	0	
1715	05	0	5	5	5		1745	35	0	0	0	0	
"	06	0	0	0	5		"	36	0	0	0	0	
	07	5	5	5	0			37	0	0	0	0	
	08	5	5	5	5			38	0	0	0	0	
	09	0	0	0	0			39	0	0	0	0	
1720	10	5	5	5	0		1750	40	0	0	0	0	
"	11	5	5	5	5		"	41	0	0	0	0	
	12	0	5	0	5			42	0	0	0	0	
	13	0	0	0	5			43	0	0	0	0	
	14	0	5	5	0			44	0	0	0	0	
1725	15	0	0	5	5		1755	45	0	0	0	0	
	16	5	5	5	5			46	0	0	0	0	
"	17	0	0	5	5		"	47	5	0	0	0	
	18	0	0	0	0			48	0	0	0	0	
	19	5	5	0	0			49	5	5	5	0	
1730	20	5	0	5	5		1800	50	0	0	0	0	
	21	0	0	0	5			51	5	5	5	5	
	22	0	5	0	0			52	0	0	0	0	
"	23	0	0	0	0		"	53	0	0	0	0	
	24	0	5	0	5			54	0	0	0	0	
1735	25	0	0	0	5		1805	55	0	0	0	0	
	26	0	0	0	5			56	0	0	0	5	
	27	0	0	0	0			57	0	0	0	0	
	28	0	0	0	0			58	0	0	0	0	
1739	29	0	0	0	0		1809	59	0	0	0	0	

Comments:

APPENDIX F.5

COOLER FIELD DATA SHEETS

SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant Ammonium Nitrate Date 8-14-80

Company Name Columbia Nitrogen Hours of Observation 14:50-15:50

Plant Address Augusta Ga Observer Jim Nedry

Type of Discharge (STACK) OTHER _____

Discharge Location Cooler scrubber outlet

Height of Point of Discharge 140'

Observer's Location:

Distance to Discharge Point 40'

Height of Observation Point 115'

Direction from Discharge Point NE

Background Description Gray metal structure

Weather: Clear Overcast (Partly Cloudy) Other _____ Color _____

Wind Direction SE Wind Velocity 3-5 mi/hr

Plume Description:

Detached: Yes No

Color: Black (White) Other _____

Plume Dispersion Behavior: Looping (Coning) Fanning

Lofting Fumigating Other _____

Estimated Distance Plume Visible 30'

Summary of Observations:

Opacity	Aggregate Time @ Opacity	Opacity	Aggregate Time @ Opacity
0	min. sec.	55	
5		60	
10		65	
15		70	
20		75	
25		80	
30		85	
35		90	
40		95	
45		100	
50			

RECORD OF VISIBLE EMISSIONS

Company Name: Columbia Nitrogen Corp
Plant Address: Augusta Ga
Stack Location: Cooler Scrubber outlet
Weather Conditions: partly cloudy

Date: 8-14-80
Observer: Jim Nedry
Observer's Location: 40 ft NE of Stack

TIME 14:50						COMMENTS
HR	MIN	SECONDS				
		00	15	30	45	
14:50	00	5	5	5	5	
	01	5	5	5	5	
	02	5	5	5	5	
	03	5	5	5	5	
	04	5	5	5	5	
	05	5	5	5	5	
	06	5	5	5	5	
	07	5	5	5	5	
	08	5	5	5	5	
	09	5	5	5	5	
	10	5	5	5	5	
	11	5	5	5	5	
	12	5	5	5	5	
	13	5	5	5	5	
	14	5	5	5	5	
	15	5	5	5	5	
	16	5	5	5	5	
	17	5	5	5	5	
	18	5	5	5	5	
	19	5	5	5	5	
	20	5	5	5	5	
	21	5	5	5	5	
	22	5	5	5	5	
	23	5	5	5	5	
	24	5	5	5	5	
	25	5	5	5	5	
	26	5	5	5	5	
	27	5	5	5	5	
	28	5	5	5	5	
15:19	29	5	5	5	5	

TIME 15:20						COMMENTS
HR	MIN	SECONDS				
		00	15	30	45	
15:20	30	5	5	5	5	
	31	5	5	5	5	
	32	5	5	5	5	
	33	5	5	5	5	
	34	5	5	5	5	
	35	5	5	5	5	
	36	5	5	5	5	
	37	5	5	5	5	
	38	5	5	5	5	
	39	5	5	5	5	
	40	5	5	5	5	
	41	5	5	5	5	
	42	5	5	5	5	
	43	5	5	5	5	
	44	5	5	5	5	
	45	5	5	5	5	
	46	5	5	5	5	
	47	5	5	5	5	
	48	5	5	5	5	
	49	5	5	5	5	
	50	5	5	5	5	
	51	5	5	5	5	
	52	5	5	5	5	
	53	5	5	5	5	
	54	5	5	5	5	
	55	5	5	5	5	
	56	5	5	5	5	
	57	5	5	5	5	
	58	5	5	5	5	
15:49	59	5	5	5	5	

Comments:

SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant Ammonium Nitrate Date 8-14-80

Company Name Columbia Nitrogen Corp Hours of Observation 15:50-16:50

Plant Address Augusta Ga. Observer Jim Nedry

Type of Discharge (STACK) OTHER _____

Discharge Location Cooler Scrubber outlet

Height of Point of Discharge 140'

Observer's Location:

Distance to Discharge Point 40'

Height of Observation Point 115'

Direction from Discharge Point NE

Background Description Gray metal Structure

Weather: Clear Overcast (Partly Cloudy) Other _____ Color _____

Wind Direction ~~SE~~ NE Wind Velocity 3-5 mi/hr

Plume Description:

Detached: Yes No

Color: Black (White) Other _____

Plume Dispersion Behavior: Looping (Coning) Fanning

Lofting Fumigating Other _____

Estimated Distance Plume Visible 20'

Summary of Observations:

Opacity	Aggregate Time @ Opacity		Opacity	Aggregate Time @ Opacity
	min.	sec.		
0			55	
5			60	
10			65	
15			70	
20			75	
25			80	
30			85	
35			90	
40			95	
45			100	
50				

RECORD OF VISIBLE EMISSIONS

Company Name: Columbia Nitrogen
Plant Address: Augusta Ga
Stack Location: Cooler Scrubber Outlet
Weather Conditions: Partly Cloudy

Date: 8-14-80
Observer: Jim Nedry
Observer's Location: 40' NE of Stack

TIME 15:50

HR	MIN	SECONDS				COMMENTS
		00	15	30	45	
1550	00	5	5	5	5	
	01	5	5	5	5	
	02	5	5	5	5	
	03	5	5	5	5	
	04	5	5	5	5	
	05	5	5	5	5	
	06	5	5	5	5	
	07	5	5	5	5	
	08	5	5	5	5	
	09	5	5	5	5	
	10	5	5	5	5	
	11	5	5	5	5	
	12	5	5	5	5	
	13	5	5	5	5	
	14	5	5	5	5	
	15	5	5	5	5	
	16	5	5	5	5	
	17	5	5	5	5	
	18	5	5	5	5	
	19	5	5	5	5	
	20	5	5	5	5	
	21	5	5	5	5	
	22	5	5	5	5	
	23	5	5	5	5	
	24	5	5	5	5	
	25	5	5	5	5	
	26	5	5	5	5	
	27	5	5	5	5	
	28	5	5	5	5	
16:19	29	5	5	5	5	

TIME 16:20

HR	MIN	SECONDS				COMMENTS
		00	15	30	45	
16:20	30	5	5	5	5	
	31	5	5	5	5	
	32	5	5	5	5	
	33	5	5	5	5	
	34	5	5	5	5	
	35	5	5	5	5	
	36	5	5	5	5	
	37	5	5	5	5	
	38	5	5	5	5	
	39	5	5	5	5	
	40	5	5	5	5	
	41	5	5	5	5	
	42	5	5	5	5	
	43	5	5	5	5	
	44	5	5	5	5	
	45	5	5	5	5	
	46	5	5	5	5	
	47	5	5	5	5	
	48	5	5	5	5	
	49	5	5	5	5	
	50	5	5	5	5	
	51	5	5	5	5	
	52	5	5	5	5	
	53	5	5	5	5	
	54	5	5	5	5	
	55	5	5	5	5	
	56	5	5	5	5	
	57	5	5	5	5	
	58	5	5	5	5	
16:49	59	5	5	5	5	

Comments:

SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant AMMONIUM NITRATE Date 8-15-80

Company Name COLUMBIA NITROGEN Hours of Observation 1100-1159

Plant Address AUGUSTA, GEORGIA Observer K. KAUFFMAN
Randall L. Kauffman

Type of Discharge (STACK) OTHER _____

Discharge Location COOLER-OUTLET

Height of Point of Discharge 140'

Observer's Location:

Distance to Discharge Point 35'

Height of Observation Point 115'

Direction from Discharge Point NE

Background Description USING METAL BUILDING FOR BACKGROUND

Weather: Clear Overcast (Partly Cloudy) Other _____ Color _____

Wind Direction SE Wind Velocity 8-10 mi/hr

Plume Description:

Detached: Yes No NO PLUME VISIBLE

Color: Black White Other _____

Plume Dispersion Behavior: Looping Coning Fanning

Lofting Fumigating Other _____

Estimated Distance Plume Visible _____

Summary of Observations:

Opacity	Aggregate Time @ Opacity	Opacity	Aggregate Time @ Opacity
0	min. sec.	55	
5		60	
10		65	
15		70	
20		75	
25		80	
30		85	
35		90	
40		95	
45		100	
50			

RECORD OF VISIBLE EMISSIONS

Company Name: COLUMBIA NITROGEN
Plant Address: AUGUSTA, GEORGIA
Stack Location: COOLER - OUTLET
Weather Conditions: PARTLY CLOUDY

Date: 8-15-80
Observer: R. KAUFFMAN Randall L. Kauffman
Observer's Location: 35' NE OF STACK

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
1100	00	0	0	0	0	PARTLY CLOUDY
	01	0	0	0	0	WIND - SE 8-10 MPH
	02	0	0	0	0	
	03	0	0	0	0	USING METAL
	04	0	0	0	0	BUILDING FOR
1105	05	0	0	0	0	BACKGROUND
	06	0	0	0	0	
	07	0	0	0	0	
	08	0	0	0	0	
	09	0	0	0	0	
1110	10	0	0	0	0	
	11	0	0	0	0	
	12	0	0	0	0	
	13	0	0	0	0	
	14	0	0	0	0	
1115	15	0	0	0	0	
	16	0	0	0	0	
	17	0	0	0	0	
	18	0	0	0	0	
	19	0	0	0	0	
1120	20	0	0	0	0	
	21	0	0	0	0	
	22	0	0	0	0	
	23	0	0	0	0	
	24	0	0	0	0	
1125	25	0	0	0	0	
	26	0	0	0	0	
	27	0	0	0	0	
	28	0	0	0	0	
1129	29	0	0	0	0	

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
						PARTLY CLOUDY
1130	30	0	0	0	0	SOUTH WIND - 8-10 MPH
	31	0	0	0	0	
	32	0	0	0	0	
	33	0	0	0	0	USING METAL
	34	0	0	0	0	BUILDING FOR
1135	35	0	0	0	0	BACKGROUND
	36	0	0	0	0	
	37	0	0	0	0	
	38	0	0	0	0	
	39	0	0	0	0	
1140	40	0	0	0	0	
	41	0	0	0	0	
	42	0	0	0	0	
	43	0	0	0	0	
	44	0	0	0	0	WIND SE - 10 MPH
1145	45	0	0	0	0	OVERCAST
	46	0	0	0	0	SUN BEHIND CLOUDS
	47	0	0	0	0	MOST OF TIME
	48	0	0	0	0	
	49	0	0	0	0	
1150	50	0	0	0	0	
	51	0	0	0	0	
	52	0	0	0	0	
	53	0	0	0	0	
	54	0	0	0	0	
1155	55	0	0	0	0	
	56	0	0	0	0	
	57	0	0	0	0	
	58	0	0	0	0	
1159	59	0	0	0	0	

Comments:

VERY SMALL AMOUNT OF DUST COMING OUT OF OUTLET WHEN OBSERVED UP CLOSE - LESS THAN 5%
FROM 35 to 40 FEET NO PLUME IS VISIBLE

RLK

SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant AMMONIUM NITRATE Date 8-15-80

Company Name COLUMBIA NITROGEN Hours of Observation 1200 - 1259

Plant Address AUGUSTA, GEORGIA Observer R. E. KAUFFMAN
Randall L. Kauffman

Type of Discharge (STACK) OTHER _____

Discharge Location COOLER - OUTLET

Height of Point of Discharge 140'

Observer's Location:

Distance to Discharge Point 35'

Height of Observation Point 115'

Direction from Discharge Point NE

Background Description USING METAL BUILDING FOR BACKGROUND

Weather: Clear (Overcast) Partly Cloudy Other _____ Color _____

Wind Direction SE Wind Velocity 10 mi/hr

Plume Description:

Detached: Yes No NO PLUME VISIBLE

Color: Black White Other _____

Plume Dispersion Behavior: Looping Coning Fanning

Lofting Fumigating Other _____

Estimated Distance Plume Visible _____

Summary of Observations:

Opacity	Aggregate Time @ Opacity	Opacity	Aggregate Time @ Opacity
0	min. sec.	55	
5		60	
10		65	
15		70	
20		75	
25		80	
30		85	
35		90	
40		95	
45		100	
50			

RECORD OF VISIBLE EMISSIONS

Company Name: COLUMBIA NITROGEN
Plant Address: AUGUSTA, GEORGIA
Stack Location: COOLER - OUTLET
Weather Conditions: PARTLY CLOUDY

Date: 8-15-80
Observer: R. KAUFFMAN Kendall L. Kauffman
Observer's Location: 40' NE OF OUTLET

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
-						
1200	00	0	0	0	0	OVERCAST
	01	0	0	0	0	WIND - SE - 10 mph
	02	0	0	0	0	SUN BEHIND CLOUDS
	03	0	0	0	0	
	04	0	0	0	0	USING METAL
1205	05	0	0	0	0	BUILDING FOR
	06	0	0	0	0	BACKGROUND
	07	0	0	0	0	
	08	0	0	0	0	
	09	0	0	0	0	
1210	10	0	0	0	0	
	11	0	0	0	0	
	12	0	0	0	0	
	13	0	0	0	0	
	14	0	0	0	0	
1215	15	0	0	0	0	
	16	0	0	0	0	
	17	0	0	0	0	
	18	0	0	0	0	
	19	0	0	0	0	
1220	20	0	0	0	0	
	21	0	0	0	0	
	22	0	0	0	0	
	23	0	0	0	0	
	24	0	0	0	0	
1225	25	0	0	0	0	
	26	0	0	0	0	
	27	0	0	0	0	
	28	0	0	0	0	
1229	29	0	0	0	0	

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
1230	30	0	0	0	0	PARTLY CLOUDY
	31	0	0	0	0	WIND - SE - 10 mph
	32	0	0	0	0	
	33	0	0	0	5	
	34	5	5	5	5	USING METAL
1235	35	5	5	5	5	BUILDING FOR
	36	5	5	5	5	BACKGROUND
	37	5	5	5	5	
	38	5	5	5	5	
	39	5	5	5	5	
1240	40	5	5	5	5	
	41	5	5	5	5	
	42	5	5	5	5	
	43	5	5	5	5	
	44	5	5	5	5	
1245	45	5	5	5	5	
	46	5	5	5	5	
	47	5	5	5	5	
	48	5	5	5	5	WIND SE - 10 mph
	49	5	5	5	5	
1250	50	5	5	5	5	
	51	5	5	5	5	
	52	5	5	5	5	
	53	5	5	5	5	
	54	5	5	5	5	
1255	55	5	5	5	5	
	56	5	5	5	5	
	57	5	5	5	5	
	58	5	5	5	5	
1259	59	5	5	5	5	

Comments:

OBSERVERS LOCATION SAME AS 1100 - 1159
VERY SMALL AMOUNT OF DUST COMING OUT OF OUTLET
WHEN OBSERVED UP CLOSE - LESS THAN 5%
FROM 35 ~ 40 FEET NO PLUME IS VISIBLE

RLK

SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant Ammonium Nitrate Date 8-15-80

Company Name Columbia Nitrogen Hours of Observation 11:00 - 12:00

Plant Address Augusta Ga Observer Jim Nedry

Type of Discharge (STACK) OTHER _____

Discharge Location Cooler Bypass

Height of Point of Discharge 140'

Observer's Location:

Distance to Discharge Point 15'

Height of Observation Point 35'

Direction from Discharge Point N

Background Description Gray Metallic Structure

Weather: Clear Overcast (Partly Cloudy) Other _____ Color _____

Wind Direction Variable S-E Wind Velocity 3-5 mi/hr

Plume Description:

Detached: Yes No

Color: Black White Other _____

Plume Dispersion Behavior: Looping Coning Fanning

Lofting Fumigating Other _____

Estimated Distance Plume Visible _____

Summary of Observations:

Opacity	Aggregate Time @ Opacity	Opacity	Aggregate Time @ Opacity
0	min. sec.	55	
5		60	
10		65	
15		70	
20		75	
25		80	
30		85	
35		90	
40		95	
45		100	
50			

RECORD OF VISIBLE EMISSIONS

Company Name: Columbia Nitrogen
Plant Address: Augusta Ga
Stack Location: Cooler Bypass
Weather Conditions: Partly Cloudy

Date: 8-15-80
Observer: Jim Nedry
Observer's Location: 15 Ft N of Stack on Platform

TIME 11:00

HR	MIN	SECONDS 00	15	30	45	COMMENTS
11:00	00	0	0	0	0	
	01	0	0	0	0	
	02	0	0	0	0	
	03	0	0	0	0	
	04	0	0	0	0	
	05	0	0	0	0	
	06	0	0	0	0	
	07	0	0	0	0	
	08	0	0	0	0	
	09	0	0	0	0	
	10	0	0	0	0	
	11	0	0	0	0	
	12	0	0	0	0	
	13	0	0	0	0	
	14	0	0	0	0	
	15	0	0	0	0	
	16	0	0	0	0	
	17	0	0	0	0	
	18	0	0	0	0	
	19	0	0	0	0	
	20	0	0	0	0	
	21	0	0	0	0	
	22	0	0	0	0	
	23	0	0	0	0	
	24	0	0	0	0	
	25	0	0	0	0	
	26	0	0	0	0	
	27	0	0	0	0	
	28	0	0	0	0	
11	29	0	0	0	0	

TIME 11:30

HR	MIN	SECONDS 00	15	30	45	COMMENTS
11	30	0	0	0	0	
	31	0	0	0	0	
	32	0	0	0	0	
	33	0	0	0	0	
	34	0	0	0	0	
	35	0	0	0	0	
	36	0	0	0	0	
	37	0	0	0	0	
	38	0	0	0	0	
	39	0	0	0	0	
	40	0	0	0	0	
	41	0	0	0	0	
	42	0	0	0	0	
	43	0	0	0	0	
	44	0	0	0	0	
	45	0	0	0	0	
	46	0	0	0	0	
	47	0	0	0	0	
	48	0	0	0	0	
	49	0	0	0	0	
	50	0	0	0	0	
	51	0	0	0	0	
	52	0	0	0	0	
	53	0	0	0	0	
	54	0	0	0	0	
	55	0	0	0	0	
	56	0	0	0	0	
	57	0	0	0	0	
	58	0	0	0	0	
1159	59	0	0	0	0	

Comments: Sun is alternately in and out from behind the clouds however no plume is visible in either case.

SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant Ammonium Nitrate Date 8-15-80

Company Name Columbia Nitrogen Hours of Observation 12:10 - 13:10

Plant Address Augusta Ga. Observer Jim Nedry

Type of Discharge (STACK) OTHER _____

Discharge Location Cooler Bypass

Height of Point of Discharge 140'

Observer's Location:

Distance to Discharge Point 15'

Height of Observation Point 135'

Direction from Discharge Point N

Background Description Gray metal structure

Weather: Clear Overcast (Partly Cloudy) Other _____ Color _____

Wind Direction Variable S - E Wind Velocity 3 - 5 mi/hr

Plume Description:

Detached: Yes No

Color: Black White Other _____

Plume Dispersion Behavior: Looping Coning Fanning

Lofting Fumigating Other _____

Estimated Distance Plume Visible _____

Summary of Observations:

Opacity	Aggregate Time @ Opacity	Opacity	Aggregate Time @ Opacity
0	min. sec.	55	
5		60	
10		65	
15		70	
20		75	
25		80	
30		85	
35		90	
40		95	
45		100	
50			

RECORD OF VISIBLE EMISSIONS

Company Name: Columbia Nitrogen
Plant Address: Augusta Ga
Stack Location: Cooler Bypass
Weather Conditions: partly Cloudy

Date: 8-15-80
Observer: Jim Nedry
Observer's Location: 15' N of Stack on platform

TIME 12:10 — COMMENTS

HR	MIN	SECONDS 00	15	30	45
1210	00	0	0	0	0
	01	0	0	0	0
	02	0	0	0	0
	03	0	0	0	0
	04	0	0	0	0
	05	0	0	0	0
	06	0	0	0	0
	07	0	0	0	0
	08	0	0	0	0
	09	0	0	0	0
	10	0	0	0	0
	11	0	0	0	0
	12	0	0	0	0
	13	0	0	0	0
	14	0	0	0	0
	15	0	0	0	0
	16	0	0	0	0
	17	0	0	0	0
	18	0	0	0	0
	19	0	0	0	0
	20	0	0	0	0
	21	0	0	0	0
	22	0	0	0	0
	23	0	0	0	0
	24	0	0	0	0
	25	0	0	0	0
	26	0	0	0	0
	27	0	0	0	0
	28	0	0	0	0
12:39	29	0	0	0	0

TIME 12:40 — COMMENTS

HR	MIN	SECONDS 00	15	30	45
12:40	30	0	0	0	0
	31	0	0	0	0
	32	0	0	0	0
	33	0	0	0	0
	34	0	0	0	0
	35	0	0	0	0
	36	0	0	0	0
	37	0	0	0	0
	38	0	0	0	0
	39	0	0	0	0
	40	0	0	0	0
	41	0	0	0	0
	42	0	0	0	0
	43	0	0	0	0
	44	0	0	0	0
	45	0	0	0	0
	46	0	0	0	0
	47	0	0	0	0
	48	0	0	0	0
	49	0	0	0	0
	50	0	0	0	0
	51	0	0	0	0
	52	0	0	0	0
	53	0	0	0	0
	54	0	0	0	0
	55	0	0	0	0
	56	0	0	0	0
	57	0	0	0	0
	58	0	0	0	0
13:09	59	0	0	0	0

Comments:

Sun is alternately in and out from behind clouds, however NO plume is visible in either case.

SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant AMMONIUM NITRATE

Date 8-15-80

Company Name COLUMBIA NITROGEN

Hours of Observation 1545 - 1640

Plant Address AUGUSTA, GEORGIA

Observer R. K. KAUFFMAN
Randall L. Kauffman

Type of Discharge (STACK) OTHER _____

Discharge Location COOLER - BYPASS STACK

Height of Point of Discharge 140

Observer's Location:

Distance to Discharge Point 45'

Height of Observation Point 115

Direction from Discharge Point E

Background Description BLUE SKY

Weather: Clear Overcast (Partly Cloudy) Other _____ Color _____

Wind Direction SE Wind Velocity 10 mi/hr

Plume Description:

Detached: Yes No NO PLUME VISIBLE

Color: Black White Other _____

Plume Dispersion Behavior: Looping Coning Fanning

Lofting Fumigating Other _____

Estimated Distance Plume Visible _____

Summary of Observations:

Opacity	Aggregate Time @ Opacity	Opacity	Aggregate Time @ Opacity
	min. sec.		
0		55	
5		60	
10		65	
15		70	
20		75	
25		80	
30		85	
35		90	
40		95	
45		100	
50			

RECORD OF VISIBLE EMISSIONS

Company Name: COLUMBIA NITROGEN
Plant Address: AUGUSTA, GEORGIA
Stack Location: COOLER - BYPASS STACK
Weather Conditions: PARTLY CLOUDY

Date: 8-15-80
Observer: R. KAUFFMAN Randall R. Kauffman
Observer's Location: 45' E. OF STACK

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
1545	00	0	0	0	0	PARTLY CLOUDY
	01	0	0	0	0	WIND - SE - 10MPH
	02	0	0	0	0	BLUE BACKGROUND
	03	0	0	0	0	
	04	0	0	0	0	
1550	05	0	0	0	0	
	06	0	0	0	0	
	07	0	0	0	0	
	08	0	0	0	0	
	09	0	0	0	0	
1555	10	0	0	0	0	
	11	0	0	0	0	
	12	0	0	0	0	
	13	0	0	0	0	
	14	0	0	0	0	
1600	15	0	0	0	0	
	16	0	0	0	0	
	17	0	0	0	0	
	18	0	0	0	0	
	19	0	0	0	0	
1605	20	0	0	0	0	
	21	0	0	0	0	
	22	0	0	0	0	
	23	0	0	0	0	
	24	0	0	0	0	
1610	25	0	0	0	0	
	26	0	0	0	0	
	27	0	0	0	0	
	28	0	0	0	0	
	29	0	0	0	0	

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
1615	30	0	0	0	0	PARTLY CLOUDY
	31	0	0	0	0	WIND - SE - 10MPH
	32	0	0	0	0	BLUE BACKGROUND
	33	0	0	0	0	
	34	0	0	0	0	
1620	35	0	0	0	0	
	36	0	0	0	0	
	37	0	0	0	0	
	38	0	0	0	0	
	39	0	0	0	0	
1625	40	0	0	0	0	
	41	0	0	0	0	
	42	0	0	0	0	
	43	0	0	0	0	
	44	0	0	0	0	
1630	45	0	0	0	0	
	46	0	0	0	0	
	47	0	0	0	0	
	48	0	0	0	0	
	49	0	0	0	0	
1635	50	0	0	0	0	
	51	0	0	0	0	
	52	0	0	0	0	
	53	0	0	0	0	
	54	0	0	0	0	
1640	55	0	0	0	0	
	56	0	0	0	0	
	57	0	0	0	0	
	58	0	0	0	0	
1644	59	0	0	0	0	

Comments:

APPENDIX F.6

COATING BAGHOUSE AND BAGGING BAGHOUSE FIELD DATA SHEETS

SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant Ammonium Nitrate Date 8-13-80

Company Name Columbia Nitrogen Corp Hours of Observation 8:45-9:45

Plant Address Augusta Ga Observer Tim Neely

Type of Discharge STACK OTHER _____

Discharge Location Clay Coater Vent (outlet.)

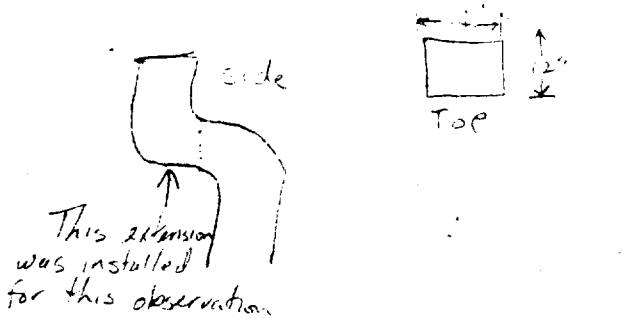
Height of Point of Discharge App 100'

Observer's Location:

Distance to Discharge Point 20'

Height of Observation Point 85'

Direction from Discharge Point ENE



Background Description Blue Sky More detail on back

Weather: Clear Overcast (Partly Cloudy) Other Hazey Color _____

Wind Direction E Wind Velocity 0-3 mi/hr

Plume Description:

Detached: Yes No

Color: Black White Other _____

Plume Dispersion Behavior: Looping Coning Fanning

Lofting Fumigating Other _____

Estimated Distance Plume Visible _____

Summary of Observations:

Opacity	Aggregate Time @ Opacity	Opacity	Aggregate Time @ Opacity
0	min. sec.	55	
5		60	
10		65	
15		70	
20		75	
25		80	
30		85	
35		90	
40		95	
45		100	
50			

RECORD OF VISIBLE EMISSIONS

Company Name: Columbia Nitrogen Date: 8-13-80
Plant Address: Augusta Ga Observer: Jim Nedry
Stack Location: Clay Coater outlet Observer's Location: E of discharge
Weather Conditions: partly Cloudy Hazey

TIME 08:45 — COMMENTS

HR	MIN	SECONDS 00	15	30	45
08:45	00	0	0	0	0
	01	0	0	0	0
	02	0	0	0	0
	03	0	0	0	0
	04	0	0	0	0
	05	0	0	0	0
	06	0	0	0	0
	07	0	0	0	0
	08	0	0	0	0
	09	0	0	0	0
	10	0	0	0	0
	11	0	0	0	0
	12	0	0	0	0
	13	0	0	0	0
	14	0	0	0	0
	15	0	0	0	0
	16	0	0	0	0
	17	0	0	0	0
	18	0	0	0	0
	19	0	0	0	0
	20	0	0	0	0
	21	0	0	0	0
	22	0	0	0	0
	23	0	0	0	0
	24	0	0	0	0
	25	0	0	0	0
	26	0	0	0	0
	27	0	0	0	0
	28	0	0	0	0
09:14	29	0	0	0	0

TIME 09:15 — COMMENTS

HR	MIN	SECONDS 00	15	30	45
09:15	30	0	0	0	0
	31	0	0	0	0
	32	0	0	0	0
	33	0	0	0	0
	34	0	0	0	0
	35	0	0	0	0
	36	0	0	0	0
	37	0	0	0	0
	38	0	0	0	0
	39	0	0	0	0
	40	0	0	0	0
	41	0	0	0	0
	42	0	0	0	0
	43	0	0	0	0
	44	0	0	0	0
	45	0	0	0	0
	46	0	0	0	0
	47	0	0	0	0
	48	0	0	0	0
	49	0	0	0	0
	50	0	0	0	0
	51	0	0	0	0
	52	0	0	0	0
	53	0	0	0	0
	54	0	0	0	0
	55	0	0	0	0
	56	0	0	0	0
	57	0	0	0	0
	58	0	0	0	0
09:44	59	0	0	0	0

Comments:

SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant AMMONIUM NITRATE Date 8-13-80

Company Name COLUMBIA NITROGEN Hours of Observation 1255-1354

Plant Address AUGUSTA, GEORGIA Observer R.E. KAUFFMAN
Randall L. Kauffman

Type of Discharge (STACK) OTHER _____

Discharge Location CLAY COATING OUTLET

Height of Point of Discharge ~~125~~ 150' FROM GROUND

Observer's Location:

Distance to Discharge Point 60'

Height of Observation Point 12'

Direction from Discharge Point SE

Background Description BLUE SKY - SOME LIGHT HAZE AT TIMES

Weather: Clear Overcast (Partly Cloudy) Other HAZE Color _____

Wind Direction SE Wind Velocity 5 mi/hr

Plume Description:

Detached: Yes No NO PLUME VISIBLE

Color: Black White Other _____

Plume Dispersion Behavior: Looping Coning Fanning

Lofting Fumigating Other _____

Estimated Distance Plume Visible _____

Summary of Observations:

Opacity	Aggregate Time @ Opacity	Opacity	Aggregate Time @ Opacity
0	min. sec.	55	
5		60	
10		65	
15		70	
20		75	
25		80	
30		85	
35		90	
40		95	
45		100	
50			

RECORD OF VISIBLE EMISSIONS

Company Name: COLUMBIA NITROGEN
Plant Address: AUGUSTA, GEORGIA
Stack Location: CLAY COATING OUTLET
Weather Conditions: BLUE SKY W/ HAZE

Date: 8-13-80
Observer: K. KAUFFMAN - Randall K. Kauffman
Observer's Location: 60' SE OF OUTLET

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
1255	00	0	0	0	0	BLUE SKY BACKGROUND
	01	0	0	0	0	WIND SE 5MPH
	02	0	0	0	0	
	03	0	0	0	0	
	04	0	0	0	0	
1300	05	0	0	0	0	
	06	0	0	0	0	
	07	0	0	0	0	
	08	0	0	0	0	
	09	0	0	0	0	
1305	10	0	0	0	0	
	11	0	0	0	0	
	12	0	0	0	0	
	13	0	0	0	0	
	14	0	0	0	0	
1310	15	0	0	0	0	
	16	0	0	0	0	
	17	0	0	0	0	
	18	0	0	0	0	
	19	0	0	0	0	
1320	20	0	0	0	0	
	21	0	0	0	0	
	22	0	0	0	0	
	23	0	0	0	0	
	24	0	0	0	0	
1326	25	0	0	0	0	
	26	0	0	0	0	
	27	0	0	0	0	
	28	0	0	0	0	
1329	29	0	0	0	0	

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
1330	30	0	0	0	0	BLUE SKY BACKGROUND
	31	0	0	0	0	WIND SE 5MPH
	32	0	0	0	0	
	33	0	0	0	0	
	34	0	0	0	0	
1330	35	0	0	0	0	
	36	0	0	0	0	
	37	0	0	0	0	
	38	0	0	0	0	
	39	0	0	0	0	
1340	40	0	0	0	0	
	41	0	0	0	0	
	42	0	0	0	0	
	43	0	0	0	0	
	44	0	0	0	0	
1340	45	0	0	0	0	
	46	0	0	0	0	
	47	0	0	0	0	
	48	0	0	0	0	
	49	0	0	0	0	
1350	50	0	0	0	0	
	51	0	0	0	0	
	52	0	0	0	0	
	53	0	0	0	0	
	54	0	0	0	0	
1350	55	0	0	0	0	
	56	0	0	0	0	
	57	0	0	0	0	
	58	0	0	0	0	
1354	59	0	0	0	0	

Comments:

SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant Ammonium NITRATE Date 8-13-80

Company Name COLUMBIA NITROGEN Hours of Observation 1357-1454

Plant Address AUGUSTA, GEORGIA Observer R.E. KAUFFMAN
Randall E. Kauffman

Type of Discharge (STACK) OTHER _____

Discharge Location CLAY COATING OUTLET

Height of Point of Discharge 150' FROM GROUND

Observer's Location:

Distance to Discharge Point 60'

Height of Observation Point 12'

Direction from Discharge Point SE

Background Description BLUE SKY - SOME LIGHT HAZE AT TIMES

Weather: Clear Overcast (Partly Cloudy) Other HAZE Color _____

Wind Direction SE Wind Velocity 5 MPH mi/hr

Plume Description:

Detached: Yes No NO PLUME VISIBLE

Color: Black White Other _____

Plume Dispersion Behavior: Looping Coning Fanning

Lofting Fumigating Other _____

Estimated Distance Plume Visible _____

Summary of Observations:

Opacity	Aggregate Time @ Opacity	Opacity	Aggregate Time @ Opacity
0	min. sec.	55	
5		60	
10		65	
15		70	
20		75	
25		80	
30		85	
35		90	
40		95	
45		100	
50			

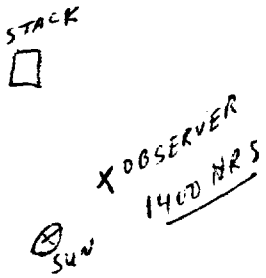
RECORD OF VISIBLE EMISSIONS

Company Name: COLUMBIA NITROGEN
Plant Address: AUGUSTA, GEORGIA
Stack Location: CLAY COATING OUTLET
Weather Conditions: BLUE SKY W/HAZE

Date: 8-13-80
Observer: R. KAUFFMAN Kendall L. Kauffman
Observer's Location: 60' SE OF OUTLET

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS	TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
1355	00	0	0	0	0	BLUE SKY BACKGROUND	1425	30	0	0	0	0	BLUE SKY BACKGROUND
	01	0	0	0	0	W/SOME HAZE		31	0	0	0	0	W/SOME HAZE
	02	0	0	0	0	WIND SE 5 MPH		32	0	0	0	0	WIND SE 5 MPH
	03	0	0	0	0			33	0	0	0	0	
	04	0	0	0	0			34	0	0	0	0	
1400	05	0	0	0	0		1430	35	0	0	0	0	
	06	0	0	0	0			36	0	0	0	0	
	07	0	0	0	0			37	0	0	0	0	
	08	0	0	0	0			38	0	0	0	0	
	09	0	0	0	0			39	0	0	0	0	
1405	10	0	0	0	0		1435	40	0	0	0	0	
	11	0	0	0	0			41	0	0	0	0	
	12	0	0	0	0			42	0	0	0	0	
	13	0	0	0	0			43	0	0	0	0	
	14	0	0	0	0			44	0	0	0	0	
1410	15	0	0	0	0		1440	45	0	0	0	0	
	16	0	0	0	0			46	0	0	0	0	
	17	0	0	0	0			47	0	0	0	0	
	18	0	0	0	0			48	0	0	0	0	
	19	0	0	0	0			49	0	0	0	0	
1415	20	0	0	0	0		1445	50	0	0	0	0	
	21	0	0	0	0			51	0	0	0	0	
	22	0	0	0	0			52	0	0	0	0	
	23	0	0	0	0			53	0	0	0	0	
	24	0	0	0	0			54	0	0	0	0	
1420	25	0	0	0	0		1450	55	0	0	0	0	
	26	0	0	0	0			56	0	0	0	0	
	27	0	0	0	0			57	0	0	0	0	
	28	0	0	0	0			58	0	0	0	0	
1424	29	0	0	0	0		1454	59	0	0	0	0	

Comments:



SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant AMMONIUM NITRATE Date 8-14-80

Company Name COLUMBIA NITROGEN Hours of Observation 1014 - 1108

Plant Address AUGUSTA, GEORGIA Observer R. E. KAUFFMAN
Randall L. Kauffman

Type of Discharge (STACK) OTHER _____

Discharge Location OUTLET - BAGGING OPERATION 2 BAGGERS OPERATING
1 - 50 Lb.
1 - 100 Lb.

Height of Point of Discharge 50' FROM GROUND

Observer's Location:

Distance to Discharge Point 100'

Height of Observation Point 50' ground level amongst RR tracks

Direction from Discharge Point SE

Background Description BLUE SKY

Weather: (Clear) Overcast Partly Cloudy Other _____ Color _____

Wind Direction SE Wind Velocity 5 mi/hr

Plume Description:

Detached: Yes No NO PLUME VISIBLE

Color: Black White Other _____

Plume Dispersion Behavior: Looping Coning Fanning
Lofting Fumigating Other _____

Estimated Distance Plume Visible _____

Summary of Observations:

Opacity	Aggregate Time @ Opacity	Opacity	Aggregate Time @ Opacity
0	min. sec.	55	
5		60	
10		65	
15		70	
20		75	
25		80	
30		85	
35		90	
40		95	
45		100	
50			

RECORD OF VISIBLE EMISSIONS

Company Name: COLUMBIA NITROGEN
Plant Address: AUGUSTA, GEORGIA
Stack Location: OUTLET - BAGGING OPERATION
Weather Conditions: CLEAR - BLUE SKY

Date: 8-14-80
Observer: R. KAUFFMAN Kendall L. Kaufman
Observer's Location: 100' SE OF OUTLET STACK

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
-		00	15	30	45	CLEAR - BLUE SKY
1014	00	0	0	0	0	WIND - SE 5 MPH
	01	0	0	0	0	
	02	0	0	0	0	
	03	0	0	0	0	
	04	0	0	0	0	
	05	0	0	0	0	
1020	06	0	0	0	0	
	07	0	0	0	0	
	08	0	0	0	0	
	09	0	0	0	0	
	10	0	0	0	0	
1025	11	0	0	0	0	
	12	0	0	0	0	
	13	0	0	0	0	
	14	0	0	0	0	
	15	0	0	0	0	
1030	16	0	0	0	0	
	17	0	0	0	0	
	18	0	0	0	0	CLEAR - BLUE SKY
	19	0	0	0	0	WIND - SE 5 MPH
	20	0	0	0	0	
1035	21	0	0	0	0	
	22	0	0	0	0	
	23	0	0	0	0	
	24	0	0	0	0	
	25	0	0	0	0	
1040	26	0	0	0	0	
	27	0	0	0	0	
	28	0	0	0	0	
	29	0	0	0	0	

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
	30	0	0	0	0	
1044	31	0	0	0	0	CLEAR - BLUE SKY
	32	0	0	0	0	WIND - 5 MPH
	33	0	0	0	0	
	34	0	0	0	0	
	35	0	0	0	0	
1050	36	0	0	0	0	50 LB. BAGGER
	37	0	0	0	0	DOWN HERE FOR
	38	0	0	0	0	A FEW MINUTES
	39	0	0	0	0	DOWN ABOUT 5 MIN.
	40	0	0	0	0	
1055	41	0	0	0	0	
	42	0	0	0	0	
	43	0	0	0	0	
	44	0	0	0	0	
	45	0	0	0	0	
1100	46	0	0	0	0	
	47	0	0	0	0	
	48	0	0	0	0	
	49	0	0	0	0	
	50	0	0	0	0	
1105	51	0	0	0	0	
	52	0	0	0	0	
	53	0	0	0	0	50 LB. BAGGER
	54	0	0	0	0	DOWN HERE
	55	0	0	0	0	
1110	56	0	0	0	0	STOPPED OPERATING
	57	0				HERE
	58					
1113	59					

Comments:

1 - 50 Lb. BAGGING UNIT } BAGGING UNITS OPERATING
1 - 100 Lb. BAGGING UNIT } DURING OBSERVATIONS

TOTAL DOWN TIME APPRX. 13 MIN.

SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant AMMONIUM NITRATE Date 8-14-80

Company Name COLUMBIA NITROGEN Hours of Observation 1123-1156

Plant Address AUGUSTA, GEORGIA Observer R.E. KAUFFMAN

Type of Discharge STACK OTHER _____

Discharge Location OUTLET - BAGGING OPERATION 2 BAGGERS ON LINE 1-50 LB. 1-100 LB.

Height of Point of Discharge 50' FROM GROUND

Observer's Location:

Distance to Discharge Point 100'

Height of Observation Point 50' ground level (amongst RR tracks)

Direction from Discharge Point SE

Background Description BLUE SKY

Weather: Clear Overcast Partly Cloudy Other _____ Color _____

Wind Direction SE Wind Velocity 5 mi/hr

Plume Description:

NO PLUME VISIBLE

Detached: Yes No

Color: Black White Other _____

Plume Dispersion Behavior: Looping Coning Fanning

Lofting Fumigating Other _____

Estimated Distance Plume Visible _____

Summary of Observations:

Opacity	Aggregate Time @ Opacity	Opacity	Aggregate Time @ Opacity
0	min. sec.	55	
5		60	
10		65	
15		70	
20		75	
25		80	
30		85	
35		90	
40		95	
45		100	
50			

RECORD OF VISIBLE EMISSIONS

Company Name: COLUMBIA NITROGEN Date: 8-14-80

Plant Address: AUGUSTA, GEORGIA Observer: R. KAUFFMAN Kendall R. Kauffman

Stack Location: OUTLET - BAGGING OPERATION Observer's Location: 100' SE OF OUTLET STA

Weather Conditions: CLEAR - BLUE SKY

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
-		00	15	30	45	CLEAR BLUE SKY
1123	00	0	0	0	0	WIND - SE 5 MPH
	01	0	0	0	0	
	02	0	0	0	0	
	03	0	0	0	0	
	04	0	0	0	0	
	05	0	0	0	0	
	06	0	0	0	0	
1130	07	0	0	0	0	
	08	0	0	0	0	
	09	0	0	0	0	
	10	0	0	0	0	
	11	0	0	0	0	
1135	12	0	0	0	0	
	13	0	0	0	0	
	14	0	0	0	0	
	15	0	0	0	0	
	16	0	0	0	0	
1140	17	0	0	0	0	
	18	0	0	0	0	
	19	0	0	0	0	
	20	0	0	0	0	
	21	0	0	0	0	
1145	22	0	0	0	0	
	23	0	0	0	0	
	24	0	0	0	0	
	25	0	0	0	0	
	26	0	0	0	0	
1150	27	0	0	0	0	
	28	0	0	0	0	
	29	0	0	0	0	

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
		00	15	30	45	
1153	30	0	0	0	0	
	31	0	0	0	0	
1155	32	0	0	0	0	
	33	0	0	0	0	STOP FOR LUNCH
	34					
	35					
	36					
1250	37					
	38					
	39					
	40					
	41					
	42					
	43					
	44					
	45					
	46					
	47					
	48					
	49					
	50					
	51					
	52					
	53					
	54					
	55					
	56					
	57					
	58					
	59					

Comments:

1 - 50 Lb. BAGGER on

1 - 100 Lb. BAGGER on

SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant Ammonium NITRATE Date 8-14-80

Company Name COLUMBIA NITROGEN Hours of Observation 1231-1334

Plant Address AUGUSTA, GEORGIA Observer R.E. KAUFFMAN
Randall L. Kauffman

Type of Discharge (STACK) OTHER _____

Discharge Location OUTLET - BAGGING OPERATION 2 BAGGERS OPERATING
1 - 50 Lb.
1 - 100 Lb.

Height of Point of Discharge 50' FROM GROUND

Observer's Location:

Distance to Discharge Point 100'

Height of Observation Point ~~50'~~ ground level (amongst RR tracks)

Direction from Discharge Point SE

Background Description BLUE SKY

Weather: (Clear) Overcast Partly Cloudy Other _____ Color _____

Wind Direction SE Wind Velocity 5 mi/hr

Plume Description:

Detached: Yes No NO PLUME VISIBLE

Color: Black White Other _____

Plume Dispersion Behavior: Looping Coning Fanning

Lofting Fumigating Other _____

Estimated Distance Plume Visible _____

Summary of Observations:

Opacity	Aggregate Time @ Opacity	Opacity	Aggregate Time @ Opacity
0	min. sec.	55	
5		60	
10		65	
15		70	
20		75	
25		80	
30		85	
35		90	
40		95	
45		100	
50			

RECORD OF VISIBLE EMISSIONS

Company Name: COLUMBIA NITROGEN
Plant Address: AUGUSTA, GEORGIA
Stack Location: OUTLET - BAGGING OPERATION
Weather Conditions: CLEAR - BLUE SKY

Date: 8-14-80
Observer: R. KAUFFMAN Kendall L. Kauffman
Observer's Location: 100' SE OF OUTLET

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
-						CLEAR - BLUE SKY
1235	00	0	0	0	0	BACKGROUND
	01	0	0	0	0	
	02	0	0	0	0	WIND - SE 5MPH
	03	0	0	0	0	
	04	0	0	0	0	
1240	05	0	0	0	0	
	06	0	0	0	0	
	07	0	0	0	0	
	08	0	0	0	0	
	09	0	0	0	0	
1245	10	0	0	0	0	
	11	0	0	0	0	
	12	0	0	0	0	
	13	0	0	0	0	
	14	0	0	0	0	
1250	15	0	0	0	0	
	16	0	0	0	0	
	17	0	0	0	0	
	18	0	0	0	0	
	19	0	0	0	0	
1255	20	0	0	0	0	
	21	0	0	0	0	
	22	0	0	0	0	
	23	0	0	0	0	
	24	0	0	0	0	
1300	25	0	0	0	0	
	26	0	0	0	0	
	27	0	0	0	0	
	28	0	0	0	0	
1304	29	0	0	0	0	

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
1305	30	0	0	0	0	CLEAR - BLUE SKY
	31	0	0	0	0	SE WIND - 5 MPH
	32	0	0	0	0	
	33	0	0	0	0	
	34	0	0	0	0	
1310	35	0	0	0	0	
	36	0	0	0	0	
	37	0	0	0	0	
	38	0	0	0	0	
	39	0	0	0	0	
1315	40	0	0	0	0	
	41	0	0	0	0	
	42	0	0	0	0	
	43	0	0	0	0	
	44	0	0	0	0	
1320	45	0	0	0	0	
	46	0	0	0	0	
	47	0	0	0	0	
	48	0	0	0	0	
	49	0	0	0	0	
1325	50	0	0	0	0	
	51	0	0	0	0	
	52	0	0	0	0	
	53	0	0	0	0	
	54	0	0	0	0	
1330	55	0	0	0	0	
	56	0	0	0	0	
	57	0	0	0	0	
	58	0	0	0	0	
1334	59	0	0	0	0	

Comments:

2 BAGGERS OPERATING
1 - 50 Lb.
1 - 100 Lb.

SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant AMMONIUM NITRATE Date 8-14-80

Company Name COLUMBIA NITROGEN Hours of Observation 1335-1401

Plant Address AUGUSTA, GEORGIA Observer R. E. KAUFFMAN
Randall L. Kauffman

Type of Discharge (STACK) OTHER _____

Discharge Location OUTLET - BAGGING OPERATION 2 BAGGERS OPERATING
1 - 50 Lb.
1 - 100 Lb.

Height of Point of Discharge 50' FROM GROUND

Observer's Location:

Distance to Discharge Point 100'

Height of Observation Point 50' ground level amongst RR tracks

Direction from Discharge Point SE

Background Description BLUE SKY

Weather: (Clear) Overcast Partly Cloudy Other _____ Color _____

Wind Direction _____ Wind Velocity _____ mi/hr

Plume Description:

Detached: Yes No NO PLUME VISIBLE

Color: Black White Other _____

Plume Dispersion Behavior: Looping Coning Fanning

Lofting Fumigating Other _____

Estimated Distance Plume Visible _____

Summary of Observations:

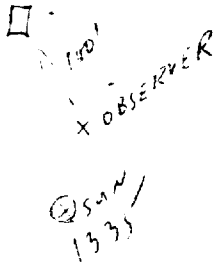
Opacity	Aggregate Time @ Opacity	Opacity	Aggregate Time @ Opacity
0	min. sec.	55	
5		60	
10		65	
15		70	
20		75	
25		80	
30		85	
35		90	
40		95	
45		100	
50			

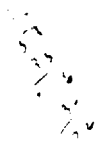
RECORD OF VISIBLE EMISSIONS

Company Name: COLUMBIA NITROGEN Date: 4-14-80
Plant Address: AUGUSTA, GEORGIA Observer: R. KAUFFMAN Randall L. Kauffman
Stack Location: OUTLET - BAGGING OPERATION Observer's Location: 100' SE OF OUTLET
Weather Conditions: CLEAR - BLUE SKY

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS	TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
1335	00	0	0	0	0	CLEAR - BLUE SKY		30					
	01	0	0	0	0	BACKGROUND		31					
	02	0	0	0	0	WIND - SE - 5MPH		32					
	03	0	0	0	0			33					
	04	0	0	0	0			34					
1340	05	0	0	0	0			35					
	06	0	0	0	0			36					
	07	0	0	0	0			37					
	08	0	0	0	0			38					
	09	0	0	0	0			39					
1345	10	0	0	0	0			40					
	11	0	0	0	0			41					
	12	0	0	0	0			42					
	13	0	0	0	0			43					
	14	0	0	0	0			44					
1350	15	0	0	0	0			45					
	16	0	0	0	0			46					
	17	0	0	0	0			47					
	18	0	0	0	0			48					
	19	0	0	0	0			49					
1355	20	0	0	0	0			50					
	21	0	0	0	0			51					
	22	0	0	0	0			52					
	23	0	0	0	0			53					
	24	0	0	0	0			54					
1400	25	0	0	0	0			55					
1401	26	0	0	0	0	STOP HERE		56					
	27							57					
	28							58					
1409	29							59					

Comments:





APPENDIX G

SCRUBBER LIQUOR DATA

SCRUBBER WATER SAMPLES

Scrubber No. and Location	Test #	Date	Time	Temp (°F)	ph
SCRUBBER B BYPASS & INLET PRILL TOWER	1	8-12-80	10:00	NO SAMPLE	NOT MEASURED
			1100	91	4.40
			1130	92	3.88
			1200	92	3.95
			1230	93	3.65
			1300	92	4.42
			AVERAGE	92	4.06

SCRUBBER WATER SAMPLES

Scrubber No. and Location	Test #	Date	Time	Temp (°F)	ph
PRILL TOWER A BYPASS & INLET	2	8-12-80	1530	93	5.88
			1600	94	5.70
			1630	92	4.75
			1700	92	5.22
			1730	93	5.70
			1800	92	4.92
			AVERAGE	93	5.36

SCRUBBER WATER SAMPLES

Scrubber No. and Location	Test #	Date	Time	Temp (°F)	ph
PRILL TOWER SCRUBBER C INLET	3	8-13-80	0900	90	4.22
			0930	89.5	3.72
			1000	91.5	3.88
			1030	92	4.05
			1100	92	3.50
			1130	No sample	NOT MEASURED
			AVERAGE	91	3.87

SCRUBBER WATER SAMPLES

Scrubber No. and Location	Test #	Date	Time	Temp (°F)	ph
PRILL DRYER	4	8-14-80	1030	100	6.45
			1100	96	6.45
			1130	98	6.25
			1200	102	6.20
			1230	104	6.12
			1300	no sample	NOT MEASURED
			1330	no sample	NOT MEASURED
AVERAGE	4	8-14-80		100	6.29

SCRUBBER WATER SAMPLES

Scrubber No. and Location	Test #	Date	Time	Temp (°F)	ph
Prill Dryer	5	8-14-80	1500	106	6.15
			1530	104	6.55
			1600	103	6.58
			1630	104	6.55
			1700	102	6.58
			1730	102	6.40
			AVERAGE	103.5	6.47

SCRUBBER WATER SAMPLES

Scrubber No. and Location	Test #	Date	Time	Temp (°F)	ph
PBILL DRYER	6	8-14-80	1800	103	6.32
			1830	103	6.38
			1900	103	6.32
			1930	103	6.32
			2000	103	6.32
			AVERAGE	103	6.33

APPENDIX H

SCRUBBER PRESSURE DROP DATA

PRESSURE DROP MEASUREMENTS

Firm: Columbia Nitrogen Corp.

Date: 8-12-80

Sampling Location: Prill Tower Inlet B

Tester: WAW

Pressure Drop, " H_2O

Scrubber	B	B			
Time					
11:00	1.8				
11.30	1.6				
12:00	1.6				
12:30	1.6				
13:00	1.6				
1530		1.4			
1600		1.4			
1630		1.6			
1700		1.6			
1730		1.6			
1800		1.4			
Average	1.64	1.5			

PRESSURE DROP MEASUREMENTS

Firm: COLUMBIA NITROGEN CORP.

Date: 8-13-80

Sampling Location: BALL TOWER

Tester: WAW

Pressure Drop, " H_2O

Scrubber	C INLET	A INLET			
Time					
0900	1.0	1.0			
0930	1.0	1.0			
1000	1.0	1.0			
1030	1.0	1.0			
1100	1.0	1.0			
1130	1.0	1.0			
AVERAGE	1.0	1.0			

APPENDIX I

AMBIENT AIR MEASUREMENT DATA

RELATIVE HUMIDITY AND TEMPERATURE

FIRM: COLUMBIA NITROGEN CORPORATION

DATE: 8-12-80

SAMPLING LOCATION: PRILL TOWER

TESTER: WAW

Scrubber	Test #	Time	Wet Bulb (°F)	Dry Bulb (°F)	R.H.
B	1	1000	77	85	69.5
		1100	77	87	63.5
		1130	77	89	57.5
		1200	77	91	52.5
		1230	77	92	50
		1300	77	93	48.5
		AVERAGE	77	89.5	56.9
	2	1530	77	95	43.5
A		1600	77	95	43.5
		1630	78	96	44
		1700	77	94	47
		1730	77	95	43.5
		1800	76	94	44
		AVERAGE	77	95	44.25

RELATIVE HUMIDITY AND TEMPERATURE

FIRM: Columbia Nitrogen Corp.

DATE: 8-13-80

SAMPLING LOCATION: PRILL TOWER

TESTER: WAW

Scrubber	Test #	Time	Wet Bulb (°F)	Dry Bulb (°F)	R.H.
C	3	0900	75	82	72
		0930	75.5	82	74
		1000	77	84	73
		1030	77	86	66
		1100	77	87	63.5
		1130	77	87	57.5
		AVERAGE	~~AVERAG~~ 76.4	84.7	67.7

RELATIVE HUMIDITY AND TEMPERATURE

FIRM: COLUMBIA NITROGEN

DATE: 8-14-80

SAMPLING LOCATION: GROUND LEVEL NEAR PAUL DRYER SCRUBBER

TESTER: WAH

Scrubber	Test #	Time	Wet Bulb (°F)	Dry Bulb (°F)	R.H.
	1	1030	78	87	67
		1100	78	89	61
		1130	78	90	59
		1200	78	93	51
		1230	79	93	54
		1300	79	95	50
		1330	79	96	47
		AVERAGE	78.4	92	56
	2	1500	77	96	42
		1530	77	97	41
		1600	77	93	47
		1630	77	95	44
		1700	78	94	49
		1730	78	93	51
		AVERAGE	77.3	95	46
	3	1800	78	93	51
		1830	78	92	54
		1900	78	92	54
		1930	78	92	54
		2000	78	92	54
		AVERAGE	78	92.2	53.4

RELATIVE HUMIDITY AND TEMPERATURE

FIRM: Columbia Nitrogen

DATE: 8/15/80

SAMPLING LOCATION: GROUND LEVEL NEAR ~~Prill Dryer~~ Prill Cooler air inlets

TESTER: WAW

Scrubber	Test #	Time	Wet Bulb (°F)	Dry Bulb (°F)	R.H.
Prill Cooler		1100	78	84	77
		1130	78	~~84~~ 86	70
	1	1200	79	86	74
		1230	79	87	70
		1300	79	90	62
		1330	79	90	62
		1400	79	91	59
		1430	79	91	59
	2	1500	79	91	59
		1530	79	91	59
		1600	79	90	62
		1630	78	89	61
		1700	78	89	61
		1730	78	87	67
		AVERAGE	78.6	88.7	64.4

RELATIVE HUMIDITY AND TEMPERATURE

FIRM: COLUMBIA NITROGEN

DATE: 8/16/80

SAMPLING LOCATION: GROUND LEVEL NEAR Pull Cooler air inlets ~~PULL COOLER~~

TESTER: WAW

Scrubber	Test #	Time	Wet Bulb (°F)	Dry Bulb (°F)	R.H.
PULL COOLER	3	0900	76	78	91
		0930	76	79	87
		1000	77	83	76
		1030	77	85	70
		1100	78	85	73
		1130	78	85	73
		1200	78	87	67
		AVERAGE	77	83	77

APPENDIX J

VOLUMETRIC FLOWRATE MEASUREMENTS AT PRILL TOWER

TABLE J-1

SUMMARY OF VOLUMETRIC FLOWRATE MEASUREMENTS AT THE PRILL TOWER INLETS AND BYPASSES AT COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

PRILL TOWER INLETS

Run Number	Run 1				Run 2			Run 3			
Location	Inlet A		Inlet C		Inlet B	Inlet C		Inlet A		Inlet B	
Date	8-12-80	8-12-80	8-12-80	8-12-80	8-12-80	8-12-80	8-12-80	8-13-80	8-13-80	8-13-80	8-13-80
Time	Before	After	Before	After	After	Before	After	Before	After	Before	After
Average Static Pressure (inches H_2O)	-1.15	-1.15	-1.02	-1.05	-1.15	-1.05	-1.15	-1.10	-1.20	-1.00	-0.90
Average Square Root ΔP	0.917	0.874	0.884	0.920	0.884	0.920	0.883	0.90	0.930	0.840	0.810
Average Stack Temperature (^{o}F)	125.6	132.7	123.1	128.2	133.1	128.2	130.8	120.0	129.0	122.0	130.0
Velocity (FPM)	3246	3140	3122	3265	3152	3265	3142	3204	3336	2995	2907
Flow Rate (ACFM)	18695	18087	17981	18805	18153	18805	18097	18452	19217	17249	16745
Flow Rate (DSCFM)	16261	15527	15805	16272	15552	16258	15566	16088	16495	14992	14360

PRILL TOWER BYPASSES

Run Number	Run 1				Run 2			Run 3			
Location	Inlet A		Inlet C		Inlet B	Inlet C		Inlet A		Inlet B	
Date	8-12-80	8-12-80	8-12-80	8-12-80	8-12-80	8-12-80	8-12-80	8-13-80	8-13-80	8-13-80	8-13-80
Time	Before	After	Before	After	After	Before	After	Before	After	Before	After
Average Static Pressure (inches H_2O)	-0.200	-0.225	-0.320	-0.275	-0.245	-0.320	-0.235	-0.150	-0.165	-0.125	-0.075
Average Square Root ΔP	1.14	1.13	1.09	1.11	1.20	1.11	1.12	1.15	1.14	1.19	1.18
Average Stack Temperature (^{o}F)	109.8	115.1	116.3	106.6	115.1	116.3	117.4	97.0	107.0	97.4	110.0
Velocity (FPM)	4003	3955	3852	3887	4239	3925	3945	3972	3972	4094	4122
Flow Rate (ACFM)	77295	76366	74374	75053	81845	75794	76172	76694	76708	79054	79600
Flow Rate (DSCFM)	69836	68294	66353	68187	72919	67371	67593	67129	68784	72087	70976

PRELIMINARY VELOCITY TRAVERSE

PLANT Columbian Nitrogen
DATE 8-12-80
LOCATION ~~Baffle~~ Scrubber Inlet C
STACK I.D. 32½
BAROMETRIC PRESSURE, in. Hg 29.78
STACK GAUGE PRESSURE, in. H_2O -1.02
OPERATORS MAA + KTK
C_p P-5 .83

V_s = 3,109 ft/min
Q = 17,[illegible]08 acfm
Q_{sd} = 15,413 dscfm

Port West-C

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	.430	88
2	.525	98
3	.550	112
4	.620	117
5	.675	119
6	.735	120
7	.930	124
8	.810	129
9	1.01	126
10	.995	128
11	.945	131
12	.890	130
13	.875	129
14	.745	128
AVERAGE	0.756	119.9

SCHEMATIC OF TRAVERSE POINT LAYOUT

Port North-C

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	.495	115
2	.420	115
3	.515	116
4	.645	120
5	.720	123
6	.835	124
7	.870	130
8	.975	129
9	1.08	133
10	1.02	134
11	1.08	131
12	1.04	133
13	.975	133
14	.840	131
AVERAGE	0.806	126.2

EPA (Dur) 233
4/72

$\sqrt{\Delta P}$ = 0.884

123.0

PRELIMINARY VELOCITY TRAVERSE

PLANT Columbia Nitrogen
DATE 8/12/80
LOCATION Scrubber Inlet A
STACK I.D. 32 1/2"
BAROMETRIC PRESSURE, in. Hg 29.78
STACK GAUGE PRESSURE, in. H_2O -1.65
OPERATORS MAA & KTK
Cp P-5 .83

V_S = 3244 ~~ft~~/min
Q = ~~16,685~~ acfm
Q_{sd} = 16,008 dscfm

SCHEMATIC OF TRAVERSE POINT LAYOUT

Port east-A

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	.725	109
2	.645	115
3	.620	116
4	.750	120
5	.725	121
6	.910	123
7	.910	125
8	.985	127
9	.970	126
10	1.08	129
11	1.05	128
12	1.05	130
13	1.02	132
14	.875	131
AVERAGE	0.872	123.7

Port south-A

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	.325	116
2	.465	118
3	.590	119
4	.755	124
5	.775	127
6	.860	128
7	.875	128
8	.950	130
9	~~1.60~~ 1.06	130
10	~~1.55~~ 1.035	132
11	~~1.80~~ 1.02	131
12	1.01	134
13	.945	132
14	.830	135
AVERAGE	0.809	127.4

EPA (Dur) 233
4/72

$\sqrt{\Delta P}$ = 0.917

PRELIMINARY VELOCITY TRAVERSE

PLANT Columbia Nitrogen
DATE 8-12-80 1435-1448
LOCATION Inlet C
STACK I.D. 32.5 5.76
BAROMETRIC PRESSURE, in. Hg 29.25
STACK GAUGE PRESSURE, in. H_2O -1.05
OPERATORS MAA + KTK
Cp P-5 .83

Vs = 3266 ft/min
Qs = 16815 ACFM
Qs = 16261 DSCFM

Port ~~South~~ North-C

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	.620	119
2	.555	121
3	.550	125
4	.725	129
5	.825	132
6	.825	132
7	.925	134
8	.950	132
9	1.04	133
10	1.15	134
11	1.20	135
12	1.20	132
13	1.05	132
14	.875	131
AVERAGE	0.878	130.

SCHEMATIC OF TRAVERSE POINT LAYOUT

Port West-C

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	.365	103
2	.565	108
3	.520	119
4	.625	123
5	.845	123
6	.920	126
7	.900	129
8	.945	131
9	1.01	133
10	1.02	134
11	1.00	135
12	1.02	134
13	.975	135
14	.860	135
AVERAGE	0.815	126.3

EPA (Dur) 233
4/72

$\sqrt{\Delta P}$ = .920 T = 128.1

PRELIMINARY VELOCITY TRAVERSE

PLANT Columbia Nitrogen
DATE 8-12-80 1410-1425
LOCATION Inlet - A
STACK I.D. 32.5 Ac 5.76 ft²
BAROMETRIC PRESSURE, in. Hg 29.25
STACK GAUGE PRESSURE, in. H_2O -1.15
OPERATORS MAA + KTK
Cp P-3 .837

V_s = 2955 FT/MIN
Q = 17020 ACFM
Q_{STD} = 14593 DSCFM

SCHEMATIC OF TRAVERSE POINT LAYOUT

Port East-A

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	.375	117
2	.555	118
3	.560	133
4	.575	131
5	.780	130
6	.925	134
7	.945	134
8	.945	136
9	.930	138
10	.985	140
11	.920	138
12	.865	138
13	.765	135
14	.575	137
AVERAGE	0.750	132.4

Port South-A

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	.425	123
2	.475	119
3	.550	125
4	.680	126
5	.755	130
6	.785	132
7	.865	132
8	1.05	136
9	1.02	136
10	.975	138
11	.925	139
12	.920	142
13	.835	140
14	.770	139
AVERAGE	0.778	132.6

EPA (Dur) 233
4/72

$\sqrt{\Delta P}$ = 0.874

T_S = 132.7

PRELIMINARY VELOCITY TRAVERSE

PLANT Columbia Nitrogen
DATE 8-12-80
LOCATION Inlet - B 1745-1800
STACK I.D. 32.5 6.76 ft²
BAROMETRIC PRESSURE, in. Hg 29.75
STACK GAUGE PRESSURE, in. H_2O -1.15
OPERATORS MAA + KTK
Cp P-5 .83

Vs = 3138 ft/min
Qs = 16074 ACFM
Qsd = 15487 DSCFM

Port south-B

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	.445	113
2	.470	114
3	.650	124
4	.675	127
5	.740	131
6	.775	132
7	.945	133
8	.930	136
9	.955	138
10	.900	136
11	.945	140
12	.800	139
13	.675	140
14	.530	141
AVERAGE	0.736	131.7

SCHEMATIC OF TRAVERSE POINT LAYOUT

Port east-B

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	.550	131
2	.635	131
3	.800	133
4	.850	135
5	.875	137
6	.950	140
7	.950	139
8	.800	137
9	.975	137
10	1.00	136
11	.930	136
12	.925	135
13	.845	136
14	.625	134
AVERAGE	0.830	134.5

EPA (Dur) 233
4/72

$\sqrt{\Delta P}$ = 0.884 T_s = 133

PRELIMINARY VELOCITY TRAVERSE

PLANT Columbia Nitrogen
DATE 8-12-80 1720-1730
LOCATION Inlet - C [redacted]
STACK I.D. 32.5 5.76 ft²
BAROMETRIC PRESSURE, in. Hg 29.75
STACK GAUGE PRESSURE, in. H_2O -1.15
OPERATORS MAA + KTK
Cp P-5 .83

Vs = 3132 ft/min
Qs = 18039 ACFM
Q_{STD} = 15518 DSCFM

Port west - C

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	.385	107
2	.475	108
3	.545	115
4	.590	121
5	.800	124
6	.775	129
7	.850	131
8	.875	132
9	1.05	134
10	1.00	135
11	1.03	137
12	.950	140
13	.865	142
14	.740	138
AVERAGE	0.766	128

SCHEMATIC OF TRAVERSE POINT LAYOUT

Port ~~south~~ North - C

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	.340	125
2	.450	121
3	.515	124
4	.550	127
5	.785	133
6	.775	138
7	.905	137
* 8	.975	136
9	1.05	137
10	1.20	138
11	1.08	138
12	1.06	141
13	.975	137
14	.795	137
AVERAGE	0.795	133.5

EPA (Dur) 233
4/72

$\sqrt{\Delta P} = 0.883$

$T_s = 130.76$

PRELIMINARY VELOCITY TRAVERSE

PLANT Columbia Nitrogen
DATE 8-13-80 (0835 - 0850)
LOCATION A - Inlet
STACK I.D. 32½
BAROMETRIC PRESSURE, in. Hg 29.71
STACK GAUGE PRESSURE, in. H_2O -1.25
OPERATORS MAA + KTK
C_p P-5 .837

Before RUN 3

V_s = 3202 ft/min
Q_s = 19[illegible]6 acfm
Q_{sd} = 16085 dscfm

SCHEMATIC OF TRAVERSE POINT LAYOUT

Port East - A

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	.450	103
2	.600	102
3	.725	115
4	.840	117
5	.930	119
6	.930	120
7	.945	121
8	.980	122
9	1.00	124
10	1.05	126
11	.945	127
12	.850	125
13	.625	127
14	.550	125
AVERAGE	0.809	119.5

Port South - A

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	.425 ~~.555~~	107 ~~113~~
2	.475	106 ~~120~~
3	.625	114
4	.650	116
5	.830	116
6	.850	120
7	.925	121
8	1.03	122
9	.975	124
10	.990	127
11	.950	126
12	.950	127
13	.975	126
14	.860	127
AVERAGE	0.809	120

EPA (Dur) 233
4/72

$\sqrt{\Delta P}$ .9

$\sqrt{\Delta P}$ = .9 T_s=120

PRELIMINARY VELOCITY TRAVERSE

PLANT Columbia Nitrogen
DATE 8-13-80
LOCATION B-Inlet (0818- 0835)
STACK I.D. 32½ 5.76
BAROMETRIC PRESSURE, in. Hg 29.71
STACK GAUGE PRESSURE, in. H_2O -1.00
OPERATORS MAA + KTK
C_p P-5 .837

Before run 3

~~V_s = 2994 ft/min~~
Q_s = 17243 acfm
~~Q_{std} = 14989 dscfm~~

Port South - B

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	.430	103
2	.485	108
3	.660	112
4	.650	115
5	.775	118
6	.775	120
7	.890	125
8	.830	122
9	.875	127
10	.900	127
11	.775	128
12	.650	128
13	.450	128
14	.320	131
AVERAGE	0.66	120.9

SCHEMATIC OF TRAVERSE POINT LAYOUT

Port east - B

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	.480	115
2	.725	115
3	.725	118
4	.775	119
5	.860	123
6	.875	126
7	.875	129
8	.920	125
9	.925	125
10	.900	125
11	.875	122
12	.775	126
13	.675	127
14	.445	125
AVERAGE	0.765	~~118.9~~ 122.9

EPA (Dur) 233
4/72

$\sqrt{\Delta P}$ = .84 T_s = 122

PRELIMINARY VELOCITY TRAVERSE

PLANT Columbia Nitrogen
DATE 8-13-80 1125-1130
LOCATION Inlet -B
STACK I.D. 32 1/2
BAROMETRIC PRESSURE, in. Hg 29.71
STACK GAUGE PRESSURE, in. H_2O -.900
OPERATORS MAA + KTK
C_p P-5 .837

after run 3 V_s = 2906 ft/min
Q_s = 16784 acfm
Q_{std} = 14358 dscfm

Port south-B

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	.345	118
2	.425	120
3	.525	124
4	.700	127
5	.775	128
6	.875	131
7	.600	130
8	.780	131
9	.840	133
10	.775	134
11	.750	133
12	.630	135
13	.545	136
14	.345	134
AVERAGE	0.63	129.6

SCHEMATIC OF TRAVERSE POINT LAYOUT

Port east-B

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	.450	114
2	.625	116
3	.660	124
4	.775	126
5	.745	129
6	.620	129
7	.800	134
8	.825	134
9	.800	136
10	.850	134
11	.825	132
12	.750	134
13	.575	137
14	.450	137
AVERAGE	0.693	129.7

EPA (Dur) 233
4/72

$\sqrt{\Delta P}$ = .81 Ts=130

PRELIMINARY VELOCITY TRAVERSE

PLANT Columbia Nitrogen
DATE 9-13-80 [redacted] - (1105 - 1115)
LOCATION Inlet - A
STACK I.D. 32 1/2
BAROMETRIC PRESSURE, in. Hg 29.71
STACK GAUGE PRESSURE, in. H_2O -1.20
OPERATORS mAA + KTK
Cp [redacted] P-5 .837

After Run 3
V_S = 3335 ft/min
QS = 12210 acfm
Q[redacted] = 16493 dscfm

Port South - A

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	.480	110
2	.645	116
3	.725	123
4	.830	128
5	1.04	132
6	1.05	128
7	.900	137
8	1.05	137
9	1.10	137
10	1.02	137
11	1.05	135
12	.950	134
15	.950	134
14	.825	132
[redacted]	[redacted]	[redacted]
AVERAGE	0.891	130

SCHEMATIC OF TRAVERSE POINT LAYOUT

Port East - A

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	.600	120
2	.525	118
3	.800	123
4	.825	126
5	.930	126
6	.950	126
7	.975	129
8	.925	131
9	.975	132
10	.940	132
11	.950	132
12	.900	132
13	.850	134
14	.680	133
[redacted]		
AVERAGE	0.842	128.

EPA (Dur) 233
4/72

$\sqrt{\Delta p}$ = .93 Ts = 127

PRELIMINARY VELOCITY TRAVERSE

PLANT Columbian Nitrogen
DATE 5-12-80
LOCATION ~~Inlet~~ Bypass C
STACK I.D. 54 Y
BAROMETRIC PRESSURE, in. Hg 29.28
STACK GAUGE PRESSURE, in. H_2O - .275
OPERATORS MAA + KTK
Cp P-3 .837

Before run 1 V_s = 3825 ~~ft/min~~
Q = 73,861 acfm
Q-std = 66,310 dscfm

SCHEMATIC OF TRAVERSE POINT LAYOUT

west-c ~~North Port~~ 1

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	.735	102
2	1.07	104
3	1.25	103
4	1.25	105
5	1.30	106
6	1.20	104
7	1.25	106
8	1.20	105
9	1.15	106
10	1.20	107
11	1.00	110
12	.945	110
AVERAGE	1.123	105.7

south-c ~~North Port 2~~

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	.930	106
2	1.20 ~~1.30~~	106
3	1.25	104
4	1.15	106
5	1.09	107
6	.995	106
7	1.45	108
8	1.50	107
9	1.45	110
10	1.65	~~111~~ 111
11	1.60	109
12	1.275	109
AVERAGE	1.26	107.4

EPA (Dur) 233
4/72

$\sqrt{\Delta p}$ = 109 T_s = 106.55

PRELIMINARY VELOCITY TRAVERSE

PLANT Columbia Nitrogen
DATE 8/12/80
LOCATION Bypass A
STACK I.D. 59 1/4"
BAROMETRIC PRESSURE, in. Hg 29.78
STACK GAUGE PRESSURE, in. H_2O -.200
OPERATORS MAA & KTK
Cp P-3 .837

Before run 1 V_s = 4011 ~~ft/min~~
Q = 77,482 acfm
Q_{std} = 69,150 dscfm

SCHEMATIC OF TRAVERSE POINT LAYOUT

Port west-A

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	.925	108
2	1.35	110
3	1.55	110
4	1.45	109
5	1.40	111
6	1.30	110
7	1.25	109
8	1.25	108
9	1.35	110
10	1.35	110
11	1.325	108
12	1.200	108
AVERAGE	1.304	109.25

Port South-A

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	.940	105
2	1.50	112
3	1.45	111
4	1.65	113
5	1.60	115
6	1.45	112
7	1.10	112
8	1.15	109
9	1.15	108
10	1.20	111
11	1.15	110
12	1.08	107
~~13~~		
~~14~~		
AVERAGE	1.276	110.4

EPA (Dur) 233
4/72

$\sqrt{\Delta P}$ = 1.14 109.8

PRELIMINARY VELOCITY TRAVERSE

PLANT Columbia Nitrogen
DATE 8-12-80 1450 - 1500
LOCATION Bypass C
STACK I.D. 59¼ 19.31 ft²
BAROMETRIC PRESSURE, in. Hg 29.75
STACK GAUGE PRESSURE, in. H_2O -.320
OPERATORS MAA - KTK
Cp P-3 .837

After run 1

V_S = 3930 ~~FT/MIN~~
Q_S = ~~70897~~ ACFM
Q_{STD} = 67474 dscfm

Port South - C

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	.830	114
2	1.25	116
3	1.275	117
4	1.30	117
5	1.10	119
6	.965	117
7	1.30	115
8	1.55	116
9	1.64	118
10	1.50	119
11	1.60	121
12	1.45	117
AVERAGE	1.30	117.2

SCHEMATIC OF TRAVERSE POINT LAYOUT

Port West - C

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	.735	113
2	~~1.0~~	115
3	1.35	116
4	1.30	113
5	1.35	115
6	1.30	116
7	1.42	114
8	1.04	115
9	1.15	117
10	1.20	115
11	1.08	116
12	.960	120
AVERAGE	1.16	115.4

EPA (Dur) 233
4/72

$\sqrt{\Delta P}$ = 1.11 T_s = 116.3

PRELIMINARY VELOCITY TRAVERSE

PLANT Columbia Nitrogen
DATE 8-12-80 1340 - 1355
LOCATION A-Bypass
STACK I.D. AREA 19.31 Ft²
BAROMETRIC PRESSURE, in. Hg 29.75
STACK GAUGE PRESSURE, in. H_2O -.225
OPERATORS MAA + KTK
C_p P-5 .83

After run 1

V_s = 3963 ~~ft/min~~
Q = 76[illegible] ACFM
Q_{std} = 68198 DSCFM

Port west-A

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	.985	113
2	1.35	120
3	1.55	115
4	1.575	119
5	1.35	117
6	1.25	117
7	1.15	115
8	1.175	115
9	1.275	114
10	1.35	110
11	1.40	110
12	1.275	113
AVERAGE	1.3	114.8

SCHEMATIC OF TRAVERSE POINT LAYOUT

Port south-A

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	.955	113
2	1.45	114
3	1.55	116
4	1.50	115
5	1.45	118
6	1.40	119
7	1.09	114
8	1.09	115
9	1.15	116
10	1.15	116
11	1.15	115
~~12~~	1.04	113
AVERAGE	1.24	115.3

EPA (Dur) 233
4/72

$\sqrt{\Delta P}$ = 1.13 T_S = 115

PRELIMINARY VELOCITY TRAVERSE

PLANT Columbia Nitrogen
DATE 8-12-80
LOCATION Bypass-B 1800-1812
STACK I.D. 55¼ 19.31 ft²
BAROMETRIC PRESSURE, in. Hg 29.25
STACK GAUGE PRESSURE, in. H_2O −.245
OPERATORS MAA + KTK
C_p P-3 .837

V_S = 4244 ~~ft/min~~
Q_S = ~~81458~~ acfm
~~Q_{std}~~ = 73028 dscfm

SCHEMATIC OF TRAVERSE POINT LAYOUT

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	.825	115
2	1.25	114
3	1.32	116
4	1.20	116
5	1.15	118
6	1.10	118
7	1.30	112
8	1.70	112
9	1.85	112
10	1.85	111
11	1.75	113
12	1.50	116
AVERAGE	1.38	114.4

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	1.30	113
2	150 ~~1.25~~	~~114~~ 116
3	1.50	114
4	1.45	113
5	1.35	114
6	1.20	113
7	1.50	117
8	1.75	119
9	1.70	116
10	1.70	117
11	1.65	119
12	1.45	118
AVERAGE	1.5	116.75

EPA (Dur) 233
4/72

$\sqrt{\Delta P}$ = 1.2 T_S = 115.1

PRELIMINARY VELOCITY TRAVERSE

PLANT Columbia Nitrogen
DATE 8-12-80 1730-1742
LOCATION Bypass - c
STACK I.D. 59 1/2 19.31 ft²
BAROMETRIC PRESSURE, in. Hg 29.75
STACK GAUGE PRESSURE, in. H_2O -.235
OPERATORS MAA + KTK
Cp P-3 .83

V_s = 3936 ft/min
Q_s = 76005 acfm
Q_{STD} = 67456 dscfm

SCHEMATIC OF TRAVERSE POINT LAYOUT

Port south-c

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	1.05	116
2	1.25	115
3	1.25	116
4	1.15	115
5	1.04	115
6	.930	114
7	1.50	118
8	1.55	116
9	1.75	117
10	1.75	120
11	1.70	119
12	1.45	120
AVERAGE	1.35	116.75

Port west-c

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	.850	119
2	1.08	118
3	1.25	117
4	1.30	117
5	1.35	117
6	1.20	115
7 *	1.40	122
8	1.30	116
9	1.25	120
10	1.15	121
11	1.10	119
12	1.00	116
AVERAGE	1.18	118.08

EPA (Dur) 233
4/72

$\sqrt{\Delta P}$ = 1.124 T_s = 117.4

PRELIMINARY VELOCITY TRAVERSE

Before run 3

PLANT Columbia Nitrogen
DATE 8-13-80 (0850 - 0902)
LOCATION A - Bypass
STACK I.D. 59 1/4
BAROMETRIC PRESSURE, in. Hg 29.71
STACK GAUGE PRESSURE, in. H_2O -.150
OPERATORS MAA + KTK
C_p P-3 .83

V_s = 3972 ~~ft/min~~
Q_s = 7[illegible] acfm
Q_{std} = 6[illegible]989 dscfm

SCHEMATIC OF TRAVERSE POINT LAYOUT

Port South-A

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	1.375	97
2	1.425	98
3	1.625	97
4	1.60	98
5	1.65	99
6	1.55	100
7	1.08	96
8	1.10	101
9	1.15	96
10	1.175	97
11	1.175	96
12	1.08	96
AVERAGE	1.33	98

Port west-A

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	1.20	97
2	1.50	97
3	1.625	97
4	1.50	98
5	1.35	97
6	1.30	97
7	1.10	93
8	1.25	94
9	1.30	95
10	1.35	97
11	1.30	97
12	1.08	98
AVERAGE	1.32	96

EPA (Dur) 233
4/72

$\sqrt{\Delta P}$ = 1.15

$\sqrt{\Delta P}$ = 1.15 T_s=97

PRELIMINARY VELOCITY TRAVERSE

Before Run 3

PLANT Columbia Nitrogen
DATE 8-13-80 (0805 - 0818)
LOCATION B-Bypass
STACK I.D. 59¼
BAROMETRIC PRESSURE, in. Hg 29.71
STACK GAUGE PRESSURE, in. H_2O -.125
OPERATORS MAA + KTK
C_p P-3 .83

V_S = 4094 ft/min
Q_S = 70054 acfm
Q_{SD} = 72095 dscf

SCHEMATIC OF TRAVERSE POINT LAYOUT

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	1.30	96
2	1.475	96
3	1.475	98
4	1.500	95
5	1.400	99
6	1.325	94
7	1.15	97
8	1.375	95
9	1.35	98
10	1.60	100
11	1.65	99
12	1.525	96
AVERAGE	1.42	96.9

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	1.15	102
2	1.225	103
3	1.325	99
4	1.20	96
5	1.125	99
6	1.15	97
7	1.325	95
8	1.50	96
9	1.225	97
10	1.20	97
11	1.20	98
12	1.475	96
AVERAGE	1.39	97.9

EPA (Dur) 233
4/72

$\sqrt{P}$ = 1.185 T_S = 9

PRELIMINARY VELOCITY TRAVERSE

After run 3

PLANT Columbia Nitrogen
DATE 8-13-80 1130 - 1240
LOCATION Bypass - B
STACK I.D. 59 1/2
BAROMETRIC PRESSURE, in. Hg 29.21
STACK GAUGE PRESSURE, in. H_2O -.075
OPERATORS MAA + KTC
C_p P-3 .83

V_s = 4122 ft/min
Q_s = 70600 acfm
Q_{STD} = 70997 dscf

Port south - B

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	1.10	112
2	1.35	115
3	1.45	111
4	1.50	111
5	1.40	110
6	1.25	109
7	1.30	107
8	1.30	110
9	1.35	107
10	1.55	109
11	1.65	113
12	1.45	112
AVERAGE	1.38	110.5

SCHEMATIC OF TRAVERSE POINT LAYOUT

Port west - B

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	1.30	112
2	1.30	111
3	1.35	111
4	1.25	107
5	1.15	109
6	1.09	112
7	1.25	111
8	1.50	110
9	1.70	110
10	1.85	108
11	1.70	108
12	1.45	111
AVERAGE	1.49	110

EPA (Dur) 233
4/72

$\sqrt{\Delta p}$ = 1.18 T = 110

PRELIMINARY VELOCITY TRAVERSE

After run 3

PLANT Columbia Nitrogen
DATE 8-13-80 (1048-1100)
LOCATION A-Bypass
STACK I.D. 59 1/4
BAROMETRIC PRESSURE, in. Hg 29.21
STACK GAUGE PRESSURE, in. H_2O -.165
OPERATORS MAA + KTK
C_p p-3 .83

V_s = 3972 ~~ft/min~~
Q_s = 76~~7~~7 ~~dscfm~~ acfm
Q_{std} = 68764 dscfm

SCHEMATIC OF TRAVERSE POINT LAYOUT

Port South-A

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	1.15	105
2	1.45	108
3	1.60	108
4	1.55	106
5	1.45	107
6	1.50	106
7	1.06	107
8	1.15	107
9	1.15	108
10	1.20	107
11	1.15	108
12	1.05	106
AVERAGE	1.28	106.9

$\overline{\sqrt{\Delta p}}$ = 1.13

Port West-A

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	1.20	108
2	1.60	113
3	1.625	112
4	1.50	107
5	1.40	106
6	1.25	110
7	1.09	105
8	1.20	106
9	1.30	106
10	1.35	106
11	1.35	107
12	1.15	106
AVERAGE	1.33	107.7

$\overline{\sqrt{\Delta p}}$ = 1.15

T_s = 107

EPA (Dur) 233
4/72

APPENDIX K

SAMPLING TRAIN CALIBRATION DATA

Includes:

K.1 Orifice Calibration Data
K.2 Nozzle Calibration Data
K.3 Pitot Tube Calibration Data

APPENDIX K.1

ORIFICE CALIBRATION DATA

DATE 08/11/80 ORIFICE NO 1-2 NAME G.GRIFFIN

BAROMETRIC PRESSURE 30.09 IN HG DRY GAS METER NO 2

ORIFICE MANOMETER SETTING IN WATER	GAS VOLUME WET TEST METER CU FT	GAS VOLUME DRY GAS METER CU FT	TEMPERATURE WET TEST METER F	TEMPERATURE DRY GAS METER INLET F	TEMPERATURE DRY GAS METER OUTLET F	TEMPERATURE DRY GAS METER AVERAGE F	TIME MIN	RATIO	DHO
0.5	5.0	5.02	73.0	84.0	83.0	83.5	12.9	1.00	1.88
1.0	5.0	5.02	79.0	84.0	83.0	83.5	9.2	1.00	1.91
2.0	10.0	10.07	79.0	84.0	83.0	83.5	13.4	1.00	2.03
3.0	10.0	10.10	79.0	84.0	83.0	83.5	11.0	0.99	2.03
						AVERAGE		1.00	1.96

USED FOR: ALL PRILL TOWER BYPASS TESTS
ALL PRE DRYER - DRYER OUTLET TESTS
ALL PRILL COOLER OUTLET TESTS

DATE 8/C8/80 ORIFICE NO D8 NAME G GRIFFIN

BAROMETRIC PRESSURE 30.13 IN HG DRY GAS METER NO 8

ORIFICE MANOMETER SETTING IN WATER	GAS VOLUME WET TEST METER CU FT	GAS VOLUME DRY GAS METER CU FT	TEMPERATURE WET TEST METER F	TEMPERATURE DRY GAS METER INLET F	TEMPERATURE DRY GAS METER OUTLET F	TEMPERATURE DRY GAS METER AVERAGE F	TIME MIN	RATIO	DHO
0.5	5.0	4.98	82.0	85.0	85.0	85.0	12.6	1.01	1.80
1.0	5.0	4.99	82.0	82.0	82.0	82.0	9.1	1.00	1.91
2.0	10.0	10.05	82.0	87.0	89.0	88.0	13.3	1.00	2.00
3.0	10.0	10.07	82.0	84.0	88.0	86.0	11.0	0.99	2.06
						AVERAGE		1.00	1.94

USED FOR: ALL PRILL TOWER OUTLET TESTS

ALL PREDRYER INLET TESTS

ALL PRILL COOLER BYPASS TESTS

DAT 17 0 FI NO NA G.C FII

BAROMETRIC PRESSURE 29.96 IN HG DRY GAS METER NO 7

ORIFICE MANOMETER SETTING IN WATER	GAS VOLUME WET TEST METER CU FT	GAS VOLUME DRY GAS METER CU FT	TEMPERATURE WET TEST METER F	TEMPERATURE DRY GAS METER INLET F	TEMPERATURE DRY GAS METER OUTLET F	TEMPERATURE DRY GAS METER AVERAGE F	TIME MIN	RATIO	DHO
0.5	5.0	5.00	81.0	87.0	88.0	87.5	13.4	1.01	2.03
1.0	5.0	4.99	81.0	86.0	87.0	86.5	9.6	1.01	2.08
2.0	10.0	10.03	81.0	86.0	88.0	87.0	13.7	1.00	2.14
3.0	10.0	10.09	81.0	86.0	88.0	87.0	11.4	0.99	2.21
						AVERAGE		1.00	2.11

USED FOR: ALL PRILL TOWER INLET TESTS
ALL DRYER INLET TESTS
ALL PRILL COOLER INLET TESTS

APPENDIX K.2

NOZZLE CALIBRATION DATA

(1)

DATE 11/29/79

INSPECTION REPORT

ELFRED MACHINE COMPANY

CUSTOMER TRC-THE RESEARCH CORP. CUSTOMER P.O. NO. 9964

S.O. NUMBER —

PURCHASED FROM ELFRED P.O. NO. _____

PART NO. 1-2

NO. PIECES ORDERED 1 NO. PIECES RECEIVED 1

TOOL NO. SET #1

PART NAME ST/STL NOZZLE

TOOL NAME _____

Actual in 3 Places	Average	Date/Initls	Actual in 3 Places	Average	Date/Initls
.2547-.2551-.2552	.2550	11/30/79			
.2570-.2570-.2571	.2570	6/15/76			
.2590-.2590-.2590	.2590	7/3/78			
.2574-.2574-.2575	.2574	10/20/75			
.2581-.2580-.2581	.2581	4/26/79			
.2582-.2582-.2583	.2582	11/27/79			
.2590-.2591-.2592	.2591	12/17/79			
.2592-.2592-.2592	.2592	1/15/80			
.2604-.2605-.2606	.2605	5/6/80			
.2613.2613-.2613	.2613	8/29/80	USED FOR PREDRYER INLET TESTS 4,5 & 6		

1st PIECE INSPECTION ☐

PARTIAL INSPECTION ☐

COMPLETE INSPECTION ☑

ACCEPTED ☑

REJECTED ☐

INSPECTOR

ELFRED MACHINE COMPANY
105 JORDAN LANE
WETHERSFIELD, CONN. 06109

NOV 30 ENTD

(1)

DATE 11/29/77

INSPECTION REPORT

ELFRED MACHINE COMPANY

CUSTOMER TRC-THE RESEARCH CORP. CUSTOMER P.O. NO. 9964

S.O. NUMBER — PURCHASED FROM ELFRED P.O. NO. ____

PART NO. 1-1 NO. PIECES ORDERED 1 NO. PIECES RECEIVED 1

TOOL NO. SET #1 PART NAME ST/STL NOZZLE

TOOL NAME ____

Actual in 3 Places	Average	Date/Initls
.1869 - .1870 - .1871	.1870	11/30/77
.1872 - .1873 - .1873	.1873	2/1/79
.1921 - .1922 - .1922	.1922	7/31/79
.1882 - .1883 - .1884	NEW TIP .1883	11/9/79
.1923 - .1923 - .1924	.1923	12/17/79
.1953 - .1953 - .1954	.1954	5/13/80
.1965 - .1965 - .1966	.1965	8/6/80
.1991 - .1992 - .1992	.1992	8/20/80

Actual in 3 Places	Average	Date/Initls

USED FOR PAUL TOWER PILOT TESTS 1, 2, 3

1st PIECE INSPECTION ☐

PARTIAL INSPECTION ☐

COMPLETE INSPECTION ☑

ACCEPTED ☐

REJECTED ☐

INSPECTOR

ELFRED MACHINE COMPANY
105 JORDAN LANE
WETHERSFIELD, CONN. 06109

NOV 30 ENT'D

(7)

DATE 11/29/77

INSPECTION REPORT

ELFRED MACHINE COMPANY

CUSTOMER TRC-THE RESEARCH CORP. CUSTOMER P.O. NO. 9964

S.O. NUMBER — PURCHASED FROM ELFRED P.O. NO.

PART NO. 2-2 NO. PIECES ORDERED 1 NO. PIECES RECEIVED 1

TOOL NO. SET #2 PART NAME ST/STL NOZZLE

TOOL NAME

Actual in 3 Places	Average	Date/Initls	Actual in 3 Places	Average	Date/Initls.
.2550-.2550-.2551	.2550	11/30/77 [initials]			
.2550-.2550-.2550	.2550	4/11/78 [initials]			
.2577-.2575-.2575	.2575	4/13/78 [initials]			
.2580-.2580-.2580	.2580	7/7/78 [initials]			
.2581-.2582.2582	.2582	10/4/78 [initials]			
2587-.2588-.2590	2588	10/26/78 [initials]			
.2593-.2593-.2594	2593	11/15/78 [initials]			
.2598-.2600-.2600	.2600	12/19/78 [initials]			
.2599-.2600-.2601	.2600	5/17/79 [initials]			
.2590-.2590-.2590	.2590	2/6/80 [initials]	Used For Dryer Inlet Tests 4R, 5, 6		
.2594-.2595-.2594	.2594	5/13/80 [initials]			
.2614-.2614-.2614	.2614	8/6/80 [initials]			
2614-.2614-.2614	2614	9/20/80 [initials]			

1st PIECE INSPECTION ☐

PARTIAL INSPECTION ☐

COMPLETE INSPECTION ☑

ACCEPTED ☑

REJECTED ☐

INSPECTOR [signature]

ELFRED MACHINE COMPANY
165 JORDAN LANE
WETHERSFIELD, CONN. 06109
NOV 30 ENTD

(2)

DATE 11/29/77

INSPECTION REPORT

ELFRED MACHINE COMPANY

CUSTOMER TRC-THE RESEARCH CORP. CUSTOMER P.O. NO. 9964

S.O. NUMBER —

PURCHASED FROM ELFRED P.O. NO.

PART NO. 2-1

NO. PIECES ORDERED 1 NO. PIECES RECEIVED 1

TOOL NO. SET #2

PART NAME ST/STL NOZZLE

TOOL NAME

Actual in 3 Places	Average	Date/Initls	Actual in 3 Places	Average	Date/Initls
.1858-.1861-.1861	.1860	11/30/77			
.1890-.1891-.1890	.1890	6/13/78			
.1865-.1870-.1870	.1870	10/17/76			
.1882-.1883-.1884	.1883	10/26/76			
.1880-.1881-.1882	.1881	12/19/76			
.1892-.1893-.1893	.1893	5/17/79			
.1889-.1890.1891	.1890	7/3/79			
.1914-.1915-.1916	.1915	8/6/80			
.1911.1912.1911	.1911	8/20/80			

USED FOR: PRILL TOWER BYPASS TESTS 1,2,3

PREDRYER DRYER OUTLET TESTS 4,5,6

PRILL COOLER OUTLET TESTS 7,8,9

1st PIECE INSPECTION ☐

PARTIAL INSPECTION ☐

COMPLETE INSPECTION ☑

ACCEPTED ☐

REJECTED ☐

INSPECTOR

ELFRED MACHINE COMPANY
165 JORDAN LANE
WETHERSFIELD, CONN. 06109

NOV 30 ENTD

(4)

DATE 11/29/77

INSPECTION REPORT

ELFRED MACHINE COMPANY

CUSTOMER TRC - THE RESEARCH CORP. CUSTOMER P.O. NO. 9964

S.O. NUMBER —

PURCHASED FROM ELFRED P.O. NO. _____

PART NO. 4 - 2

NO. PIECES ORDERED 1 NO. PIECES RECEIVED 1

TOOL NO. SET #4

PART NAME ST / STL NOZZLE

TOOL NAME _____

Actual in 3 Places	Average	Date/Initls
.2551-.2550-.2550	.2550	11/30/77
.2557 - .2558 - .2558	.2558	8/11/78
.2574 - .2575 - .2575	.2575	12/28/78
.2580 - .2582 - .2583	.2582	1/24/79
.2583 - .2585 - .2587	.2585	5/17/79
.2599 - .2600 - .2600	.2600	7/11/79
.2600 - .2601 - .2601	.2601	2/5/80
.2591 .2591 - .2592	.2591	9/20/80

Actual in 3 Places	Average	Date/Initls

USED FOR PBLI COOLER BYPASS TESTS 7,8,9

1st PIECE INSPECTION ☐

PARTIAL INSPECTION ☐

COMPLETE INSPECTION ☑

ACCEPTED ☑

REJECTED ☐

INSPECTOR

ELFRED MACHINE COMPANY
165 JORDAN LANE
WETHERSFIELD, CONN. 06109

(4)

DATE 12/29/77

INSPECTION REPORT

ELFRED MACHINE COMPANY

CUSTOMER TRC-THE RESEARCH CORP. CUSTOMER P.O. NO. 1547

S.O. NUMBER — PURCHASED FROM ELFRED P.O. NO. ____

PART NO. 4-5 (1/8) NO. PIECES ORDERED 1 NO. PIECES RECEIVED 1

TOOL NO. ____ PART NAME ST/STL NOZZLE

TOOL NAME ____

Actual in 3 Places	Average	Date/Initls	Actual in 3 Places	Average	Date/Initls.
.1251-.1251-.1250	.1251	12/30/77			
.1254-.1255-.1256	.1255	5/17/79			
.1282-.1283-.1283	.1283	8/20/80			
			USED FOR PRIM. TOWER OUTLET TESTS 1,2,3		

1st PIECE INSPECTION ☐

PARTIAL INSPECTION ☐

COMPLETE INSPECTION ☑

ACCEPTED ☑

REJECTED ☐

INSPECTOR

ELFRED MACHINE COMPANY
165 JORDAN LANE
WETHERSFIELD, CONN. 06109

DEC 29 E...

APPENDIX K.3

PITOT TUBE CALIBRATION DATA

TRC ENVIRONMENTAL CONSULTANTS

CLIENT COLUMBIA NITROGEN
CHARGE NO. 1430-E80 TESTER ASTLE/ALGIER

CALIBRATION DATA
TYPE S PILOT TUBE

DATE 08/06/80 TEMP.(F)= 76.0 BARO.PRES.(IN.HG)=30.01

STANDARD PITOT NO. CE-1 SERIAL NO. 30

NO. OF SCREENS	STD DELTA P ** W.C.	TYPE S DELTA P ** W.C.	COEFF * CP(S)	DEVIATION	ERROR
1	0.130	0.185	0.830	-0.00	0.00
2	0.245	0.345	0.834	0.00	0.00
3	0.450	0.635	0.833	0.00	0.00
4	0.675	0.965	0.828	-0.00	0.00
5	1.165	1.650	0.832	0.00	0.00
		AVERAGE CP(S)	0.831		
		REVERSE (S) PITOT AND RERUN TEST			
1	0.075	0.105	0.837	0.01	0.00
2	0.228	0.325	0.829	-0.00	0.00
3	0.372	0.530	0.829	-0.00	0.00
4	0.890	1.260	0.832	0.00	0.00
5	1.160	1.650	0.830	-0.00	0.00
		AVERAGE CP(S)	0.831		

* CP(S)=0.99 SQRT(DELTA P(STANDARD) / DELTA P(S))
DIFFERENCE OF AVERAGE CP(S) = 0.00

FS01 STOP 00000

USED FOR TESTS 1,2,3 PRILL TOWER BYPASS
TESTS 4,5,6 PREDRYER DRYER OUTLET
TESTS 7,8,9 PRILL COOLER OUTLET

TRC ENVIRONMENTAL CONSULTANTS

CLIENT COLUMBIA NITROGEN
CHARGE NO. 1430-E80 TESTER ASTLE/ALGIER

CALIBRATION DATA
TYPE S PILOT TUBE

DATE 08/05/80 TEMP.(F)= 80.0 BARO.PRES.(IN.HG)=30.02

STANDARD PITOT NO. CE-1 SERIAL NO. 29

NO. OF SCREENS	STD DELTA P ** W.C.	TYPE SA DELTA P ** W.C.	COEFF * CP(S)	DEVIATION	ERROR
1	0.055	0.080	0.821	-0.00	0.00
2	0.215	0.310	0.824	-0.00	0.00
3	0.450	0.640	0.830	0.01	0.00
4	0.780	1.130	0.823	-0.00	0.00
5	1.140	1.635	0.827	0.00	0.00
		AVERAGE CP(S) =	0.825		
		REVERSE (S) PITOT AND RERUN TEST			
1	0.037	0.125	0.826	-0.00	0.00
2	0.260	0.365	0.836	0.01	0.00
3	0.460	0.655	0.830	-0.00	0.00
4	0.630	0.895	0.831	0.00	0.00
5	1.019	1.450	0.830	-0.00	0.00
		AVERAGE CP(S)	0.830		

* CP(S)=0.99SQRT(DELTA P(STANDARD) / DELTA P(S))
DIFFERENCE OF AVERAGE CP(S) = 0.01

FSD1 STOP 00000

USED FOR TESTS 1,2,3 PRILL TOWER INLET
TESTS 4,5,6 PREDRYER INLET
TESTS 7,8,9 PRILL COOLER BYPASS

TRC ENVIRONMENTAL CONSULTANTS

CLIENT COLUMBIA NITROGEN
CHARGE NO. 1430-E80 TESTER ASTLE/ALGIER

CALIBRATION DATA
TYPE S PILOT TUBE

DATE 08/05/80 TEMP.(F) = 82.0 BARO.PRES.(IN.HG) = 30.02

STANDARD PITOT NO. CE-1 SERIAL NO. 37

NO. OF SCREENS	STD DELTA P ** W.C.	TYPE SA DELTA P ** W.C.	COEFF *CP(S)	DEVIATION	ERROR
1	0.065	0.090	0.841	-0.00	0.00
2	0.210	0.284	0.851	0.01	0.00
3	0.430	0.585	0.849	0.00	0.00
4	0.785	1.075	0.846	-0.00	0.00
5	1.185	1.630	0.844	-0.00	0.00
		AVERAGE CP(S)	0.846		
		REVERSE (S) PITOT AND RERUN TEST			
1	0.080	0.110	0.844	-0.01	0.00
2	0.365	0.490	0.854	0.00	0.00
3	0.575	0.775	0.853	0.00	0.00
4	0.825	1.105	0.855	0.00	0.00
5	1.155	1.550	0.855	0.00	0.00
		AVERAGE CP(S)	0.852		

* CP(S) = 0.99 SQRT(DELTA P(STANDARD) / DELTA P(S))
DIFFERENCE OF AVERAGE CP(S) = 0.01

FS01 STOP 00000

USED FOR TESTS 1,2,3 PRILL TOWER OUTLET

4R,5,6 DRYER INLET

7,8,9, PRILL COOLER INLET

TRC ENVIRONMENTAL CONSULTANTS

CLIENT COLUMBIA NITROGEN
CHARGE NO. 1430-E80 TESTER ASTLE/ALGIER

CALIBRATION DATA
TYPE S PILOT TUBE

DATE 08/06/80 TEMP.(F)= 80.0 BARO.PRES.(IN.HG)=30.01

STANDARD PITOT NO. CE-1 SERIAL NO. P-5

NO. OF SCREENS	STD DELTA P ** W.C.	TYPE S DELTA P ** W.C.	COEFF * CP(S)	DEVIATION	ERROR
1	0.125	0.175	0.837	0.01	0.00
2	0.235	0.335	0.829	-0.00	0.00
3	0.515	0.735	0.829	-0.00	0.00
4	0.685	0.980	0.828	-0.00	0.00
5	1.000	1.430	0.828	-0.00	0.00

AVERAGE CP(S) 0.830

REVERSE (S) PITOT AND RERUN TEST

1	0.125	0.175	0.837	0.01	0.00
2	0.235	0.335	0.829	-0.00	0.00
3	0.515	0.735	0.829	-0.00	0.00
4	0.685	0.980	0.828	-0.00	0.00
5	1.000	1.430	0.828	-0.00	0.00

AVERAGE CP(S) 0.830

* CP(S)=0.99 SQRT(DELTA P(STANDARD) / DELTA P(S))
DIFFERENCE OF AVERAGE CP(S) = 0.00

FS01 STOP 00000

Used For: Velocity Measurements on Prill Tower Inlets

TRC ENVIRONMENTAL CONSULTANTS

CLIENT COLUMBIA NITROGEN
CHARGE NO. 1430-E80 TESTER ASTLE/ALGIER

CALIBRATION DATA
TYPE S PILOT TUBE

DATE 08/05/80 TEMP.(F)= 80.0 BARO.PRES.(IN.HG)=30.02

STANDARD PITOT NO. CE-1 SERIAL NO. 3-S

NO. OF SCREENS	STD DELTA P ** W.C.	TYPE SA DELTA P ** W.C.	COEFF * CP(S)	DEVIATION	ERROR
1	0.077	0.102	0.860	0.02	0.01
2	0.126	0.179	0.831	-0.01	0.00
3	0.410	0.580	0.832	-0.01	0.00
4	0.670	0.940	0.836	-0.00	0.00
5	1.190	1.700	0.828	-0.01	0.00
		AVERAGE CP(S)	0.837		
		REVERSE (S) PITOT AND RERUN TEST			
1	0.110	0.153	0.839	0.00	0.00
2	0.176	0.245	0.839	-0.00	0.00
3	0.330	0.460	0.839	-0.00	0.00
4	0.690	0.960	0.839	0.00	0.00
5	1.180	1.640	0.840	0.00	0.00
		AVERAGE CP(S)	0.839		

* CP(S)=0.99 SQRT(DELTA P(STANDARD) / DELTA P(S))
DIFFERENCE OF AVERAGE CP(S) = 0.00

FS01 STOP 00000

Used for: Velocity Measurements on Prill Tower Bypass

APPENDIX L

SAMPLING AND ANALYSIS PROCEDURES

Includes:

L.1 Ammonium Nitrate Procedures
L.2 Ammonia Procedures
L.3 Summary of Procedures

APPENDIX L.1

AMMONIUM NITRATE PROCEDURES

APPENDIX A - REFERENCE TEST METHODS

* * * * *

METHOD 18 - DETERMINATION OF PARTICULATE EMISSIONS FROM AMMONIUM NITRATE PLANTS

1. Applicability and Principle

1.1 Applicability. This method applies to the determination of ammonium nitrate particulate emissions from predryers, dryers, granulators, coolers, precoolers, and prilling towers in ammonium nitrate production facilities and in other sources when specified in the regulations.

1.2 Principle. Ammonium nitrate particulate emissions are withdrawn isokinetically from the source, collected in water, and measured with a specific ion electrode (SIE).

2. Range and Sensitivity

2.1 Range. The range of the method is limited only by the lower nitrate concentration detection limit of the SIE. A typical linear measurement range is 6×10^{-6} to 1.0 M nitrate ion, or about 1.2×10^{-4} to 21 g/scm (0.5×10^{-4} to 9.0 gr/scf) for a 3.0-m^3 sample.

2.2 Sensitivity. The sensitivity of the technique varies according to the particular combination of electrode and readout meter.

3. Interferences

The following ions and molar concentrations are reported by one vendor to cause a 10 percent error when measuring a 10^{-3} M nitrate concentration: 10^{-7} ClO_4^-; 10^{-5} I^-; 10^{-4} ClO_3^-; 6×10^{-4} Br^-; 4×10^{-3} HS^-, CN^-; 2×10^{-3} NO_2^-; 4×10^{-2} HCO_3^-, Cl^-; 10^{-1} OAc^-.

4. Precision, Accuracy, and Stability

The precision and accuracy of the entire procedure and the stability of the samples have not been statistically determined. However, limited data collected during the initial method evaluation tests indicated the precision at the 95 percent confidence interval to be 19.7 percent and the samples to be stable for at least 30 days.

5. Apparatus

5.1 Sampling Train. The schematic diagram of the sampling train in Figure 18-1 shows that the Method 18 train is similar in contruction to the Method 5 train. The sampling train consists of the following components:

5.1.1 Probe Nozzle, Probe Liner, Pitot Tube, Differential Pressure Gauge, Metering System, and Barometer. Same as Method 5, Sections 2.1.1, 2.1.2, 2.1.3, 2.1.4, 2.1.8, and 2.1.9, respectively. Stainless steel (type 316) probe liners may also be used.

5.1.2 Impingers. Five impingers connected in series with vacuum tight fittings as shown in Figure 18-1. For the first, third, fourth, and fifth impingers, the tester may use the Greenburg-Smith design, modified by replacing the tip with a 1.25-cm ID (1/2 in.) glass tube extending to 1.25 cm (1/2 in.) from the bottom of the flask. For the second impinger, use the Greenburg-Smith design with a standard tip.

5.2 Sample Recovery.

5.2.1 Probe-Liner and Probe-Nozzle Brushes, Graduated Cylinder and/or Balance, Plastic Storage Containers, and Rubber Policeman. Same as Method 5, Sections 2.2.1, 2.2.5, 2.2.6, 2.2.7, respectively.

5.2.2 Wash Bottle. Glass or polyethylene.

5.2.3 Sample Storage Containers. Polypropylene, 1-liter capacity.

5.2.4 Funnel. Glass or polypropylene.

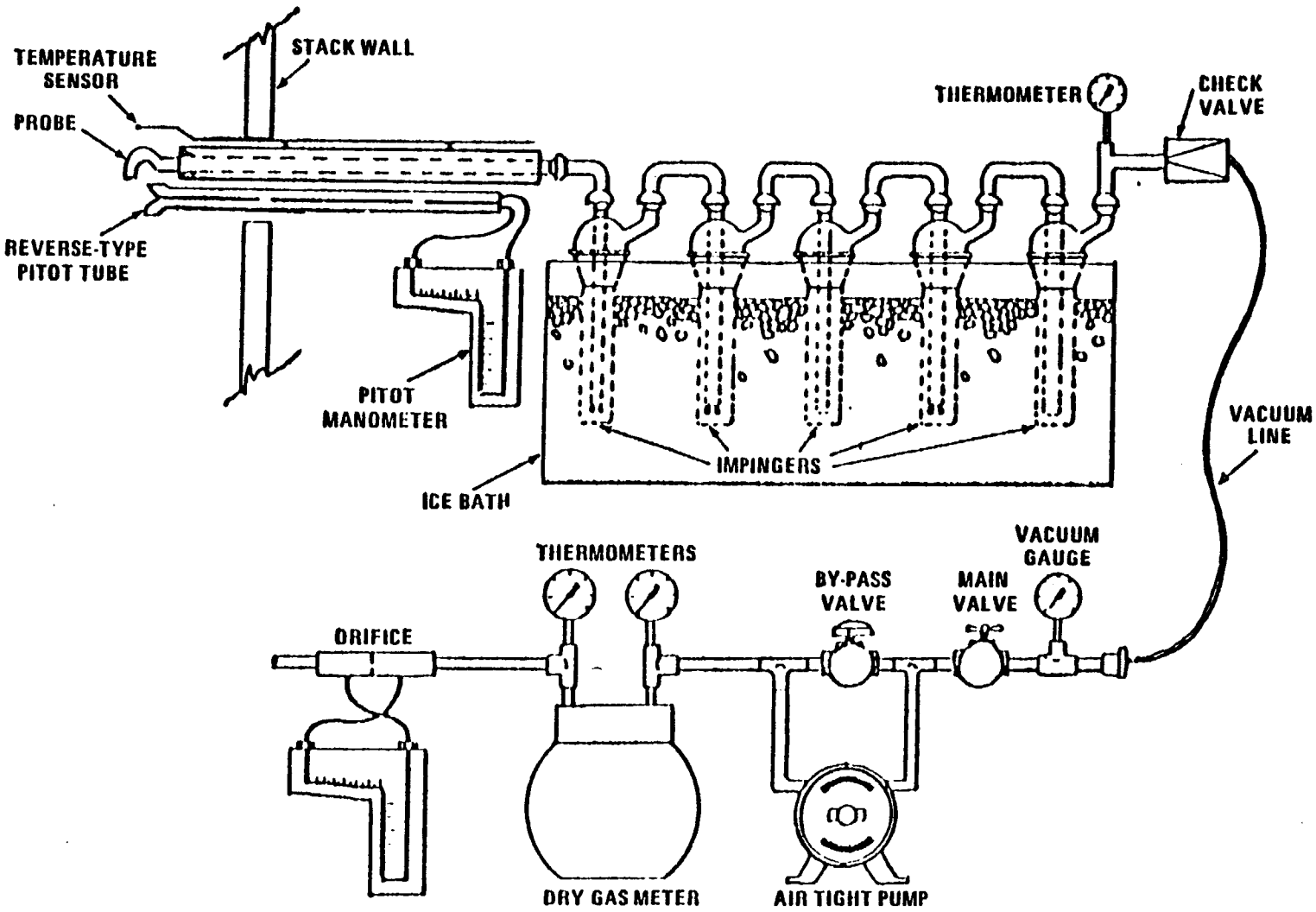


Figure 18-1. Particulate sampling train.

5.2.5 Flask. Glass with ground glass joints to match the probe liner.

5.3 Analysis. For analysis, the following equipment is needed:

5.3.1 Beakers. Glass or polypropylene, 1000-ml and 250-ml capacity.

5.3.2 Balance. Triple-beam or dual-pan, 1500-g capacity to measure within ±0.5 g.

5.3.3 Nitrate Ion Activity Sensing Electrode.

5.3.4 Reference Electrode. Double junction, or equivalent, suitable for use with the nitrate electrode and electrometer.

5.3.5 Electrometer. A pH meter with millivolt (mV) scale capable of ± 0.5-mV resolution, or a specific ion meter made especially for specific ion use.

5.3.6 Magnetic Stirrer. With TFE* -coated stirring bars.

5.3.7 Graduated Cylinder. 500-ml, graduated in divisions of 2 ml, capable of measuring volume to ± 1 ml.

5.3.8 Thermometer, 0-100°C.

5.3.9 Vacuum filtration apparatus.

5.3.10 Desiccator

5.3.11 Analytical balance capable of weighing to 0.1 mg.

5.3.12 Petri dishes for filter storage.

6. Reagents

Use ACS reagent-grade chemicals or equivalent, unless otherwise specified.

6.1 Sampling and Sample Recovery. The reagents used in sample recovery are as follows:

6.1.1 Silica Gel, Crushed Ice, and Stopcock Grease. Same as Method 5, Sections 3.1.2, 3.1.4, 3.1.5, respectively.

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* Mention of trade names or specific products does not constitute endorsement by the U.S. Environmental Protection Agency.

6.1.2 Water. Deionized distilled, to conform to ASTM Specification D 1193-74, Type 3. At the option of the analyst, the $KMnO_4$ test for oxidizable organic matter may be omitted when high concentrations of organic matter are not expected to be present.

6.1.3 Sulfuric Acid (H_2SO_4), 1 N. Add 28 ml of concentrated H_2SO_4 to 500 ml of deionized distilled water in a 1-liter volumetric flask. Dilute to exactly 1 liter with deionized distilled water.

6.1.4 Preservative Solution, 1 M Boric Acid. Dissolve 6.2 g of boric acid in 90 ml of boiling deionized distilled water in a 100-ml volumetric flask. Dilute to exactly 100 ml with deionized distilled water.

6.2 Analysis. The reagents needed for analysis are listed below:

6.2.1 Water. Same as in Section 6.1.2.

6.2.2 Ionic Strength Adjustor (ISA). Dissolve 26.4 g of ammonium sulfate in 50 ml of deionized distilled water in a 100-ml volumetric flask. Dilute to exactly 100 ml with deionized distilled water.

6.2.3 Standard Ammonium Nitrate (NH_4NO_3) Solution, 1 mg/ml. Weigh exactly 1.290 g of NH_4NO_3 and transfer into a 1-liter volumetric flask. Add 500 ml of dionized distilled water and dissolve. Dilute to exactly 1 liter with deionized distilled water.

6.2.4 Reference Electrode Filling Solution. Add 2 ml of ISA to a 100-ml volumetric flask and dilute to exactly 100 ml with deionized distilled water. This solution is used to fill the outer chamber of the reference electrode.

6.2.5 Filters. Glass fiber compatible with the vacuum filtration apparatus.

7. Procedure

7.1 Sampling. Because of the complexity of this method, testers should be trained and experienced with the test procedure to ensure reliable results.

7.1.1 Pretest Preparation. Follow the general procedure given in Method 5, Section 4.1.1, except omit the directions for the filter.

7.1.2 Preliminary Determinations. Follow the general procedure given in Method 5, Section 4.1.2, except as follows: Select a nozzle size based on the range of velocity heads in order to maintain isokinetic rates below 28 liters/min (1.0 cfm).

7.1.3 Preparation of Sampling Train. Follow the general procedure given in Method 5, Section 4.1.3, except place 100 ml of deionized distilled water in each of the first two impingers, place 100 ml of 1 N H_2SO_4 in the third impinger, leave the fourth impinger empty, and place the preweighed silica gel in the fifth impinger. Assemble the train as shown in Figure 18-1.

7.1.4 Leak-Check Procedures. Follow the leak-check procedures given in Method 5, Sections 4.1.4.1 (Pretest Leak-Check), 4.1.4.2 (Leak-Checks During Sample Run), and 4.1.4.3 (Post-test Leak-Check).

7.1.5 Sampling Train Operation. Follow the general procedure given in Method 5, Section 4.1.5. For each run, record the data required on a data sheet such as the one shown in Method 5, Figure 5-2. Maintain isokinetic sampling rates at less than 28 liters/min (1.0 cfm). Maintain probe temperature at approximately 6°C above stack temperature, but no higher than 85°C.

7.1.6 Calculation of Percent Isokinetic. Same as Method 5, Section 4.1.6.

7.2 Sample Recovery. Begin proper cleanup procedure as soon as the probe is removed from the stack at the end of the sampling period. Allow the probe to cool.

When the probe can be safely handled, wipe off all external particulate matter near the tip of the probe nozzle, and place a cap over it to prevent losing or gaining particulate matter. Do not cap off the probe tip tightly

while the sampling train is cooling down. Capping would create a vacuum and thus draw water from the impingers into the probe.

Before moving the sampling train to the cleanup site, remove the probe from the sample train, wipe off the silicone grease, and cap the open outlet of the probe. Be careful not to lose any condensate that might be present. Wipe off the silicone grease from the impinger inlet where the probe was fastened and cap it. Remove the umbilical cord from the last impinger and cap the impinger. If a flexible line is used between the first impinger or condenser and the probe, disconnect the line at the probe and let any condensed water or liquid drain into the impingers or condenser. Either ground-glass stoppers, plastic caps, or serum caps may be used to close these openings.

Transfer the probe-impinger assembly to the cleanup area. This area should be clean and protected from the wind to minimize the chances of contaminating or losing the sample. Treat the impinger contents as follows:

7.2.1 Container No. 1. Measure and record the contents of the first two impingers to the nearest $\pm$ 1 ml. Transfer the liquid to Container No. 1.

Taking care to see that dust on the outside of the probe or other exterior surfaces does not get into the sample, quantitatively recover particulate matter or any condensate from the probe nozzle, probe fitting, and probe liner and place the washes in Container No. 1. Follow the procedure stated below:

Carefully remove the probe nozzle. Rinse the inside surface with deionized distilled water from a wash bottle, and brush with a Nylon bristle brush. Rinse and brush three times, after which make a final rinse of the inside surface with deionized distilled water. Brush and rinse the inside

parts of the Swagelok fitting with water in a similar way until no visible particles remain.

Place 100 ml of deionized distilled water into a 200-ml erlenmeyer flask with a ground glass joint. Attach the flask to the probe liner using a pinch-type clamp. Close the opposite end of the probe with a non-contaminating stopper. Allow the water to drain to the stoppered end while tilting and rotating the probe. Return the water to the flask, and remove the stopper. Insert a probe brush into the open end, and with a twisting action run the brush through the probe into the flask. Pull the brush back through the probe, remove the flask from the probe, and place the flask contents into the sample container. Place a second 100 ml of deionized distilled water into the flask, and repeat the cleaning procedure. Perform this entire cleaning procedure three times or until the probe liner appears to be visually clean. Afterwards, rinse the brush and flask, and quantitatively collect these washings in the sample container.

It is recommended that two people clean the probe to minimize sample losses. Between sampling runs, protect the brushes and flasks from contamination.

Measure and record the volume of the contents of Container No. 1. Add 2 ml of the boric acid preservative solution per 100 ml of sample to Container No. 1. Mark the liquid level of the container to determine later whether leakage occurred during shipment. Cap and seal the containers and return them to the laboratory for analysis.

7.2.2 Impingers No. 3 and 4. Measure and record the volume of the contents of the third and fourth impingers. Discard the liquid.

7.2.3 Container No. 2 (Silica Gel). Note the color of the indicating silica gel to determine whether it has been completely spent, and make a notation of its condition. Transfer the silica gel to its original container and seal. The tester may use a funnel and rubber policeman as aids in transferring the silica gel. The small amount of particles that may adhere to the impinger wall need not be removed. Since the gain in weight is to be used for moisture calculations, do not use any water or other liquids to transfer the silica gel. If a balance is available in the field, the tester may follow the procedure for this container in Analysis, Section 7.3.3.

7.3 Analysis. Treat the contents of the sample containers as described below:

7.3.1 Container No. 1. Filter the sample through a pre-weighed glass fiber filter using a vacuum filtration apparatus. Wash the filter three times with small quantities of deionized distilled water. Transfer the filtrate to a one-liter volumetric flask, and dilute to exactly one liter with deionized distilled water. This diluted volume is V_t. Pipet a 100 ml aliquot of sample into a 250 ml beaker. Add 2 ml ISA to the beaker.

Place the filter on a pre-weighed glass weighing dish. Desiccate the filter for 24 hours in a desiccator containing anhydrous calcium sulfate. Weigh to a constant weight and report the results to the nearest 0.1 mg. For purposes of this section, the term "constant weight" means a difference of no more than 0.5 mg or 1 percent of total weight less tare weight, whichever is greater, between consecutive weighings, with no less than 6 hours of desiccation time between weighings.

If ambient laboratory temperature differs by more than $\pm 2^{\circ}C$ from the temperature at which the nitrate calibration standards were measured, condition the samples and standards in a constant temperature bath before measurement. Stir the sample with a magnetic stirrer during measurement to minimize electrode response time. If the stirrer generates enough heat to change solution temperature, place a piece of temperature insulating material, such as cork, between the stirrer and the beaker.

Insert the nitrate and reference electrodes into the solution. When a steady mV reading is obtained, record it. Determine the concentration (µg/ml) from the calibration curve. Between electrode measurements, rinse the electrodes with deionized distilled water and wipe dry.

7.3.2 Blank Determination. Treat three 100-ml aliquots of the deionized distilled water used for sampling and sample recovery as in Section 7.3.1. Report the average blank concentration in µg/ml.

7.3.3 Container No. 2 (Silica Gel). Weigh the spent silica gel (or silica gel plus impinger) to the nearest 1.0 g using a balance. (The tester may conduct this step in the field.)

8. Calibrations

8.1 Sampling Train. Calibrate the sampling train components according to the indicated Sections of Method 5: Probe Nozzle (5.1), Pitot Tube (5.2), Metering System (5.3), Temperature Gauges (5.5), Leak-Check of the Metering System (5.6), and Barometer (5.7).

8.2 Standard Solutions. Add 0.0, 1.0, 5.0, 10.0, 15.0, 20.0, and 25.0 ml of the NH_4NO_3 standard solution (6.2.3) to a series of seven 100-ml volumetric flasks along with 2 ml of ISA and 2 ml of boric acid preservative. The concentrations of the calibration standards are 0, 10, 50, 100, 150, 200

and 250 µg NO_3^-/ml, respectively. If any sample concentrations exceed 250 µg NO_3^-/ml, dilute the sample to bring its concentrations below the highest standard solution concentration.

8.3 Calibration Curve. Zero and standardize the electrometer according to the manufacturer's instructions using the calibration standards in Section 8.2; treat as in Section 7.3.1. Begin with the most concentrated, and proceed to the most dilute. Reverse the order and repeat the mV determination. Record the readings for each concentration. Prepare a calibration curve by plotting the mV reading on the linear scale of semilogarithmic graph paper versus the concentration on the log scale. Calibrate the nitrate electrode daily and check hourly.

9. Calculations

9.1 Using the data from this test, calculate Average Dry Gas Meter Temperature, Average Orifice Pressure Drop, Dry Gas Volume, Volume of Water Vapor, Moisture Content, Isokinetic Variation and Acceptable Results, as described in Method 5, Sections 6.2, 6.3, 6.4, 6.5, 6.11 and 6.12, respectively.

9.2 Mass of Ammonium Nitrate. Calculate the total weight of ammonium nitrate (m) collected in the sample using Equation 18-1.

$$m = 1.29 \times 10^{-6} \; V_t \; m_a - V_b \; m_b \qquad \text{Eq. 18-1}$$

Where:

m = Total amount of ammonium nitrate collected in sample, grams.

V_t = Total volume of mixed sample, ml. See Section 7.3.1.

m_a = Concentration of nitrate in sample aliquot, µg/ml.

V_b = Total volume of water initially placed in train plus all rinse volumes, ml.

m_b = Concentration of nitrate in blank, µg/ml.

1.29×10^{-6} = Conversion factor, (g NH_4NO_3/g NO_3^-) (g/µg).

9.3 Particulate Concentration. Calculate the ammonium nitrate particulate concentration (c) in g/dscm (gr/dscf) as follows:

$$c = K \frac{m}{V_{m(std)}} \qquad \text{Eq. 18-2}$$

Where:

$V_{m(std)}$ = Volume of gas sample measured by dry gas meter, corrected to standard conditions, dscm.

K = 1.0 for metric units (c in g/dscm).

= 0.4370 for English units (c in gr/dscf).

10. Bibliography

10.1 Orion Research. Analytical Methods Guide. May 1975.

10.2 Same as Method 5, Citations 1 through 9 of Section 7.

APPENDIX L.2

AMMONIA PROCEDURES

PART III

SPECIFIC ION ELECTRODE METHOD

Ammonia

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Ed Tew
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North Carolina

SPECIFIC ION ELECTRODE

INTRODUCTION

Aqueous ammonia concentrations may be determined using a specific ion electrode attached to a standard pH meter. This procedure may be used to measure dissolved ammonia or ammonium ion in aqueous solutions. After proper pH adjustment, the ammonia electrode responds logarithmically to the level of ammonia in the solution. The response of the electrode to ammonia concentration is recorded in millivolt readings directly from the pH meter. A standard calibration curve is prepared by ploting the log of the ammonia concentration vs. the millivolt response. The samples are then analyzed accordingly and their concentration are calculated from the calibration curve. The method is simple and quick, requiring little sample preparation.

THEORY

The electrode consists of an internal reference solution separated from the sample solution by a hydrophobic gas-permeable membrane. The principle of operation involves the passage of dissolved ammonia in the solution through the membrane until the partial pressures of ammonia on both sides of the membrane are equal. As the ammonia passes through the membrane, it dessolves in the filling solution and to a small extent reacts reversibly with the water in the filling solution:

$$NH_3 + H_2O \rightleftharpoons NH_4^+ + OH^-$$

The relationship between ammonia, ammonium and hydroxide ion is given by the following equation:

$$\frac{[NH_4^+][OH^-]}{[NH_3]} = \text{constant} \cdot (K)$$

Since the internal filling solution contains ammonium chloride at a sufficientl high level so that the ammonium ion concentration is fixed, then this relationship may be rewritten:

$$[OH^-] = [NH_3] \cdot \text{constant}$$

This shows the relationship between the free ammonia in the sample and the hydroxide ion concentration in the filling solution. As the NH_3 migrates through the membrane, the concentration of hydroxide ion changes in the internal reference solution, thus changing the potential of the electrode sensing element in a Nerstean manner:

$$E = E_o - S \log [OH^-]$$

Therefore,

$$E = E_1 - S \log [NH_3]$$

From the above two equations, one can see that the sensing element changes with the change in concentration of NH_3 in the sample. In order to convert ammonium ion to ammonia, the pH of the sample must be adjusted with standard base to a pH of 11 or greater according to the following equation:

$$NH_3 + H_2O \rightleftharpoons NH_4^+ + OH^-$$

APPRATUS

Ammonia Electrode, Model 95-10, Orion Research Incorporated
Model 701 Digital pH Meter
Electrode Holder, Cat. No. 92-00-01, Orion Research Incorporated
Magnetic Stirrer with stirring bar

REAGENTS

Sodium Hydroxide, 5 Normal, NaOH

Prepare by dissolving 200 grams of reagent grade sodium hydroxide in a 1-liter volumetric flask and dilute to mark with ammonia-free distilled-deionized water. This will give you a 0.1 Molar solution.

INTERFERENCES

Ionic species cannot cross the gas-permeable membrane, so they cannot affect electrode operation. The level of ions in solution can, however, change the solubility of ammonia to some degree, affecting the electrode calibration. Best results are obtained if standards and samples have about the same level of ions (and other dissolved species) present. Therefore, the samples analyzed must be diluted to a dissolved species concentration of 0.2 Molar or less.

The only other interference recorded is water vapor, which can diffuse across the membrane. The addition of NaOH will help equalize the osmotic pressure on both sides of the membrane so that the water vapor will not diffuse across the membrane.

STANDARD CURVE

Prepare a standard calibration curve by making serial dilutions from the 10^{-1} M ammonium sulfate solution to prepare 10^{-2} M, 10^{-3} M, 10^{-4} M, 10^{-5} M, and 10^{-6} M standards. Starting with the least concentrated standard, 10^{-6} M, and working to the most concentrated standard, 10^{-2} M, take a 10-ml aliquot of each, add 0.2 ml of 5-N NaOH and place the electrode in the standard solution until a constant millivolt reading is obtained. Use a stirring bar to agitate the sample. Repeat this procedure until all standards have been analyzed. Between each standard, rinse the electrode with several portions of distilled-deionized water. Once all standards have been analyzed, a calibration curve as in

Specific Ion Electrode

Calibration Graph

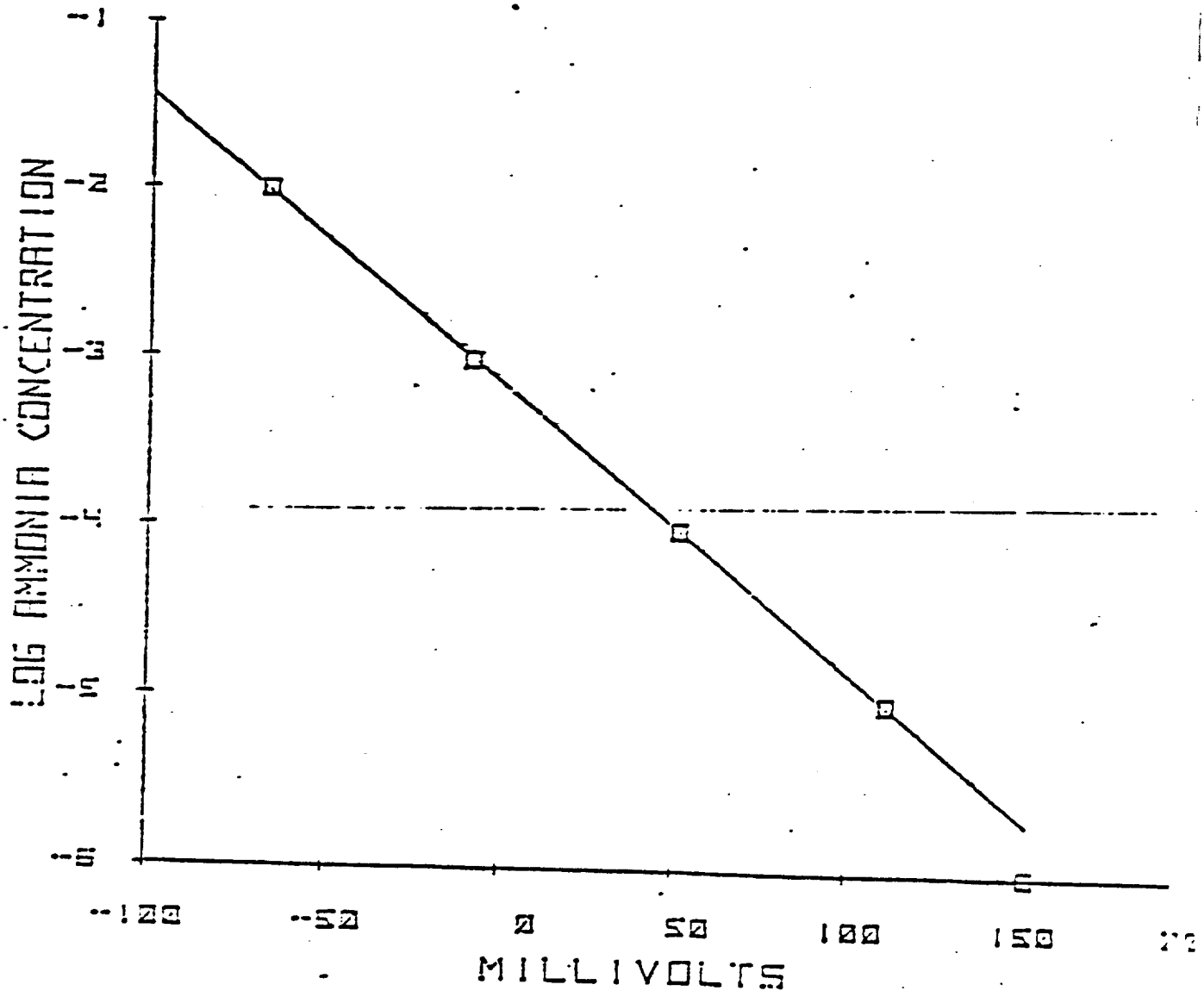

Figure 6

CONC.	TRIALS	MEAN	SIGMA
1E-06	2	152.4	0.00
1E-05	2	111.9	0.14
1E-04	2	51.7	0.28
1E-03	2	-8.1	0.00
1E-02	2	-66.3	0.14

CORRECTION FACTOR= 1.04320E-06
SLOPE= -0.016822610
INTERCEPT = -3.124855002

Figure 6 should be produced. Between 10^{-5} M and 10^{-2} M the curve is linear, but a correction factor must be added to produce a linear curve between 10^{-6} M and 10^{-5} M ammonia concentration.

SAMPLE ANALYSIS

Because the probe wash, probe plug and impinger catches are very acidic, it is necessary to dilute them so the total concentration of dissolved species is ~0.2 M. To reach this level, 1 ml aliquots are diluted by a factor of 20 with distilled-deionized water then treated as normal samples. Record the mv reading after a constant value is observed. For best results, start with the least concentrated samples (probe plug and probe wash), then analyze the impinger catches. Also, the samples and standards should be at the same temperature and should be agitated by the stirring bar at the same rate.

From the standard curve, record the millivolt readings from the samples and note concentrations.

CALCULATIONS

$$\text{mg } NH_3 = (\text{moles/1000 ml})\ (D_1)\ (D_2)\ (17 \text{ grams/mole})\ (1000 \text{ mg/g})$$

$$\text{ug/M}^3 = (\text{mg } NH_3)\ (10^3 \text{ ug/mg})/M^3$$

$$\text{ppm} = (\text{ug/M}^3)\ \left(\frac{0.02445}{17}\right)$$

where: D_1 = dilution volume of original sample, ml

D_2 = dilution factor of sample analyzed

M^3 = volume of flue gas sampled corrected to standard conditions, M^3

APPENDIX L.3

SUMMARY OF PROCEDURES

L.3 SUMMARY OF PROCEDURES

L.3.1 Nitrate

Nitrate (NO_3^-) was analyzed in samples using a specific ion electrode direct measurement method.

Apparatus

- Orion Nitrate Ion Electrode Model 93-07
- Orion double junction reference electrode Model 90-02
- Orion Specific Ion Meter, Model 407 A/F or equivalent
- Magnetic stirrer and small magnetic stirring bar
- Pipettes: Volumetric type 0.5 - 100 ml
- Volumetric flasks: 100, 250, 500, 1,000 ml sizes
- Graduated cylinders: 50 and 100 ml sizes
- Beakers: 150 ml size

Reagents

- Ionic Strength Adjustor (ISA): Dissolve 26.4g of ammonium sulfate in 50 ml of deionized, distilled water in a 100-ml volumetric flask. Dilute to exactly 100 ml with water.

- Standard Ammonium Nitrate Solution (1 mg/ml): Weigh exactly 1.290 g of NH_4NO_3 and transfer into a 1 liter volumetric flask. Dissolve and dilute to exactly 1 liter with deionized distilled water.

- Reference Electrode Filling Solution: Add 2 ml of ISA to a 100-ml volumetric flask and dilute to exactly 100 ml with deionized, distilled water. This solution is used to fill the outer chamber of the reference electrode.

- Preservative Solution (1M Boric Acid): Dissolve 6.2g of boric acid in 90 ml of boiling deionized, distilled water in a 100 ml volumetric flask. Dilute to exactly 100 ml with water.

Procedure

Calibrate the specific ion meter (equipped with the nitrate electrode and reference electrode) for direct measurement using 10 and 100 ppm NO_3^- standards following the procedures described in the meter and electrode manuals (Meter Range 1.0-100ppm). 1.0, 5.0 and 50.0 ppm NO_3^- standards are read to check the accuracy of the calibration. 1 ml of the boric acid solution and 2 ml of ISA are added to 100 ml of the standard before the

measurements are made. Place the electrode in 100 ml of sample and stir using a magnetic stirrer. Add 2.0 ml of ISA and record the meter reading after it stabilizes. Dilute samples which are off scale to the right. Check the meter calibration between every 5 or 6 samples.

Calculations

Multiply the meter reading by the meter calibration factor and appropriate dilution factors to obtain the sample concentration in ppm NO_3. (If 1.0 on the meter scale is set to equal X ppm NO_3, then the meter calibration factor equals X).

To convert the sample concentration to total mg NO_3, multiply the ppm NO_3 by the sample volume in liters.

To convert results from NO_3 to NH_4NO_3, multiply by 1.29.

L.3.2 Ammonia - Specific Ion Electrode Method

Samples were analyzed using the ammonia gas-sensing electrode.

Apparatus

- Orion Ammonia Electrode, Model 95-10 or equivalent
- Orion Specific Ion Meter, Model 407 A/F or equivalent
- Magnetic stirrer and small magnetic stirring bar
- Pipettes, Volumetric type 0.5 - 100 mls
- Volumetric Flasks 100, 250, 500, 1000 ml sizes
- Graduated Cylinders, 50 and 100 ml sizes
- Beakers, 150 ml size

Reagents

- Sodium Hydroxide 10 M (400 g/l)
- Ammonium Chloride Stock Solution (0.1 M)
- 5.35g NH_4Cl + 0.5 ml H_2SO_4
  dissolved and diluted in 1 liter in a volumetric flask.

Procedure

Calibrate the electrode for direct measurement using 10 and 100 ppm ammonia standards following the procedures described in the meter and electrode manuals (Meter Range 1.0 - 100 ppm). 1.0, 5.0, and 50.0 ppm ammonia standards are read to check the accuracy of the calibration. Place the electrode in 100 ml of sample and stir using a magnetic stirrer. Add 1.0 ml of 10M NaOH to raise the pH to 11 and record the meter reading after it stabilizes. Dilute samples which are off scale to the right. Check the meter calibration frequently using fresh standards, between every 3 or 4 samples.

Calculations

Multiply the meter reading by the meter calibration factor and appropriate dilution factors to obtain the sample concentration in ppm NH_3. (If 1.0 on the meter scale is set to equal x ppm NH_3, then the meter calibration factor equals x).

To convert the sample concentration to total mg NH_3, multiply the ppm NH_3 by the sample volume in liters. To convert results from NH_3 to NH_4NO_3, multiply by 4.706.

L.3.3 Solids

Undissolved solids were analyzed by a gravimetric method.

Apparatus

- Analytical Balance. Capable of weighing to 0.0001g
- Desiccator
- Vacuum filtering system
- Pre-weighed glass fiber filters (3-1/2" - 4-1/2" diameter)

Procedure

Weigh numbered glass fiber filters to constant weight: desiccate for 24 hours, then weigh with at least 6 hours between weights; two consecutive weights should agree within 0.5mg). Filter a known volume of impinger sample or scrubber solution through a weighed filter using a vacuum filtering system. Rinse the filter with water 3 or 4 times to remove any dissolved solids from the filter. Desiccate the filter and weigh to constant weight.

Calculations

$$\text{total mg solids} = \left[\text{final weight (g)} - \text{initial weight (g)}\right] \times 1000 \text{ mg/g}$$

$$\text{ppm solids} = \frac{\text{total mg solids}}{\text{volume filtered (liters)}}$$

APPENDIX M

ANALYSIS DATA

Includes:

M.1 Laboratory Data Summaries
M.2 Discussion of Analysis Methods
M.3 Chemical Laboratory Notebook

APPENDIX M.1

LABORATORY DATA SUMMARIES

NITRATE ANALYSIS

Columbia Nitrogen Corporation

p. 183

Sample ID	Volume (Mls.)	1st Dilution	2nd Dilution	Mls in 100 Mls	10 on Meter = x ppm	Meter Reading	Factors	ppm NO_3 (ppm)	mg NO_3 (mg)	mg NH_4NO_3 Based on NO_3
	A	B	C	D	E	F	B×C×D/100×E=G	F×G=H	H×A/1000=I	$I \times \frac{80 \text{ (Molecular Weight of } NH_4NO_3)}{62 \text{ (Molecular Weight of } NO_3)} = J$
BI-By-W	1010	–	–	100	10.0	0.104	10	1.04	1.05	1.35
BI-In-W	995	–	–	100	10.0	<0.100	10	<1.0	<0.995	< 1.28
BI-Out-W	935	–	–	100	10.0	<0.100	10	<1.0	<0.935	< 1.206
1-PT-By-W	1125	–	–	100	10.0	2.3	10	23	25.9	33.41
1-PT-In-W	1195	–	–	100	10.0	5.35	10	53.5	63.9	82.4
1-PT-Out-W	1090	–	–	100	10.0	0.385	10	3.85	4.2	5.42
2-PT-By-W	920	–	–	100	10.0	3.42	10	34.2	31.5	40.6
2-PT-In-W	1140	–	–	100	10.0	8.55	10	85.5	97.5	125.8
2-PT-Out-W	1170	–	–	100	10.0	0.325	10	3.25	3.8	4.91
3-PT-By-W	1110	–	–	100	10.0	3.25	10	32.5	36.1	46.5
3-PT-In-W	1095	–	–	100	10.0	8.80	10	88	96.4	124.4
3-PT-Out-W	1080	–	–	100	10.0	0.795	10	7.95	8.59	11.08

Sample ID	Volume (mls.)	1st Dilution	2nd Dilution	Mls in 100 Mls	1.0 on Meter = x ppm	Meter Reading	Factors	ppm NO_3 (ppm)	Mg NO_3 (Mg)	Mg NH_4NO_3 Based on NO_3
4 PD Pre D-W	1105	4 → 250	10 → 100	100	10	1.53	250/4 × 100/10 × 10	9562.5	10566	13630
4R PD-Dry-W	1060	4 → 250	10 → 100	100	10	2.88	250/4 × 100/10 × 10	18000	19080	24613
4 PD-Out-Wa	1140	25 → 100	—	100	10	2.58	100/25 × 10	103.2	117.6	152
-Wb	1140	25 → 100	—	100	10	2.58	100/25 × 10	103.2	117.6	152 } 151
-Wc	1140	25 → 100	—	100	10	2.52	100/25 × 10	100.8	114.9	148
5-PD-Pre-D-W	1020	4 → 250	10 → 100	100	10	1.98	250/4 × 100/10 × 10	12375	12622	16282
5 PD-Dry-W	990	4 → 250	10 → 100	100	10	4.05	250/4 × 100/10 × 10	25312	25059	32326
5-PD-Out-W	1080	25 → 100	—	100	10	2.52	100/25 × 10	100.8	108.9	140.4
6 PD-Pre D-W	1205	4 → 250	10 → 100	100	10	1.71	250/4 × 100/10 × 10	10687.5	12878	16613
6 PD-Dry Water only	475	4 → 250	5 → 100	100	10	0.985	250/4 × 100/5 × 10	12312.5	5848	7544
6-PD Dry-PW&LW	680	4 → 250	5 → 100	100	10	1.93	250/4 × 100/5 × 10	24125	16405	21162
6-PD-Out-W	990	25 → 100	—	100	10	3.12	100/25 × 10	124.8	123.6	159
7-PC-By-W	985	10 → 100	—	100	10	2.80	10 × 100/10	280	276	356
7-PC-In-W	1220	4 → 250	10 → 100	100	10	3.52	10 × 250/4 × 100/10	22000	26840	34624
7-PC Out W	1150	25 → 100	—	100	10	1.78	10 × 100/25	71.2	81.9	106

Sample ID	Volume (mls.)	1st Dilution	2nd Dilution	Mg In 100 mls.	I.C. On Meter = X ppm	Meter Reading	Factors	ppm NO_3 (ppm)	Mg NO_3 (m^3)	Mg NH_4NO_3 Based On NO_3
8 PC-B1-(-)	1045	10 → 100	-	100	10	2.43	$10 \times 100/10$	243	2.54	388
8 PC-1H-(-)	1060	4 → 250	10 → 100	100	10	2.30	$10 \times 100/10 \times 250/4$	14375	15400	23736
8 PC-Ox1-(-)	1025	25 → 100	-	100	10	1.416	$10 \times 100/25$	58.4	59.9	77.2
9 PC-B1-(-)	1280	10 → 100	-	100	10	2.22	$10 \times 100/10$	222	284	369
9 PC-1H-(-)	1170	4 → 250	10 → 100	100	10	2.716	$10 \times 100/10 \times 250/4$	17850	20882	26035
9-PC-Ox1-(-)a	1185	25 → 100	-	100	10	1.02	$10 \times 100/25$	40.8	47.1	60.8
9-PC-Ox1-(-)b	1155	25 → 100	-	100	10	1.04	$10 \times 100/25$	41.6	48.6	62.0 } 61.2
9-PC-Ox1-(-)c	1155	25 → 100	-	100	10	1.02	$10 \times 100/25$	40.8	47.1	60.8
1-PT-S	-	4 → 250	5 → 100	100	10	4.55	$10 \times 100/5 \times 250/4$	56875	-	73369
2 PT-S	-	4 → 250	5 → 100	100	10	4.75	$10 \times 100/5 \times 250/4$	59375	-	76594
3 PT-S	-	4 → 250	5 → 100	100	10	4.45	$10 \times 100/5 \times 250/4$	55625	-	71756
4-PD-S	-	4 → 250	3 → 1000	100	10	8.42	$10 \times 250/4 \times 100/3$	441667	-	569750
5 PD-S	-	4 → 250	3 → 1000	100	10	8.90	$10 \times 250/4 \times 100/3$	500000	-	645000
6 PD-S	-	4 → 250	3 → 1000	100	10	8.52	$10 \times 250/4 \times 100/3$	525000	-	677250

AMMONIA ANALYSIS

Columbia Nitrogen Corporation

SAMPLE ID	VOLUME (mls.)	1st DILUTION	2ND DILUTION	mls IN 100 MLS.	x ppm = 1.0 ON METER	METER READING	FACTORS	ppm NH_3 (ppm)	TOTAL Mg NH_3 (Mg)		TOTAL Mg NH_4NO_3 BASED ON Mg NH_3
	A	B	C	D	E	F	B×C×D/100×E=G	F×G=H	H×A/1000=I	I × 80/17 (Molecular Wt Of NH_4NO_3) / (Molecular Wt Of NH_3)	= J
1-PT-By-W	1125	—	—	100	10.0	1.08	10.0	10.8	12.15		57.2
1-PT-By A	460	5→100	—	100	10.0	<0.1	10×100/5	<20	<9.2		<43.3
1-PT-In-W	1195	—	—	100	10.0	4.55	10×0	45.5	54.4		256
1-PT-In A	510	5→100	—	100	10.0	0.4	10.0×100/5	80.0	40.8		192
1-PT-Out-W	1070	—	—	100	10.0	1.72	10.0	17.2	18.7		88
1-PT-Out-A	555	5→100	—	100	10.0	<0.1	10.0×100/5	<20	<11.1		<52.2
2-PT-By-W	920	—	—	100	10.0	1.45	10	14.5	13.3		62.6
2-PT-By-A	535	5→100	—	100	10.0	<0.10	10×100/5	<20	<10.7		<50.4
2-PT-In W	1140	—	—	100	10.0	5.62	10.0	56.2	64		301.1
2-PT-In A	550	5→100	—	100	10.0	0.32	10.0×100/5	64	35.2		165.7
2-PT-Out-W	1170	—	—	100	10.0	1.43	10.0	14.3	16.7		78.6
2-PT-Out-A	562	5→100	—	100	10.0	<0.10	10.0×100/5	<20	<11.24		<52.9
3-PT-By-W	1110	—	—	100	10.0	1.30	10.0	13.0	14.43		67.9
3-PT-By A	520	5→100	—	100	10.0	<0.16	10.0×100/5	<20	<10.4		<48.9
3-PT-In-W	1075	—	—	100	10.0	4.4	10.0	44	48.2		326.8
3-PT-In A	565	5→100	—	100	10.0	0.282	10.0×100/5	56.4	31.9		150.1
3-PT-Out-W	1080	—	—	100	10.0	1.72	10.0	17.2	18.6		87.5
3-PT-Out-A	520	5→100	—	100	10.0	<0.10	10.0×100/5	<20	<10.4		<48.9

Ammonia (cont.)

Sample I.D.	Volume (mls.)	1st Dilution	2nd Dilution	mls in 100 mls	x ppm = 1.0 on Meter	Meter Reading	Factors	ppm NH3 (ppm)	Total mg NH_3 (mg)		Total mg NH_4NO_3 Based on NH_3
4-PD-PRED-W	1105	2→100		100	10.0	5.25	10 × 100/2	2625	2901		13652
4-PD PRED-A	540	5→100		100	10.0	0.455	10 × 100/5	91	49.14		231
4R-PD-DRY-W	1060	2→250		100	10.0	3.85	10 × 250/2	4812	5101		24006
4R-PD-DRY-A	500	5→100		100	10.0	<0.1	10 × 100/5	<20	<10		<47.1
4-PD-OUT-W	1140	—		100	10.0	8.7	10	87	99.2		467
4-PD-OUT-A	595	5→100		100	10.0	0.372	10 × 100/5	68.4	40.7	39.4	185
						0.330	10 × 100/6	64	38.1		
5-PD-PRED-W	1020	2→100		100	10.0	7.10	10 × 100/2	3550	3621		17040
5-PD-PRE D-A	550	5→100		100	10.0	0.42	10 × 100/5	84	46.2		217.
5-PD-DRY-W	990	2→250		100	10.0	5.75	10 × 250/2	7188	7116		33488
5-PD-DRY-A	678	5→100		100	10.0	<0.10	10 × 100/5	<20	<10.36		<48.8
5-PD-OUT-W	1080	25→100		100	10.0	2.92	10 × 100/25	117	126		593
5-PD-OUT A	545	5→100		100	10.0	0.545	10 × 100/5	109	59.4		280
6-PD-PRED W	1005	2→101		100	10.0	5.95	10 × 100/2	2975	3585		16871
6-PD-PRED-A	560	5→100		100	10.0	0.322	10 × 100/5	64.4	36.1		170
6-PD-DRY-W imp	476	2→250		100	10.0	3.15	10 × 250/2	3938	1870	692	32763
6-PD-DRY-PUDDLE	680	2→250		100	10.0	6.65	10 × 250/2	1562	5142		
6-PD-DRY-A	520	5→100		100	10.0	<0.10	10 × 100/5	<20	<10.4		<48.9
6-PD-OUT-W	990	25→100		100	10.0	2.48	10 × 100/5	99.2	98.2		462
6-PD-OUT-A	678	5→100		10.	10.0	0.302	10 × 100/5	60.4	34.9		164

Ammonia (NH_4^+)

Sample ID	Volume (mls.)	1° Dilution	2° Dilution	mls. IN 100 mls.	x mm = 1.0 on Meter	Meter Reading	Factors	ppm NH_4 (ppm)	Total mg NH_3 (mg)		Total mg NH_4NO_3 Based On mg NH_3
7-PC-By-Wa	985	25→100		100	10.0	2.08	10×100/25	83.2	82		
7 PC By Wb	985	25→100		100	10.0	2.08	10×100/25	83.2	82	81.2	382
7-PC-By-Wc	985	25→100		100	10.0	2.02	10×100/25	80.8	79.6		
7-PC-By-A	500	5→100		100	10.0	<0.10	10×100/5	420	<10		<47.1
7-PC-In-W	1230	2→250		100	10.0	5.25	10×250/2	6562	8006		31676
7-PC-In-A	310	5→100		100	10.0	< 0.10	10×100/5	<20	< 6.2		< 29.2
7-PC-Out-W	1150			100	10.0	6.15	10	61.5	70.7		333
7-PC-Out-A	560	5→100		100	10.0	0.62	10×100/5	1240	69.4		327
8-PC-By-W	1045	25→100		100	10.0	1.75	10×100/25	70	73.2		344
8 PC-By-A	575	5→100		100	10.0	<0.10	10×100/5	<20	<11.5		< 54.1
8-PC-In-W	1280	2→250		100	10.0	3.18	10×250/2	3900	4992		23498
8-PC-In-A	530	5→100		100	10.0	<0.10	10×100/5	<20	<10.6		< 49.9
8-PC-Out-W	1,025			100	10.0	4.08	10	40.8	41.8		197
8 PC-Out-A	468	5→100		100	10.0	0.190	10×100/5	38	17.6		82.6
9-PC-By-W	1280	25→100		100	10.0	1.50	10×100/25	60	76.8		361
9-PC-By-A	490	5→100		100	10.0	<0.1	10×100/5	<20	< 9.8		< 46.1
9-PC-In-W	1170	2→250		100	10.0	3.62	10×250/2	4525	5294		24915
9-PC-In-A	478	5→100		100	10.0	<0.1	10×100/5	<20	< 9.56		< 45
9-PC-Out-W	1155	100		100	10.0	4.08	10	40.8	47.1		222
9-PC-Out-A	530	5→100		100	10.0	0.280	10×100/5	43.6	23.1		109

Ammonia (cont'd)

Sample ID	Volume (mls.)	1st Dilution	2nd Dilution	mls. in 100 mls.	7 ppm = 1.0 on Meter	Meter Reading	Factors	ppm NH_3 (PPM)	Total Mg NH_3 (Mg)	Total Mg NH_4NO_3 Based on Mg NH_3
BL-By-W	1010	–	–	100	10.0	<0.1	10	<1.0	<1.01	<4.75
BL-By-A	498	5→100	–	100	10.0	<0.1	10×100/5	<20	<9.96	<9.96
BL-In-W	995	–	–	100	10.0	<0.1	10	<1.0	<0.995	<4.68
BL-In-A	382	5→100	–	100	10.0	<0.1	10×100/5	<20	<7.64	<35.95
BL-Out-W	935	–	–	100	10.0	<0.1	10	<1.0	<0.935	<4.4
BL-Out A	450	5→100	–	100	10.0	<0.1	10×100/5	<20	<9.0	
1-PT-S	–	4→250	10→100	100	10.0	2.75	10×100/10×250/4	17188	–	80887
2-PT-S	–	4→250	10→100	100	10.0	2.38	10×100/10×250/4	18000	–	84708
3-PT-S	–	4→250	10→100	100	10.0	2.82	10×100/10×250/4	17625	–	82943
4-PD-S	–	2→250	2→100	100	10.0	2.18	100/2×10×250/2	136250		641192
5-PD-S	–	2→250	2→100	100	10.0	2.60	100/2×10×250/2	156250		735312
6-PD-S	–	2→250	2→100	100	10.0	2.68	100/2×10×250/2	167500		788055

TRC – Environmental Consultants, Inc.

Report of Chemical Analysis of Non-Routine Samples

Client: EPA - Columbia Nitrogen

Contract No: 1430-E80-31

Reviewed by: Marilyn Rennert

Report to: W. Wade

Laboratory No: 261-80(3)

Date Received: 8-18-80

Date Reported: 9-5-80 - rev

Type Sample: Filter _____ Fuel Oil _____ Sediment _____ Impinger ✓ Other _____

Sample Number	Location Sample Volume, mls	Analysis No. 1 mg NH_3	based on NH_3 Analysis No. 2 mg NH_4NO_3	Analysis No. 3 mg NO_3	based on NO_3 Analysis No. 4 mg NH_4NO_3	Analysis No. 5 total mg Solids	Analysis No. 6
Blank-By-W	1010	<1.01	<~~5.18~~ 4.75	1.05	1.36	nd <3.0	
Blank-By-A	498	<9.96	<46.9				
Blank-In-W	995	<0.995	<4.68	<0.995	<1.28		
Blank-In-A	382	<7.64	<36.0				
Blank-Out-W	935	<0.935	<4.40	<0.935	<1.21	nd <3.0	
Blank-Out-A	450	<9.0	<42.4				
1-PT-By-W	1125	12.2	57.2	25.9	33.4	13.03	
1-PT-By-A	460	<9.2	<43.3				
1-PT-In-W	1195	54.4	256	63.9	82.5		
1-PT-In-A	510	40.8	192				
1-PT-Out-W	1090	18.7	88.2	4.20	5.41	8.13	
1-PT-Out-A	555	<11.1	<52.2				

Analyzed by: [signature]

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TRC Environmental Consultants, Inc.

Report of Chemical Analysis of Non-Routine Samples

Client: EPA - Columbia Nitrogen

Contract No: 1430 - E80-31

Reviewed by: Marilyn Bennett

Report to: W. Wade

Laboratory No: 261-80 (5)

Date Received: 8-18-80

Date Reported: 9/5/80

Type Sample: Filter ____ Fuel Oil ____ Sediment ____ Impinger ✓ Other ____

Sample Number	Location Sample Volume, mls	Analysis No. 1 mg NH_3	Analysis No. 2 based on NH_3 mg NH_4NO_3	Analysis No. 3 mg NO_3	Analysis No. 4 based on NO_3 mg NH_4NO_3	Analysis No. 5 total mg soluble	Analysis No. 6
2-PT-By-W	920	13.3	62.8	31.5	40.6	nd < 3.0	
2-PT-By-A	535	< 10.7	< 50.4				
2-PT-In-W	1170	64.0	301	97.5	125.8		
2-PT-In-A	550	35.2	166				
2-PT-Out-W	1,170	16.7	78.7	3.88	5.00	nd < 3.0	
2-PT-Out-A	562	< 11.2	< 52.9				
3-PT-By-W	1,110	14.4	67.9	36.1	46.5	nd < 3.0	
3-PT-By-A	520	< 10.4	< 48.9				
3-PT-In-W	1,095	48.2	227	96.4	124.4		
3-PT-In-A	565	31.9	150				
3-PTOut-W	1,080	18.6	87.4	8.59	11.1	3.22	
3-PT-Out-A	520	< 10.4	< 48.9				

Analyzed by: Margaret Dyer

Form CL-0012, Rev.

TRC – Environmental Consultants, Inc.

Report of Chemical Analysis of Non-Routine Samples

Client: EPA – Columbia Nitrogen

Contract No: 1430-E80-31

Reviewed by: Marilyn Rennert

Report to: W. Wade

Laboratory No: 861-80 (3)

Date Received: 8-18-80

Date Reported: 9/5/80

Type Sample: Filter ____ Fuel Oil ____ Sediment ____ Impinger ✓ Other ____

Sample Number	Location Sample Volume, mL	Analysis No. 1 mg NH_3	Analysis No. 2 based on NH_3 mg NH_4NO_3	Analysis No. 3 mg NO_3	Analysis No. 4 based on NO_3 mg NH_4NO_3	Analysis No. 5 total mg. S.i.u.	Analysis No. 6
4-PD-PreD-W	1,105	2901	13,650	10,566	13,630		
4-PD-PreD-A	540	49.14	231				
4R-PD-Dry-W	1,060	5101	24,005	19,080	24,613		
4R-PD-Dry-A	500	<10.0	<47.1				
4-PD-Out-W	1,140	99.2	467	116.7	151	nd < 3.0	
4-PD-Out-A	595	39.4	186				
5-PD-PreD-W	1,020	3621	17,040	12,632	16,283		
5-PD-PreD-A	550	46.2	217				
5-PD-Dry-W	990	7116	33,488	25,059	32,336		
5-PD-Dry-A	518	<10.36	<48.8				
5-PD-Out-W	1,080	13.1	61.5	108.9	140.	4.06	
5-PD-Out-A	545	59.4	280				

Analyzed by: Margaret Page

Form C[illegible]2, Rev

TR Env ent nsu s, I

Report of Chemical Analysis of Non-Routine Samples

Client: EPA - Columbia Nitrogen

Contract No: 1430-E80-31

Reviewed by: Marilyn Rennert

Report to: W. Wade

Laboratory No: 261-80(8)

Date Received: 8-18-80

Date Reported: 9/5/80

Type Sample: Filter _____ Fuel Oil _____ Sediment _____ Impinger ✓ Other _____

Sample Number	Location	Analysis No. 1 mg NH_3	based on NH_3 Analysis No. 2 mg NH_4NO_3	Analysis No. 3 mg NO_3	based on NO_3 Analysis No. 4 mg NH_4NO_3	Analysis No. 5	Analysis No. 6
6-PD-Pre D-W	1,205	3,585	16,870	12,878	16,613		
6-PD-Pre D-A	560	36.1	170				
* 6-PD-Dry-W	water impingers only 475	1,870	8,802	5,848	7,544		
6-PD-Dry-PW, LW	Probe Wash + Line Wash only 680	5,142	24,201	16,405	21,162		
6-PD-Dry-A	520	<10.4	<48.9				
6-PD-Out-W	990	98.2	462	123.6	159	nd <3.0	
6-PD-Out-A	578	34.9	164				

* The probe wash + line wash was kept separate from the impinger water because it appeared that acid from the third impinger went into the second impinger water sample. The samples had to be diluted by a large factor, so that any interference from the H_2SO_4 on the nitrate value was eliminated.

Analyzed by: Margaret Fox

Form CL-0012, Rev.

PS-7

TRC – Environmental Consultants, Inc.

Report of Chemical Analysis of Non-Routine Samples

Client: EPA - Columbia Nitrogen

Contract No: 1430-E80-31

Reviewed by: Marilyn Bennett

Report to: W. Wade

Laboratory No: 261-80 (5)

Date Received: 8-15-80

Date Reported: 9-5-80

Type Sample: Filter ____ Fuel Oil ____ Sediment ____ Impinger ✓ Other ____

Sample Number	Location Volume, mls	Analysis No. 1 mg NH_3	Analysis No. 2 mg NH_4NO_3 (based on NH_3)	Analysis No. 3 mg NO_3	Analysis No. 4 mg NH_4NO_3 (based on NO_3)	Analysis No. 5	Analysis No. 6
7-PC-By-W	985	81.2	382	276	356	nd <3.0	
7-PC-By-A	500	<10.0	<47.1				
7-PC-In-W	1,220	8006	37,677	26,840	34,624		
7-PC-In-A	310	<6.2	<29.2				
8-PC-By-W	1,045	78.2	344	254	328	nd <3.0	
8-PC-By-A	575	<11.5	<54.1				
8-PC-In-W	1,280	4992	23,492	18,400	23,736		
8-PC-In-A	530	<10.6	<49.9				
9-PC-By-W	1,280	76.8	361	284	367	nd <3.0	
9-PC-By-A	490	<9.8	<46.1				
9-PC-In-W	1,170	5294	24,915	20,182	26,035		
9-PC-In-A	478	<9.56	<45.0				

Analyzed by: Margaret Fox

Form C[illegible]12, R[illegible]

TR Env. ient. nsu s, I

Report of Chemical Analysis of Non-Routine Samples

Client: EPA - Columbia Nitrogen

Contract No: 14-31-E50-31

Reviewed by: Marilyn Rennert

Report to: W. Wade

Laboratory No: 261-80 (3)

Date Received: E-18-80

Date Reported: 9/5/80

Type Sample: Filter _____ Fuel Oil _____ Sediment _____ Impinger _____ Other Scrubber Waters

Sample Number	Location	Analysis No. 1 mg/mL NH_3	Analysis No. 2 mg/mL NH_4NO_3	Analysis No. 3 mg/mL NO_3	Analysis No. 4 mg/mL NH_4NO_3	Analysis No. 5 mg/L solids	Analysis No. 6
1-PT-S		17.188	80.687	56.875	73.369	26.0	
2-PT-S		18.000	84.708	59.375	76.594	56.6	
3-PT-S		17.625	82.943	55.625	71.756	46.2	
4-PD-S		136.25	644.172	441.667	569.750	44.7	
5-PD-S		156.25	735.312	500.000	645.000	20.1	
6-PD-S		167.50	788.255	525.000	677.250	8.3	

Analyzed by: Vincent Fox

Form CL-0012, Rev.

TRC – Environmental Consultants, Inc.

Report of Chemical Analysis of Non-Routine Samples

Client: EPA - Columbia Nitrogen
Contract No: 1430 -E80
Reviewed by: Marilyn Rennert
Report to: V. Wade

Laboratory No: 261-80(4)
Date Received: 8-18-80
Date Reported: 9/5/80

Type Sample: Filter _____ Fuel Oil _____ Sediment _____ Impinger _____ Other Audit Samples

Sample Number	Location	mg NO_3/ml Analysis No. 1 TRC analytical Value	mg NO_3/ml Analysis No. 2 EPA - True Value	Analysis No. 3* % Error	Analysis No. 4	Analysis No. 5	Analysis No. 6
01273		9.00	8.98	+ 0.22			
02260		57.0	55.9	+ 1.97			
03274		6.00	6.07	-1.15			
04281		228.1	224	+1.83			
05267		19.6	18.95	+3.43			
				Average 1.72			
*	% Error =	analytical value − true value / true value		× 100			

Analyzed by: Margaret Fox

Form CL-0012, Rev

APPENDIX M.2

DISCUSSION OF ANALYSIS METHODS

M.2 DISCUSSION OF ANALYSIS METHODS

All samples were analyzed on-site for ammonia and nitrate within 48 hours of collection.

M.2.1 Sample Recovery and Preservation

The probe and line washes were performed in accordance with Section 7.2.1 of Method 18 "Determination of Particulate emissions from Ammonium Nitrate Plants". The probe was brushed and rinsed with deionized water three times or until no visible particles remained. The wash was placed in a glass container with a teflon-lined cap. The contents of impingers 1 & 2 were measured to the nearest $\pm$1 ml and then transfered to a sample jar along with the triple rinses of the impingers and connecting glassware. The contents of the third the fourth impingers were measured to the nearest $\pm$1 ml and transferred to a third sample jar along with the triple rinses (with one normal sulfuric acid) of the third, fourth and fifth impingers.

The three sample jars (probe + line washes, water impingers, and acid impingers) were then given to the TRC chemist for preparation for analysis. The probe and line wash and the water impinger contents were combined and the total volume measured in a graduated cylinder. The sample was then spilt and the portion for the nitrate analysis was preserved with 1 ml boric acid solution per 100 ml of sample. The ammonia portion remained untreated.

Five or six scrubber liquor samples were collected during each test run at the prill tower and prill dryers. After reaching room temperature, the pH of each sample was measured and the samples from a given test run were then combined to form one composite sample per test run. A known volume from a composite sample was vacuum filtered through a preweighed glass fiber filter. The filter was rinsed and then returned to the TRC laboratory to be weighed

for undissolved solids. The filtrate was split and the nitrate portion was preserved with boric acid solution.

M.2.2 Nitrate Analysis

The preserved water portion of the impinger samples was analyzed for nitrate using a specific ion electrode as described in Method 18, "The Determination of Particulate Emissions from Ammonium Nitrate Plants". An Orion Specific Ion Meter Model 407 A/F was used so the calibration procedure was modified to follow the instrument manual directions. It was not necessary to graph the standard concentrations vs. millivolts because the meter was calibrated for direct measurement in ppm nitrate and checked with intermediate standards.

The acid portion of the impinger train was not measured for NO_3^- because samples with a pH of less than 2 are difficult to measure reliably. The high mobility of the hydrogen ions makes it impossible to "swamp out" their effect on the junction potential. During the third test at the dryer inlet a part of the acid from the third impinger was drawn back into the second impinger. This was discovered during the measurement of the impinger contents. The contents of the first and second impingers were combined and analyzed separately from the probe and line wash. This was done in order to confine any acid interference to only part of the water sample. The pH of the sample (6-PD-Dry-Water only) was less then 2. However, the nitrate concentration was so high that the sample was diluted 1250 times before measurement. The pH after the dilution was near 7 which would indicate that there was no interferences from the acid for this measurement.

The meter was calibrated for the range of 1.00 - 100.0 ppm nitrate. 10 ppm and 100 ppm nitrate standards were used to set the calibration and 1.0,

5.0, and 50.0 ppm standards were read to check the calibration. The 5.0 and 50.0 ppm standards read within 3% of their true values. The 1.0 ppm standard read between 1.4 to 1.6 ppm. The only samples which had readings below 5.0 ppm were the three clean-up evaluation samples, two of which were below scale, and Tests 1 and 2 Prill Tower Outlet Samples which read between 3 and 4 ppm nitrate.

During each set of analyses, one sample was analyzed in triplicate as part of a general laboratory quality control procedure. A summary of this data is presented as follows:

RESULTS OF TRIPLICATE ANALYSES OF NITRATE (mg NO_3^-)

Sample ID	Test 1	Test 2	Test 3	Mean	Standard Deviation
2-PT-Out-W	3.80	3.95	3.88	3.88	0.075
4-PD-Out-W	117.6	117.6	114.9	116.7	1.56
9-PC-Out-W	47.1	48.0	47.1	47.4	0.52

The audit samples and some of the emission samples were also analyzed by the known addition method. This method was done as a check on the direct measurement results. It was easily performed with the specific ion meter. The results differed from the direct measurement numbers by an average of +8.3%. The average error for the audit samples was 7.5% for the known addition method compared to 1.72% for the direct method. These results indicate that the known addition method is not as accurate as the direct measurement method; therefore, the known addition results were not used. Table M-1 shows the results of these comparison analyses.

TABLE M-1

COMPARISON OF DIRECT MEASUREMENT TO KNOWN ADDITION MEASUREMENT OF NITRATE BY SPECIFIC ION ELECTRODE

Sample Identification	A Direct (mg NO_3^-/ml)	B Known Addition (mg NO_3^-/ml)	Actual EPA Value (mg NO_3^-/ml)	% Difference (B/A) x 100	% Error: Audit Samples by Known Addition
Audit Sample 01273	9.00	9.90	8.98	10.0	10.2
Audit Sample 02260	57.0	60.62	55.9	6.4	8.4
Audit Sample 03274	6.00	6.38	6.07	6.3	5.1
Audit Sample 04281	228.1	238	224	4.3	6.2
Audit Sample 05267	19.6	20.4	18.95	4.1	7.7
					7.5 Average
Bl-By-W	1.04	1.30		25.0	
Bl-In-W	1.0	1.14		14.0	
Bl-Out-W	1.0	1.12		12.0	
1-PT-By-W	23.0	23.0		0.0	
1-PT-In-W	53.5	56.0		4.7	
1-PT-Out-W	3.85	4.2		9.1	
4R-PD-Dry-W	18.00	20.625		14.6	
5-PD-Dry-W	25.312	25.936		2.5	
6-PD-Dry W only	12.312	13.500		9.6	
6-PD-Dry-PW, LW only	24.125	24.688		2.3	
				8.3	Average (including audit samples)

KEY:
- Bl = Blank
- By = Bypass
- In = Inlet
- Out = Outlet
- PT = Prill Tower
- PD = Prill Dryer
- Dry = Dryer
- W = Water Fraction
- W only = Water Impingers Only
- PW, LW only = Probe Wash and Line Wash Only

M.2.3 Ammonia Analyses

The water impinger samples and acid impingers samples and the scrubber liquors were analyzed for ammonia using an Orion Ammonia Electrode Model 95-10 and specific ion meter Model 407 A/F. The only parameter that required control was the level of dissolved species. Therefore, the acid impinger samples were diluted to less than 0.2M before measurements were taken.

The specific ion meter was calibrated to read 1.0 - 100 ppm ammonia. At the lower end the standards read high: 1.0 ppm read from 1.2 -1.65 ppm and 5.0 ppm read from 5.0 - 5.60 ppm. The 50.0 ppm standard read within 1% of its true value. All the blank samples and the diluted acid portions of the prill tower bypass and outlet, dryer inlet and the cooler bypass and inlet samples read below scale (less than 1.0 ppm ammonia). The diluted acid portions of the prill tower inlet, predryer inlet and predryer/dryer outlet read between 3.0 - 5.4 ppm ammonia. The results of these acid impinger samples may be high as indicated by the standard readings. The water portion of the impinger samples and the scrubber liquor samples read above 10 ppm so that these results should be within 1% to 2% of the true value.

During each analysis set, one sample was analyzed in triplicate as part of a general laboratory quality control procedure. A summary of this data is presented as follows:

RESULTS OF TRIPLICATE ANALYSES OF AMMONIA (mg NH_3)

Sample ID	Test 1	Test 2	Test 3	Mean	Standard Deviation
2-PT-In-W	62.13	64.4	65.6	64.0	1.76
5-PD-Out-W	126	133	135	131.3	4.73
7-PC-By-W	82.0	82.0	79.6	81.2	1.39

M.2.4 Undissolved Solids

After the field preparation the scrubber liquor filters were returned to TRC to be weighed to constant weight on a five place balance. The original test directive did not require the filtering of the impinger samples for undissolved solids. After returning from the field this was requested for bypass and outlet water impinger samples. The volume of the unpreserved ammonia analysis portion of the sample was measured and then filtered through a preweighed glass fiber filter. The filter was rinsed with deionized, distilled water, then desiccated for 24 hours before weighing to constant weight. This procedure was done 18 to 22 days after sample collection. The first prill tower bypass sample (1-PT-By-W) appeared to contain a large amount of an orange-colored precipitate, perhaps an iron compound. This may have fallen out of solution during the three week time period since sample collection.

The Blank bypass and outlet samples were filtered and weighed. The difference between the initial and final weights was negative (-1.26 mg for the Bypass and -1.58 mg for the outlet). Eight of the 12 field samples gave negative weights also. These field sample filters were very similar in appearance to the blanks, containing a very light particulate. The prill tower Test 1 sample, as mentioned, had an orange precipitate and was measurable. Filters for samples 3-PT-Out-W and 4-PD-Out-W appeared to contain slightly more particulate than the blank and gave positive readings (1.06 and 0.64 mg).

Since the blanks and many of the samples gave negative weights, the limit of detection for this set of filters was set at 1.0 mg. Only one third of the sample was filtered since the remainder has been either preserved or used in other analyses. Multiplying by this factor raised the limit of detection to 3.0 mg.

APPENDIX M.3

CHEMICAL LABORATORY NOTEBOOK

5/7/80

Prepare new standards and reagents for on site analysis - Standard salts dried at 104°C & dessicated

2 liters 1000ppm NO_3 solution 1.29g NH_4NO_3/l

2.58g /2l

2l 0.1N/ NH_4Cl std = 5.35g NH_4Cl/l

10.70g /2l

New Boric Acid Preservative 2l 62g/l H_3BO_3

124g /2l

Ionic Strength Adjustor 264g $(NH_4)_2SO_4$/l

1l 10N NaOH. 400g/l

Witnessed & Understood by me.	Date	Invented by	Date
		Recorded by Margaret Fox	5/7/80

From Page No.__

8-11-80

Set up lab + Clean up area
pH meter

2IE-Meter

Prepare 1N H_2SO_4 28 mls H_2SO_4 → 1l

To prepare 2000 mls = 56 mls H_2SO_4 added to 1,944 mls H_2O

(2500 mls = 70 mls → 2,430 mls H_2O

Perform Specific Ion Meter - Check p10 of manual
Step 4 recal reads 2.92 (2.9 ± 0.1) -OK

Prepare - Nitrate Standards - Stock = 1000 ppm NO_3

Prep Stds
100 ppm NO_3 50 → 500.
10 5 → 500.
1.0 25 mls 10 ppm → 250.
5.0 ~~25~~ 10 mls 100 ppm → 200.
50.0 10 mls 1000 ppm → 200

Prepare Ammonia Stds Stock 0.1 Molar NH_4Cl = 5.35 g/l
Want 1000 ppm NH_3
0.1 M = 1,700 mg NH_3/l $\frac{1000}{1700}$ = .0588 = 58.8 mls → 1l

10.0 ppm NH_3 = 25 → 250 of 100 ppm
1.0 ~~5 → 100 of 100~~ p 25 → 250 of 100
5 ppm 5 → 100 of 100 ppm
50 5 → 100 of 1000 ppm

To Page No

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by Margaret Fox	8/11/80

..E CNC

Project No. 1430-E80
Book No. CNC-LAB

n Page No.

8/11/80

Analysis of EPA Ammonium Nitrate in Water Samples

Results reported in mg NO_3/ml solution.

Slope = 91.5%

Sample #	Code	Standard (from p2)	Meter Reading
	01273	100.0 ppm	10.0 set
	02260	10.0	1.0 set
	03274	1.0	~~1.0~~ 0.158
	04281	5.0	0.495
	05267	50.0	~~5~~ 4.90

Sample ID	1st Dilution	2nd Dilution	mls in Beaker	1.0 on Meter = X ppm	Meter Reading	FACTORS	ppm NO_3	analyzed mg/ml NO_3	actual mg/ml NO_3
01273	5→250	10→100	100	10.0	1.80	$10 \times \frac{100}{10} \times \frac{250}{5}$	9000	9.00	8.98
								% Error	+0.22%
02260	5→250	5→100	100	10.0	5.70 ~~5.85~~	$10 \times \frac{100}{5} \times \frac{250}{5}$	57,000	57.0	55.9
								% Error	+1.97%
03274	5→250	25→100	100	10.0	3.00	$10 \times \frac{100}{25} \times \frac{250}{5}$	6,000	6.00	6.07
								% Error	-1.15
04281	5→250	4→500	100	10.0	3.65	$10 \times \frac{500}{4} \times \frac{250}{5}$	228,125	228.1	224.
								% Error	+1.83
05267	5→250	10→100	100	10.0	3.92	$10 \times \frac{100}{10} \times \frac{250}{5}$	19,600	19.6	18.95
								% Error	+3.43

Calculations

$$\text{mg/ml } NO_3 = \text{Meter reading} \times \frac{10 \text{ ug/ml}}{1.0 \text{ Meter reading}} \times \frac{1 \text{ mg}}{1000 \text{ ug}} \times \frac{\text{Volume of 2nd dil}}{\text{mls diluted}} \times \frac{\text{volume 1st dilution}}{\text{mls diluted}}$$

$$\% \text{ Error} = \frac{\text{Analytical Result} - \text{Actual Value}}{\text{Actual Value}} \times 100$$

To Page No.

nessed & Understood by me, Lennon 8-25-80

Date

Invented by

Recorded by Margaret McFox

Date 8/12/80

Project No. 1430-E80
Book No. MF-CNC- TITLE CNC

Page No. —

8/12/80

Audit Stds - Known Addition
- See p 17 of Orion NO_3 electrode Manual

Add 1.0 ml of 1000 ppm NO_3

Sample #		Q Reading	[illegible]	[illegible]	[illegible]
1		1.9	[illegible]	[illegible]	[illegible]
2	add 2 mls	3.4	[illegible]	[illegible]	[illegible]
3		3.4	[illegible]	[illegible]	[illegible]
4		4.0	[illegible]	[illegible]	[illegible]
5		3.9	[illegible]	[illegible]	[illegible]

8/12/80

The above known addition samples are not as close as the direct measurement samples because the known addition 1000 ppm solution was too dilute. Should have a 5,000 or 10,000 ppm NO_3 solution. If time allows I will prepare these standards and rerun the Audit Samples (See p 6 ~~8/19/80 These were not repeated~~)

10,000 ppm NO_3 = 12.9 g NH_4NO_3/l

Prep 500 mls = 6.45 g NH_4NO_3/l

wtd Peaks 12.6554
6.45
19.1054

To Page No. ____

nessed & Understood by me,	Date	Invented by	Date
		Recorded by Margaret Fox	5/12/80

TITLE CWC

Project No. 1430-E80

Book No. CWC-LAB

From Page No.—

Sample Volumes

Sample ID	Volume ml	Filter ID	Date
Bl-By-W	1010		8-12-80
Bl-By-A	498.		
Bl-In-W	995		
Bl-In-A	382.		
Bl-Out-W	935		
Bl-Out-A	450.		
1-PT-By-W	1,125		
1-PT-By-A	460.		
1-PT-In W	1,195		
1-PT-In-A	510		
1-PT-Out-W	1,090		
1-PT-Out-A	555		

To P

Witnessed & Understood by me.	Date	Invented by	Date
		Recorded by Margaret Day	8/12/80

Project No. 1430-E80-31
Book No CNC-LAB TITLE CNC

From Page No.

Repeat Audet Sample using Standard addition 8/12/80
with a ~~10,000~~ 5,000 ppm NO_3 solution = 5.000 mg/ml

ID	1st Dilution	2nd Dilution	Q Reading	~~ppm~~ mg/ml Result FACTOR	
01273	5→250	5→100	0.198	$\frac{250}{5} \times \frac{100}{5}$	9.90
02960		5→250	0.485	$\frac{250}{5} \times \frac{250}{5}$	60.62
03274		10→100	0.255	$\frac{250}{5} \times \frac{100}{10}$	6.38
04281		~~2→1000~~ 4→1000	0.380	$\frac{250}{5} \times \frac{1000}{4}$	238
05267	↓	3→100	0.245	$\frac{250}{5} \times \frac{100}{3}$	20.4

$$C_0 = \frac{Q}{100} C_S$$

$$C_0 = \frac{Q}{100} \times 5.00 \text{ mg/ml}$$

Calculation

$$mg/ml^{NO_3} = \frac{Q}{100} \times 5.000 \text{ mg/ml} \times \frac{\text{Volume of 2nd dilution}}{\text{ml diluted}} \times \frac{\text{volume of 1st dilute}}{\text{ml dilution}}$$

To Page N

Witnessed & Understood by me.	Date	Invented by	Date,
M. Rennert	8/21/80	Recorded by Margaret Fry	8/12/80

TITLE Columbia Nitrogen	Project No. 1430-E80-
	Book No. CNC-LAB

From Page No.— Ammonia Analysis 8/12/80

Ammonia Standards Stock 0.1 M NH_4Cl

ppm stds	Prep	Meter Reading	Slope =
100.0	58.8 mls → 1l ⇒	10.0 set	~~90%~~
10.0	100 mls of 100 ppm → 1l	1.00 set	92%
1.0	25 mls of 10 ppm → 250	0.125	
5.00	5 mls of 100 ppm → 100	0.525	
50.0	50 mls of 100 ppm → 100	4.95	

Sample ID	Volume mls	1st Dilution	2nd Dilution	mls in 100 mls	1.0 on meter = x ppm	Meter Reading	FACTORS	ppm NH_3	total mg NH_3	total mg NH_4NO_3 Based on NH_3
Bl-By-W	1010	~~5~~	—	100	10.0	<0.1	10	<1.0	<1.01	<~~5.13~~ 4.75
Bl-By-A	498	5→100	—	100	10.	<0.1	$10 \times \frac{100}{5}$	<20	<9.96	<46.9
Bl-In-W	995	—	—	100	10.	<0.1	10	<1.0	<0.995	<4.68
Bl-In A	382	5→100	—	"	10.	<0.1	$10 \times \frac{100}{5}$	<20	<7.64	<36.0 <35.95
Bl-Out-W	935	—	—	"	10.0	<0.1	10	<1.0	<0.935	<4.40
Bl-Out-A	450.	5→100	—	"	10.0	<0.1	$10 \times \frac{100}{5}$	<20.	<9.0	<42.4
Field lab tap water	—	—	—	"	10.0	<0.1	10	<1.0		

Factor to convert NH_3 → NH_4NO_3 is 4.706
Calculated on P 13

To Page No. 8

Witnessed & Understood by me.	Date	Invented by	Date
M. Rennert	8-21-80	Recorded by Margaret M. Fox	8/13/80

8

Project No. 1430-E80

Book No. CNC-LAB TITLE CNC

Page No.

Ammonia Continue from p7 8-12-80

Sample ID	Volume mls	1st Dilution	2nd Dilution	mls in 100 mls	1.0 on meter = X ppm	Meter Reading	FACTORS	ppm NH_3	total mg NH_3	total mg NH_4NO_3 based on NH_3
1-T-By-W	1125	—	—	100	10.0	1.08	10.0	10.8	12.15	57.2
1-T-By-A	460	5→100	—	100	10.0	<0.10	$10 \times \frac{100}{5}$	<20	<9.2	<43.3
1-PT-In-W	1195	—	—	100	10.0	4.55	10	45.5	54.4	256
1-PT-In-A	510	5→100	—	100	10.0	0.400	$10 \times \frac{100}{5}$	80.0	40.8	192
1-PT-Out-W	1,090	—	—	100	10.0	~~1.58~~ 1.72	10 × [illegible]	17.2	18.7	88.2
1-PT-Out A	555	5→100	—	100	10.0	<0.10	$10 \times \frac{100}{5}$	<20	<11.1	<52.2

To Page No.

ed & Understood by me. | Date | Invented by | Date 8/13/80

Recorded by Margaret McFx

11

TITLE CNC

Project No. 1430-E80

Book No. CNC-LAB

From Page No.

Nitrate Analysis

8/12/80

Stock = 1000 ppm NO_3

Standard	Prep	Meter Reading	Slope 92%
100.0	50 ml 1000 ppm → 500	10.0 set	
10.0	5 ml of 1000 ppm → 500	1.00 set	
1.0	25 mls of ~~250~~ 100 ppm → 250	0.155	
5.0	5 ml of 100 ppm → 100	0.505	
50.0	5 ml of 1000 ppm → 100	5.00	

Sample ID	Volume mls	1st Dilution	2nd Dilution	mls in 100 mls	1.0 on meter = 7 ppm	Meter Reading	FACTORS	ppm NO_3	mg NO_3	mg NH_4NO_3 based on NO_3
Bl-By-W	1010	—	—	100	10.0	0.104	10	1.04	1.05	1.36
Bl-In-W	995	—	—	100	10.0	<0.100	10	<1.0	<0.995	<1.28
Bl-Out-W	935	—	—	100	10.0	<0.100	10	<1.0	<0.935	<1.21
1-PT-By-W	1125	—	—	100	10.0	2.30	10	23.0	25.9	33.4
1-PT-In-W	1195	—	—	100	10.0	5.35 ~~9.3~~	10	53.5	63.9	82.5
1-PT-Out-W	1090	—	—	~~50.0~~ 100	~~10.0~~ 10.0	~~0.4~~ ~~9.3~~ 0.385 (0.385)	10	3.85	4.20	5.41
Tap Water	—	—	—	100	10.0	0.170	10	1.7		
5,000 ppm	—	2→250	—	100	10.0	4.05	10 × 250/2	5062		
MRI 2	—	—	—	(100)	10.0	5.20	10.0	52.0		
MRI Dil 2	—	—	—	100		6.00	10.0	60.0		

To Page No.

Witnessed & Understood by me, P. Lemon 8-25-80

Date

Invented by

Recorded by [illegible]

Date 8/3/80

Project No. 1437-E80
Book No. CNC-LAB TITLE CNC

From Page No.

Nitrate By Standard Additions 8/12/80

No Dilution necessary

#	Volume	Cs	Q	C_o (ppm NO_3)
Bl-By W		50	2.60	1.3
Bl-In W		100	1.14	1.14
Bl-Out W		100	1.12	1.12
I-PT-By-W		1000	2.30	23.0
1-PT-In-W		5000	1.12	56.0
1-PT-Out-W		100	4.2	4.2

Calculation

$$C_o = \frac{Q}{100} C_s$$

C_o = Sample concentration
Q = reading from green increment real
C_s = concentration of added Standard

To Page No.

Witnessed & Understood by me. M. Rennet

Date 8/21/80

Invented by

Recorded by Margaret Fox

Date 8/12/80

| | |

TITLE CNC

Project No. 1430-E80

Book No. CNC-LAB

From Page No.

pH of Scrubber Water 8-13-80 10:4

(7=7.0 10 pH (=9.2) Test 1+2 Prill Tower.

Prill T	Test #	Part #	pH
	1	1	4.40
		2	3.88
		3	3.95
		4	3.65
		2	4.42
	2	1	5.88
		2	5.70
		3	~~4.78~~ 4.75
		4	5.22
		5	5.70
		6	4.92
pH 4.01=4.0	3	1	4.22
pH 7.0=6.92		2	3.72
		3	3.88
		4	4.05
		5	3.50

8/13/80 1:05

To Page No.

Witnessed & Understood by me.	Date	Invented by	Date
		Recorded by Margaret Fox	8/13/80

Project No. 1430-E-80
Book No. CAK-LAB TITLE C N C

From Page No.__

8/1

Sample Volumes

Sample ID	Volume mL	Filter ID	Date
2-PT-By-W	920		8-13-80
2-PT-By-A	535		
2-PT-In-W	1,140.		
2 PT-In-A	550		
2-PT-Out-W	1,170.		
2-PT-Out A	562		
3-PT-By-W	1,110		
3-PT-By-A	590		
3-PT-In-W	1,095		
3-PT-In-A	565		
3-PT-Out-W	1,080.		
3-PT-Out-A	520		
1-S	585	5041	
2-S	710	5042	
3-S	560	5043	

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Witnessed & Understood by me.	Date	Invented by	Date
		Recorded by Margaret Ivy	8/13/80

TITLE CNC

Project No. 1430-E80
Book No. CNC-LAO

From Page No.

8-13-80

Gravimetric factor for NH_4NO_3

NH_4NO_3	weight
2 N =	28
4 H =	4.0
3-O =	48.0
	80.0 g

weight NH_3 = 17 g

to convert $NH_3 \rightarrow NH_4NO_3$ multiply by

$$\frac{NH_4NO_3}{NH_3} = \frac{80}{17} = 4.706$$

weight NO_3 = 62 g

To convert $NO_3 \Rightarrow NH_4NO_3$ multiply by

$$\frac{NH_4NO_3}{NO_3} = \frac{80}{6.2} = 1.290$$

To Page No.

Witnessed & Understood by me.	Date	Invented by	Date
M. Rennert	8/21/80	Recorded by Margaret Fox	8/13/80

Project No. 1430-E80
Book No. CNC-LAB TITLE CNC

Page No.__ Ammonia analysis 8-14-80

Stock 0.1M NH_4Cl

Standards	Prep	Meter Reading	Slope 91%
100 ppm	58.8 ml stock → 1 l	10.0 set	
10.0 ppm	100 ml of 100 ppm → 1 l	1.00 set	
1.00 ppm	25 ml of 10 ppm → 250 ml	0.132	
5.00 ppm	5 ml of 100 ppm → 100.	~~0.4~~ 0.500	
50.0 ppm	50 ml of 100 ppm → 100	5.05	

Sample ID	Volume mls	1st dilution	2nd Dilution	mls in Beaker → 100	1.0 on meter = X ppm	Meter Reading	FACTORS	ppm NH_3	total mg NH_3	total mg NH_4NO_3 Based on NH_3
2-PT-By-W	920	—	—	100	10.0	1.45	10.	14.5	13.3	62.8
2-PT-By-A	535	5 → 100	—	"	"	<0.10	$10 \times \frac{100}{5}$	<20.	<10.7	<50.4
2-PT-In-W QA	1140	—	—	"	"	5.45	10	54.5	62.13	292.4
2-PT-In-A	550	5 → 100	—	"	"	0.320	$10 \times \frac{100}{5}$	64.0	35.2	165.6
2-PT-Out-W	1170	—	—	"	"	1.43	10	14.3	16.7	78.7
2-PW-Out-A	562	5 → 100	—	"	"	<0.10	$10 \times \frac{100}{5}$	<20.	<11.2	<52.9
3-PT-By-W	1110	~~5 → 100~~ no	—	"	"	1.30	10	13.0	14.4	67.9
3-PT-By-A	520	5 → 100	—	"	"	<0.10	$10 \times \frac{100}{5}$	<20.	<10.4	<48.9

see average p15

To Page No.____

Witnessed & Understood by me, J. Rennett

Date 8-21-80

Invented by

Recorded by M. Fox

Date 8/15/80

Project No. 1430-E80

.E CNC

Book No. CNC-LAB

m Page No. 14

Ammonia Analysis — Continued 8-14-80

Sample ID	Volume mls	1st Dilution	2nd Dilution	mls in Beaker →100	1.0 on Meter = x ppm	Meter Reading	FACTORS	ppm NH_3	total mg NH_3	total mg as NH_4NO_3
3-PT-In-W	1,095	—	—	100	10.0	4.40 ~~4.35~~	10	44.0	48.18	227.
3-PT-In-A	565	5→100	—	"	"	0.282	$10 \times \frac{100}{5}$	56.4	31.9	150
3-PT-Out-W	1,080	—	—	"	"	1.72	10	17.2	18.6	87.4
3-PT-Out-A	520	5→100	—	"	"	<0.10	$10 \times \frac{100}{5}$	<20	<10.4	<48.9
1-PT-S	—	4→250	10→100	"	"	2.75	$10 \times \frac{100}{10} \times \frac{250}{4}$	17,188		ppm NH_4 80,887
2-PT-S	—	4→250	10→100	"	"	2.88	$10 \times \frac{100}{10} \times \frac{250}{4}$	18,000		84,708 ppm
3-PT-S	—	4→250	10→100	"	"	2.82	$10 \times \frac{100}{10} \times \frac{250}{4}$	17,625		82,943 ppm
QA										
2-PT-In-W b	1140 ~~1,095~~	—	—	100	"	5.65 ~~5.35~~	10	56.5	64.4 ~~61.9~~	303 ~~291~~
2-PT-In-W c	1140 ~~1,095~~	—	—	"	"	5.75	10	57.5	65.6 ~~63.0~~	308 ~~296~~
QA	Average	2-PT-In-W				a		54.5	62.1	292
						b		56.5	64.4	303
						c		57.5	65.6	308
							Ave	56.2	64.0	301

To Page No.

tnessed & Understood by me, M. Remert

Date 8-21-80

Invented by

Recorded by M. Fox

Date 8/15/80

Project No. 1430-E-80

Book No. CNC-LAB TITLE CNC

Page No.

Nitrate Analysis

Ted 263

8-14-80

Stock 1000 ppm NO_3

Slope 93%

Standard	Prep	Meter Reading
100.0 ppm	~~25 → 250~~ ~~100 → 500~~	10.0 set
10.0 ppm	5 mls of stock → 500	1.00 set
1.00 ppm	25 mls ~~of~~ 10 ppm → 250	0.158
5.00 ppm	5 mls of 100 → 100,	~~0.480~~ 0.575
50.0 ppm	5 mls of 1000 → 100,	~~4.85~~ 5.00

Sample ID	Volume mls	1st Dilution	2nd dilution	mls in 100 mls	1.0 on Meter = X ppm	Meter Reading	FACTORS	ppm NO_3	total mg NO_3	total mg NH_4NO_3
2-PT-By-W	920	—	—	100	10.0	3.42	10	34.2	31.5	40.6
2-PT-In-W	1,140	—	—	"	"	8.55	10	85.5	97.5	125.8 ~~126~~
2-PT-Out-W	1,170	—	—	"	"	0.325	10	3.25	3.80	4.90 ~~one~~ 4.17
3-PT-By-W	1,110	—	—	"	"	3.25	10	32.5	36.1	46.5
3-PT-In-W	1,095	—	—	"	"	8.80	10	88.0	96.4	124.4
3-PT-Out-W	1080	—	—	"	"	~~0.445~~ 0.795	10	7.95	8.59	11.08
" repeat		—	—	"	"	0.795				
1-PT-S	—	4 → 250	5 → 100	"	"	4.55	$10 \times \frac{100}{5} \times \frac{250}{4}$	56,875		73,369 ppm
2-PT-S	—	4 → 250	5 → 100	"	"	4.75	$10 \times \frac{100}{5} \times \frac{250}{4}$	59,375		76,594
3-PT-S	—	4 → 250	5 → 100	"	"	4.45	$10 \times \frac{100}{5} \times \frac{250}{4}$	55,625		71,756

To Page No.

essed & Understood by me,	Date	Invented by	Date
P. Lemon 8-25-80		Recorded by Margaret Fox	8/15/80

Nitrate Analysis

8-14-80

Sample ID	Volume mls	1st Dilution	2nd Dilution	mls in 100 ml	1.0 = Meter Reading = x ppm	Meter Reading	FACTORS	ppm NO_3	total mg NO_3	total mg NH_4NO_3
QA										
2-PT-Out-W b	1170	—	—	100	10.0	0.338	10	3.38	3.95	5.10
2-PT-Out-W c	1170	—	—	"	"	0.332	10	3.32	3.88	5.01
MSI A-4	—	—	—	100	10.0	1.48	10	14.8		

Quality Assurance Average 2 PT-Out-W

	ppm NO_3	total mg NO_3	total mg NH_4NO_3
a	3.25	3.80	4.90
b	3.38	3.95	5.10
c	3.32	3.88	5.01
Ave	3.32	3.88	5.00

To Page No.

Witnessed & Understood by me,	Date	Invented by	Date
P. Lennon 8-25-80		Recorded by Margaret Lee	8/15/80

Project No. 1430-E80

Book No. CNC-LAB TITLE CNC

From Page No. —

Sample Volumes

8/1

Sample ID	Volume mls	Filter ID	Date
			8-14-80
4-PD-PreD-W (ED)	1,105		
4-PD-PreD-A	540		
4-PD-Dry-W (Leigh)	Void		
4-PD-Dry-A	Void		
4-PD-Out-W (Jim)	1,140		
4-PD-Out-A	595		
5-PD-PreD-W	1,020		
5-PD-PreD-A	550		
5-PD-Dry-W	9,90		
5-PD-Dry-A	518		
5-PD-Out-W	1,080		
5-PD-Out-A	545		

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by Margaret M. [illegible]	8/

TLE CNC

Project No. 1430-E80

Book No. CNC-LAB

1

om Page No.

Sample Volumes

Sample ID	Volume	Filter ID	Date
6-PD-PreD-W	1205		8/15/80
6-PD-~~Dry~~ PreD-A	560		
* 6-PD-Dry-Water only	475		
* 6-PD-Dry-PW, LW	680		
6-PD-Dry-A	520		
6-PD-Out-W	990.		
6-PD-Out A	578		
4R ~~2~~-PD-Dry-W	1,060		
4R ~~2~~-PD-Dry A ~~W~~ (Leigh's last test)	500.		
4-PD-S	485	5044	
5-PD-S	640	5045	
6-PD-S	525	~~5045~~ 5046	

* Skip Alleman did the moisture on test # 6-PD-Dry - Imp 2 (H_2O) had a high water volume. The third Imp 3 (H_2SO_4) only had ~ 60 ml. H_2SO_4. I checked the pH of the Water Impinger bottles. It was acidic. I will ~~keep~~ keep the PW & LW separate from the Water Imp Sample. I'll adjust pH of water imp if necessary to do NO_3. I'll also do Standard additions on the sample

pH of PW & LW neutral

To Page No.

Witnessed & Understood by me. | Date | Invented by | Date 8/15/80

Recorded by Margaret [illegible]

Project No. 1430-E80
Book No. CNC-LAB TITLE CNC

Page No.

pH - Prill Dryer Sample 8-15-80
Scrubber Water

Calibration

	Part	pH	pH Buffer	Reddy
			4.01	4.00
4-PD-S	1	6.45	7.00	6.88
	~~3~~			
	2	6.45		
	3	6.25		
	4	6.20		
	5	6.12		
5-PD-S	1	6.15		
	2	6.55		
	3	6.58		
	4	6.55		
	5	6.58		
	6	6.40		
6-PD-S	1	6.32		
	2	6.38		
	3	6.32		
	4	6.32		
	5	6.32		

4.01 = 4.10
7.00 = 7.00 cal

To Page No.

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by Margaret Fox	8/15/80

Project No. 1430-E-80

Book No. CWC-4AB TITLE CWC

a e No.__ Nitrate Analysis - Prill Dryer 8/15/80

Stock 1000 ppm NO_3

Standard	Prep	Meter Reading	Slope 93%
100.0 ppm NO_3	50 → 500	10.0 set	
10.0	5 → 500	1.00 set	
1.00	25 ml 10 ppm → 250	0.148	
5.00	5 ml of 100 ppm → 100.	0.515	
50.00	5 ml of 1000 ppm → 100.	5.05	

Sample ID	Volume mls	1st Dilution	2nd Dilution	mls in 100 mls	1.0 on = x ppm	Meter Reading	FACTORS	ppm NO_3	total mg NO_3	mg NH_4NO_3
-PD-PreDW	1105	4 → 250	10 → 100	100	10.0	1.53	$10 \times \frac{100}{10} \times \frac{250}{4}$	9562.	10,567	13,630
PD-Dry-W Repeat	1060	4 → 250	10 → 100	100	"	2.88	$10 \times \frac{100}{10} \times \frac{250}{4}$	18,000	19,080 ~~23,220~~	24,613 ~~29,954~~
PD-Out-W (QA-a)	1140	25 → 100	—	"	"	2.58	$10 \times \frac{100}{25}$	103.2	117.6	152
								see average p 23		
PD-PreDW	1020	4 → 250	10 → 100	"	"	1.98	$10 \times \frac{100}{10} \times \frac{250}{4}$	12,375	12,622	16,283
PD-Dry-W	990	4 → 250	10 → 100	"	"	4.05	$10 \times \frac{100}{10} \times \frac{250}{4}$	25,312	25,059	32,327
PD-Out-W	1,080	25 → 100	—	"	"	2.52	$10 \times \frac{100}{25}$	100.8	108.9	140.4
-PD-PreDW	1205	4 → 250	10 → 100	"	"	1.71	$10 \times \frac{100}{10} \times \frac{250}{4}$	10,688	12,878	16,613
-PD-Dry-W water only pH ok	475	4 → 250	5 → 100	"	"	0.985	$10 \times \frac{100}{5} \times \frac{250}{4}$	12,312	5,848	7,544
PD-Out-W	990	25 → 100	—	"	"	3.12	$10 \times \frac{100}{25}$	124.8	123.6	159
-PD-Dry-PW&LW	680	4 → 250	5 → 100	"	"	1.93	$10 \times \frac{100}{5} \times \frac{250}{4}$	24,125	16,405	21,162

To Page No.____

sed & Understood by me, Lennon 8/25/80

Date

Invented by

Recorded by Margaret Fox

Date 8/16/80

TLE CWC

Project No. 1430-E-80
Book No. CWC-LAB

om Page No.

Nitrate Analysis - Prill Dryer 8/15/80

Sample ID	Volume mls	1st Dilution	2nd Dilution	mls in → 100 mls	100 Meter = X ppm	Meter Reading	Factors	ppm NO_3	total mg NO_3	total mg NH_4NO_3
4-PD-S	—	4→250	3→1000	10 100	10.0	2.12	$10 \times \frac{1000}{3} \times \frac{250}{4}$	441,667		569,750 ppm NH_4NO_3
5-PD-S	—	4→250	3→1000 ~~5→250~~	"	"	2.40	$10 \times \frac{1000}{3} \times \frac{250}{4}$	500,000		645,000 ppm NH_4NO_3
6-PD-S	—	4→250	3→1000 ~~5→250~~	"	"	2.52	$10 \times \frac{1000}{3} \times \frac{250}{4}$	525,000		677,250 ppm NH_4NO_3
Quality Assurance										
4-PD-Out-W b	1140	25→100	—	"	"	2.58	$10 \times \frac{100}{25}$	103.2	117.6	152
4-PD-Out-W c	1140	25→100	—	"	"	2.52	$10 \times \frac{100}{25}$	100.8	114.9	148.
a								103.2	117.6	152
QA 4-PD-Out-W Average							ave	102.4	116.7	151

To Page No.

Witnessed & Understood by me, P. Lennon 8/25/80

Date

Invented by

Recorded by Margaret Fox

Date 8/16/80

Project No. 73-EVO

Book No. CNC-LAB TITLE CNC

From Page No.

Nitrate - Standard Addition 8/15/80

Sample ID	Volume	C_s conc of std added	Q	1st dilution	2nd dilution	Calculation	C_o ppm NO_3	total mg NO_3
4-PD-Dry-W	1060	1000	3.3	4→250	10→100	$\frac{3.3}{100} \times \frac{1000}{1} \times \frac{250}{4} \times \frac{100}{10}$	20,625	21,862
5-PD-Dry-W	990	5000	0.83	4→250	10→100	$\frac{0.83}{100} \times \frac{5000}{1} \times \frac{250}{4} \times \frac{100}{10}$	25,938	25,679
6-PD-Dry-Wood	475	1000	1.08	4→250	5→100	$\frac{1.08}{100} \times \frac{1000}{1} \times \frac{250}{4} \times \frac{20}{5}$	13,500	6,412
6-PD-Dry-Pl Wood	440	5000	0.395	4→250	5→100	$\frac{0.395}{100} \times \frac{5000}{1} \times \frac{250}{4} \times \frac{20}{5}$	24,688	16,788

Calculation

C_o = ppm NO_3 $= \frac{Q}{100} \times C_s \times$ dilution factor

C_o = sample conc

Q = readings

C_s = conc. of added std

To Page No.

Witnessed & Understood by me.	Date	Invented by	Date
M. Bennett 8-27-80		Recorded by Margaret Fry	8/15/80

Project No. 1430-E80

Book No. CNC-LAB TITLE CNC

Page No.__ Ammonia Analysis - Pritt Dryer 8/16/80

Stock 0.1M NH_4Cl - Slope 92%

Standards	Prep	Meter Reading
100.0 ppm NH_3	58.8 ml of Stock → 1l	10.0 set
10.0 ppm NH_3	100 ml 100 ppm → 1l	1.00 set
1.0 ppm NH_3	5 ml 100 ppm → 500 ml	0.120
5.00 "	10 ml of 100 ppm → 200	0.505
50.0 "	100.0 ml of 100 ppm → 200	5.00

Sample ID	Volume ml	1st Dilution	2nd Dilution	ml in 100 ml	1.00 on meter = 4 ppm	Meter Reading	Factors	ppm NH_3	mg NH_3	mg NH_4NO_3
4-PD-PreD-W	1,105	2→100	—	100	10.0	5.25	$10 \times \frac{100}{2}$	2625	2901	13,650
4-PD-PreD-A	540	5→100	—	"	"	0.455	$10 \times \frac{100}{5}$	91	49.14	231
4R-PD-Dry-W	1060	2→250	—	"	"	3.85	$10 \times \frac{250}{2}$	4812	5101	24,005
~~4R-PD-Dry-A~~										
4R-PD-Dry-A	500	5→100	—	"	"	<0.10	$10 \times \frac{100}{5}$	<20	<10	<47.1
"		"	"	"	"	<0.10	$10 \times \frac{100}{5}$			
4-PD-Out-W	1140	—	—	"	"	8.70	10	87	99.2	467
4-PD-Out-A	595	5→100	—	"	"	0.342	$10 \times \frac{100}{5}$	68.4	40.7	192
		"	—	"	"	~~0.316~~ 0.320	$10 \times \frac{100}{5}$	64.0	38.1	179
5-PD-PreD-W	1020	2→100	—	"	"	7.10	$10 \times \frac{100}{2}$	3550	3621	17,040
5-PD-PreD-A	550	5→100	—	"	"	0.420	$10 \times \frac{100}{5}$	84.0	46.2	217

To Page No.____

essed & Understood by me, M. Remmet 8/22/80 | Date | Invented by | Date 8/16/80

Recorded by Margaret Jay

I I

T E CNC

Project No. 1430-E80

Book No. CNC-LAB

: Page No.— Ammonia Analysis - Pilot Dryer cont 8/14/80

Sample ID	Volume mls	1st Dilution	2nd Dilution	mls in 100 mls	1.0 = mg/L = ppm	Meter Reading	Factor	ppm NH_3	mg NH_3	mg as NH_4NO_3
5-PD-Dry W	990	2→250	—	100	10.0	5.75	$10\times\frac{250}{2}$	7168	7116	33,488
5-PD-Dry A	518	5→100	—	100	10.0	<0.10	$10\times\frac{100}{5}$	<20	<10.36	<48.8
5-PD-Out-W	2) 1080	25→100	—	"	"	2.92	$10\times\frac{100}{25}$	117	126	594 Duplicate
5-PD-Out-A	545	5→100	—	"	"	0.545	$10\times\frac{100}{5}$	109	59.4	280
6-PD-PreD-W	1205	2→100	—	"	"	5.95	$10\times\frac{100}{2}$	2975	3585	16,870.
6-PD-PreD-A	560	5→100	—	"	"	0.322	$10\times\frac{100}{5}$	644	36.1	170.
6-PD-Dry-Water Drop only	475	2→250 ~~2→250~~	—	"	"	3.12	$10\times\frac{250}{2}$	3938	1870	8802
6-PD-Dry-Pulp only	680	2→250				6.05	$10\times\frac{250}{2}$	7562	5142	24,201
6-PD-Dry-A	520	5→100				0.10	$10\times\frac{100}{5}$	<20	<10.4	<48.9
6-PD-Out-W	990	25→100	—	"	"	2.48	$10\times\frac{100}{25}$	99.2	98.2	462
6-PD-Out-A	578	5→100				0.302	$10\times\frac{100}{5}$	60.4	34.9	164
4-PD-S	—	2→250	2→100			2.18	$10\times\frac{100}{2}\times\frac{250}{2}$	136,250		641,193
45-PD-S	—	2→250	2→100			2.50	$10\times\frac{100}{2}\times\frac{250}{2}$	156,250		735,312
6-PD-S	—	2→250	2→100			2.68	$10\times\frac{100}{2}\times\frac{250}{2}$	167,500		784,255
QA-5-PD-Out	Wb 1080	25→100	—	"	"	3.08	$10\times\frac{100}{25}$	123.2	133,	626
5-PD-Out	A c 1080	25→100	—	"	"	3.16	$10\times\frac{100}{25}$	124.8	135	634
								117	126	594
								extend to 4th sig fig → 121.7	134	618

Page No.

tnessed & Understood by me, M. Rennell 8/22/80 | Date | Invented by | Date 8/14/80

Recorded by Margaret Dyo

Project No. 1430-EVO
Book No. CNC-LAB TITLE CNC

From Page No. —

Sample Values - Ted - Prill Cooler 8/14/80

Sample ID	Value rads
7-PC-By-W	985
7-PC-By-A	500 rads
7-PC-In-W	1220
7-PC-In A	310.
7-PC-Out-W	1,150
7-PC-Out-A	560
8-PC-By-W	1,045
8-PC-By-A	575
8-PC-In-W	1,280
8-PC-In-A	530.
8-PC-Out-W	1,025
8-PC-Out A	462

To P.

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by Margaret Sox	8/16/80

TITLE CWC

Project No. 1430-E80

Book No. CWC-LRB

From Page No.

Sample Volume - Drill Cooler 8/16/80

Sample ID	Volume ml
9-PC-By-W	1280
9-PC-By-A	490
9-PC-In-W	~~1155~~ 1170
9-PC-In A	~~530~~ 478
9-PC-Out-W	1155
9-PC-Out A	530

To Page No.

Witnessed & Understood by me.	Date	Invented by	Date
		Recorded by Margaret Fox	8/16/80

Project No. 143-E&O

Book No. CNC-LAB TITLE CNC

Page No. — Ammonia Analyses - Prill Cooler 8-16-80

Slope 93%

Standard - Pyped p 26

ppm NH_3	Meter Reading	
100.0	10.0	Set
10.0	1.00	set
1.0	0.165	
5.0	0.560	
50.0	~~5.25~~ 5.00	

Sample ID	Volume ml	1st dilution	2nd dilution	ml in 100 ml	1.0 on Meter = X ppm	Meter Reading	Factors	ppm NH_3	total mg NH_3	mg as NH_4NO_3
7-PC-B_y-W	985	25→100	—	100	10.0	2.08	$10\times\frac{100}{25}$	83.2	82.0	386
7-PC-B_y-A	500	5→100	—	"	"	<0.10	$10\times\frac{100}{5}$	<20	<10.0	<47.1
7-PC-In-W	1220	2→250	—	"	"	5.25	$10\times\frac{250}{2}$	6562	8006	37,677
7-PC-In-A	310	5→100	—	"	"	<0.10	$10\times\frac{100}{5}$	<20	<6.2	<29.2
7-PC-Out-W	1150	~~100~~	—	"	"	6.15	10	61.5	70.7	333
7-PC-Out-A	560	5→100	—	"	"	0.620	$10\times\frac{100}{5}$	124	69.4	327
8-PC-B_y-W	1045	25→100	—	"	"	1.75	$10\times\frac{100}{25}$	70	73.2	344
8-PC-B_y-A	575	5→100	—	"	"	<0.10	$10\times\frac{100}{5}$	<20	<11.5	<54.1
8-PC-In-W	1280	2→250	—	"	"	3.12	$10\times\frac{250}{2}$	3900	4992	23,492
8-PC-In-A	530	5→100	—	"	"	<0.10	$10\times\frac{100}{5}$	<20	<10.6	<49.9

100 average n=31

To Page No. 31

Read & Understood by me.	Date	Invented by	Date
M. Penner 8-22-80		Recorded by Margaret Fay	8/14/80

TLE CNC	Project No. 1430-E-80
	Book No. CNC-LAB

c Page No. 30.

Ammonia Analysis - continued 8/16/80

Prill Cooler

Sample ID	Volume mls	1st Dilution	2nd dilution	ml in 100 ml	1.0 cm Meter = x ppm	Meter Reading	Factor	ppm NH_3	total mg NH_3	mg as NH_4NO_3
8-PC-Out-W	1,025	—	—	100	10.0	4.08	10	40.8	41.8	197
8-PC-Out-A	462	5→100	—	"	"	0.190	$10 \times \frac{100}{5}$	38	17.6	82.6
9-PC-By-W	1,280	25→100	—	"	"	1.50	$10 \times \frac{100}{25}$	60.0	76.8	361
9-PC-By-A	490	5→100		"	"	<0.10	$10 \times \frac{100}{5}$	<20	<9.8	<46.1
9-PC-In-W	1170	2→250	—	"	"	3.62	$10 \times \frac{250}{2}$	4525	5294	24,915
9-PC-In-A	478	5→100	—	"	"	<0.10	$10 \times \frac{100}{5}$	<20	<9.56	<45.0
9-PC-Out-W	1155	100	—	"	"	4.08	10x	40.8	47.1	222
9-PC-Out-A	530	5→100	—	"	"	0.218	$10 \times \frac{100}{5}$	43.6	23.1 ~~22.1~~	109
7A										
7-PC-By-W_b	985	25→100	—	100	10.0	2.08	$10 \times \frac{100}{25}$	83.2	82.0	386
7-PC-By-W_c	985	25→100	—	"	"	2.02	$10 \times \frac{100}{25}$	80.8	79.6	374
8.0 7-PC-By(1)$_a$								83.2	82.0	386
						Average		82.43	81.2	382

To Page No.

Witnessed & Understood by me.	Date	Invented by	Date
M. Remit 8/22/80		Recorded by Margaret Fox	8/16/80

Project No. 1430-F-80
Book No. CNC-LAG TITLE CNC

Page No.

Nitrate Analyser - Prill Cooler 8-17-80

Stock 1000 ppm NO_3

Slope 93%

Stds - Prep		Meter Reading
100.0 ppm NO_3	25 → 250	10.0
10.0	5 → 500	1.00
1.0	10 ml of 10 ppm → 100	0.142
5.0	5 ml of 100 ppm → 100	0.515
50.0	5 ml of 1000 ppm → 100	5.00

Sample ID	Volume ml	1st dilution	2nd dilution	ml in 100 ml	1.0 on meter = X ppm	Meter Reading	Factor	ppm NO_3	total mg NO_3	mg NH_4NO_3
7-PC-By-W	985	10→100	—	100	10.0	2.80	$10 \times \frac{100}{10}$	280	276	356
7-PC-In-W	1220	4→250	10→100	"	"	3.52	$10 \times \frac{100}{10} \times \frac{250}{4}$	22,000	26,840	34,624
7-PC-Out-W	1150	25→100	—	"	"	1.78 ~~$10 \times \frac{100}{25}$~~	$10 \times \frac{100}{25}$	71.2	81.9	106
8-PC-By-W	1045	10→100	—	"	"	2.43	$10 \times \frac{100}{10}$	243	254	328
8-PC-In-W	1280	4→250	10→100	"	"	2.30	$10 \times \frac{100}{10} \times \frac{250}{4}$	14,375	18,400	23,736
8-PC-Out-W	1025	25→100	—	"	"	1.46	$10 \times \frac{100}{25}$	58.4	59.9	77.2
9-PC-By-W	1280	10→100	—	"	"	2.22	$10 \times \frac{100}{10}$	222	284	367
9-PC-In-W	1170	4→250	10→100	"	"	2.76	$10 \times \frac{100}{10} \times \frac{250}{4}$	17,250	20,182	26,035
9-PC-Out-W a	1155	25→100	—	"	"	1.02	$10 \times \frac{100}{25}$	40.8	47.1	60.8
9-PC-Out-W b	1155	25→100	—	"	"	1.04	$10 \times \frac{100}{25}$	41.6	48.0	62.0
" c	1155	25→100	—	"	"	1.02	$10 \times \frac{100}{25}$	40.8	47.1	60.8
							ave	41.1	47.4	61.2

To Page No.

Witnessed & Understood by me.	Date	Invented by	Date
P. Lemon	8/25/80	Recorded by Margaret Fox	8/17/80

TITLE CNC

Project No. 1430-E80

Book No. CNC-LAB

From Page No.

8/19/80

Sample Identification Code

Sequence #	Power Location	Sampling Point	W Water (Prob Wash, line Wash & 1st & 2nd Impinger) or Acid - A
1	Prill Tower (PT)	Bypass (By)	Water W
2		Inlet (In)	or Acid A
3		Outlet (Out)	
4	Prill Dryer	Predryer (PreD)	W or A
5		Dryer Dry	
6		Outlet Out	
7	Prill Cooler	Bypass By	W or A
8		Inlet In	
9		Outlet Out	

Scrubber Waters

1	PT	S
2		
3		
4	PD	S
5		
6		

To Page No.

Witnessed & Understood by me,	Date	Invented by	Date
[illegible]	8/19/80	Recorded by [illegible]	8/19/80

Project No. 1430-E80
Book No. CNC-LAB TITLE CNC

n Page No.

8/19/80

Calculation of Stock Sampler

$$mg/l\ NO_3 \text{ or } NH_3 = \text{Meter Reading} \times \frac{10.0\ ppm}{1.0\ \text{Meter Reading}} \times \frac{\text{Volume 1st Dilution}}{\text{ml diluted}} \times \frac{\text{Volume 2nd dilution}}{\text{ml diluted}}$$

$$\text{total mg } NH_3 \text{ or } NO_3 = mg/l \times \text{Sample Volume in liters}$$

$$\text{Total mg } NH_4NO_3 \text{ based on } NH_3 = \text{total mg } NH_3 \times 4.706$$

$$\text{Total mg } NH_4NO_3 \text{ based on } NO_3 = \text{total mg } NO_3 \times 1.29$$

To Page No.

tnessed & Understood by me.	Date	Invented by	Date
		Recorded by Margaret M. Fox	8/19/80

E CNC

Project No. 1430-E80-31

Book No. CNC-LAB

Page No. — Scrubber Water - Insoluble Particulate

8/19/80

Sample ID	Sample Volume filtered mls	Filter #	Initial filter weight	FW_1	FW_2	FW_3	Ave FW Constant Weight	mg particulate	mg/l particulate
1-PT-S	585	5041	0.44026	0.45546	0.45550		0.45548	15.22	26.0
2-PT-S	710	5042	0.44148	0.48168	0.48168		0.48168	40.20	56.6
3-PT-S	560	5043	0.44282	0.46862	0.46872		0.46867	25.85	46.2
4-PD-S	485	5044	0.44182	0.46350	0.46350		0.46350	21.68	44.7
5-PD-S	640	5045	0.43968	0.45254	0.45260		0.45257	12.89	20.1
6-PD-S	525	5046	0.43630	0.44066	0.44066		0.44066	4.36	8.30

To Page No. - No. 37

ssed & Understood by me. T. Rennet

Date 9/2/80

Invented by

Recorded by Margaret Fox

Date 8/20/80

Project No. Columbia 1430-E80-30

TITLE Columbia Nitrogen

Book No. CNC-4B

From Page No. 36 Insoluble Particulate - By Pass + Outlet Samples 9/3/80
continued

Sample ID	Total Volume mls	Aliquot filtered mls	Filter ID	Initial CW of Filter	FW_1 FW_3	FW_2 FW_4	Average Constant FW, g	mg Particulate in aliquot	Total mg Particulate in sample
4-PD-Out-W	1140	420	5055	0.44040	0.44107	0.44100	0.44104	0.64	nd 1.74
5-PD-Out-W	1080	410	5056	0.44152	0.44000	0.43997	0.43998	~~-0.~~ -1.54	4.06
6-PD-Out-W	990	450	5057	0.43642	0.43574	0.43581 ~~0.43623~~	0.43578	-0.64	nd -1.41
7-PC-By-W	985	390	5058	0.43964	0.43835	0.43851	0.43843	-1.21	nd -3.06
8-PC-By-W	1045	500	5059	0.45493	0.45359	0.45366	0.45362	-1.31	nd -2.74
9-PC-By-W	1280	640	5060	0.45236	0.45205	0.45216	0.45210	-0.26	nd -0.52

Let Limit of detection = 1 mg wht 1 mg × $\frac{\text{Total Vol.}}{\text{aliquot}}$ = ~3 mg

To Page

Witnessed & Understood by me, P. Lennon

Date 9-5/80

Invented by

Recorded by [illegible]

Date [illegible]

Project No. 1430-T-80-30

Book No. CNC-LAB TITLE Columbia Nitrogen

Page No. Insoluble Particulate - Bypass & Outlet 9/3/80

Sample ID	Total Volume mls	aliquot filtered	Filter ID	Initial CW of Filter, g	FW_1 FW_3	FW_2 FW_4	Ave Const FW_1, g	mg particulate in aliquot	total mg Particulate in sample
Blank-By-W	1010	390	5047	0.44396	0.44768	0.44772	0.44770	-1.26	nd
Blank-Out-W	935	335	5048	0.44731	0.44566	0.44580	0.44573	-1.58	nd
1-PT-By-W	1125	500	5049	0.44412	0.44981	0.45001	0.44991	5.79 ~~5.80~~	13.03 ~~13.05~~
1-PT-Out-W	1090	460	5050	0.43985	0.44324	0.44331	0.44328	3.43	8.13
2-PT-By-W	920	305	5051	0.43736	0.43619	0.43623 ~~0.43581~~	0.43621	-1.15	nd -3.47
2-PT-Out-W	1170	350	5052	0.43362	0.43272	0.43290	0.43281	-0.81	nd -2.71
3-PT-By-W	1110	365	5053	0.43526	0.43426	0.43435	0.43430	-0.96	nd -2.92
3-PT-Out-W	1040	355	5054	0.43260	0.43372	0.43360	0.43366	1.06	3.22

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Witnessed & Understood by me.	Date	Invented by	Date
P. Lennon	9/5/80	Recorded by Margaret M. [illegible]	9/5/80

APPENDIX N

AUDIT SAMPLE ANALYSES

Includes:

N.1 TRC Audit Samples (Emission Tests)
N.2 MRI Audit Samples (Particle Size Tests)

APPENDIX N.1

TRC AUDIT SAMPLES (EMISSION TESTS)

AUDIT SAMPLE ANALYSIS AT COLUMBIA NITROGEN CORPORATION

Five ammonium nitrate solutions were delivered to the TRC chemist on August 11, 1980 and were analyzed on-site with the nitrate specific ion electrode procedure. 5 ml of each solution was diluted to 250 ml, then appropriate second dilutions were taken to obtain concentrations between 10 and 100 ppm NO_3^-. The results were expressed in mg NO_3^-/ml and were within the 10% tolerance set for these samples. The average percent error for the five samples was +1.72%. The results are as follows:

Audit Sample Analysis Results

Sample Number	Actual Values mg NO_3^-/ml (A)	Reported Values mg NO_3^-/ml (R)	% Error $\frac{R-A}{A} \times 100$
01273	8.98	9.00	+0.22
02260	55.9	57.0	+1.97
03274	6.07	6.00	-1.15
04281	224	228.1	+1.83
05267	18.95	19.6	+3.43
			+1.72 Average

Tolerance: $\pm$10%

APPENDIX N.2

MRI AUDIT SAMPLES (PARTICLE SIZE TESTS)

Discussion and Summary

Five ammonium nitrate audit samples were supplied to MRI by EPA for analysis using the same techniques as were used on the test samples. The purpose of these samples was to validate the EPA analytical methods and laboratory protocol employed during the period of field testing (Quality Control).

The ammonium nitrate audit samples were received in a liquid state. The samples were diluted and then prepared for analysis using the same solution and specific ion electrode as the samples collected during the field testing. The test method followed is the EPA method for the "Determination of Particulate (Ammonium Nitrate) Emission from Ammonium Nitrate Plants," (a complete copy of this method can be found in Appendix G-2).

The audit samples were analyzed before the collected field samples and were also done after the test samples were completely analyzed. This was done to check for quality control before and after the test sample analysis.

Table 1-F-1 contains the results of the audit samples as analyzed by MRI in the field and at Kansas City. The percent error in the MRI results as compared to the EPA results is also tabulated. The relative SIE percent error of audit samples analyzed at Kansas City before and after the test samples were 5.35% and 5.63% respectively.

TABLE 1-F-1. SUMMARY OF AUDIT SAMPLE ANALYSIS BY SELECTIVE ION ELECTRODE

Audit Sample No.	Actual conc. (mg/ml)	Lab conc. before (mg/ml)	Relative SIE % error
Audit Samples Analyzed at Kansas City			
Initial test samples			
01249	8.98	9.32	3.79
02250	55.9	57.98	3.72
03247	6.07	6.19	1.98
04285	224.0	243.4	8.66
05266	17.95	19.49	8.58
Average			5.35
Final test samples			
01249	8.98	9.09	1.22
02250	55.9	58.48	4.62
03247	6.07	6.19	1.98
04285	224.0	246.7	10.13
05266	17.95	19.78	10.19
Average			5.63
Audit Samples Analyzed in Field			
01249	8.98	10	11.4
02250	55.9	75	34.2
03247	6.07	7.063	16.4
04285	224.0	305	36.2
05266	17.95	18.25	1.7
Average			19.9
01249	8.98	8.2	8.7
02250	55.9	6.8	21.6
03247	6.07	6.8	12.0
04285	224	202.5	9.6
05266	17.95	17.2	4.2
Average			11.2
01249	8.98	8.7	3.1
02250	55.9	53	5.2
03247	6.07	5.4	11.0
04285	224	190	15.2
05266	17.95	16.4	8.6
Average			8.6

COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA

Sample I.D.	Date	Aliquot analyzed (ml)	Dilution	Average mv	µg/ml NO_3^- in aliquot analyzed	mg/ml NO_3^-
Audit Samples Analyzed in Kansas City						
Initial test samples						
Audit No. 05266	9/04/80	100	250	155.25	77.94	19.49
Audit No. 03247		100	250	183.55	24.75	6.19
Audit No. 04285		100	200	87.45	1,216.8	243.4
Audit No. 01249		100	500	190.55	18.64	9.32
Audit No. 02250		100	1,000	162.55	57.98	57.98
Final test samples						
Audit No. 05266	9/12/80	100	250	152.5	79.13	19.78
Audit No. 03247		100	250	180.9	24.79	6.19
Audit No. 04285		100	200	85.3	1,233.5	246.7
Audit No. 02250		100	1,000	159.9	58.48	58.48
Audit No. 01249		100	500	188.5	18.17	9.09
Audit Samples Analyzed in Field						
Audit No. 01249	8/11/80	100	500	134	0.020	10
Audit No. 02250		100	1,000	100	0.075	75
Audit No. 03247		100	250	125.5	0.0283	7.063
Audit No. 04285		100	200	21.8	1.525	305
Audit No. 05266		100	350	101	0.073	18.25
Audit No. 01249	8/12/80	100	100	95	0.082	8.2
Audit No. 02250		100	1,100	97.5	0.068	68
Audit No. 03247		100	100	99.5	0.068	6.8
Audit No. 04285		100	2,500	95.5	0.081	202.5
Audit No. 05266		100	200	93.5	0.086	17.2
Audit No. 01249	8/14/80	100	100	362	0.087	8.7
Audit No. 02250		100	1,100	376	0.053	53
Audit No. 03247		100	100	375.5	0.054	5.4
Audit No. 04285		100	2,500	366	0.076	190
Audit No. 05266		100	200	363.5	0.082	16.4

Project No. 4462.137 Date of Work: 8-6-20 Work Performed by: C Gil

Title or Purpose: Weights for Nitrate Standards Continued From:

Dried and dessicated prior to weighing

#1 24.96446
23.54539
1.41957
1.100 mg/ml

#2 23.54539
22.14124
1.40415
1.088 mg/ml

#3 22.14124
20.84962
1.29162
1.001 mg/ml

#4 20.84962
19.56369
1.28593
0.997 mg/ml

#5 18.20766
16.93567
1.27199
0.986 mg/ml

#6 16.93567
15.63649 ea.
1.29918
1.007 mg/ml

#7 15.61521
14.26810
1.34711
1.044 mg/ml

#8 14.26810
13.01108
1.25702
0.974 mg/ml

#9 13.01108
11.72294
1.28814
0.999 mg/ml

#10 13.67669
12.36769
1.30900
1.015 mg/ml

Continued To:

Entered By:

Date:

Disclosed To And Understood By Me:

Date:

Date:

Project No. Date of Work: 8-11-80 Work Performed by: L. Wilcox

Title or Purpose: NO_3^- electrode calibration Continued From:

Stock solution

Standard #1 (see p. 1) 1.41957 g NH_4NO_3 in 1000 ml H_2O
≙ 1.100 mg NO_3^-/ml.

Standard Solutions

#	Vol. Stock	Final vol.	Calc. final conc.	mV	
1	0	50 ml	0	220	200
2	0.5 ml	50 ml	0.011 mg/ml	149	149
3	2.0 ml	50 ml	0.044	112	110.5
4	5.0	50 ml	0.110	92	92
5	~~7.0~~ 7.0	50 ml	0.154	82.5	82.5
6	10.0	50 ml	0.220	72	74
7	15.0	50 ml	0.330	62.5	62.5

Procedure - Dissolve preweighed NH_4NO_3 into 1 liter flask, dilute to mark. Pipet series of volumes of stock solution into 50 ml vol flasks, add 1 ml ISA soln, 1 ml boric acid preservative, dilute to mark. Each solution measured using MV meter & recorder. (see Method 18)

Continued To: Disclosed To And Understood By Me:

Entered By: Date:

Date: Date:

Project No. Date of Work: 8-11 Work Performed by:

Title or Purpose: Continued From:

Audit Samples

Sample #	dilution
02250	1ml to 1000ml
01249	2ml to 1000ml
04285	5ml to 1000ml
05266	2ml to 500ml
03247	2ml to 500ml

Sample #	dil ratio	mV	Soln Conc.	Audit conc.
01249	500	135	0.019	9.5 mg/ml
02250	1000	100	0.075	75
04285	200	21.5	1.55	310
01249	500	133	0.021	10.5
02250	1000	100	0.075	75
04285	200	22	1.50	300
05266	250	~~135~~ 101	0.073	18.25
03247	250	126	0.028	7
05266	250	101	0.073	18.25
03247	250	125	0.0285	7.125

Continued To:

Entered By:

Date:

Disclosed To And Understood By Me:

Date:

Date:

Project No. Date of Work: 8-12-80 Work Performed by: Wilcox

Title or Purpose: Audit Samples (Rerun) Continued From:

Stock NH_4NO_3 solution

Vial #2 (p. 1) 1.90415 g NH_4NO_3 in 1000 ml H_2O

C NO_3^- = 1.088 mg/ml

#	Vol Stock	Final Vol	Calc Conc.	MV 1	2	3
1	2 ml	250 ml	0.00870			
2	5 ml	100 ml	0.0544			
3	10 ml	100	0.109			
4	15 ml	100	0.163			
5	20 ml	100	0.218			
6	25 ml	100	0.272			
7	0	50	0			
~~Blank~~	0					

ISA — 2ml/100ml soln

Boric Acid — 2ml/100ml soln

Continued To: Disclosed To And Understood By Me:

Entered By: Date:

Date: Date:

Project No. Date of Work: 8-12-80 Work Performed by: WDeal

Title or Purpose: Continued From:

Audit Samples
Procedure

Sample No.	Dil	Ratio			
01249	5ml to 500ml	100	95	.082	9.2
02	5 to 500, 50 to 500	1000	99.1	.062	6.1
03	5ml to 500ml	100	94.5	.068	6.8
04	5 to 500, 20 to 500	2500	95.5	.071	17.8
05	5ml to 1000ml	200	98.5	.092	17.2

Continued To:

Entered By:

Date:

Disclosed To And Understood By Me:

Date:

Date:

Project No. Date of Work: 8-12-80 Work Performed by: Wilcox

Title or Purpose: Calibration Curve #3 Continued From:

#	Vol Std	Final Vol	~~Calc Conc.~~	Calc Conc.
1	5	250 ml	~~0.0200~~	0.0200 mg/ml
2	~~2~~ 5	100	~~0.0400~~	0.0501
3	~~8~~ 10	100	~~0.0~~	0.1001
4	~~10~~ 15	100		0.150
5	~~15~~ 20	100		0.200
6	~~20~~ 30	100		0.300
7	0	50	~~0~~	0

Stock solution #3 c = 1.001 mg NO_3^-/ml (see p. 1)

	Meter		Chart	
#	mV			
1	133	131.5	~~133~~ 130.5	130.5
2	104	106	~~111~~ 111.5	111.5
3	95	94	~~95~~ 95.5	94
4	82.5	81	83.5	81.5
5	75.5	73	76	74.5
6	69.5	62.5	66	63.5
7	202	~~200~~ 203	207	208.5

Continued To: Disclosed To And Understood By Me:

Entered By: Date:

Date: Date:

Project No. Date of Work: 3-13-80 Work Performed by: Wilcox

Title or Purpose: Calibration Curve # 4 Continued From:

#	Vol Stock	Final Vol	Calc. conc.	mV meter	mV chart
1	2	250 ml	0.00798 mg/ml	110.5	110
2	2	100	0.0199	88	84.5
3	5	100	0.0499	63.5	60.5
4	10	100	0.0997	45.5	43.5
5	15	100	0.150	34.5	33
6	30	100	0.299	16	16
7	0	50	0	171	167.5

Stock Solution # 4 c = 0.997 mg/ml

Audit Sample #4 p. 5 EPA conc. 224 mg/ml
MRI - 61 mV

Audit Sample #2 p. 5 EPA conc 55.
MRI - 71.5 mV

VOID
bad electrode

Continued To:

Entered By:

Date:

Disclosed To And Understood By Me:

Date:

Date:

Project No. Date of Work: 8-12-80 Work Performed by:

Title or Purpose: Run #1 TP-4 Continued From:

Fluidized Bed Cooler

~~Stage~~ Impactor - ~~81.5mv~~ meter

81.5 mV chart

Stage	MV
1	72
2	131.5
3	176
4	193.5
Back	210

Continued To:

Disclosed To And Understood By Me:

Entered By:

Date:

Date:

Date:

Project No. Date of Work: Work Performed by:

Title or Purpose: Calibration Curve #4 Continued From:

Same solutions as p. 7, electrode solns changed

Stock solution = 0.997 mg NO_3^-/ml

#	Conc.	mV
1	.00798 mg/ml	123
2	.0199	98
3	.0499	
4	.0997	
5	.150	
6	.299	
7	0	

VOID

Continued To:

Entered By:

Date:

Disclosed To And Understood By Me:

Date:

Date:

Project No. Date of Work: 8-13-80 Work Performed by: Wilcox

Title or Purpose: Calibration Curve Check Continued From:

Two sets of electrodes checked to determine if analysis system is working properly

Stock Solution - same as p. 7

#	Conc.	MRI Electrodes	CNC Electrodes
1	0.00798	131	~~334~~ 395 *
3	0.0499	89	~~395~~ 357
6	0.299	36	306
Audit 3		84	351
7 (blank)	0	184.5	334

* range change gives 395 mv on range 4, 405 mv on range 3 ave 400 mv

~~slope = -0.00313~~ ~~-0.00336~~
~~intercept = 0.386~~ ~~1.304~~
~~corr = -0.9482~~ ~~-0.9536~~

~~Audit 3~~

Audit 3 0.0517 [illegible] 0.0526 [illegible]
5.26

Continued To:

Entered By:

Date:

Disclosed To And Understood By Me:

Date:

Date:

Project No. Date of Work: Work Performed by:

Title or Purpose: Calib Curve #5 Continued From:

Stock Solution #5 1.27199 g NH_4NO_3 in 1000 ml
c = 0.986 mg NO_3^-/ml (see p. 1)

#	Vol. Stock ml	Final Vol ml	Calc Conc mg NO_3/ml	Meter mV	
1	2	250	0.00789	417.5	419
2	2	100	0.0197	400,5	398
3	5	100	0.0493	↓ 376.0	↑ 380,5
4	10	100	0.0986	356.5	361,5
5	15	100	0.148	340.5	353
6	30	100	0.295	327.0	331
7	0	50	0	469.0	469

m = .0166
b = 4.87
Corr = -0.9959

m = -0.0182
b = 5.598
Corr = -.9968

Continued To:

Entered By:

Date:

Disclosed To And Understood By Me:

Date:

Date:

Project No. Date of Work: 8-14-80 AM Work Performed by:

Title or Purpose: Audit Samples Continued From:

Solutions Prepared on p. 5

#	dil ratio	~~aliquot~~ mV	aliquot conc	stock conc.	EPA
1	100	362	.087	8.7	8.98
2	1000	376	.053	53	55.7
3	100	375.5	.054	5.4	6.07
4	2500	366	.076	190	204
5	200	363.5	.082	16.4	17.75

Continued To: Disclosed To And Understood By Me:

Entered By: Date:

Date: Date:

Project No. 4462-37 Date of Work: 9/15/80 Work Performed by: DW

Title or Purpose: NO3 SIE Continued From: p44

5 INPUT"ENTER INTERCEPT, SLOPE";A,B
8 LPRINT A,B
20 INPUT X
25 LPRINT A+B*EXP(X*B+A)
35 PRINT A+B*EXP(X*B+A)
36 GOTO 10

RADIO SHACK TRS 80

CAL. CURVE #1

	INTERCEPT (A) MV	SLOPE (B) MV/mg NO3
01	127.85	159.111
02	166.7	22.7477
03	222.2	5.44371
04	226.55	3.17624

CAL. CURVE #2

~~0320~~	18.6464	-.0495211
05246	155.15	77.3419
03247	160.75	24.7327
04285	97.45	1219.73
01249	150.55	18.6383
02250	152.55	57.3754
05	166.5	.699826

CAL. CURVE #3

	18.6221	-.0493782
06	144.2	123.725
07	193.5	28.7582
08	224.2	5.694
09	226.6	3.19833

CAL CURVE #4

	18.2765	-.0498559
10	182.2	.64633
11	182.7	437.466
12	187.1	31.4966
13	189	8.21282
14	223.5	2.85764
15	154.6	52.4677

CAL CURVE #5

	18.5122	-.0497575
16	188.2	10.4466
17	192.2	20.6951
18	141.7	1.88888
19	194.2	.765811
20	189.2	55.3124
21	193.5	5.42265
22	191.9	14.5968
~~23~~	~~18.654~~	~~-.0496322~~

CAL CURVE #6

	18.654	-.0496322
23	148.1	1.7738
24	145.1	111.930
25	192.5	16.7734
26	193.1	16.5781
27	222.7	5.46829
28	166.6	226465
29	168.7	13.8159
30	208.3	8.72256
31	153.8	75.4512
32	193.5	16.3879

CAL CURVE #7

	18.5295	-.0495667
33	143.3	111.753
34	183.5	21.9765
35	125.9	159.68
36	184.8	28.7547
37	256.5	.754622

CAL CURVE #8

	18.6121	-.0496335
38	146.8	104.356
39	199.5	12.8537
40	132.1	437.46
41	148.1	137.812
42	152.7	78.3483
43	206.5	9.12458
44	145.5	109.243
45	184.1	22.2232

CAL. CURVE #9

	18.534	-.0498084
46	178.1	.652294
47	116.7	741.243
48	183.4	59.7646
49	123.2	477.641
50	151.55	134.33

CAL. CURVE #10

	18.5873	-.0493945
51	148.4	94.9837
52	199.4	12.833
53	146.7	105.64
54	206.7	9.07656
55	197.3	.619669
56	153.6	65.4465
57	114.1	331.369
58	135.4	14.8813
59	192	16.9993
60	145.9	169.316
61	195.6	14.6822

CAL. CURVE #11

	18.5968	-.0496645
62	154	76.457
63	197.7	12.9294
64	267.3	.762754
65	218.4	5.57155
66	241	2.22255

CAL. CURVE #12

	18.5988	-.0496423
67	152.1	14.2594
68	156.7	12.3133
69	178.3	23.1395
70	124.5	346.966
71	179.3	27.6664
72	173	22.2507
73	155.1	.760792

CAL CURVE #13

	18.6019	-.0496707
74	158.5	25.1574
75	187.7	139.421
76	179.3	19.464
77	132.7	14.6942
78	121.2	19.2726
79	118.6	438.606
80	188.2	25.5812
81	132.1	17.4211
82	170	.645737
05246	152.5	77.3221
03247	160.3	24.7886
04285	98.2	1222.53
~~0325~~	18.6019	-.0496707
02250	159.3	58.4755
01249	188.5	18.27

Continued To:

Entered By Me:

Date:

Date:

Date:

Project No. 4480-37 Date of Work: 9/4/80 Work Performed by: M.J. 9/4/80

Title or Purpose: SAME Continued From: 25

Sample No.	Calibration Curve No.	mv Reading No. 1	mv Reading No. 2	mv Reading No. 3	Average mv Reading	* Identification	Sample vol. AND/OR Dilution	µg/ml NO_3^-	mg NO_3^- Total
01	1 3 2	127.7	128.0		127.85	F.B.C. TP4, R-1, S-1	25mℓ	25.3	65.1
02	1 3 2	186.7	186.7		186.7	" " " S-2	260mℓ	23.75	6.18
03	1 3 2	223.4	223.0		223.2	" " " S-3	500mℓ	5.44	2.7
04	1 3 2	236.5	236.6		236.55	" " " S-4	1000mℓ	3.18	3.18
	2	155.1	155.4		155.25	AUDIT # 05266	2mℓ-500mℓ	77.4	19.49
	2	183.6	183.5		183.55	" # 03247	2mℓ-500mℓ	24.75	6.19
	2	87.5	87.4		87.45	" # 04285	5mℓ-1000mℓ	126.8	243.4
	2	1996	190.5		190.55	" # 01249	2mℓ-1000mℓ	18.64	9.32
	2	162.6	162.5		162.55	" # 02250	1mℓ-100mℓ	57.98	57.98
05	2	266.0	267.0		266.5	BLANK, RUN 1	250mℓ	0.86	0.22

NOTE: (1) FLUIDIZED BED COOLER TP4 WAS CHANGED TO UNCONTROLLED PRILL TOWER EXHAUST TP4 FOR FINAL REPORT.

(2) FLUIDIZED BED COOLER TP3 WAS CHANGED TO PRILL TOWER SCRUBBER INLET TP3 FOR FINAL REPORT.

* F.B.C. = FLUIDIZED BED COOLER

Continued To:

Disclosed To And Understood By Me:

Entered By: Date:

Date: Date:

Project No. 4482-37 Date of Work: 9/12/80 Work Performed by: YW

Title or Purpose: NO_3^- SIE Continued From: p42

Sample No.	Calibration Curve No.	mv Reading No. 1	mv Reading No. 2	mv Reading No. 3	Average mv Reading	Identification	SAMPLE VOLUME AND/OR Dilution	µg/ml NO_3^-	mg NO_3^- Total
67	12	193.4	193.0	193.0	193.1	P.T.I. CTP3, R-15, S-3	350 ml	14.23	4.98
68	12	197.1	196.4	196.5	196.7	" " " " S-4	800 ml	12.32	9.86
69	12	175.6				PREDR.* EX. TP1, R-16, S-1	210 ml	29.40	11.76
↳	↳	175.6	175.1	175.2	175.3	" " " " "	5 ml to 1000 ml		
70	12	114.4	114.5		114.5	" " " " S-2	200 ml	348.1	69.6
71	12	176.9	176.6		176.8	" " " " S-3	200 ml	27.66	5.53
72	12	173.1	172.8		173.0	" " " R-16, S-4	700 ml	32.28	22.60
73	12	265.0	265.4		265.2	BLANK RUN 16317	250 ml	0.72	0.19
74	13					PREDR. EX. TP1, R-17, S-1	350 ml	25.20	17.64
↳	↳	180.6	180.5	180.4	180.5	" " " " "	5 ml to 1000 ml		
75	13	117.7	117.6		117.7	" " " " S-2	300 ml	328.3	98.4
76	13	179.5	179.0		179.3	" " " " S-3	350 ml	26.46	9.26
77	13	193.6	193.7		193.7	" " " " S-4	700 ml	14.69	10.28
78	13	~~191.3~~				" " " R-18, S-1	350 ml	16.27	11.39
↳	↳	191.3	191.0		191.2	" " " " "	5 ml to 1000 ml		
79	13	110.7	110.5		110.6	" " " " S-2	250 ml	438.6	109.7
80	13	180.3	180.0		180.2	" " " " S-3	250 ml	25.51	6.38
81	13	202.0	202.1		202.1	" " " " S-4	600 ml	10.42	6.25
82	13	270.0	270.0		270.0	BLANK RUN 18	250 ml	0.65	0.16
	13	152.5			152.5	AUDIT # 05266	2 ml to 500 ml	79.13	19.78
	13	180.9			180.9	" 03247	2 ml to 500 ml	24.79	6.19
	13	85.3			85.3	04285	5 ml to 1000 ml	1233.5	246.7
	13	159.9			159.9	02250	1 ml to 100 ml	58.48	58.48
	13	188.5			188.5	01249	2 ml to 1000 ml	18.17	9.09

* PREDRIED EXHAUST

Entered By: Date:

Date: Date:

APPENDIX O

CLEANUP EVALUATION RESULTS

Includes:

O.1 TRC Cleanup Results (Emission Tests)
O.2 MRI Cleanup Results (Particle Size Tests)

APPENDIX O.1

TRC CLEANUP RESULTS (EMISSION TESTS)

TRC CLEANUP EVALUATION RESULTS AT COLUMBIA NITROGEN CORPORATION, AUGUST, 1980

Three cleanup evaluation tests were performed to establish blank values for the sample collectors before the emission tests began. The sample trains were precharged as specified for the actual test program and then the impinger contents were recovered and analyzed for ammonium nitrate and ammonia.

The ammonia values were below the limit of detection for the meter calibration which was 1.0 ppm NH_3. The stoichiometric factor for coverting from NH_3 to NH_4NO_3 was 4.706 which made the limit of detection 4.706 ppm NH_4NO_3 based on ammonia. The acid samples were diluted twenty times in order to reduce interference from the 1N sulfuric acid. Therefore, the limit of detection for the acid portion of the sampling train was 94.1 ppm NH_4NO_3. When converted to total mg for the train, this averaged 4.6 mg NH_4NO_3 for the water portion and 42 mg for the acid portion. Because of the high limit of detection for the acid portion, the maximum percent background was calculated for the water portion only and then for the combined water and acid portions.

Only the water portion of the sampling train was analyzed for nitrate. The limit of detection for the method was 1.0 ppm NO_3^- or 1.29 ppm NH_4NO_3. The bypass blank gave the only result above the limit of detection and then only slightly higher.

The maximum-percent-background results are presented in Tables 0-1, 0-2, and 0-3. A summary of the percent background averages for each test location is as follows:

Average Maximum Percent Background

Sample Location		NH_4NO_3 Based on NH_3		NH_4NO_3 Based on NO_3^-
		Water	Water & Acid	Water
Prill Tower	Bypass	7.6	47	3.4
	Inlet	1.8	9.5	1.2
	Outlet	5.2	34	19
Prill Dryer	PreDryer	0.03	0.32	0.01
	Dryer	0.01	0.14	0.01
	Outlet	0.9	6.6	0.81
Prill Cooler				
	Bypass	1.3	12.6	0.39
	Inlet	0.02	0.15	0.01

TABLE 3-1

CLEANUP EVALUATION RESULTS FOR BYPASS AND PREDRYER INLET EMISSIONS

Test ID	Blank-By	1-PT-By	2-PT-By	3-PT-By	4PD-Pre	5-PD-Pre	6-PD-Pre	7-PC-By	8-PC-By	9-PC-By
mg NH_4NO_3 based on NH_4 (water only)	4.75	57.2	62.8	67.9	13,650	17,040	16,870	382	344	361
Maximum % Background		8.3	7.6	7.0	0.03	0.03	0.03	1.2	1.40	1.3
mg NH_4NO_3 based on NH_4 (water & acid)	51.6	100.5	113.2	416.8	13,881	17,257	17,040	429.1	398.1	407.1
Maximum % Background		51	46	44	0.37	0.30	0.30	12.0	13.0	12.7
mg NH_4NO_3 based on NO_3^- (water only)	1.36	33.4	40.6	46.5	13630	16,283	16,613	356	328	367
Maximum % Background		4.1	3.3	2.9	0.01	0.01	0.01	0.38	0.41	0.37

KEY: PT = Prill Tower
PD = Prill Dryer
PC = Prill Cooler
Pre = Predryer
By = Bypass

TABLE 0-2

CLEANUP EVALUATION RESULTS FOR INLET AND DRYER INLET EMISSIONS

Test ID	Blank-In	1-PT-In	2-PT-In	3-PT-In	4R-PD-Dry	5-PD-Dry	6-PD-Dry	7-PC-In	8-PC-In	9-PC-In
mg NH_4NO_3 based on NH_4 (water only)	4.68	25.6	301	227	24,005	33,488	33,003	37,677	23,492	24,915
Maximum % Background		1.8	1.6	2.1	0.02	0.01	0.01	0.01	0.02	0.02
mg NH_4NO_3 based on NH_4 (water & acid only)	40.7	448	467	377	24,052	33,537	33,052	37,706	23,542	24,960
Maximum % Background		9.1	8.7	10.8	0.17	0.12	0.12	0.11	0.17	0.16
mg NH_4NO_3 based on NO_3^- (water only)	1.28	82.5	125.8	124.4	24,613	32,326	28,706	34,624	23,736	26,035
Maximum % Background		1.6	1.0	1.0	0.01	0.01	0.01	0.01	0.01	0.01

KEY: PT = Prill Tower
PD = Prill Dryer
PC = Prill Cooler
Dry = Dryer
In = Inlet

TABLE 0-3

CLEANUP EVALUATION RESULTS FOR OUTLET EMISSIONS

Test ID	Black Out	1-PT-Out	2-PT-Out	3-PT-Out	4-PD-Out	5-PD-Out	6-PD-Out
mg NH_4NO_3 based on NH_4 water only	4.40	88.22	78.7	87.4	46.7	618	462
Maximum % Background		5.0	5.6	5.0	0.9	0.7	1.0
mg NH_4NO_3 based on NH_4 water & acid only	46.8	140.4	131.6	136.3	653	898	626
Maximum % Background		33	36	34	7.2	5.2	7.5
mg NH_4NO_3 based on NO_3^- water only	1.21	5.41	5.00	11.1	151	140	159
Maximum % Background		22	24	11	0.80	0.86	0.76

KEY: PT = Prill Tower
PD = Prill Dryer
Out = Outlet

APPENDIX O.2

MRI CLEANUP RESULTS (PARTICLE SIZE TESTS)

BLANK HANDLING PROCEDURE

A 250 ml sample of the deionized distilled water used in washing the HCSS impactor stages was taken after every two tests in order to validate wash water purity. The water was transferred from a 5 gal. nalgene bottle to a squirt bottle, then measured and sealed in a sample jar. All blanks were treated like samples. Blank correction factors were applied to the appropriate samples in the final calculations. Copies of lab data can be found in Appendix B-2.

TABLE 1-H-1. COLUMBIA NITROGEN CORPORATION, AUGUSTA, GEORGIA (BLANKS)

Sample No.	Sample I.D.	Aliquot analyzed (ml)	Sample volume (ml)	Dilution	Average mv	µg/ml NO_3^- in aliquot analyzed	Total mg/ml NO_3^-
05	Blank R-1	100	250	-	266.5	0.86	8.6×10^{-4}
10	Blank R-2 and 3	100	250	-	262.2	0.65	6.5×10^{-4}
19	Blank R-4 and 5	100	300	-	264.3	0.77	7.7×10^{-4}
28	Blank R-6 and 7	100	300	-	266.6	0.84	8.4×10^{-4}
37	Blank R-8 and 9	100	250	-	266.5	0.75	7.5×10^{-4}
46	Blank R-10 and 11	100	300	-	270.1	0.65	6.5×10^{-4}
55	Blank R-12 and 13	100	300	-	267.3	0.81	8.1×10^{-4}
64	Blank R-14 and 15	100	300	-	267.3	0.76	7.6×10^{-4}
73	Blank R-16 and 17	100	250	-	265.2	0.76	7.6×10^{-4}
82	Blank R-18	100	250	-	270.0	0.65	6.5×10^{-4}

APPENDIX P

PROCESS OPERATIONS LOG

COLUMBIA NITROGEN CORPORATION

August 29, 1980

Mr. A. J. Miles
RADIAN CORPORATION
3024 Pickett Road
Durham, North Carolina 27705

Dear Andy:

Please find enclosed the original copies of the nonconfidential data sheets that were accumulated during the testing of our ammonium nitrate low density plant emissions. They were signed by Karl Sass at the time of testing and reviewed later. After reviewing the sheets and the operating logs, Mr. Sass does not believe that there were any anomalies in process operations that occured during the test period that would have affected emissior for the sources tested.

Yours truly,

Richard A. Lawson

Richard A. Lawson
Environmental Chemist

CC: Karl Sass (without attachment)

POST OFFICE BOX 1483
AUGUSTA, GEORGIA 30903
TELEPHONE (404) 724-8771
TELEX 545448 COL NIT AUG

COLUMBIA NITROGEN
LOW DENSITY TEST

Test No. #1 Date 8/12 MRZ Test No. X TRC Test No. B-B Prill Tower Initials RDR

	PRILL TOWER						SOURCE PREDRYER			DRYER			COOLER			BRINKS					DUCON			PEABODY		
	Flow to #1 Evap x 1.5 GPM	Steam to #2 Evap x 800 #/HR	Production Rate (CALC) a Ton/HR	Melt #3 Temp °F	Melt Conc	Prill Temp	Prill Temp	Prill Moisture	~~Production Rate~~	Prill Temp	Prill Moisture	~~Production Rate~~	Prill Temp	Prill Moisture	Production Rate #4 b Ton/HR	Scrubber Liq pH #5	Scrubber Liq Flow ΔP #6 PSI	Scrubber Liq AN Conc	Fan #7	ΔP #8 UPPER/#9 LOWER	Scrubber Liq Flow #12	Fan	ΔP #11	Scrubber Liq Flow #10	Fan #13 A/B	ΔP #14
Meter No.																										
Base No.																										
Time								0 8:00			0 8:00			0 8:00												
10:30	0	0	31.6	0											23.6				34							
10:45	0	0	"	-1		0	0			0			0		23.6					12.1/1.36						
11:00	0	0	"	0											22.6				"							
11:15	0	0	"	-1	0										22.6	3.75		7.23								
11:30	0	0	"	-1				-.07			+.10			+.06	22.6				"	12.2/1.36						
11:45	0	0	"	0											23.6											
12:00	0	0	"	-1											22.6	3.9	52	7.22	"	12.3/1.36						
12:15	0	+0.1	"	-1											23.6											
12:30	0	+0.1	"	-1											23.6		52		"	12.4/1.36						
12:45	0	+0.1	"	-1		-4	+2			+4			0		23.6											
13:00	0	0	"	0											23.6		53		"	12.5/1.36						
13:15	0	+0.1	"	-1											23.6											
13:30	0	+0.1	"	0											23.6				"							
14:00					+.02 @15:00	-2	+3	+.42		+6	+.08		+1	+.05												

TRC Start 10:45 Stop 1:20

MASS Emissions

a. Calc. From Flow to Evap.
b. Corrected to remove coating material

K.W.J. 8/12/80
RDR 8/12/80

C

COLUMBIA NITROGEN
LOW DENSITY TEST

Test No. #1 Date 8/12 MRI Test No. TP#4 Cooler TRC Test No. X Initials RDB

	PRILL TOWER								PREDRYER				DRYER				COOLER				BRINKS					DUCON			PEABODY		
	Flow to #1 Evap	Steam to #2 Evap x 800#/HR	Production (CALC) Ton/HR Rate x	Melt #3 Temp	Melt Conc	Prill Temp	Prill Temp	Prill Moisture	~~Production Rate~~	Prill Temp	Prill Moisture	~~Production Rate~~	Prill Temp °F	Prill Moisture	Production #4 Rate b Ton/HR	Scrubber Liq pH #5	Scrubber Liq Flow #6	Scrubber Liq AN Conc	Fan #7	ΔP #8 UPPER/#9 LOWER	Scrubber Liq Flow #12	Fan	ΔP #11	Scrubber Liq Flow #10	Fan #13 A/B	ΔP #14
Meter No.																															
Base No.																															
Time																															
14:20			31.6													@12:45 0	@11:30 +0.06	24.4													
14:50			"															24.6													
15:20			"															24.6													
15:50			"															24.6													
16:20			"															24.6													

MRI - Start 2:20 Stop 3:25

PARTICLE SIZE

a. Calculated from Flow to Evap.
b Corrected to remove coating material

K.W.S. 8/12/80

COLUMBIA NITROGEN
LOW DENSITY TEST

Test No. #2 Date 8/12/80 Test No. TP#4 Cooler TRC Test No. A-A Prill Tower Initials RDR

	PRILL TOWER						SOURCE PREDRYER			DRYER			COOLER			BRINKS					DUCON			PEABODY		
	Flow to #1 Evap x 1.56 Pm	Steam to #2 Evap x 800 #/hr	Production Rate (CALC) P Ton/HR	Melt #3 Temp °F	Melt Conc %	Prill Temp °F	Prill Temp °F	Prill Moisture %	~~Production Rate~~	Prill Temp °F	Prill Moisture %	~~Production Rate~~	Prill Temp °F	Prill Moisture %	Production Rate #4 Ton/HR	Scrubber Liq pH #5	Scrubber Liq ΔP #6 psi	Scrubber Liq AN Conc.	Fan #7	ΔP #8 UPPER/#9 LOWER	Scrubber Liq Flow #12	Fan	ΔP #11	Scrubber Liq Flow #10	Fan #13 A/B	ΔP #14
Meter No.																										
Base No.																										
Time						14:00 -2	14:00 +3	14:00 +.42		14:00 +6	14:00 +.08		14:00 +1	14:00 +.05												
15:00	+0.5	0	31.6	-1	+.02	+1	+6			+6			0		24.1				34							
15:15	+1.0	0	"	-1											24.6				34							
15:30	+1.0	+.1	"	-1											24.6		53		34							
15:45	0	+.1	"	0											24.6		~~53~~		34							
16:00	0	+.1	"	-1		0	+4	-.37		+5	-.04		-1	0	24.6	5.6	53	5.7	34	12.7/1.38						
16:15	0	+.1	"	0											24.6				34							
16:30	0	+.1	"	0											24.6		53		34	12.9/1.38						
16:45	0	+.1	"	0											24.1				34							
17:00	0	+.1	"	-1		+3	+7			+7			-1		24.6	5.7	53	8.04	34	12.8/1.8						
17:15	+.5	+.1	"	0											24.6				34							
17:30	0	+.1	"	-1											24.6		52		34	12.9/1.36						
17:45	0	+.2	"	-1											24.6				34							
18:00	+.5	+.2	"	-1	~~[illegible]~~	+5	+7	-.37		+7	-.05		-3	+.01	24.6	5.7	53	8.35	34	12.9/1.34						
18:15	0	+.1	"	-1											24.6				34							
18:30	+.5	+.1	"	-1											24.6				34							
18:45	0	+.1	"	-1											24.6				34							

#2 TRC Start @ 3:30 Stop 6:00 Mass Emission
~~MRI Start @ 3:30 Stop 3:30~~ Particle Size
#2 MRI Start @ 5:40 Stop Particle Size

a Calculated from Flow to Evap.
b Corrected to remove coating material

RDR 8/18/80

COLUMBIA NITROGEN
LOW DENSITY TEST

E

Test No. #3 Date 3/13/80 MRI Test No. TP#4 Cooler TRC Test No. C-C Prill Tower Initials RDR

	PRILL TOWER						SOURCE PREDRYER			DRYER			COOLER			BRINKS					DUCON			PEABODY		
	Flow to #1 Evap x 15 GPM	Steam to #2 Evap x 500 #/HR	Production (A) (CALC) Rate Ton/hr	Melt #3 Temp °F	Melt Conc %	Prill Temp °F	Prill Temp °F	Prill Moisture %	~~Production Rate~~	Prill Temp °F	Prill Moisture %	~~Production Rate~~	Prill Temp °F	Prill Moisture %	Production (B) #4 Rate to Ton/hr	Scrubber Liq pH #5	Scrubber Liq ΔP #6 PSI	Scrubber Liq AN Conc	Fan #7	ΔP #8 UPPER/#9 LOWER	Scrubber Liq Flow #12	Fan	ΔP #11	Scrubber Liq Flow #10	Fan #13 A/B	ΔP #14
Meter No.																										
Base No.																										
Time																										
6:00								-0.07			+.04			+.03												
7:00						-8	-10			-6			-5													
7:30 +	+2.5	0	33.1	-1											25.4				34							
7:45	+3.0	0	33.4	-1											25.4				34							
8:00	+3.0	0	33.4	-1		-7	-9	+.02		-5	+.11		-5	+.15	25.4	3.35		7.30	34							
8:40	+3.0	+.2	33.4	-1											25.4				34							
8:45	—	—	—												—				—							
↑ 9:00	-7.0	-.2		+1	-1.95										25.4		52		34	1.21						
9:15	+3.0	+.5	33.4	+2											25.4				34							
9:30	+2.5	+.4	33.1	+1											25.1		52		34	1.22						
9:45	+2.5	+.3	33.1	+1											24.6				34	1.35						
10:00	+3.0	+.2	33.4	+1		-7	-4	+.15		-4	+.06		-1	+.15	25.6	3.4	52	7.11	34	1.35						
10:15	+2.5	+.2	33.1	-1											26.1				34							
10:30	+3.0	+.5	33.4	+3											25.6		52		34	1.21						
10:45	+3.0	+.3	33.4	+2											25.6				34							
11:00	+2.5	+.3	33.1	+2											25.6		52		34	1.21						
11:15	+3.0	+.3	33.4	+2											25.6				34							
11:30	+3.0	+.3	33.4	+2											26.1				34							
11:45	—	—																								
12:00						-1	+3	-.19		+2	+.16		+1	+.09		5.1		7.21								

MRI - Start 8:45 Stop 9:45 TRC - Start 8:45 Stop 11:20 Visible @ Coaters + Prill Tower

A Calc from flow to Evap. ↑ 10 minute decrease in production due to loss

B Corrected to remove coating material of steam to Evap.

RDR

COLUMBIA NITROGEN
LOW DENSITY TEST

Test No. #4 Date 8/13/80 MRI Test No. TP#3 Cooler TRC Test No. _____ Initials RDR

F

	PRILL TOWER						SOURCE PREDRYER			DRYER			COOLER			BRINKS					DUCON			PEABODY		
	Flow to #1 Evap + 1.5 GPM	Steam to #2 Evap 1800 #/HR	Production (A) (CALC) Rate Tons/HR	Melt #3 Temp °F	Melt % Conc	Prill Temp °F	Prill Temp °F	Prill % Moisture	~~Production Rate~~	Prill Temp °F	Prill Moisture %	~~Production Rate~~	Prill Temp °F	Prill Moisture %	Production (B) #4 Rate Tons/HR	Scrubber Liq pH #5	Scrubber Liq ~~Flow~~ PSI #6 to nozzle	Scrubber Liq AN Conc	Fan #7	ΔP #8 UPPER/#9 LOWER	Scrubber Liq Flow #12	Fan	ΔP #11	Scrubber Liq Over ~~Flow~~ PSI #10	Fan #13 A/B	~~ΔP~~ #14 ~~#13~~ ΔP (C) Flow %
Meter No.																										
Base No.																										
Time																										
12:00						-1	+3	-.19		+2	+.16		+1	+.09		5.1		7.21								
12:30	+3	+.3	33.4	+2											26.6				34							
12:45	+3	+.3	33.4	+2											26.6				34							
1.00	+3	+.3	33.4	+2											25.1				34							
1.15	–	–	–												–				–							
1:30	+3	+.3	33.4	+1											26.6				34							
1:45	+2.5	+.4	33.1	+1											26.6				34							
2:00	+2.5	+.4	33.1	+1		+3	+4	+.19		+2	+.20		0	+.07	26.6				34							
2:15	+3	+.4	33.1	+2											26.6				34							
2:30	+2.5	+.4	33.1	+2											26.6				34							
2:45	+2.5	+.4	33.1	+2											27.1				34							
3:00	+3.0	+.4	33.4	+1											26.6				34							

MRI Start 1:45 Stop 1:45

A Calc. from Flow to Evap
B Corrected to remove coating
C – 100% = 43 GPM

RDR 8/13/80

COLUMBIA NITROGEN
LOW DENSITY TEST

G

Test No. ~~8~~ #4 Date 8/13/80 MRI Test No. TP#3 Cooler TRC Test No. I Initials RDR

	PRILL TOWER						PREDRYER			DRYER			COOLER			BRINKS					DUCON			PEABODY (C)		
	Flow to #1 Evap x1.5 GPM	Steam to #2 Evap x800 #/HR	Production (CALC) Rate (A) Ton/HR	Melt #3 Temp °F	Melt Conc %	Prill Temp °F	Prill Temp °F	Prill Moisture %	~~Production Rate~~	Prill Temp °F	Prill Moisture %	~~Production Rate~~	Prill Temp °F	Prill Moisture %	Production (B) Rate to Ton/HR #4	Scrubber Liq pH #5	Scrubber Liq Flow PSI #6	Scrubber Liq AN Conc	Fan #7	ΔP #8 UPPER/#9 LOWER	Scrubber Liq Flow #12	Fan #11	ΔP	Scrubber Liq PSI #10	Fan #13 A/B	~~ΔP~~ #14 Flow
Meter No.																										
Base No.																										
Time																										
4:00	+3	+.4	33.4	+2	+1.42	+2	+6	-.20		+2	-.04		-3	-.03	26.6				34							
4:15	+3	+.4	33.4	+2											26.6				34							
4:30	+3	+.4	33.4	+2											26.6				34							
#2 4:45	+3	+.5	33.4	+2											26.6				34							
5:00	+3	+.5	33.4	+2		+1	+8			+4			-2		26.6				34							
5:15	+3	+.5	33.4	+3											26.6				34							
5:30	+3	+.4	33.4	+2											26.6				34							
6:00								-.55			-.05			0												
#3 6:15	+3	+.4	33.4	+2											26.6				34							
6:30	+3	+.4	33.4	+2											26.6				34							
6:45	+3	+.3	33.4	+2											26.6				34							
7:00	+3	+.4	33.4	+1		-2	+6			+4			+1		26.6				34							
7:15	+3	+.5	33.4	+2											26.6				34							

#2 MRI Start - 4:20 Stop - 5:20
#3 MRI Start - 6:25 Stop - 7:10

A - Calc from Flow to Evap.
B - Corrected to remove coating
C - 100% = 43 GPM

RDR 8/13/80

COLUMBIA NITROGEN
LOW DENSITY TEST

H

Test No. #5 Date 8/14/80 MRI Test No. B-B TRC Test No. X Initials RDR

Prill Tower

	PRILL TOWER						SOURCE PREDRYER			DRYER			COOLER			BRINKS					DUCON			PEABODY		
	Flow to #1 Evap 4.5 GPM	Steam to #2 Evap 8.00 #/HR	Production (A) (CALC) Rate Ton/HR	Melt #3 Temp °F	Melt % Conc	Prill Temp °F	Prill Temp °F	Prill Moisture %	~~Production Rate~~	Prill Temp °F	Prill Moisture %	~~Production Rate~~	Prill Temp °F	Prill Moisture %	Production (B) #4 Rate Ton/HR	Scrubber Liq pH #5	Scrubber Liq PSI #6	Scrubber Liq AN Conc	Fan #7	ΔP #8 UPPER/#9 LOWER	Scrubber Liq Flow #12	Fan	ΔP #11	Scrubber Liq PSI #10	Fan #13 A/B	Flow #14 (C)
Meter No.																										
Base No.																										
Time																										
9:30	+4	+2.4	33.9	+4		-15									20.6				34							
9:45	+4	+2.3	33.9	+5											21.6											
#1 B Inlet 10:00	+4	+2.3	33.9	+4											23.6				34							
10:15	+3.5	+2.3	33.7	+5											24.1											
10:30	+3.5	+2.4	33.7	+3											24.1				34							
10:45	+3.5	+2.5	33.7	+3											24.1											
11:00	+4	+2.6	33.9	+2	-.58	-7									24.6											
12:00	+3.5	+2.5	33.7	+4		-6	+4								22.6											
#2 B Outlet Bypass 12:15	+3.0	+2.5	33.4	+4											22.6											
12:30	+2.5	+2.4	33.1	+3											22.6											
12:45	+3.0	+2.4	33.4	+4											22.6											
1:00	+3.5	+2.4	33.7	+4		-6	+46								22.1											
1:15	+3.0	+2.1	33.4	+3											22.1											
1:30	0	+2.0	31.9	+3											22.1											
1:45	-1	+1.8	31.4	+3											22.1											
2:00	-1	+1.6	31.4	+3		-6	+7								22.1											
2:15	-1	+1.6	31.4	+3											21.6											
2:30	-1	+1.5	31.4	+2											21.6											
2:45	-3	+1.2	30.4	+2											21.1											
3:00	-4	+1.0	29.9	+2		-7	+7			0			-2		20.6											
3:15	-4	+1.0	29.9	+3											20.6											
		#1	MRI		Start		9:55		Stop	10:50	#2	Start	12:05	Stop	37.5											

Bagging - Opacity on Bagging
Avg Prod. 3.0 Ton/HR
Start Vis. @ 10:14
Stop Vis. @ 2:00

A - Calc. from Flow to Evap.
B - Corrected to remove coating

C - 100% = 43 GPM
* System down & Start up @ 8:00 - System on Prill Tower normal @ 9:30 RDR 8/14/80

COLUMBIA NITROGEN
LOW DENSITY TEST

Test No. #6 Date 8/14 MEL Test No. 4 TRC Test No. TP#215 Initials EDR

I

Prilling Tower

Time	Flow to #1 Evap ×1.5 GPM	Steam to #2 Evap ×100 #/HR	Production (QALC) Rate TPH	Melt #3 Temp °F	Melt % Conc	Prill Temp °F
Meter No.						
Base No.						
10:00	+4	+2.3	32.9	+4		9:30 -18
10:15	+3.5	+2.3	33.7	+5		
10:30	+3.5	+2.4	33.7	+3		
10:45	+3.5	+2.5	33.7	+3		
11:00	+4	+2.6	33.9	+2	-.54	-7
11:15	+4	+2.6	33.9	+4		
11:30	+4	+2.6	33.9	+3		
11:45	+4	+2.6	33.9	+4		
12:00	+3.5	+2.5	33.7	+4		-6
12:15	+3.0	+2.5	33.7	+4		
12:30	+2.5	+2.4	33.1	+3		
12:45	+3.0	+2.4	33.4	+4		
1:00	+3.5	+2.4	33.7	+4		-6
1:15	+3	+2.1	33.4	+3		
+ 1:30	0	+2.0	31.9	+3		
1:45	-1	+1.8	31.9	+3		
2:00	-1	+1.6	31.9	+3		-6
2:15	-1	+1.6	31.9	+2		
2:30	-1	+1.5	31.9	+2		
				#1	TRC	Start 10:30

Source

Time	Pregdryer Prill Temp °F	Pregdryer Prill Moisture %	Pregdryer Prod Rate	Dryer Prill Temp °F	Dryer Prill Moisture %	Dryer Production Rate
10:00	9:30 -12			9:30 -8		
10:15						
10:30						
10:45						
11:00	+18			-18		
11:15						
11:30						
11:45						
12:00	+4	-.17		+2	+.22	
12:15						
12:30						
12:45						
1:00	+6			0		
1:15						
+ 1:30						
1:45						
2:00	+7	-.05		+2	+.08	
2:15						
2:30						
				Start 2:20		

Time	Cooler Prill Temp °F	Cooler Prill Moisture %	Cooler Production Rate TPH	Brinks Scrubber Liq #5 pH	Brinks Scrubber Liq #6 Flow BT	Brinks Scrubber Liq AN Conc.	Duion Scrubber Liq #7 ΔP #8 Wire/#9 Lower	Duion Scrubber Liq #12 Flow	Duion Scrubber Liq #11 ΔP	Peabody Scrubber Liq #10 Flow	Peabody Scrubber Liq #13 A/B Conc	Peabody Scrubber Liq #12 ΔP Flow
10:00	9:30 -3		23.6									
10:15			24.1									.1
10:30			24.1							30	164/160	21
10:45			24.1									
11:00	+1		24.6							31		
11:15			24.6									
11:30			23.6							30	160/160	20
11:45			22.1									
12:00	-1	+.07	22.6							31	166/160	20
12:15			22.6									
12:30			22.6							30	160/170	22
12:45			22.6									
1:00	-3		22.6							31	160/170	21
1:15			22.1									
+ 1:30			22.1							31	160/170	25
1:45			22.1									
2:00	-1	+.07	22.1									
2:15			22.1									
2:30			21.6									
				NOTE: Orifice Inlet Emulsion #1			MAKE DISCARDED					

A = Calc. from Flow to Evap
B = Corrected to remove coating

C-1000 = 436 GPM

+ Inlets down @ 10:45
bac 1 up @ bac 2 = 5

EDR/8/14

COLUMBIA NITROGEN
LOW DENSITY TEST

Test No. #7 Date 8/4 MRI Test No. A (Inlet Prill Tower) TRC Test No. TP #1,2+5 (Predryer, Dryer) Initials RDR

J

	PRILL TOWER						SOURCE PREDRYER			DRYER			COOLER			BRINKS					DUCON			PEABODY		
	Flow to #1 Evap x 1.5 GPM	Steam to #2 Evap x 800 #/HR	Production (A) (CALC) Rate Tons/hr	Melt #3 Temp °F	Melt Conc %	Prill Temp °F	Prill Temp °F	Prill Moisture %	~~Production Rate~~	Prill Temp °F	Prill Moisture %	~~Production Rate~~	Prill Temp °F	Prill Moisture %	Production (B) #4 Rate Tons/hr	Scrubber Liq pH #5	Scrubber Liq Flow #6	Scrubber Liq AN Conc	Fan #7	ΔP #8 UPPER/#9 LOWER	Scrubber Liq Flow #14	Fan	ΔP #11	Scrubber Liq #10 PSI	Fan #13 A/B	~~ΔP~~ #12 (C) % Flow
Meter No.																										
Base No.																										
Time																										
2:00						-6	+7	-.05		+2	+.08		-1	+.07												A
3:00	-4	+1	29.9	+2		-7	+7			0			-2		20.6				34					30	160/170	50
3:15	-4	+1	29.9	+3											20.6											
3:30	-4	+1	29.9	+3											19.6				34					30	160/165	50
3:45	-4	+1	29.9	+2											19.6											
Low 4:00	-4	+1	29.9	+3		-8	+6	-.11		0	+.01		-2	-.03	19.6				34					30	160/170	40
4:15	-4	+1	29.9	+3											19.6											
4:30	-4	+1	29.9	+3	-.85										19.6				34					30	160/170	42
4:45	-4	+1.1	29.9	+2											19.1											
Outlet Door 5:00	-4	+1.2	29.9	+3		-5	+8			0			-3		19.1				34					30	160/170	31
5:15	-4	+1.5	29.9	+2											18.6											
#2 Door 5:30	-4	+1.6	29.9	+2											18.6				34							
5:45	-4	+1.8	29.9	+4											18.6											
6:00	-4	+1.8	29.9	+3		-3	+6	-.32		0	+.10		-3	-.03	18.6				34							
6:15	-4	+1.8	29.9	+4											18.6											
6:30	-4	+1.8	29.9	+3											18.6				34							
6:45	-4.5	+1.7	31.2	+3											18.6											
7:00	-4	+1.6	29.9	+4											18.6											
7:15																										

(A) Calc from Flow to Evap
(B) Corrected for coating on prill
(C) 100% = 43 GPM

TRC - Begin @ 3:00 Stop
MRI Begin @ 5:05 Stop

NOTE: DRYER INLET #1 + #2 MADE DURING THIS TIME
RDR 8/14 80

COLUMBIA NITROGEN
LOW DENSITY TEST

Test No. #8 Date 8/14 MRI Test No. X TRC Test No. TP 4,2,5 Initials RDR
Predryer, Dryer

K

	PRILL TOWER						SOURCE PREDRYER			DRYER			COOLER			BRINKS					DUCON			PEABODY		
	Flow to #1 Evap N.S.G.P.M.	Steam to #2 Evap 1500 #/HR	Production (CALC) Rate Ton/HR	Melt #3 Temp °F	Melt Conc %	Prill Temp °F	Prill Temp °F	Prill % Moisture	~~Production Rate~~	Prill Temp °F	Prill % Moisture	~~Production Rate~~	Prill Temp °F	Prill % Moisture	Production #4 Rate Ton/HR	Scrubber Liq pH #5	Scrubber Liq Flow #6	Scrubber Liq AN Conc	Fan #7	ΔP #8 UPPER/#9 LOWER	Scrubber Liq Flow #14	Fan	ΔP #11	Scrubber Liq #10 PSI	Fan #13 A/B	#12 % Flow
Meter No.																										
Base No.																										
Time																										
outlet 6:00	-4	+1.8	29.9	+3		-3	+6	-.32		0	+.10		-3	-.03	18.6											
6:15	-4	+1.8	29.9	+4											18.6											
outlet 6:30	-4	+1.8	29.9	+3											18.6									30	160 165	30
6:45	-3.5	+1.7	31.2	+3											18.6											
7:00	-4	+1.6	29.9	+4		-8	+5			0			-4		18.6									30	160 165	30
7:15	-4	+1.6	29.9	+3											18.6											
outlet 7:30	-4	+1.5	29.9	+4											18.6									30	160 170	30
7:45	-4	+1.5	29.9	+4											18.6											
outlet 8:00	-4	+1.5	29.9	-3		-6	+4	-.21		+1	+.05			+.01	18.6									30	160 170	30
8:15																										

A - Calc from Flow to Evap
B - Corrected to remove coating
... GP

TRC start 6:05 stop 8:05

RDR 8/14/80

COLUMBIA NITROGEN
LOW DENSITY TEST

Test No. #7 Date 9/15 MEL Test No. ~~#C~~ TRC Test No. ~~#~~ Initials RRK

PT bypass, Prayon system

Source

	PRILL TOWER							PREDRYER			DRYER			COOLER			BRINKS					PEABODY			
	Flow to #1 Evap	Steam to #2 Evap	Production (A) (CALC) Rate Tons/hr	Melt #3 Temp °F	Melt % Conc	Prill Temp. °F	Prill Temp °F	Prill Moisture %	Prod Rate	Prill Temp °F	Prill Moisture %	Prod Rate	Prill Temp °F	Prill Moisture %	Production (B) #4 Rate Tons/hr	Scrubber Liq #5 pH	Scrubber Liq #6 Flow	Scrubber Liq #7 SP Cond.	Fan #7	ΔP #8 Wiper/#9 Lower	Scrubber Liq #8 Flow	Fan #11 Amps (est)	ΔP #12 Inlet	Scrubber Liq #10 PSI	Fan #13 A/B	ΔP (C) #14 Inlet
Meter No.																									
Base No.																									
Time																									
8:00	-4	+1.5	29.9	+3		-10	-4	-.01		-6	4.02		-5	-.01	19.6				34						
8:15	—	—	—	—																					
8:30	-4	+1.6	29.9	+3											20.6				34						
8:45	-4	+1.6	29.9	+2											20.6										
9:00	-4	+1.5	29.9	+2		-9	-3			-3			-4		20.6				34						
Begin 9:15	-4	+1.4	29.9	+4											20.6										
Clean 9:30	-4	+1.3	29.9	+3	-.68										20.6				34						
9:45	-4	+1.3	29.9	+4											20.6										
10:00	-4	+1.2	29.9	+4		-7	-2	-.14		-3	4.02		-3	-.01	20.6				34			10/51			
10:15	-4	+1.1	29.9	+4											20.6										
10:30	-4	+1.1	29.9	+3											20.6				34	20		26			
10:45	-4	+1.1	29.9	+3											20.6										
11:00	-4	+1.0	29.9	+3		-8	0			-2			-3		21.1				34	20		26			
11:15	-4	+1.0	29.9	+4											21.1										
11:30	-4	+1.0	29.9	+3											21.1				34						
11:45	-4	+1.0	29.9	+3											21.1										
12:00	-4	+1.0	29.9	+4		-8	+1	-.25		0		4.03	-3	0	21.1				34						
12:15	-4	+1.0	29.9	+4											21.1										
12:30	-4	+1.0	29.9	+3											20.6				34						
12:45																									
1:00																									

A Calc from Flow & Evap

B Corrected to remove clay

C 1005 = 43 GPM

TRC—Begin cont

MEL Begin 9:15 Cont

RRK 8/11/80

COLUMBIA NITROGEN
LOW DENSITY TEST

Test No. #10 Date 8/15 MRZ Test No. X TRC Test No. TP 3 [illegible] Cooler Initials RDR

M

	PRILL TOWER						SOURCE PREDRYER			DRYER			COOLER			BRINKS					DUCON			PEABODY		
	Flow to #1 Evap x 1.5 GPM	Steam to #2 Evap x 800#/hr	Production (A) (CALC) Rate Ton/hr	Melt #3 Temp °F	Melt Conc %	Prill Temp °F	Prill Temp °F	Prill Moisture %	~~Production Rate~~	Prill Temp °F	Prill Moisture %	~~Production Rate~~	Prill Temp °F	Prill Moisture %	Production (B) #4 Rate Ton/hr	Scrubber Liq pH #5	Scrubber Liq Flow #6	Scrubber Liq AN Conc	Fan #7	ΔP #8 UPPER/#9 LOWER	Scrubber Liq Flow % #14	[illegible]	ΔPSI #11 Nozzle	Scrubber Liq #10 PSI	Fan #13 A/B	ΔP #12 % Flow
Meter No.																										
Base No.																										
Time					-.68	09:30																				
10:00	-4	+1.2	29.9	+4		-7	-2	-.14		-3	+.02		-3	-.01	20.6							[illegible]	[illegible]		[illegible]	
11:00	-4	+1.0	29.9	+3		-8	0			-2			-3		21.1						20	16.4	26	20	[illegible]	
Begin Outlet 11:15	-4	+1	29.9	+4											21.1											
Outlet 11:30	-4	+1	29.9	+3											21.1						20		26			
Inlet 11:45	-4	+1	29.9	+3											21.1											
Cooler Bypass 12:00	-4	+1	29.9	+4		-8	+1	-.25		0	+.03		-3	0	21.1						18	[illegible]	25			
12:15	-4	+1	29.9	+4											21.1											
12:30	-4	+1	29.9	+3											20.6						18		25			
12:45	-4	+1.0	29.9	+4											21.1											
1:00	-4	+1.2	29.9	+3		-8	+2			0			-3		21.1						16		25			
Outlet Dup 1:15	-4	+1.3	29.9	+3											21.1											
1:30	-4	+1.3	29.9	+3											21.1						16		25			
1:45	-4	+1.2	29.9	+3											21.1											
Bypass Dup 2:00	-4	+1.2	29.9	+3		-6	+4	-.16		+2	+.01		-2	0	21.6						10	[illegible]	25			
2:15	-4	+1.2	29.9	+2											20.6											
Inlet Dup 2:30	-4	+1.2	29.9	+3											20.6						10		25			
2:45	-4	+1.1	29.9	+2											20.6											

A Calc from Flow to Evap
B Corrected to remove clay
[illegible] 30

TRC Begin 11:04 End 12:40

RDR 8/15/80

COLUMBIA NITROGEN
LOW DENSITY TEST

Test No. #11 Date 5/5 Met Test No. A Bypass TRC Test No. TP3 2&6 Initials RDR
P&D Inlet #2 Cooler

Source

	PRILL TOWER							PREDRYER			DRYER			COOLER			BRINKS				DUSTRON			PEABODY		
	Flow to #1 Evap x 1/5 DP	Steam to #2 Evap x 500 #/HR	Production Rate (CALC) Tons/HR	Melt #3 Temp °F	Melt % Conc.	Prill Temp °F	Prill Temp °F	Prill Moisture %	Production Rate	Prill Temp °F	Prill Moisture %	Production Rate	Prill Temp °F	Prill Moisture %	Production Rate #4 Tons/HR	Scrubber Liq #5 pH	Scrubber Liq #6 Flow	Scrubber Liq AN Conc.	Flow #7	ΔP #8 UPPER/#9 LOWER	Scrubber Liq #10 Flow	Flow #11	PSI #12	Scrubber Liq #13 Flow	Flow #15 A/B	ΔP #14
Meter No.																										
Base No.																										
Time																										
2:00	-4	+1.2	29.9	+3		-6	+4	-.16		+2	+.01		-2	0	21.1				34		10	6.8 / 3.3	25			
2:30	-4	+1.2	29.9	+3											20.6				34		10		25			
2:45	-4	+1.1	29.9	+2											20.6				34							
3:00	-4	+1.1	29.9	+2		-6	+5			0			-4		20.6				34		10	6.5 / 3.3	26			
3:15	-4	+1.1	29.9	+4											20.6											
3:30	-4	+1.0	29.9	+4											20.1				34		10		26			
3:45	-4	+1.0	29.9	+3											20.6				34							
4:00	-4	+1.1	29.9	+3		-6	+6	-.16		+10	+.04		-1	-.08	20.6						10	6.7 / 2.8	25			
4:15	-4	+1.2	29.9	+2											18.6				34							
4:30	-4	+1.3	29.9	+3											20.1						10		25			
4:45	-4	+1.3	29.9	+3											20.1				34							
5:00	-4	+1.2	29.9	+4											20.1						10		26			
5:15	-4	+1.1	29.9	+2											20.6				34							
5:30	-4	+1.1	29.9	+3											20.1											
~~7:00~~	~~-4~~	~~+1.6~~																								
~~7:00~~	-4	0	29.9	-2	(										23.6											
7:15	-4	0	29.9	-2											22.6						12		24			
7:30	-4	0	29.9	-2	-1.75										22.6											
7:45	-4	0	29.9	-2											22.6											
8:00	-4	0	29.9	-2	)										22.6							X / 2.43				

Bypass #3 Inlet Opened 2:30 Closed 5:00
Bypass #3 Outlet Opened 2:30 Closed 5:00

A Calc. from Flow to Evap
B Connected to remove clog
C Lost Power 4:30 PM

MET Began 2:40 Ended 5:30
TRC Began 2:30 Ended 5:30
Hi Began 7:25 Ended

#2, #3 D Inlet, A Bypass
TP3 4,6 #1, #2 Cooler
RDR 5/15/80

COLUMBIA NITROGEN
LOW DENSITY TEST

Test No. #12 Date 8/10 Met Test No. C-1 to PTRC Test No. TPC #3-6 Initials RDC

PO inlet — Source — Cooler

	PRILL TOWER							PREDRYER			DRYER			COOLER			BRINKS				DUCON			PEABODY		
	Flow % (A)	Evap x 1/2 GPM	Steam to #2 Evap 1/2 PSIG	Production (CALC) Rate Tons/hr	Melt #3 Temp °F	Melt % Cond	Pr.11 Temp °F	Pr.11 Temp °F	Pr.11 Moisture %	Production Rate	Pr.11 Temp °F	Pr.11 Moisture %	Production Rate	Pr.11 Temp °F	Pr.11 Moisture %	Production #4 Rate Tons/hr	Scrubber Liq #5 pH	Scrubber Liq #6 Flow	Scrubber Liq #7 AN Conc	Flow	ΔP #8 Wire/#9 Liquor	Scrubber Liq #10 Flow	Flow	Post #11	Scrubber Liq #10 Flow	Flow #13 A/B	ΔP #14
Meter No.																										
Base No.																										
Time					+1.750	7:50																				
8:00	-4	0	29.9	-2		-16	-2	+02		-6	+.04		-7	+.10	22.6				34		X 3.68					
8:45	-4	0	29.9	-2											"											
9:00	-4	0	29.9	-2		-12	0			-6			-5		"				34		12		24			
9:15	-4	0	29.9	-3											"											
9:30	-4	+.1	29.9	-3											"				34		12		24			
9:45	-	-	-	-											-				32							
10:00	-4	+.1	29.9	-2		-10	+4	-.23		-5	1.01		-5	+.04	22.1						6.9 5.6					
10:15	-4	+.1	29.9	-3											"				34		12		24			
10:30	-4	+.1	29.9	-2											"											
10:45	-4	+.1	29.9	-2											22.6				34		12		25			
11:00	-4	+.1	29.9	-2		-12	-2			+2			+1		"						6.9 5.6					
11:15	-4	+.1	29.9	-3											"				34		1					
11:30	-4	+.0	29.9	-2											"						12		25			
11:45	-4	+.0	29.9	-3											"											
12:00	-4	+.0	29.9	-3		-8	+2	-.04		0	1.01		+3	-.04	"						12		25			
12:15	-4	+.0	29.9	-3											"											
12:30	-4	+.0	29.9	-2											"											
1:00	-4	+.0	29.9	-2											"											
1:15	-4	+.0	29.9	-3											22.6											

A - Calc from Flow x Evap

B - Corrected to remove cooling of

ΔP Begin 9:50 End 10:20 TPC Beg in 9:12 End 11:45

" Begin 12:17 End 12:28 " 10:18 " 1:20

APPENDIX Q

PROJECT PARTICIPANTS

PROJECT PARTICIPANTS
COLUMBIA NITROGEN CORPORATION
AUGUSTA, GEORGIA, AUGUST 11-16, 1980

TRC

Willard A. Wade III	Project Manager and Crew Chief
Leigh A. Gammie	Project Engineer and Emission Tester
Edward D. Astle	Emission Tester
James E. Carona	Emission Tester
Mark A. Algier	Emission Tester
Gilbert A. Griffin	Emission Tester
Kevin Keane	Emission Tester
James Nedry	Visible Emissions Observer
Randall Kauffman	Visible Emissions Observer
Margret M. Fox	Project Chemist
Dudley Alleman	Cleanup Technician
Ellen Scanlon	Cleanup Technician
Susan Reynolds	Data Reduction Technician
Eric A. Pearson	Project Scientist

MRI

Dr. Kenneth Wilcox	Program Coordinator
Mark Hansen	Associate Scientist
George Cobb	Assistant Scientist
Tom Walker	Junior Scientist

Radian

Andrew Miles	Environmental Engineer
Roger Rader	Environmental Engineer

Columbia Nitrogen Corporation

Max Beal	Manager, Environmental Activities
Richard A. Lawson	Environmental Control Chemist

EPA

Clyde E. Riley	Technical Manager
Eric A. Noble	Process Manager

APPENDIX R

SCOPE OF WORK

Includes:

R.1 TRC Work Assignment, Technical Directives and Associated Correspondence

R.2 MRI Work Assignment and Associated Correspondence

R.3 Radian Associated Correspondence

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

July 3, 1980

Mr. Will Wade
TRC Environmental Consultants, Inc.
125 Silas Deane Highway
Wethersfield, Connecticut 06109

Reference: EPA Contract No. 68-02-2820, Work Assignment No. 25, Columbia Nitrogen Corporation, Augusta, Georgia, EMB Report No. 80-NHF-16

Dear Will:

This correspondence is to document and clarify the scope of work for the above referenced work assignment. The proposed emission test program shall be conducted during low and high density prill tower operations. However, plant personnel have stated that there is a possibility, that the prill tower will not be producing the high density product during our scheduled test program.

Three cleanup evaluation tests shall be performed before the initial sampling begins. The cleanup evaluation tests are designed to prepare the sample collectors for the test program, to establish blank values obtained from the test collectors, and to familiarize the cleanup personnel with the specified sample recovery procedures. The collector trains, including the probes and flexible lines, shall be prepared and properly precleaned before conducting the cleanup evaluation tests. The impingers are to be precharged as specified in the actual test program. Afterwards the collectors, including the probes and flexible lines, are to be cleaned and the samples recovered and analyzed as specified in the actual test program.

To establish the quality assurance for the analytical activities I will supply you with five ammonium nitrate-in-water audit samples. These samples shall be anlayzed for nitrate by EPA Method 18, Determination of Particulate Emissions From Ammonium Nitrate Plants. The results shall be expressed in milligrams nitrate per milliliter of solution and total milligrams nitrate per sample. The audit samples shall be analyzed at the field lab and the results confirmed for accuracy before analyzing the field samples. I will deliver the five ammonium nitrate (AN) samples to you on July 28, 1980 at the Augusta plant site.

Low Density Test

Prill Tower (LD)

The concurrent scrubber bypass, inlet, and outlet AN - ammonia particulate runs shall cover approximately 144 minutes each. The three bypass stacks shall be referenced as Bypass A, Bypass B, and Bypass C. The three scrubber inlet ducts shall be referenced as Inlet A, Inlet B, and Inlet C. Individual particulate runs shall be conducted at each of the bypass and scrubber inlet locations concurrently with the single scrubber outlet location (see following list).

Run 1	Run 2	Run 3
Bypass A	Bypass B	Bypass C
Inlet A	Inlet B	Inlet C
Outlet	Outlet	Outlet

The bypass and scrubber outlet samples shall each be collected using 36 traverse points. The scrubber inlet duct samples shall be collected using 48 traverse points.

The train configuration shall consist of a glass-lined probe connected by a flexible Teflon line to six(6) impingers. The first two impingers are to be prefilled with deionized, distilled water (100 mls each). The next two are to be prefilled with 1N H_2SO_4 (100 mls each). The fifth impinger shall remain empty while the sixth shall be prefilled with 200 grams of indicating silica gel.

The first, third, fifth, and sixth impingers shall be of the Greenburg-Smith design, modified by replacing the tip with an 1/2 inch glass tube extended to within 1/2 inch of the impinger's bottom.

The second and fourth impingers are of the regular design for the Greenburg-Smith units including tips with orifice plates located within 1/2 inch of the bottom. No filter is required.

Each probe shall be heated to the temperature range of the stack plus 10°F; not to exceed 180°F. The probe temperature shall be measured and recorded for each traverse point. However, if you do not have this capability you may record the variable transformer setting and submit calibration curves utilizing the procedures outlined in APTD-0576. Data measurements shall be required for each traverse point. In addition each train operator shall maintain a daily log detailing problems, delays, elapsed sampling times, and associated comments.

Sample cleanup and recovery procedures include the following:

(1) Measure and record the moisture gained in the six impingers.

(2) The probe, flexible Teflon line, first two impingers and their connecting glassware shall be rinsed with deionized, distilled water into one container. The probe shall be brushed and rinsed.

(3) The third, fourth and fifth impingers and their connecting glassware shall be rinsed with a 1N H_2SO_4 solution and placed in a second container.

Brush and/or rinse the parts in the above prescribed manner at least three times or until no visible particles remain.

The collected emission samples shall be anlayzed as follows:

1. Analyze the water portion for nitrate content by EPA Method 18 (Specific Ion Electrode)

2. Analyze the water portion for ammonia content by Specific Ion Electrode

3. Analyze the 1N H_2SO_4 portion for ammonia content by Specific Ion Electrode.

Contractor shall analyze the collected samples for nitrate and ammonia content within 48 hours after collection. During the particulate test periods, average volumetric flow rates (DSCFM) shall be determined at each bypass and scrubber inlet location that is not being tested for particulate emissions. Traverse measurements of velocity (ΔPs) and temperature shall be recorded for each location at the beginning and end of each particulate run.

The bypass stack velocity measurements shall be made utilizing 24 traverse points. The scrubber inlet velocity measurements shall be collected using 28 traverse points.

Visible emission observations shall be conducted concurrently with the individual bypass and scrubber outlet particulate runs. Meteorological conditions permitting, three 2-hour monitoring periods shall be performed by two certified observers; one observer shall view the bypass emissions and the second observer shall view the scrubber outlet emissions. Data reduction shall be presented in 6-minute sets of 24 consecutive readings as outlined in "Guidelines For Evaluation of Visible Emissions" EPA-340/1-75-007.

Pressure drop measurements across the scrubbing device shall be recorded every 30 minutes using a U-tube manometer. Measurements shall be performed at the scrubber inlet location associated with the sampled particulate emissions.

Ambient air temperature and relative humidity measurements shall be recorded every 30 minutes during the test periods. These measurements shall be made within a 200 foot radius of the prill tower using a mercury-filled thermometer and a wet bulb apparatus.

Scrubber solution aliquots shall be collected every 30 minutes during the 2-hour test periods. For each aliquot sample, the temperature shall be measured immediately after collection and the pH shall be measured when the sample reaches room temperature (70°F). Afterwards, the aliquots are to be combined to form one composite sample for each location.

The samples shall be filtered using a tared glass fiber filler and a vacuum filtration apparatus to remove undissolved material. The filter shall

be stored in a petri dish for return to the TRC lab for desiccation and weighing.

The scrubbing solution samples shall be analyzed for the following:

1. Nitrate - Analyze within 20 days after collection by the specific ion electrode procedure.

2. Ammonia - Analyze within 20 days after collection by the specific ion electrode procedure.

3. Solids - Dry the funnel filter, desiccate and weigh to determine undissolved solids within 20 days after field test.

Predryer - Dryer (LD)

The three AN-ammonia concurrent particulate runs at the predryer and dryer inlets shall cover 144 minutes over 48 traverse points and 132 - minutes over 44 traverse points respectively. Concurrently the three runs at the predryer - dryer outlet shall cover approximately 120 minutes over 40 traverse points.

The particulate train configuration, sample recovery, and analytical methods shall be identical to the procedures described in the prior prill tower section.

Visible emission observations shall be conducted concurrently with the predryer-dryer scrubber outlet particulate runs. Three sets of observations covering approximately 2 hours each shall be conducted by a certified observer. Data reduction shall be summarized as described in the prior prill tower section.

Ambient air temperature and relative humidity measurements shall be recorded every 30 minutes. These measurements shall be made within a 100 foot radius of the predryer-dryer air-intakes.

Pressure drop measurements along with aliquots of scrubber solution shall be collected approximately every 30 minutes. The pressure drop measurements shall be measured across the Peabody scrubber. The scrubber solution shall be collected from the sump area. Scrubber solution recovery and analytical procedures are described in the prior prill tower section.

Fluidized Bed Cooler (LD)

Three AN ammonia particulate runs at the cooler bypass stack shall cover 120 minutes over 12 traverse points. Five minute readings shall be recorded at each of the traverse points. Each axis shall be traversed twice, making a total elapsed time of 60 minutes per port. Concurrently the three particulate runs at the cooler-inlet-to-Ducon scrubber shall cover 144 minutes over 48 traverse points. Sampling and analytical procedures are described in the prior prill tower section. Visible

Because of the large number of directions and specifications, I am requesting that the Technical Manager be notified in writing before any specification deviation and/or change in the above referenced Work Assignment be executed by TRC. Technical directions issued by the Technical Manager involving verbal interpretation of specifications or technical portions of the work description shall be confirmed and issued in writing by the Technical Manager within five(5) working days after issuance.

If you have any questions regarding these instructions or require additional information, please do not hesitate to contact me.

Sincerely yours,

Clyde E. Riley

Clyde E. Riley
Field Testing Section
Emission Measurement Branch

cc:

Ms. Marge Fox, TRC
Mr. Leigh Gamble, TRC
Mr. Roger Radar, Radian (Durham)
Mr. Andrew Miles, Radian (Durham)
Mr. Max Beal, Columbia Nitrogen Corporation
Mr. Richard Lawson, Columbia Nitrogen Corporation
Mr. Ken Wilcox, Midwest Research Institute
Mr. Mike Fogle, Georgia Department of Natural Resources
Mr. Eric Noble, EPA, ISB

Ambient air temperature, relative humidity, and pressure drop measurements shall be recorded every 30 minutes during the test periods.

High Density With Bypass Stacks Test

Prill Tower

Methods and procedures for these test runs shall be identical to the procedures outlined in the preceding Low Density Prill Tower section.

Particulate train operations data, percent isokinetics, percent moisture, volumetric flows (DSCFM), and nitrate analytical data shall be summarized at the end of each work day. The summarized data shall be reviewed at a morning briefing (8:30 a.m.) along with the prior day's data sheets and the current day's schedule.

Plant members along with Radian personnel plan to attend these meetings and will be responsible for projecting the process operations schedule.

Mr. Beal of Columbia Nitrogen Corporation has requested that we schedule our work operations from 7:00 a.m. to 7:00 p.m. However, these times may be changed if necessary. Present plans are to suspend work operations for August 3, however this is dependent upon fulfillment of the schedule and may be changed if necessary.

Test Program Schedule

The following dates represents the schedule that shall be observed during this work assignment. If these are not satisfactory please contact me.

Item	Due Date
TRC submits work schedule and list of project personnel to Technical Manager	July 10, 1980
Field program begins	July 28
Field program concluded	August 8
Preliminary field and analytical data	August 8
Outline for emission report to Technical Manager	August 15
Outline with comments returned to TRC	August 26
Analysis program concluded	August 29
Computer data output	September 5
Complete preliminary data to Technical Manager	September 12
First draft report to Technical Manager	October 3
Process data received from Radian	October 8
Draft report sent to Columbia Nitrogen for review	October 14
Comments received from Columbia Nitrogen	November 14
First draft comments returned to TRC	November 21
Final report received	December 19

emission observations shall be conducted concurrenlty with the cooler particulate runs. Three sets of observations covering 1 hour each shall be conducted by a certified observer on the bypass stack emissions as well as the scrubber outlet emissions.

Ambient air temperature, relative humidity and pressure drop measurements shall be recorded every 30 minutes during the test periods.

Rotary Drum Coater and Bagging

Visible emission observations shall be conducted at each of the coater and bagging operation baghouses. Three sets of 1 hour observations shall be conducted by a certified observer at each of the sites.

High Density-Normal Operation Test

Prill Tower (HD)

An individual AN-ammonia particulate run shall be conducted at each of the three scrubber inlet duct locations. Concurrently three particulate runs shall be performed at the scrubber outlet location. Sampling, sample recovery, and analytical procedures are detailed in the prior Low Density-Prill Tower section.

Volumetric flow rates (DSCFM) shall be determined at each scrubber inlet location that is not being tested for particulate emissions. Procedures are described in the Low Density-Prill Tower section.

Visible emission observations shall be conducted concurrently with the scrubber outlet particulate runs. Three, 2-hour sets shall be performed on the scrubber outlet emissions by a certified observer (Bypass stacks will not be operating).

Pressure drop measurements across the scrubbing device shall be recorded every 30 minutes during the test periods. Measurements shall be performed at the scrubber inlet location associated with the sampled particulate emissions.

Ambient air temperature and relative humidity measurements shall be recorded every 30 minutes during the test periods.

Scrubber solution aliquots shall be collected every 30 minutes during the test periods. Detailed procedures relating to sample preparation and analyses are presented in the prior Low Density-Prill Tower section.

Fluidized Bed Cooler (HD)

Three AN-ammonia particulate runs shall be performed at the cooler bypass stack. Concurrently three particulate runs shall be performed at the cooler-inlet-to-Ducon scrubber. Sampling and analytical procedures shall be the same as described in the prior cooler section.

Visible emission observations shall be performed concurrently with the cooler particulate runs. Observations shall be recorded for both the cooler bypass and the Ducon scrubber outlet emissions.

WORK ASSIGNMENT ENVIRONMENTAL PROTECTION AGENCY Research Triangle Park, N.C. 27711	EPA CONTRACT NO. 68-02-2820 CONTRACTOR TRC of New England ASSIGNMENT NO. 25 ASSIGNMENT CHANGE NO.
TITLE Perform NSPS Emission Test Program at an Ammonium Nitrate Manufacturing Facility	DATE

DESCRIPTION

The Contractor shall perform an emission test program in accordance with the basic contract scope of work for the Emission Measurement Branch, and as set forth in the attached "Source Sampling and Analysis Schedule" at the following site:

Company Name: Columbia Nitrogen Corporation
Location: Augusta, Georgia
Industry: Ammonium Nitrate
Project No.: 80-NHF-16

The Emission Measurement Branch's Technical Manager is Clyde E. Riley, Mail Drop 13, EMB, ESED, OAQPS, Research Triangle Park, North Carolina 27711.

Upon notification of approval of the proposed source test report, the Contractor shall provide 20 copies of the appendices and 35 copies of the final report without appendices.

All pretest survey, proposed final, and final source test reports and SOTDAT Data Form shall be submitted directly to J. E. McCarley, Emission Measurement Branch, ESED, Mail Drop 13, Research Triangle Park, North Carolina 27711.

All samples shall be discarded 6 months after the field test program.

ESTIMATE OF	GOVERNMENT ESTIMATE	CONTRACTOR ESTIMATE
LABOR HOURS	2060	
DURATION OF WORK	3 months	
COMPLETION DATE	September 30,1980	

REQUESTER'S SIGNATURE	ORG CODE	TELEPHONE	DATE
Clyde E. Riley C.E. Riley	ESED/EMB	(919) 541-5243	6/30/80

APPROVALS (as applicable)	SIGNATURE	DATE
BRANCH CHIEF	[signature]	7/1/80
DIVISION CHIEF	Dan R. Goodwin	7/2/80
PROJECT MANAGER	Thomas M. Bibb	7/1/80
CONTRACTING OFFICER		

CONTRACTOR'S REPRESENTATIVE ACKNOWLEDGMENT

SIGNATURE	TITLE	DATE

EPA(RTP)305

Page 1

68-02-287

SOURCE SAMPLING AND ANALYSIS SCHEDULE

(Low Density Test)

Company Name: Columbia Nitrogen Corporation

Company Location: Augusta, Georgia

Industry: Ammonium Nitrate

Process: Prill Tower

Control Equipment: Scrubber

Sampling Point Figure 1	Total No. of Samples	Sample Type	Sampling Method	Sample Collected By	Minimum Sampling Time	Minimum Gas Volume Sampled ft^3	Initial Analysis Type	Initial Analysis Method	Initial Analysis By	Final Analysis Type	Final Analysis Method	Final Analysis By
	3	Cleanup Evaluation	EPA Method 18	CTR	N/A	N/A	AN	EPA-18	CTR	NH_3	SIE	CT
	5	Quality Assurance	-	-	N/A	N/A	AN	EPA-18	CTR			
TP1*	1	AN Particulate	EPA-18	CTR	2 hrs.	60	AN	EPA-18	CTR	NH_3	SIE	CT
TP5*	1	"	"	"	"	"	"	"	"	"	"	"
TP4*	1	"	"	"	"	"	"	"	"	"	"	"
TP2*	1	Volumetric Flow	EPA-12	CTR	N/A	N/A	Average DSCFM	EPA-2	"			
TP3*	1	"	"	"	"	"	"	"	"			
TP6*	1	"	"	"	"	"	"	"	"			
TP7*	1	"	"	"	"	"	"	"	"			
TP4*	1	Visible Emissions	EPA-9	CTR	2 hrs	N/A	Average 6-minute intervals	EPA-9	CTR			
TP5*	1	"	"	"	2 hrs	"	"	"	"			
TP1*/TP4	1	Pressure Drop	U-Tube Manometer	CTR	2 hrs	N/A	Measurement shall be recorded every 30 minutes during test periods.					

N/A - Not Applicable

SIE - Specific Ion Electrode

* Simultaneous Sampling Required

REMARKS:

1. Sampling shall be performed with ± 10% isokinetic conditions.
2. Methods are EPA unless indicated otherwise.
3. Impingers and analysis of impinger catch will be per the Federal Register, Volume [illegible], No. 159, Part II, Tuesday, Aug. 17, 1971, unless specifically changed by the [illegible]

68-02-2820

SOURCE SAMPLING AND ANALYSIS SCHEDULE

(Low Density Test)

Company Name: Columbia Nitrogen Corporation

Company Location: Augusta, Georgia

Industry: Ammonium Nitrate

Process: Prill Tower

Control Equipment: Scrubber

Sampling Point Figure 1	Total No. of Samples	Sample Type	Sampling Method	Sample Collected By	Minimum Sampling Time	Minimum Gas Volume Sampled ft³	Initial Analysis Type	Initial Analysis Method	Initial Analysis By	Final Analysis Type	Final Analysis Method	Final Analysis By
TP2	1*	AN Particulate	EPA-18	CTR	2 hrs	60	AN	EPA-18	CTR	NH_3	SIE	CT
TP6	1*	"	"	"	"	"	"	"	"	"	"	"
TP4	1*	"	"	"	"	"	"	"	"	"	"	"
TP1	1*	Volumetric Flow	EPA-1,2	CTR	N/A	N/A	Average DSCFM	EPA-2	CTR			
TP3	1*	"	"	"	"	"	"	"	"			
TP5	1*	"	"	"	"	"	"	"	"			
TP7	1*	"	"	"	"	"	"	"	"			
TP4	1*	Visible Emissions	EPA-9	CTR	2 hrs	N/A	Average 6-minute intervals					
TP6	1*	"	"	"	2 hrs.	"	"					
TP2 / TP4	1*	Pressure Drop	U. Tube Manometer	CTR	2 hrs.	N/A	Measurements shall be recorded every 30 minutes during test periods					
TP3	1	*AN Particulate	EPA-18	CTR	2 hrs.	60	AN	EPA-18	CTR	NH_3	SIE	CT
TP7	1	* "	"	"	"	"	"	"	"	"	"	"
TP4	1	* "	"	"	"	"	"	"	"	"	"	"
TP1	1	*Volumetric Flow	EPA-1,2	CTR	N/A	N/A	Average DSCFM	EPA-2	CTR			

REMARKS:

1. Sampling shall be performed with ± 10% isokinetic conditions.
2. Methods are EPA unless indicated otherwise.
3. Impingers and analysis of impinger catch will be per the Federal Register, Vol. [illegible], No. 159, Part II, Tuesday, Aug. 17, 1971, unless specifically changed by the [illegible]
4. [illegible] volumes are for each sample.

* Simultaneous [illegible] Required

08-02-6820

SOURCE SAMPLING AND ANALYSIS SCHEDULE

(Low Density Test)

Company Name: Columbia Nitrogen Corporation

Company Location: Augusta, Geo[illegible]a

Industry: Ammonium Nitrate

Process: Prill Tower

Control Equipment: Scrubber

Sampling Point Figure 1	Total No. of Samples	Sample Type	Sampling Method	Sample Collected By	Minimum Sampling Time	Minimum Gas Volume Sampled ft^3	Initial Analysis Type	Initial Analysis Method	Initial Analysis By	Final Analysis Type	Final Analysis Method
TP2	1	*Volumetric Flow	EPA-1,2	CTR	N/A	N/A	Average DSCFM	EPA-2	CTR		
TP5	1	* "	"	"	"	"	"	"	"		
TP6	1	* "	"	"	"	"	"	"	"		
TP4	1	*Visible Emissions	EPA-9	CTR	2 hrs	N/A	Average 6-minute intervals				
TP7	1	* "	"	"	2 hrs	"	"				
~~TP-3~~ TP-4	1	*Pressure Drop	U. Tube Manometer	CTR	2 hrs	N/A	Measurements shall be recorded every 30 minutes during test periods				
TP-9	3	Scrubber Sol. in	Composite	CTR	2 hrs	N/A	Tempt, pH	TBD	CTR	% AN, % NH_3 % solids	SIE Filter
TP-10	3	Scrubber Sol. out	Composite	CTR	2 hrs	N/A	Tempt., pH	TBD	CTR	"	"
TP-8	3	Ambient Air Tempt.	Mercury Thermometer	CTR	2 hrs	N/A	Measurements shall be recorded				
TP-8	3	Relative Humidity	Wet, Dry Bulb	"	"	N/A	every 30 minutes during test periods				

TBD - To be determined
N/A - Not Applicable
SIE - Specific Ion Electrode

REMARKS:

1. Sampling shall be performed within ± 10% isokinetic conditions.
2. Methods are EPA unless indicated otherwise.
3. Impingers and analysis of impinger catch will be per the Federal Register, Volume 3[illegible] No. [illegible] Part [illegible] Tuesday, [illegible] unless specifically changed by the [illegible]

SOURCE SAMPLING AND ANALYSIS SCHEDULE

(Low Density Test)

68-02-2821

Company name: Columbia Nitrogen Corporation

Location: Augusta, Georg

Industry: Ammonium Nitrate

Process: Fluidized Bed Cooler

Control Equipment: Scrubber

Sampling Point Figure 2	Total No. of Samples	Sample Type	Sampling Method	Sample Collected By	Minimum Sampling Time	Minimum Gas Volume Sampled ft^3	Initial Analysis Type	Initial Analysis Method	Initial Analysis By	Final Analysis Type	Final Analysis Method	Final Analysis
TP3	3*	AN Particulate	EPA-18	CTR	2 hrs	60	AN	EPA-18	CTR	NH_3	SIE	CT
TP4	3*	"	"	"	1 hr	30	"	"	"	"	"	"
TP4	3*	Visible Emissions	EPA-9	CTR	1 hr	N/A	Average 6-min. intervals	EPA-9	CTR			
TP6	3*	"	"	"	1 hr	"	"	"	"			
TP14	3*	Ambient Air Tempt.	Mercury Thermometer	CTR	2 hrs	N/A	Measurements shall be recorded					
TP14	3*	Relative Humidity	Wet Dry Bulb	"	2 hrs	"	every 30 minutes during					
TP3 TP6	3*	Pressure Drop	U-Tube Manometer	"	2 hrs	"	test periods.					

N/A - Not Applicable

SIE - Specific Ion Electrode

REMARKS:

1. Sampling shall be performed with ± 10% isokinetic conditions.
2. Methods are EPA unless indicated otherwise.
3. Impingers and analysis of impinger catch will be per the Federal Register, Volume 36, No. 159, Part II, Tuesday, Aug. 17, 1971, unless specifically changed by the

SOURCE SAMPLING AND ANALYSIS SCHEDULE

(Low Density Test)

Company Name: Columbia Nitrogen Corporation

Company Location: Augusta, Georgia

Industry: Ammonium Nitrate

Process: Predryer and Dryer

Control Equipment: Scrubber

Sampling Point (Figure 2)	Total No. of Samples	Sample Type	Sampling Method	Sample Collected By	Minimum Sampling Time	Minimum Gas Volume Sampled (ft^3)	Initial Analysis			Final Analysis	
							Type	Method	By	Type	Method
TP1	3*	AN Particulate	EPA-18	CTR	1 hr	30	AN	EPA-18	CTR	NH_3	SIE
TP2	3*	"	"	"	1 hr	30	"	"	"	"	"
TP5	3*	"	"	"	2 hrs	60	"	"	"	"	"
TP5	3*	Visible Emissions	EPA-9	CTR	2 hrs	N/A	Average 6-min. intervals	EPA-9	CTR		
TP10	3*	Scrubber Sol.	Composite	CTR	2 hrs	N/A	Tempt. pH	TBD	CTR	% AN, % NH_3, % solids	SIE
TP14	3*	Ambient Air Tempt.	Mercury Thermometer	CTR	2 hrs	N/A	Measurements shall be recorded				
TP14	3*	Relative Humidity	Wet, Dry Bulb	"	2 hrs	"	every 30 minutes during				
TP5 TP15	3*	Pressure Drop	U. Tube Manometer	"	2 hrs	"	test periods.				

N/A - Not Applicable

SIE - Specific Ion Electrode

TBD - To be determined

REMARKS:

1. Sampling shall be performed with ± 10% isokinetic conditions.
2. Methods are EPA unless indicated otherwise.
3. Impingers and analysis of impinger catch will be per the Federal Register, Volume 36, No. 159 Part II, Tuesday Aug. 17, 1971, unless specifically changed by [illegible]

SOURCE SAMPLING AND ANALYSIS SCHEDULE

(Low or High Density)

Co. Name: Columbia Nitrogen

Co. Local: Augusta, Georgia

Industry: Ammonium Nitrate

Process: Rotary Drum Coater

Control Equipment: Baghouse

Sampling Point Figure 3	Total No. of Samples	Sample Type	Sampling Method	Sample Collected By	Minimum Sampling Time	Minimum Gas Volume Sampled ft^3	Initial Analysis Type	Initial Analysis Method	Initial Analysis By	Final Analysis Type	Final Analysis Method	Final Analysis By
TP1	3	Visible Emissions	EPA-9	CTR	1 hr	N/A	Average 6-min. intervals	EPA-9	CTR			

REMARKS:

1. Sampling shall be performed with ± 10% isokinetic conditions.
2. Methods are EPA unless indicated otherwise.
3. Impingers and analysis of impinger catch will be per the Federal Register, Volume 36, No. 159, Part II, Tuesday, Aug. 17, 1971, unless specifically changed by the [illegible]

* Simultaneous [illegible] ing Required

SOURCE SAMPLING AND ANALYSIS SCHEDULE

(Low or High Density)

Company Name: Columbia Nitrogen

Company Location: Augusta, Georgia

Industry: Ammonium Nitrate

Process: Bagging

Control Equipment: Baghouse

Sampling Point Figure 3	Total No. of Samples	Sample Type	Sampling Method	Sample Collected By	Minimum Sampling Time	Minimum Gas Volume Sampled ft^3	Initial Analysis Type	Initial Analysis Method	Initial Analysis By	Final Analysis Type	Final Analysis Method	Final Analysis By
TP1	3	Visible Emissions	EPA-9	CTR	1 hr	N/A	Average 6-min. intervals	EPA-9	CTR			

REMARKS:

1. Sampling shall be performed with ± 10% isokinetic conditions.
2. Methods are EPA unless indicated otherwise.
3. Impingers and analysis of impinger catch will be per the Federal Register, Volume 36, No. 159, Part II, Tuesday, Aug. 17, 1971, unless specifically changed by the [illegible]

Result ____ Sa ____ Requi

58-[illegible]-3820

SOURCE SAMPLING AND ANALYSIS SCHEDULE

(High Density - Normal Operations)

Company Name: Columbia Nitrogen Corporation

Company Location: Augusta, Georgia

Industry: Ammonium Nitrate

Process: Prill Tower

Control Equipment: Scrubber

Sampling Point Figure 1	Total No. of Samples	Sample Type	Sampling Method	Sample Collected By	Minimum Sampling Time	Minimum Gas Volume Sampled ft³	Initial Analysis Type	Initial Analysis Method	Initial Analysis By	Final Analysis Type	Final Analysis Method	Final Analysis By
TP1*	1	AN Particulate	EPA-18	CTR	2 hrs	60	AN	EPA-18	CTR	NH_3	SIE	CTR
TP4*	1	"	"	"	"	"	"	"	"	"	"	"
TP2*	1	Volumetric Flow	EPA-1,2	CTR	N/A	N/A	Average DSCFM	EPA-2	CTR			
TP3*	1	"	"	"	"	"	"	"	"			
TP4*	1	Visible Emissions	EPA-9	CTR	2 hrs	N/A	Average 6-min. intervals	EPA-9	CTR			
TP1* TP4	1	Pressure Drop	U. Tube Manometer	CTR	2 hrs	N/A	Measurements shall be recorded every 30 minutes during test periods					
TP2	1*	AN Particulate	EPA-18	CTR	2 hrs	60	AN	EPA-18	CTR	NH_3	SIE	CTR
TP4	1*	"	"	"	"	"	"	"	"	"	"	"
TP1	1*	Volumetric Flow	EPA-1,2	CTR	N/A	N/A	Average DSCFM	EPA-2	CTR			
TP3	1*	"	"	"	"	"	"	"	"			
TP4	1*	Visible Emissions	EPA-9	CTR	2 hrs	N/A	Average 6-min. intervals	EPA-9	CTR			
TP-2 TP-4	1*	Pressure Drop	U-Tube Manometer	CTR	2 hrs	N/A	Measurements shall be recorded every 30 minutes during test periods.					
TP3	1	*AN Particulate	EPA-18	CTR	2 hrs	60	AN	EPA-18	CTR	NH_3	SIE	CTR
TP4	1	* "	"	"	"	"	"	"	"	"	"	"

REMARKS:

1. Sampling shall be performed within 10% isokinetic conditions.
2. Methods are EPA unless indicated otherwise.
3. Impingers and analysis of impinger catch will be per the Federal Register, Volume 36, No. 159, Part II, Tuesday, Aug. 17, 1971, unless specifically changed by the Pro[illegible]

SOURCE SAMPLING AND ANALYSIS SCHEDULE

(High Density-Normal Operations)

Company Name: Columbia Nitrogen Corporation

Company Location: Augusta, Georgia

Industry: Ammonium Nitrate

Process: Prill Tower

Control Equipment: Scrubber

Sampling Point (Figure 1)	Total No. of Samples	Sample Type	Sampling Method	Sample Collected 2/	Minimum Sampling Time	Minimum Gas Volume Sampled (ft^3)	Initial Analysis: Type	Initial Analysis: Method	Initial Analysis: By	Final Analysis: Type	Final Analysis: Notes
TP1	1	*Volumetric Flow	EPA-1,2	CTR	N/A	N/A	Average DSCFM	EPA-2	CTR		
TP2	1	* "	"	"	"	"	"	"	"		
TP4	1	*Visible Emissions	EPA-9	CTR	2 hrs	N/A	Average 6-min. intervals	EPA-9	CTR		
TP3 / TP4	1	*Pressure Drop	U-Tube Manometer	CTR	2 hrs	N/A	Measurements shall be recorded every 30 minutes during test periods				
TP9	3	Scrubber Sol. in	Composite	CTR	2 hrs	N/A	Tempt. pH	TBD	CTR	% AN, % NH_3 / % solids	SIE / Filter
TP10	3	Scrubber Sol. out	Composite	"	"	"	"	"	"	"	"
TP8	3	Ambient Air Tempt.	Mercury Thermometer	CTR	2 hrs	N/A	Measurements shall be recorded				
TP8	3	Relative Humidity	Wet, Dry Bulb	"	"	"	every 30 minutes during test periods				

REMARKS:

1. Sampling shall be performed with ± 10% isokinetic conditions.
2. Methods are EPA unless indicated otherwise.
3. Impingers and analysis of impinger catch will be per the Federal Register, Volume 36, No. 159, Part II, Tuesday, Aug. 17, 1971, unless specifically changed by the Project

SOURCE SAMPLING AND ANALYSIS SCHEDULE

(High Density - Normal Operation)

Co. Name: Columbia Nitrogen Corporation

Co. Local: Augusta, Georgia

Industry: Ammonium Nitrate

Process: Fluidized Bed Cooler

Control Equipment: Scrubber

Sampling Point Figure 2	Total No. of Samples	Sample Type	Sampling Method	Sample Collected By	Minimum Sampling Time	Minimum Gas Volume Sampled (ft^3)	Initial Analysis Type	Initial Analysis Method	Initial Analysis By	Final Analysis Type	Final Analysis Method	Final Analysis By
TP3	3*	AN Particulate	EPA-18	CTR	2 hrs	60	AN	EPA-18	CTR	NH_3	SIE	CTR
TP4	3*	"	"	"	1 hr	30	"	"	"	"	"	"
JP4	3*	Visible Emissions	EPA-9	CTR	1 hr	N/A	Average 6-min. intervals	EPA-9	CTR			
TP6	3*	"	"	"	1 hr	"	"	"	"			
TP14	3*	Ambient Air Tempt.	Mercury Thermometer	CTR	2 hrs	N/A	Measurements shall be recorded					
TP14	3*	Relative Humidity	Wet, Dry Bulb	"	2 hrs	"	every 30 minutes during					
TP-3 TP6	3*	Pressure Drop	U. Tube Manometer	:	2 hrs	"	test periods.					

N/A - Not Applicable

SIE - Specific Ion Electrode

* Minimum No. Required

REMARKS:

1. Sampling shall be performed within ± 10% isokinetic conditions.
2. Methods are EPA unless indicated otherwise.
3. Impingers and analysis of impinger catch will be per the Federal Register, Volume 36, No. 159, Part II, Tuesday, Aug. 17, 1971, unless specifically changed by the Project Officer.

SOURCE SAMPLING AND ANALYSIS SCHEDULE

(High Density with Bypass Stacks)

Company Name: Columbia Nitrogen Corporation

Company Location: Augusta, Georgia

Industry: Ammonium Nitrate

Process: Prill Tower

Control Equipment: Scrubber

Sampling Point Figure 1	Total No. of Samples	Sample Type	Sampling Method	Sample Collected By	Minimum Sampling Time	Minimum Gas Volume Sampled ft^3	Initial Analysis Type	Initial Analysis Method	Initial Analysis By	Final Analysis Type	Final Analysis Method	Final Analysis By
TP1*	1	AN Particulate	EPA-18	CTR	2 hrs	60	AN	EPA-18	CTR	NH_3	SIE	CT
TP5*	1	"	"	"	"	"	"	"	"	"	"	"
JP4*	1	"	"	"	"	"	"	"	"	"	"	"
TP2*	1	Volumetric Flow	EPA-1,2	CTR	N/A	N/A	Average DSCFM	EPA-2	CTR			
TP3*	1	"	"	"	"	"	"	"	"			
TP6*	1	"	"	"	"	"	"	"	"			
TP7*	1	"	"	"	"	"	"	"	"			
TP4*	1	Visible Emissions	EPA-9	CTR	2 hrs	N/A	Average 6-min. intervals	EPA-9	CTR			
TP5*	1	"	"	"	2 hrs	"	"	"	"			
TP1* TP4	1	Pressure Drop	U-Tube Manometer	CTR	2 hrs	N/A	Measurements shall be recorded every 30 minutes during test periods.					
TP2	1*	AN Particulate	EPA-18	CTR	2 hrs	60	AN	EPA-18	CTR	NH_3	SIE	CT
TP6	1*	"	"	"	"	"	"	"	"	"	"	"
TP4	1*	"	"	"	"	"	"	"	"	"	"	"
TP1	1*	Volumetric Flow	EPA-1,2	CTR	N/A	N/A	Average DSCFM	EPA-2	CTR			

REMARKS:

1. Sampling shall be performed with ± 10% isokinetic conditions.
2. Methods are EPA unless indicated otherwise.
3. Impingers and analysis of impinger catch will be per the Federal Register, Volume 36, [illegible]

SOURCE SAMPLING AND ANALYSIS SCHEDULE

(High Density with Bypass Stacks)

Co. Name: Columbia Nitrogen Corporation

Co. Loc.: Augusta, Georgia

Industry: Ammonium Nitrate

Process: Prill Tower

Control Equipment: Scrubber

Sampling Point (figure)	Total No. of Samples	Sample Type	Sampling Method	Sample Collected By	Minimum Sampling Time	Minimum Gas Volume Sampled ft³	Initial Analysis Type	Initial Analysis Method	Initial Analysis By	Final Analysis Type	Final Analysis Method	Final Analysis By
TP3	1*	Volumetric Flow	EPA-1,2	CTR	N/A	N/A	Average DSCFM	EPA-2	CTR			
TP5	1*	"	"	"	"	"	"	"	"			
TP7	1*	"	"	"	"	"	"	"	"			
TP4	1*	Visible Emissions	EPA-9	CTR	2 hrs	N/A	Average 6-min. intervals	EPA-9	CTR			
TP6	1*	"	"	"	2 hrs	"	"	"	"			
~~TP2~~ TP4	1*	Pressure Drop	U-Tube Manometer	CTR	2 hrs	N/A	Measurements shall be recorded every 30 minutes during test periods.					
TP3	1	*AN Particulate	EPA-18	CTR	2 hrs	60	AN	EPA-18	CTR	NH_3	SIE	CTR
TP7	1	* "	"	"	"	"	"	"	"	"	"	"
TP4	1	* "	"	"	"	"	"	"	"	"	"	"
TP1	1	*Volumetric Flow	EPA-1,2	CTR	N/A	N/A	Average DSCFM	EPA-2	CTR			
TP2	1	* "	"	"	"	"	"	"	"			
TP5	1	* "	"	"	"	"	"	"	"			
TP6	1	* "	"	"	"	"	"	"	"			
TP4	1	*Visible Emissions	EPA-9	CTR	2 hrs	N/A	Average 6-min. intervals	EPA-9	CTR			

REMARKS:

1. Sampling shall be performed with ± 10% isokinetic conditions.
2. Methods are EPA unless indicated otherwise.
3. Impingers and analysis of impinger catch will be per the Federal Register, Volume 36, No. 159, Part II, Tuesday, Aug. 17, 1971, unless specifically changed by the Project Officer.
4. Sampling time and gas volumes are for each sample.

* Simultaneous Sampling Required

Environmental Protection Agency

SOURCE SAMPLING AND ANALYSIS SCHEDULE

(High Density with Bypass Stacks)

Company Name: Columbia Nitrogen Corporation

Company Location: Augusta, Georgia

Industry: Ammonium Nitrate

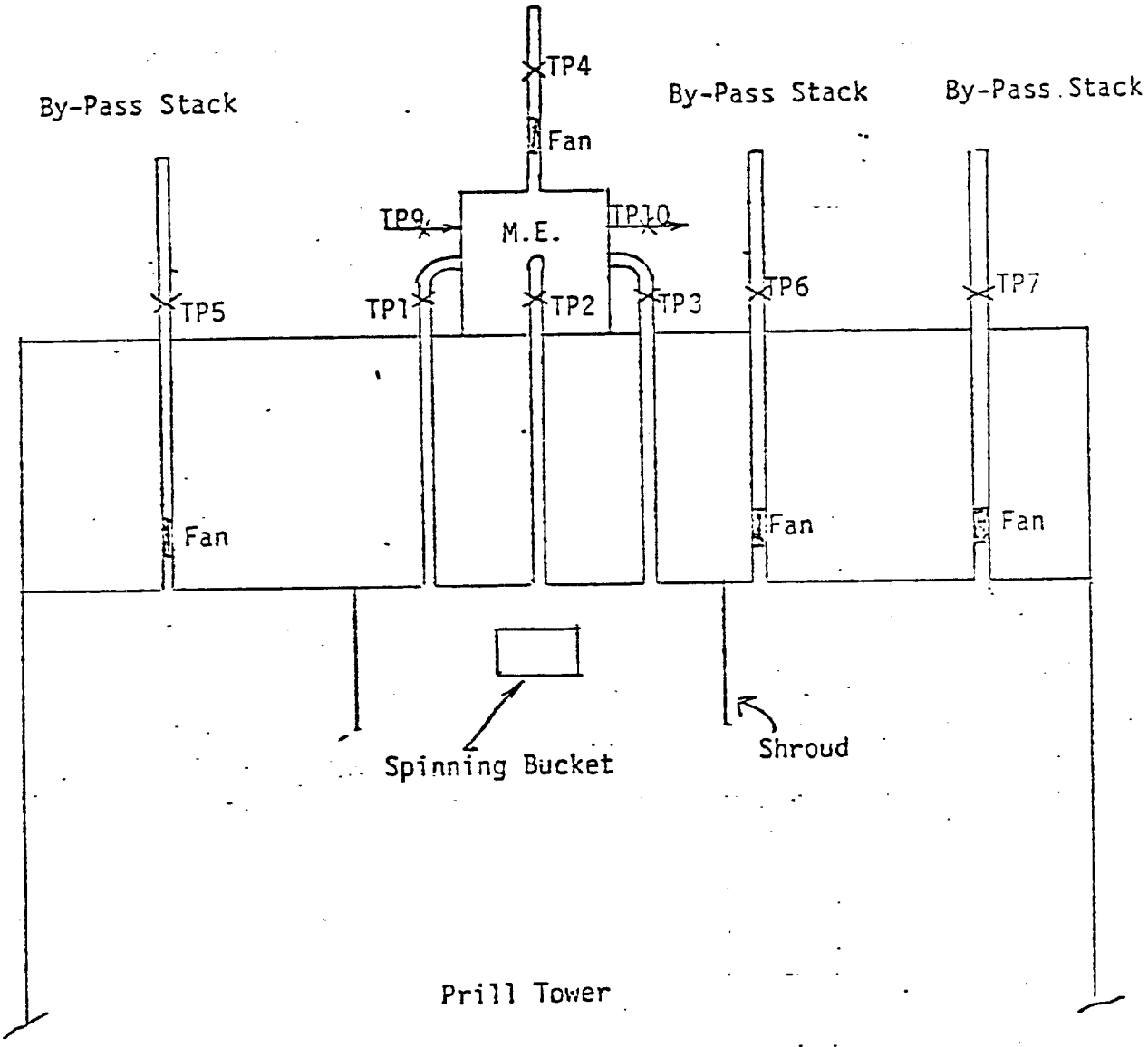
Process: Prill Tower

Control Equipment: Scrubber

Sampling Point Figure 1	Total No. of Samples	Sample Type	Sampling Method	Sample Collected 2/	Minimum Sampling Time	Minimum Gas Volume Sampled ft^3	Initial Analysis Type	Initial Analysis Method	Initial Analysis By	Final Analysis Type	Final Analysis Method	Final Analysis By
TP7	1	*Visible Emissions	EPA-9	CTR	2 hrs	N/A	Average 6-min. intervals	EPA-9	CTR			
TP3 TP4	1	*Pressure Drop	U-Tube Manometer	CTR	2 hrs	N/A	Measurements shall be recorded every 30 minutes during test periods.					
TP9	3	Scrubber Sol. in	Composite	CTR	2 hrs	N/A	Tempt, pH	TBD	CTR	% AN, % NH_3 % Solids	SIE Filter	
TP10	3	Scrubber Sol. out	"	"	"	"	"	"	"	"	"	
TP8	3	Ambient Air Tempt.	Mercury Thermometer	CTR	2 hrs	N/A	Measurements shall be recorded every 30 minutes during test periods					
TP8	3	Relative Humidity	Wet, Dry Bulb	"	"	"						

REMARKS:

1. Sampling shall be performed with ± 10% isokinetic conditions.
2. Methods are EPA unless indicated otherwise.
3. Impingers and analysis of impinger catch will be per the Federal Register, Volume 36, No. 159, Part II, Tuesday, Aug. 17, 1971 unless specifically changed by the Project Officer.



TP8 X

Figure 1. Ammonium Nitrate Prill Tower Proposed Sampling Points

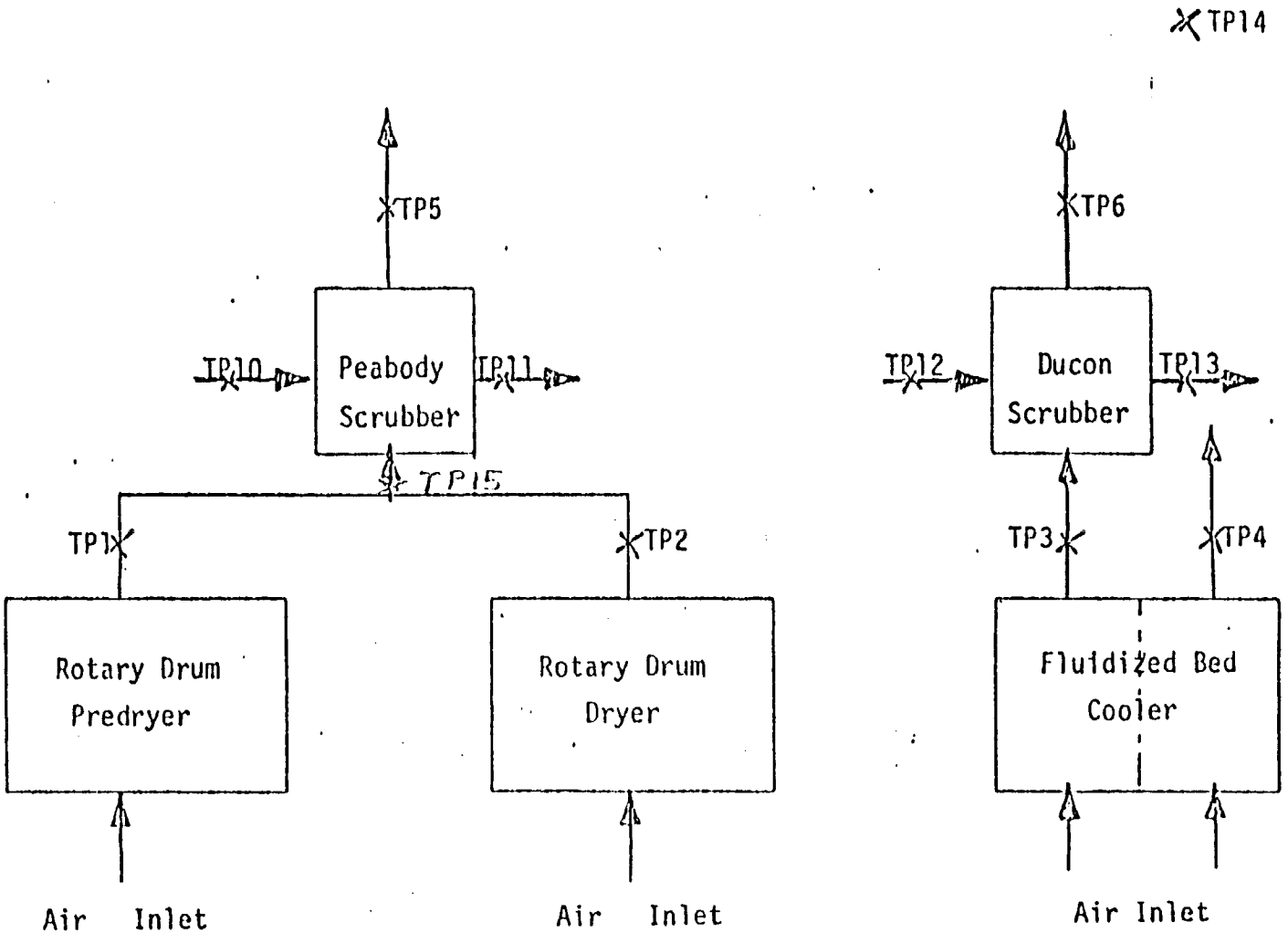


Figure 2. Columbia nitrogen solids finishing train proposed sampling points.

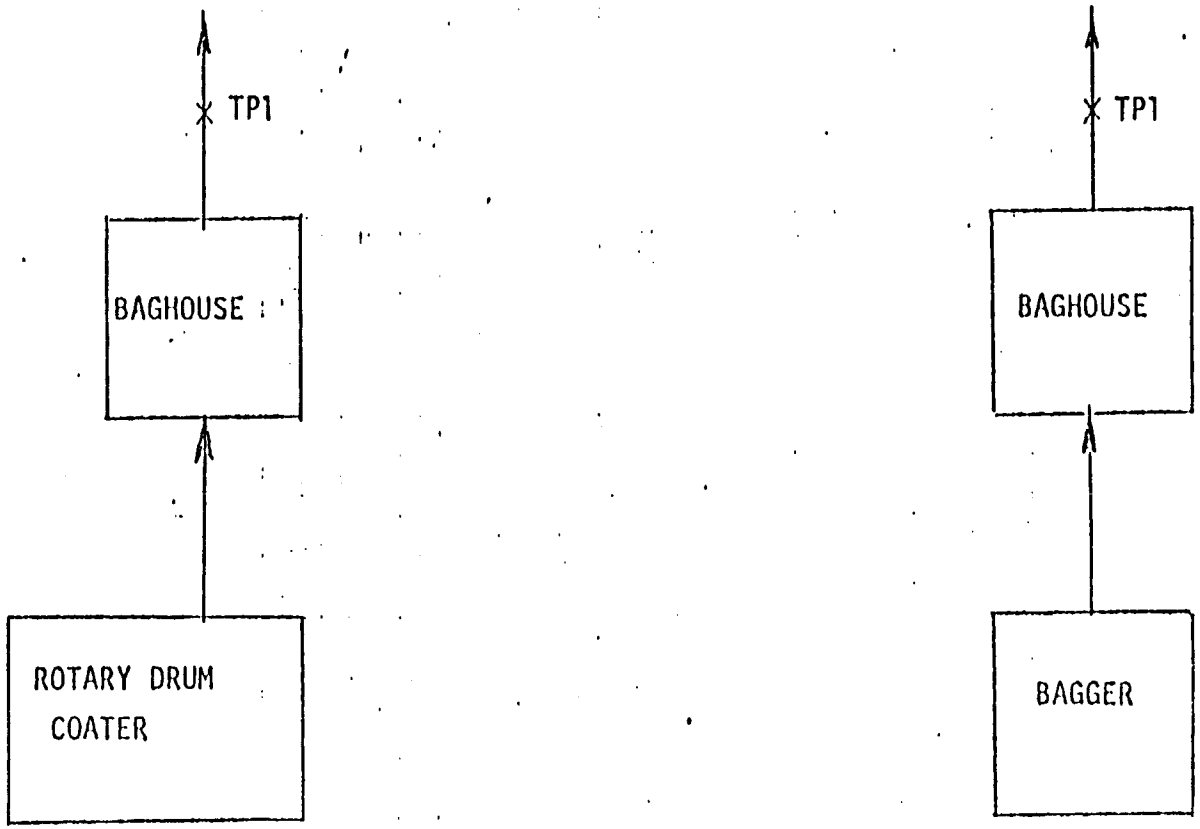


FIGURE 3. COLUMBIA NITROGEN COATER AND BAGGER PROPOSED SAMPLING POINTS

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

July 28, 1980

Mr. Will Wade
TRC Environmental Consultants, Inc.
125 Silas Deane Highway
Wethersfield, Connecticut 06109

Reference: EPA Contract No. 68-02-2820, Work Assignment 25, Columbia Nitrogen Corporation, Augusta, Georgia, EMB Report No. 80-NHF-16

Dear Will:

This letter is to revise the emission test schedule for the above referenced Work Assignment. The high density emission test program will be conducted during October 1980, as was discussed during our telephone conversation of July 22, 1980.

The following dates represent the schedule that will be observed during the low density emission test program.

Revised Low Density Test Program Schedule

Item	Due Date
Field Program Begins	August 11, 1980
Field Program Concluded	August 19, 1980
Preliminary Field and Analytical Data (1 copy)	August 19, 1980
Outline for Emission Report to Technical Manager (2 copies)	August 20, 1980
Outline With Comments Returned to TRC	August 26, 1980
Analysis Program Concluded	August 29, 1980
Computer Data Output	September 5, 1980
Complete Preliminary Data for Technical Manager (3 copies)	September 12, 1980
First Draft Report to Technical Manager (4 copies)	October 3, 1980
Process Data Received From Radian	October 8, 1980
Draft Report Sent to Columbia Nitrogen for Review	October 14, 1980
Comments Received From Columbia Nitrogen	November 14, 1980
First Draft Comments Returned to TRC	November 21, 1980
Final Report Received (35 Copies)	December 19, 1980

If these dates are not satisfactory or if you have any questions, please contact me.

Sincerely yours,

Clyde E. Riley

Clyde E. Riley
Field Testing Section
Emission Measurement Branch

cc: Richard Atkins, TRC
Marge Fox, TRC
Leigh Gamble, TRC
Andrew Miles, Radian (Durham)
Roger Radar, Radian (Durham)
Max Beal, Columbia Nitrogen Corporation
Richard Lawson, Columbia Nitrogen Corporation
Mike Fogle, Georgia Department of Natural Resources
Ken Wilcox, Midwest Research Institute
Eric Noble, EPA, ISB

EMISSION MEASUREMENT BRANCH

TECHNICAL DIRECTIVE NO. 1

Task Title Perform NSPS Emission Test Program at an Ammonium Nitrate Manufacturing Facility Date 9/9/80

Contractor TRC Environmental Consultants Project No. 80-NHF-16

Contract Number 68-02-2820 Work Assignment Number 25

Task Manager Clyde E. Riley

Verbal Directions Given to Mr. Will Wade

Directive:

1. The following low and high density AN emission samples (water portions) shall be analyzed for insoluble particulates.

   Prill Tower Bypass 3 runs
   Prill Tower Outlet 3 runs
   Predryer-Dryer Outlet 3 runs
   Cooler Bypass 3 runs

   The water portion from each run shall be filtered using a tared glass fiber filter and a vacuum filtration setup to remove all traces of undissolved material. A vacuum flask, vacuum pump, Buchner funnel, and tared glass fiber filters will be needed to perform this filtration operation. Dry the funnel filter, desicate and weigh to determine undissolved particulate.

2. Pressure drop measurements at the predryer-dryer scrubber ($\frac{TP-15}{TP-5}$) and the cooler scrubber ($\frac{TP-3}{TP-6}$) are to be cancelled. This is due to the absence of measurement locations at these sites. CNC prefers not to cut extra holes for these measurements (low and high density tests).

3. Cancel scrubber solution collection and analysis (low and high density test) scheduled for the prill tower TP-10.

cc: Contractor Project Manager
Peter Kalika

Contractor Task Leader
Will Wade

Clyde E. Riley
Task Manager, EMB

Section Chief, EMB

APPENDIX R.2

MRI WORK ASSIGNMENT AND ASSOCIATED CORRESPONDENCE

WORK ASSIGNMENT

ENVIRONMENTAL PROTECTION AGENCY

Research Triangle Park, N.C. 27711

EPA CONTRACT NO: 68-02-2814

CONTRACTOR: Midwest Research Institute

ASSIGNMENT NO: 37

ASSIGNMENT CHANGE NO:

TITLE: Perform Particle Size Test Program at an Ammonium Nitrate Manufacturing Facility

DATE: JUL 7 1980

DESCRIPTION

The Contractor shall perform an emission test program in accordance with the basic contract scope of work for the Emission Measurement Branch, and as set forth in the attached "Source Sampling and Analysis Schedule" at the following site:

Company Name: Columbia Nitrogen Corporation
Location: Augusta, Georgia
Industry: Ammonium Nitrate
Project No.: 80-NHF-16

The Emission Measurement Branch's Technical Manager is Clyde E. Riley, Mail Drop 13, EMB, ESED, OAQPS, Research Triangle Park, North Carolina 27711.

Upon notification of approval of the proposed source test report, the Contractor shall provide 3 copies of the final report with appendices.

All pretest survey, proposed final, and final source test reports and SOTDAT Data Forms shall be submitted directly to J. E. McCarley, Emission Measurement Branch, ESED, Mail Drop 13, Research Triangle Park, North Carolina 27711.

All samples shall be discarded 6 months after the field test program.

ESTIMATE OF	GOVERNMENT ESTIMATE	CONTRACTOR ESTIMATE
LABOR HOURS	400	
DURATION OF WORK	3 months	
COMPLETION DATE	September 30, 1980	

REQUESTER'S SIGNATURE	ORG CODE	TELEPHONE	DATE
Clyde E. Riley C. E. Riley	ESED/EMB	(919) 541-5243	

APPROVALS (as applicable)	SIGNATURE	DATE
BRANCH CHIEF	[signature] EMB	7/1/80
DIVISION CHIEF	Dan R. Goodwin	7/2/80
PROJECT MANAGER	Thomas M. Bibb	7/1/80
CONTRACTING OFFICER	[signature]	7/7/80

CONTRACTOR'S REPRESENTATIVE ACKNOWLEDGMENT

SIGNATURE	TITLE	DATE

EPA(RTP)295

Page 1

SOURCE SAMPLING AND ANALYSIS SCHEDULE

(Low Density Test)

Contract No.: 68-02-2814

Task No.:

Company Name: Columbia Nitrogen Corporation

Company Location: Augusta, Georgia

Industry: Ammonium Nitrate

Process: Prill Tower

Control Equipment: Scrubber

Sampling Point Figure 1.	Total No. of Samples	Sample Type	Sampling Method	Sample Collected By	Minimum Sampling Time	Minimum Gas Volume Sampled ft^3	Initial Analysis Type	Initial Analysis Method	Initial Analysis By	Final Analysis Type	Final Analysis Method	Final Analysis By
TP1	1	Particle Size	Anderson High Capacity	CTR	30 min	N/A	Effective Cut Diameters	SIE	CTR			
TP2	1	"	"	"	"	"	"	"	"			
TP3	1	"	"	"	"	"	"	"	"			
TP5	1	"	"	"	"	"	"	"	"			
TP6	1	"	"	"	"	"	"	"	"			
TP7	1	"	"	"	"	"	"	"	"			

N/A - Not applicable.

SIE - Specific Ion Electrode

REMARKS:

1. Sampling shall be performed with ± 10% isokinetic conditions.
2. Methods are EPA unless indicated otherwise.

SOURCE SAMPLING AND ANALYSIS SCHEDULE

(Low Density Test)

Contract No.: 68-02-2814 | Task No.:

Company Name: Columbia Nitrogen Corporation | Company Location: Augusta, Georgia

Industry: Ammonium Nitrate | Process: Predryer - Dryer | Control Equipment: Scrubber

Sampling Point Figure 2.	Total No. of Samples	Sample Type	Sampling Method	Sample Collected By	Minimum Sampling Time	Minimum Gas Volume Sampled ft^3	Initial Analysis Type	Initial Analysis Method	Initial Analysis By	Final Analysis Type	Final Analysis Method	Final Analysis By
TP1	3	Particle Size	Anderson High Capacity	CTR	30 min	N/A	Effective Cut Diameters	SIE	CTR			
TP2	3	"	"	"	"	"	"	"	"			

N/A - Not applicable
SIE - Specific Ion Electrode

REMARKS:

1. Sampling shall be performed with ± 10% isokinetic conditions.
2. Methods are EPA unless indicated otherwise.

SOURCE SAMPLING AND ANALYSIS SCHEDULE

(Low Density Test)

Contract No.: 68-02-2814 | Task No.:

Company Name: Columbia Nitrogen Corporation | Company Location: Augusta, Georgia

Industry: Ammonium Nitrate | Process: Fluidized Bed Cooler | Control Equipment: Scrubber

Sampling Point Figure 2	Total No. of Samples	Sample Type	Sampling Method	Sample Collected By	Minimum Sampling Time	Minimum Gas Volume Sampled (ft^3)	Initial Analysis Type	Initial Analysis Method	Initial Analysis By	Final Analysis Type	Final Analysis Method	Final Analysis By
TP3	3	Particle Size	Anderson High Capacity	CTR	30 min	N/A	Effective Cut Diameters	SIE	CTR			
TP4	3	"	"	"	"	"	"	"	"			

N/A - Not applicable
SIE - Specific Ion Electrode

REMARKS:

1. Sampling shall be performed with ± 10% isokinetic conditions.
2. Methods are EPA unless indicated otherwise.

SOURCE SAMPLING AND ANALYSIS SCHEDULE
(High Density - Normal Operation)

Contract No.: 68-02-2814 | Task No.:

Company Name: Columbia Nitrogen Corporation | Company Location: Augusta, Georgia

Industry: Ammonium Nitrate | Process: Prill Tower | Control Equipment: Scrubber

Sampling Point (Nozzle)	Total No. of Samples	Sample Type	Sampling Method	Sample Collected By	Minimum Sampling Time	Minimum Gas Volume Sampled ft^3	Initial Analysis			Final Analysis		
							Type	Method	By	Type	Method	By
FP 1	1	Particle Size	Anderson High Capacity	CTR	30 min	N/A	Effective Cut Diameter	SIE	CTR			
TP2	1	"	"	"	"	"	"	"	"			
FP3	1	"	"	"	"	"	"	"	"			

N/A - Not Applicable
SIE - Specific Ion Electrode

REMARKS:

1. Sampling shall be performed with ± 10% isokinetic conditions.
2. Methods are EPA unless indicated otherwise.

SOURCE SAMPLING AND ANALYSIS SCHEDULE
(High Density - Normal Operation)

Contract No.: 68-02-2814 | Task No.:

Company Name: Columbia Nitrogen Corporation | Company Location: Augusta, Georgia

Industry: Ammonium Nitrate | Process: Fluidized Bed Cooler | Control Equipment: Scrubber

Sampling Int Sure 2	Total No. of Samples	Sample Type	Sampling Method	Sample Collected By	Minimum Sampling Time	Minimum Gas Volume Sampled ft³	Initial Analysis Type	Initial Analysis Method	Initial Analysis By	Final Analysis Type	Final Analysis Method	Final Analysis By
TP 3	3	Particle Size	Anderson High Capacity	CTR	30 min	N/A	Effective Cut Diameter	SIE	CTR			
TP4	3	"	"	"	"	"	"	"	"			

N/A - Not Applicable
SIE - Specific Ion Electrode

REMARKS:

1. Sampling shall be performed within ± 10% isokinetic conditions.
2. Methods are EPA unless indicated otherwise.

SOURCE SAMPLING AND ANALYSIS SCHEDULE
(High Density W/Bypass Stacks)

Contract No.: 68-02-2614

Company Name: Columbia Nitrogen Corporation

Company Location: Augusta, Georgia

Industry: Ammonium Nitrate

Process: Prill Tower

Control Equipment: Scrubber

Sampling Point (Figure 1)	Total No. of Samples	Sample Type	Sampling Method	Sample Collected By	Minimum Sampling Time	Minimum Gas Volume Sampled ft³	Initial Analysis Type	Initial Analysis Method	Initial Analysis By	Final Analysis Type	Final Analysis Method	Final Analysis By
TP 1	1	Particle Size	Anderson High Capacity	CTR	30 min	N/A	Effective Cut Diameter	SIE	CTR			
TP2	1	"	"	"	"	"	"	"	"			
TP3	1	"	"	"	"	"	"	"	"			
TP5	1	"	"	"	"	"	"	"	"			
TP6	1	"	"	"	"	"	"	"	"			
TP7	1	"	"	"	"	"	"	"	"			

N/A - Not Applicable
SIE - Specific Ion Electrode

REMARKS:

1. Sampling shall be performed with ± 10% isokinetic conditions.
2. Methods are EPA unless indicated otherwise.
3. [illegible] per [illegible]

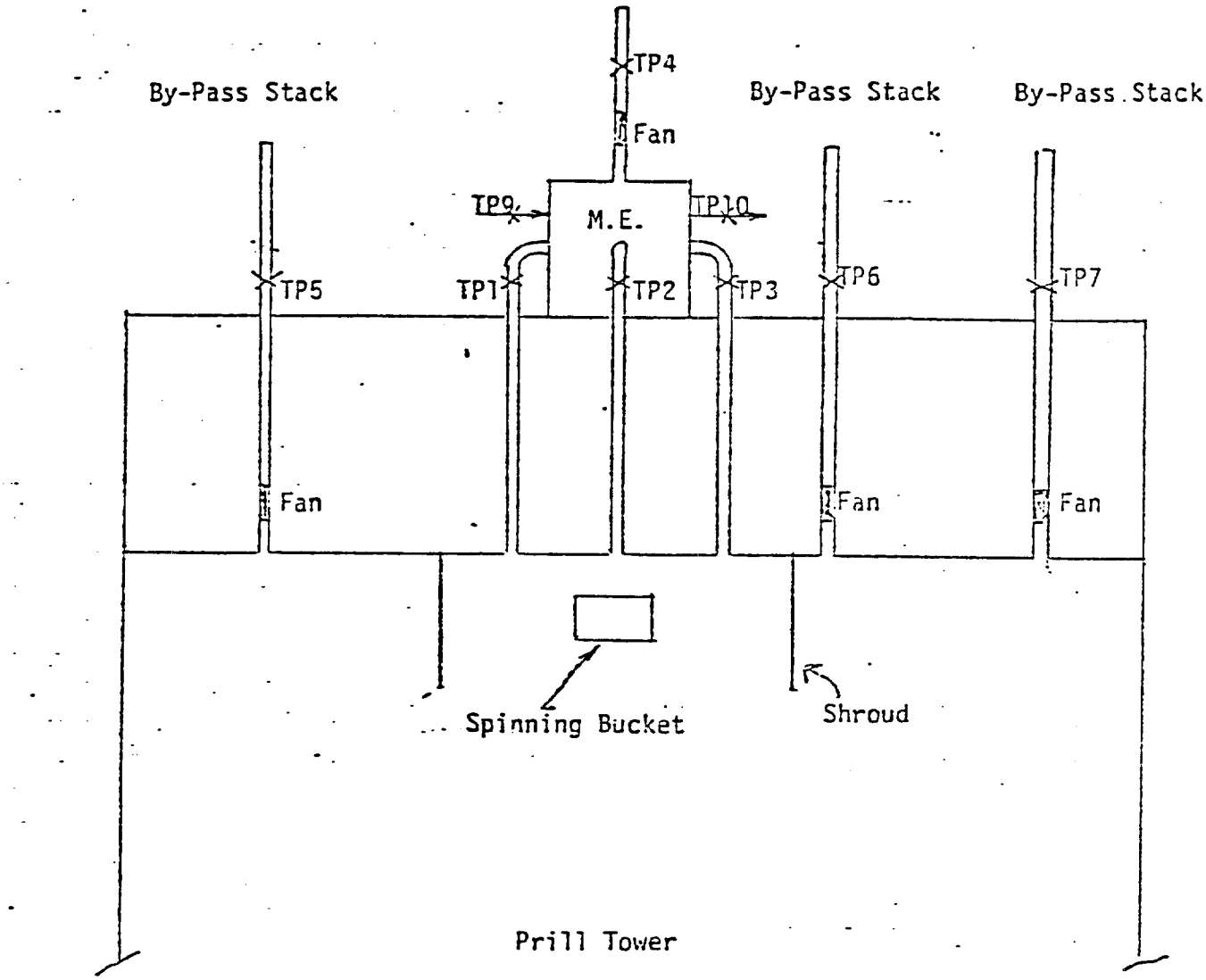


Figure 1. Ammonium Nitrate Prill Tower Proposed Sampling Points

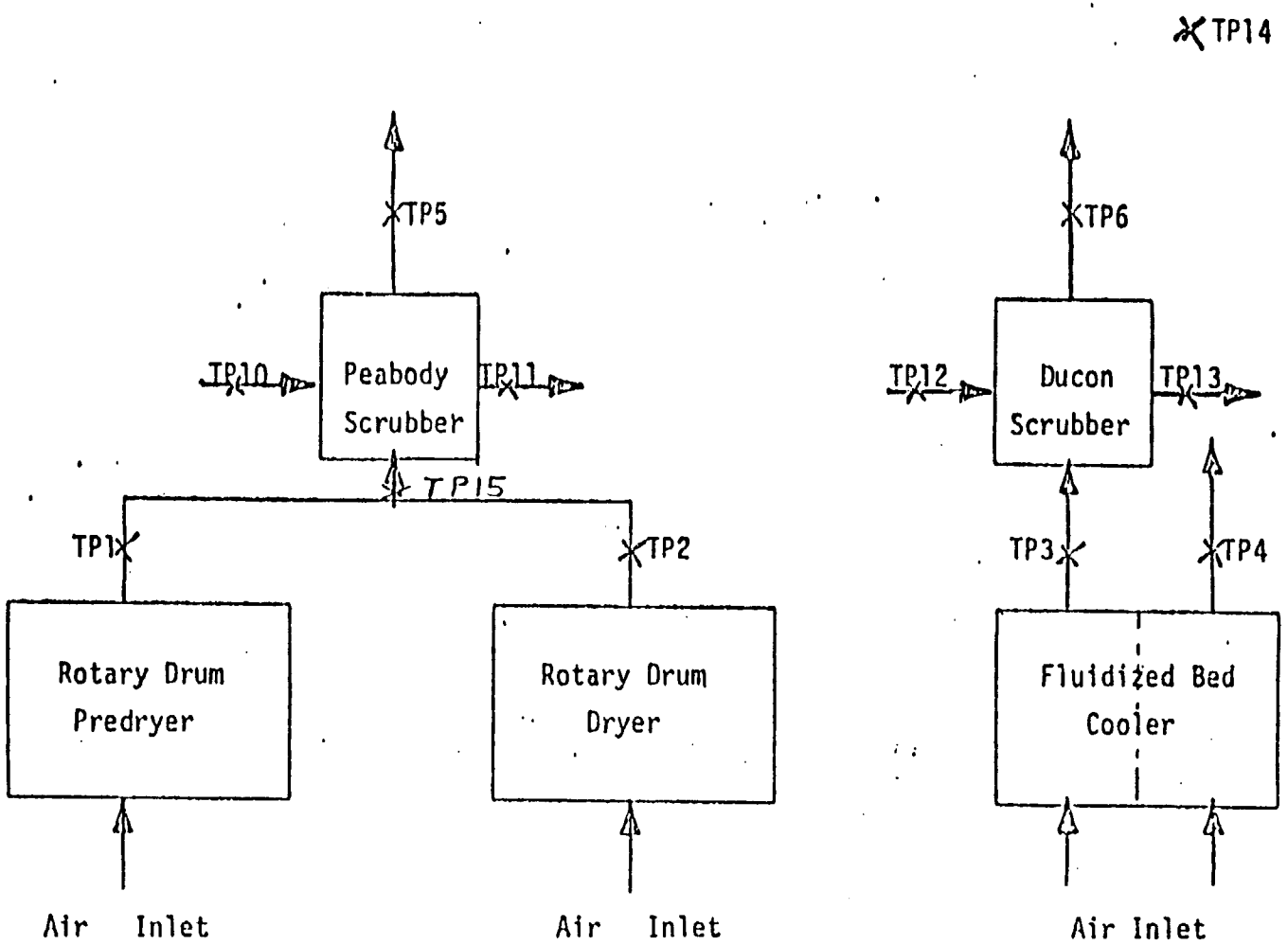


Figure 2. Columbia nitrogen solids finishing train proposed sampling points.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

July 10, 1980

Mr. Kenneth Wilcox
Midwest Research Institute
425 Volker Boulevard
Kansas City, Missouri 64110

Reference: EPA Contract No. 68-02-2814, Work Assignment No. 37, Columbia Nitrogen Corporation, Augusta, Georgia, EMB Report No. 80-NHF-16

Dear Ken:

This letter is to clarify the scope of work for the above referenced work assignment. The proposed emission test program shall be conducted during low and high density prill tower operations.

Individual particle size samples shall be collected at the prill tower bypass and scrubber inlet locations, the dryer and predryer inlet locations, and the cooler inlet and bypass locations. The three prill tower bypass stacks shall be referenced as Bypass A, Bypass B, and Bypass C. The three prill tower scrubber inlet ducts shall be referenced as Inlet A, Inlet B, and Inlet C.

The particle size determinations shall be conducted using an Anderson high capacity sampler. The sample train shall consist of an in-situ unit containing a straight nozzle, two impaction chambers and a cyclone. The sampler shall be connected by a 3/8" I.D. flexible Teflon line (12 feet length) to four(4) impingers. The first two impingers are to be prefilled with deionized, distilled water (100 mls each). The third impinger is to be prefilled with 1 NH_2SO_4 (100 mls). The fourth is to be prefilled with 200 grams of indicating silica gel.

The first, third, and fourth impingers shall be of the Greenburg-Smith design, modified by replacing the tip with an 1/2 inch glass tube extended to within 1/2 inch of the impinger's bottom.

The second impinger shall be of the regular design for the Greenburg-Smith units.

The particle sizing unit shall be inserted into the stack for a minimum of 15 minutes to allow the unit to reach equilibrium stack temperature. The system shall then be leaked-checked before positioning the nozzle at an average velocity point. Heating of the external probe and flexible line is not required. Each run shall cover a minimum of 30 minutes and be performed using isokinetic sampling conditions at a sampling rate of between 0.5 and

and 0.75 ACFM. Data measurements shall be recorded at five minute intervals. In addition the train operator shall maintain a daily log detailing sampling problems, delays, elapsed sampling times, and associated comments. The unit shall be leaked-checked after completion of the runs.

Sample cleanup and recovery procedures shall be performed in a secluded, clean area as follows. Brush and/or rinse with deionized, distilled water the following items into the referenced glass or plastic containers.

Stage 1 - Container No. 1
Stage 2 - Container No. 2
Stage 3 - Container No. 3
Flexible Teflon line, first two impinger contents and their connecting glassware - Container No. 4

The water contents of the first two impingers shall be used to initially rinse the flexible Teflon line (two rinses approximately 100 mls each). These are to be followed by a final rinse with deionized distilled water (50 mls). Each rinse shall be placed in container No. 4. Brushing of the flexible line is not required. Limited amounts of water shall be used in the recovery procedures due to the low sample concentrations.

The contents of impingers No. 3 and 4 shall be discarded or reused for a second run.

The particle size catches shall be analyzed as follows:

1. Initial analyses shall be performed on the first run from each location within 48 hours after collection. Each of the four catches per run shall be analyzed by the specific ion electrode method (EPA Method 18 - Determination of Particulate Emissions From Ammonium Nitrate Plants). The initial analyses shall yield data from which can be determined if enough sample has been collected for examination.

2. The remaining samples shall be analyzed within 20 days after collection at the MRI laboratories in Kansas City, Missouri.

Particle sizing tests are requested for the following process locations and/or conditions.

Process Condition	Uncontrolled Emission	No. Runs
Low Density	Prill Tower Inlet A	1
	Prill Tower Inlet B	1
	Prill Tower Inlet C	1
	Prill Tower Bypass A	1
	Prill Tower Bypass B	1
	Prill Tower Bypass C	1
	Predryer	3
	Dryer	3
	Fluidized Cooler To Scrubber	3
	Fluidized Cooler Bypass	3

Process Condition	Uncontrolled Emission	No. Runs
High Density (Normal Operation)	Prill Tower Inlet A	1
	Prill Tower Inlet B	1
	Prill Tower Inlet C	1
	Fluidized Cooler To Scrubber	3
	Fluidized Cooler Bypass	3
High Density (With Bypass Stacks)	Prill Tower Inlet A	1
	Prill Tower Inlet B	1
	Prill Tower Inlet C	1
	Prill Tower Bypass A	1
	Prill Tower Bypass B	1
	Prill Tower Bypass C	1

Particle size train operations data and percent isokinetics shall be summarized at the end of each work day. The summarized data shall be reviewed at a morning briefing (8:30 a.m.) along with the prior day's data sheets and the current day's schedule.

Plant members along with Radian personnel plan to attend these meetings and will be responsible for projecting the process operations schedule.

Mr. Beal of Columbia Nitrogen Corporation has requested that we schedule our work operations from 7:00 a.m. to 7:00 p.m. However, these times may be changed if necessary. Present plans are to suspend work operations for August 3, however this is dependent upon fulfillment of the schedule and may be changed if necessary.

Test Program Schedule

The following dates represents the schedule that shall be observed during this work assignment. If these are not satisfactory please contact me.

Item	Due Date
MRI submits work schedule and list of project personnel to Technical Manager	July 15, 1980
Field program begins	July 28
Field program concluded	August 8
Preliminary field data	August 8
Outline for emission report to Technical Manager	August 15
Outline with comments returned to MRI	August 22
Analysis program concluded	August 29
Computer data output	September 5
Complete preliminary data to Technical Manager	September 12
First draft report to Technical Manager	September 19
Draft report sent to Columbia Nitrogen for review	September 26
Comments received from Columbia Nitrogen	October 10
First draft comments returned to MRI	October 24
Final report received (3 copies)	November 14

Because of the number of directions and specifications, I am requesting that the Technical Manager be notified in writing before any specification deviation and/or change in the above referenced Work Assignment be executed by MRI. Technical directions issued by the Technical Manager involving verbal interpretation of specifications or technical portions of the work description shall be confirmed and issued in writing by the Technical Manager within five(5) working days after issuance.

If you have any questions regarding these instructions or require additional information, please do not hesitate to contact me.

Sincerely yours,

Clyde E. Riley

Clyde E. Riley
Field Testing Section
Emission Measurement Branch

cc:

Mr. Will Wade, TRC
Mr. Roger Radar, Radian (Durham)
Mr. Andrew Miles, Radian (Durham)
Mr. Max Beal, Columbia Nitrogen Corporation
Mr. Richard Lawson, Columbia Nitrogen Corporation
Mr. Mike Fogle, Georgia Department of Natural Resources
Mr. Eric Noble, EPA, ISB

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

July 28, 1980

Mr. Kenneth Wilcox
Midwest Research Institute
425 Volker Boulevard
Kansas City, Missouri 64110

Reference: EPA Contract No. 68-02-2814, Work Assignment No. 37, Columbia Nitrogen Corporation, Augusta, Georgia, EMB Report No. 80-NHF-16

Dear Ken:

This letter is to revise the existing emission test schedule for the above referenced Work Assignment. The high density emission test program will be conducted during October 1980.

The following dates represent the schedule that will be observed during the low density emission test program.

Revised Low Density Test Program Schedule

Item	Due Date
MRI Submits Work Schedule and List of Project Personnel to Technical Manager	July 31, 1980
Field Program Begins	August 11, 1980
Field Program Concluded	August 16, 1980
Preliminary Field Data (1 copy)	August 16, 1980
Outline for Emission Report to Technical Manager (2 copies)	August 25, 1980
Outline With Comments Returned to MRI	September 2, 1980
Analysis Program Concluded	September 5, 1980
Computer Data Output	September 12, 1980
Complete Preliminary Data to Technical Manager (3 copies)	September 19, 1980
First Draft Report to Technical Manager (3 copies)	September 26, 1980
Draft Report Sent to Columbia Nitrogen for Review	September 30, 1980
Comments Received From Columbia Nitrogen	October 15, 1980
First Draft Comments Returned to MRI	October 22, 1980
Final Report Received (3 copies)	November 7, 1980

If these dates are not satisfactory or if you require additional information, please contact me.

Sincerely yours,

Clyde E. Riley

Clyde E. Riley
Field Testing Section
Emission Measurement Branch

cc: Max Beal, Columbia Nitrogen Corporation
Mike Fogle, Georgia Department of Natural Resources
Richard Lawson, Columbia Nitrogen Corporation
Eric Noble, EPA, ISB
Andrew Miles, Radian (Durham)
Roger Radar, Radian (Durham)
Will Wade, TRC

UNITED ST. .ES ENVIRONMENTAL PROTECTIO. \GENCY
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

DESIGNATION OF AUTHORIZED REPRESENTATIVE FOR STANDARDS OF PERFORMANCE FOR NEW STATIONARY SOURCES (SECTION 111)

Midwest Research Institute is hereby designated an Authorized Representative of the Administrator of the U.S. Environmental Protection Agency for the purpose of assisting in the development of a standard of performance under 42 U.S.C. 7411 for the ammonium nitrate manufacturing industry under Contract No. 68-02-2814.

This designation is made pursuant to the Clean Air Act, 42 U.S.C. 7414. The United States Code provides that, upon presentation of this credential, the Authorized Representative named herein: (A) shall have a right of entry to, upon, or through any premises in which an emission source is located or in which records required to be maintained under 42 U.S.C. 7414(a)(1) are located, and (B) may at reasonable times have access to and copy any records, inspect any monitoring equipment or method required under 42 U.S.C. 7414(a)(1), and sample any emissions which the owner or operator of such source is required to sample.

Authorized Representatives of the Administrator are subject to the provisions of 42 U.S.C. 7414(c) respecting confidentiality of methods or processes entitled to protection as trade secrets, as implemented by 40 CFR 2.301(h)(41 F.R. 36912, September 1, 1976).

Date: JUL 2 1980

Designation Expires: December 31, 1980

for Walter C. Barber
Deputy Assistant Administrator for Air Quality
Planning and Standards

APPENDIX R.3

RADIAN ASSOCIATED CORRESPONDENCE

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

DATE:

SUBJECT: Request for Additional Testing, Ammonium Nitrate Industry

FROM: Kenneth R. Durkee, Chief
Standards Documentation Section, ISB, ESED (MD-13)

TO: Stanley T. Cuffe, Chief
Industrial Studies Branch, ESED (MD-13)

Attached is a brief rationale prepared by Radian to support this request for additional testing at another ammonium nitrate plant. The requested test would involve determination of opacities, mass emissions and particle size distribution on a prill tower during production of low and high density prills; on a predryer and dryer; and a cooler. In addition, opacities measurements for coating and bagging operations have also been requested. The test program has been discussed with Gene Riley of EMB. The total cost for the testing has been estimated by EMB to be $90,000 to $100,000. This includes on-site analysis of prill tower samples so Radian will have preliminary emissions data available immediately. EMB has already determined the facilities are testable. Testing could be initiated by the middle of July and completed by the 8th of August. Radian has said the testing could be performed and they could maintain the project schedule and meet the October 30 scheduled NAPTAC meeting.

RADIAN
CORPORATION

TO: Ken R. Durkee, Chief
Standards Documentation Section, ISD, ESED (MD-13)

FROM: Roger D. Rader and Andrew J. Miles

SUBJECT: Rationale for Testing the Columbia Nitrogen Ammonia Nitrate Facility

1.0 INTRODUCTION

The purpose of this paper is to present the rationale for testing the Columbia Nitrogen ammonium nitrate plant in Augusta, Georgia. The paper is organized to present the rationale for the requested testing for each facility, the type of testing requested, costs of testing, and the schedule for testing.

Eight potential emission sources have been identified in the ammonium nitrate industry for possible development of new source performance standards (NSPS). These are:

1. High density prill towers.
2. Low density prill towers.
3. Granulators.
4. Predryers.
5. Dryers.
6. Coolers (rotary drum and fluid bed).
7. Coaters.
8. Bagging operations.

The present EPA source test data is shown in Table 1. The data gaps indicated in Table 1 will be discussed in Section 3.0 as supporting the need for additional testing.

2.0 DESCRIPTION OF THE COLUMBIA NITROGEN FACILITY

Columbia Nitrogen recently expanded their urea and ammonium nitrate production facilities in Augusta, Georgia. One new ammonium nitrate tower was built with the capability of producing both low and high density prills. (See Figure 1). The tower is equipped with six stacks, a shroud (a collection device), and a brinks mist eliminator unit. Three of the stacks are manifolded from inside the shroud into the Brinks. The three remaining stacks

TABLE 1. EPA TESTING

Facility	Uncontrolled Emissions Data	Controlled Emissions Data	Control Equipment
High Density (HD) Prill Tower	X (3.1 lbs/ton)	X (1.55 lbs/ton)	Tray Scrubber
Low Density (LD) Prill Tower	--	--	
Rotary Granulator (RG)	X (290 lbs/ton)	X (.5 lbs/ton)	Settling Chamber and Ent. Scrubber
Pan Granulator (PG)	X (2.76 lbs/ton)	X (.05 lb/ton)	Venturi Scrubber
Precooler (PG) & Chain Mill Area	X (33.1 lbs/ton)	X (0.2 lb/ton)	Wet Spray Scrubber
Cooler RG	X (17.3 lbs/ton)	X (0.07 lb/ton)	Wet Ent. Scrubber
HD	X (1.16 lbs/ton)	X (0.17 lbs/ton)	Spray Chamber
RG	X (14.8 lbs/ton)	--	
LD	X (2.3 lbs/ton)	--	
PG	X (0.51 lbs/ton)	--	
Dryers LD	X (2.9 lbs/ton)	--	
Predryer LD	X (5.2 lbs/ton)	--	
Coater	--	--	
Bagging	--	--	

X indicates test data available (measured emissions)

are vented directly to the atmosphere. Each of the three bypass stacks have airflows comparable to the Brinks airflow. For high density prilling, the typical operating mode is to operate at a reduced airflow, with all the air passing through the Brinks (bypass stacks closed). It can also be produced with all the bypass stacks operating, with the only discernible difference being a 10°F lower prill temperature at the base of the tower. In this mode (the design condition), the function of the shroud is to capture all the particulate formed in the vicinity of the droplet forming device (a spinning bucket). Low density prills are normally produced with the Brinks and all the bypass stacks operating.

During the expansion, new solids finishing equipment was also built. This included a rotary drum predryer, a rotary drum dryer, and a fluidized bed cooler incorporating two cooling beds. The emissions from the predryer and dryer are routed to a multiple tray scrubber. Seventy percent of the airflow from the fluidized bed cooler is treated by a single mechanical impingement scrubber, and the remainder is vented uncontrolled.

3.0 RATIONALE FOR TESTING

3.1 Prill Towers

3.1.1 High Density Production. As shown in Table 1, EPA has tested only one high density prill tower. It was equipped with a two-tray scrubber treating the total tower airflow. The resulting test data measured uncontrolled emissions of 3.1 lbs/ton and controlled emissions of 1.55 lbs/ton; a 50 percent reduction efficiency. Columbia Nitrogen's plant was compliance tested in 1979 and 1980 by the Georgia State Department of Natural Resources. They did not measure uncontrolled emissions but controlled emissions were measured as 0.07 lbs/ton. Their measurements were performed using a modified Method 5 which they claim took into account some of the problems of sampling and analyzing ammonium nitrate emissions. EMB has reviewed some of their procedures and determined their estimates should be in the "ball park". Therefore, it is our judgement that this plant is a viable candidate for testing.

Columbia Nitrogen's operations during high density production are not typical in the industry in that they do not operate the bypass fans during

production. The total airflow goes to the Monsanto Brinks mist eliminator. Other plants in the industry with similar systems operate the bypass fans and the Brinks fan during high density production. Therefore, two tests are recommended to the Monsanto Brinks mist eliminator. One test on the tower with bypass and the brinks fans all in operation; this is typical for the industry. Columbia Nitrogen personnel have said this would pose no problem. A second test is requested on the tower with only the Brinks fan operating; as Columbia Nitrogen is currently operating. The two tests would allow us to determine the difference in overall control efficiencies.

3.1.2 Low Density. The majority of the growth in the ammonium nitrate solids production segment of the industry is expected to occur in low density production. Low density prills are used for explosives and munitions and are not generally used as fertilizers. At present, no EPA source test data has been obtained on emissions from low density prill towers. It is presently proposed to use the emission level of 1.55 lbs/ton from the high density source test data to set emission levels for low density prill towers. However, industry source test data indicates that uncontrolled emission levels from low density prill towers are much lower than from high density prill towers. As a result, a limitation of 1.55 lbs/ton could result in an NSPS which would have no impact on low density prill towers.

Therefore, we request a test on the prill tower during low density production. One test is requested during low density production with the bypass and brinks, fan operating; as Columbia Nitrogen normally operates.

3.2 Predryer and Dryer

EPA has no controlled emissions data on these units but does have uncontrolled emissions data. The uncontrolled emissions data indicates these units to be significant particulate emitters. Columbia Nitrogen uses rotary drum predryers and dryers which is typical of the industry.

Since no EPA controlled test data exists, no controlled industry data using Method 18 is available and since the control device is testable, it is recommended that the predryer and dryer be tested during low density production.

3.3 Coolers

EPA has uncontrolled and controlled emissions data from a high density rotary drum cooler, but there is no emissions data on fluidized bed coolers. Since Columbia Nitrogen has a fluid bed cooler which is testable, it is recommended that this device be tested during low density and high density production.

3.4 Coaters and Bagging Operations

No EPA test data is available for these operations. Since industry data indicates these sources are readily controlled by baghouses and Columbia Nitrogen operations are so equipped, it is recommended that opacity measurements be taken.

4.0 TESTING REQUESTED

Opacity and mass emission testing is requested for the prill tower, predryer, dryer and cooler. These are typical measurements taken and could allow NSPS to be developed for opacity and/or mass emissions. Particle size distribution is also requested for these facilities. Particle sizes of $>10\mu$, .3 to 10μ incrementally, and $<.3\mu$ are recommended. The particle size distribution on the inlets to the control device would allow emission to be characterized from each of the sources tested and permit comparison of actual and expected particulate removal effectiveness of the control devices.

Opacities only would be determined on coating and bagging operations since this will probably be the only basis for the NSPS for these facilities.

The sampling points and tests requested are presented in Figures 1, 2 and 3 and their attachments.

5.0 COSTS OF TESTING

EMB has made the following estimates for testing each of the facilities as proposed above.

	Sample Collection	Analysis	On-Site Analysis
Prill Tower			
High Density Production	24,000	6,000	4,000
Low Density Production	15,000	2,000	2,000
Predryer and Dryer	10,000	2,000	
Cooler	20,000	4,000	
Coating	1,000		
Bagging	1,000		
TOTAL COST	$92,000		

With contingencies, travel, etc. it is estimated the final cost will be approximately $100,000.

6.0 TEST SCHEDULE

EMB has estimated the following test and report schedule if testing and analysis is performed as discussed above.

Survey of Plant	Week of June 16, 1980
Testing	July 21-August 8, 1980
Preliminary Data on Prill Tower	By August 8, 1980
Complete Preliminary Test Data	September 4, 1980
Draft Report	October 8, 1980

The schedule above is based on the prill tower sample analysis being performed on-site. EMB has indicated that preliminary results could then be obtained before moving offsite. Otherwise, preliminary results could not be expected for 4 to 5 weeks. Since these results are so important to the continued and timely development of NSPS for the industry, it is Radian's judgement that these analyses be done onsite. It is Radian's judgement that if the testing is performed in accordance with the above that the NAPCTAC meeting of October 30, 1980 could be met and the project remain on schedule.

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