Note: This is a reference cited in *AP 42, Compilation of Air Pollutant Emission Factors, Volume I Stationary Point and Area Sources.* AP42 is located on the EPA web site at www.epa.gov/ttn/chief/ap42/

The file name refers to the reference number, the AP42 chapter and section. The file name "ref02_c01s02.pdf" would mean the reference is from AP42 chapter 1 section 2. The reference may be from a previous version of the section and no longer cited. The primary source should always be checked.

Background Report Reference

AP-42 Section Number: 11.21

Background Chapter: 4

Reference Number: 8

Title: Emission Test Report: Stauffer Chemical Company, Tarpon Springs, FL

US EPA

June 1972

ELEMENTAL PHOSPHORUS

EMISSION TESTING REPORT

PROJECT NUMBER 72 MM 05

(8)

STAUFFER CHEMICAL COMPANY

TARPON SPRINGS, FLORIDA

FINAL

DRAFT/WP
d3006-4/971130
03/30/92 1

(8)

Emission Test Report
Review Checklist

Reviewer: Michelle Ramsey
Review Date: 18 May 1992

A. Background Information

1. Facility name: Stauffer Chemical Company

   Location: Tarpon Springs, Florida

2. Source category: white-out E, F, A + B and ✓ those boxes rus

3. Test date:

4. Test sponso

5. Testing cont l Specialists, Inc.

6. Purpose of te NSPS as authorized

7. Pollutants mea

   (PM) PM-10 Pb CO_2

   Others (list): ide,

NO FEED OR PRODUCTION RATES

8. Process overview. On an attached page provide a block diagram of the unit operations and associated air pollution control systems at the facility. Identify process tested with letters from the beginning of the alphabet (A, B, C, etc.) and APC systems with letters from end of alphabet (V, W, X, etc.). Also identify test locations with Arabic numerals (1,2,3, ...). Using the ID symbols from that sketch complete the table below that identifies processes or unit operations tested.

Test ID	Process	Process ID	Emissions tested		APCD (controlled emissions only)
			Uncontrolled	Controlled	
1, 2	Slag Tapping Operation	A	E	F	Scrubber
3, 4	Nodulizing Kiln	B	A	B	Kiln Scrubber

B. Process Information

1. Provide a brief narrative description of the process. With as much detail as possible, (e.g., if a furnace or conveyor system is used, identify the type of unit) describe the equipment used for those operations tested. (Note: If process description provided in test report is adequate, attach copy or reproduce here.)

see attached

white-out E, F, A + B
and ✓ those boxes

NO FEED
OR PRODUCTION
RATES

2. For each process tested list feedstock materials and products. Indicate if activity factors are for feed (F) rate or product (P) rate.

Process ID	Feedstock materials	Products	Basis for activity factor	F/P
B	CO from phosphorus furnace/ residual fuel oil			

Basis for data: _____
(Indicate page/table Nos. in test report)

3. For each process or operation tested and each test run note process capacity and operating rate during test.

Process ID	Capacity	Units	Test run	Process rate	Units
			1		
			2		
			3		
			4		
			1		
			2		
			3		
			4		
			1		
			2		
			3		
			4		
			1		
			2		
			3		
			4		

Basis for data: _____

C. Air Pollution Control Systems Tested

1. For each air pollution control system pollution control system identified in A.8, note the following

ID	Type of APCD	Manufacturer	Model No.
Z	scrubber		
W	scrubber		

Note: Be as specific as possible in identifying APCD. For example, indicate "pulse jet fabric filter" rather than simply "fabric filter."

2. For each system identified above, provide a narrative description. For fugitive systems describe capture techniques as well as the removal techniques (use a separate page if necessary)

3. Using the attached parameter list for guidance complete the table below. (Use additional pages as needed.)

APCD ID	Parameter	Units	Readings			
			Run 1	Run 2	Run 3	Run 4
W						
Type of APCD: scrubber	pH of H_2O					
Type of APCD:						
Type of APCD:						

D. Sampling and Analysis Methods

1. Complete the following table

Test location	Pollutant	S & A method	Reference/ conditional method	Deviations noted
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N

E. Emission Data Documentation

1. Tabulate the following stack gas data from the test report. (Use additional pages as needed.)

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	~~Run 4~~
1	Stack temperature	°F	219	173	189	
	Moisture					
	Oxygen					
	Volumetric flow, actual	14	14,000	14,600	13,100	
	Volumetric flow, standard					
	Percent isokinetic	%	75.8	107	113	98.6
	Pollutant concentration:					
	Stack temperature					
	Moisture					
	Oxygen					
	Volumetric flow, actual					
	Volumetric flow, standard					
	Percent isokinetic					
	Pollutant concentration:					
	Stack temperature					
	Moisture					
	Oxygen					
	Volumetric flow, actual					
	Volumetric flow, standard					
	Percent isokinetic					
	Pollutant concentration:					

RUN 1 DOESN'T LOOK PROMISING

DELETE VOLUMETRIC FLOW, ACTUAL

2. If a method used was not a reference or conditional method, provide a narrative discussion including any data manipulation needed to make results correspond to reference or conditional method results.

3. Describe any deviations identified above.

2. Tabulate pollutant mass flux rates

Test ID	Pollutant	Units	Mass flux rates			
			Run 1	Run 2	Run 3	Run 4

3. Present example emission factor calculations below.

4. Tabulate emission factors

Process	Pollutant	Units	Average emission factor	
			Uncontrolled	Controlled

ATTACHMENT A
APCD PARAMETERS

Type of APCD	Parameters
Fabric filter	Cleaning mechanism Bag type Cleaning frequency Air to cloth ratio (A/C) Pressure drop Inlet temperature
ESP	Type (wet or dry) Number of fields Rapping cycle (if dry) Specific Collection Area (SCA) Particulate resistivity (if known) Spark rate Current and power levels
Venturi (or other high energy) scrubber	Pressure drop Liquid/gas (L/G) ratio Mist eliminator type
Packed-bed scrubber	Packing depth L/G ratio Caustic use (Y/N) pH Mist eliminator type
Carbon absorber	Bed depth Superficial gas velocity Bed temperature Desorption mechanism (media) Flue-gas moisture Cycle length Time-on-line after breakthrough

ELEMENTAL PHOSPHORUS

EMISSION TESTING REPORT

PROJECT NUMBER 72 MM 05

STAUFFER CHEMICAL COMPANY

TARPON SPRINGS, FLORIDA

FINAL

PEDCO ENVIRONMENTAL

EMISSION TESTING REPORT

PROJECT NUMBER 72 MM 05

STAUFFER CHEMICAL COMPANY

TARPON SPRINGS, FLORIDA

FINAL

Prepared by

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Contract No. 68-02-0237

Task 4

EPA Project Officer: John Wilkens
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PEDCo-Environmental Specialists, Inc.
Cincinnati, Ohio

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I. INTRODUCTION

Atmospheric emissions of fluorides, phosphorus pentoxide, total particulate, and sulfur dioxide from Stauffer Chemical Company's elemental phosphorus plant at Tarpon Springs, Florida, were sampled to form a data base for New Source Performance Standards as authorized by the Clean Air Act of 1970.

Tests were made to determine fluoride and phosphorus pentoxide concentrations before and after the venturi scrubber serving a furnace slag tapping operation. Fluoride, phosphorus pentoxide, total particulate, and sulfur dioxide concentrations before and after the spray chamber serving the feed nodulizing kiln were also measured. In addition, the fluoride and P_2O_5 concentrations in the air return line and the CO line leading to the kiln were measured. All field testing was conducted by PEDCo-Environmental Specialists, Inc. and all sample analyses were performed by the Environmental Protection Agency's Office of Air Quality and Planning. Table 1 summarizes the test locations, dates, and the measurements made. In addition, Stauffer Chemical Company conducted fluoride tests at the nodulizing kiln spray chamber outlet during this test series using both manual and continuous bubbler systems.

This test series was interrupted by Hurricane Agnes. Sampling therefore occurred during two different periods.

TABLE 1.

SUMMARY OF PROGRAM MEASUREMENTS MADE AT STAUFFER CHEMICAL COMPANY IN TARPON SPRINGS, FLORIDA

DATE 1972	TEST NO.	TEST SITE	STACK GAS PARAMETERS			EMISSIONS
			Velocity	Temp.	% H_2O	
6/13	1AK	Kiln Spray				Fluorides & P_2O_5
6/14	2AK	Chamber Inlet				
7/18	3AK					
7/20	1					Particulate & SO_2[c]
7/21	2					
7/21	3					
6/13	1BK	Kiln Spray	a			Fluorides & P_2O_5
6/14	2BK	Chamber Outlet, B				
7/18	3BK					
6/13	1CK	Kiln Spray				
6/14	2CK	Chamber Outlet C				
7/18	3CK	5.7' Above Site B				
7/20	1	Kiln Spray				Particulate
7/21	2	Chamber Outlet, B				
7/21	3					
6/15	1-CO	CO Line	b			Fluorides & P_2O_5
7/19	1,2,3	Air Return Line	Velocity			
6/16	1S	Slag Tap Scrubber				Fluorides & P_2O_5
6/21	2S	Inlet				
6/21	3S					
6/16	1S	Slag Tap Furnace				
6/21	2S	Outlet				
6/21	3S					

a) Velocity too low to measure and was calculated based on gas volume measured at inlet site and dilution air drawn into duct.

b) No velocity measured due to dangerous conditions (explosion) and small sampling port.

c) Also sampled for SO_2 on July 19 at inlet and outlet site

In all cases, the tests were run to determine average emission concentrations and rates under normal operating conditions. Whenever possible, testing was conducted during normal operating conditions.

Slag Tapping Operation

At this plant, the slag tapping ports in the electric arc furnace were covered by a movable hood system which vented fumes during slag tapping through a venturi scrubber and out the stack. Stack gases were sampled before and after the scrubber as shown by Points E and F in Figure 1. For the three test runs sampling was conducted only during the tapping operation to determine concentrations of fluoride and phosphorus pentoxide (P_2O_5). Samples of the scrubber water were also collected at Points g and h as shown in Figure 1.

Nodulizing Kiln

Gases from the feed nodulizing kiln pass through cyclone collectors and then a large diameter spray chamber which also serves as the exit stack. Stack gases were sampled before and after the spray chamber at Points A, and B and C, respectively, as shown in Figure 1. The C location was 5.7 ft. above Site B and was sampled to determine the effect of additional residence time of the gaseous emissions in the

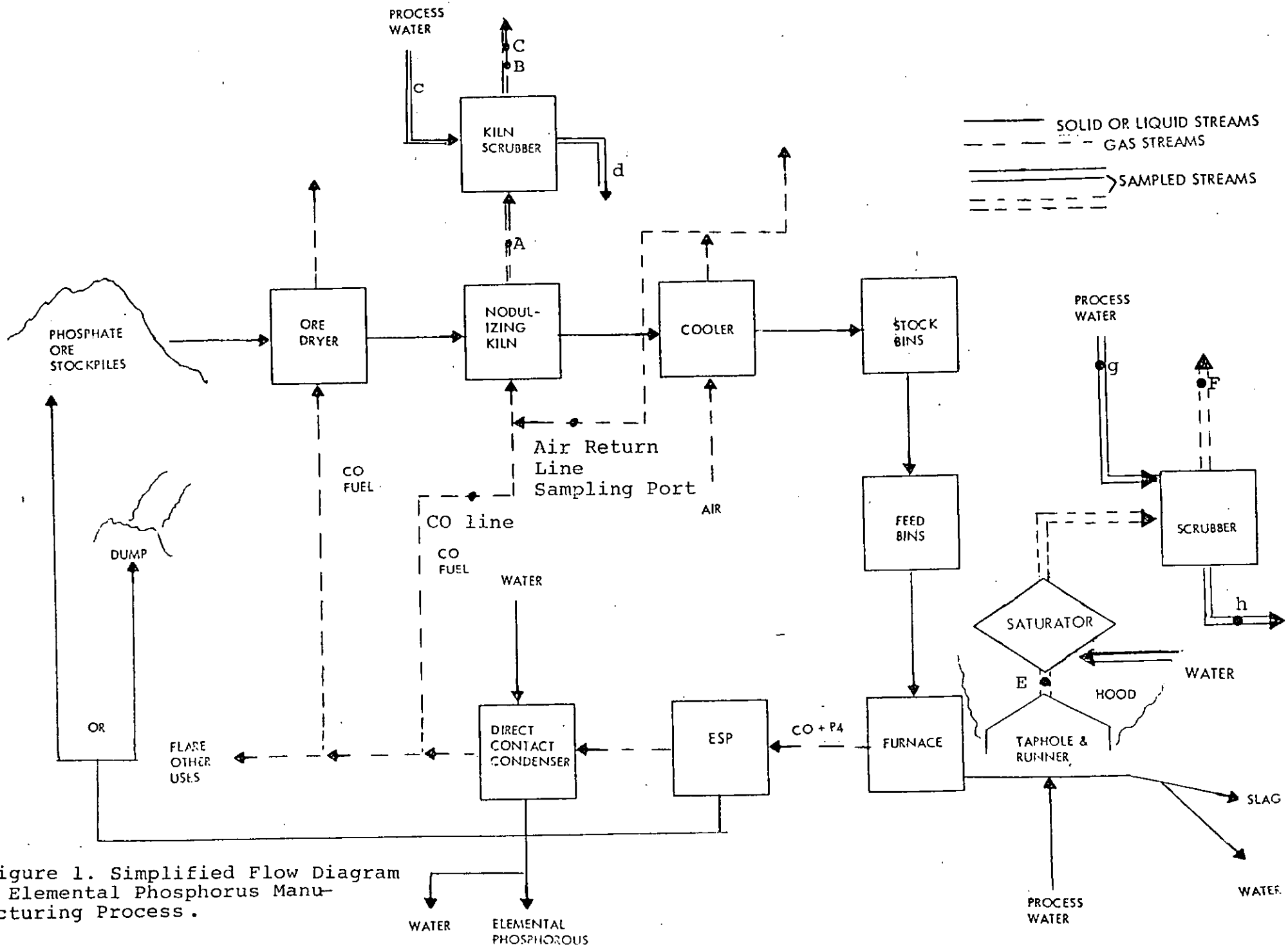


Figure 1. Simplified Flow Diagram of Elemental Phosphorus Manufacturing Process.

large stack. Sampling site A was located before the spray chamber. Scrubber water samples were taken at Points c and d.

Simultaneous testing was done at the three emission test sites, A, B, and C to determine concentrations of fluoride and P_2O_5. Triplicate tests were made. Simultaneous tests were performed at two test sites, A and B, to determine concentrations of particulate and sulfur dioxide. Triplicate tests were made for these constituents. During the fluoride and particulate tests, gas samples were also taken for molecular weight determinations.

Raw material and product samples were also collected during the test periods and analyzed for fluorides, P_2O_5, and trace metals. Complete analysis of these samples is included in EMB file 72-MM-05.

II. SUMMARY AND DISCUSSION OF RESULTS

Slag Tapping Operation

Slag tapping was an intermittent operation which occured approximately every 70 minutes. Each tap lasted for approximately 12 minutes. Sampling was conducted simultaneously before and after the venturi scrubber only during the tapping periods to determine the concentrations of fluorides and P_2O_5.

Tables 2, 3, and 4 summarize the stack gas and scrubber water data obtained during these tests. Sampling procedures are described in Section V. More detailed sampling and analytical results are included in the appendices to this report. Emission data are reported on a concentration (grains per standard cubic foot) basis, and also as pounds per hour emitted during the slag tapping periods.

The higher gas flows measured at the outlet site indicate leakage of outside air into the duct system around the fan. Measured moisture content of the outlet stream showed that the gas was not saturated with water. This may be due to some reheating of the gas because of the hot slag being dumped near the duct leading to the outlet site, and also incomplete saturation in the venturi scrubber.

TABLE 2. SLAG TAPPING - SCRUBBER INLET
FLUORIDE & P_2O_5 EMISSIONS SUMMARY

Run Number	1	2 Composite	3	Weighted Average
Date	6-16-72	6-21-72	6-21-72	
Volume of Gas Sampled - DSCF[a]	29.78	26.00	20.10	25.29
Percent Moisture by Volume	2.60	1.82	2.15	2.19
Average Stack Temperature - F	219	173	189	194
Stack Volumetric Flow Rate - DSCFM[b]	14,000	14,600	13,100	13,900
Stack Volumetric Flow Rate - ACFM[c]	18,900	18,200	16,900	18,000
Percent Isokinetic	75.8	107	113	98.6
Percent by Volume CO_2	<1	<1	<1	<1
Percent by Volume O_2	21.0	21.0	21.0	21.0
Percent by Volume CO	<1	<1	<1	<1
Percent by Volume N_2	79.0	79.0	79.0	79.0
Fluoride Emissions - water soluble				
mg Collected	107	42.4	35.5	61.6
gr/DSCF	0.0555	0.0251	0.0272	0.0376
gr/ACF	0.0410	0.0201	0.0212	0.0289
lb/hr[d]	6.66	3.14	3.06	4.48
Fluoride Emissions - total				
mg Collected	107.1	44.2	35.8	62.4
gr/DSCF	0.0555	0.0262	0.0275	0.0381
gr/ACF	0.0410	0.0209	0.0213	0.0293
lb/hr[d]	6.66	3.28	3.08	4.53
Fluoride Emissions, % insoluble	0.093	4.07	0.838	1.28
P_2O_5 Emissions - water soluble				
mg Collected	509	453.2	527.6	496.6
gr/DSCF	0.264	0.269	0.405	0.303
gr/ACF	0.195	0.215	0.316	0.234
lb/hr	31.7	33.6	45.4	36.1
P_2O_5 Emissions - total				
mg Collected	509.6	465.8	532.3	502.4
gr/DSCF	0.264	0.276	0.408	0.306
gr/ACF	0.195	0.221	0.318	0.235
lb/hr[d]	31.7	34.5	45.8	36.5
P_2O_5 Emissions, % insoluble	1.18	2.71	0.883	1.16

[a] Dry standard cubic feet at 70 F, 29.92 in. Hg.

[b] Dry standard cubic feet per minute at 70 F, 29.92 in. Hg.

[c] Actual cubic feet per minute.

[d] During slag tapping only.

TABLE 3. SLAG TAPPING - SCRUBBER OUTLET
FLUORIDE & P_2O_5 EMISSIONS SUMMARY

Run Number	1	2	3	Weighted Average
Date	6-16-72	6-21-72	6-21-72	
Volume of Gas Sampled - DSCF[a]	28.95	27.29	26.71	27.65
Percent Moisture by Volume	7.56	5.62	5.86	6.35
Average Stack Temperature - °F	121	120	119	120
Stack Volumetric Flow Rate - DSCFM[b]	18,800	17,200	17,200	17,900
Stack Volumetric Flow Rate - ACFM[c]	22,500	20,000	20,000	20,800
Percent Isokinetic	106	107	105	106
Percent by Volume CO_2	<1	<1	<1	<1
Percent by Volume O_2	21.0	21.0	21.0	21.0
Percent by Volume CO	<1	<1	<1	<1
Percent by Volume N_2	79.0	79.0	79.0	79.0
Fluoride Emissions - water soluble				
mg Collected	3.21	1.70	1.40	2.10
gr/DSCF	0.00171	0.000960	0.000808	0.00117
gr/ACF	0.0143	0.000824	0.000692	0.000995
lb/hr[d]	0.276	0.142	0.119	0.179
Fluoride Emissions - total				
mg Collected	4.25	2.43	1.58	2.75
gr/DSCF	0.00227	0.00137	0.000912	0.00153
gr/ACF	0.0189	0.00118	0.000781	0.00130
lb/hr[d]	0.365	0.202	0.134	0.233
Fluoride Emissions, % insoluble	24.5	30.0	11.4	22.0
P_2O_5 Emissions - water soluble				
mg Collected	57.5	61.3	82.1	67.0
gr/DSCF	0.0307	0.0346	0.0474	0.0376
gr/ACF	0.0256	0.0298	0.0406	0.0325
lb/hr	4.94	5.11	6.98	5.68
P_2O_5 Emissions - total				
mg Collected	63.8	62.4	83.9	69.9
gr/DSCF	0.0340	0.0352	0.0484	0.0390
gr/ACF	0.0256	0.0298	0.0406	0.0325
lb/hr[d]	5.48	5.21	7.14	5.94
P_2O_5 Emissions, % insoluble	9.87	1.76	2.15	4.15

[a] Dry standard cubic feet at 70 °F, 29.92 in. Hg.

[b] Dry standard cubic feet per minute at 70°F, 29.92 in. Hg.

[c] Actual cubic feet per minute.

[d] During slag tapping only.

TABLE 4. SCRUBBER WATER ANALYSIS - SLAG TAP PROCESS VENTURI SCRUBBER

Date 1972	Test No.	Soluble Fluorides mg/liter		P_2O_5 mg/ml		pH	
6/16	1 - Discharge	282		1.4		2.78	
		366	avg = 375	1.7	avg = 1.7	2.50	avg = 2.53
		477		1.9		2.32	
6/21	2 - Discharge	365		1.7		2.62	
		340	avg = 359	1.6	avg = 1.6	2.75	avg = 2.75
		373		1.4		2.88	
6/21	3 - Discharge	596		2.5		2.15	
		452	avg = 491	1.8	avg = 1.9	2.43	avg = 2.40
		426		1.5		2.61	
6/21	Slag Pit[a]	243		1.4		3.48	
6/21	Slag Pit[a]	238		1.0		3.56	

a) This water is used for scrubber water make-up.

Flexible Teflon® tubing was used between the probe and first impinger for all tests at both the inlet and outlet sites.

Fluoride Data Evaluation - The measured values for the slag tapping appear to be representative of process emissions except for Test 1 (inlet and outlet) which has approximately twice the emission rate as compared to Tests 2 and 3. The following are possible reasons for the high fluoride measurement on Test 1:

1. During the first slag tap the sampling crew on the inlet side was driven off the platform by the high concentration of acid-gas fumes (probably escaping from under the furnace fume hood). The EPA Project Officer, John Wilkens, had delayed the first slag tap for approximately two hours.

2. The analytical results in Appendix E, show that for the inlet Test 1 the soluble fluorides were 107 mg/sample as compared to 42.4 mg/sample and 35.5 mg/sample of soluble fluorides respectively for Tests 2 and 3. Sample volumes were approximately the same for all three tests.

3. The percent isokinetic for Test 1 inlet was only 76% as compared to 107% and 113% for Tests 2 and 3. This would result in the possibility of a higher grain loading. Only four traverse ports were used during Test 1 at the inlet. During Tests 2 and 3 16 traverse points were used. The P_2O_5 concentration was however not out-of-line for this run.

Based on these observations, Test 1 inlet does not appear to be representative of normal operation. Water soluble fluoride emissions were in the range of 0.025 to 0.027 grains/DSCF at the scrubber inlet and averaged 0.0012 grains/DSCF at the outlet. The scrubber collection efficiency, based on pounds of total fluoride emitted, averaged 95%.

P_2O_5 Data Evaluation - The Test 3 inlet concentration of 0.405 grains/DSCF for the water soluble P_2O_5 is approximately 35% higher than the concentration measured in Tests 1 and 2. However, no reason is apparent for this, and an average of 0.303 grains/DSCF on the inlet appears to be representative of normal operation. The outlet concentrations, averaging 0.038 grains/DSCF and ranging from 0.031 to 0.048 grains/DSCF are also considered in the range of normal operation. Average scrubber collection efficiency for water soluble P_2O_5 was 88%.

Nodulizing Kiln Operation

Tables 5 to 13 summarize the data obtained on the nodulizing kiln spray chamber. Tests for fluorides, P_2O_5, total particulate, and sulfur dioxide were conducted before and after the spray chamber which was used to reduce atmospheric emissions. Since the outlet flow from the spray

TABLE 5. NODULIZING KILN TESTS - STACK GAS VOLUMETRIC FLOW RATES

RUN NO.	DATE	INLET		OUTSIDE TEMPERING AIR		OUTLETS		
		GAS VELOCITY FPM[a]	GAS VOLUME SCFM[b]	GAS VELOCITY FPM[a]	GAS VOLUME SCFM[b]	PORT SITE	GAS VELOCITY FPM[a]	GAS VOLUME SCFM[b]
Fluoride 1	6/13/72	6,490	23,900			Lower (B)	86.4	26,400
						Upper (C)	80.0	26,400
Fluoride 2	6/14/72	6,230	24,300			Lower (B)	94.7	26,800
						Upper (C)	91.9	26,800
	6/22/72			2,730	2,520			
Fluoride 3	7/18/72	6,800	24,300	2,730	2,520	Lower (B)	95.9	26,800
						Upper (C)	85.8	26,800
Particulate 1	7/20/72	4,700 5,960[c]	18,100 22,700[c]			Lower (B)	81.2	25,200
Particulate 2	7/21/72	5,440 5,840[c]	20,700 22,200[c]			Lower (B)	81.6	24,700
Particulate 3	7/21/72	5,230 5,390[c]	20,200 20,700[c]			Lower (B)	74.1	23,200

[a] Feet per minute, stack conditions.

[b] Standard cubic feet per minute, dry basis at 70°F, 29.92 in. Hg.

[c] Represents flow measurements determined by performing a separate pitot traverse before or after each particulate run. Normal inlet sampling covered only 12 traverse points and was considered not as representative as the separate pitot traverses that covered 24 points.

TABLE 6. FLUORIDE & P_2O_5 EMISSION DATA SUMMARY
NODULIZING KILN - SCRUBBER SPRAY CHAMBER INLET

Run Number	1 Composite	2	3	Weighted Average
Date	6-13-72	6-14-72	7-18-72	
Volume of Gas Sampled - DSCF[a]	64.03	28.65	32.70	41.79
Percent Moisture by Volume	19.9	19.1	20.7	19.9
Average Stack Temperature - °F	702	653	729	695
Stack Volumetric Flow Rate - DSCFM[b]	23,900	24,300	24,300	24,200
Stack Volumetric Flow Rate - ACFM[c]	67,000	64,300	70,200	67,200
Percent Isokinetic	102	105	120	109
Percent by Volume CO_2	1.7	12.4	16	
Percent by Volume O_2	20.3	13.3	8	
Percent by Volume CO	0.87	<1	2.2	
Percent by Volume N_2	77.1	74.3	73.8	
Fluoride Emissions - water soluble				
mg Collected	7300.8	3201.5	5401.4	5301
gr/DSCF	1.76	1.72	2.54	1.95
gr/ACF	0.626	0.651	0.880	0.703
lb/hr[d]	360	358	530	405
Fluoride Emissions - total				
mg Collected	8171.1	3382.6	5546.2	5700
gr/DSCF	1.97	1.84	2.61	2.10
gr/ACF	0.703	0.694	0.898	0.757
lb/hr[d]	404	382	540	434
Fluoride Emissions, % insoluble	10.7	5.35	2.61	6.68
P_2O_5 Emissions - water soluble				
mg Collected	85.1	243.1	317.5	215
gr/DSCF	0.0205	0.131	0.150	0.0795
gr/ACF	0.00731	0.0528	0.0516	0.0293
lb/hr	4.18	27.2	31.1	16.5
P_2O_5 Emissions - total				
mg Collected	149.6	466.7	d	-
gr/DSCF	0.0360	0.251	d	-
gr/ACF	0.0128	0.100	d	-
lb/hr[d]	7.36	52.2	d	-
P_2O_5 Emissions, % insoluble	43.1	47.9	d	-

[a] Dry standard cubic feet at 70 °F, 29.92 in. Hg.

[b] Dry standard cubic feet per minute at 70°F, 29.92 in. Hg.

[c] Actual cubic feet per minute.

[d] Analysis of P_2O_5 insoluble portion impossible due to gel being formed when sodium hydroxide was combined with sample.

TABLE 7. FLUORIDE & P_2O_5 EMISSION DATA SUMMARY
NODULIZING KILN - SCRUBBER SPRAY CHAMBER OUTLET B

Run Number	1	2	3	Weighted Average
Date	6-13-72	6-14-72	7-18-72	
Volume of Gas Sampled - DSCF[a]	43.07	39.97	58.67	47.24
Percent Moisture by Volume	10.0	16.7	19.0	15.2
Average Stack Temperature - °F	138	140	135	138
Stack Volumetric Flow Rate - DSCFM[b]	26,400[d]	26,800[d]	26,800[d]	26,700[d]
Stack Volumetric Flow Rate - ACFM[c]	33,100	36,300	36,800	35,400
Percent Isokinetic	74.1	67.8	62.6	68.2
Percent by Volume CO_2	13.3	6.0		
Percent by Volume O_2	13.4	17.9		
Percent by Volume CO	0.2	<1		
Percent by Volume N_2	73.1	76.1		
Fluoride Emissions - water soluble				
mg Collected	8.8	4.7	24.5	12.7
gr/DSCF	0.00315	0.00181	0.00643	0.00414
gr/ACF	0.00251	0.00134	0.00468	0.00313
lb/hr[d]	0.689	0.404	1.47	0.947
Fluoride Emissions - total				
mg Collected	9.45	5.3	25.0	13.3
gr/DSCF	0.00338	0.00204	0.00656	0.00434
gr/ACF	0.00270	0.00151	0.00478	0.00328
lb/hr[d]	0.742	0.457	1.50	0.992
Fluoride Emissions, % insoluble	6.88	11.3	2.00	4.51
P_2O_5 Emissions - water soluble				
mg Collected	23.9	15.1	67.0	35.3
gr/DSCF	0.00855	0.00582	0.0176	0.0115
gr/ACF	0.00683	0.00431	0.0128	0.00859
lb/hr	1.94	1.33	4.04	2.64
P_2O_5 Emissions - total				
mg Collected	26.6	17.8	70.4	38.3
gr/DSCF	0.00951	0.00686	0.0185	0.0125
gr/ACF	0.00760	0.00508	0.0135	0.00933
lb/hr[d]	2.20	1.56	4.23	2.86
P_2O_5 Emissions, % insoluble	10.2	15.2	4.84	7.83

[a] Dry standard cubic feet at 70 °F, 29.92 in. Hg.

[b] Dry standard cubic feet per minute at 70°F, 29.92 in. Hg.

[c] Actual cubic feet per minute.

[d] Outlet volumetric flows based on inlet flow measurements plus additional tempering air entering prior to the outlet sampling site.

TABLE 8. FLUORIDE & P_2O_5 EMISSION DATA SUMMARY
NODULIZING KILN - SCRUBBER SPRAY CHAMBER OUTLET C

Run Number	1	2	3 Composite	Weighted Average
Date	6-13-72	6-14-72	7-18-72	
Volume of Gas Sampled - DSCF[a]	44.78	39.42	27.07	37.09
Percent Moisture by Volume	3.17	14.1	9.01	8.76
Average Stack Temperature - °F	136	140	138	138
Stack Volumetric Flow Rate - DSCFM[b]	26,400[d]	26,800[d]	26,800[d]	26,700[d]
Stack Volumetric Flow Rate - ACFM[c]	30,700	35,200	32,900	32,900
Percent Isokinetic	74.7	65.8	105	81.8
Percent by Volume CO_2	13.3	6.0		
Percent by Volume O_2	13.4	17.9		
Percent by Volume CO	0.2	<1		
Percent by Volume N_2	73.1	76.1		
Fluoride Emissions - water soluble				
mg Collected	4.1	6.4	11.1	7.20
gr/DSCF	0.00141	0.00250	0.00631	0.00299
gr/ACF	0.00122	0.00191	0.00514	0.00243
lb/hr[d]	0.320	0.576	1.45	0.684
Fluoride Emissions - total				
mg Collected	4.42	7.6	11.6	7.87
gr/DSCF	0.00151	0.00297	0.00660	0.00327
gr/ACF	0.00130	0.00226	0.00537	0.00266
lb/hr[d]	0.343	0.684	1.52	0.748
Fluoride Emissions, % insoluble	7.2	15.8	4.31	8.51
P_2O_5 Emissions - water soluble				
mg Collected	11.5	17.1	25.5	18.0
gr/DSCF	0.00395	0.00668	0.0145	0.00747
gr/ACF	0.00340	0.00510	0.0118	0.00605
lb/hr	0.898	1.54	3.33	1.72
P_2O_5 Emissions - total				
mg Collected	13.2	19.7	26.4	19.8
gr/DSCF	0.00454	0.00770	0.0150	0.00822
gr/ACF	0.00391	0.00588	0.0122	0.00662
lb/hr[d]	1.03	1.77	3.45	1.88
P_2O_5 Emissions, % insoluble	12.9	13.2	3.41	9.09

[a] Dry standard cubic feet at 70 °F, 29.92 in. Hg.

[b] Dry standard cubic feet per minute at 70°F, 29.92 in. Hg.

[c] Actual cubic feet per minute.

[d] Outlet volumetric flows based on inlet flow measurements plus additional tempering air entering prior to the outlet sampling site.

TABLE 9. PARTICULATE EMISSION DATA
NODULIZING KILN-SCRUBBER SPRAY CHAMBER INLET

RUN NUMBER	1	2	3	WEIGHTED AVERAGE
Date	7-20-72	7-21-72	7-21-72	
Volume of Gas Sampled-DSCF[a]	23.02	25.006	24.81	24.28
Percent Moisture by Volume	20.1	18.4	18.1	18.9
Average Stack Temperature-°F	652	682	670	668
Stack Volumetric Flow Rate-DSCFM[b]	18,100	20,700	20,200	19,700
Stack Volumetric Flow Rate-ACFM[c]	48,500	56,100	54,000	52,900
Percent Isokinetic	114	108	110	111
Percent Excess Air	167	39.4	44.7	83.7
Feed Rate-ton/hr				
Particulates-probe, cyclone, and filter catch				
mg	1069	1054.6	1114.5	1079
gr/DSCF	0.715	0.650	0.692	0.685
gr/ACF	0.266	0.240	0.259	0.254
lb/hr	111	115	120	116
Particulates-total catch				
mg	1382.9	1196.7	1347.9	1309
gr/DSCF	0.925	0.738	0.838	0.831
gr/ACF	0.345	0.272	0.313	0.309
lb/hr	143	131	145	140
Percent impinger catch	22.7	11.9	17.3	17.6

[a] Dry standard cubic feet at 70°F, 29.92 in. Hg.

[b] Dry standard cubic feet per minute at 70°F, 29.92 in. Hg.

[c] Actual cubic feet per minute

TABLE 10. PARTICULATE EMISSION DATA
NODULIZING KILN-SCRUBBER SPRAY CHAMBER OUTLET

RUN NUMBER	1	2	3	WEIGHTED AVERAGE
Date	7-20-72	7-21-72	7-21-72	
Volume of Gas Sampled-DSCF[a]	105.57	109.38	105.51	106.82
Percent Moisture by Volume	19.6	22.7	20.1	20.8
Theoretical Saturated percent moisture	12.0	13.5	11.5	12.5
Average Stack Temperature-°F	122	126	120	123
Stack Volumetric Flow Rate-DSCFM[b]	25,200	24,700	23,200	24,400
Stack Volumetric Flow Rate-ACFM[c]	31,200	31,300	28,400	30,300
Percent Isokinetic	119	127	130	125
Feed Rate-ton/hr				
Particulates-probe, and filter catch				
mg	386.4	417	300.3	368
gr/DSCF	0.0564	0.0587	0.0439	0.0531
gr/ACF	0.0455	0.0466	0.0360	0.0426
lb/hr	12.3	12.5	8.76	11.1
Particulates-total catch				
mg	634.5	799.3	630.2	688
gr/DSCF	0.0926	0.113	0.0922	0.0993
gr/ACF	0.0749	0.0892	0.0754	0.0797
lb/hr	20.1	23.9	18.4	20.8
Percent impinger catch	39.1	47.8	52.3	46.5

[a] Dry standard cubic feet at 70°F, 29.92 in. Hg.

[b] Dry standard cubic feet per minute at 70°F, 29.92 in. Hg.

[c] Actual cubic feet per minute calculated from saturated gas conditions.

NOTES: All outlet volumetric flows are based on inlet duct gas flow plus 2530 SCFM for dilution air entering the gas stream prior to the outlet sampling point.

TABLE 11. NODULIZING KILN
SUMMARY OF GASEOUS TESTING

A. CARRIER GASES[a]

RUN NO.	DATE	GAS COMPOSITION (VOLUME % DRY)			
		CO_2	O_2	CO	N_2[b]
Fluoride 1	6-13-72				
Inlet		1.70	20.3	0.87	77.1
Outlet		13.3	13.4	0.20	73.1
Fluoride 2	6-14-72				
Inlet		12.4	13.3	<1	74.3
Outlet		6.0	17.9	<1	76.1
Fluoride 3	7-18-72				
Inlet		16.0	8.0	2.2	73.8
Outlet					
Particulate 1	7-20-72				
Inlet		18.6	12.1	1.93	67.4
Outlet		-	-	-	-
Particulate 2	7-21-72				
Inlet		18.3	6.47	2.00	73.3
Outlet		12.2	10.7	2.90	74.2
Particulate 3	7-21-73				
Inlet		18.4	6.70	1.43	73.4
Outlet		11.3	10.8	2.30	75.6

B. SULFUR DIOXIDE EMISSIONS

RUN NO.	DATE	SPRAY CHAMBER INLET ppm SO_2[c]	SPRAY CHAMBER OUTLET ppm SO_2[c]
1	7-19-72	2540	144
2	7-20-72	2100	210
3	7-20-72	787	415
		Weighted Average 1610	Weighted Average 235

TABLE 11. Continued

C. FLUORIDE EMISSIONS
(CO LINE TO KILN)

RUN NO.	DATE	FLUORIDE EMISSIONS, (GR/DSCF[d]) WATER SOLUBLE	TOTAL
1	6-15-72	0.000630	0.000630

[a] Orsat analysis
[b] Determined by differences, includes other gases
[c] Parts per million by volume
[d] Grains per dry standard cubic feet

TABLE 12. AIR RETURN LINE
FLUORIDE & P_2O_5 DATA SUMMARY

Run Number	1	2	3	Weighted Average
Date	7-19-72	7-19-72	7-19-72	
Volume of Gas Sampled - DSCF[a]	5.73	5.72	5.62	5.68
Percent Moisture by Volume	2.90	3.36	3.26	3.18
Average Stack Temperature - °F	700	700	700	700
Stack Volumetric Flow Rate - DSCFM[b]	16,900	16,800	16,800	16,800
Stack Volumetric Flow Rate - ACFM[c]	36,400	36,400	36,400	36,400
Percent Isokinetic	-	See note	-	-
Percent by Volume CO_2	0	0	0)	Assumed values based on air
Percent by Volume O_2	21	21	21)	
Percent by Volume CO	0	0	0)	
Percent by Volume N_2	79	79	79)	
Fluoride Emissions - water soluble				
mg Collected	79.5[d]	42.6	63.4	61.8
gr/DSCF	0.214[d]	0.115	0.174	0.168
gr/ACF	0.0995[d]	0.0530	0.080	0.0775
lb/hr[d]	31.1	16.5	25.2	24.3
Fluoride Emissions - total				
mg Collected	79.6[d]	42.7	63.5	61.9
gr/DSCF	0.215[d]	0.115	0.174	0.168
gr/ACF	0.0996[d]	0.0531	0.080	0.0776
lb/hr[d]	31.1[d]	16.6	25.2	24.3
Fluoride Emissions, % insoluble	0.13[d]	0.23	0.16	0.16
P_2O_5 Emissions - water soluble				
mg Collected	1.2	1.3	1.4	1.3
gr/DSCF	0.00323	0.00350	0.00384	0.00352
gr/ACF	0.00149	0.00161	0.0018	0.00163
lb/hr	0.48	0.51	0.55	0.51
P_2O_5 Emissions - total				
mg Collected	1.7	1.9	2.0	1.9
gr/DSCF	0.00457	0.0051	0.0055	0.00506
gr/ACF	0.00211	0.0023	0.0025	0.00230
lb/hr[d]	0.68	0.74	0.79	0.74
P_2O_5 Emissions, % insoluble	29	31.6	30	31.6

[a] Dry standard cubic feet at 70 °F, 29.92 in. Hg.

[b] Dry standard cubic feet per minute at 70°F, 29.92 in. Hg.

[c] Actual cubic feet per minute.

[d] Observed interference in analysis (see Sampling & Analytical Procedures Section).

Note: Run not conducted using isokinetic sampling procedures due to small sampling port.

TABLE 13. SCRUBBER WATER ANALYSES - NODULIZING KILN SPRAY CHAMBER

Date 1972	Test No.	Soluble Fluorides mg/liter	Soluble P_2O_5 mg/ml	pH
6/13	1 - Intake	27.8 38 avg = 32.3 31	0.1 0.02 avg = 0.05 0.02	7.65 9.25 avg = 8.50 8.60
6/13	1 - Discharge	1200 480 avg = 779 657	0.04 0.03 avg = 0.033 0.03	2.12 2.18 avg = 2.14 2.12
6/14	2 - Intake	42 40 avg = 41 40	0.02 0.02 avg = 0.02 0.02	8.39 8.80 avg = 8.73 9.01
6/14	2 - Discharge	549 610 avg = 602 647	0.1 0.05 avg = 0.10 0.16	2.49 2.34 avg = 2.39 2.34
7/18	3 - Intake	21 33 avg = 24 18	0.01 0.01 avg = 0.01 0.01	5.50 6.00 avg = 5.70 5.60
7/18	3 - Discharge	976 22 avg = 482 447	0.09 0.04 avg = 0.06 0.05	2.40 3.50 avg = 2.88 2.75

chamber was too low to measure with a pitot tube, the value was calculated and based on the sum of the inlet flow and the outside tempering air which entered the duct just before the induced draft fan (see Table 5). Two outlet test sites were used to measure fluorides and P_2O_5. These sites, designated by test numbers BK and CK were 5.7 ft. apart near the top of the spray tower (see Figure 6, Page 38). Sampling ports B, D, F, and H were associated with test site BK, and Ports A, C, E, and G were associated with the upper (downstream) site CK.

Table 5 summarizes the measured gas velocities at the inlet, and the calculated velocities and volumes at the outlet.

Fluoride Evaluation (Water soluble) - Tests 1 and 2 with inlet loadings of 1.76 grains/DSCF and 1.72 grains/DSCF, respectively, as seen in Table 6, seem to be representative of normal kiln operation. Carbon monoxide from the furnace supplying fuel to the kiln and residual fuel oil were normal during testing, and pH control of the scrubber water by addition of lime was controlled satisfactorily as shown by the data in Table 13. Testing was interrupted by inclement weather (Hurricane Agnes) and Test 3 was conducted a month later on July 18, 1972. The following observations are pertinent to Test 3:

1. Due to equipment limitations at the inlet site, four points on the 12 point traverse were not sampled and the remaining eight points were used in obtaining the stack sample (see Appendix C, Field Data).

2. Table 13 shows that the pH of the inlet scrubber water was not well controlled during Test 3. Measurements of 5.5 to 6.0 pH for Test 3 were obtained as compared to 7.65 to 9.00 pH measurements for Tests 1 and 2.

Inlet Test 3 is therefore not too representative of normal operation, but is indicative of emission control fluctuations which can be expected. Average grain loadings for the water soluble fluorides averaged 1.95 grains/DSCF before the spray chamber, and 0.0041 at the outlet. Total fluorides measured at the inlet site averaged 434 pounds/hour. The spray chamber was very effective in reducing fluoride concentrations and achieved an average collection efficiency of more than 99% with an average outlet loading of 0.99 pound/hour at site BK.

The attempt at relating increased residence time of the gas stream in the spray chamber to a reduction in emissions was not conclusive since only slightly lower values were measured on the average at the downstream sampling site. The close proximity of the downstream sampling site to the stack exit caused the flow and probably the pollutant concentrations to be affected by the wind.

P_2O_5 Evaluation - Outlet B, Tests 1 and 2 appear representative of normal operation with average water soluble P_2O_5 loadings of 0.0058 to 0.0086 grains/DSCF. Inlet loadings of 0.02 to 0.13 grains/DSCF were measured at this time. Carbon monoxide from the furnace supplying fuel to the kiln and residual fuel oil usage were normal during testing. The scrubber water pH was satisfactorily adjusted to an alkaline range to control emissions. For Test 3, the inlet total P_2O_5 loading is not reported. The insoluble portion consisted of a very large amount of particulate matter and upon fusion with sodium hydroxide in the analysis procedure a gel was formed. The soluble P_2O_5 for this test was slightly higher than for Tests 1 and 2.

Concentrations of water soluble P_2O_5 averaged 0.08 grains/DSCF at the inlet and 0.009 at the spray chamber outlet and appear to be representative of emissions for this unit over extended periods of time. The spray chamber collection efficiency for P_2O_5 removal was approximately 87% based on the data at Site B.

Table 8 summarizes the data obtained at the downstream outlet site, CK. Average values for both fluorides and P_2O_5 are approximately 25% lower than those measured at Site B.

However, one cannot state whether these lower concentrations are caused by the increased residence time in the spray chamber or by dilution with outside air which blew into the chamber.

Isokinetic sampling rates at the outlet were generally low for the fluoride runs. This was due to a variety of factors including; sampling rates so low that orifice pressure could not be read accurately; higher than expected moisture content; and not accounting for dilution air added to vent gas flow between inlet and outlet sites. This low isokinetic sampling rate would tend to bias the test results on the high side.

Particulate Evaluation - Tables 9 and 10 present the particulate emission data obtained for the inlet and outlet of the spray chamber. Only the lower (BK) outlet sampling site was used for particulate measurements and samples were taken at a single point approximately six feet into the stack at each port for a total of four sampling points. The definition of true particulate in this type of gas stream when sampled with a train using a glass probe and fiber glass filter is very difficult because of the reactivity of gaseous fluorides with the sampling equipment.

The inlet tests are representative of uncontrolled emission rates and agreed fairly well from test to test and averaged 0.69 grains/DSCF for the front portion of the sampling train (probe, cyclone, and filter). The "total particulate" concentration averaged 0.83 grains/DSCF. The outlet samples also agreed fairly well from test to test. All of these tests were run at a sampling rate which was approximately 25% too high; thus biasing the results on the low side. Outlet particulate concentrations averaged 0.053 and 0.099 grains/DSCF respectively for the front portion (probe and filter) and total train fractions. The impinger contents averaged 46.5% of the total particulate collected.

Excessively high moisture content of the stack gas confirms the observed presence of entrained water droplets.

The spray chamber removed an average of 90% of the particulate as determined by the front portion of the sampling train.

Sulfur Dioxide Evaluation - Table 11 presents the SO_2 data obtained at the spray chamber inlet and outlet. Inlet concentrations averaged 1610 ppm and the outlet averaged 235 ppm yielding a scrubber efficiency of approximately 85%. This efficiency was, however, very variable.

Presented in Table 11 also are the fluoride results from the CO line tests. Due to the high carbon monoxide content of this line, and the potential presence of trace amounts of phosphorus, a severe explosion hazard existed when the sampling port was opened. For this reason, only one test was run at this location. A very low fluoride concentration of 0.00063 grains/DSCF was found.

Air Return Line

Table 12 summarizes the data obtained on the air return line. These samples were taken by sampling at a constant rate with a straight probe since little, if any, visible particulate matter was present in this gas stream.

The concentrations of soluble fluorides in the air return line range from 0.115 to 0.214 grains/DSCF. Soluble phosphorus pentoxide concentrations range from 0.00323 to 0.00384 grains/DSCF.

Scrubber Water Samples

Presented in Table 13 are the analytical results of the scrubber water samples, collected during the fluoride and P_2O_5 sampling at the nodulizing kiln spray chamber. The lower pH of the scrubber water intake during Run 3 (5.7

compared to 8.5 and 8.7 for Runs 1 and 2) did not result in any significant change in scrubber efficiency for fluorides and P_2O_5.

Three separate samples were taken during each test period at approximately one-hour intervals.

III. PROCESS DESCRIPTION AND OPERATION

Elemental phosphorus is produced from phosphate rock by reduction in an electric arc-furnace. Typical ores contain 10-13% phosphorus so that about 10 tons of rock must be processed per ton of phosphorus produced. Considerable quantities of coke, silica, and recycled materials are fed to the furnace with the beneficiated ore. Table 14 presents a typical analysis for the fluoride content of various materials used in the elemental phosphorus manufacturing process (see Figure 1).

Prior to being fed to the furnace, the ore is agglomerated and heat-hardened in a direct-fired rotary kiln. The partially fused product is cooled and crushed to a specified size before being fed to the electric-arc furnace. Aside from some particulates, the major emissions from this feed preparation step are fluorides.

At Stauffer's Tarpon Springs Plant, the rotary kiln is fired with a combination of CO from the phosphorus furnace and residual fuel oil. The gaseous kiln effluent is passed through low pressure drop cyclones, diluted with quench air, blown through a fan and scrubbed with water in a spray tower. The scrubber water has an inlet design pH of 7 to 7.5 which is maintained by lime addition. Particulate collected in the cyclones is recycled to the kiln feed.

TABLE 14. FLUORIDE CONTENT OF VARIOUS PROCESS STREAMS

PROCESS STREAM	FLUORIDE ANALYSIS mg/gram
Kiln Feed	
Coarse	35 - 45
Fine	32
Kiln Product	31
Furnace Phosphate	
Rock Feed	38
Residual Fuel Oil	0.06
Kiln Nodules	33
Coke	0.14
Silica Sand	0.06
Furnace Slag	28.5
Ferro Phosphorus	0.10
Phosphorus Condenser Water	276 mg/liter pH 1.63

Kiln operation is usually erratic. Not only do mechanical and operating problems affect its performance, but furnace problems are also reflected at the kiln. The kiln uses CO directly from the furnace as a partial fuel source. Because of the erratic furnace operation, the kiln did not operate smoothly during testing. However, this is representative of "usual" operating procedures and production rates were reasonably close to design capacity.

Rock fed to the kiln is of two types. The two materials are weighed (moist) into the kiln. An undetermined, variable amount of undersized product is returned to the kiln from the cyclone collectors.

The furnace feed is carefully proportioned with silica and coke before being transferred to feed bins directly above the furnace. The feed mixture then moves by gravity from the bins down into the furnace as the furnace feed is consumed.

The reaction within the furnace is approximated by the following equation:

$$2\ Ca_3\ (PO_4)_2 + 10\ C + 6\ SiO_2 \xrightarrow{(2300\text{-}2700°F)} P_4 + 10\ CO + 6\ CaSiO_3$$

Elemental phosphorus and carbon monoxide leave the furnace as a gas. Dust is removed from the stream by an electrostatic precipitator and the phosphorus vapor is condensed out in

direct-contact water condensers. Waste CO gas is used as a fuel in the kiln operation or flared. Fuel oil is also used for kiln fuel when the furnace is down, or insufficient CO is available.

The non-gaseous by-products of slag and ferrophos (FeP_4) are periodically tapped from the furnace into open-pits and quenched with water. Ferrophos is tapped into molds.

Furnace tapping operations are a source of particulate emissions in the form of P_2O_5, coke smoke, and fluorides. Hooding over the front of the furnace and over the slag runner is satisfactory. However, the hood over the metal catch pot is unsatisfactory since it is too small and poorly placed. There is no hood over the ferrophos molds. Vent gases from the hood system pass through a water saturator and then through a venturi scrubber.

Make-up water for the scrubber is fed into the circulating pump discharge. Total instrumentation on this system is a pressure gauge on the water line to the venturi. The lack of instrumentation combined with the make-up water feed method makes estimates of the total water circulation rate difficult.

IV. LOCATION OF SAMPLING POINTS

Slag Tapping

Figures 2, 3, and 4 show the slag tapping scrubber inlet and outlet sampling sites. As shown, 16 points were used at the horizontal inlet duct (8 along each diameter), and 36 points (18 along each diameter) at the outlet site. Both ducts were circular.

Nodulizing Kiln

Figures 5, 6, and 7 show the sampling port locations on the kiln spray chamber inlet and outlet respectively for the Tarpon Springs Plant. The inlet site was located in a vertical round section leading down to the induced-draft fan. Twelve points were sampled along each diameter. The outlet sites were in the top of the spray chamber, approximately 78 feet above the inlet line. The two outlet sites were identical except that site CK was 5.7' downstream from site BK. Sixty sampling points were to be used at each outlet site. However, due to probe length limitations caused by the narrow platform, Point 15 in each port was not sampled.

Particulate was sampled only at the lower (BK) site at the spray chamber outlet, and since a rigid probe was used, only a single point approximately 6' into the chamber was sampled at each of the four ports.

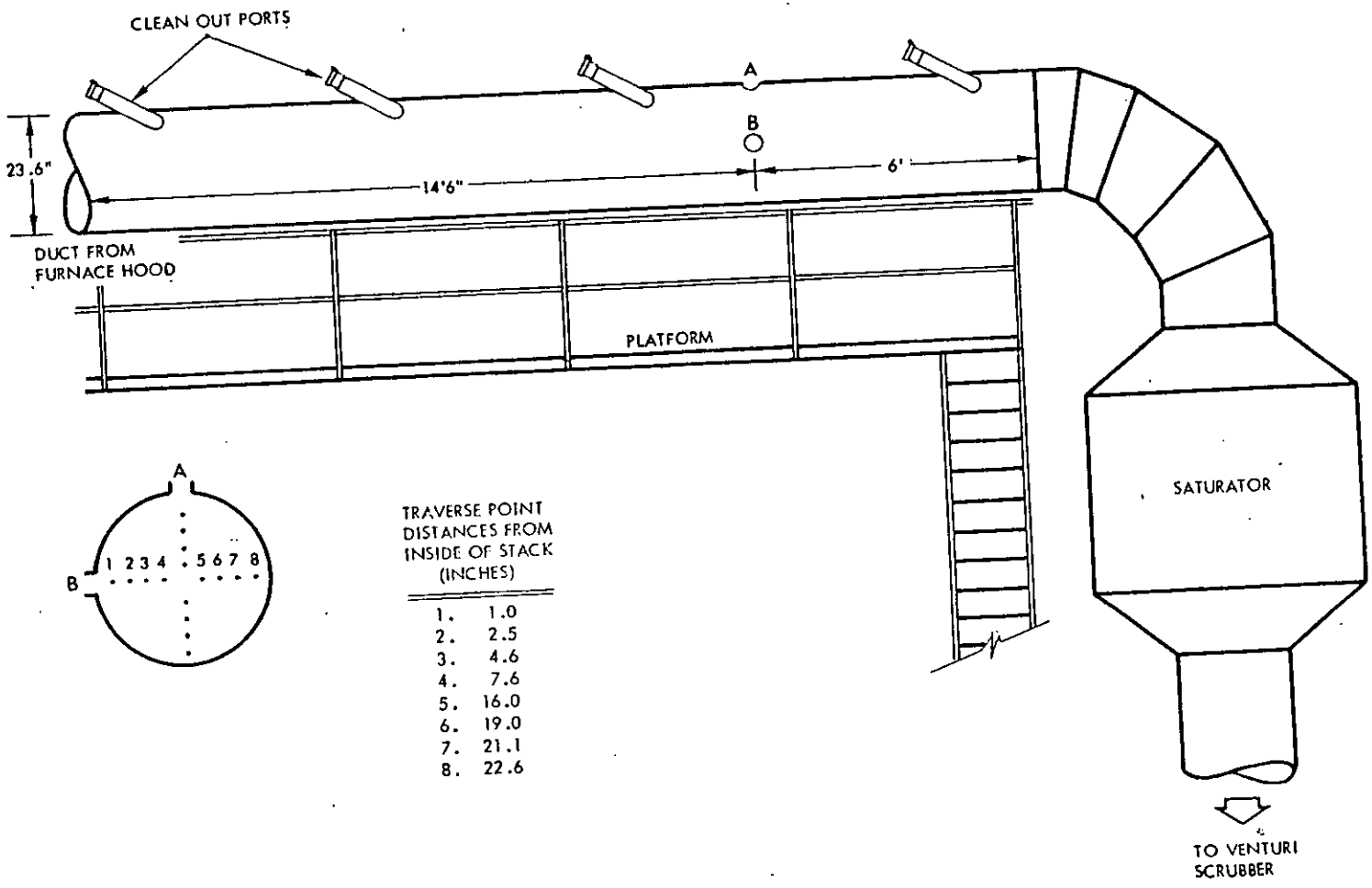
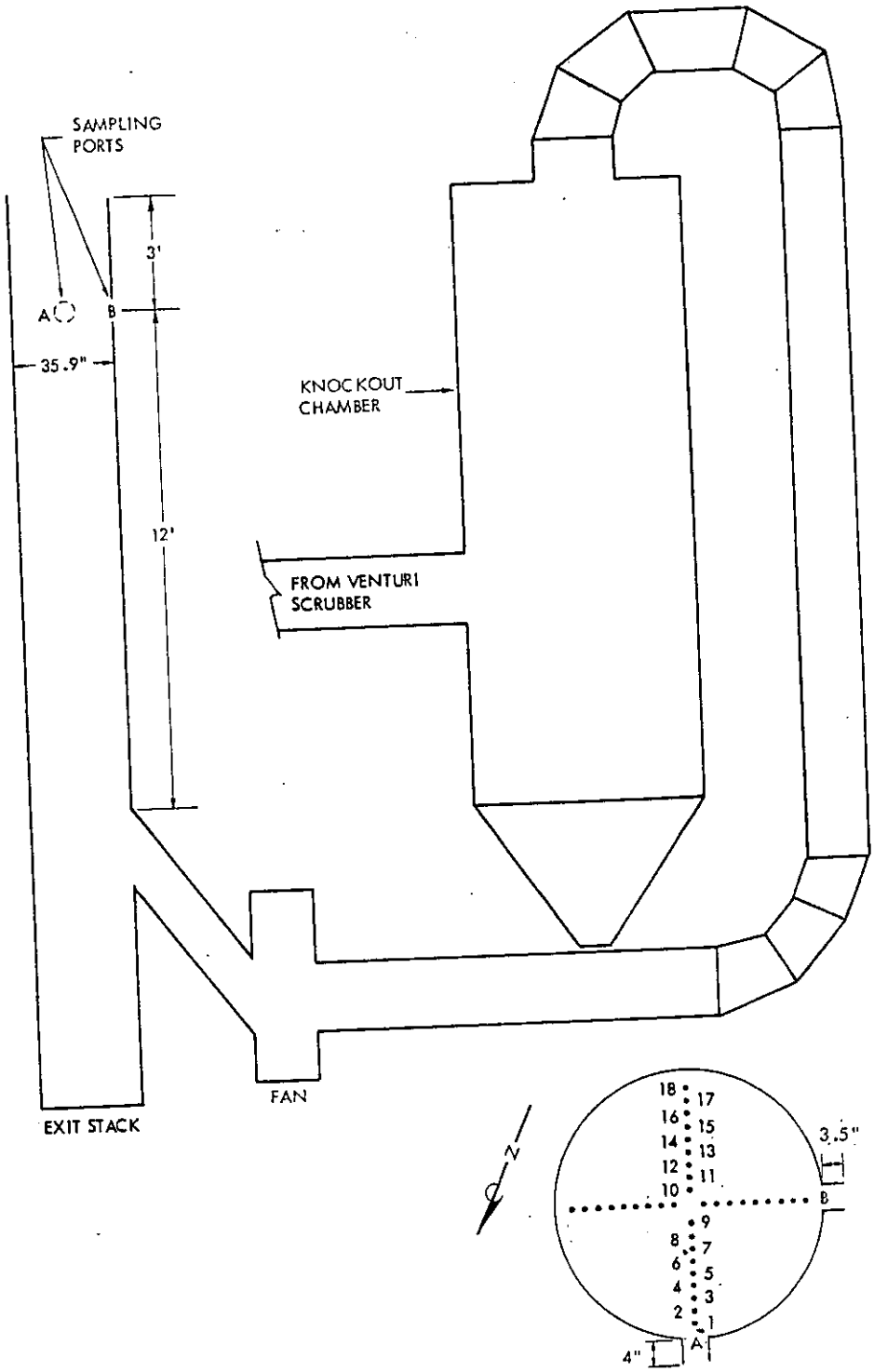


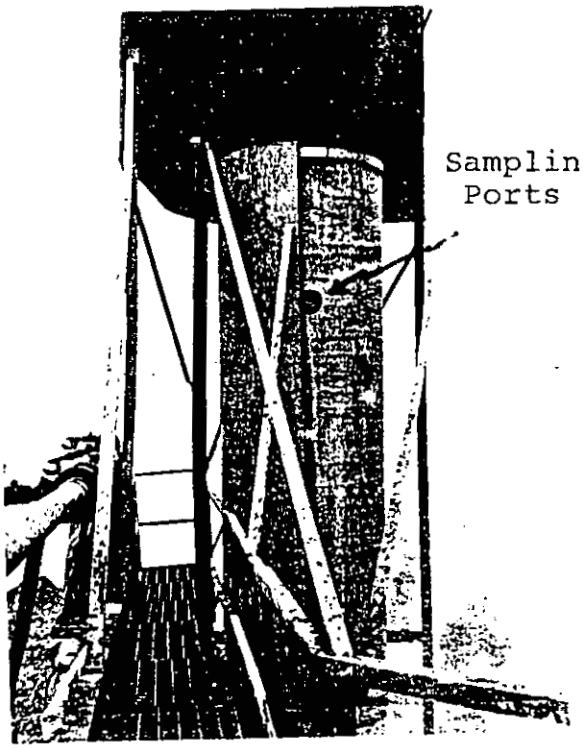
Figure 2. Slag tap scrubber inlet sampling site.



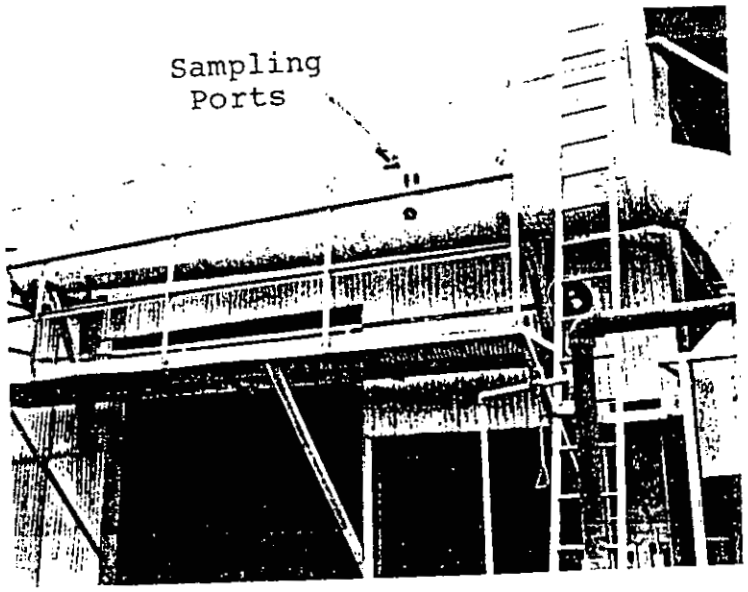
TRAVERSE POINT DISTANCE FROM INSIDE OF STACK (INCHES)

1.	1.0
2.	1.6
3.	2.7
4.	3.9
5.	5.2
6.	6.7
7.	8.4
8.	10.6
9.	13.7
10.	22.1
11.	25.2
12.	27.3
13.	29.1
14.	30.5
15.	31.9
16.	32.1
17.	34.3
18.	34.9

Figure 3. Slag tap scrubber outlet sampling site Stauffer Chemical Co., Tarpon Springs, Florida.



Outlet duct leading from venturi scrubber. Sampling ports were later installed 3' from top.



Inlet duct leading from hood inside building to saturator

Figure 4. Slag tapping sampling sites.

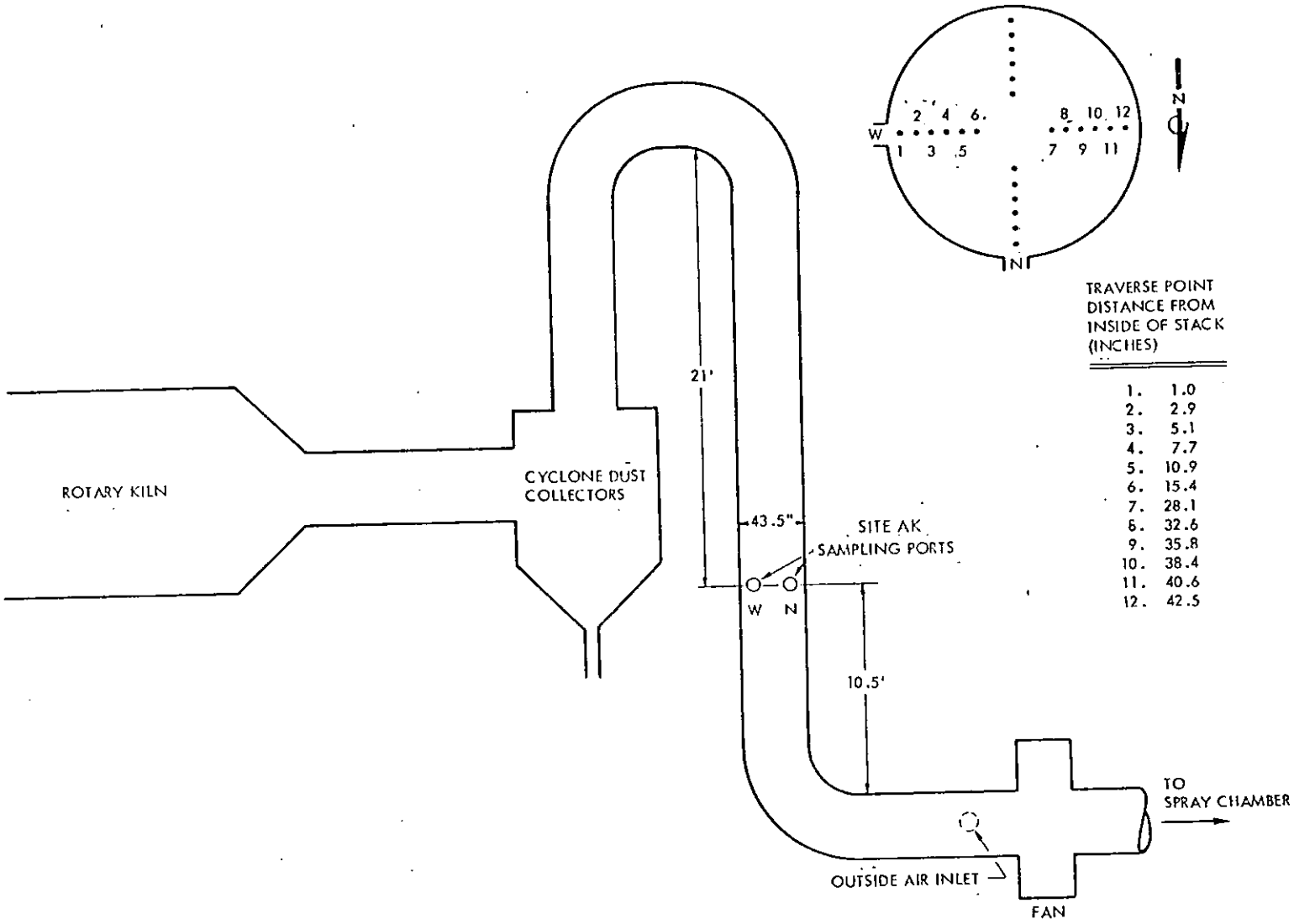


Figure 5. Kiln scrubber inlet sampling site
Stauffer Chemical Co., Tarpon Springs, Florida.

TRAVERSE POINT DISTANCE FROM INSIDE OF STACK (INCHES)	
1.	2.1
2.	6.9
3.	11.7
4.	16.4
5.	21.7
6.	26.1
7.	32.9
8.	38.7
9.	45.2
10.	52.2
11.	59.9
12.	68.4
13.	78.4
14.	90.1
15.	108.5

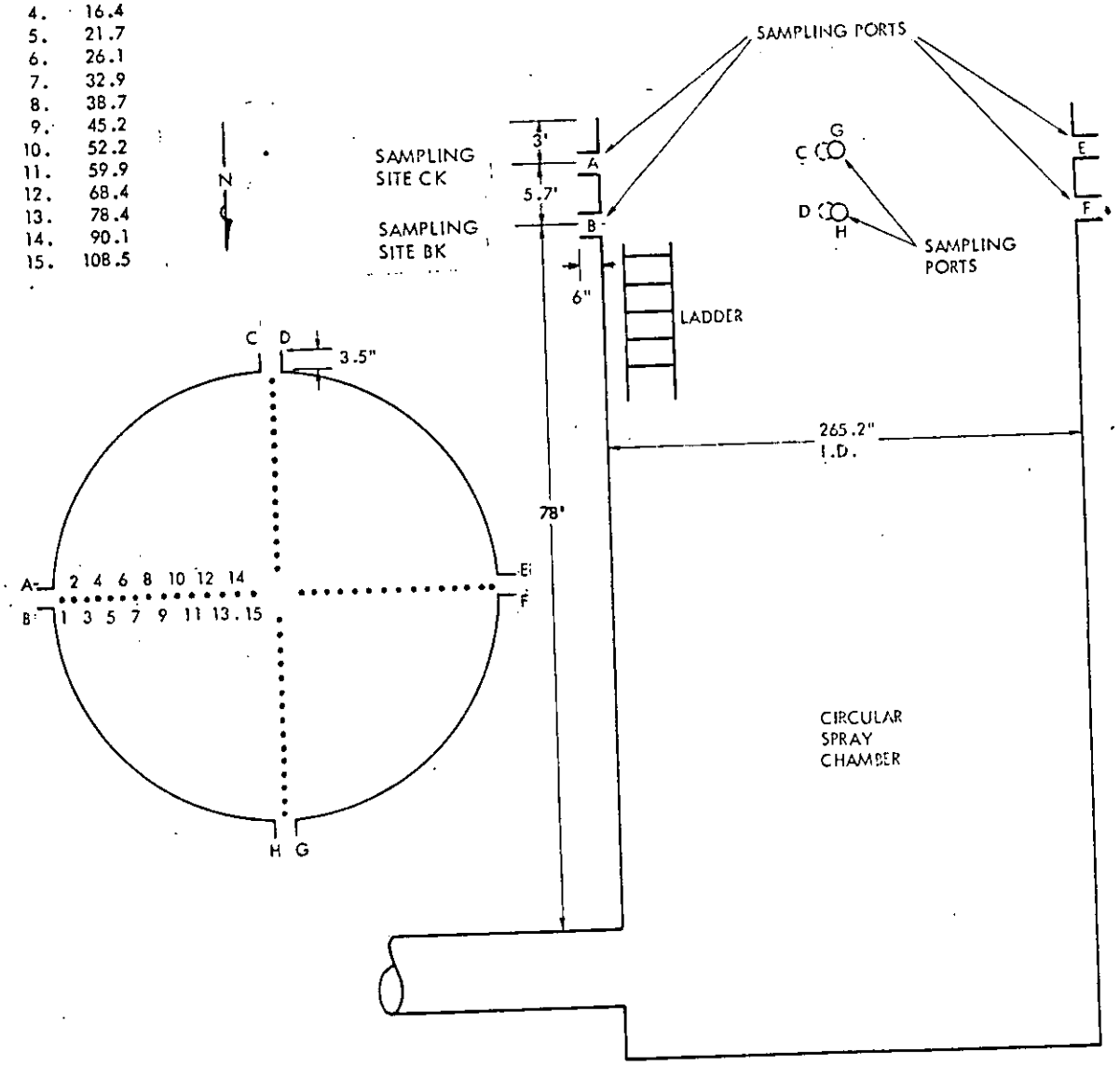
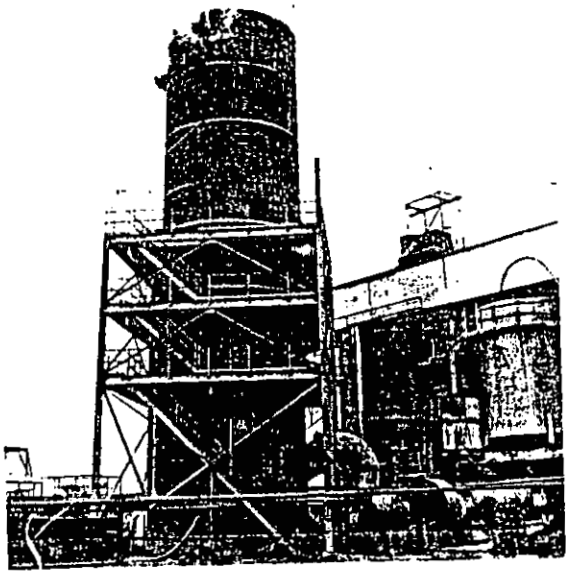
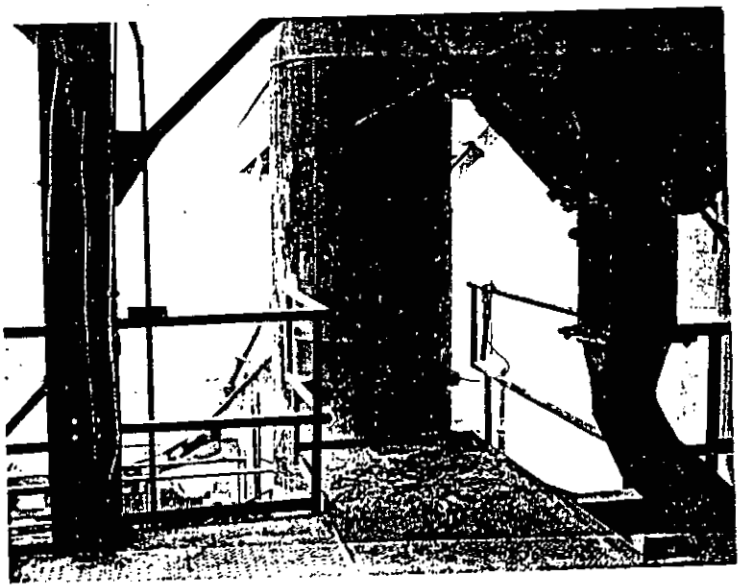


Figure 6. Kiln scrubber outlet sampling site
Stauffer Chemical Co., Tarpon Springs, Florida.



Spray chamber. Outlet sampling ports were later located 3' and 8.7' from top of chamber



Inlet site showing existing ports near floor. Cyclone hoppers seen in right foreground

Figure 7. Spray chamber inlet and outlet sampling sites.

Gas samples taken for Orsat analyses were collected by traversing across the spray chamber inlet and outlet ducts. Sulfur dioxide samples were taken at a single point in the spray chamber outlet, and at two locations (one in each port) at the inlet.

V. SAMPLING AND ANALYTICAL PROCEDURES

All sampling procedures were selected by EPA prior to field sampling. All analyses of collected samples were also performed by EPA. Details of the sampling procedures are presented in Appendix D. At all sampling sites, narrow work space and poor accessibility hindered completion of the work. In addition, interruptions due to process malfunctions and thunderstorms further delayed the test program.

Velocity and Gas Temperature

All gas velocities were measured with a type S pitot tube and inclined draft gage. In all cases, velocities were measured at each sampling point across the stack diameter to determine an average value according to procedures described in the Federal Register[1] - Method 1. Temperatures were measured by long stem dial thermometers, except at the spray chamber outlet sites where a chromel-alumel thermocouple was used because of the large diameter.

Molecular Weight

An integrated sample of the stack gases was collected during each run by pumping gas into a Mylar R bag at the rate of approximately 0.5 liter per minute. This bag sample was then analyzed with an Orsat apparatus for CO_2, O_2 and CO.

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[1] Federal Register, Vol. 36, No. 247, December 23, 1971

Fluorides and P_2O_5

The basic train for all total fluorides and phosphorus pentoxide samples is shown in Figure 8 and consisted of three standard Greenburg-Smith impingers containing 100 ml each of 10% sodium hydroxide, one empty, straight tip impinger, a 3" or 4" unheated Whatman #1 paper filter, and an impinger containing approximately 200 grams of accurately weighed silica gel. The impingers were contained in an ice-water bath. A stainless steel nozzle and glass lined probe were used in all cases. A flexible Teflon® line, approximately 7' long, connected the probe to the first impinger when sampling at the slag tap inlet and outlet sites, and when sampling for fluorides and P_2O_5 at the kiln spray chamber outlet. A flexible connector was used since traversing with a rigid train was not possible at these sites.

In most cases sampling was conducted under isokinetic conditions either by calculating an average velocity and sampling rate,[a] or by monitoring the velocity with a pitot tube and adjusting the sampling rate accordingly.

Train clean-up consisted of measuring the volume increase of the impinger contents and silica gel weight gain, a triple water rinse of all components from nozzle tip to filter holder, and triple acetone rinse of all components. The impinger

a) This was required at the kiln outlet where the sampling velocity was too low to measure.

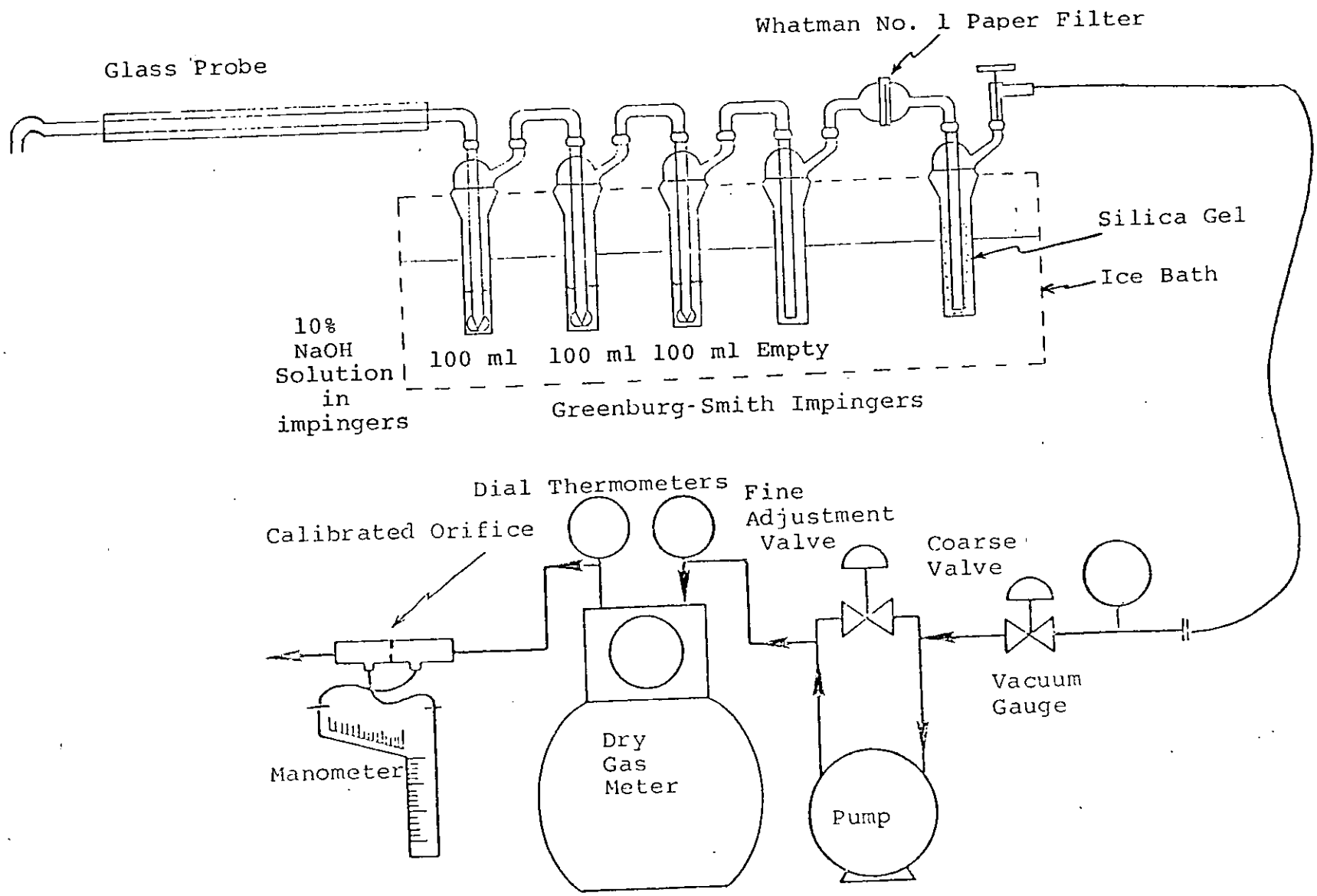


Figure 8. Fluoride and P_2O_5 sampling train.

contents, filter, and water rinse were combined in one glass sample jar and the acetone rinse was placed in a separate jar.

Particulates

Method 5 as described in the Federal Register, December 23, 1971, was used to measure particulate matter. This sampling train is shown in Figure 9. At the kiln inlet, a cyclone was used just before the filter and the duct was traversed for only six of the 12 points along each diameter. At the outlet site, one point was sampled in each of the four ports at the 'B' test site. This sampling point was about 6' inside the stack wall.

The train clean-up procedure included measuring the water collected and weighing the silica gel to determine moisture content. The probe, cyclone, and front half of the filter holder were then rinsed with acetone and placed in a container. The rear half of the train consisting of the rear half of the filter holder, impingers, and connectors was rinsed with water and the water then added to the impinger contents. The rear half of the train was then rinsed with acetone and the washings placed in a third sample jar. The filter was placed in a separate container.

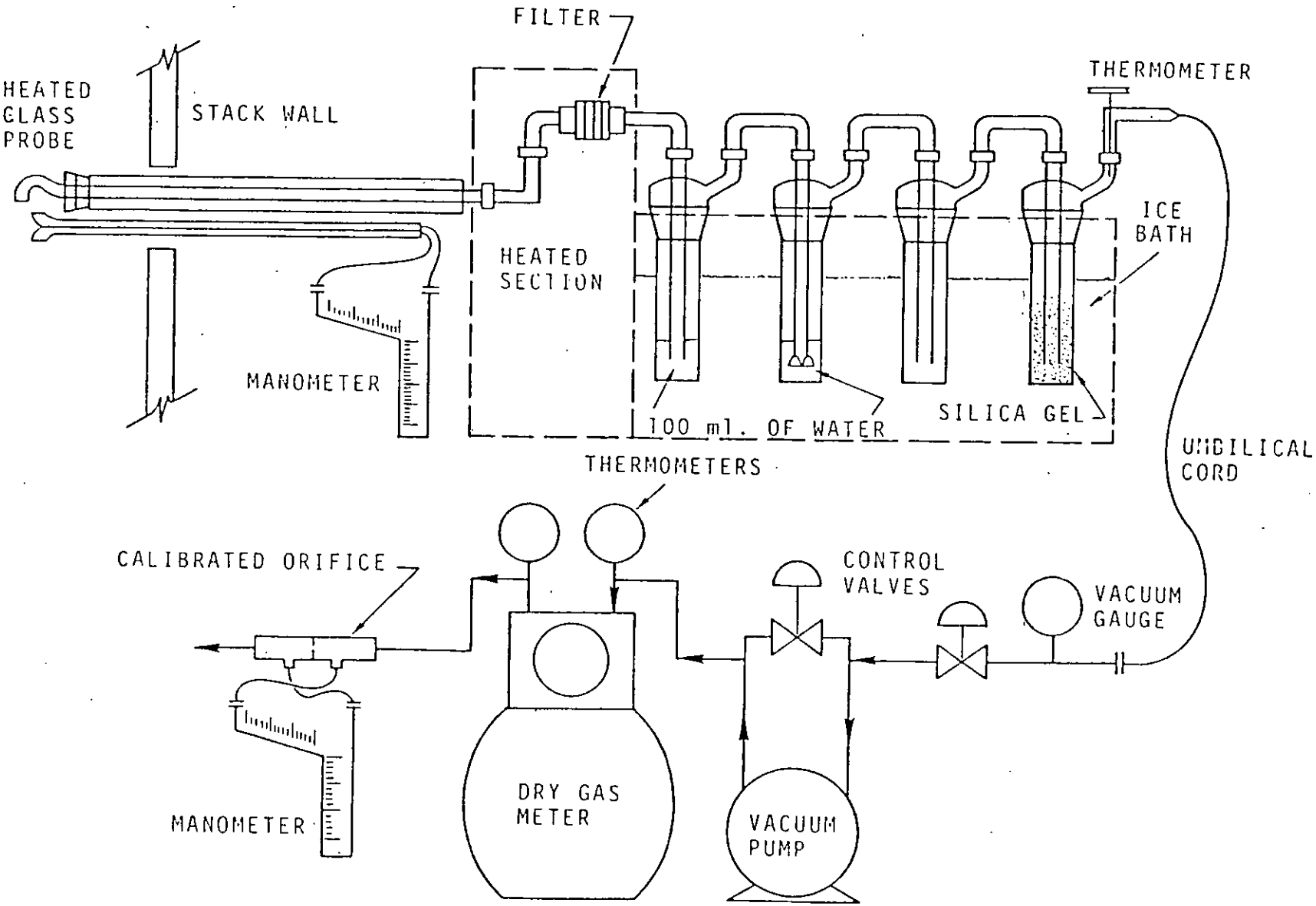


Figure 9. Particulate sampling train.

Sulfur Dioxide

EPA Method 6 in the Federal Register, December 23, 1971, was used to measure SO_2. The sampling train is shown in Figure 10 and consisted of a heated glass probe, a midget bubbler (fritted glass tip) containing 15 ml of 80% isopropyl alcohol, glass wool, two midget impingers containing 15 ml each of 3% H_2O_2, and a fourth dry impinger. The probe washings and the bubbler contents were discarded after each run. The midget impinger contents were placed in a glass sample container. These impingers were then rinsed with distilled water and the washings placed into this same container.

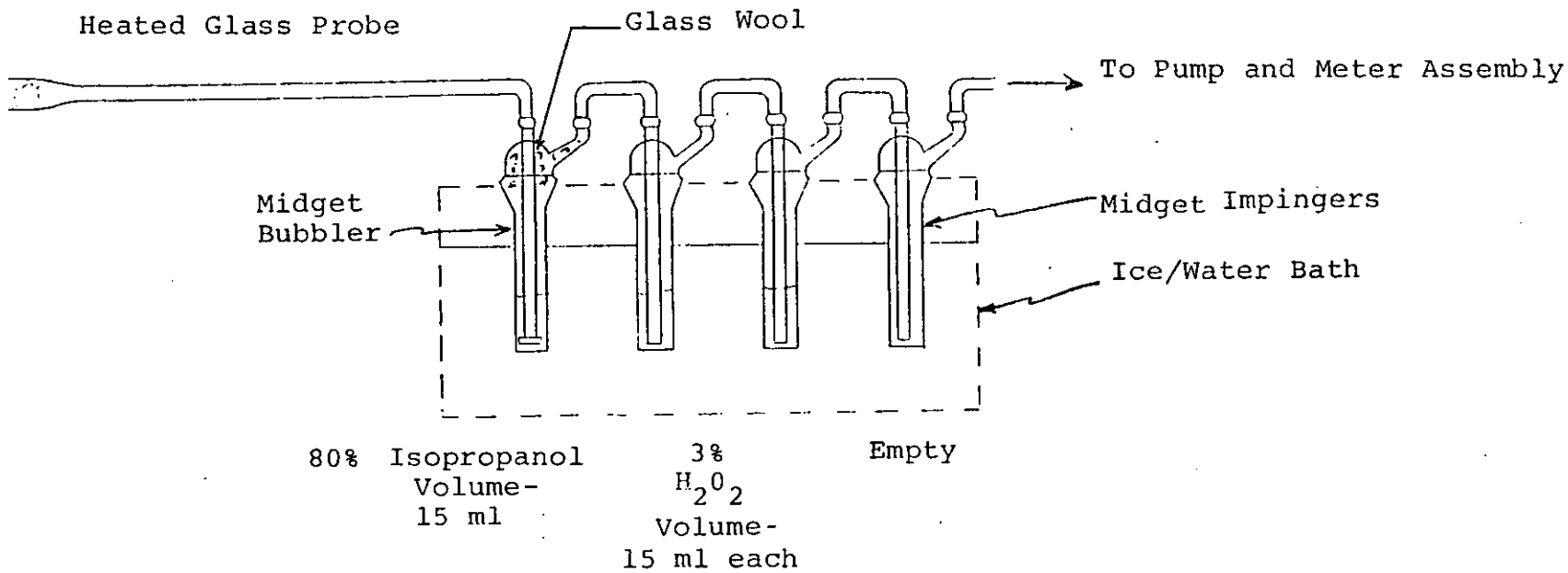


Figure 10. Sulfur dioxide sampling train.

APPENDIX A

FLUORIDE, P_2O_5, AND PARTICULATE SAMPLING DATA

This Appendix contains sampling and analytical data, example calculations, and a listing of field data for each run. Table A15 lists the equations used for the particulate emission calculations. Also shown in Table A15 are example calculations for Particulate-Run 1 at the nodulizing kiln scrubber spray chamber inlet.

Standard conditions are taken as 70°F and 29.92 in. of Hg. on a dry basis.

A-1

Slag Tapping Operation

Fluoride & P_2O_5 Emission Sampling Data

Table A1. Slag Tapping - Scrubber Inlet

Data Summary For Run 2

Run No.		2A	2B	2 Composite
Test Date		6-21-72	6-21-72	6-21-72
Sampling Time, 24 hour clock		1250-1300	1455-1742	1250-1742
D_n	Sampling Nozzle Diameter, in.	0.1875	0.125	0.1385
T_t	Net Time of Test, Min.	10.4	37.6	48
P_b	Barometric Pressure, in. Hg Absolute	29.85	29.85	29.85
P_m	Average Orifice Pressure Drop, in. H_2O	1.33	0.509	0.682
V_m	Volume of Dry Gas Sampled at Meter Conditions, DCF	6.989	19.791	26.780
T_m	Average Gas Meter Temperature, °F	85	86	86
$V_{m_{std}}$	Volume of Dry Gas Sampled at Standard Conditions[a], DSCF	6.80	19.18	25.98
V_w	Total H_2O Collected in Impingers and Silica Gel, ml	-	-	10.2
$V_{w_{gas}}$	Volume of Water Vapor Collected at Standard Conditions[b], SCF	-	-	0.483
%M	% Moisture in Stack Gas, by Volume	-	-	1.83
M_d	Mole Fraction of Dry Gas	-	-	0.982
$\%CO_2$	Volume % Dry	<1	<1	<1
$\% O_2$	Volume % Dry	21.0	21.0	21.0
% CO	Volume % Dry	<1	<1	<1
$\% N_2$	Volume % Dry	79.0	79.0	79.0
% EA	Percent Excess Air	-	-	-
MW_d	Molecular Weight of Stack Gas, Dry Basis	28.9	28.9	28.9

Table A1. (Cont'd.) Slag Tapping - Scrubber Inlet

Run No.		2A	2B	2 Composite
MW	Molecular Weight of Stack Gas, Wet Basis	-	-	28.7
C_p	Pitot Tube Coefficient	0.850	0.850	0.850
T_s	Average Stack Temperature °F	159	177	173
N_p	Net Sampling Points	4	15	20
P_{st}	Static Pressure of Stack Gas, in. Hg	-0.70	-0.70	-0.70
P_s	Stack Gas Pressure, in. Hg Absolute	29.1	29.1	29.1
V_s	Stack Gas Velocity at Stack Conditions, fpm	5430	6180	6020
A_s	Stack Area, in.^{2}	436	436	436
Q_s	Dry Stack Gas Volumetric Flow Rate at Standard Conditions,[c] DSCFM	13,400	14,900	14,600
Q_a	Stack Gas Volumetric Flow Rate at Stack Conditions, ACFM	16,400	18,700	18,200
% I	Percent Isokinetic	76.6	122	107
% O	Percent Opacity	-	-	-
T_c	Unit Feed Rate-ton/hr	-	-	-

Note: Complete inlet test results can be found in the following table.

[a] Dry standard cubic feet at 70°F, 29.92 in. Hg.

[b] Standard conditions at 70°F, 29.92 in. Hg.

[c] Dry standard cubic feet per minute at 70°F, 29.92 in. Hg.

Table A2. Slag Tapping - Scrubber Inlet

Fluoride & P_2O_5 Emission Data

Run No.		1	2 composite	3
Test Date		6-16-72	6-21-72	6-21-72
Sampling Time, 24 hour clock		1344-1900	1250-1742	1858-220
D_n	Sampling Nozzle Diameter, in.	0.1875	0.1385	0.125
T_t	Net Time of Test, Min.	44.1	48	48.1
P_b	Barometric Pressure, in. Hg Absolute	29.97	29.85	29.80
P_m	Average Orifice Pressure Drop, in. H_2O	1.39	0.682	0.433
V_m	Volume of Dry Gas Sampled at Meter Conditions, DCF	30.805	26.780	20.616
T_m	Average Gas Meter Temperature, °F	92	86	82
$V_{m_{std}}$	Volume of Dry Gas Sampled at Standard Conditions[a], DSCF	29.78	26.00	20.10
V_w	Total H_2O Collected in Impingers and Silica Gel, ml	16.6	10.2	9.3
$V_{w_{gas}}$	Volume of Water Vapor Collected at Standard Conditions[b], SCF	0.787	0.483	0.441
%M	% Moisture in Stack Gas, by Volume	2.60	1.82	2.15
M_d	Mole Fraction of Dry Gas	0.974	0.982	0.979
$\%CO_2$	Volume % Dry	<1	<1	<1
$\% O_2$	Volume % Dry	21.0	21.0	21.0
% CO	Volume % Dry	<1	<1	<1
$\% N_2$	Volume % Dry	79.0	79.0	79.0
% EA	Percent Excess Air	-	-	-
MW_d	Molecular Weight of Stack Gas, Dry Basis	28.9	28.9	28.9

Table A2.(Cont'd.)Slag Tapping - Scrubber Inlet
Fluoride & P_2O_5 Emission Data

Run No.		1	2 Composite	3
MW	Molecular Weight of Stack Gas, Wet Basis	28.6	28.7	28.7
C_p	Pitot Tube Coefficient	0.850	0.850	0.850
T_s	Average Stack Temperature °F	219	173	189
N_p	Net Sampling Points	15	20	17
P_{st}	Static Pressure of Stack Gas, in. Hg	-0.86	-0.70	0.70
P_s	Stack Gas Pressure, in. Hg Absolute	29.1	29.1	29.1
V_s	Stack Gas Velocity at Stack Conditions, fpm	6250	6020	5570
A_s	Stack Area, in.^{2}	436	436	436
Q_s	Dry Stack Gas Volumetric Flow Rate at Standard Conditions,[c] DSCFM	14,000	14,600	13,100
Q_a	Stack Gas Volumetric Flow Rate at Stack Conditions, ACFM	18,900	18,200	16,900
% I	Percent Isokinetic	75.8	107	113
% O	Percent Opacity	-	-	-
I_c	Unit Feed Rate-ton/hr	-	-	-
m_f	Fluoride Emissions Water Soluble, mg	107	42.4	35.5
m_t	Fluoride Emissions Total, mg	107.1	44.2	35.8
F_c	Fluoride Emissions %, Insoluble	0.093	4.07	0.838
F_{an}	Fluroide, Water Soluble, gr/SCF	0.0555	0.0251	0.0272
F_{ao}	Fluoride - Total, gr/SCF	0.0555	0.0262	0.0275

Table A2.(Cont'd.)Slag Tapping - Scrubber Inlet

Fluoride & P_2O_5 Emission Data

Run No.		1	2 Composite	3
F_{at}	Fluoride - Water Soluble, gr/ACF	0.0410	0.0201	0.0212
F_{au}	Fluoride - Total, gr/ACF	0.0410	0.0209	0.0213
F_{aw}	Fluoride - Water Soluble, lb/hr[d]	6.66	3.14	3.06
F_{ax}	Fluoride - Total, lb/hr[d]	6.66	3.28	3.08
PO_f	P_2O_5 - Water Soluble, mg	509	453.2	527.6
PO_t	P_2O_5 - Total, mg	509.6	465.8	532.3
PO_c	P_2O_5 - % Insoluble	1.18	2.71	0.883
PO_{an}	P_2O_5 - Water Soluble, gr/SCF	0.264	0.269	0.405
PO_{ao}	P_2O_5 - Total gr/SCF	0.264	0.276	0.408
PO_{aw}	P_2O_5 - Water Soluble, lb/hr[d]	31.7	33.6	45.4
PO_{ax}	P_2O_5 - Total, lb/hr[d]	31.7	34.5	45.8

[a]Dry standard cubic feet at 70°F, 29.92 in. Hg.

[b]Standard conditions at 70°F, 29.92 in. Hg.

[c]Dry standard cubic feet per minute at 70°F, 29.92 in. Hg.

[d]During slag tapping only.

Table A3. Slag Tapping - Scrubber Outlet

Fluoride & P_2O_5 Emissions Data

Run No.		1	2	3
Test Date		6-16-72	6-21-72	6-21-72
Sampling Time, 24 hour clock		1344-1900	1250-1742	1858-220(
D_n	Sampling Nozzle Diameter, in.	0.1875	0.1875	0.1875
T_t	Net Time of Test, Min.	53	54	54
P_b	Barometric Pressure, in. Hg Absolute	29.70	29.85	29.80
P_m	Average Orifice Pressure Drop, in. H_2O	0.893	0.696	0.696
V_m	Volume of Dry Gas Sampled at Meter Conditions, DCF	30.530	28.392	27.584
T_m	Average Gas Meter Temperature, °F	97	91	86
$V_{m_{std}}$	Volume of Dry Gas Sampled at Standard Conditions[a], DSCF	28.95	27.29	26.71
V_w	Total H_2O Collected in Impingers and Silica Gel, ml	49.9	34.3	35.1
$V_{w_{gas}}$	Volume of Water Vapor Collected at Standard Conditions[b], SCF	2.37	1.63	1.67
%M	% Moisture in Stack Gas, by Volume	7.56	5.62	5.86
M_d	Mole Fraction of Dry Gas	0.924	0.944	0.941
$\%CO_2$	Volume % Dry	<1	<1	<1
$\% O_2$	Volume % Dry	21.0	21.0	21.0
% CO	Volume % Dry	<1	<1	<1
$\% N_2$	Volume % Dry	79.0	79.0	79.0
% EA	Percent Excess Air	-	-	-
MW_d	Molecular Weight of Stack Gas, Dry Basis	28.9	28.9	28.9

Table A3. (Cont'd.) Slag Tapping - Scrubber Outlet

Fluoride & P_2O_5 Emissions Data

Run No.		1	2	3
MW	Molecular Weight of Stack Gas, Wet Basis	28.1	28.3	28.3
C_p	Pitot Tube Coefficient	0.850	0.850	0.850
T_s	Average Stack Temperature °F	121	120	119
N_p	Net Sampling Points	36	36	36
P_{st}	Static Pressure of Stack Gas, in. Hg	+.03	+.03	+.03
P_s	Stack Gas Pressure, in. Hg Absolute	29.7	29.8	29.8
V_s	Stack Gas Velocity at Stack Conditions, fpm	3200	2860	2860
A_s	Stack Area, in.^{2}	1012	1012	1012
Q_s	Dry Stack Gas Volumetric Flow Rate at Standard Conditions,[c] DSCFM	18,800	17,200	17,200
Q_a	Stack Gas Volumetric Flow Rate at Stack Conditions, ACFM	22,500	20,000	20,000
% I	Percent Isokinetic	106	107	105
% O	Percent Opacity	0-15	0-10	0-10
I_c	Unit Feed Rate-ton/hr	-	-	-
m_f	Fluoride Emissions - Water Soluble, mg	3.21	1.70	1.40
m_t	Fluoride Emissions - Total, mg	4.25	2.43	1.58
F_c	Fluoride Emissions - %, Insoluble	24.5	30.0	11.4
F_{an}	Fluoride - Water Soluble, gr/SCF	0.00171	0.000960	0.00080
F_{ao}	Fluoride - Total, gr/SCF	0.00227	0.00137	0.00091

Table A3. (Cont'd.) Slag Tapping - Scrubber Outlet
Fluoride & P_2O_5 Emissions Data

Run No.		1	2	3
F_{at}	Fluoride - Water Soluble, gr/ACF	0.0143	0.000824	0.000691
F_{au}	Fluoride - Total, gr/ACF	0.0189	0.00118	0.000781
F_{aw}	Fluoride - Water Soluble, lb/hr[d]	0.276	0.142	0.119
F_{ax}	Fluoride - Total, lb/hr[d]	0.365	0.202	0.134
PO_f	P_2O_5 - Water Soluble, mg	57.5	61.3	82.1
PO_t	P_2O_5 - Total, mg	63.8	62.4	83.9
PO_c	P_2O_5 - % Insoluble	9.87	1.76	2.15
PO_{an}	P_2O_5 - Water Soluble, gr/SCF	0.0307	0.0346	0.0474
PO_{ao}	P_2O_5 - Total, gr/SCF	0.0340	0.0352	0.0484
PO_{aw}	P_2O_5 - Water Soluble, lb/hr[d]	4.94	5.11	6.98
PO_{ax}	P_2O_5 - Total, lb/hr[d]	5.48	5.21	7.14

[a] Dry standard cubic feet at 70°F, 29.92 in. Hg.
[b] Standard Conditions at 70°F, 29.92 in. Hg.
[c] Dry standard cubic feet per minute at 70°F, 29.92 in. Hg.
[d] During slag tapping only.

Table A-4 VOLUMETRIC FLOWRATE DATA FOR THE NODULIZING KILN TESTS

INLET

		Fluoride			Particulate		
Run No.		1	2	3	1	2	3
Test Date		6/13/72	6/14/72	7/18/72	7/20/72	7/21/72	7/21/72
Sampling Time, 24 hour clock		1245-2010	1045-1415	1115-1545	1900-1915	0930-0945 1055-1110	1055-1110 1330-1345
P_b	Barometric Pressure, in. Hg Absolute	30.04	30.07	30.22	30.20	30.23	30.23
% M	% Moisture in Stack Gas, by Volume	19.9	19.1	20.7	20.1	18.4	18.2
M_d	Mole Fraction of Dry Gas	0.801	0.809	0.793	0.799	0.816	0.818
MW_d	Molecular Weight of Stack Gas, Dry Basis	29.1	30.5	30.9	31.5	31.2	31.2
MW	Molecular Weight of Stack Gas, Wet Basis	26.9	28.1	28.2	28.8	28.8	28.8
C_p	Pitot Tube Coefficient	0.850	0.850	0.850	0.850	0.850	0.850
T_s	Average Stack Temperature °F	702	653	729	665	690	680
N_p	Net Sampling Points	52[a]	24	24	24	24	24
P_{st}	Static Pressure of Stack Gas, in. Hg	-0.84	-0.70	-0.89	-0.89	-0.94	-0.95
P_s	Stack Gas Pressure, in. Hg Absolute	29.2	29.4	29.3	29.3	29.3	29.3
V_s	Stack Gas Velocity at Stack Conditions, fpm	6490	6230	6800	5960	5840	5390
A_s	Stack Area, in.^{2}	1486	1486	1486	1486	1486	1486
Q_s	Dry Stack Gas Volumetric Flow Rate at Standard Conditions,[c] DSCFM	23,900	24,300	24,300	22,700	22,200	20,700
Q_a	Stack Gas Volumetric Flow Rate at Stack Conditions, ACFM	67,000	64,300	70,200	61,500	60,300	55,600

a) Each traverse point sampled at least two times.

Table A-5 VOLUMETRIC FLOWRATE DATA FOR THE NODULIZING KILN TESTS OUTLET[1]

		Fluoride			Particulate		
Run No.		1	2	3	1	2	3
Test Date		6/13/72	6/14/72	7/18/72	7/20/72	7/21/72	7/21/72
Sampling Time, 24 hour clock		1245-2010	1045-1415	1115-1545	1900-1915	0930-0945 1055-1110	1055-1110 1330-1345
P_b	Barometric Pressure, in. Hg Absolute	30.0	30.1	30.2	30.20	30.23	30.23
% M	% Moisture in Stack Gas, by Volume	(2)	(2)	(2)	19.6	22.7	20.1
	Theoretical Saturated Percent Moisture				12.0	13.5	11.5
	Mole Fraction of Dry Gas				0.804	0.773	0.799
M_d	Mole Fraction of Dry Gas (Theoretical)	(2)	(2)	(2)	0.880	0.865	0.885
MW_d	Molecular Weight of Stack Gas, Dry Basis	30.7	29.7	29	30.0	30.4	30.2
MW	Molecular Weight of Stack Gas, Wet Basis	(2)	(2)	(2)	27.6	27.6	27.7
C_p	Pitot Tube Coefficient	0.850	0.850	0.850	0.850	0.850	0.850
T_s	Average Stack Temperature °F	(2)	(2)	(2)	122	126	120
N_p	Net Sampling Points	60	60	60	24	24	24
P_{st}	Static Pressure of Stack Gas, in. Hg	0	0	0	0	0	0
P_s	Stack Gas Pressure, in. Hg Absolute	30.0	30.1	30.2	30.2	30.2	30.2
V_s	Stack Gas Velocity at Stack Conditions, fpm	B-86.4 C-80.0	B-94.7 C-91.9	B-95.9 C-85.8	81.2	81.6	74.1
A_s	Stack Area, in.^{2}	55,238	55,238	55,238	55,238	55,238	55,238
Q_s	Dry Stack Gas Volumetric Flow Rate at Standard Conditions, DSCFM	26,400	26,800	26,800	25,200	24,700	23,200
Q_a	Stack Gas Volumetric Flow Rate at Stack Conditions, ACFM	(2)	(2)	(2)	31,200	31,300	28,400

1) Outlet volumetric flows based on inlet flow measurements plus additional tempering air entering prior to the outlet sampling site (see Table 5 in text).

2) Data is separated according to Points B and C.

APPENDIX A - 2

Nodulizing Kiln Operation

Includes: Spray Chamber Inlet and Outlet, CO, and Air Return Lines.

Fluoride, P_2O_5, and Particulate Emission Sampling Data

Table A6 Nodulizing Kiln - Scrubber Spray Chamber Inlet
Data Summary for Run 1 Fluoride, P_2O_5

Run No.		1A	1B	1 composite
Test Date		6-13-72	6-13-72	6-13-72
Sampling Time, 24 hour clock		1245-1338	1415-2010	1245-2010
Sampling Location				
D_n	Sampling Nozzle Diameter, in.	0.250	0.1875	0.203
T_t	Net Time of Test, Min.	30.5	89.5	120
P_b	Barometric Pressure, in. Hg Absolute	30.04	30.04	30.04
P_m	Average Orifice Pressure Drop, in. H_2O	1.37	0.703	0.857
V_m	Volume of Dry Gas Sampled at Meter Conditions, DCF	20.670	45.296	65.966
T_m	Average Gas Meter Temperature, °F	91	88	89
$V_{m_{std}}$	Volume of Dry Gas Sampled at Standard Conditions[a], DSCF	20.01	44.02	64.03
V_w	Total H_2O Collected in Impingers and Silica Gel, ml	-	-	335
$V_{w_{gas}}$	Volume of Water Vapor Collected at Standard Conditions[b], SCF	-	-	15.9
% M	% Moisture in Stack Gas, by Volume	-	-	19.9
M_d	Mole Fraction of Dry Gas	-	-	0.801
% CO_2	Volume % Dry	-	-	1.70
% O_2	Volume % Dry	-	-	20.3
% CO	Volume % Dry	-	-	0.867
% N_2	Volume % Dry	-	-	77.1
% EA	Percent Excess Air	-	-	-
MW_d	Molecular Weight of Stack Gas, Dry Basis	-	-	29.1

Table A6 (cont'd.)

Run No.				
MW	Molecular Weight of Stack Gas, Wet Basis	-	-	26.9
C_p	Pitot Tube Coefficient	0.850	0.850	0.850
T_s	Average Stack Temperature, °F	674	710	702
N_p	Net Sampling Points	12	40	52
P_{st}	Static Pressure of Stack Gas, in. H_2O	-0.84	-0.84	-0.84
P_s	Stack Gas Pressure, in. Hg Absolute	29.2	29.2	29.2
V_s	Stack Gas Velocity at Stack Conditions, fpm	5440	6810	6490
A_s	Stack Area, ft.^{2}	1486	1486	1486
Q_s	Dry Stack Gas Volumetric Flow Rate at Standard Conditions,[c] DSCFM	20,500	24,900	23,900
Q_a	Stack Gas Volumetric Flow Rate at Stack Conditions, ACFM	56,100	70,300	67,000
% I	Percent Isokinetic	96.5	106	102

[a] Dry standard cubic feet at 70°F, 29.92 in. Hg.

[b] Standard conditions at 70°F, 29.92 in. Hg.

[c] Dry standard cubic feet per minute at 70°F, 29.92 in. Hg.

NOTE: Complete inlet test results can be found in the following tables.

Table A7 Nodulizing Kiln - Scrubber Spray Chamber Inlet Fluoride and P_2O_5 Emission Data Summary

Run No.		1 composite	2	3
Test Date		6-13-72	6-14-72	7-18-72
Sampling Time, 24 hour clock		1245-2010	1045-1415	1115-1545
Sampling Location				
D_n	Sampling Nozzle Diameter, in.	0.203	0.1875	0.1875
T_t	Net Time of Test, Min.	120	60	60
P_b	Barometric Pressure, in. Hg Absolute	30.04	30.07	30.22
P_m	Average Orifice Pressure Drop, in. H_2O	0.857	0.655	0.807
V_m	Volume of Dry Gas Sampled at Meter Conditions, DCF	65.966	29.613	33.926
T_m	Average Gas Meter Temperature, °F	89	91	96
$V_{m_{std}}$	Volume of Dry Gas Sampled at Standard Conditions[a], DSCF	64.03	28.65	32.70
V_w	Total H_2O Collected in Impingers and Silica Gel, ml	335	143	180
$V_{w_{gas}}$	Volume of Water Vapor Collected at Standard Conditions[b], SCF	15.9	6.77	8.54
% M	% Moisture in Stack Gas, by Volume	19.9	19.1	20.7
M_d	Mole Fraction of Dry Gas	0.801	0.809	0.793
% CO_2	Volume % Dry	1.70+	12.4	16.0
% O_2	Volume % Dry	20.3	13.3	8.0
% CO	Volume % Dry	0.867	<1	2.2
% N_2	Volume % Dry	77.1	74.3	73.8
% EA	Percent Excess Air	-	-	-
MW_d	Molecular Weight of Stack Gas, Dry Basis	29.1	30.5	30.9

+ value appears low

Table A7 (cont'd.)

Run No.		1 Composite	2	3
F_{at}	Fluoride-water soluble gr/ACF	0.626	0.651	0.880
F_{au}	Fluoride-total, gr/ACF	0.703	0.694	0.898
F_{aw}	Fluoride-water soluble lb/hr	360	358	530
F_{ax}	Fluoride-total, lb/hr	404	382	540
PO_1	P_2O_5-water soluble, mg	85.1	243.1	317.5
PO_t	P_2O_5-total, mg	149.6	466.7	d
PO_c	P_2O_5 % insoluble	43.1	47.9	d
PO_{an}	P_2O_5-water soluble gr/SCF	0.0205	0.131	0.150
PO_{ao}	P_2O_5-total, gr/SCF	0.0360	0.251	d
PO_{aw}	P_2O_5-water soluble lb/hr	4.18	27.2	31.1
PO_{ax}	P_2O_5-total, lb/hr	7.36	52.2	d
PO_{at}	P_2O_5-water soluble gr/ACF	0.00731	0.0528	0.0516
PO_{aa}	P_2O_5-total, gr/ACF	0.0128	0.100	d

[a]Dry standard cubic feet at 70 degrees F, 29.29 in. Hg.

[b]Standard conditions at 70 degrees F, 29.29 in Hg.

[c]Dry standard cubic feet per minute at 70 degrees F, 29.29 in. Hg.

[d]Analysis of P_2O_5 insoluble portion for Run No. 3 was impossible due to gel being formed when sodium hydroxide was combined with sample.

Table A7 (cont'd.)

Run No.		1 composite	2	3
MW	Molecular Weight of Stack Gas, Wet Basis	26.9	28.1	28.2
C_p	Pitot Tube Coefficient	0.850	0.850	0.850
T_s	Average Stack Temperature, °F	702	653	729
N_p	Net Sampling Points	52	24	24
P_{st}	Static Pressure of Stack Gas, in. H_2O	-0.84	-0.70	-0.89
P_s	Stack Gas Pressure, in. Hg Absolute	29.2	29.4	29.3
V_s	Stack Gas Velocity at Stack Conditions, fpm	6490	6230	6800
A_s	Stack Area, $ft.^2$	1486	1486	1486
Q_s	Dry Stack Gas Volumetric Flow Rate at Standard Conditions, DSCFM	23,900	24,300	24,300
Q_a	Stack Gas Volumetric Flow Rate at Stack Conditions, ACFM	67,000	64,300	70,200
% I	Percent Isokinetic	102	105	120
% O	Percent Opacity	-	-	-
T_c	Unit Feed Rate-ton/hr	-	-	-
m_f	Fluoride Emissions-mg, water soluble	7300.8	3201.5	5401.4
m_t	Fluoride Emissions, Total, mg	8171.1	3382.6	5546.2
F_c	Fluoride Emissions % insoluble	10.7	5.35	2.61
F_{an}	Fluoride-Water soluble gr/SCF	1.76	1.72	2.54
F_{ao}	Fluoride-Total, gr/SCF	1.97	1.84	2.61

Table A8 Nodulizing Kiln - Scrubber Spray Chamber Outlets Site B
Fluoride and P_2O_5 Emission Data Summary

Run No.		1	2	3
Test Date		6-13-72	6-14-72	7-18-72
Sampling Time, 24 hour clock		1240-2018	1058-1559	1040-1500
Sampling Location				
D_n	Sampling Nozzle Diameter, in.	0.924	0.924	1.43
T_t	Net Time of Test, Min.	183	180	120
P_b	Barometric Pressure, in. Hg Absolute	30.0	30.1	30.2
P_m	Average Orifice Pressure Drop, in. H_2O	d	d	d
V_m	Volume of Dry Gas Sampled at Meter Conditions, DCF	44.310	41.403	60.908
T_m	Average Gas Meter Temperature, °F	87	92	96
$V_{m_{std}}$	Volume of Dry Gas Sampled at Standard Conditions[a], DSCF	43.07	39.97	58.67
V_w	Total H_2O Collected in Impingers and Silica Gel, ml	101	169	290
$V_{w_{gas}}$	Volume of Water Vapor Collected at Standard Conditions[b], SCF	4.79	8.01	13.7
% M	% Moisture in Stack Gas, by Volume	10.0	16.7	19.0
M_d	Mole Fraction of Dry Gas	0.900	0.833	0.810
% CO_2	Volume % Dry	13.3	6.0	e
% O_2	Volume % Dry	13.4	17.9	e
% CO	Volume % Dry	0.2	<1	e
% N_2	Volume % Dry	73.1	76.1	e
% EA	Percent Excess Air	-	-	-
MW_d	Molecular Weight of Stack Gas, Dry Basis	30.7	29.7	30.0[e]

Table A8 (cont'd.)

Run No.		1	2	3
MW	Molecular Weight of Stack Gas, Wet Basis	29.4	27.7	27.7
C_p	Pitot Tube Coefficient	0.850	0.850	0.850
T_s	Average Stack Temperature, °F	138	140	135
N_p	Net Sampling Points	60	60	60
P_{st}	Static Pressure of Stack Gas, in. H_2O	0	0	0
P_s	Stack Gas Pressure, in. Hg Absolute	30.0	30.1	30.2
V_s	Stack Gas Velocity at Stack Conditions, fpm	86.4	94.7	95.9
A_s	Stack Area, ft.^{2}	55,238	55,238	55,238
Q_s	Dry Stack Gas Volumetric Flow Rate at Standard Conditions, DSCFM	26,400	26.800	26.800
Q_a	Stack Gas Volumetric Flow Rate at Stack Conditions, ACFM	33,100	36,300	36,800
% I	Percent Isokinetic	74.1	67.8	62.6
% O	Percent Opacity	-	-	-
T_c	Unit Feed Rate-ton/hr	-	-	-
m_f	Fluoride Emissions-mg, water soluble	8.8	4.7	24.5
m_t	Fluoride Emissions, Total, mg	9.45	5.3	25.0
F_c	Fluoride Emissions % insoluble	6.88	11.3	2.00
F_{an}	Fluoride-Water soluble, gr/SCF	0.00315	0.00181	0.00643
F_{ao}	Fluoride-Total, gr/SCF	0.00338	0.00204	0.00656

Table A8 (cont'd.)

Run No.		1	2	3
F_{at}	Fluoride-water soluble gr/ACF	0.00251	0.00134	0.00468
F_{au}	Fluoride-total, gr/ACF	0.00270	0.00151	0.00478
F_{aw}	Fluoride-water soluble lb/hr	0.689	0.404	1.47
F_{ax}	Fluoride-total, lb/hr	0.742	0.457	1.50
PO_1	P_2O_5-water soluble, mg	23.9	15.1	67.0
PO_t	P_2O_5-total, mg	26.6	17.8	70.4
PO_c	P_2O_5 % insoluble	10.2	15.2	4.84
PO_{an}	P_2O_5-water soluble gr/SCF	0.00855	0.00582	0.0176
PO_{ao}	P_2O_5-total, gr/SCF	0.00951	0.00686	0.0185
PO_{aw}	P_2O_5-water soluble lb/hr	1.94	1.33	4.04
PO_{ax}	P_2O_5-total, lb/hr	2.20	1.56	4.23
PO_{at}	P_2O_5-water soluble gr/ACF	0.00683	0.00431	0.0128
PO_{aa}	P_2O_5-total, gr/ACF	0.00760	0.00508	0.0135

[a]Dry standard cubic feet at 70 degrees F, 29.29 in. Hg.

[b]Standard conditions at 70 degrees F, 29.29 in Hg.

[c]Dry standard cubic feet per minute at 70 degrees F, 29.29 in. Hg.

[d]Assumed atmospheric pressure at meter.

[e]Measured data were incorrect. Use value based on test 1 and 2.

Table A9 Nodulizing Klin - Scrubber Spray Chamber Outlet C
Data Summary for Run 3 Fluoride, P_2O_5

Run No.		3A	3B	3 composite
Test Date		7-18-72	7-18-72	7-18-72
Sampling Time, 24 hour clock		1040-1228	1327-1458	1040-1458
Sampling Location				
D_n	Sampling Nozzle Diameter, in.	1.43	0.500	0.965
T_t	Net Time of Test, Min.	60	60	120
P_b	Barometric Pressure, in. Hg Absolute	30.22	30.22	30.22
P_m	Average Orifice Pressure Drop, in. H_2O	-	-	-
V_m	Volume of Dry Gas Sampled at Meter Conditions, DCF	17.658	10.229	27.887
T_m	Average Gas Meter Temperature, °F	90	92	91
$V_{m_{std}}$	Volume of Dry Gas Sampled at Standard Conditions[a], DSCF	17.16	9.91	27.07
V_w	Total H_2O Collected in Impingers and Silica Gel, ml	-	-	56.5
$V_{w_{gas}}$	Volume of Water Vapor Collected at Standard Conditions[b], SCF	-	-	2.68
% M	% Moisture in Stack Gas, by Volume	-	-	9.01
M_d	Mole Fraction of Dry Gas	-	-	0.910
% CO_2	Volume % Dry	-	-	d
% O_2	Volume % Dry	-	-	d
% CO	Volume % Dry	-	-	d
% N_2	Volume % Dry	-	-	d
% EA	Percent Excess Air	-	-	-
MW_d	Molecular Weight of Stack Gas, Dry Basis			30[d]

Table A9 (continued)

Run No.		3A	3B	3 composite
MW	Molecular Weight of Stack Gas, Wet Basis	—	—	27.7
C_p	Pitot Tube Coefficient	0.850	0.850	0.850
T_s	Average Stack Temperature, °F	138	138	138
N_p	Net Sampling Points	30	30	60
P_{st}	Static Pressure of Stack Gas, in. H_2O	0	0	0
P_s	Stack Gas Pressure, in. Hg Absolute	30.2	30.2	30.2
V_s	Stack Gas Velocity at Stack Conditions, fpm	85.8	85.8	85.8
A_s	Stack Area, ft.^{2}	55,238	55,238	55,238
Q_s	Dry Stack Gas Volumetric Flow Rate at Standard Conditions,[c] DSCFM	26,800	26,800	26,800
Q_a	Stack Gas Volumetric Flow Rate at Stack Conditions, ACFM	32,900	32,900	32,900
% I	Percent Isokinetic	36.6	173	105

[a] Dry standard cubic feet at 70°F, 29.92 in. Hg.

[b] Standard conditions at 70°F, 29.92 in. Hg.

[c] Dry standard cubic feet per minute at 70°F, 29.92 in. Hg.

[d] Measured data are incorrect. Use value based on test 1 and 2 at site B.

NOTE: Complete Outlet C results can be found in the following tables.

Table A10 Nodulizing Kiln-Scrubber Spray Chamber Outlet C Fluoride and P_2O_5 Emission Data Summary

Run No.		1	2	3 composite
Test Date		6-13-72	6-14-72	7-18-73
Sampling Time, 24 hour clock		1240-2018	1058-1559	1040-1500
Sampling Location				
D_n	Sampling Nozzle Diameter, in.	0.931	0.931	0.965
T_t	Net Time of Test, Min.	183	180	120
P_b	Barometric Pressure, in. Hg Absolute	30.0	30.1	30.2
P_m	Average Orifice Pressure Drop, in. H_2O	d	d	d
V_m	Volume of Dry Gas Sampled at Meter Conditions, DCF	45.873	40.542	27.887
T_m	Average Gas Meter Temperature, °F	84	88	91
$V_{m_{std}}$	Volume of Dry Gas Sampled at Standard Conditions[a], DSCF	44.78	39.42	27.07
V_w	Total H_2O Collected in Impingers and Silica Gel, ml	30.9	137	56.5
$V_{w_{gas}}$	Volume of Water Vapor Collected at Standard Conditions[b], SCF	1.46	6.49	2.68
% M	% Moisture in Stack Gas, by Volume	3.17	14.1	9.01
M_d	Mole Fraction of Dry Gas	0.968	0.859	0.910
% CO_2	Volume % Dry	13.3	6.0	
% O_2	Volume % Dry	13.4	17.9	
% CO	Volume % Dry	0.2	<1	
% N_2	Volume % Dry	73.1	76.1	
% EA	Percent Excess Air	-	-	-
MW_d	Molecular Weight of Stack Gas, Dry Basis	30.7	29.7	30[e]

Table A10 (cont'd.)

Run No.		1	2	3 composite
MW	Molecular Weight of Stack Gas, Wet Basis	30.3	28.0	28.0
C_p	Pitot Tube Coefficient	0.850	0.850	0.850
T_s	Average Stack Temperature, °F	136	140	138
N_p	Net Sampling Points	60	60	60
P_{st}	Static Pressure of Stack Gas, in. H_2O	0	0	0
P_s	Stack Gas Pressure, in. Hg Absolute	30.0	30.1	30.2
V_s	Stack Gas Velocity at Stack Conditions, fpm	80.0	91.9	85.8
A_s	Stack Area, $ft.^2$	55,238	55,238	55,238
Q_s	Dry Stack Gas Volumetric Flow Rate at Standard Conditions, DSCFM	26,400	26,800	26,800
Q_a	Stack Gas Volumetric Flow Rate at Stack Conditions, ACFM	30,700	35,200	32,900
% I	Percent Isokinetic	74.7	65.8	105
% O	Percent Opacity	-	-	-
T_c	Unit Feed Rate-ton/hr	-	-	-
m_f	Fluoride Emissions-mg, water soluble	4.10	6.4	11.1
m_t	Fluoride Emissions, Total, mg	4.42	7.6	11.6
F_c	Fluoride Emissions % insoluble	7.20	15.8	4.31
F_{an}	Fluoride-Water soluble	0.00141	0.00250	0.00631
F_{ao}	Fluoride-Total, gr/SCF	0.00151	0.00297	0.00660

Table A10 (cont'd)

Run No.		1	2	3 composite
F_{at}	Fluoride-water soluble gr/ACF	0.00122	0.00191	0.00514
F_{au}	Fluoride-total, gr/ACF	0.00130	0.00226	0.00537
F_{aw}	Fluoride-water soluble lb/hr	0.320	0.576	1.45
F_{ax}	Fluoride-total, lb/hr	0.343	0.684	1.52
PO_1	P_2O_5-water soluble, mg	11.5	17.1	25.5
PO_t	P_2O_5-total, mg	13.2	19.7	26.4
PO_c	P_2O_5 % insoluble	12.9	13.2	3.41
PO_{an}	P_2O_5-water soluble gr/SCF	0.00395	0.00668	0.0145
PO_{ao}	P_2O_5-total, gr/SCF	0.00454	0.00770	0.0150
PO_{aw}	P_2O_5-water soluble lb/hr	0.898	1.54	3.33
PO_{ax}	P_2O_5-total, lb/hr	1.03	1.77	3.45
PO_{at}	P_2O_5-waste soluble, gr/ACF	0.00340	0.00510	0.0118
PO_{aa}	P_2O_5-total, gr/ACF	0.00391	0.00588	0.0122

[a] Dry standard cubic feet at 70°F, 29.92 in. Hg.

[b] Standard conditions at 70°F, 29.92 in. Hg.

[c] Dry standard cubic feet per minute at 70°F, 29.92 in. Hg.

[d] Assumed atmospheric pressure at meter.

[e] Measured data incorrect. Use value based on data from test 1 and 2 at site B.

Table A11. Particulate Emission Data
Nodulizing Kiln - Scrubber Spray Chamber Inlet

Run No.		1	2	3
Test Date, 1972		7-20-72	7-21-72	7-21-73
Sampling Time, 24 hour clock		1500-1730	0855-1050	1220-1324
Sampling Location				
D_n	Sampling Nozzle Diameter, in.	0.1875	0.1875	0.1875
T_t	Net Time of Test, Min.	60	60	60
P_b	Barometric Pressure, in. Hg Absolute	30.20	30.23	30.23
P_m	Average Orifice Pressure Drop, in. H_2O	0.395	0.482	0.483
V_m	Volume of Dry Gas Sampled at Meter Conditions, DCF	23.701	25.798	25.870
T_m	Average Gas Meter Temperature, °F	91	93	99
$V_{m_{std}}$	Volume of Dry Gas Sampled at Standard Conditions[a], DSCF	23.02	25.01	24.81
V_w	Total H_2O Collected in Impingers and Silica Gel, ml	122	119	116
$V_{w_{gas}}$	Volume of Water Vapor Collected at Standard Conditions[b], SCF	5.78	5.64	5.50
% M	% Moisture in Stack Gas, by Volume	20.1	18.4	18.1
M_d	Mole Fraction of Dry Gas	0.799	0.816	0.818
% CO_2	Volume % Dry	18.6	18.3	18.4
% O_2	Volume % Dry	12.1	6.47	6.70
% CO	Volume % Dry	1.93	2.00	1.43
% N_2	Volume % Dry	67.4	73.3	73.4
% EA	Percent Excess Air	167	39.4	44.7
MW_d	Molecular Weight of Stack Gas, Dry Basis	31.5	31.2	31.2

Table A11. (cont'd.)

Run No.		1	2	3
MW	Molecular Weight of Stack Gas, Wet Basis	28.8	28.8	28.8
C_p	Pitot Tube Coefficient	0.850	0.850	0.850
T_s	Average Stack Temperature, °F	652	682	670
N_p	Net Sampling Points	12	12	12
P_{st}	Static Pressure of Stack Gas, in. Hg	-0.89	-1.07	-1.08
P_s	Stack Gas Pressure, in. Hg Absolute	29.3	29.2	29.2
V_s	Stack Gas Velocity at Stack Conditions, fpm	4700	5440	5230
A_s	Stack Area, in.^{2}	1486	1486	1486
Q_s	Dry Stack Gas Volumetric Flow Rate at Standard Conditions,[c] DSCFM	18,100	20,700	20,200
Q_a	Stack Gas Volumetric Flow Rate at Stack Conditions, ACFM	48,500	56,100	54,000
% I	Percent Isokinetic	114	108	110
% O	Percent Opacity	-	-	-
T_c	Unit Production Rate -	-	-	-
m_f	Particulate - Probe, Cyclone, and Filter, mg	1069	1054.6	1114.5
m_t	Particulate - Total, mg	1382.9	1196.7	1347.9
I_c	% Impinger Catch	22.7	11.9	17.3
C_{an}	Particulate - Probe, Cyclone, and Filter, gr/SCF	0.715	0.650	0.692
C_{ao}	Particulate - Total, gr/SCF	0.925	0.738	0.838

Table A11. (cont'd.)

Run No.		1	2	3
C_{at}	Particulate - Probe, Cyclone, and Filter, gr/ACF	0.266	0.240	0.259
C_{au}	Particulate - Total, gr/ACF	0.345	0.272	0.313
C_{aw}	Particulate - Probe, Cyclone, and Filter, lb/hr.	111	115	120
C_{ax}	Particulate - Total, lb/hr.	143	131	145

[a] Dry standard cubic feet at 70°F, 29.92 in. Hg.

[b] Standard conditions at 70°F, 29.92 in. Hg.

[c] Dry standard cubic feet per minute at 70°F, 29.92 in. Hg.

Table A12. Particulate Emission Data
Nodulizing Kiln - Scrubber Spray Chamber Outlet

Run No.		1	2	3
Test Date, 1972		7-20-72	7-21-72	7-21-72
Sampling Time, 24 hour clock		1510-1805	0828-1100	1133-1407
Sampling Location				
D_n	Sampling Nozzle Diameter, in.	1.426	1.426	1.426
T_t	Net Time of Test, Min.	120	120	120
P_b	Barometric Pressure, in. Hg Absolute	30.20	30.23	30.23
P_m	Average Orifice Pressure Drop, in. H_2O	2.38	2.60	2.50
V_m	Volume of Dry Gas Sampled at Meter Conditions, DCF	108.700	113.007	110.010
T_m	Average Gas Meter Temperature, °F	93	97	103
$V_{m_{std}}$	Volume of Dry Gas Sampled at Standard Conditions[a], DSCF	105.57	109.38	105.51
V_w	Total H_2O Collected in Impingers and Silica Gel, ml	543	679	559
$V_{w_{gas}}$	Volume of Water Vapor Collected at Standard Conditions[b], SCF	25.7	32.2	26.5
% M	% Moisture in Stack Gas, by Volume With Entrainment	19.6	22.7	20.1
	Theoretical Saturated Moisture, %	12.0	13.5	11.5
M_d	Mole Fraction of Dry Gas	0.804	0.773	0.799
	Based on Theoretical Moisture	0.880	0.865	0.885
% CO_2	Volume % Dry	-	12.2	11.3
% O_2	Volume % Dry	-	10.7	10.8
% CO	Volume % Dry	-	2.9	2.3
% N_2	Volume % Dry	-	74.2	75.6
% EA	Percent Excess Air	-	-	-
MW_d	Molecular Weight of Stack Gas, Dry Basis	30.0[d]	30.4	30.2

Table A12. (cont'd.)

Run No.		1	2	3
MW	Molecular Weight of Stack Gas, Wet Basis	27.6	27.6	27.7
	Based on Theoretical Moisture	28.6	28.7	28.8
C_p	Pitot Tube Coefficient	0.850	0.850	0.850
T_s	Average Stack Temperature, °F	122	126	120
N_p	Net Sampling Points	24	24	24
P_{st}	Static Pressure of Stack Gas, in. Hg	0	0	0
P_s	Stack Gas Pressure, in. Hg Absolute	30.2	30.2	30.2
V_s	Stack Gas Velocity at Stack Conditions, fpm	81.2	81.6	74.1
A_s	Stack Area, in.^{2}	55,238	55,238	55,238
Q_s	Dry Stack Gas Volumetric Flow Rate at Standard Conditions,[c] DSCFM	25,200	24,700	23,200
Q_a	Stack Gas Volumetric Flow Rate at Stack Conditions, ACFM	31,200	31,300	28,400
% I	Percent Isokinetic	119	127	130
% O	Percent Opacity	-	-	-
T_c	Unit Production Rate -	-	-	-
m_f	Particulate - Probe, and Filter, mg	386.4	417	300.3
m_t	Particulate - Total, mg	634.5	799.3	630.2
I_c	% Impinger Catch	39.1	47.8	52.3
C_{an}	Particulate - Probe, Cyclone, and Filter, gr/SCF	0.0564	0.0587	0.0439
C_{ao}	Particulate - Total, gr/SCF	0.0926	0.113	0.0922

Table A12. (cont'd.)

Run No.		1	2	3
C_{at}	Particulate - Probe, Cyclone, and Filter, gr/ACF	0.0455	0.0466	0.0360
C_{au}	Particulate - Total, gr/ACF	0.0749	0.0892	0.0754
C_{aw}	Particulate - Probe, Cyclone, and Filter, lb/hr.	12.3	12.5	8.76
C_{ax}	Particulate - Total, lb/hr.	20.1	23.9	18.4

[a] Dry standard cubic feet at 70°F, 29.92 in. Hg.

[b] Standard conditions at 70°F, 29.92 in. Hg.

[c] Dry standard cubic feet per minute at 70°F, 29.92 in. Hg. based on inlet flow plus dilution air.

[d] Assumed value based on tests 2 & 3.

[e] Outlet volumetric flows based on separate inlet velocity traverse runs conducted before and after each inlet test, plus 2530 SCFM for dilution air entering the system prior to the outlet sampling point. (See Table 5 in body of report).

TABLE A-13. CO LINE TO KILN
FLUORIDE DATA SUMMARY

RUN NUMBER	1
Date	6-15-72
Volume of Gas Sampled-DSCF[a]	26.89
Percent Moisture by Volume	5.78
Average Stack Temperature-°F	NM
Stack Volumetric Flow Rate-DSCFM[b]	NM
Stack Volumetric Flow Rate-ACFM[c]	NM
Fluoride Emissions-Water Soluble	
mg	1.1
gr/DSCF	0.000630
Fluoride Emissions-Total	
mg	1.1
gr/DSCF	0.000630
Fluoride Emissions % Insoluble	0

[a] Dry standard cubic feet at 70°F, 29.92 in. Hg.
[b] Dry standard cubic feet per minute at 70°F, 29.92 in. Hg.
[c] Actual cubic feet per minute
NM - Not measured-sampling conditions were too dangerous

Table A14 Air Return Line
Data Summary

Run No.		1	2	3
Test Date		7-19-72	7-19-72	7-19-72
Sampling Time, 24 hour clock		1028-1058	1104-1134	1142-1212
Sampling Location				
D_n	Sampling Nozzle Diameter, in.[d]	0.472	0.472	0.472
T_t	Net Time of Test, Min.	30	30	30
P_b	Barometric Pressure, in. Hg Absolute	30.15	30.15	30.15
P_m	Average Orifice Pressure Drop, in. H_2O	0.115	0.110	0.100
V_m	Volume of Dry Gas Sampled at Meter Conditions, DCF	5.971	6.030	5.957
T_m	Average Gas Meter Temperature, °F	98	104	106
$V_{m_{std}}$	Volume of Dry Gas Sampled at Standard Conditions[a], DSCF	5.73	5.72	5.62
V_w	Total H_2O Collected in Impingers and Silica Gel, ml	3.6	4.2	4.0
$V_{w_{gas}}$	Volume of Water Vapor Collected at Standard Conditions[b], SCF	0.171	0.199	0.190
% M	% Moisture in Stack Gas, by Volume	2.90	3.36	3.26
M_d	Mole Fraction of Dry Gas	0.971	0.966	0.967
% CO_2	Volume % Dry			
% O_2	Volume % Dry			
% CO	Volume % Dry			
% N_2	Volume % Dry			
% EA	Percent Excess Air	-	-	-
MW_d	Molecular Weight of Stack Gas, Dry Basis	29[e]	29[e]	29[e]

Table A14 (cont'd.)

Run No.		1	2	3
MW	Molecular Weight of Stack Gas, Wet Basis	28.7	28.7	28.7
C_p	Pitot Tube Coefficient	0.850	0.850	0.850
T_s	Average Stack Temperature, °F	700	700	700
N_p	Net Sampling Points	6	6	6
P_{st}	Static Pressure of Stack Gas, in. H_2O	+1.17	+1.17	+1.17
P_s	Stack Gas Pressure, in. Hg Absolute	31.3	31.3	31.3
V_s	Stack Gas Velocity at Stack Conditions, fpm	4390	4390	4390
A_s	Stack Area, ft.^{2}	1195	1195	1195
Q_s	Dry Stack Gas Volumetric Flow Rate at Standard Conditions, DSCFM	16,900[c]	16,800	16,800
Q_a	Stack Gas Volumetric Flow Rate at Stack Conditions, ACFM	36,400	36,400	36,400
% I	Percent Isokinetic	7.6	7.71	7.60
% O	Percent Opacity	-	-	-
T_c	Unit Feed Rate-ton/hr	-	-	-
m_f	Fluoride Emissions-mg, water soluble	79.5[f]	42.6	63.4
m_t	Fluoride Emissions, Total, mg	79.6[f]	42.7	63.5
F_c	Fluoride Emissions % insoluble	0.13[f]	0.23	0.16
F_{an}	Fluoride-Water soluble, gr/SCF	0.214[f]	0.115	0.174
F_{ao}	Fluoride-Total, gr/SCF	0.215[f]	0.115	0.174

Table A14 (cont'd)

Run No.		1	2	3
F_{at}	Fluoride-water soluble gr/ACF	0.0995[f]	0.0530	0.080
F_{au}	Fluoride-total, gr/ACF	0.0996[f]	0.0531	0.080
F_{aw}	Fluoride-water soluble lb/hr	31.1[f]	16.5	25.2
F_{ax}	Fluoride-total, lb/hr	31.1[f]	16.6	25.2
PO_1	P_2O_5-water soluble, mg	1.2	1.3	1.4
PO_t	P_2O_5-total, mg	1.7	1.9	2.0
PO_c	P_2O_5 % insoluble	29	31.6	30
PO_{an}	P_2O_5-water soluble gr/SCF	0.00323	0.00350	0.00384
PO_{ao}	P_2O_5-total, gr/SCF	0.00457	0.00515	0.00555
PO_{aw}	P_2O_5-water soluble lb/hr	0.48	0.51	0.55
PO_{ax}	P_2O_5-total, lb/hr	0.68	0.74	0.79
PO_{at}	P_2O_5-water soluble gr/ACF	0.00150	0.00161	0.00177
PO_{aa}	P_2O_5-total, gr/ACF	0.00211	0.00235	0.00253

[a]Dry standard cubic feet at 70 degrees F, 29.29 in. Hg.

[b]Standard conditions at 70 degrees F, 29.29 in. Hg.

[c]Dry standard cubic feet per minute at 70 degrees F, 29.29 in. Hg.

[d]Not possible to use a nozzle due to small port opening. Assumed I.D. of probe to be 12 mm or 0.472 inches.

[e]Based on air

[f]Observed interference while conducting analysis

TABLE A-15. EXAMPLE CALCULATIONS

Nodulizing Kiln Spray Chamber Inlet - Run 2 - Particulate

1. Volume of dry gas sampled at standard conditions - 70°F, 29.92" Hg, ft^3.

$$V_{m_{std}} = \frac{17.71 \times V_m \left(P_B + \frac{P_m}{13.6}\right)}{(T_m + 460)} = \frac{17.71 \times 25.798 \left(30.23 + \frac{0.48}{13.6}\right)}{(93 + 460)}$$

$$= 25.006 \text{ DSCF}$$

2. Volume of water vapor at 70°F & 29.92" Hg, $Ft.^3$

$$V_{w_{gas}} = 0.0474 \times V_w = 0.0474 \times 119 = 5.636 \text{ Ft.}^3$$

3. % moisture in stack gas

$$\%M = \frac{100 \times V_{w_{gas}}}{V_{m_{std}} + V_{w_{gas}}} = \frac{100 \times 5.636}{25.006 + 5.636} = 18.4$$

4. Mole fraction of dry gas

$$M_d = \frac{100 - \%M}{100} = \frac{100 - 18.4}{100} = 0.816$$

5. Average molecular weight of dry stack gas

$$M\,W_d = (\%CO_2 \times \frac{44}{100}) + (\%O_2 \times \frac{32}{100}) + [(\%N_2 + \%CO \times \frac{28}{100})] +$$

$$(18.27 \times .44) + (6.47 \times .32) + [(73.26 + 2.0) \times \frac{28}{100}] = 31.2$$

6. Molecular weight of stack gas

$$M\,W = M\,W_d \times M_d + 18\,(1 - M_d) = 31.2 \times .816 + 18\,(1-.816) = 28.76$$

7. Stack velocity @ stack conditions, fpm

$$V_s = 5128.8C_p \times \sqrt{\Delta P \times (T_s + 460)} \left[\frac{1}{P_s \times M\,W}\right]^{1/2} =$$

$$5128.8\,(.85)\sqrt{1.15\,(682 + 460)} \left[\frac{1}{29.16 \times 28.76}\right]^{1/2} = 5440$$

8. Stack gas volume @ standard conditions, SCFM

$$Q_s = \frac{0.123 \times V_s \times A_s \times M_d \times P_s}{(T_s + 460)} =$$

$$\frac{0.123 \times 5440 \times 1486 \times .816 \times 29.16}{682 + 460} = 20{,}700$$

9. Per cent isokinetic

$$\%I = \frac{1032 \times (T_s + 460) \times V_{m_{std}}}{V_s \times T_t \times P_s \times M_d \times (D_n)^2} = \frac{1032(682+460)25.006}{5440 \times 60 \times 29.16 \times .816 \times (.1875)^2} = 108\%$$

10. Particulate - probe, cyclone, & filter, gr/SCF

$$C_{an} = 0.0154 \times \frac{M_f}{V_{m\ std}} = 0.0154 \times \frac{1054.6}{25.006} = 0.650$$

11. Particulate total, gr/SCF

$$C_{ao} = 0.01543 \times \frac{M_t}{V_{m_{std}}} = 0.01543 \times \frac{1196.7}{25.006} = 0.738$$

12. Particulate - probe, cyclone & filter, gr/CF at stack conditions

$$C_{at} = \frac{17.71 \times C_{an} \times P_s \times M_d}{(T_s + 460)} = \frac{17.71 \times 0.650 \times 29.16 \times .816}{682 + 460}$$

$$= 0.240$$

13. Particulate - total, gr/CF @ stack conditions

$$C_{au} = \frac{17.71 \times C_{ao} \times P_s \times M_d}{(T_s + 460)} = \frac{17.71 \times 0.738 \times 29.16 \times .816}{682 + 460} = 0.272$$

14. Particulate - probe, cyclone, & filter, lb/hr.

$$C_{aw} = 0.00857 \times C_{an} \times Q_s = 0.00857 \times 0.650 \times 20{,}700 = 115$$

15. Particulate - total, lb/hr.

$$C_{ax} = 0.00857 \times C_{ao} \times Q_s = 0.00857 \times 0.738 \times 20{,}700 = 131$$

APPENDIX B

GASEOUS RESULTS

The results of the testing for sulfur dioxide are presented in the following tables.

TABLE B-1. SULFUR DIOXIDE EMISSION DATA SUMMARY
NODULIZING KILN SCRUBBER SPRAY CHAMBER INLET

(Barium Perchlorate Method)

RUN NO.	1	2	3	WEIGHTED AVERAGE
Date	7-19-72	7-20-72	7-20-72	
Sampling Time	11:45 12:20	14:00 14:30	15:45 16:15	
mg SO_2	337.6	269.0	176.7	261.1
T_m-Average Gas Meter Temperature, °F	91	92	90	91
P_b-Barometric Pressure, "Hg	30.15	30.15	30.15	30.15
V_m-Volume of Dry Gas Sampled @ Meter Conditions, $Ft.^3$	1.820	1.758	3.070	2.216 ~~6.648~~
ppm SO_2 by Volume	2,540	2,100	787	1,614
lb/SCF	4.20	3.48	1.30	2.67

TABLE B-2. SULFUR DIOXIDE EMISSION DATA SUMMARY
NODULIZING KILN SCRUBBER SPRAY CHAMBER OUTLET

(Barium Perchlorate Method)

RUN NO.	1	2	3	WEIGHTED AVERAGE
Date	7-19-72	7-20-72	7-20-72	
Sampling Time	11:25 12:50	13:50 15:15	15:30 17:00	
mg SO_2	27.0	40.5	50.0	39.2
T_m-Average Gas Meter Temperature, °F	93	93	90	92
P_b-Barometric Pressure, "Hg	30.15	30.15	30.15	30.15
V_m-Volume of Dry Gas Sampled @ Meter Conditions, $Ft.^3$	2.572	2.648	1.649	2.290 ~~6.869~~
ppm SO_2 by Volume	144	210	415	235
lb/SCF	2.38	3.48	6.87	3.88

APPENDIX C

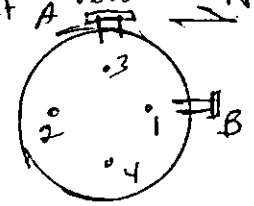
ORIGINAL FIELD DATA

APPENDIX C-1

SLAG TAPPING OPERATION

Three Inlet and Three Outlet Tests
for Fluoride and P_2O_5

PLANT: STAUFFER CHEMICAL COMPANY - TARPON
DATE: 16 JUNE 1972
SAMPLING LOCATION: SLAG TAPPING Scrubber Inlet
SAMPLE TYPE: FLUORIDE
RUN NUMBER: 1
OPERATOR: RSA & J. GEIGER
AMBIENT TEMPERATURE: 90°F
BAROMETRIC PRESSURE: 29.97
STATIC PRESSURE, (P_s): ~~0~~ —
FILTER NUMBER (s): SEE CLEANUP SHEET



SCHEMATIC OF TRAVERSE POINT LAYOUT

PROBE LENGTH AND TYPE: 4' - Glass
NOZZLE I.D.: .1875
ASSUMED MOISTURE, %: 1
SAMPLE BOX NUMBER: —
METER BOX NUMBER: 3
METER $\Delta H_@$: 1.52 @ 0.75 cfm
C FACTOR: 0.90
PROBE HEATER SETTING: N/A
HEATER BOX SETTING: N/A
REFERENCE Δp: —

READ AND RECORD ALL DATA EVERY 3 MINUTES

FLUSH No.	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 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	1344 ~~1345~~	487.807									
	B 1	3		489.954	2.20	1.8	1.3	165	93 ~~88~~	93 ~~88~~	15	NA	73
	1	6		492.120	2.20	1.8	1.3	205	92	88	15	NA	—
	1	9		494.251	2.20	1.8	1.3	230	96	89	15	NA	—
	1	12		496.360	2.20	1.8	1.2	230	98	89	15	NA	—
	1	15		498.430	2.20	1.8	1.2	225	101	89	15	NA	82
	2	18		500.500	2.50	2.0	1.2	185	104	89	15	NA	76
	2	21		502.600	2.55	2.05	1.3	205	90	90	16	NA	73
	2	24		504.740	2.55	2.05	1.5	242	94	90	20	NA	—
	2	27		507.090	2.55	2.05	1.5	250	98	90	20	NA	72
	2	30		508.397	2.55	2.05	1.5	247	100	90	20	NA	
	~~3~~												
				509.636									
	A 3	~~33~~ 34		510.770	2.50	2.0	1.5	210	88	86	20	NA	70
	3	36		512.340	2.50	2.0	1.5	230	89	86	20	NA	63
	3	39		514.682	2.50	2.0	1.5	248	94	87	20	NA	63
	4	42		517.010	3.50	2.8	1.5	235	98	87	20	NA	63
	4	~~45~~ 44.1		518.612	3.50	2.8	1.5	175	102	87	20	NA	63
				30.805									

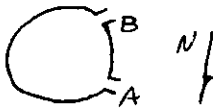
$$30.805 \times \frac{530}{579} = 28.19$$

COMMENTS:

EPA (Dur) 235
4 72

FIELD DATA

PLANT STAUFFER CHEMICAL
DATE 16 JUNE 72
SAMPLING LOCATION SLAG TAP SCRUBBER OUTLET
SAMPLE TYPE FLOURIDES
RUN NUMBER 1
OPERATOR G.F., B.Z.
AMBIENT TEMPERATURE 90°C
BAROMETRIC PRESSURE 29.7
STATIC PRESSURE, (P_s) -0.35
FILTER NUMBER (s) SEE EXTENDED SHEET



SCHEMATIC OF TRAVERSE POINT LAYOUT

PROBE LENGTH AND TYPE 4' GLASS LINED W/FLEXIBLE TEFLON CONNECTOR
NOZZLE I.D. 0.1875"
ASSUMED MOISTURE, % 3
SAMPLE BOX NUMBER 3
METER BOX NUMBER 7
METER $\Delta H_@$ 1.55 @ 0.75 CFM
C FACTOR 0.89
PROBE HEATER SETTING
HEATER BOX SETTING
REFERENCE Δp

READ AND RECORD ALL DATA EVERY 1.5 MINUTES

FLUSH NUMBER	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 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	410.588									
	A-1	1.5	411.43	0.92		1.12	122	84	88	7	—	
	2	3	412.39	0.96		1.18	122	84	88	7	N.A.	74
	3	4.5	413.45	1.20		1.45	122	84	88	8.5		73
	4	6	414.51	1.25		1.50	120	84	88	9		73
	5	7.5	415.612	1.30		1.59	119	94	88	9		
	6	9	416.70	1.25		1.32	119	99	99	9		
	7	10.5	417.76	0.98		1.04	119	99	99	7		75
	8	12	418.66	0.85		0.91	120	99	99	6		75
	9	13.5	419.49	0.68		0.73	120	101	99	5		76
	10	15	420.20	0.38		0.42	120	102	99	4		79
	11	16.5	420.82	0.42		0.46	[illegible]	[illegible]	[illegible]	3.5		
	12	18	421.43	0.35		0.38	121	103	100	3		85
	13	19.5	422.04	0.35		0.38	122	[illegible]	[illegible]	3		83
	14	21	422.64	0.37		0.40	121	[illegible]	[illegible]	3		88
	15	22.5	423.27	0.37		0.40	122	[illegible]	[illegible]	3		83
	16	24	423.87	0.35		0.38	122	103	100	3		
	17	25.5	424.46	0.36		0.39	122	103	100	3		86
	18	27	425.071	0.35		0.38	122	103	100	3		
			14.4830									

COMMENTS: LEAKAGE @ 15" Hg = Ø CFM

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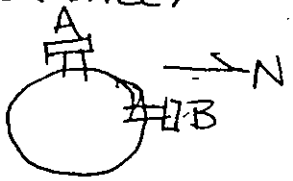
TRAVERSE POINT NUMBER	SAMPLING TIME, min / CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\,in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F
B-1	27.5	425.79	0.53		0.57	122	100	100	4	NA	
2	29	426.57	0.65		0.70		100	100	5		
3	30.5	427.39	0.70		0.75		101	100	5		
4	32	428.24	0.72		0.77				5		
5	33.5	429.10	0.76		0.82		104	101	6		
6	35	429.96	0.70		0.75		104	101	5.5		
7	36.5	430.82	0.68		0.73	122	106	101	5	~~72~~	78
8	38	431.65	0.73		0.78		107	101	5.5		
9	39.5	432.47	0.63		0.67		108	102	5		
10	41	439.264	0.65		0.70		108	102	5		
11	42.5	434.11	0.85		0.92		88	87	6		
12	44	435.06	0.92		1.02		88	87	6.5		
13	45.5	436.05	1.15		1.21		89	87	7		
14	47	437.09	1.30		1.40		90	88	8.5		
15	48.5	438.14	1.40		1.50		92	88	9		
16	50	439.29	1.45		1.52		93	88	9		
17	51.5	440.37	1.40		1.50		95	88	9		
18	53	441.118	1.35		1.42		96	88	9		
					32.16/36 = .89						
	TOTAL	30.53									
		30.53 × 530/560 = 28.89									

EPA (Dur) 236
4 72

11" outlet to scrubber

FIELD DATA

PLANT STAUFFER CHEMICAL Co. - TARPON SPRINGS
DATE 21 JUNE 72
SAMPLING LOCATION SLAG TAP SCRUBBER INLET
SAMPLE TYPE FLUORIDES
RUN NUMBER 2
OPERATOR RSAMICK
AMBIENT TEMPERATURE 90°F
BAROMETRIC PRESSURE 29.85"
STATIC PRESSURE, (P_s) -9.6"
FILTER NUMBER (s)



SCHEMATIC OF TRAVERSE POINT LAYOUT

PROBE LENGTH AND TYPE 4' Glass
NOZZLE I.D. .1875"
ASSUMED MOISTURE, % 2
SAMPLE BOX NUMBER
METER ~~BOX~~ NUMBER 3
METER $\Delta H_@$ 1.52 @ 0.75 cfm
C FACTOR ~~0~~
PROBE HEATER SETTING N/A
HEATER BOX SETTING N/A
REFERENCE Δp

READ AND RECORD ALL DATA EVERY 3 MINUTES

SLAG TAP No.	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 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	1250	519.448									
1	B-1	3		521.432	1.8	1.5	1.2	145	83	83	23	—	85°
	2	6		523.492	2.2	1.8	1.2	160	84	83	24	—	73°
	3	9		525.521	2.2	1.8	1.2	168	90	84	24	—	73°
	4	~~12~~ 10.4		526.437	2.2	1.8	1.7	168	92	84	24	—	74
*	8	☆											
3	4	12.0	1455	527.219	3.0	0.58	0.58	180	84	84	11	—	86
	5	15.0		529.124	3.0	0.58	0.58	195	86	85	11	—	63
	6	18.0		530.764	2.7	0.52	0.52	195	87	85	11	—	63
	7	21.0		532.404	2.7	0.52	0.52	170	90	85	11	—	63
	8	23.0		533.468	2.7	0.52	0.52	170	90	85	12	—	63
4	8	24.0	1605	533.920	2.30	0.46	.46	120	84	84	10	—	86
	A-1	27.0		535.549	2.30	.46	.46	142	85	84	10	—	67
	2	30.0		536.924	2.00	.40	.40	165	86	84	10	—	64
	3	33.0		538.314	2.30	.46	.46	185	88	85	14	—	63
	4	35.1		539.191	2.30	.46	.35	213	88	85	25	—	62
				Note: Changed filters									
5	4	36.0	1730	539.426	2.30	.42	.46	150	84	84	10	—	86
	5	39.0		541.486	3.00	.58	.58	162	84	84	11	—	71
	6	42.0		543.126	3.00	.58	.58	180	85	84	12	—	66
	7	45.0		544.592	3.00	.58	.58	205	87	84	12	—	64
	8	48.0		546.228	3.00	.58	.58	230	90	85	12	—	64

COMMENTS:

☆ changed from 3/16" to 1/8" nozzle

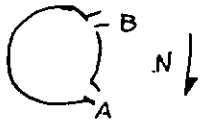
1/8" Nozzle 4.79 X 530 / 638

* Power Failure on meter line

EPA (Dur) 235
4 72

FIELD DATA

PLANT STAUFFER CHEMICAL
DATE 21 JUNE 72
SAMPLING LOCATION SLAG TAP SCRUBBER OUTLET
SAMPLE TYPE FLOURIDES
RUN NUMBER 2
OPERATOR G.F. B.Z.
AMBIENT TEMPERATURE 90°F
BAROMETRIC PRESSURE 29.85
STATIC PRESSURE, (P_s) -0.38
FILTER NUMBER (s)



SCHEMATIC OF TRAVERSE POINT LAYOUT

PROBE LENGTH AND TYPE 4' GLASS LINED W/FLEXIBLE TEFLON CONNECTOR
NOZZLE I.D. 0.1875
ASSUMED MOISTURE, % 8
SAMPLE BOX NUMBER 3
METER BOX NUMBER 7
METER $\Delta H_@$ 1.55 @ 0.75 CFM
C FACTOR 0.87
PROBE HEATER SETTING
HEATER BOX SETTING
REFERENCE Δp

READ AND RECORD ALL DATA EVERY 1.5 MINUTES

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 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 / 1250	441.255									
A-1	1.5	442.08	0.93		0.99	118	90	90	6		
2	3.0	443.03	0.95		1.02	118	90	90	6		74
3	4.5	443.98	0.97		1.05	118	91	90	6		
4	6.0	444.93	1.00		1.08	118	92	90	6		73
5	7.5	445.856	0.98		1.04	119	93	91	6		72
6	9.0	446.84	0.84		0.90	119	93	93	6.5		
7	10.5	447.77	0.78		0.84	119	93	93	5		66
8	12	448.68	0.62		0.67	119	94	93	4.5		
9	13.5	449.49	0.38		0.42	120	95	93	3.5		67
10	15	450.17	0.36		0.39	120	95	94	3		70
11	16.5	450.78	0.36		0.39	120	95	94	3		
12	18	451.388	0.37		0.41	120	95	94	3		71
13	19.5	451.99	0.40		0.44	120	93	93	3		
14	21	452.65	0.38		0.42	119	93	93	3		73
15	22.5	453.26	0.39		0.43	↓	93	93	3		
16	24	453.91	0.39		0.43	↓	94	93	3		
17	25.5	454.54	0.39		0.43	119	94	93	3		70
18	27	455.179	0.38		0.42	120	94	94	3		70

COMMENTS: LEAKAGE @ 15" Hg = Ø CFM

EPA (Dur) 235
4 72

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 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
B-1	~~455.7~~ 28.5		455.776	0.36		0.40	120	94	94	3		
2	30		456.48	0.53		0.58	↓	89	89	4		
3	31.5		457.24	0.59		0.64	↓	89	89	4		
4	33		458.05	0.68		0.74	↓	89	89	4.5		
5	34.5		458.86	0.73		0.79	120	90	89	5		64
6	36		459.73	0.78		0.84	↓	91	89	5		
7	37.5		460.56	0.73		0.79	↓	92	89	5		
8	39		461.37	0.65		0.71	120	93	90	5		67
9	40.5		462.128	0.58		0.64	↓	93	90	5		
10	42		462.91	0.63		0.68	↓	89	89	4.5		
11	43.5		463.72	0.69		0.75	↓	89	89	5.0		
12	45		464.56	0.73		0.78	↓	89	89	5		
13	46.5		465.39	0.75		0.82	↓	90	89	5		
14	48		466.26	0.77		0.84	↓	90	89	5		
15	49.5		467.09	0.77		0.84	↓	91	89	5		
16	51		467.98	0.81		0.88	↓	92	89	5		
17	52.5		468.81	0.74		0.80	↓	93	89	5		
18	54		469.647	0.72		0.77	↓	94	89	5		

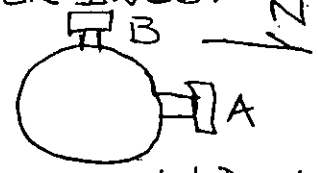
$$28.392 \times \frac{530}{550} = 27.4 \text{ SCF}$$

EPA (Dur) 236
4 72

THIS TEST DONE FIRST

FIELD DATA

PLANT: STAUFFER - TARPON
DATE: 21 JUNE 72
SAMPLING LOCATION: SLAG TAP SCRUBBER INLET
SAMPLE TYPE: FLUORIDE
RUN NUMBER: 3
OPERATOR: R S AMICK
AMBIENT TEMPERATURE: 85
USE 29.85 SEE TEST2 → BAROMETRIC PRESSURE: 29.
STATIC PRESSURE, (P_s): -9.6
FILTER NUMBER (s):



Horizontal Duct
SCHEMATIC OF TRAVERSE POINT LAYOUT

PROBE LENGTH AND TYPE: 4' Glass w/ Teflon Connector
NOZZLE I.D.: 1/8"
ASSUMED MOISTURE, %: 1
~~SAMPLE BOX NUMBER~~:
METER ~~BOX~~ NUMBER: 3
METER $\Delta H_@$: 1.52 @ 0.75
C FACTOR: 0.90
PROBE HEATER SETTING: N/A
HEATER BOX SETTING: N/A
REFERENCE Δp:

READ AND RECORD ALL DATA EVERY 3 MINUTES

SLAG TAP No.	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 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 / 700	546.340									
↑	A-1	3	547.452	.85	.165	.165	124	82	82	4	—	71
	2	6	548.573	2.2	.44	.44	142	82	82	4	—	70
1	3	9	549.900	2.5	.48	.48	225	82	82	4	—	70
	4	12	551.216	2.5	.49	.49	250	83	82	4	—	70
↓	5	14.6	552.510	2.8	.57	.57	290	85	82	4	—	70
	5	15.0 810	553.819	2.5	.49	.49	126	82	82	7	—	71
	6	18.0	554.057	2.7	.53	.53	145	82	82	7	—	70
	7	21.0	555.429	2.7	.53	.53	172	82	82	7	—	67
	8	24.0	556.878	2.8	.55	.55	248	83	82	8	—	63
	B-1	27.0 910	558.250	1.8	.36	.36	118	82	82	6	—	73
	2	30	559.461	1.8	.36	.36	140	82	82	6	—	67
	3	33	560.652	1.8	.37	.37	200	82	82	6	—	64
	4	36	561.761	1.2	.27	.27	225	83	82	5	—	63
	5	39	562.852	1.5	.29	.29	202	84	82	5	—	63
	6	42 1012	563.892	.70	.14	.14	150	82	82	5	—	71
	7	45	565.219	3.3	.70	.70	225	82	82	11	—	63
	8	48.1	566.956	3.2	.62	.62	230	83	82	11	—	64
												64

COMMENTS:

EPA (Dur) 235
4 72

FIELD DATA

PLANT STAUFFER CHEMICAL
DATE 21 JUNE 72
SAMPLING LOCATION SLAG TAP SCRUBBER OUTLET
SAMPLE TYPE FLOURIDES
RUN NUMBER 3
OPERATOR Cr. F. B. Z.
AMBIENT TEMPERATURE
BAROMETRIC PRESSURE
STATIC PRESSURE, (P_s) -0.35
FILTER NUMBER (s)

SCHEMATIC OF TRAVERSE POINT LAYOUT

PROBE LENGTH AND TYPE 4' GLASS LINED W/FLEXIBLE TEFLON CONNECTOR
NOZZLE I.D. 0.1875
ASSUMED MOISTURE, % 8
SAMPLE BOX NUMBER 3
METER BOX NUMBER 7
METER $\Delta H_@$ 1.55 @ 0.75 CFM
C FACTOR 0.87
PROBE HEATER SETTING
HEATER BOX SETTING
REFERENCE Δp

READ AND RECORD ALL DATA EVERY 1.5 MINUTES

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 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 / 0658	469.779									
A-1	1.5	470.67	1.05		1.12	112	83	83	6		
2	3	471.68	1.20		1.28	112	83	83	7		69
3	4.5	472.63	0.97		1.05	112	84	83	6.5		
4	6	473.56	0.93		0.98	112	85	83	6		68
5	7.5	474.47	0.90		0.96	112	87	83	6		
6	9	475.37	0.88		0.94	119	88	83	6		74
7	10.5	476.25	0.83		0.89	119	89	84	6		
8	12	477.10	0.72		0.78	120	90	84	5		77
9	13.5	477.85	0.60		0.65	120	90	84	4.5		
10	15	478.496	0.40		0.44	120	90	84	4		78
11	16.5	479.09	0.39		0.43		84	83	3		
12	18	479.71	0.38		0.42		84	83	3		
13	19.5	480.32	0.39		0.43		84	83	3		
14	21	480.92	0.39		0.43	119	85	83	3		69
15	22.5	481.53	0.37		0.40	119	85	84	3		
16	24	482.12	0.37		0.40	119	86	84	3		
17	25.5	482.70	0.37		0.40	120	86	84	3		69
18	27	483.317	0.40		0.44	120	87	84	3.5		

COMMENTS: LEAKAGE @ 15" Hg = Ø CFM

EPA (Dur) 235
4 72

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 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
B-1	28.5		483.96	0.44		0.48	120	84	84	3.5		
2	30		484.68	0.53		0.58		85	84	4		
3	31.5		485.43	0.59		0.65		86	85	4		
4	33		486.23	0.68		0.74		87	85	5		
5	34.5		487.06	0.72		0.78		88	85	5		
6	36		487.87	0.70		0.75	120	89	85	5		68
7	37.5		488.66	0.68		0.74		90	85	5		
8	39		489.47	0.65		0.71		91	86	5		
9	40.5		490.24	0.62		0.68		92	86	5		
10	42		490.973	0.56		0.62		92	86	4.5		
11	43.5		491.78	0.65		0.71		86	86	5		
12	45		492.30	0.65		0.71	120	86	86	5		70
13	46.5		493.12	0.68		0.74		88	87	5		
14	48		493.92	0.70		0.76		89	87	5		
15	49.5		494.75	0.69		0.75		90	87	5		
16	51		495.54	0.70		0.76		91	87	5		
17	52.5		496.36	0.70		0.76		92	87	5		
18	54		497.363	0.64		0.70		93	87	5		

$27.584 \times \frac{530}{530} = 26.58$ scf

Dm .69

EPA (Dur) 236
4 72

GAS VELOCITY AND VOLUME DATA

VELOCITY TRAVERSE DATA

Test No. PRELIM.

Location [illegible] - Inlet

not [illegible]

Point	Position Inches[a]	Reading, Δp "H_2O	$\sqrt{\Delta p}$	T_s °F
A-1		3.40		
2		3.10		
3		3.00		
4		3.05		
5		3.25		
6		3.20		
7		3.25		
8		3.10		
B-1		2.50		
2		2.90		
3		3.15		
4		3.40		
5		3.25		
6		3.25		
7		3.50		
8		3.60		120
Total		- 50.85		
Average		- 3.18		

a) From outside of port to sampling point.

Pitot tube "S" TYPE

Manometer 0-10" H_2O

Thermometer DIAL

Data Recorder G.F.

Date 16 JUNE 72

Stack Inside Dimensions _____

Stack Area, A_s = _____ sq. ft.

Barometric Pressure, P_b = _____ "Hg

Stack Gage Pressure = _____ "H_2O

Stack Abs. Pressure, P_s = _____ $\frac{\text{"}H_2O}{13.6}$ + P_b = _____ "Hg

Stack Gas Temp., T_s = _____ °F + 460 = _____ °R

Molecular Weight of Stack Gas, M_s = _____

$$V_s = 174 \sqrt{\Delta p}\ Cp \sqrt{T_s \times \frac{29.92}{P_s} \times \frac{29}{M_s}}\ \text{ft/min.}$$

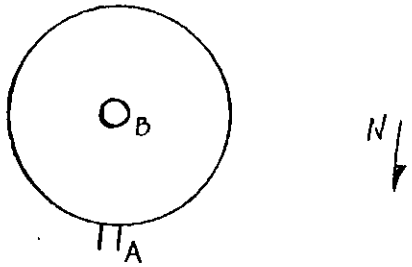
V_s =

Q, Volume = _____ ft/min. x _____ sq. ft. = _____ cfm

Q_w, Standard Volume at 70°F and 29.92 "Hg (Wet Basis) =

$$Q \times \frac{530}{T_s} \times \frac{P_s}{29.92} = 17.7 \times \_\_\_\_ \times \_\_\_\_ = \_\_\_\_$$

$Q_s = Q_w \times (100-W)/100$ = _____



PEDCo-ENVIRONMENTAL
SUITE 8 · ATKINSON SQUARE
CINCINNATI, OHIO 45246
513/771-4330

APPENDIX C-2

NODULIZING KILN SPRAY CHAMBER INLET AND OUTLET

3 Inlet tests for Fluorides and P_2O_5

6 Outlet tests for Fluorides and P_2O_5

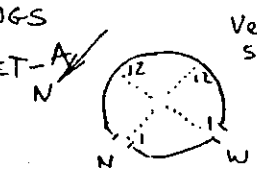
3 Inlet tests for Particulate

3 Outlet tests for Particulate

2 Velocity traverses for Dilution Air

FIELD DATA

PLANT STAUFFER - TARPON SPRINGS
DATE 13 JUNE 72
SAMPLING LOCATION KILN SCRUBBER INLET - A
SAMPLE TYPE FLUORIDES, P_2O_5
RUN NUMBER 1-A-K
OPERATOR FM JG
AMBIENT TEMPERATURE 85
BAROMETRIC PRESSURE 30.04
STATIC PRESSURE, (P_s) - 11.5" H2O
FILTER NUMBER (s) SEE CLEAN-UP SHEET



Vertical STACK

PROBE LENGTH AND TYPE 3' & 5' PYREX
NOZZLE I.D. 0.250
ASSUMED MOISTURE, % 22
SAMPLE BOX NUMBER 2
METER BOX NUMBER 3
METER $\Delta H_@$ 1.52 @ 0.75 SCFM
C FACTOR 0.65
PROBE HEATER SETTING NA
HEATER BOX SETTING NA
REFERENCE Δp

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 2.5 MINUTES

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 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 / 12:45	390.322									
N-1	2.5	391.700	0.50	0.66	0.66	680	86	87	4.5	NA	74
W-1	5.0	392.932	0.55	0.71	0.71	685	86	87	9.0		70
N-2	7.5	394.450	0.81	1.00	1.00	685	89	87	14.5		69
N-2	10.0	395.961	0.81	1.00	1.00	685	91	87	14.5		69 — FILTER CHANGE 1ST IMP RUCK
N-3	12.5	397.551	1.10	1.40	1.40	680	91	87	12.0		71
N-3	15.0	399.049	1.10	1.40	1.10	685	93	87	19.0		69 — FILTER CHANGE AGAIN
N-4	17.5 1325	401.058	1.35	1.70	1.70	670	91	88	14.0		67
N-4	20.0	403.053	1.35	1.70	1.70	670	95	88	14.0		69
N-5	22.5	405.022	1.35	1.70	1.70	665	99	88	14		72
N-5	25.0	406.950	1.35	1.70	1.70	665	99	88	15		72
N-6	27.5	409.000	1.55	1.90	1.90	660	105	89	18		76
N-6	30.0 (1)	410.992	1.55	1.90	1.90	660	107	89	18		76
N-7	32.5 1-1:15	412.918 20.670	2.35	0.97	0.97	725	90	89	7.5		76
N-7	35.0	414.100	2.35	0.97	0.97	725	93	89	7.5		76
—	1645	414.105 ~~23.778~~	—	—	—	—	—	—	—		—
N-8	37.5	415.615 ~~23.778~~	2.55	1.05	1.05	725	86	86	9.0		65
N-8	40.0	417.127	2.55	1.05	1.05	720	87	86	10.0		63
N-9	~~42.5~~ 43	419.000	2.75	1.10	1.10	730	90	85	12.0		64
N-9	45.0	420.220	2.75	1.10	1.10	720	92	85	12.0		67
N-10	47.5	421.741	2.75	1.10	1.10	720	95	85	12.0		72
N-10	50.0	423.280	2.75	1.10	1.10	725	97	85	13.5		71
N-11	52.5	424.871	2.25	0.94	0.94	720	99	85	13.0		71
N-11	55.0	426.331	2.25	0.94	0.94	720	100	85	13.0		71

COMMENTS: 1ST IMPINGER CHANGED TO OPEN END TYPE AFTER 15 MIN. INTO TEST
(1) NOZZLE CHANGED TO 0.1875" AFTER 30.45 MINUTES INTO TEST; NOMOGRAPH ADJUSTED

EPA (Dur) 239
4 72

RUN 1-A-K

FIELD DATA

PLANT
DATE
SAMPLING LOCATION
SAMPLE TYPE
RUN NUMBER
OPERATOR
AMBIENT TEMPERATURE
BAROMETRIC PRESSURE
STATIC PRESSURE, (P_s)
FILTER NUMBER (s)

PROBE LENGTH AND TYPE
NOZZLE I.D.
ASSUMED MOISTURE, %
SAMPLE BOX NUMBER
METER BOX NUMBER
METER $\Delta H_@$
C FACTOR
PROBE HEATER SETTING
HEATER BOX SETTING
REFERENCE Δp

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY _____ MINUTES

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 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
		426.331									
N-12	57.5	427.755	1.95	0.82	0.82	720	101	85	10.5		70
N-12	60.0	429.129	1.95	0.82	0.82	720	101	85	10.5		70
W-12	62.5	430.352	1.50	0.63	0.63	725	85	85	9.0		65
W-12	65.0	431.591	1.50	0.63	0.63	710	87	85	9.0		64
W-11	67.5	432.752	1.65	0.69	0.69	710	90	85	9.0		64
W-11	68.9 *	433.190	1.65	0.69	0.50	720	93	85	18		64
		LEAK CHECK ~~42.003~~									
		433.325 19.003									
W-11	70.0	433.894	1.65	0.69	0.69	715	85	85	18		64
	—	PROBE TIP PLUGGED	—	—	—	—	—	—	—		—
	—	433.907	—	—	—	—	—	—	—		—
W-10	~~72.5~~ 71.1	434.400 1.075	2.0	0.84	0.84	715	85	85	18		64
		435.099				~~720~~	~~84~~	~~84~~			~~69~~
W-10	72.5	435.875	1.80	0.75	0.75	720	84	84	11		69
W-10	75.0	437.141	1.80	0.75	0.75	720	84	84	11		65
W-9	77.5	438.382	1.70	0.71	0.71	730	87	84	15		65
W-9	80.0	439.579	1.70	0.71	0.71	730	89	84	18		65
W-8	80.25	439.580	1.60	0.67	0.67				18		
		IMPINGER PLUGGED									

COMMENTS: *

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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 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
			439.641									
W-8	82.5		440.780	1.65	0.70	0.70	720	83	83	10		70
W-8	85.0		442.011	1.65	0.70	0.70	720	84	83	14		65
W-7	86.0*		442.435	1.55	0.65	0.65	—	—	—	—		—
W-7	87.5		443.121	1.50	0.63	0.63	700	82	82	12		70
W-7	90.0		444.179	1.50	0.63	0.63	700	84	82	18		70
W-6	92.5		445.280	1.35	0.57	0.57	690	84	83	11		66
W-6	95.0		446.410	1.35	0.57	0.57	685	87	83	12		66
W-5	97.5		447.540	1.20	0.50	0.50	685	88	83	13		69
W-5	100.0		448.651	1.20	0.50	0.50	685	90	83	13		71
W-4	102.5		449.772	1.10	0.47	0.47	685	92	83	13		71
W-4	105.0		450.937	1.10	0.47	0.47	685	93	83	13		74
W-3	107.5		452.000	1.05	0.45	0.45	685	88	83	10		74
W-3	110.0		452.981	1.05	0.45	0.45	680	91	83	14		74
W-2	112.5		453.950	1.05	0.45	0.45	680	92	84	18		74
W-2	115.0		455.164	1.45	0.61	0.61	690	90	85	7.5		73
W-1	117.5		456.276	0.25	0.11	0.11	690	92	85	4.0		74
W-1	120.0		457.122	0.30	0.13	0.13	695	92	85	4.0		74

~~23.098~~

~~23.098 + 1.075~~

~~Total = 19.085 + 1.263~~

~~for .1875 nozzle~~

~~23.778 / .250" nozzle~~

~~Grand Total = 26.131~~

~~23.098 + 1.075 +~~ 46.366 ft.³

~~19.085 = 43.258~~ - .1875" nozzle

20.67

~~23.778~~ - .250" nozzle

Total = 67.036 ~~inch nozzle~~

$20.67\ ft.^3 \times \frac{530}{555} = 19.74$ SCF

$46.366 \times \frac{530}{555} = 44.27$ SCF

EPA (Dun) 236
4 72

* 3rd Impinger replaced with new one contains 100 ml 10% NaOH

DRY MOLECULAR WEIGHT DETERMINATION

PLANT STAUFFER CHEMICAL CO. (TARPON SPRINGS, FLA) COMMENTS: SAMPLE PROBABLY INACCURATE* J.G.

DATE 13 JUNE 72

SAMPLING TIME (24-hr CLOCK) 1240-2100

SAMPLING LOCATION INLET (RUN 1) RUN 1-A-K

SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) BAG - CONTINUOUS

ANALYTICAL METHOD ORSAT

AMBIENT TEMPERATURE 85°F

OPERATOR F. MEADOWS + J GEIGER

* DUE TO PUMP LEAKAGE

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	3.1	3.1	1.0	1.0	1.0	1.0	1.7	44/100	0.748
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	22.3	19.2	21.6	20.6	22.2	21.2	20.33	32/100	6.507
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)	23.9	1.6	22.2	0.6	22.6	0.4	0.867	28/100	0.243
N_2 (NET IS 100 MINUS ACTUAL CO READING)		76.1		77.8		77.4	77.10	28/100	21.588
								TOTAL	29.086

EPA (Dur) 230

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513/771-4330

LABORATORY DATA

Impinger solution & Water Wash: Container No: 72-000-744 (3)
Acetone Wash: 72-000-745

Note: Probe broken at end — washes contain some pieces of broken glass. Break (approx 3/4" of tip of liner) probably occurred after sample was taken, and should not affect the sample.

PLANT STAUFFER
TEST NO. 1-A-K
LOCATION TARPON SPRINGS
DATE 13-JUNE 1972
SITE KILN SCRUBBER INLET

Box #2

Container No.	~~CONTAINER~~/FILTER NUMBER	WEIGHT OF PARTICULATE COLLECTED, M_n grams		
		FINAL WEIGHT	TARE WEIGHT	WEIGHT GAIN
00-744	72-341, 72-342,			
	72-343, 72-346,			
	72-347			
	TOTAL			

FILTER DRYING PROCEDURE

NOTE: FILTER IN ACETONE USED FOR CLEANUP OF IMPINGER STEM AT SAMPLING SITE ONLY.

	VOLUME OF CONDENSATE COLLECTED, V_c	
	IMPINGER VOLUME, ml	SILICA GEL WEIGHT g
FINAL	715	676.8
INITIAL	400	656.8
LIQUID COLLECTED	315	20.0
TOTAL VOLUME COLLECTED	~~315~~ ~~345~~ 335	g = 20.0 ml

Equivalent condensate volume: $V_{w_c} = 0.0474 \times V_c = 0.0474 \times 335$

~~1.23~~ 1.25 inch orifice $\frac{\cancel{2.0474}}{67.0\ 36} \times 15.88 =$ ~~5.03~~ scf ~~4.98~~ = ~~14.93~~ Total ~~15.88~~ scf

GAS VELOCITY AND VOLUME DATA

Test No. PREL. (DATA KEPT WITH RUN 1-A-K)

Location STAUFFER KILN SCRUBBER INLET

VELOCITY TRAVERSE DATA

Point	Position Inches[a]	Reading, Δp "H_2O	$\sqrt{\Delta p}$	T_s °F
1		0.04	.200	730
2		0.70	.837	
3		0.90	.949	
4		1.05	1.025	
5		1.25	1.118	
6		1.40	1.183	
7		1.65	1.284	
8		1.75	1.323	720
9		1.90	1.379	
10		1.70	1.304	
11		1.60	1.265	
12		1.45	1.204	
D-1		0.05	.224	730
2		1.10	1.048	
3		1.45	1.204	
4		1.70	1.304	
5		1.85	1.360	
6		2.00	1.414	
7		1.30	1.140	
8		1.10	1.048	
9		1.05	1.025	
10		0.93	.964	730
11		0.82	.905	
12		0.69	.831	
Total		-	25.535	2910
Average		-	1.064	727.5

a) From outside of port to sampling point.

Pitot tube S

Manometer 0-10

Thermometer 0-1000°F

Data Recorder F. MEADOWS

Date 13 JUNE 1972 9:10 - 9:25 A.M.

Stack Inside Dimensions 43.5" ϕ

Stack Area, A_s = 10.321 sq. ft.

Barometric Pressure, P_b = 30.04 "Hg

Stack Gage Pressure = -11.5 "H_2O

Stack Abs. Pressure, P_s = $-11.5 \frac{"H_2O}{13.6} + P_b$ = 29.19 "Hg

Stack Gas Temp., T_s = 728 °F + 460 = 1188 °R

Molecular Weight of Stack Gas, M_s = 29.0

$$V_s = 174 \sqrt{\Delta p}\ Cp \sqrt{T_s \times \frac{29.92}{P_s} \times \frac{29}{M_s}}\ \text{ft/min.}$$

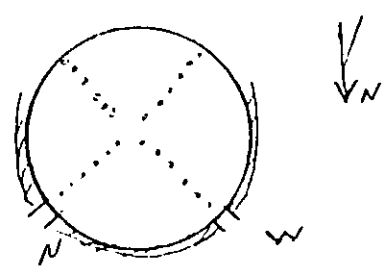
$$V_s = 174 \times .85 \times 1.064 \sqrt{1188 \times \frac{29.92}{29.19} \times \frac{29}{29}} = 5491 \text{ FPM}$$

Q, Volume = 5491 ft/min. x 10.321 sq. ft. = 56,673 cfm

Q_w, Standard Volume at 70°F and 29.92 "Hg (Wet Basis) =

$$Q \times \frac{530}{T_s} \times \frac{P_s}{29.92} = 17.7 \times \frac{56{,}673}{1188} \times \frac{29.19}{29.92} = 24{,}647$$

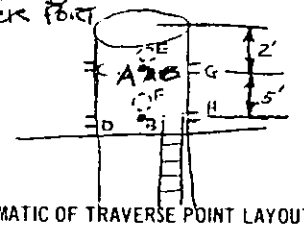
$Q_s = Q_w \times (100-W)/100$ = _____



PEDCo-ENVIRONMENTAL
SUITE 8 • ATKINSON SQUARE
CINCINNATI, OHIO 45246
513/771-4330

FIELD DATA

PLANT STAUFFER CHEMICAL
DATE 13 JUNE 72
SAMPLING LOCATION KILN SCRUBBER OUTLET - B -Lower Point
SAMPLE TYPE FLOURIDES
RUN NUMBER 1-B-K
OPERATOR G.F., B.Z., G.P.
AMBIENT TEMPERATURE 85 °F
BAROMETRIC PRESSURE 30.04
STATIC PRESSURE, (P_s) 0
FILTER NUMBER (s) SEE CLEANUP SHEET



SCHEMATIC OF TRAVERSE POINT LAYOUT

PROBE LENGTH AND TYPE 8 FT PYREX
NOZZLE I.D. 0.924
ASSUMED MOISTURE, % 20
SAMPLE BOX NUMBER 3
METER BOX NUMBER 6
METER $\Delta H_@$ 1.85 @ 0.75 CFM
C FACTOR —
PROBE HEATER SETTING —
HEATER BOX SETTING —
REFERENCE Δp —

READ AND RECORD ALL DATA EVERY 3 MINUTES

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 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 / 1240	933.577									
B-1	~~4~~ 3	934.54	—	—	—		88	87	5	—	
2	~~7~~ 6	935.41				142	89	87	5		83
3	9	936.28					90	87	5		82
4	12	936.95				142	90	88	5		
5	15	937.66				143	91	88	5		84
6	18	938.35				143	92	89	5		84
7	21	938.97				143	92	89	5		84
8	24	939.57				142	92	89	5		83
9	27	940.21				142	92	89	5		83
10	30	940.91				139	93	90	5		84
11	33	941.45				140	93	90	5		
12	36	942.08				140	94	90	5		85
13	39	942.75				139	94	91	5		85
14	42	943.36				142	95	92	5		
15	45	944.08									
D-1	48	944.716				140	81	80	5		
2	51	945.42					81	80	5		67
3	54	946.14				140	82	80	5		67
4	57	946.87				140	82	81	5		
5	60	947.59				140	84	81	5		73
6	63	948.29				140	84	81	5		69
7	66	948.99				140	85	82	5		

COMMENTS: LEAKAGE @ 15" Hg = 0 CFM

EPA (Dur) 235
4 72

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		INLET ($T_{m\,in}$), °F	OUTLET ($T_{m\,out}$), °F			
D-8	69	949.67	—			140	86	82	5	—	69
9	72	950.35				140	86	82	5	—	68
10	75	951.03				140	87	83	5		68
11	78	951.68				140	88	84	5		68
12	81	952.35				140	89	84	5		67
13	84	953.03				140	89	84	5		67
14	87	953.69				140	90	85	5		68
15	90	954.40				140	91	86	5		68
E-1	93	955.110				138	86	85	5		78
2	96	956.50				138	88	86	5		78
3	99	957.90				138	88	86	5		75
4	102	958.67				140	88	86	5		75
5	105	959.24				139	88	86	5		76
6	108	959.84				139	88	86	5		76
7	111	960.49				139	88	86	5		76
8	114	961.27				140	89	86	5		76
9	117	962.00				138	89	86	5		76
10	120	962.73				138	90	87	5		75
11	123	963.44				138	90	87	5		76
12	126	964.18				138	90	87	5		76
13	129	964.87				138	90	87	5		75
14	132	965.61				138	90	87	5		75
15	135	966.33				138	90	87	5		75
H-1	138	967.049				120	85	85	5		81
2	141	967.88				134	85	85	5		76
3	144	968.59				130	86	85	5		76
4	147	969.29				129	86	85	5		75
5	150	970.00				139	86	85	5		75
6	153	970.70				135	87	85	5		75
7	156	971.40				135	87	85	5		73
8	159	972.12				138	88	85	5		75
9	162	972.84				132	88	85	5		75
10	165	973.56				135	88	85	5		75
11	168	974.28				135	88	86	5		75
12	171	975.00				135	88	86	5		75

EPA (Dun 236
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[redacted] Ku[redacted] - 8 [redacted]

1. of 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 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
H-13	174		975.72				130	88	86	5		75
14	177		976.43				130	88	86	5		75
15	180		977.15				135	88	86	5		75
	FINAL		977.887									
	Total		44.31									

$44.31 \times \frac{530}{548} = 42.85$ SCF

EPA (Dur) 236
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CINCINNATI, OHIO 45246
513/771-4330

LABORATORY DATA

	Container No
Impinger Solns & Water Wash	72-000-746 (2)
Acetone Wash	72-000-747

PLANT STAUFFER

TEST NO. 1-B-K

LOCATION TARPON SPRINGS KILN OUTLET-B

DATE 13-JUNE 1972

SITE KILN SCRUBBER OUTLET LUNE K

Box 3

Container No	CONTAINER/FILTER NUMBER	WEIGHT OF PARTICULATE COLLECTED, M_n grams		
		FINAL WEIGHT	TARE WEIGHT	WEIGHT GAIN
000-746	72-396			
	TOTAL			

FILTER DRYING PROCEDURE _____

	VOLUME OF CONDENSATE COLLECTED, V_c	
	IMPINGER VOLUME, NaOH ml	SILICA GEL WEIGHT g
FINAL	385	657.7
INITIAL	300	642.0
LIQUID COLLECTED	85	15.7
TOTAL VOLUME COLLECTED	100.7	~~15.7g = ml~~

Equivalent condensate volume: $V_{w_c} = 0.0474 \times V_c = 0.0474 \times 100.7$ = 4.77 scf

4.77 dry or ~~[illegible]~~

FIELD DATA

PLANT STAUFFER CHEMICAL
DATE 13 JUNE 72
SAMPLING LOCATION KILN SCRUBBER OUTLET - Upper - C
SAMPLE TYPE FLOURIDES
RUN NUMBER 1-C-K
OPERATOR G.F., G.P. B.Z.
AMBIENT TEMPERATURE 85°F
BAROMETRIC PRESSURE 30.04
STATIC PRESSURE, (P_s) Ø
FILTER NUMBER (s) SEE CLEANUP SHEET

PROBE LENGTH AND TYPE 5 FT PYREX
NOZZLE I.D. 0.931
ASSUMED MOISTURE, % 20
SAMPLE BOX NUMBER 1
METER BOX NUMBER 2
METER $\Delta H_@$ 1.39 @ 0.75 CFM
C FACTOR —
PROBE HEATER SETTING —
HEATER BOX SETTING —
REFERENCE Δp —

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY ~~X~~ 3 MINUTES

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 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 / 12:40	193.005									
A-1	3	194.01	—	—	—	140	86	84	5	—	
2	6	195.01					87	84	5		80
3	~~12~~ 9	196.01				142	87	84	5		
4	12	196.82				142	87	84	5		80
5	15	197.64					88	84	5		
6	18	198.41				142	88	84	5		82
7	21	199.17					89	85	5		82
8	24	199.92				142	89	85	5		82
9	27	200.63				142	89	85	5		82
10	30	201.35				139	89	85	5		
11	33	202.03				139	89	85	5		82
12	36	202.71				139	90	85	5		84
13	39	203.39				140	90	85	5		84
14	42	204.05				139	91	86	5		
15	45	204.84				140	91	86	5		
C-1	48 / ~~1430~~ 1657	205.393				132	80	77	5		70
2	51	206.51				140	80	77	5		
3	54	207.56				140	81	77	5		70
4	57	208.58				140	82	78	5		
5	60	209.52				140	83	78	5		70
6	63	210.37				140	83	78	5		70
7	66	211.16				140	83	78	5		

COMMENTS: LEAKAGE @ 15" Hg = Ø CFM

NOTE: 1430 - KILN SHUT DOWN DUE TO LACK OF PHOSPHATE ROCK.

NOTE: COULD NOT SAMPLE AT LAST POINT IN ANY PORT BECAUSE PORT HOLE WAS TOO SMALL FOR THE PROBE WITH ATTACHMENTS, THEREFORE WE SAMPLED FOR 6 MINUTES AT POINT 14 IN ALL PORTS.

EPA (Dur) 235
4 72

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 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
C-8	69	211.86	—			140	83	78	5	—	70
9	72	212.56				140	84	78	5		70
10	75	213.26				140	84	78	5		70
11	78	213.98				140	84	78	5		69
12	81	214.68				140	85	78	5		69
13	84	215.40				140	85	78	5		69
14	87	216.13				140	86	79	5		70
15	90	216.83				140	86	80	5		70
E-1	93 \ 1820	217.543				135	83	81	5		80
2	96	218.25				135	84	81	5		80
3	99	218.95				140	84	82	5		77
4	102	219.66				140	84	82	5		77
5	105	220.36				140	85	82	5		76
6	108	221.06				139	85	82	5		76
7	111	221.79				137	85	82	5		76
8	114	222.49				139	86	82	5		76
9	117	223.20				138	86	82	5		76
10	120	223.91				139	86	82	5		76
11	123	224.62				138	86	82	5		76
12	126	225.32				138	86	82	5		76
13	129	226.04				135	87	82	5		75
14	132	226.75				136	87	82	5		75
15	135	227.47				136	87	82	5		75
G-1	138 \ 1930	228.173				119	82	80	5		~~73~~ 79
2	141	228.88				120	83	80	5		76
3	144	229.59				116	83	81	5		75
4	147	230.31				120	84	81	5		75
5	150	231.02				128	84	81	5		75
6	153	231.73				128 ~~135~~	84	81	5		75
7	156	232.44				128	86	81	5		75
8	159	233.14				138	86	81	5		74
9	162	233.86				138	86	81	5		74
10	165	234.58				135	86	81	5		74
11	168	235.30				132	86	81	5		74
12	171	236.01				129	87	81	5		75

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 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
G-13	174	236.74				129	87	81	5		75
14	177	237.46				129	87	82	5		74
15	180	238.16				131	87	82	5		74
	FINAL	238.878									
	TOTAL	45.873 X $\frac{530}{546}$ = 44.53									

NOTE: EXTRA 3 MINUTES OF SAMPLING TIME AT FINAL POINT

EPA (Dur) 236
4 72

)Co-ENVIRONMENTAL
SUITE 8 • ATKINSON SQUARE
CINCINNATI, OHIO 45246
513/771-4330

LABORATORY DATA

apinger Soln & Water Wash
Acetone Wash

Container No.
72-000-745 (2)
72-000-749

PLANT STAUFFER

TEST NO. 1-C-K

LOCATION TARPON SPRINGS

DATE 13 JUNE

SITE KILN SCRUBBER OUTLET UPPER

30 X #1

tainer No:
000-745

~~CONTAINER~~/FILTER NUMBER	WEIGHT OF PARTICULATE COLLECTED, M_n grams		
	FINAL WEIGHT	TARE WEIGHT	WEIGHT GAIN
72-304			
TOTAL			

FILTER DRYING PROCEDURE

	VOLUME OF CONDENSATE COLLECTED, V_c	
	IMPINGER VOLUME, NaOH ml	SILICA GEL WEIGHT g
FINAL	318	700.8
INITIAL	300	687.9 g
LIQUID COLLECTED	18	12.9
TOTAL VOLUME COLLECTED	30.9	g = ml

17.333

Equivalent condensate volume: $V_{w_c} = 0.0474 \times V_c = 0.0474 \times 30.9$

1.46 x 160 = 1.46 scf

DRY MOLECULAR WEIGHT DETERMINATION

PLANT STAUFFER CHEMICAL CO. (TARPON SPRINGS, FLA) COMMENTS: RUNS {1-B-K, 1-C-K}

DATE 13 JUNE 72

SAMPLING TIME (24-hr CLOCK) 1240 - 2030

SAMPLING LOCATION OUTLET (RUN 1) - UPPER & LOWER

SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) BAG - CONTINUOUS

ANALYTICAL METHOD ORSAT

AMBIENT TEMPERATURE 85°F

OPERATOR C. PARNELL, G FORTE, R ZIMMER, R. ANICK

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	12.1	12.1	14.8	14.8	13.0	13.0	13.30	44/100	5.852
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	26.2	14.1	27.8	13.0	26.0	13.0	13.37	32/100	4.278
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)	26.8	0.6	27.8	0.0	26.0	0.0	0.20	28/100	0.056
N_2 (NET IS 100 MINUS ACTUAL CO READING)		73.2		72.2		74.0	73.13	28/100	20.476
								TOTAL	30.662

FIELD DATA

PLANT STAUFFER - TARPON SPRINGS
DATE 14 JUNE 72
SAMPLING LOCATION KILN SCRUBBER - INLET
SAMPLE TYPE 75
RUN NUMBER 2-A-K
OPERATOR FIM JG
AMBIENT TEMPERATURE 85°F
BAROMETRIC PRESSURE 30.07
STATIC PRESSURE, (P_s) -9.6
FILTER NUMBER (s) SEE CLEAN UP SHEET

PROBE LENGTH AND TYPE 3 FT & 5 FT PYREX
NOZZLE I.D. 0.1875
ASSUMED MOISTURE, % 22
SAMPLE BOX NUMBER —
METER BOX NUMBER 3
METER $\Delta H_@$ 1.52 @ 0.75 SCFM
C FACTOR 0.65
PROBE HEATER SETTING —
HEATER BOX SETTING —
REFERENCE Δp —

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 2.5 MINUTES

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 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 ~~1345~~	458.053									
W-12	~~2.5~~ 3.0	459.421	1.2	0.50	0.50	665	83	83	5.5		74
W-11	5.0	460.297	1.2	0.50	0.50	660	83	83	6.0		73
W-10	7.5	461.529	1.5	0.63	0.63	660	85	84	7.0		75
W-9	10.0	462.896	1.75	0.73	0.73	660	85	85	8.0		71
W-8	12.5	464.284	2.0	0.83	0.83	665	87	85	8.0		68
W-7	15.0	465.687	2.1	0.87	0.87	665	90	85	8.0		65
W-6	17.5	467.090	1.95	0.81	0.81	670	92	85	8.0		65
W-5	20.0	468.411	1.6	0.67	0.67	675	93	86	8.0		67
W-4	22.5	469.700	1.6	0.67	0.67	675	94	86	8.0		70
W-3	25.0	470.914	1.55	0.65	0.65	700	95	86	7.5		70
W-2	27.5	471.837	0.55	0.23	0.23	685	95	87	5.0		69
W-1	30.0	472.692	0.85	0.36	0.36	700	92	87	6.0		69
N-12	32.5 1345	474.101	2.00	0.83	0.83	625	89	89	8.0		65
N-11	35.0	475.610	2.80	1.10	1.10	630	91	90	10.0		63
N-10	37.5	477.137	2.60	1.05	1.05	630	94	90	10.0		63
N-9	40.0	478.674	2.50	1.00	1.00	630	96	90	10.0		64
N-8	42.5	480.203	2.50	1.00	1.00	630	99	90	10.0		66
N-7	45.0	481.688	2.10	0.87	0.87	635	100	91	10.0		69
N-6	47.5	482.970	1.40	0.58	0.58	635	101	91	7.5		70
N-5	50.0	484.100	1.15	0.48	0.48	635	101	91	7.5		71
N-4	52.5	485.089	.90 ~~1.05~~	0.38	0.38	635	100	91	7.0		73
N-3	55.0	486.064	1.05	0.44	0.44	635	99	91	9.0		73
N-2	57.5	486.875	0.63	0.27	0.27	635	96	91	8.0		72
N-1	60	487.666	0.65	0.28	0.28	635	97	91	8.5		72
		29.613	$\times \frac{530}{550} = 28.54$								

COMMENTS:

EPA (Dur) 235
4 72

DRY MOLECULAR WEIGHT DETERMINATION

PLANT STAUFFER CHEMICAL CO (TARPON SPRINGS, FLA.)
DATE 14 JUNE 72
SAMPLING TIME (24-hr CLOCK) 1043 - 1515
SAMPLING LOCATION INLET (RUN 2) - A - K
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) BAG - CONTINUOUS
ANALYTICAL METHOD ORSAT
AMBIENT TEMPERATURE 85°F
OPERATOR F. MEADOWS, J GEIGER

COMMENTS:

GAS \ RUN	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	12.6	12.6	12.2	12.2	12.4	12.4	12.4	44/100	5.456
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	25.4	12.8	26.0	13.8	25.8	13.4	13.333	32/100	4.266
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)	25.4	0.0	26.0	0.0	25.8	0.0	0.000	28/100	0.000
N_2 (NET IS 100 MINUS ACTUAL CO READING)		74.6		74.0		74.2	74.267	28/100	20.794
								TOTAL	30.516

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513/771-4330

LABORATORY DATA

Impinger solutions Water Wash } Container No: 72-~~000~~-756 (2)
Acetone Wash 72-~~000~~-757

PLANT STAUFFER CHEMICAL TARPON SPRINGS
TEST NO. 2-A-K
LOCATION TARPON SPRINGS, Fla. ~~KILN SCRUBBER INLET~~
DATE 14 JUNE 1972
SITE KILN SCRUBBER INLET

Box #2

~~CONTAINER~~/FILTER NUMBER	WEIGHT OF PARTICULATE COLLECTED, M_n grams		
	FINAL WEIGHT	TARE WEIGHT	WEIGHT GAIN
72-344			
TOTAL			

iner No.
000-756

NOTE: FILTER 72-351 USED FOR ACETONE CLEAN-UP ONLY

FILTER DRYING PROCEDURE

	VOLUME OF CONDENSATE COLLECTED, V_c	
	IMPINGER VOLUME, ml	SILICA GEL WEIGHT g
FINAL	430	676.6
INITIAL	300	663.8
LIQUID COLLECTED	130	12.8
TOTAL VOLUME COLLECTED	130 + 12.8 =	142.8 g = 142.8 ml

Equivalent condensate volume: V_{w_c} = 0.0474 x V_c = 0.0474 x 142.8

~~142.8~~ = _____ scf

GAS VELOCITY AND VOLUME DATA

Test No. 2-A-K

Location NODULIZING KILN SCRUBBER-INLET

DATA FROM METER SHEET

VELOCITY TRAVERSE DATA

Point	Position Inches[a]	Reading, Δp "H_2O	$\sqrt{\Delta p}$	T_s °F
W-12		1.2	1.10	665
W-11		1.2	1.10	660
W-10		1.5	1.22	660
W-9		1.75	1.32	660
W-8		2.00	1.41	665
W-7		2.10	1.45	665
W-6		1.95	1.40	670
W-5		1.60	1.27	675
W-4		1.60	1.27	675
W-3		1.55	1.25	700
W-2		0.55	.74	685
W-1		0.85	.92	700
				~~675~~
N-12		2.00	1.41	~~630~~ 625
N-11		2.80	1.67	~~630~~ 630
N-10		2.60	1.61	630
N-9		2.50	1.58	630
N-8		2.50	1.58	630
N-7		2.10	1.45	635
N-6		1.40	1.18	635
N-5		1.15	1.07	635
N-4		.90	.95	635
N-3		1.05	1.02	635
N-2		0.63	.78	635
N-1		0.65	.81	635
Total			24.50	~~15070~~ 15070
Average		-	1.23	~~652.9~~ 652.9

Stack Inside Dimensions ——

Stack Area, A_s = —— sq. ft.

Barometric Pressure, P_b = 30.07 "Hg

Stack Gage Pressure = ~~-11.5~~ -9.6 "H_2O

Stack Abs. Pressure, P_s = $\frac{-.71}{13.6}$ "H_2O + P_b = 29.36 "Hg

Stack Gas Temp., T_s = 652.9 °F + 460 = 1112.9 °R

Molecular Weight of Stack Gas, M_s = ≈ 23.56

$$V_s = 174\sqrt{\Delta p}\ Cp\sqrt{T_s \times \frac{29.92}{P_s} \times \frac{29}{M_s}}\ \text{ft/min.}$$

$$V_s = 174(1.23)(0.85)\sqrt{1112.9 \times \frac{29.92}{29.36} \times \frac{29}{23.56}} = 6804\ \text{fpm}$$

1396 37.4

Q, Volume = _____ ft/min. x _____ sq. ft. = _____ cfm

Q_w, Standard Volume at 70°F and 29.92 "Hg (Wet Basis) =

$$Q \times \frac{530}{T_s} \times \frac{P_s}{29.92} = 17.7 \times \_\_\_\_ \times \_\_\_\_ = \_\_\_\_$$

$Q_s = Q_w \times (100-W)/100$ = _____

a) From outside of port to sampling point.

Pitot tube "S"

Manometer DIAL

Thermometer DIAL

Data Recorder F. MEADOWS

Date 14 JUNE 72

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513/771-4330

PERCENT ISOKINETIC DETERMINATION

Plant STAUFFER CHEMICAL COMPANY

Run Number 2-A-1

Location NODULIZING KILN SCRUBBER INLET

Date 14 JUNE 72 Time 1000 - 1600

Operator F. MEADOWS

I. Pitot Velocity:

From Velocity Traverse Sheet = 6804 fpm $\times \frac{1}{60}$ = 113.4 fps

II. Percent Moisture

(Wt. in grams of moisture collected + grain wt. increase in silica gel) x .0474 = scf

(~~[illegible]~~ 142.8) x .0474 = 6.77 scf

$$\% \text{ moisture} = \frac{\text{scf of moisture}}{\text{scf of moisture} + \text{meter scf}} \times 100$$

$$\frac{(6.77)}{(6.77) + (28.54)} \times 100 = 19.2 \text{ \% moisture}$$

III. Percent Isokinetic

$$= \frac{(1.667)[(0.00267)(\text{Total Moisture in mls.}) + \frac{V_m}{T_m}\left(P_{bar} + \frac{\Delta H}{13.6}\right) \times T_s}{\theta \times V_s \times P_s \times A_n}$$

$$= \frac{(1.667)[(.00267)(142.8 + \frac{(29.18)}{(530)}(30.07 + \frac{.687}{13.6})] \times (1112.9)}{(60)(113.4)(29.36)(.00019)}$$

.38 2.00 01.62

= 97.8 %

where:

I = Percent of isokinetic sampling.

V_{lc} = Total volume of liquid collected in impingers and silica gel (See Fig. 5-3), ml.

ρ_{H_2O} = Density of water, 1 g/ml.

R = Ideal gas constant, 21.83 inches Hg-cu. ft./lb-mole °R.

Mw_{H_2O} = Molecular weight of water, 18 lb/lb-mole.

V_m = Volume of gas sample passed through the dry gas meter (meter conditions), cu. ft.

T_m = Absolute average dry gas meter temperature (see Figure 5-2), °R.

P_{bar} = Barometric pressure at sampling site, inches Hg.

ΔH = Average pressure drop across the orifice (see Fig. 5-2), inches H_2O.

T_s = Absolute average stack gas temperature (see Fig. 5-2), °R.

θ = Total sampling time, min.

V_s = Stack gas velocity calculated by Method 2, Equation 2-9, ft./sec.

P_s = Stack gas pressure, inches Hg.

FIELD DATA

PLANT STAUFFER CHEMICAL
DATE 14 JUNE 72
SAMPLING LOCATION KILN SCRUBBER OUTLET - B
SAMPLE TYPE FLUORIDES
RUN NUMBER 2 - B - K
OPERATOR G.F. G.P. B.Z.
AMBIENT TEMPERATURE 85 °F
BAROMETRIC PRESSURE 30.08
STATIC PRESSURE, (P_s) Ø
FILTER NUMBER (s) SEE CLEANUP SHEET

PROBE LENGTH AND TYPE GLASS LINED W/FLEXIBLE TEFLON CONNECTOR
NOZZLE I.D. 0.524
ASSUMED MOISTURE, % 10
SAMPLE BOX NUMBER 3
METER BOX NUMBER 6
METER $\Delta H_@$ 1.85 @ 0.75 cfm
C FACTOR N/A
PROBE HEATER SETTING
HEATER BOX SETTING
REFERENCE Δp

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 3 MINUTES

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 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	978.009									
B-1	3	978.57	—			128	84	83	5	—	~~84~~ 81
2	6	979.31				140	85	83	5		~~84~~ 80
3	9	980.10				140	86	83	5		~~84~~ 78
4	12	980.67				141	86	83	5		~~76~~ 78
5	15	981.34				141	87	84	5		78
6	18	982.05				142	87	84	5		78
7	21	982.72					88	85	5		78
8	24	983.41					89	86	5		80
9	27	984.07				141	89	86	5		79
10	30	984.78				140	90	86	5		78
11	33	985.48					91	86	5		79
12	36	986.21					92	87	5		79
13	39	986.92				141	92	88	5		78
14	42	987.64					93	88	5		78
15	45	988.349				141	93	88	5		78
D-1	48	988.349					89	88	5		84
2	51	989.00				138	90	88	5		78
3	54	989.76					90	88	5		76
4	57	990.48					91	89	5		77
5	60	991.20					92	89	5		77
6	63	991.90					92	89	5		78
7	66	992.61					93	90	5		78

COMMENTS: LEAKAGE @ 15" Hg = Ø CFM

NOTE: WINDS MOSTLY FROM EAST

NOTE: NO TEMPERATURES ON PORT 'D' DUE TO THERMOCOUPLE FAILURE

EPA (Dur) 235
4 72

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		INLET ($T_{m\,in}$), °F	OUTLET ($T_{m\,out}$), °F			
D-8	69	993.30	—				94	90	5	—	77
9	72	994.00					94	90	5		76
10	75	994.73					95	91	5		76
11	78	995.39					95	91	5		77
12	81	996.10					96	92	5		76
13	84	996.80					96	92	5		77
14	87	997.53					96	92	5		79
15	90	998.20					98	93	5		79
		998.904									
F-1	93	999.72				132	92	91	5		86
2	96	0.55				132	92	91	5		81
3	99	1.28				140	93	91	5		81
4	102	1.98				139	93	91	5		82
5	105	2.69				140	93	92	5		82
6	108	3.36				140	94	92	5		82
7	111	4.05				139	94	92	5		84
8	114	4.75				142	95	92	5		84
9	117	5.44				142	95	92	5		83
10	120	6.12				140	95	92	5		81
11	123	6.84				141	96	93	5		81
12	126	7.55				137	96	93	5		80
13	129	8.28				140	97	93	5		81
14	132	9.10				141	97	94	5		80
15	135	9.747				142	98	94	5		81
H-1	138	10.27				143	93	92	5		89
2	141	10.34				145	93	92	5		89
3	144	10.74				142	93	92	5		89
4	147	11.42				145	94	92	5		87
5	150	12.17				142	95	93	5		83
6	153	12.91				145	96	93	5		81
7	156	13.65				142	96	93	5		81
8	159	14.37				145	97	93	5		81
9	162	15.08				140	97	94	5		81
10	165	15.81				143	97	94	5		81
11	168	16.48				142	98	94	5		80
12	171	17.19				140	98	94	5		80

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		INLET ($T_{m\,in}$), °F	OUTLET ($T_{m\,out}$), °F			
H-13	174	17.91				141	98	94	5		81
14	177	18.64				141	98	94	5		81
15	180	19.412				141	99	95	5		82
FINAL		41.403									

$$41.403 \times \frac{530}{600} = 36.57$$

EPA (Dur) 236
4 72

'EDCo-ENVIRONMENTAL
SUITE 8 • ATKINSON SQUARE
CINCINNATI, OHIO 45246
513/771-4330

LABORATORY DATA

	Container No.
Impinger Solution and Water Wash	72-CTT-755(7)
Acetone Wash	72-CTT-759

PLANT STAUFFER CHEMICAL

TEST NO. 2-B-K

LOCATION TARPON SPRINGS, FLA. ~~KILN SCRUBBER OUTLET~~

DATE 14 JUNE 72

SITE KILN SCRUBBER OUTLET

Box #3

Container No.
CTT-755

~~CONTAINER~~/FILTER NUMBER	WEIGHT OF PARTICULATE COLLECTED, M_n grams		
	FINAL WEIGHT	TARE WEIGHT	WEIGHT GAIN
72-39P			
TOTAL			

FILTER DRYING PROCEDURE _____

	VOLUME OF CONDENSATE COLLECTED, V_c	
	IMPINGER VOLUME, ml	SILICA GEL WEIGHT g
FINAL	457	658.8
INITIAL	300	646.6
LIQUID COLLECTED	157	12.2
TOTAL VOLUME COLLECTED	157 + 12.2	169.2 g = 169.2 ml

FIELD DATA

PLANT STAUFFER CHEMICAL
DATE 14 JUNE 72
SAMPLING LOCATION KILN SCRUBBER OUTLET - C
SAMPLE TYPE FLORIDES
RUN NUMBER 2-C-K
OPERATOR G.F., G.P., B.Z.
AMBIENT TEMPERATURE
BAROMETRIC PRESSURE 30.08
STATIC PRESSURE, (P_s) 0
FILTER NUMBER (s) Ø

PROBE LENGTH AND TYPE GLASS LINED W/FLEXIBLE TEFLON CONNECTOR
NOZZLE I.D. 0.931
ASSUMED MOISTURE, % 10
SAMPLE BOX NUMBER 1
METER BOX NUMBER 2
METER $\Delta H_@$ ~~N/A~~ 1.39 @ 0.75 cfm
C FACTOR N/A
PROBE HEATER SETTING
HEATER BOX SETTING
REFERENCE Δp

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 3 MINUTES

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 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 / 1058	238.987									
A-1	3	239.23				141	82	80	5	–	~~81~~ 84
2	6	239.48				138	82	80	5		~~80~~ 84
3	9	239.72				138	83	81	5		~~78~~ 84
4	12	240.56				140	83	81	5		~~78~~ 76
5	15	241.42				141	84	82	5		75
6	18	242.23				142	84	82	5		75
7	21	243.01					85	82	5		76
8	24	~~237~~ 243.72					86	82	5		78
9	27	244.44				141	87	83	5		78
10	30	245.11				138	87	83	5		78
11	33	245.79					87	83	5		79
12	36	246.45					88	84	5		80
13	39	247.14				141	88	84	5		77
14	42	247.79					88	84	5		76
15	45	248.466				141	88	84	5		76
C-1	48 / 1208	248.466				139	85	84	5		80
2	51	249.17					86	84	5		78
3	54	249.86					86	84	5		75
4	57	250.54					87	85	5		75
5	60	251.22					87	85	5		75
6	63	251.91					88	85	5		74
7	66	252.59					89	85	5		74

COMMENTS: LEAKAGE @ 15" Hg = Ø CFM

NOTE: WINDS MOSTLY FROM EAST

NOTE: NO TEMPERATURES ON PORT 'C' DUE TO THERMO COUPLE FAILURE

EPA (Dur) 235
4 72

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		INLET ($T_{m\,in}$), °F	OUTLET ($T_{m\,out}$), °F			
C-8	69	253.26	–				90	86	5	–	74
9	72	253.93					90	86	5		74
10	75	254.60					90	86	5		74
11	78	255.27					90	86	5		74
12	81	255.95					90	86	5		74
13	84	256.63					91	87	5		74
14	87	257.31					92	86	5		76
15	90	~~257~~ 258.99					92	86	5		76
		258.672									
E-1	93 \ 1403	259.48	–			141	88	86	5		80
2	96	260.26				142	88	87	5		76
3	99	261.05				131	89	87	5		75
4	102	261.82				132	90	87	5		75
5	105	262.54				135	90	87	5		75
6	108	263.25				140	91	87	5		75
7	111	263.95				136	92	88	5		76
8	114	264.63				138	92	88	5		78
9	117	265.27				140	93	88	5		79
10	120	265.92				140	93	88	5		78
11	123	266.58				136	94	89	5		78
12	126	267.23				140	94	89	5		79
13	129	267.88				138	95	89	5		79
14	132	268.56				138	96	90	5		81
15	135	269.188				135	96	90	5		80
G-1	138 \ 1514	269.94				142	90	88	5		80
2	141	270.70				143	90	88	5		79
3	144	271.45				143	91	88	5		79
4	147	272.19				145	92	89	5		79
5	150	272.86				142	92	89	5		79
6	153	273.54				143	93	89	5		79
7	156	274.21				145	93	89	5		79
8	159	274.88				145	93	89	5		79
9	162	275.55				140	93	89	5		79
10	165	276.22				143	93	89	5		79
11	168	276.87				140	94	89	5		79
12	171	277.54				141	94	89	5		79

EPA (Dur) 236
4 72

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 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
CT-13	174		278.20				141	94	89	5		80
14	177		278.87				135	95	89	5		80
15	180		279.529				142	95	89	5		80
FINAL			40.542				5732					
						Av. =	139.80					
			40.542 ×	530 / 599.8	= 35.82 SCF							
			%									

EPA (Dur) 236
4 72

DRY MOLECULAR WEIGHT DETERMINATION

PLANT STAUFFER CHEMICAL CO. (TARPON SPRINGS, FLA.) COMMENTS:
DATE 14 JUNE 72
SAMPLING TIME (24-hr CLOCK) 1058 - 1630
SAMPLING LOCATION OUTLET (RUN 2) - B & C - K
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) BAG - CONTINUOUS
ANALYTICAL METHOD ORSAT
AMBIENT TEMPERATURE 85°F
OPERATOR G. FORTE, G. PARNELL, R. ZIMMER

GAS \ RUN	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	6.0	6.0	6.0	6.0	6.0	6.0	6.0	44/100	2.640
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	24.0	18.0	23.8	17.8	24.0	18.0	17.933	32/100	5.739
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)	24.0	0.0	23.8	0.0	24.0	0.0	0.00	28/100	0.000
N_2 (NET IS 100 MINUS ACTUAL CO READING)		76.0		76.2		76.0	76.067	28/100	21.299
								TOTAL	29.678

EPA (Dur) 230
4/72

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LABORATORY DATA

	Container No.
Impinger Solution and Water Wash	72-000-760(2)
Acetone Wash	72-000-761

PLANT STAUFFER CHEMICAL

TEST NO. 2-C-K

LOCATION TARPON SPRINGS, Fla.

DATE 14 JUNE 72

SITE KILN SCRUBBER OUTLET-C

Box #1

~~CONTAINER~~/FILTER NUMBER	WEIGHT OF PARTICULATE COLLECTED, M_n grams		
	FINAL WEIGHT	TARE WEIGHT	WEIGHT GAIN
72-397			
TOTAL			

FILTER DRYING PROCEDURE _____

	VOLUME OF CONDENSATE COLLECTED, V_c	
	IMPINGER VOLUME, ml	SILICA GEL WEIGHT g
FINAL	425	685.0
INITIAL	300	672.9
LIQUID COLLECTED	125	12.1
TOTAL VOLUME COLLECTED	125 + 12.1	137.1 g = 137.1 ml

Equivalent condensate volume: $V_{w_c} = 0.0474 \times V_c = 0.0474 \times$ 137.1 = 6.5 scf

6.5

NOTE: COULD NOT SAMPLE AT POINTS 9,10,11,&12 IN EACH PORT DUE TO INACCESSABILITY

FIELD DATA

Orifice ΔH = 0.4
Δp = 0.95

PLANT STAUFFER CHEMICAL
DATE 7-18-72
SAMPLING LOCATION NODULIZING KILN SPRAY TOWER INLET
SAMPLE TYPE FLUORIDE
RUN NUMBER 3 AK
OPERATOR FM
AMBIENT TEMPERATURE 90°F
BAROMETRIC PRESSURE 30.22
STATIC PRESSURE, (P_s) -12.2
FILTER NUMBER (s)

PROBE LENGTH AND TYPE 3' GLASS
NOZZLE I.D. 0.1875
ASSUMED MOISTURE, % 16
SAMPLE BOX NUMBER —
METER BOX NUMBER —
METER ΔH@ 1.39 @ 0.75
C FACTOR @ 0.66
PROBE HEATER SETTING N/A
HEATER BOX SETTING N/A
REFERENCE Δp

SCHEMATIC OF TRAVERSE POINT LAYOUT

12 Points each Way

READ AND RECORD ALL DATA EVERY 2.5 MINUTES

16

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 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 / ~~1115~~ 1100	298.121									
N-~~12~~ 8	2.5	299.700	2.55	1.10	1.10	720	90	89	11	—	68
N-~~12~~ 8	5.0	301.301	2.55	1.10	1.10	720	93	89	13	—	66
N-8	7.5	302.972	2.55	1.10	1.10	715	96	89	13	—	68
N-8	10.0	304.610	2.55	1.10	1.10	715	99	89	13.5		74
N-8	12.5	306.244	2.55	1.10	1.10	710	102	89	13.5		76
N-7	15.0	307.890	2.40	1.05	1.05	710	106	89	13.0		76
N-6	17.5	309.130	1.10	0.49	0.49	650	105	89	8.5		77
N-5	20.0	310.341	1.30	0.58	0.58	640	106	90	9.0		75
N-4	22.5	311.715	1.70	0.75	0.75	640	108	90	11.0		74
N-3	25.0	312.952	1.50	0.65	0.65	630	109	91	9.0		74
N-2	27.5	314.200	1.20	0.53	0.53	630	109	91	9.0		74
N-1	30.0 1145	315.419	1.15	0.51	0.51	630	110	91	9.5		76
—	1510 ~~1500~~	315.469 *	—	—	—	—	—	—	—	—	—
W-8	32.5	317.251	2.30	1.10	1.10	780	94	92	9.5		68
W-8	35.0	318.901	2.30	1.10	1.10	770	96	92	11.0		68
W-8	37.5	320.542	2.30	1.10	1.10	760	99	92	13.0		70
W-8	40.0	322.152	2.30	1.10	1.10	770	102	92	16.0		75
W-8	42.5	323.751	2.30	1.10	1.10	790	104	92	20.0		77
W-7	45.0	325.471	2.00	1.00	1.00	790	107	92	10.0		75
W-6	47.5	326.500	1.20	0.58	0.58	800	103	92	9.0		80
W-5	50.0	327.900	0.94	0.46	0.46	800	103	92	13.0		78
W-4	52.5	328.966	1.00	0.49	0.49	820	103	92	13.0		78
W-3	55.0	329.942	0.94	0.47	0.47	770	96	~~96~~ 92	7.0		80

COMMENTS:

LEAKAGE RATE - 0 CFM @ 17" Hg

EPA (Dur) 235
4 72

* THIRD IMPINGER SOLUTION HAD CRYSTALIZED, removed and replaced

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 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
			329.942									
W-2	57.5		331.070	0.92	0.45	0.45	770	98	92	6		76
W-1	60.0	1545	332.047	0.72	0.35	0.35	760	99	92	6		68

33.926 X 530/555 = 32.40 Scf

*Note - glass probe found broken during clean-up - Suspected increased cfms

EPA (Dur) 236
4 72

DRY MOLECULAR WEIGHT DETERMINATION

PLANT STAUFFER CHEMICAL

DATE 18 JULY 72

SAMPLING TIME (24-hr CLOCK) 1100 - 1600 RUN 3AK

SAMPLING LOCATION KILN SCRUBBER INLET

SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) CONTINUOUS BAG

ANALYTICAL METHOD ORSAT

AMBIENT TEMPERATURE 90°F

OPERATOR C.F.

COMMENTS:

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	16.6	16.6	16.0	16.0	15.6	15.6	16.0	44/100	7.04
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	22.8	6.2	23.6	7.6	26.0	10.4	8.0	32/100	2.56
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)	26.2	3.4	26.4	2.8	26.5	0.5	2.2	28/100	0.62
N_2 (NET IS 100 MINUS ACTUAL CO READING)	~~73.8~~	73.8	~~73.6~~	73.6	~~73.5~~	73.5	73.8 73.2	28/100	20.66 20.61
								TOTAL	30.88 30.83

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LABORATORY DATA

PLANT Stauffer - Tarpon Springs

TEST NO. 3 AK

LOCATION

DATE 18 July 72

SITE Inlet - Kiln - Spray Tower

Box # 3

CONTAINER/FILTER NUMBER	WEIGHT OF PARTICULATE COLLECTED, M_n grams		
	FINAL WEIGHT	TARE WEIGHT	WEIGHT GAIN
72 357			
~~[illegible]~~			
TOTAL			

FILTER DRYING PROCEDURE

	VOLUME OF CONDENSATE COLLECTED, V_c	
	IMPINGER VOLUME, ml	SILICA GEL WEIGHT g
FINAL	~~[illegible]~~ 470 ml	210.3 g → [illegible]
INITIAL	300 ml	200 g
LIQUID COLLECTED	170	* [illegible] = 10.3
TOTAL VOLUME COLLECTED	~~[illegible]~~ 180.3	g = [illegible] ml

Assume 20% moisture - [illegible] [illegible]

Equivalent condensate volume: V_{w_c} = 0.0474 x V_c = 0.0474 x 180.3 = 8.55 scf

* Note: Impinger final volume not actual - [illegible]

NOMOGRAPH DATA

PLANT STAUFFER CHEMICAL Co. - TARPON SPRINGS

DATE 18 July 1972

SAMPLING LOCATION NODULIZING KILN - INLET to Spray Tower

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H_2O	$\Delta H_@$	1.39
AVERAGE METER TEMPERATURE (AMBIENT + 20 °F), °F	$T_{m\,avg.}$	90
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	16
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	30.22
STATIC PRESSURE IN STACK, in. ~~Hg~~ Water ($P_m \pm 0.073$ x STACK GAUGE PRESSURE in in. H_2O)	P_s	-9.6
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s/P_m	1
AVERAGE STACK TEMPERATURE, °F	$T_{s\,avg.}$	700
AVERAGE VELOCITY HEAD, in. H_2O	$\Delta p_{avg.}$	1.23
MAXIMUM VELOCITY HEAD, in. H_2O	$\Delta p_{max.}$	1.67
C FACTOR		~~.64~~ .66
CALCULATED NOZZLE DIAMETER, in.		~~0.1875~~ .250
ACTUAL NOZZLE DIAMETER, in.		0.1875
REFERENCE Δp, in. H_2O		1.0 ⇒ 0.42 ΔH

EPA (Dur) 234
4/72

GAS VELOCITY AND VOLUME DATA

Test No. 3

Location ~~Inlet to Neutralizing~~ ~~K.to Spray Tower~~

VELOCITY TRAVERSE DATA

Point	Position Inches[a]	Reading, Δp "H_2O	$\sqrt{\Delta p}$	T_s °F
N-8		2.55	1.6	720
8		2.55	1.6	720
8		2.55	1.6	715
8		2.55	1.6	715
7		3.48	1.86	710
6		1.10	1.05	710
5		1.30	1.14	650
4		1.70	1.30	640
3		1.50	1.22	640
2		1.20	1.13	630
1		1.15	1.07	630
				630
W-8		2.30	1.52	780
8		2.30	1.52	770
8		2.30	1.52	760
8		2.30	1.52	770
8		2.30	1.52	790
7		2.00	1.42	770
6		1.20	1.13	800
5		0.94	.97	800
4		1.00	1.00	820
3		0.94	.97	770
2		0.92	.96	770
1		0.72	.85	760
Total		-	29.31	17490
Average		-	~~1.21~~ 1.22	729

a) From outside of port to sampling point.

Pitot tube 15"

Manometer 0-3"

Thermometer DIAL

Data Recorder R. S. AMICK

Date 18 July 1972

Stack Inside Dimensions 43" I.D.

Stack Area, A_s = 14.52 sq. ft.

Barometric Pressure, P_b = 30.22 "Hg

Stack Gage Pressure = −12.2 "H_2O

Stack Abs. Pressure, P_s = $-.90 \frac{"H_2O}{13.6}$ + P_b = 29.32 "Hg

Stack Gas Temp., T_s = 729 °F + 460 = 1189 °R

Molecular Weight of Stack Gas, M_s = _____

$V_s = 174 \sqrt{\Delta p}\ Cp \sqrt{T_s \times \frac{29.92}{P_s} \times \frac{29}{M_s}}$ ft/min.

V_s = 174 (~~2.15~~ 1.22)(.85) $\sqrt{1189 \frac{29.92}{29.32} \times 1}$ = 6279 (1213 34.8)

Q, Volume = _____ ft/min. x _____ sq. ft. = _____ cfm

Q_w, Standard Volume at 70°F and 29.92 "Hg (Wet Basis) =

$Q \times \frac{530}{T_s} \times \frac{P_s}{29.92}$ = 17.7 x _____ x _____ = _____

$Q_s = Q_w \times (100-W)/100$ = _____

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Velocity Traverse for volume

GAS VELOCITY AND VOLUME DATA

Test No. 3

Location Inlet to Nodulizing Kiln Spray Tower

VELOCITY TRAVERSE DATA

Point	Position Inches[a]	Reading, Δp "H_2O	$\sqrt{\Delta p}$	T_s °F
1		0.64		725
2		0.85		
3		1.05		
4		1.10		
5		1.10		
6		1.15		
7		1.75		
8		2.05		
9		2.05		
10		1.95		
11		1.80		
12		1.25		
1		0.90		
2		1.05		
3		1.10		
4		1.25		
5		1.35		
6		1.35		
7		1.70		
8		1.90		
9		2.00		
10		2.00		
11		1.95		
12		1.50		
Total				
Average		-		

a) From outside of port to sampling point.

Pitot tube 5"

Manometer 0-3"

Thermometer DIAL

Data Recorder EM

Date 18 July 72

Stack Inside Dimensions 43"

Stack Area, A_s = _____ sq. ft.

Barometric Pressure, P_b = _____ "Hg

Stack Gage Pressure = _____ "H_2O

Stack Abs. Pressure, P_s = _____ $\frac{\text{"}H_2O}{13.6}$ + P_b = _____ "Hg

Stack Gas Temp., T_s = _____ °F + 460 = _____ °R

Molecular Weight of Stack Gas, M_s = _____

$$V_s = 174 \sqrt{\Delta p}\ Cp \sqrt{T_s \times \frac{29.92}{P_s} \times \frac{29}{M_s}}\ \text{ft/min.}$$

V_s =

Q, Volume = _____ ft/min. x _____ sq. ft. = _____ cfm

Q_w, Standard Volume at 70°F and 29.92 "Hg (Wet Basis) =

$$Q \times \frac{530}{T_s} \times \frac{P_s}{29.92} = 17.7 \times \_\_\_\_ \times \_\_\_\_ = \_\_\_\_$$

$Q_s = Q_w \times (100-W)/100$ = _____

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PERCENT ISOKINETIC DETERMINATION

Plant STAUFFER CHEMICAL COMPANY - TARPON

Run Number 3

Location Nodulizing Kiln Spray Tower Inlet

Date 18 July 72 Time ~~[illegible]~~ 1115 - 1615

Operator Frank Meadows

I. Pitot Velocity:

From Velocity Traverse Sheet = 6279 fpm $\times \frac{1}{60}$ = 104.65 fps

II. Percent Moisture

(Wt. in grams of moisture collected + grain wt. increase in silica gel) x .0474 = scf

(~~[illegible]~~) x .0474 = ~~[illegible]~~ 8.6 - assume for approximation purposes. scf

$$\% \text{ moisture} = \frac{\text{scf of moisture}}{\text{scf of moisture + meter scf}} \times 100$$

$$\frac{(\text{~~[illegible]~~})}{(\text{~~[illegible]~~}) + (\text{~~[illegible]~~})} \times 100 = \text{~~[illegible]~~ } 20 \text{ \% moisture}$$

III. Percent Isokinetic

$$= \frac{(1.667)\left[(0.00267)(\text{Total Moisture in mls.}) + \frac{V_m}{T_m}\left(P_{bar} + \frac{\Delta H}{13.6}\right)\right] \times T_s}{\theta \times V_s \times P_s \times A_n}$$

$$= \frac{(1.667)\left[(.00267)(\overset{.48}{\cancel{V8}}) + \frac{(33.93)}{(555)}\left(30.22 + \frac{\overset{.90}{\cancel{.07}}}{13.6}\right)\right] \times (1189)}{(60)(104.7)(29.32)(.000192)}$$

= 130.02 % Note: Approximation of moisture content one of probable explanations for high % isokinetic - in addition - several

where:

I = Percent of isokinetic sampling.

V_{lc} = Total volume of liquid collected in impingers and silica gel (see Fig. 5-3), ml.

ρ_{H_2O} = Density of water, 1 g/ml.

R = Ideal gas constant, 21.85 inches Hg cu. ft./lb.-mole °R.

Mw_{H_2O} = Molecular weight of water, 18 lb./lb.-mole.

V_m = Volume of gas sample through the dry gas meter (meter conditions), cu. ft.

T_m = Absolute average dry gas meter temperature (see Figure 5-2), °R.

P_{bar} = Barometric pressure at sampling site, inches Hg.

ΔH = Average pressure drop across the orifice (see Fig. 5-2), inches H_2O.

T_s = Absolute average stack gas temperature (see Fig. 5-2), °R.

θ = Total sampling time, min.

V_s = Stack gas velocity calculated by Method 2, [illegible]

~~Note: % isokinetic not calculat~~

* Note: Pyrex glass probe discovered broken during clean-up

FIELD DATA

PLANT STAUFFER CHEMICAL
DATE 18 JULY 72
SAMPLING LOCATION KILN SCRUBBER OUTLET
SAMPLE TYPE FLOURIDES
RUN NUMBER 3 - BK
OPERATOR G.F., G.P., B.Z.
AMBIENT TEMPERATURE 90
BAROMETRIC PRESSURE 30.22
STATIC PRESSURE, (P_s) Ø
FILTER NUMBER (s)

PROBE LENGTH AND TYPE GLASS LINED W/FLEXIBLE TEFLON CONNECTOR.
NOZZLE I.D. 1.426
ASSUMED MOISTURE, % 18
SAMPLE BOX NUMBER 2
METER BOX NUMBER 7
METER $\Delta H_@$ 1.55 @ 0.75 CFM
C FACTOR N/A
PROBE HEATER SETTING N/A
HEATER BOX SETTING N/A
REFERENCE Δp

Lower (B) outlet
Sample rate
≈ 0.58 cfm

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 2 MINUTES

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 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	500.898									
B-1	2	501.42					86	87	7		
2	4	502.14					87	87	9		71
3	6	502.93					88	87	15		68
4	8	503.85			0.50	139	89	87	16		
5	10	504.75			0.42	140	90	87	17		
6	12	505.53			0.43	140	91	88	18		68
7	14	506.35			0.41		92	88	19		69
8	16	507.11			0.33		93	88	19		70
9	18	507.91			0.42		94	88	20		
10	20	508.72			0.40		95	88	21		70
11	22	509.61			0.53		96	89	21		
12	24	510.50			0.82	140	97	89	21		
13	26	511.59			0.87	140	100	90	20		
14	28	512.73			0.88	140	101	90	20		74
15	30	513.673			0.86		102	90	20		
D-1	32	514.69			0.92		93	91	15		73
2	34	515.94			0.95		95	91	18		80
3	36	517.07									75
4	38	518.24			0.92		98	91	18		
5	40	519.40			0.91		100	92	18		78
6	42	520.55			0.90		101	92	18		
7	44	521.71			0.90		103	93	18		

COMMENTS: LEAKAGE @ 15" Hg = 0 CFM

NOTE: INTERMITTENT STOPS DURING SAMPLING OF LAST PORT DUE TO RAIN & POWER FAILURES

EPA (Dur) 235
4 72

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		INLET ($T_{m\,in}$), °F	OUTLET ($T_{m\,out}$), °F			
D-8	46	522.88			0.90	140	105	93	18		75
9	48	524.02			0.89	139	107	94	18		78
10	50	525.19			0.89		108	94	19		77
11	52	526.32			0.88		108	95	19		
12	54	527.47			0.95		109	95	19		77
13	56	528.69			0.97		110	95	19		
14	58	529.88			0.98	141	110	95	19		77
15	60	530.923			0.98		111	96	19		
E-1	62	531.90			0.98		96	94	13		
2	64	533.18			1.00		96	95	14		72
3	66	534.41			0.98		97	95	13		71
4	68	535.58			0.98	135	99	95	12		74
5	70	536.76			0.98		100	95	12		75
6	72	538.98 ~~[illegible]~~			0.99	141	102	95	12		77
7	74	539.19			0.99	135	103	95	12		78
8	76	540.40			0.98	120	105	95	12		82
9	78	541.55			0.96		106	96	12		
10	80	542.76			0.96		106	96	12		79
11	82	543.97			0.96		107	96	11		
12	84	545.12			0.96		107	96	12		79
13	86	546.27			0.96		108	97	12		81
14	88	547.40			0.94		108	97	13		80
15	90	548.448			0.85		108	97	14		
H-1	92	549.36					95	95			
2	94	550.32			0.75		94	92	15		
3	96	551.29					94	92			
4	98	552.40			0.65	130.	94	92	22		
5	100	552.98			0.57		94	92			
6	102	553.78			0.50		94	92			
7	104	554.25			0.51		96	92	19		
8	106	555.53			0.55		96	92	22		
9	108	556.27			0.40	130	96	92	15		78
10	110	557.18			0.60		98	92	20		
11	112	558.16			0.57		98	92	20		
12	114	559.00			0.55		99	93	20		

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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 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
H-13	116	559.94			0.65		100	93	20		77
14	118	560.94			0.60		100	93	20		77
15	120	561.806			0.65	135	101	93	20		

$60.908 - \frac{\cancel{150}}{120} = .507$ cfm

$60.908 \times \frac{530}{555} = 58.16$ scf

% moisture $= \frac{2.75 \text{ scf}}{2.7 + 58.16} = 4.4\%$

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LABORATORY DATA

PLANT Stauffer - Tarpon Springs

TEST NO. #3 BK

LOCATION TARPON SPRINGS

DATE 18 July 72

SITE Outlet - Kiln

Box #2

CONTAINER/FILTER NUMBER	WEIGHT OF PARTICULATE COLLECTED, M_n grams		
	FINAL WEIGHT	TARE WEIGHT	WEIGHT GAIN
72 478			
TOTAL			

FILTER DRYING PROCEDURE _____

	VOLUME OF CONDENSATE COLLECTED, V_c	
	IMPINGER VOLUME, ml	SILICA GEL WEIGHT g
FINAL	575 ml	215.1
INITIAL	300 ml	200 g
LIQUID COLLECTED	275	15.1
TOTAL VOLUME COLLECTED	290.1	g = ml

Equivalent condensate volume: $V_{w_c} = 0.0474 \times V_c = 0.0474 \times$ 290.1 = 13.8 scf

FIELD DATA

PLANT STAUFFER CHEMICAL
DATE 18 JULY 72
SAMPLING LOCATION KILN SCRUBBER OUTLET
SAMPLE TYPE FLOURIDES
RUN NUMBER 3 CK
OPERATOR Cr.F. G.P. B.Z.
AMBIENT TEMPERATURE 90
BAROMETRIC PRESSURE 30.22
STATIC PRESSURE, (P_s) Ø
FILTER NUMBER (s)

PROBE LENGTH AND TYPE GLASS LINED W/ FLEXIBLE TEFLON CONNECTOR
NOZZLE I.D. 1.434
ASSUMED MOISTURE, % 15
SAMPLE BOX NUMBER 1
METER BOX NUMBER 3
METER $\Delta H_@$ 1.52 @ 0.75 CFM
C FACTOR N/A
PROBE HEATER SETTING N/A
HEATER BOX SETTING N/A
REFERENCE Δp

Upper (C) Outlet
Sample rate = 0.58 cfm

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 2 MINUTES

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 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 / 1040	966.907									
A-1	2	967.32				132	84	85	10		
2	4	967.90				140	85	86	13	~~70~~	70
3	6	968.44				140	85	86	15		
4	8	969.02					85	86			69
5	10	969.58			0.25		86	86	18		
6	12	970.19			0.22		87	87	20		68
7	14	970.76				140	88	87	20		68
8	16	971.34			0.21	139	89	87	20		
9	18	971.92			0.20	140	90	87	21		69
10	20	972.49			0.20	140	90	87	21		
11	22	973.06			0.20	140	91	87	21		69
12	24	973.63			0.20		92	88	21		
13	26	974.21			0.20		92	88	21		
14	28	974.78			0.20		93	88	21		70
15	30	975.352			0.20		94	88	21		
C-1	32 / 1158	975.96			0.22		87	87	18		72
2	34	976.57			0.21		89	88	20		
3	36	977.18			0.21		90	88	20		72
4	38	977.81			0.21		91	88	21		75
5	40	978.44			0.22	130	92	88	21		
6	42	979.05			0.22	140	93	89	21		84
7	44	979.68			0.22		94	89	21		

COMMENTS: LEAKAGE @ 15" Hg = 0 CFM

NOTE: WHEN MOVING FROM PORT "C" TO PORT "E" THE WELD ON THE NOZZLE NECK CRACKED & NOZZLE FELL OFF INTO STACK. (APPROX. 1235 P.M.)

EPA (Dur) 235
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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 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
C-8	46	980.30			0.22		96	90	21		85
9	48	980.91			0.22		97	90	21		85
10	50	981.53			0.22	140	99	90	21		85
11	52	982.14			0.22	140	100	91	21		
12	54	982.77			0.22		100	91	21		
13	56	983.40			0.22		101	91	21		87
14	58	984.00			0.22	140	102	92	21		88
15	60	984.565			0.22		103	92	21		
E-1	62 \ 1327	985.11				125	92	91	15		
2	64	985.70				135	92	91			74
3	66	986.26				110	93	92	15		74
4	68	986.81					95	92	13		75
5	70	987.33			0.12		95	92	13		75
6	72	987.80			0.06		96	93	6		76
7	74	988.16			0.05		96	93	5		78
8	76	988.51			0.04	138	96	93	5		87
9	78	988.83			0.04		96	93	5		81
10	80	989.15			0.04	139	96	93	5		
11	82	989.47			0.04		96	93	5		
12	84	989.78			0.04		97	93	5		81
13	86	990.10			0.04	133	97	93	5		81
14	88	990.40			0.04		97	93	5		81
15	90	990.711			0.04		97	93	5		
G-1	92 \ 1428	991.03			0.04		92	91	5		
2	94	991.28			0.04		92	91	5		
3	96	991.54			0.04		90	90	5		
4	98	991.83			0.04	139	90	90	5		
5	100	992.12			0.04		90	90	5		
6	102	992.43			0.04		90	90	5		
7	104	992.72			0.04		90	90	5		
8	106	992.95			0.04		90	90	5		
9	108	993.21			0.04		90	90	5		
10	110	993.47			0.04		90	90	5		85
11	112	993.72			0.04	140	90	90	5		
12	114	994.00			0.04	135	90	89	5		

EPA (Dur) 236
4 72

NOTE: USED ½ NOZZLE FOR PORTS "E" & "G"
- Sample Rate ≈ 0.15 cfm

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 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
G-13	116	993.26			0.04		90	90	5		85
14	118	994.52			0.04	135	90	90	5		86
15	120	994.794			0.04		90	90	5		

27.887 cf ÷ ~~130~~ 120 minutes = ~~.154 cfm~~ .232 cfm

= × 530/555 = 26.63 scf

% moisture = 13.8 / (13.8 + 26.63) = 34.13%

EPA (Dur) 236
4 72

NOTE: INTERMITTENT STOPS DURING SAMPLING OF LAST PORT DUE TO RAIN & POWER FAILURES

DRY MOLECULAR WEIGHT DETERMINATION

PLANT STAUFFER CHEMICAL
DATE 18 JULY 72
SAMPLING TIME (24-hr CLOCK) 1100 - 1600
SAMPLING LOCATION KILN SCRUBBER OUTLET 3B+CK
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) CONTINUOUS BAG
ANALYTICAL METHOD ORSAT
AMBIENT TEMPERATURE 90°F
OPERATOR Cr. F.

COMMENTS:

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	0.3	0.3	0.2	0.2	0.2	0.2	0.23	44/100	0.10
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	24.2	23.9	23.9	23.7	24.6	24.4	24.0	32/100	7.68
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)	25.7	1.5	25.6	1.7	25.5	0.9	1.36	28/100	0.38
N_2 (NET IS 100 MINUS ACTUAL CO READING)	~~74.3~~ ~~24.3~~	74.3	~~74.4~~ ~~24.4~~	74.4	~~74.5~~ ~~24.5~~	74.5	74.4	28/100	20.83
								TOTAL	28.99

EPA (Dur) 230
4/72

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LABORATORY DATA

PLANT Stauffer-Tarpon Spring

TEST NO. 3CK

LOCATION Tarpon Springs

DATE 18 July 72

SITE OUTLET-KILN

Box #1

CONTAINER/FILTER NUMBER	WEIGHT OF PARTICULATE COLLECTED, M_n grams		
	FINAL WEIGHT	TARE WEIGHT	WEIGHT GAIN
72 4835			
TOTAL			

FILTER DRYING PROCEDURE _____

	VOLUME OF CONDENSATE COLLECTED, V_c	
	IMPINGER VOLUME, ml	SILICA GEL WEIGHT g
FINAL	350ml	206.5g
INITIAL	300ml	200g
LIQUID COLLECTED	50ml	6.5
TOTAL VOLUME COLLECTED	56.5	g = ml

Equivalent condensate volume: $V_{w_c} = 0.0474 \times V_c = 0.0474 \times$ 56.5 = 2.7 scf

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT Stauffer Chemical - Tarpon Springs
DATE 30 June 72
SAMPLING LOCATION Nodulating Kiln Spray Tower Outlet
INSIDE OF FAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE A) 271.2"
INSIDE OF NEAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE B) 6"
STACK I.D., (DISTANCE A - DISTANCE B) 265.2"
NEAREST UPSTREAM DISTURBANCE ~~[illegible]~~ 78'
NEAREST DOWNSTREAM DISTURBANCE ≈6'
CALCULATOR RAZ

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	.008	265.2	2.12	6	8.1
2	.026		6.9		12.9
3	.044		11.7		17.7
4	.062		16.4		22.4
5	.082		21.7		27.7
6	.102		27.1		33.1
7	.124		32.9		38.9
8	.146		38.7		44.7
9	.171		45.3		51.3
10	.197		52.2		58.2
11	.226		59.9		65.9
12	.258		68.4		74.4
13	.296		75.5		84.5
14	.342		90.7		96.7
15	.409		108.5		114.5
16	.591		156.7		162.7
17	.658		174.5		180.5
18	.704		156.7		192.7
19	.742		196.8		202.8
20	.774		205.3		211.3
21	.803		213.0		219.0
22	.829		219.9		225.9
23	.854		226.5		232.5
24	.876		232.3		239.3

PAGE 3 of 2

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT Stauffer Chemical - Tarpon Springs
DATE 20 JUNE 72
SAMPLING LOCATION Nodulating Kiln - Spray Tower Outlet
INSIDE OF FAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE A) 271.2"
INSIDE OF NEAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE B) 6"
STACK I.D., (DISTANCE A - DISTANCE B) 265.2"
NEAREST UPSTREAM DISTURBANCE
NEAREST DOWNSTREAM DISTURBANCE
CALCULATOR RAZ

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)
25	.898	265.2	238.1	6	244.1
26	.918		243.5		249.5
27	.938		248.8		254.8
28	.956		253.5		259.5
29	.974		258.3		264.3
30	.992		263.1		269.1

EPA (Dur) 232

FIELD DATA

PLANT STAUFFER
DATE 20 JULY 72
SAMPLING LOCATION KILN SCRUBBER INLET
SAMPLE TYPE PARTICULATE
RUN NUMBER 1
OPERATOR FM
AMBIENT TEMPERATURE
BAROMETRIC PRESSURE 30.60
STATIC PRESSURE, (P_s) -12.2
FILTER NUMBER (s) SEE CLEANUP SHEET

PROBE LENGTH AND TYPE
NOZZLE I.D. 3/16"
ASSUMED MOISTURE, % 16
SAMPLE BOX NUMBER —
METER BOX NUMBER —
METER $\Delta H_@$ 1.37 @ 0.75 CFM
C FACTOR 0.66
PROBE HEATER SETTING —
HEATER BOX SETTING
REFERENCE Δp —

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY _____ MINUTES

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		INLET ($T_{m\,in}$), °F	OUTLET ($T_{m\,out}$), °F			
	0 / 1500	351.309									
W-6	5	353.500	0.90	0.39	0.39	670	88	86	5.5	280	77
W-5	10	355.188	0.55	0.23	0.23	640	91	86	5.5	250	80
W-4	15	356.744	0.58	0.25	0.25	620	93	87	5.5	~~280~~ 255	81
W-3	20	358.268	0.55	0.23	0.23	640	95	87	5.5	250	82
W-2	25	359.700	0.42	0.18	0.18	660	97	88	5.5	260	82
W-1	30	361.371	0.53	0.23	0.23	640	97	88	5.5	275	81
N-6	35	363.524	1.20	~~0.35~~	0.50	650	89	86	5.5	250	78
N-5	40	365.749	1.20	0.52	0.52	650	92	87	5.5	255	77
N-4	45	368.160	1.40	0.60	0.60	650	96	87	5.5	~~235~~ 235	79
N-3	50	370.585	1.40	0.60	0.60	660	99	87	5.5	250	80
N-2	55	372.971	1.35	0.59	0.59	670	102	89	5.5	215	81
N-1	60	375.610	0.97	0.42	0.42	670	103	89	5.5	275	81

23.701 ACF X $\frac{530}{550}$ = 22.84 SCF

COMMENTS:

LEAKAGE RATE - 0.01 CFM @ 16" Hg

EPA (Dur) 235
4 72

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LABORATORY DATA

PLANT STAUFFER-TARPON

TEST NO. 1 - PARTICULATE

LOCATION TARPON SPRINGS, FLA. ~~KILN SCRUBBER INLET~~

DATE 20 July 1972

SITE KILN SCRUBBER INLET

BOX # 1

CONTAINER/FILTER NUMBER	WEIGHT OF PARTICULATE COLLECTED, M_n grams		
	FINAL WEIGHT	TARE WEIGHT	WEIGHT GAIN
~~72-413~~			
72-411			
~~72-412~~			
TOTAL			

FILTER DRYING PROCEDURE _____

	VOLUME OF CONDENSATE COLLECTED, V_c	
	IMPINGER VOLUME, ml	SILICA GEL WEIGHT g
FINAL	308	~~261.0~~ 261.0
INITIAL	200	247.0
LIQUID COLLECTED	108	14.0
TOTAL VOLUME COLLECTED	122	g = 122 ml

Equivalent condensate volume: $V_{w_c} = 0.0474 \times V_c = 0.0474 \times 122$

122 = 5.78 scf

GAS VELOCITY AND VOLUME DATA

VELOCITY TRAVERSE DATA

Test No. 1

Location Kiln Spray Tower Inlet

Particulate DATA FROM METER SHEET

Point	Position Inches[a]	Reading, Δp "H_2O	$\sqrt{\Delta p}$	T_s °F
W-6		.90	.947	676
-5		.55	.740	640
4		.58	.760	620
3		.55	.740	640
2		.42	.646	660
1		.53	.726	640
N-6		1.20	1.09	650
-5		1.20	1.09	650
4		1.40	1.18	650
3		1.40	1.18	660
2		1.35	1.16	670
1		0.97	.984	670
				7870
Total		-	11.243	~~13500~~
Average		-	.94	~~1~~652

12
600
7200

a) From outside of port to sampling point.

Pitot tube "S" - Partial traverse

Manometer 0-3"

Thermometer DIAL

Data Recorder E. MEADOWS

Date 20 July 1972

Stack Inside Dimensions 43"

Stack Area, A_s = _____ sq. ft.

Barometric Pressure, P_b = 30.15 "Hg

Stack Gage Pressure = -12.2 "H_2O

Stack Abs. Pressure, P_s = $\frac{-.90 \text{ "}H_2O}{13.6}$ + P_b = 29.25 "Hg

Stack Gas Temp., T_s = 652 °F + 460 = 1112 °R

Molecular Weight of Stack Gas, M_s = _____

$V_s = 174 \sqrt{\Delta p}\ Cp \sqrt{T_s \times \frac{29.92}{P_s} \times \frac{29}{M_s}}$ ft/min.

36 1137.47

$V_s = 174(.94)(.85)\sqrt{1112 \times \frac{29.92}{29.25} \times 1}$ = ~~5004~~ 5009 ft/min

Q, Volume = _____ ft/min. x _____ sq. ft. = _____ cfm

Q_w, Standard Volume at 70°F and 29.92 "Hg (Wet Basis) =

$Q \times \frac{530}{T_s} \times \frac{P_s}{29.92}$ = 17.7 x _____ x _____ = _____

$Q_s = Q_w \times (100-W)/100$ = _____

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GAS VELOCITY AND VOLUME DATA

Velocity Traverse
For Volume Determination

Test No. 1

Location Inlet Spray ~~Tower Kiln~~ Particulate

VELOCITY TRAVERSE DATA

Point	Position Inches[a]	Reading, Δp "H_2O	$\sqrt{\Delta p}$	T_s °F
N-1		.90		665
2		1.10		
3		1.20		
4		1.30		
5		1.20		
6		1.30		
7		1.70		
8		1.90		
9		1.95		
10		1.85		
11		1.60		
12		1.20		
W-1		1.10		
2		1.50		
3		1.60		
4		1.90		
5		1.80		
6		1.70		
7		1.40		
8		1.30		
9		1.40		
10		1.20		
11		1.10		
12		.83		
Total		-		
Average		-		

Stack Inside Dimensions 43"

Stack Area, A_s = _____ sq. ft.

Barometric Pressure, P_b = 30.15 "Hg

Stack Gage Pressure = -12.2 "H_2O

Stack Abs. Pressure, P_s = $\frac{-.90 \text{ "}H_2O}{13.6}$ + P_b = 29.25 "Hg

Stack Gas Temp., T_s = 665 °F + 460 = 1125 °R

Molecular Weight of Stack Gas, M_s = _____

$V_s = 174 \sqrt{\Delta p}\ Cp \sqrt{T_s \times \frac{29.92}{P_s} \times \frac{29}{M_s}}$ ft/min.

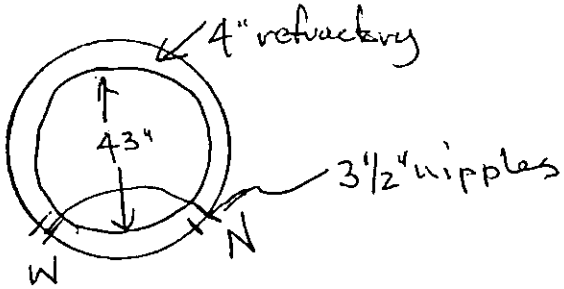
V_s =

Q, Volume = _____ ft/min. x _____ sq. ft. = _____ cfm

Q_w, Standard Volume at 70°F and 29.92 "Hg (Wet Basis) =

$Q \times \frac{530}{T_s} \times \frac{P_s}{29.92}$ = 17.7 x _____ x _____ = _____

$Q_s = Q_w \times (100-W)/100$ = _____



a) From outside of port to sampling point.

Pitot tube 5"
Manometer 0-3"
Thermometer Dial

Time: 1900

Data Recorder R SA & G. Riley

Date 20 July 72

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DRY MOLECULAR WEIGHT DETERMINATION

PLANT STAUFER CHEMICAL CO. (TARPON SPRINGS, FLA.)
DATE 20 JULY '72
SAMPLING TIME (24-hr CLOCK) 1500 - 1730
SAMPLING LOCATION INLET - PARTICULATE TEST
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) BAG - CONTINUOUS
ANALYTICAL METHOD ORSAT
AMBIENT TEMPERATURE 90°F
OPERATOR F. MEADOWS, D. ARMENTROUT

COMMENTS:

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	18.4	18.4	18.7	18.7	18.6	18.6	18.57	44/100	8.0
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	32.4	13.5	31.1	12.4	32.0	13.4	12.1	32/100	12.9
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)	32.7	3.8	32.6	1.5	32.5	0.5	1.93	28/100	2.2
N_2 (NET IS 100 MINUS ACTUAL CO READING)	67.3	67.3		67.4		67.5	32.6 67.40	28/100	18.87
								TOTAL	

EPA (Dur) 230
4/72

PERCENT ISOKINETIC DETERMINATION

Plant STAUFFER CHEMICAL COMPANY - T

Run Number 1 - IN

Location TARPON SPRINGS, FLORIDA

Date 20 July 1972 Time 1215 - 1720

Operator F. MEADOWS

I. Pitot Velocity:

From Velocity Traverse Sheet = 5004 fpm $\times \frac{1}{60}$ = 83.42 fps

II. Percent Moisture

(Wt. in grams of moisture collected + grain wt. increase in silica gel) x .0474 = scf

(122) x .0474 = 5.78 scf

$$\% \text{ moisture} = \frac{\text{scf of moisture}}{\text{scf of moisture + meter scf}} \times 100$$

$$\frac{(5.78)}{(5.78) + (22.84)} \times 100 = 20.20\% \text{ moisture}$$

III. Percent Isokinetic

$$= \frac{(1.667)[(0.00267)(\text{Total Moisture in mls.}) + \frac{V_m}{T_m}\left(P_{bar} + \frac{\Delta H}{13.6}\right) \times T_s}{\theta \times V_s \times P_s \times A_n}$$

$$= \frac{(1.667)[(.00267)(122) + \frac{(23.7)}{(550)}(30.15 + \frac{.357}{13.6})] \times (1125)}{(60)(83.42)(29.25)(.000192)}$$

= 108.4 %

where:

I = Percent of isokinetic sampling.

V_{lc} = Total volume of liquid collected in impingers and silica gel (See Fig. 5-3), ml.

ρ_{H_2O} = Density of water, 1 g/ml.

R = Ideal gas constant, 21.83 inches Hg-cu. ft./lb.-mole-°R.

Mw_{H_2O} = Molecular weight of water, 18 lb./lb.-mole.

V_m = Volume of gas sample through the dry gas meter (meter conditions), cu. ft.

T_m = Absolute average dry gas meter temperature (see Figure 5-2), °R.

P_{bar} = Barometric pressure at sampling site, inches Hg.

ΔH = Average pressure drop across the orifice (see Fig. 5-2), inches H_2O.

T_s = Absolute average stack gas temperature (See Fig. 5-2), °R.

θ = Total sampling time, min.

V_s = Stack gas velocity calculated by Method 2, Equation 2-2, ft./sec.

P_s = Absolute stack gas pressure, inches Hg.

A_n = Cross-sectional area of nozzle, sq. ft.

FIELD DATA

PLANT STAUFFER CHEMICAL
DATE 20 JULY 72
SAMPLING LOCATION KILN SCRUBBER OUTLET
SAMPLE TYPE PARTICULATES
RUN NUMBER 1
OPERATOR G.F., G.P., B.B.
AMBIENT TEMPERATURE
BAROMETRIC PRESSURE 30.15
STATIC PRESSURE, (P_s)
FILTER NUMBER (s)

VOID

PROBE LENGTH AND TYPE GLASS LINED / FLEXIBLE CONN.
NOZZLE I.D. 0.930
ASSUMED MOISTURE, %
SAMPLE BOX NUMBER 3
METER BOX NUMBER 7
METER $\Delta H_@$ 1.55 @ 0.75 CFM
C FACTOR
PROBE HEATER SETTING
HEATER BOX SETTING
REFERENCE Δp

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 2 MINUTES

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		INLET ($T_{m\,in}$), °F	OUTLET ($T_{m\,out}$), °F			
	0 / 0940	561.868									
B-1	2	562.56		0.33	0.33		84	84	4		
2	4	563.25		0.33	0.33		84	84	4	~~34~~ 260	~~260~~ 74
3	6	563.95			0.33	125	84	84	4	~~73~~	73
4	8	564.65			0.33	126	85	84	4		
5	10	565.34			0.33	128	85	83	4	300	73
6	12	566.03			0.33		86	84	5	270	73
7	14	566.65			0.15		87	84	4		
8	16	567.22			0.20		87	84	4	230	
9	18	567.82			0.25		87	84	5		
10	20	568.45			0.30		86	84	6		74
11	22	569.09			0.33		88	85	7	260	
12	24	569.69			0.25	128	89	85	7		75
13	26	570.17			0.15	128	89	85	7	250	76
14	28	570.64			0.13		89	85	7	240	78
15	30	571.173			0.13		89	86	6		
D-1	32	571.94			0.40		86	86	6		
2	34	572.54			0.40		86	86	6	250	75
3	36	573.34			0.40	112	87	86	10		
4	38	574.07			0.40		87	86	12		73
5	40	574.82			0.40	110	88	87	15		
6	42	575.56			0.40		90	87	16		72
7	44	576.33			0.40		90	87	16		

COMMENTS: LEAKAGE RATE @ 15" Hg = 0 CFM

Filter plugging problems - decide to go with rigid train & sample at one point in each port.

EPA (Dur) 235
4 72

FIELD DATA

PLANT STAUFFER CHEMICAL
DATE 20 JULY 72
SAMPLING LOCATION KILN SCRUBBER OUTLET
SAMPLE TYPE PARTICULATES
RUN NUMBER 1
OPERATOR C.F., B.E., G.P.
AMBIENT TEMPERATURE 90°F
BAROMETRIC PRESSURE 30.15
STATIC PRESSURE, (P_s) N/A
FILTER NUMBER (s)

PROBE LENGTH AND TYPE 8' Glass
NOZZLE I.D. 1.426
ASSUMED MOISTURE, % 20%
SAMPLE BOX NUMBER
METER BOX NUMBER 3
METER $\Delta H_@$ 1.52 @ 0.75 CFM
C FACTOR N/A
PROBE HEATER SETTING N/A
HEATER BOX SETTING N/A
REFERENCE Δp

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 5 MINUTES

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 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 / 1510	12.718									
PORT "F"	5	* 16.927			2.30	110	87	87	5	290	70
	10	21.45			2.30	125	87	86	7		
	15	25.91			2.30	125	91	85	7	300	
	20	30.39			2.30	125	96	85	8		
	25	34.83			2.30	125	100	85	8		
	30	39.332			2.30	125	101	86	9	250	81
"H"	35 / 1605	44.32			2.40	122	88	84	8		
	40	48.04			2.40	125	91	84	8	300	95
	45	52.64			2.40	123	95	85	9	290	69
	50	57.20			2.40	120	99	85	10		
	55	61.57			2.40	115	101	86	10	260	79
	60	66.532			2.50	122	101	86	12		
B ~~"A"~~	65 / 1648	71.09			2.50	120	90	86	10		
	70	75.78			2.50	120	98	86	12	310	77
	75	80.45			2.50	113	102	87	12		
	80	85.16			2.50	125	104	88	14		
	85	89.84			2.50	121	105	88	14	260	84
	90	94.449			2.50	120	106	89	14		
"D"	95 / 1735	99.12			2.50	118	91	88	8	305	68
	100	103.89			2.50	120	100	88	13		

COMMENTS: LEAKAGE @ 15" Hg = 0 CFM

* STOPPED TESTING FOR KILN BREAK DOWN

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4 72

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 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
	105	108.45			2.50	120	106	89	20		
	110	112.92			2.30	122	110	90	23	310	76
	115	117.26			2.10	128	110	90	23		
	120	121.418			2.00	128	110	90	23	335	73

108.7 acf $\times \frac{530}{550} =$ 104.74

% Moisture $= \frac{25.7}{104.7 + 25.7} = 19.7\%$

*Note - Acetone Wash From Probe Is Combined with Acetone wash From Train

EPA (Dur) 236
4-72

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LABORATORY DATA

PLANT STAUFFER CHEMICAL

TEST NO. 1- PARTICULATE

LOCATION TARPON SPRINGS

DATE 20 July 72

SITE Kiln Scrubber Outlet

Box # 3

CONTAINER/FILTER NUMBER	WEIGHT OF PARTICULATE COLLECTED, M_n grams		
	FINAL WEIGHT	TARE WEIGHT	WEIGHT GAIN
72 449			
TOTAL			

FILTER DRYING PROCEDURE _____

	VOLUME OF CONDENSATE COLLECTED, V_c	
	IMPINGER VOLUME, ml	SILICA GEL WEIGHT g
FINAL	705	284.6
INITIAL	200	247.0
LIQUID COLLECTED	505	37.6
TOTAL VOLUME COLLECTED	542.6	g = ml

Equivalent condensate volume: $V_{w_c} = 0.0474 \times V_c = 0.0474 \times$ 542.6 = 25.7 scf

DRY MOLECULAR WEIGHT DETERMINATION

PLANT STAUFFER CHEMICAL CO. - TARPON

DATE 20 July 72

SAMPLING TIME (24-hr CLOCK) 1530 - 1730

SAMPLING LOCATION KILN SCRUBBER OUTLET

SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) CONTINUOUS BAG

ANALYTICAL METHOD

AMBIENT TEMPERATURE 90°F

OPERATOR G. FORTE

COMMENTS: TEST 1

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	4.1	4.1	4.1	4.1	~~4.1~~ 3.9	[illegible]	4.0	44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	33.6	[illegible]	34.0	[illegible]	33.8	[illegible]	[illegible]	32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)	37.7	[illegible]	36.3	[illegible]	36.4	[illegible]	[illegible]	28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)							[illegible]	28/100	
								TOTAL	

[illegible] - use values based on Tests 2+3

FIELD DATA

PLANT STAUFFER - TARPON
DATE 21 JULY 72
SAMPLING LOCATION KILN SCRUBBER INLET
SAMPLE TYPE PARTICULATE
RUN NUMBER 2
OPERATOR FIM
AMBIENT TEMPERATURE 90
BAROMETRIC PRESSURE 30.23
STATIC PRESSURE, (P_s)
FILTER NUMBER (s) SEE CLEAN UP SHEETS

PROBE LENGTH AND TYPE
NOZZLE I.D. 3/16"
ASSUMED MOISTURE, % 16
SAMPLE BOX NUMBER —
METER BOX NUMBER —
METER $\Delta H_@$ 1.39 @ 0.75
C FACTOR 0.66
PROBE HEATER SETTING —
HEATER BOX SETTING —
REFERENCE Δp —

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 5 MINUTES

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 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 / 0855	375.167									
W-6	5	377.476	1.20	0.50	0.50	630	89	84	5.0	240	72
W-5	10	379.686	1.15	0.49	0.49	630	91	84	5.0	250	75
W-4	15	381.862	1.20	0.50	0.50	630	95	85	5.0	275	76
W-3	20	384.191	~~1.25~~ 1.40	~~0.52~~ 0.55	~~0.52~~ 0.58	630	99	85	5.0	275	76
W-2	25	386.321	1.05	0.43	0.43	630	101	87	5.0	260	76
W-1	30	388.410	1.10	0.45	0.45	640	102	87	5.0	270	76
N-6	35 / 10:17	390.582	1.25	0.52	0.52	690	95	89	5.0	275	73
N-5	40	392.935	1.50	0.60	0.60	700	98	90	5.0	260	74
N-4	45	395.170	1.25	0.52	0.52	730	100	90	5.0	280	76
N-3	50	397.300	1.15	0.49	0.49	750	102	90	5.0	305	77
N-2	55	399.286	1.00	0.42	0.42	760	103	90	5.0	300	77
N-1	60	400.965	0.67	0.28	0.28	765	103	90	5.0	290	78
		25.798									

COMMENTS: LEAKAGE RATE - 0 CFM @ 17" Hg

EPA (Dur) 235
4 72

DRY MOLECULAR WEIGHT DETERMINATION

PLANT STAUFFER CHEMICAL Co. -TARPON COMMENTS:
DATE 21 July 72
SAMPLING TIME (24-hr CLOCK)
SAMPLING LOCATION INLET TEST #2 -KILN
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) CONTINUOUS BAG
ANALYTICAL METHOD
AMBIENT TEMPERATURE 90°F
OPERATOR R S Amick

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	18.8	18.8	18.0	18.0	18.0	18.0	18.27	44/100	8.04
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	25.3	6.5	25.5	7.5	23.4	5.4	6.47	32/100	2.07
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)	27.2	1.9	27.4	1.9	25.6	2.2	2.00	28/100	0.56
N_2 (NET IS 100 MINUS ACTUAL CO READING)	~~72.8~~	72.8		72.6		74.4	73.27	28/100	20.52
								TOTAL	31.19

EPA (Dur) 230
4/72

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LABORATORY DATA

PLANT STAUFFER

TEST NO. 2 - PARTICULATE

LOCATION TARPON SPRINGS, FLA.

DATE 21 JULY 72

SITE KILN SCRUBBER INLET

CONTAINER/FILTER NUMBER	WEIGHT OF PARTICULATE COLLECTED, M_n grams		
	FINAL WEIGHT	TARE WEIGHT	WEIGHT GAIN
72-412			
TOTAL			

FILTER DRYING PROCEDURE

	VOLUME OF CONDENSATE COLLECTED, V_c	
	IMPINGER VOLUME, ml	SILICA GEL WEIGHT g
FINAL	305	235.9 w cap
INITIAL	200	222.0 w cap
LIQUID COLLECTED	105	13.9
TOTAL VOLUME COLLECTED	118.9	g = ml

Equivalent condensate volume: $V_{w_c} = 0.0474 \times V_c = 0.0474 \times$ 118.9 = 5.64 scf

GAS VELOCITY AND VOLUME DATA

VELOCITY TRAVERSE DATA

Point	Position Inches[a]	Reading, Δp "H_2O	$\sqrt{\Delta p}$	T_s °F
N-1	8.4	0.~~55~~0.80		640
2	10.4	~~1.05~~0.51		
3	12.6	~~1.~~ 1.15		
4	15.1	0.76		
5	18.2	0.95		
6	22.8	1.05		
7	35.2	1.45		
8	39.8	1.50		
9	42.9	1.65		
10	45.4	1.50		
11	47.6	1.30		
12	49.6	~~1.~~ 1.10		
W-1		1.05		
2		1.30		
3		1.60		
4		1.75		
5		1.75		
6		1.75		
7		1.05		
8		1.0		
9		1.05		
10		1.10		
11		1.05		
12		0.55		
Total		-		
Average		-		

a) From outside of port to sampling point.

Pitot tube "S" TYPE
Manometer 0- 11 TUBE
Thermometer 0-1000°F DIAL

Data Recorder F.M.

Date 21 JULY 72

TIME 9:30 A.M.

Test No. 2

Location KILN SCRUBBER INLET PARTICULATE

Stack Inside Dimensions 43.5"ϕ

Stack Area, A_s = _____ sq. ft.

Barometric Pressure, P_b = 30.23 "Hg

Stack Gage Pressure = -14.6 "H_2O

Stack Abs. Pressure, P_s = $-14.6 \frac{"H_2O}{13.6}$ + P_b = _____ "Hg

Stack Gas Temp., T_s = 640 °F + 460 = 1100 °R

Molecular Weight of Stack Gas, M_s = _____

$$V_s = 174 \sqrt{\Delta p}\ Cp \sqrt{T_s \times \frac{29.92}{P_s} \times \frac{29}{M_s}}\ \text{ft/min.}$$

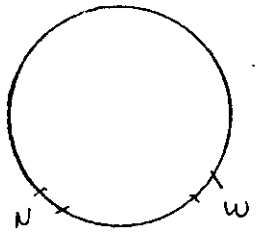
V_s =

Q, Volume = _____ ft/min. x _____ sq. ft. = _____ cfm

Q_w, Standard Volume at 70°F and 29.92 "Hg (Wet Basis) =

$$Q \times \frac{530}{T_s} \times \frac{P_s}{29.92} = 17.7 \times \_\_\_\_ \times \_\_\_\_ = \_\_\_\_$$

$Q_s = Q_w \times (100-W)/100$ = _____



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GAS VELOCITY AND VOLUME DATA

VELOCITY TRAVERSE DATA

Point	Position Inches[a]	Reading, Δp "H_2O	$\sqrt{\Delta p}$	T_s °F
U-1		1.10		740
2		1.10		
3		1.16		
4		1.25		
5		1.40		
6		1.55		
7		1.85		
8		2.00		
9		2.30		
10		2.20		
11		1.50		
12		1.10		
W-1		1.00		
2		1.40		
3		1.55		
4		2.00		
5		2.25		
6		2.15		
7		1.65		
8		1.30		
9		1.20		
10		1.10		
11		1.05		
12		0.77		V
Total		-		
Average		-		

a) From outside of port to sampling point.

Pitot tube "S" TYPE
Manometer 0-10" H_2O
Thermometer 0-1000°F DIAL

Data Recorder KM

Date 21 JULY 72

TIME 10:55 A.M.

Test No. 2-A

Location KILN SCRUBBER INLET

Stack Inside Dimensions _____

Stack Area, A_s = _____ sq. ft.

Barometric Pressure, P_b = 30.23 "Hg

Stack Gage Pressure = -11.2 "H_2O

Stack Abs. Pressure, P_s = $-11.2 \frac{\text{"}H_2O}{13.6}$ + P_b = _____ "Hg

Stack Gas Temp., T_s = 740 °F + 460 = 1200 °R

Molecular Weight of Stack Gas, M_s = _____

$$V_s = 174 \sqrt{\Delta p}\ Cp \sqrt{T_s \times \frac{29.92}{P_s} \times \frac{29}{M_s}} \text{ ft/min.}$$

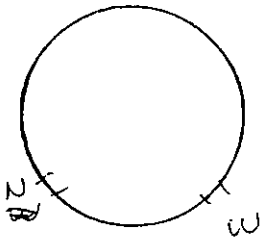
V_s =

Q, Volume = _____ ft/min. x _____ sq. ft. = _____ cfm

Q_w, Standard Volume at 70°F and 29.92 "Hg (Wet Basis) =

$$Q \times \frac{530}{T_s} \times \frac{P_s}{29.92} = 17.7 \times \_\_\_\_ \times \_\_\_\_ = \_\_\_\_$$

$Q_s = Q_w \times (100-W)/100$ = _____



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513/771-4330

FIELD DATA

PLANT STAUFFER CHEMICAL
DATE 21 JULY 72
SAMPLING LOCATION KILN SCRUBBER OUTLET
SAMPLE TYPE PARTICULATES
RUN NUMBER 2
OPERATOR G.F., B.Z.
AMBIENT TEMPERATURE 90°F
BAROMETRIC PRESSURE 30.25
STATIC PRESSURE, (P_s) —
FILTER NUMBER (s) —

PROBE LENGTH AND TYPE GLASS LINED
NOZZLE I.D. 1.426
ASSUMED MOISTURE, % —
SAMPLE BOX NUMBER 3
METER BOX NUMBER 3
METER $\Delta H_@$ 1.52 @ 0.75 CFM
C FACTOR —
PROBE HEATER SETTING —
HEATER BOX SETTING —
REFERENCE Δp —

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 5 MINUTES

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 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 / 0828	121.533									
PORT "B"	5	126.22			2.60	132	82	81	7		
	10	130.99			2.60	132	88	81	8	275	77
	15	135.73			2.60	130	95	82	8	330	81
	20	140.55			2.60	128	101	83	8		
	25	145.38			2.60	125	105	85	8	250	79
	30	150.123			2.60	120	108	86	9	300	79
"H"	35 / 0905	154.86			2.60	121	102	87	10		
	40	159.66			2.60	118	105	87	10	275	75
	45	164.43			2.60	132	108	88	11	265	77
	50	169.22			2.60	128	111	88	12	310	78
	55	174.02			2.60	128	113	89	13		
	60	178.835			2.60	128	114	90	13	340	80
"F"	65 / 0943	183.47			2.60	123	102	90	14	340	78
	70	188.28			2.60	126	107	90	15		
	75	193.09			2.60	126	112	91	15		
	80 *	197.69			2.60	126	114	91	15	300	77
	85	201.10			2.60	123	114	91	24		
	90	205.973			2.60	125	102	91	8	290	70
"D"	95	210.61			2.60	123	102	89	8		
	100	215.38			2.60	125	102	90	8	295	70

COMMENTS: LEAKAGE RATE @ 15" Hg = 0 CFM

* STOPPED TESTING TO CHANGE FILTERS (82.3 MIN.)

EPA (Dur) 235
4 72

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 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
PORT "D"	105		220.17			2.60	121	105	91	9	310	72
	110		224.99			2.60	121	112	92	9		
	115		229.79			2.60	128	114	93	9		
	120		234.540			2.60	128	114	93	9		

EPA (Dur) 236
4 72

DRY MOLECULAR WEIGHT DETERMINATION

PLANT STAUFFER CHEMICAL Co. - TARPON COMMENTS:
DATE 21 July 72
SAMPLING TIME (24-hr CLOCK) 8:30
SAMPLING LOCATION ~~[illegible]~~ COLLECT - KILN - TEST #02
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) CONTINUOUS BAG
ANALYTICAL METHOD
AMBIENT TEMPERATURE 90°F
OPERATOR R S AMICK

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	12.6	12.6	12.0	12.0	12.0	12.0	12.2	44/100	5.37
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	24.2	11.6	21.4	9.4	23.2	11.2	10.7	32/100	3.43
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)	27.4	3.2	23.6	2.2	26.5	3.3	2.9	28/100	0.81
N_2 (NET IS 100 MINUS ACTUAL CO READING)	~~[illegible]~~	72.6		76.4		73.5	74.2	28/100	20.77
								TOTAL	30.40

EPA (Dur) 230
4/72

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LABORATORY DATA

PLANT Stauffer - Tarpon Springs
TEST NO. Test #2 Particulate
LOCATION Tarpon Springs
DATE 21 July 72
SITE Kiln Scrubber Outlet

Box #3

CONTAINER/FILTER NUMBER	WEIGHT OF PARTICULATE COLLECTED, M_n grams		
	FINAL WEIGHT	TARE WEIGHT	WEIGHT GAIN
1 72 448			
5 ~~72~~ 72-447			
~~72~~			
TOTAL			

FILTER DRYING PROCEDURE _____

	VOLUME OF CONDENSATE COLLECTED, V_c	
	IMPINGER VOLUME, ml	SILICA GEL WEIGHT g
FINAL	843	281.0
INITIAL	200	245.3
LIQUID COLLECTED	643	35.7
TOTAL VOLUME COLLECTED		g = ml

Equivalent condensate volume: $V_{w_c} = 0.0474 \times V_c = 0.0474 \times$ 678.7 = 32.17 scf

FIELD DATA

PLANT STAUFFER - TARPON SPRINGS
DATE 21 JULY 72
SAMPLING LOCATION KILN SCRUBBER INLET
SAMPLE TYPE PARTICULATE
RUN NUMBER 3
OPERATOR FM
AMBIENT TEMPERATURE 90
BAROMETRIC PRESSURE 30.23
STATIC PRESSURE, (P_s) SEE VELOCITY DATA
FILTER NUMBER (s) SEE CLEAN-UP SHEET

PROBE LENGTH AND TYPE
NOZZLE I.D. 3/16
ASSUMED MOISTURE, % 16
SAMPLE BOX NUMBER –
METER BOX NUMBER –
METER $\Delta H_@$ 1.39 @ 0.75 CFM
C FACTOR 0.66
PROBE HEATER SETTING –
HEATER BOX SETTING 260
REFERENCE Δp –

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 5 MINUTES

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		INLET ($T_{m\,in}$), °F	OUTLET ($T_{m\,out}$), °F			
	0 / 1220	401.210									
W-6 EE	5	403.521	1.25	0.54	0.54	710*	93	90	5	260	70
W-5 FF	10	405.950	~~1.58~~ 1.60	~~0.64~~ 0.64	~~0.64~~ 0.64	700	97	91	5	275	72
W-4 GG	15	408.526	1.60	0.68	0.68	700	101	91	5	260	75
W-3 HH	20	410.926	1.35	0.58	0.58	700	104	91	5	260	75
W-2 II	25	413.234	1.20	0.51	0.51	700	105	92	5	270	75
W-1 JJ	30	415.440	1.25	0.53	0.53	695	107	93	5	270	75
N-6 EE	35	418.087	1.75	0.75	0.75	680	108	94	5	160	74
N-5 FF	40	420.301	1.00	0.43	0.43	650	109	94	5	230	75
N-4 GG	45	422.262	0.78	0.36	0.36	640	109	95	5	275	75
N-3 HH	50	424.084	0.67	0.30	0.30	630	109	95	5	275	76
N-2 II	55	425.594	0.47	0.21	0.21	610	109	95	5	290	76
N-1	60 / 13:24	427.080	0.48	0.21	0.21	630	109	96	5	240	77
		26.0									

COMMENTS: LEAKAGE RATE - 0 @ 16" Hg *NOMOGRAPH ADJUSTED FOR TEMP. CHANGES

EPA (Dur) 235
4 72

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LABORATORY DATA

PLANT STAUFFER

TEST NO. 3

LOCATION TARPON SPRINGS, FLA

DATE 21 JULY 72

SITE KILN SCRUBBER INLET

CONTAINER/FILTER NUMBER	WEIGHT OF PARTICULATE COLLECTED, M_n grams		
	FINAL WEIGHT	TARE WEIGHT	WEIGHT GAIN
72-413			
TOTAL			

FILTER DRYING PROCEDURE

NOTE!! PROBE BROKEN DURING CLEAN-UP. PIECES OF GLASS IN SAMPLE ARE FRAGMENTS OF BROKEN PROBE!!

	VOLUME OF CONDENSATE COLLECTED, V_c	
	IMPINGER VOLUME, ml	SILICA GEL WEIGHT g
FINAL	302	261.1
INITIAL	200 ml	247.6 w/o cap
LIQUID COLLECTED	102 ml	13.5
TOTAL VOLUME COLLECTED	115.5	g = 115.5 ml

Equivalent condensate volume: $V_{w_c} = 0.0474 \times V_c = 0.0474 \times$ 115.5 = 5.47 scf

DRY MOLECULAR WEIGHT DETERMINATION

PLANT STAUFFER CHEMICAL CO.
DATE 21 July 72
SAMPLING TIME (24-hr CLOCK) 1130
SAMPLING LOCATION INLET - KILN TEST #3 PARTIC.
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) CONTIN. BAG
ANALYTICAL METHOD
AMBIENT TEMPERATURE 90° F
OPERATOR RSAMICK

COMMENTS:

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	18.2	18.2	18.6	18.6	18.4	18.4	18.40	44/100	8.10
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	25.3	7.1 R	25.8	7.2	24.2	5.8	6.7	32/100	2.14
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)	27.4	2.1	27.4	1.6	24.8	.60	1.43	28/100	0.400
N_2 (NET IS 100 MINUS ACTUAL CO READING)	Ø	72.6		72.4		75.2	73.4	28/100	20.55
								TOTAL	31.19

EPA (Dur) 230
4/72

GAS VELOCITY AND VOLUME DATA

VELOCITY TRAVERSE DATA

Test No. 3

Location KILN SCRUBBER INLET

Point	Position Inches[a]	Reading, Δp "H_2O	$\sqrt{\Delta p}$	T_s °F
W-1		0.14		670
2		1.60		
3		0.88		
4		1.00		
5		0.92		
6		1.05		
7		0.95		
8		0.90		
9		0.85		
10		0.80		
11		0.71		
12		0.65		
U-1		0.31		
2		0.75		
3		0.67		
4		0.65		
5		0.72		
6		0.95		
7		1.10		
8		1.20		
9		1.20		
10		1.25		
11		1.15		
12		0.81		
Total		-		
Average		-		

Stack Inside Dimensions _____

Stack Area, A_s = _____ sq. ft.

Barometric Pressure, P_b = _____ "Hg

Stack Gage Pressure = -14.8 "H_2O

Stack Abs. Pressure, P_s = _____ $\frac{\text{"}H_2O}{13.6}$ + P_b = _____ "Hg

Stack Gas Temp., T_s = _____ °F + 460 = _____ °R

Molecular Weight of Stack Gas, M_s = _____

$$V_s = 174 \sqrt{\Delta p}\ Cp \sqrt{T_s \times \frac{29.92}{P_s} \times \frac{29}{M_s}} \text{ ft/min.}$$

V_s =

Q, Volume = _____ ft/min. x _____ sq. ft. = _____ cfm

Q_w, Standard Volume at 70°F and 29.92 "Hg (Wet Basis) =

$$Q \times \frac{530}{T_s} \times \frac{P_s}{29.92} = 17.7 \times \_\_\_\_ \times \_\_\_\_ = \_\_\_\_$$

$Q_s = Q_w \times (100-W)/100$ = _____

a) From outside of port to sampling point.

Pitot tube S

Manometer 0-10" H_2O

Thermometer 0-1500 °F

Data Recorder KM

Date 21 JULY 78

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FIELD DATA

PLANT STAUFFER CHEMICAL
DATE 21 JULY 72
SAMPLING LOCATION KILN SCRUBBER OUTLET
SAMPLE TYPE PARTICULATES
RUN NUMBER 3
OPERATOR G.F. G.P.
AMBIENT TEMPERATURE 90°F
BAROMETRIC PRESSURE 30.25
STATIC PRESSURE, (P_s) —
FILTER NUMBER (s) —

PROBE LENGTH AND TYPE GLASS LINED
NOZZLE I.D. 1.426
ASSUMED MOISTURE, % —
SAMPLE BOX NUMBER 2
METER BOX NUMBER 3
METER $\Delta H_@$ 1.52 @ 0.75 CFM
C FACTOR —
PROBE HEATER SETTING —
HEATER BOX SETTING —
REFERENCE Δp —

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 5 MINUTES

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 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 / 1133	234.718									
PORT "D"	5	239.45			2.60		90	89	13		
	10	244.22			2.60	120	100	90	15	380	95
	15	248.99			2.60		110	91	15		
	20	253.75			2.60	129	114	92	15	310	75
	25	258.44			2.60	129	118	93	16	280	76
	30	262.576			2.60	125	120	104	21		
"F"	35 / 1209	266.55			1.90	122	102	93	23	270	72
	40	270.49			1.90	113	107	93	23	300	70
	45	274.34			1.75	120	110	92	23	270	69
	50	* 278.58			2.60	125	100	92	10		
	55	283.32			2.60	125	105	92	10		
	60	287.977			2.60	115	112	92	11	265	67
"H"	65 / 1300	292.66			2.60	119	100	93	11	350	70
	70	297.38			2.60	125	107	93	12	300	62
	75	302.15			2.60	120	113	93	13		
	80	307.07			2.60	118	118	94	13	305	67
	85	311.65			2.60	115	121	95	14		
	90	316.397			2.60	120	122	95	15	325	66
"B"	95 / 1337	321.05			2.60	118	107	95	15		
	100	325.78			2.60	118	113	95	15	260	66

COMMENTS: LEAKAGE RATE @ 15" Hg = .015 CFM

* STOPPED TESTING TO REPLACE FILTER (46.5 min.)

EPA (Dur) 235
4 72

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		INLET ($T_{m\ in}$), °F	OUTLET ($T_{m\ out}$), °F			
PORT "B"	105		330.50			2.60	115	114	95	16		
	110		335.29			2.60	110	118	95	16		
	115		340.09			2.60	118	120	95	17	210	70
	120		344.728			2.60	110	122	95	18		

EPA (Dur) 236
4-72

DRY MOLECULAR WEIGHT DETERMINATION

PLANT STAUFFER CHEMICAL COMPANY

DATE 21 July 72

SAMPLING TIME (24-hr CLOCK) 1130

SAMPLING LOCATION KILN ~~INLET~~ OUTLET - TEST #3 - PARTICULATE

SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) CONTINUOUS BAG

ANALYTICAL METHOD

AMBIENT TEMPERATURE

OPERATOR

COMMENTS:

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	11.5	11.5	11.0	11.0	11.4	11.4	11.3	44/100	4.97
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	22.5	11.0	21.6	10.6	22.1	10.7	10.77	32/100	3.45
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)	25.8	3.3	23.5	1.9	23.8	1.7	2.30	28/100	.644
N_2 (NET IS 100 MINUS ACTUAL CO READING)	74.	74.2		76.5		76.2	75.63	28/100	21.18
								TOTAL	30.24

EPA (Dur) 230
4/72

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LABORATORY DATA

PLANT Stauffer

TEST NO. 3-Particulate

LOCATION Tarpon Springs

DATE 21 July 72

SITE Scrubber Outlet-Kiln

Box # 2

CONTAINER/FILTER NUMBER	WEIGHT OF PARTICULATE COLLECTED, M_n grams		
	FINAL WEIGHT	TARE WEIGHT	WEIGHT GAIN
72-446			
~~72-451~~			
SHARE 72-445			
SHARE 72-444			
TOTAL			

FILTER DRYING PROCEDURE _____

	VOLUME OF CONDENSATE COLLECTED, V_c	
	IMPINGER VOLUME, ml	SILICA GEL WEIGHT g
FINAL	708	296.2
INITIAL	200	245.4
LIQUID COLLECTED	508	50.8
TOTAL VOLUME COLLECTED	558.8	g = 558.8 ml

Equivalent condensate volume: $V_{w_c} = 0.0474 \times V_c = 0.0474 \times$ ~~558.8~~ 558.8 = 26.48 scf

4 1,58

196/25

GAS VELOCITY AND VOLUME DATA

Test No. — Velocity

Location Cold Air Inlet to Kiln spray tower

VELOCITY TRAVERSE DATA

Point	Position Inches[a]	Reading, Δp "H_2O	$\sqrt{\Delta p}$	T_s °F
A-V		.90	.95	85
2		.83	.91	
3		.90	.95	
4		.90	.85	
5		.70	.84	
6		.47	.65	
7		.35	.59	
8		.40	.63	
9		.40	.63	
10		.42		
B-1		.70		
2		.60		
3		.60		
4		.55		
5		.50		
6		.55		
7		.62		
8		.83		
9		.80		
10		.62		
Total		-		
Average		-		

a) From outside of port to sampling point.

Pitot tube S

Manometer

Thermometer DIAL

Data Recorder R S Amick

Date 22 JUNE 1972

Stack Inside Dimensions _____

Stack Area, A_s = _____ sq. ft.

Barometric Pressure, P_b = 29.87 "Hg

Stack Gage Pressure = −1.25 "H_2O

Stack Abs. Pressure, P_s = _____ $\frac{\text{"}H_2O}{13.6}$ + P_b = _____ "Hg

Stack Gas Temp., T_s = 85 °F + 460 = 545 °R

Molecular Weight of Stack Gas, M_s = _____

$V_s = 174 \sqrt{\Delta p}\ Cp \sqrt{T_s \times \frac{29.92}{P_s} \times \frac{29}{M_s}}$ ft/min.

V_s =

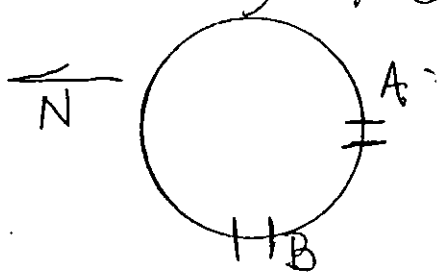
Q, Volume = _____ ft/min. x _____ sq. ft. = _____ cfm

Q_w, Standard Volume at 70°F and 29.92 "Hg (Wet Basis) =

$Q \times \frac{530}{T_s} \times \frac{P_s}{29.92}$ = 17.7 x _____ x _____ = _____

$Q_s = Q_w \times (100-W)/100$ = _____

Horizontal Duct



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13.5"

GAS VELOCITY AND VOLUME DATA

Test No. 2
Location Cold Air Inlet to Kiln Spray Tower

VELOCITY TRAVERSE DATA

Point	Position Inches[a]	Reading, Δp "H_2O	$\sqrt{\Delta p}$	T_s °F
A-1	2.5 .37	.50	.707	90
2	5.2 1.1	.52	.721	
3	11.6 2.0	.63	.794	
4	22.6 3.1	.80	.894	
5	31.2 4.6	.90	.949	
6	65.5 8.9	.71	.843	
7	77.4 10.4	.50	.707	
8	85.4 11.5	.45	.671	
9	91.8 12.4	.43	.656	
10	97.5 13.2	.40	.633	
B-1		.50	.707	
-2		.50	.707	
3		.71	.843	
4		.76	.872	
5		1.03	1.010	
6		.98	.990	
7		.86	.927	
8		.80	.894	
9		.65	.806	
10		.57	.755	
Total		-	15.154	
Average		-	0.758	

a) From outside of port to sampling point.

Pitot tube 15"
Manometer
Thermometer DIAL

Data Recorder RSA
Date 18 July 72

Stack Inside Dimensions 13.5"
Stack Area, A_s = .994 ft² sq. ft.
Barometric Pressure, P_b = 30.22 "Hg
Stack Gage Pressure = −1.25 "H_2O
Stack Abs. Pressure, P_s = $\frac{-1.25}{13.6}$ "H_2O + P_b = 30.19 "Hg
Stack Gas Temp., T_s = 90 °F + 460 = 550 °R
Molecular Weight of Stack Gas, M_s = 29

$$V_s = 171\sqrt{\Delta p}\ Cp\sqrt{T_s \times \frac{29.92}{P_s} \times \frac{29}{M_s}}\ \text{ft/min.}$$

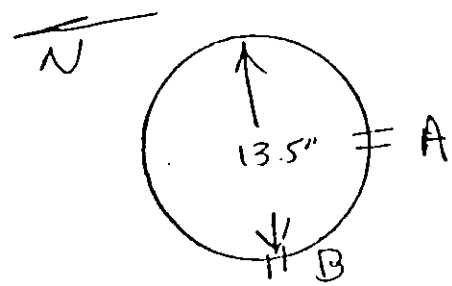
$$V_s = 148 \times .758\sqrt{\frac{550 \times 29.92}{30.19}} = 2616$$

Q, Volume = 2616 ft/min. x 0.994 sq. ft. = 2600 cfm

Q_w, Standard Volume at 70°F and 29.92 "Hg (Wet Basis) =

$$Q \times \frac{530}{T_s} \times \frac{P_s}{29.92} = 17.7 \times 2600 \times \frac{30.19}{550} = 252$$

$Q_s = Q_w \times (100-W)/100$ = _____



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APPENDIX C-3

SO_2 TESTS ON NODULIZING KILN SPRAY

CHAMBER INLET AND OUTLET

3 Inlet

3 Outlet

PEDCo-ENVIRONMENTAL SPECIALISTS, INC.

GAS SAMPLING FIELD DATA

Material Sampled for SO_2

Date 19 JULY 1972

Plant STAUFFER Location TARPON SPRINGS

Bar. Pressure _____ "Hg Comments: KILN INLET

Ambient Temp. ~90 °F

Run No. 1

Power Stat Setting –

Filter Used: Yes___ No___

Operator F.M.

	CLOCK TIME	METER (Ft.^{3})	FLOW METER SETTING	METER TEMPERATURE
PORT W	11:45	31.460	~1.6 l/min	91
	:50	31.780		90.5
	:55	32.091		90.5
	12:00	32.431		91
PORT N	MOVE 12:05	32.431		90.5
	12:10	32.691		91
	12:15	32.980		91
	12:20	33.280		91

30 MIN SAMPLE

1 Impingers with 15 ml of ISOPROPYL

2 Impingers with 15 ea ml of 3% H_2O_2

Total number of Impingers 4

Sample Bottle No. _____

Impinger Bucket No. _____

Meter Box No. _____

PEDCo-ENVIRONMENTAL SPECIALISTS, INC.

GAS SAMPLING FIELD DATA

Material Sampled for SO_2

Date 19 July 1972

Plant STAUFFER Location TARPON SPRINGS

Bar. Pressure _____ "Hg Comments: KILN SCRUBBER OUTLET

Ambient Temp. 85 °F

Run No. 1

Power Stat Setting _____

Filter Used: Yes ___ No ___

Operator R. A.

CLOCK TIME	METER (Ft.^{3})	FLOW METER SETTING	METER TEMPERATURE °F
11:25	49.824	~1.2 l/min	92
11:40	50.707		92
11:55	51.360		94
12:20	51.759		94
12:50	52.396		94
60 min SAMPLE			

1 Impingers with 15 ml of ISOPROPYL

2 Impingers with 15 cc. ml of 3% H_2O_2

Total number of Impingers 4 (1 dry)

Sample Bottle No. _____

Impinger Bucket No. _____

Meter Box No. _____

PEDCo-ENVIRONMENTAL SPECIALISTS, INC.

GAS SAMPLING FIELD DATA

Material Sampled for SO_2

Date 20 JULY 1972

Plant STAUFFER Location TARPON SPRINGS

Bar. Pressure 30.15 "Hg Comments: KILN INLET

Ambient Temp. ~90 °F

Run No. 2

Power Stat Setting _____

Filter Used: Yes___ No___

Operator _____

~~CLOCK~~ TIME	METER (Ft.^{3})	FLOW METER SETTING	METER TEMPERATURE
2:00 0	33.687		90
5	34.000		90.5
10	34.293		91
15	34.573		91
20	34.885		93.5
25	35.165		95
30	35.445		95.5

1 Impingers with 15 ml of ISOPROPYL

2 Impingers with 15 ea ml of 3% H_2O_2

Total number of Impingers _____

Sample Bottle No. _____

Impinger Bucket No. _____

Meter Box No. _____

Sample volume after rinse = 74 ml
10 ml given to Stauffer

GAS SAMPLING FIELD DATA

Material Sampled for SO_2

Date 20 JULY 1972

Plant STAUFFER Location TARPON SPRINGS

Bar. Pressure 30.15 "Hg Comments: KILN OUTLET

Ambient Temp. 90 °F

Run No. 2

Power Stat Setting

Filter Used: Yes ___ No X

Operator R. A

Port	CLOCK TIME	METER (Ft.^{3})	FLOW METER SETTING	METER TEMPERATURE
F	~~F~~	53.107		93
H		53.714		94
B		54.402		97
D		55.045		95
	3:15	55.755		88
		2.648		

1 Impingers with 15 ml of 1 SO

2 Impingers with 15 ml of 3% H_2O_2

Total number of Impingers

Sample Bottle No.

Impinger Bucket No.

Meter Box No.

Sample volume after rinse = 94 ml -
10 ml given to Stauffer

GAS SAMPLING FIELD DATA

Material Sampled for SO_2

Date 20 JULY 1972

Plant STAUFFER Location TARPON SPRINGS

Bar. Pressure 30.15 "Hg Comments: KILN INLET

Ambient Temp. ~85 °F

Run No. 3

Power Stat Setting _____

Filter Used: Yes___ No___

Operator _____

3:40 - 4:15

PORT	~~CLOCK~~ TIME	METER (Ft.^{3})	FLOW METER SETTING	METER TEMPERATURE	
	0	436.115	~2 l/min	90	91
W	15	437.780		93	93
N	30	439.185		86	87
	TOTAL 30	3.07			

1 Impingers with 15 ml of ISOPROPYL

2 Impingers with 15 ml of 3% H_2O_2

Total number of Impingers 4 (1 dry)

Sample Bottle No. _____

Impinger Bucket No. _____

Meter Box No. _____

GAS SAMPLING FIELD DATA

Material Sampled for SO2

Date 20 JULY 1972

Plant STAUFFER Location TARPON SPRINGS

Bar. Pressure 30.15 "Hg Comments: OUTLET

Ambient Temp. 90 °F

Run No. 3

Power Stat Setting 5

Filter Used: Yes ___ No Y

Operator RSA

CLOCK TIME	METER (Ft.^{3})	FLOW METER SETTING	METER TEMPERATURE
3:30	56.285		86
	56.318		87
	56.904		92
	57.453		94
	57.934		93

1 Impingers with 15 ml of 150

2 Impingers with 15 ml of [illegible]

Total number of Impingers ___

Sample Bottle No. ___

Impinger Bucket No. ___

Meter Box No. ___

APPENDIX C-4

AIR RETURN LINE - 3 TESTS FOR FLUORIDES AND P_2O_5

CO LINE - 1 TEST FOR FLUORIDES AND P_2O_5

FIELD DATA

PLANT STAUFFER CHEMICAL
DATE 13 JULY 72
SAMPLING LOCATION KILN AIR RETURN
SAMPLE TYPE FLUORIDES
RUN NUMBER 1
OPERATOR G.F., G.P., D.A.
AMBIENT TEMPERATURE 90°F
BAROMETRIC PRESSURE ~~29.95~~ 30.15
STATIC PRESSURE, (P_s) +16.0
FILTER NUMBER (s) —

PROBE LENGTH AND TYPE GLASS LINED
NOZZLE I.D. ~~[illegible]~~ NONE
ASSUMED MOISTURE, % —
SAMPLE BOX NUMBER 2
METER BOX NUMBER 2
METER $\Delta H_@$ 1.39 @ 0.75 CFM
C FACTOR —
PROBE HEATER SETTING N/A
HEATER BOX SETTING N/A
REFERENCE Δp N/A

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 5 MINUTES

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 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
	1028	332.048									
	5	333.12			0.11	700	95	94	5		125
	10	334.08			0.11	700	96	95	5		115
	15	335.04			0.11	700	98	95	5		120
	20	336.01			0.12	700	100	96	5		115
	25	337.02			0.12	700	103	98	5		113
	30	338.019			0.12	700	104	99	5		115
		5.971									

COMMENTS: SAMPLE RATE CONSTANT AT APPROX. 0.2 CFM AS INSTRUCTED BY GENE RILEY (EPA)

EPA (Dur) 235
4 72

FIELD DATA

PLANT STAUFFER CHEMICAL
DATE 19 JULY 72
SAMPLING LOCATION KILN ~~SCRUBBER~~ AIR RETURN
SAMPLE TYPE FLUORIDES
RUN NUMBER 2
OPERATOR G.F. G.P. D.A.
AMBIENT TEMPERATURE 90°F
BAROMETRIC PRESSURE ~~29.95~~ 30.15
STATIC PRESSURE, (P_s) +16.0
FILTER NUMBER (s)

PROBE LENGTH AND TYPE GLASS LINED
NOZZLE I.D. NONE
ASSUMED MOISTURE, % ——
SAMPLE BOX NUMBER 1
METER BOX NUMBER 2
METER $\Delta H_@$ 1.39 @ 0.75 CFM
C FACTOR ——
PROBE HEATER SETTING N/A
HEATER BOX SETTING N/A
REFERENCE Δp

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 5 MINUTES

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 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
	1104	338.010									
	5	338.95			0.12	700	104	100	8		
	10	339.99			0.12	700	106	100	9		115
	15	341.03			0.11	700	106	100	9		115
	20	342.05			0.11	700	107	101	9		110
	25	343.05			0.10	700	107	102	9		113
	30	344.049			0.10	700	108	103	9		
		6.030									

COMMENTS: SAMPLE RATE CONSTANT AT APPROX. 0.2 CFM AS INSTRUCTED BY GENE RILEY (EPA)

EPA (Dur) 235
4-72

FIELD DATA

PLANT STAUFFER CHEMICAL
DATE 19 JULY 72
SAMPLING LOCATION KILN AIR RETURN
SAMPLE TYPE FLUORIDES
RUN NUMBER 3
OPERATOR G.F. G.P. D.A.
AMBIENT TEMPERATURE 90°
BAROMETRIC PRESSURE 30.15
STATIC PRESSURE, (P_s) +16.0"
FILTER NUMBER (s)

PROBE LENGTH AND TYPE GLASS LINED
NOZZLE I.D. NONE
ASSUMED MOISTURE, % —
SAMPLE BOX NUMBER 3
METER BOX NUMBER 2
METER $\Delta H_@$ 1.39 @ 0.75 CFM
C FACTOR N/A
PROBE HEATER SETTING N/A
HEATER BOX SETTING N/A
REFERENCE Δp N/A

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 5 MINUTES

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 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
	1142	344.040									
	5	345.12			0.11	700	110	104	5		110
	10	346.22			0.11	700	109	103	5		120
	15	347.16			0.10	700	109	103	5		122
	20	348.18			0.10	700	109	104	5		125
	25	349.18			0.10	700	109	104	5		130
	30	350.006			0.10	700	109	104	5		125
		5.957									

COMMENTS: SAMPLE RATE CONSTANT AT APPROX. 0.2 CFM AS INSTRUCTED BY GENE RILEY (EPA)

EPA (Dur) 235
4 72

GAS VELOCITY AND VOLUME DATA

Test No. PRELIM.

Location KILN AIR RETURN

VELOCITY TRAVERSE DATA

Point	Position Inches[a]	Reading, Δp "H_2O	$\sqrt{\Delta p}$	T_s °F
1	2.6	1.00		700
2	3.7	0.87		
3	4.9	0.90		
4	6.2	0.93		
5	7.6	0.89		
6	9.3	0.89		
7	11.1	0.92		
8	13.6	0.90		
9	16.9	0.89		
10	26.2	0.64		
11	29.5	0.61		
12	31.8	0.58		
13	33.8	0.57		
14	35.4	0.61		
15	36.8	0.70		
16	38.2	0.77		
17	39.4	0.78		
18	40.7	0.80		
Total		-		
Average		-		

a) From outside of port to sampling point.

Pitot tube "S" TYPE

Manometer 0-10" H_2O

Thermometer DIAL

Data Recorder G.F.

Date 19 JULY 72

Stack Inside Dimensions 39" ø

Stack Area, A_s = _____ sq. ft.

Barometric Pressure, P_b = 30.15 "Hg

Stack Gage Pressure = +16.0 "H_2O

Stack Abs. Pressure, P_s = _____ $\frac{\text{"}H_2O}{13.6}$ + P_b = _____ "Hg

Stack Gas Temp., T_s = _____ °F + 460 = _____ °R

Molecular Weight of Stack Gas, M_s = _____

$$V_s = 174 \sqrt{\Delta p}\ Cp \sqrt{T_s \times \frac{29.92}{P_s} \times \frac{29}{M_s}}\ \text{ft/min.}$$

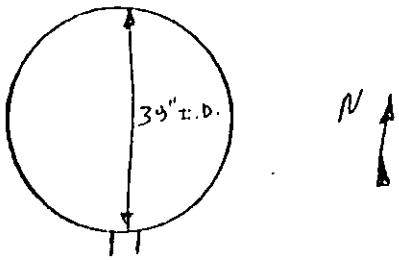
V_s =

Q, Volume = _____ ft/min. x _____ sq. ft. = _____ cfm

Q_w, Standard Volume at 70°F and 29.92 "Hg (Wet Basis) =

$$Q \times \frac{530}{T_s} \times \frac{P_s}{29.92} = 17.7 \times \_\_\_ \times \_\_\_ = \_\_\_$$

$Q_s = Q_w \times (100-W)/100$ = _____



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FIELD DATA

PLANT STAUFFER CHEMICAL
DATE 15 JUNE 72
SAMPLING LOCATION CO LINE
SAMPLE TYPE FLUORIDES
RUN NUMBER 1-CO
OPERATOR FIN
AMBIENT TEMPERATURE 92
BAROMETRIC PRESSURE 30.0
STATIC PRESSURE, (P_s) —
FILTER NUMBER (s) —

PROBE LENGTH AND TYPE 4' TEFLON
NOZZLE I.D. N.A.
ASSUMED MOISTURE, % N.A.
SAMPLE BOX NUMBER —
METER BOX NUMBER —
METER $\Delta H_@$ —
C FACTOR N.A.
PROBE HEATER SETTING N.A.
HEATER BOX SETTING N.A.
REFERENCE Δp N.A.

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 3 MINUTES

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 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 / 1616	402.147									
	3	403.890					~~97~~	~~97~~	8.5		74
	6	405.826					97	97	8.5		69
	9	408.043					~~97~~ 97	~~97~~ 97	11.0		67
	12	410.279					98	97	11.0		~~67~~ 73
	15	412.473					99	99	11.0		—
OFF	~~18~~ 16.25	413.363					100	99	11.0		—
	18	414.500					99	99	11.0		78
	21	416.701					98	99	11.0		73
	24	418.760					98	98	11.0		73
	27	420.713					95	97	11.0		73
	30	422.981					95	96	13.0		74
	33	425.221					95	96	13.0		74
	36	427.442					94	95	13.5		75
	40	430.350					93	95	13.5		75
							1355	1361	158		878
							97	97	11.3		73

COMMENTS: 40 28.203

EPA (Dur) 235
4 72

$V_{STD} = 28.203 \times \frac{530}{557} \times \frac{29.96}{29.92} = 26.872$ SCF $V_t = 26.872 + 2.88 = 29.752$

PEDCo-ENVIRONMENTAL
SUITE 8 • ATKINSON SQUARE
CINCINNATI, OHIO 45246
513/771-4330

LABORATORY DATA

PLANT STAUFFER CHEMICAL

TEST NO. 1-CO

LOCATION TARPON SPRINGS

DATE 15 JUNE 72

SITE CO LINE TEST 1

CONTAINER/FILTER NUMBER	WEIGHT OF PARTICULATE COLLECTED, M_n grams		
	FINAL WEIGHT	TARE WEIGHT	WEIGHT GAIN
TOTAL			

FILTER DRYING PROCEDURE _____

	VOLUME OF CONDENSATE COLLECTED, V_c	
	IMPINGER VOLUME, ml	SILICA GEL WEIGHT g
FINAL	528	683.4
INITIAL	500	676.6
LIQUID COLLECTED	28	6.8
TOTAL VOLUME COLLECTED	28 + 6.8	34.8 g = 34.8 ml

Equivalent condensate volume: $V_{w_c} = 0.0474 \times V_c = 0.0474 \times 34.8$

~~1.650~~ = 1.650 scf

% moisture = $\left(\frac{2.88}{29.752}\right) \times 100 = 9.68 = 9.7\%$

APPENDIX D

SAMPLING PROCEDURES

DETERMINATION OF PARTICULATE EMISSIONS FROM STATIONARY SOURCES

INTRODUCTION

The following method was used in this test program. Sampling and analytical procedures followed those described in the Federal Register.[1]

SAMPLING APPARATUS

The particulate sampling train in the procedure used in these tests met design specifications established by the EPA. The following equipment was used.

Nozzle - Stainless steel (316) with sharp, tapered leading edge.

Probe - Pyrex glass with a heating system capable of maintaining a minimum gas temperature of 250°F at the exit end during sampling and prevent condensation from occurring.

Pitot Tube - Type S attached to probe to monitor stack gas velocity.

Filter Holder and Filter - A Pyrex glass filter holder with a heating system capable of maintaining minimum temperature of 225°F was used. A 3" diameter fiberglass filter (MSA 1106BH) was used in all tests.

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[1] Federal Register, Vol. 36, No. 247, Part II - Thursday, Dec. 23, 1971.

Impingers - Four impingers connected in series with glass ball joints were used. The first, third, and fourth impingers were of the Greenburg-Smith design, modified by replacing the tip with a 1/2 inch I.D. glass tube extending to 1/2 inch from the bottom of the flask. The second impinger was of the Greenburg-Smith design with a standard tip. The impingers were contained in an ice-water bath.

Metering System - Vacuum gauge, leak-free pump, thermometers capable of measuring temperature to within 5°F, dry gas meter with 2% accuracy, and related equipment, were used to maintain an isokinetic sampling rate and to determine sample volume.

Barometer - An aneroid barometer was used to measure atmospheric pressures to within 0.01 inches Hg.

SAMPLING PROCEDURE

After selecting the sampling site and the number of traverse points, the stack pressure, temperature, moisture, and range of velocity head were measured according to procedures described in Methods 1, 2, and 4 of the Federal Register (December 23, 1971).

Approximately 200 grams of silica gel were weighed in a sealed impinger prior to each test. Glass fiber filters (3" diameter) were desiccated for at least 24 hours and weighed

to the nearest 0.1 mg. One-hundred ml. of distilled water was placed in each of the first two impingers; the third impinger was initially empty; and the impinger containing the silica gel was placed next in series. The train was set up as shown in Figure D-1. The sampling train was leak checked at the sampling site by plugging the inlet to the filter holder and pulling a 15 in. Hg vacuum. Leakage rates of less than 0.02 cfm at a vacuum of 15 in. Hg were recorded in all cases. The probe assembly was then attached and crushed ice was placed around the impingers. More ice was added during the run to keep the temperature of the gases leaving the last impinger at approximately 70°F.

During sampling, pertinent sampling data were recorded at each sampling point and when significant changes in gas flow conditions required additional adjustments in flow rate. Isokinetic sampling rates were set throughout the sampling period with the aid of a nomograph.

SAMPLE RECOVERY PROCEDURE

The sampling train was moved carefully from the test site to the cleanup area at the plant. Samples of the acetone and water used in the sample recovery were taken for use as blanks. The sample fractions were recovered as follows:

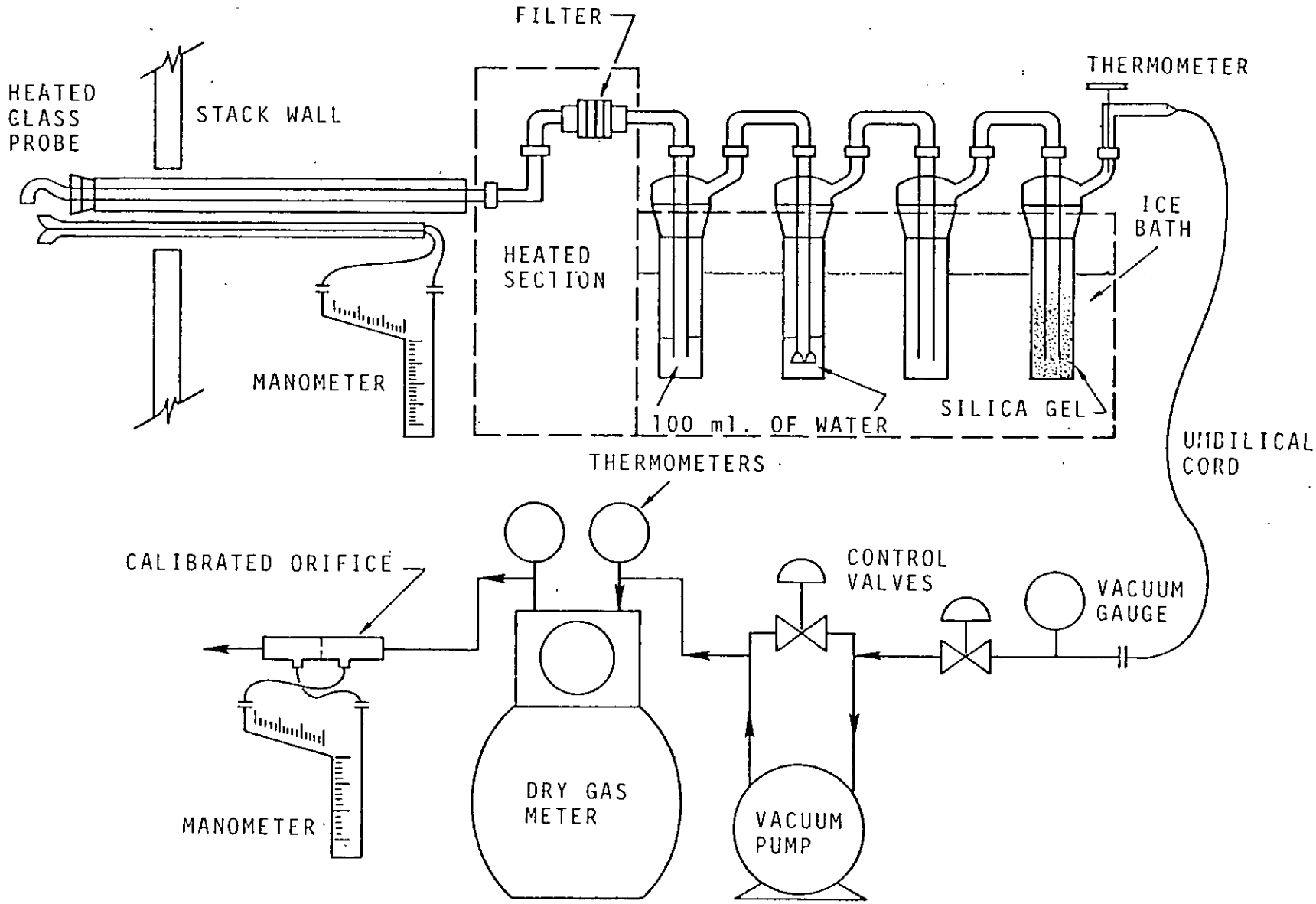

Figure D-1 Particulate sampling train.

Container No. 1 - The filter was removed from its holder and placed in a petri dish and sealed.

Container No. 2 - Loose particulate and acetone washings from all sample-exposed surface prior to the filter were placed in a glass jar and sealed.

Container No. 3 - The condensate from the first three Greenburg-Smith impingers was measured within ± 1 ml. and placed into a glass jar. Water rinsings from the back half of the filter holder, the fritted glass support, all connectors, and the first three Greenburg-Smith impingers were placed in this container and the container sealed with tape.

Container No. 4 - Acetone rinsings from the back half of the filter holder, the fritted glass support, all connectors, and the first three Greenburg-Smith impingers were placed in this container and sealed.

The silica gel from the fourth impinger was weighed and recorded. The used silica gel was discarded.

ANALYTICAL PROCEDURES

The following procedures were used and followed the methods described in the Federal Register of August 17, 1971.[1]

Container No. 1 - The filter and any loose particulate matter from this sample container was placed into tared glass weighing dish, desiccated to a constant weight and weighed to the nearest 0.1 mg.

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1. Federal Register August 17, 1971, Vol. 36, No. 159 Part II,

Container No. 2 - The acetone washings were transferred to a tared beaker and evaporated to dryness at ambient temperature and pressure; desiccated to a constant weight; and weighed to the nearest 0.1 mg.

Container No. 3 - Organic matter from the impinger solution was extracted with three 25 ml. portions each of ethyl ether and chloroform. The extracts were combined into a tared beaker; evaporated until no solvent remained at about 70°F. The sample was then desiccated to a constant weight and weighed to the nearest 0.1 mg. The remaining water was evaporated by boiling in a tared beaker, and the residue weighed.

Container No. 4 - The acetone washings from the back half of the filter holder, fritted support, connectors and first three Greenburg-Smith impingers were transferred to a tared beaker, and evaporated to dryness at ambient temperature and pressure. The sample was then desiccated to a constant weight and weighed to the nearest 0.1 mg.

The total particulate weight was obtained by totaling the weights of the individual sample components. The front half of the sample consisted only of the filter and probe washings. All liquid fractions were corrected for acetone and distilled water blank values.

DETERMINATION OF FLUORIDES AND P_2O_5

INTRODUCTION

The following method was used in this test program to measure total fluorides and total phosphorus compounds.

SAMPLING APPARATUS

The sampling train used in these tests met specifications established by the EPA and consisted of the following components:

Nozzle - Stainless steel (316) with sharp, tapered leading edge.

Probe - Pryex glass. No heating of the probe was done in the tests. A Teflon[R] flexible tube connected the probe to the first impinger.

Pitot Tube - Type S attached to probe to monitor stack gas velocity.

Filter Holder - Pyrex glass with coarse porosity frit. A 3" diameter Whatman No. 1 filter paper was used. No heating of the filter was done in these tests.

Impingers - Five impingers connected in series with glass ball joints were used. The first three impingers were of the standard Greenburg-Smith design. The fourth and fifth impingers

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[R] Registered Trademark-DuPont Co.

were modified by replacing the tip with a 1/2 inch I.D. glass tube extending to 1/2 inch from the bottom of the flask. The filter was located between the fourth and fifth impinger as shown in Figure D-2.

Metering System - Vacuum gauge, leak-free pump, thermometers capable of measuring temperature to within 5°F, dry gas meter with 2% accuracy, and related equipment, were used to maintain an isokinetic sampling rate and to determine sample volume.

Barometer - An aneroid barometer to measure atmospheric pressure to within 0.01 inches Hg.

SAMPLING PROCEDURE

After selecting the sampling site and the number of traverse points, the stack pressure, temperature, moisture, and range of velocity head were measured according to procedures described in Method 1, 2, and 4 of the Federal Register (December 23, 1971).

Approximately 200 grams of silica gel were weighed in a sealed impinger prior to each test. A filter was placed into the filter holder. One-hundred ml. of 10% NaOH was placed in each of the first three impingers; the fourth impinger was initially empty; the filter was placed after this impinger; and the fifth impinger containing the silica gel was placed next

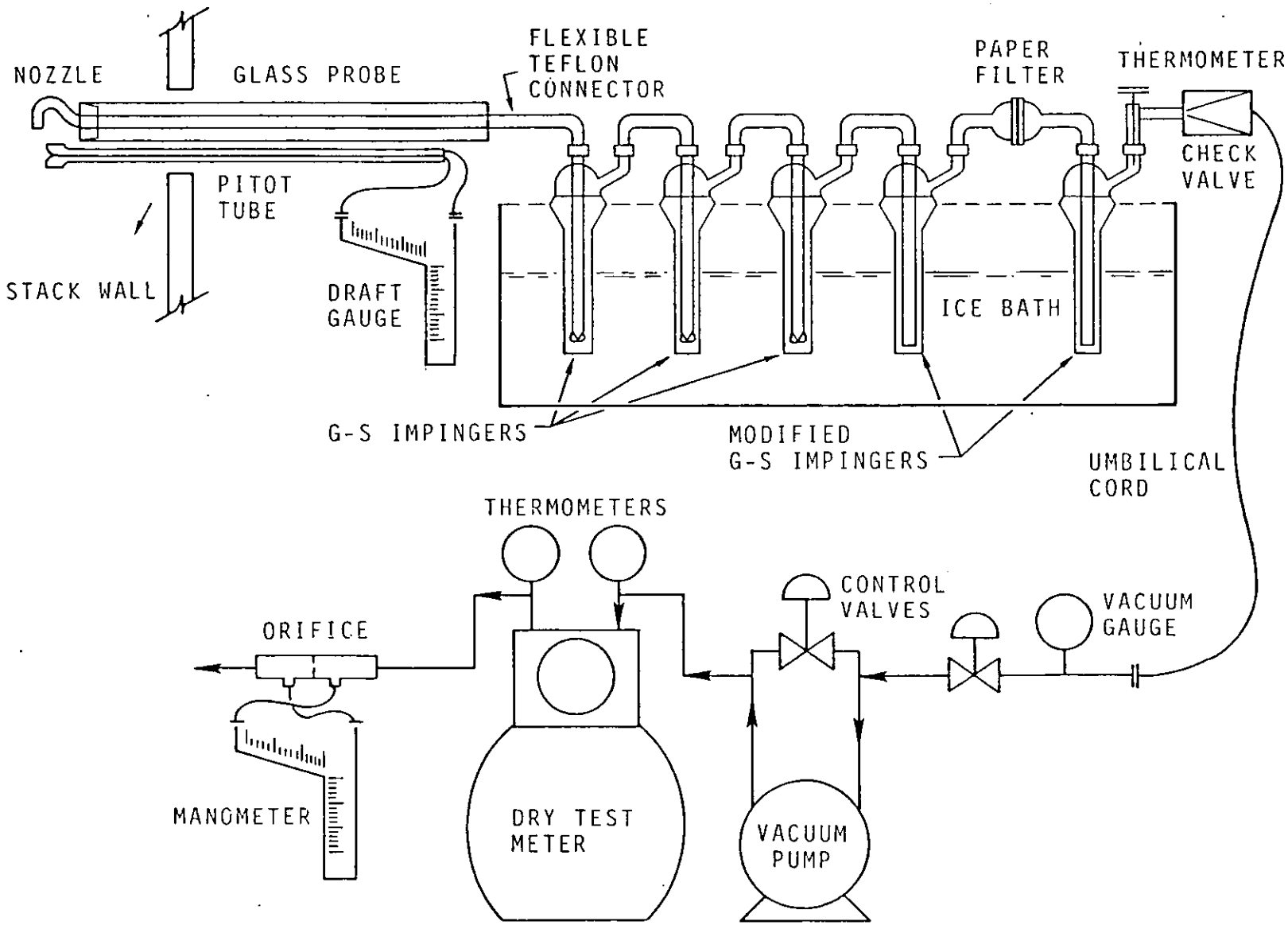

Figure D-2 Fluoride and P_2O_5 sampling train.

in series. The sampling train was leak checked at the sampling site by plugging the inlet to the first impinger and pulling a 15 in. Hg vacuum. Leakage rates of less than 0.02 cfm at a vacuum of 15 in. Hg were recorded in all cases. The probe assembly was then attached and crushed ice was placed around the impingers. More ice was added during the run to keep the temperature of the gases leaving the last impinger at approximately 70°F.

During sampling, pertinent sampling data were recorded at each sampling point and when significant changes in gas flow conditions required additional adjustments in flow rate. Isokinetic sampling rates were set throughout the sampling period with the aid of a nomograph.

SAMPLE RECOVERY PROCEDURE

The sampling train was moved carefully from the test site to the cleanup area at the plant. Samples of the acetone and water used in the sample recovery were taken for use as blanks. The sample fractions were recovered as follows:

Container No. 1 - The condensate from the first four Greenburg-Smith impingers was measured within ± 1 ml. and placed into a glass jar. Water rinsings from the probe, flexible connector, all other connectors, and the first four Greenburg-Smith impingers were placed in this container. Three water rinsings were made. The filter was also placed in this container.

Container No. 2 - Acetone rinsings from the entire train were placed in this container and sealed. Three acetone rinsings were performed.

The silica gel from the fifth impinger was weighed and recorded. The used silica gel was discarded.

ANALYTICAL PROCEDURES

All analyses were performed by Environmental Protection Agency staff at Research Triangle Park, North Carolina. The phosphomolybdovanadate colorimetric method was used.

SULFUR DIOXIDE SAMPLING PROCEDURE

INTRODUCTION

EPA Method 6[1] was used to measure sulfur dioxide concentrations. A constant sampling rate was used in all tests.

EQUIPMENT

A heated Pyrex glass probe was connected by glass ball and socket joints to a midget bubbler. This bubbler contained 15 ml of 80% isopropyl alcohol. The upper part of this bubbler was packed with glass wool, and it was then connected in series to three midget impingers. The first two impingers contained 15 ml each of 3% H_2O_2. The third impinger was dry. A silica gel drying tube was inserted in the vacuum line which led to a pump, rotameter, and dry gas meter assembly. The bubbler and impingers were contained in an ice water bath.

PROCEDURE

The peroxide reagent was prepared fresh daily by diluting 30% hydrogen peroxide with water in a 1:10 ratio. Fifteen ml of 80% isporopyl alcohol was added to the first bubbler, and 15 ml of 3% H_2O_2 to each of the next two impingers. The inlet to the first bubbler was then plugged and the train checked for leaks by pulling a 15" Hg. vacuum. After leak checking, the probe was attached and its heater started, and ice was added to the bath around the impingers.

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[1] Federal Register, Vol. 36, No. 247, Part II, Dec. 23, 1971.

Pertinent data on meter volume, temperature, and pressure were recorded during the sampling period.

When sampling was completed, ambient air was passed through the train for 15 minutes. The probe was then rinsed with distilled water and these rinsings along with the contents of the bubbler (isopropyl alcohol) were discarded. The contents of the three bubblers were poured into a glass container, and these bubblers and the connecting glassware were rinsed with distilled water. The rinsings were placed in the same container.

Analysis was performed by Environmental Protection Agency's OAP and utilized thorin indicator and titration with barium perchlorate.

APPENDIX E

ANALYTICAL PROCEDURES AND RESULTS

E-1

Slag Tapping Operation

- Analytical Procedures and Results -

TABLE E1. ANALYTICAL RESULTS

SLAG TAPPING - TARPON SPRINGS, FLORIDA

Test No.	Emissions Found[a], mg/sample					
	Fluorides[b]			P_2O_5[c]		
	Soluble	Insoluble	Total	Soluble	Insoluble	Total
1 A-S	107	0.11	107.11	509	0.6	509.6
1 B-S	3.21	1.04	4.25	57.5	6.3	63.8
2 A-S	42.4	1.8	44.2	453.2	12.6	465.8
2 B-S	1.7	0.73	2.43	61.3	1.1	62.4
3 A-S	35.5	0.27	35.77	527.6	4.7	532.3
3 B-S	1.4	0.18	1.58	82.1	1.8	83.9

a) Water and acetone washings, impinger contents, and filter.

b) Analysis by SPADNS reagent.

c) Analysis by ammonium phosphomolybdovanadate colorimetric method.

AS designates the scrubber inlet site.

BS designates the scrubber outlet site.

E-2

Nodulizing Kiln Operation

- Analytical Procedures and Results -

Table B3. Particulate Analysis Results

Stauffer Chemical, Tarpon Springs
Nodulizing Kiln

Run	Sampling Location	Sample I.D. No.	Sample Fraction	Weight Found, mg
1	Inlet	72-001-617	Acetone wash of front half	675.5
		-618	Filter	393.5
		-619	Contents & Water wash of back half (mass)	151.1
		-620	Contents & Water wash of back half (org)	146.3
		-621	Acetone wash of back	16.5
			Total	1382.9
1	Outlet	72-001-622	Acetone wash of front half	48.6
		-623	Filter	337.8
		-624	Contents & Water wash of back half (mass)	229.8
		-625	Contents & Water wash of back half (org)	18.3
		-626	Acetone wash of back (lost in shipping)	-
			Total	634.5
2	Inlet	72-001-627	Acetone wash of front half	676.0
		-628	Filter	378.6
		-629	Contents & Water wash of back half (mass)	93.4
		-630	Contents & Water wash of back half (org)	a
		-631	Acetone wash of back	48.7
			Total	1196.7
2	Outlet	72-001-632	Acetone wash of front half	45.3
		-633	Filter	371.7
		-634	Contents & Water wash of back half (mass)	339.3
		-635	Contents & Water wash of back half (org)	13.8
		-636	Acetone wash of back	29.2
			Total	799.3
3	Inlet	72-001-637	Acetone wash of front half	845.8
		-638	Filter	268.7
		-639	Contents & Water wash of back half (mass)	214.4
		-640	Contents & Water wash of back half (org)	-
		-641	Acetone wash of back	19.0
			Total	1347.9
3	Outlet	72-011-642	Acetone wash of front half	23.1
		-643	Filter	277.2
		-644	Contents & Water wash of back half (mass)	288.9
		-645	Contents & Water wash of back half (org)	14.4
		-646	Acetone wash of back	26.6
			Total	630.2

a) sample not extracted

TABLE E4. SULFUR DIOXIDE ANALYTICAL RESULTS NODULIZING KILN SPRAY CHAMBER INLET AND OUTLET

TEST	DATE 1972	Sulfur Dioxide	
		I.D. No.	mg
1 Inlet	7/19	72-001-672	337.6
1 Outlet	7/19	-671	27.0
2 Inlet	7/20	-674	269.1
2 Outlet	7/20	-673	40.6
3 Inlet	7/20	-676	176.6
3 Outlet	7/20	-675	50.0

TABLE E 5. ANALYTICAL RESULTS KILN AIR RETURN & CO LINE

Test No.	Emissions Found[a], mg/sample					
	Fluorides[b]			P_2O_5[c]		
	Soluble	Insoluble	Total	Soluble	Insoluble	Total
1 Air Return	79.5	0.1	79.6	1.17	0.59	1.76
2 Air Return	42.6	0.1	42.7	1.3	0.59	1.89
3 Air Return	63.5	0.1	63.6	1.4	0.59	1.99
1 CO Line	1.1	<0.06	1.1			

a Water and acetone washings, impinger contents, and filter.

b Analysis by SPADNS reagent.

c Analysis by ammonium phosphomolybdovanadate colorimetric method.

APPENDIX F

SAMPLE IDENTIFICATION LOG

For more detailed information please refer to the EMB Report File No. 72-MM-05.

TABLE F2.(Cont'd.) NODULIZING KILN OPERATION

Kiln Fluoride Run No. 2; Date 6-14-72 (Cont'd.)

Sample No.	Sampling Location	Fraction
72-000-762	Scrubber water in	Scrubber water No. 1
-763	Scrubber water in	Scrubber water No. 2
-764	Scrubber water in	Scrubber water No. 3
72-000-765	Scrubber water discharge	Scrubber water No. 1
-766	Scrubber water discharge	Scrubber water No. 2
-767	Scrubber water discharge	Scrubber water No. 3

Kiln Fluoride Run No. 3; Date 7-18-72

72-001-659	Inlet	Impinger solution, filters and wash
-660	Inlet	Acetone wash
72-001-661	Outlet B	Impinger solution, filters and wash
-662	Outlet B	Acetone wash
72-001-663	Outlet C	Impinger solution, filters and wash
-664	Outlet C	Acetone wash
72-001-665	Scrubber water in	Scrubber water No. 1
-666	Scrubber water in	Scrubber water No. 2
-667	Scrubber water in	Scrubber water No. 3
72-001-668	Scrubber water discharge	Scrubber water No. 1
-669	Scrubber water discharge	Scrubber water No. 2
-670	Scrubber water discharge	Scrubber water No. 3

Blanks for Fluoride Runs 1, 2, & 3

	Volume	
72-000-889	-	Whatman #1 filter papers
72-001-691	230	Distilled water
-692	200	Acetone blank
-693	366	10% NaOH solution

TABLE F2.(Cont'd.) NODULIZING KILN OPERATION

Kiln Sulfur Dioxide Run No. 2; Date 7-20-72

Sample No.	Sampling Location	Fraction
72-001-674	Inlet	Impinger contents and wash
-673	Outlet	Impinger contents and wash

Kiln Sulfur Dioxide Run No. 3; Date 7-20-72

72-001-676	Inlet	Impinger contents and wash
-675	Outlet	Impinger contents and wash

Kiln Particulate Sampling

See Appendix E-2, Table E3.

APPENDIX G

TEST LOG

TEST LOG-STAUFFER CHEMICAL CO.

TARPON SPRINGS, FLORIDA

NODULIZING KILN

DATE 1972	LOCATION	PORT	RUN	POLLUTANTS	CLOCK TIME START	END	ELASPED TIME	COMMENTS
6/13	Inlet	N	1	Fluorides & P_2O_5	1245	1302.5	17.5	Change first impinger
					1325	1337.5	12.5	Change nozzle to 0.1875
					1415	1420	5	Process shut down and thunderstorm
					1642	1707	25	
							60 Total	
		W			1740	1800	18	First impinger plugged
					1805	1811	6	Replace third impinger
					1815	1851	36	
							60 Total	
6/13	Outlet BK	B	1	Fluorides & P_2O_5	1240	1325	45	
		D			1650	1735	45	Process shut down 1430-1640
		F			1820	1905	45	
		H			1925	2010	45	
							180 Total	
6/13	Outlet CK	A	1	Fluorides & P_2O_5	1240	1325	45	
		C			1657	1742	45	Process shut down 1430-1640
		E			1820	1905	45	
		G			1930	2015	45	
							180 Total	

DATE 1972	LOCATION	PORT	RUN	POLLUTANTS	CLOCK TIME START	END	ELASPED TIME	COMMENTS
6/14	Inlet	W	2	Fluorides &	1045	1115	30	
		N		P_2O_5	1345	1415	30	
							60 Total	
6/14	Outlet BK	B	2	Fluorides &	1058	1143	45	
		D		P_2O_5	1208	1253	45	
		F			1403	1448	45	
		H			1514	1559	45	
	Outlet CK	A	2	Fluorides &	1058	1143	45	
		C		P_2O_5	1208	1253	45	
		E			1403	1448	45	
		G			1514	1559	45	
							180 Total	
7/18	Inlet	N	3	Fluorides &	1115	1145	30	
		W		P_2O_5	1510	1540	30	
							60 Total	
7/18	Outlet BK	B	3	Fluorides &	1040	1125	45	
		D		P_2O_5	1158	1243	45	
		F			1327	1412	45	
		H			1428	1513	45	
							180 Total	
	Outlet CK	A	2	Fluorides &	1040	1125	45	
		C		P_2O_5	1158	1243	45	
		E			1327	1412	45	
		G			1428	1513	45	
							180 Total	
7/19	Inlet		1	SO_2	1145	1200	15	
					1205	1220	15	
							30 Total	
	Outlet		1	SO_2	1125	1155	30	Thunder storms
					1220	1250	30	after 1300
							60 Total	

DATE 1972	LOCATION	PORT	RUN	POLLUTANTS	CLOCK TIME START	END	ELASPED TIME	COMMENTS
7/20	Inlet		2	SO_2	1400	1430	30	
	Outlet		2		1350	1420	30	
					1445	1515	30	
							60 Total	
7/20	Inlet		3	SO_2	1549	1615	30	
	Outlet		3		1530	1600	30	
					1630	1700	30	
							60 Total	
7/20	Inlet	W	1	Particulate	1520	1550	30	
		N			1700	1730	30	
							60 Total	
7/20	Outlet BK	F	1	Particulate	1510	1515	5	Process down for 5 min
		H			1520	1545	25	
		B			1605	1635	30	
		D			1648	1718	30	
					1735	1805	30	
							120 Total	
7/20	Outlet BK	B	–	Particulate	940	1010	30	Void this test-
		D			1030	1042	12	decide to use rigid
							42 Total	trains
7/21	Inlet	W	2	Particulate	855	925	30	
		N			1017	1047	30	
							60 Total	

DATE 1972	LOCATION	PORT	RUN	POLLUTANTS	CLOCK TIME START	CLOCK TIME END	ELASPED TIME	COMMENTS
7/21	Outlet BK	B	2	Particulate	828	858	30	
		H			905	935	30	
		F			943	958	15	Changed Filters
		D			1003	1018	15	
					1030	1100	30	
							120 Total	
7/21	Inlet	W	3	Particulate	1220	1250	30	
		N			1254	1324	30	
							60 Total	
7/21	Outlet BK	D	3	Particulate	1133	1203	30	
		F			1209	1220	11	Changed Filters
		H			1225	1244	19	
		B			1300	1330	30	
					1337	1407	30	
							120 Total	
				CO LINE				
6/15	CO Line	-	1	Fluorides & P_2O_5	1616	1626	10	
					1630	1706	30	
							40 Total	
				AIR RETURN LINE				
7/19		-	1	Fluorides & P_2O_5	1028	1058	30	
			2		1104	1134	30	
			3		1142	1212	30	
							90 Total	

TEST LOG

Stauffer Chemical Co.
Tarpon Springs, Florida

Personnel: EPA - John Wilkens and Bill King

Stauffer - J. Gabris and R. Brown

PEDCo - R. Amick, R. Gerstle, G. Forte, G. Parnell, R. Zimmer, and F. Meadows

NODULIZING KILN

DATE	TIME	EVENT
6/11/72	Evening	G. Parnell and R. Zimmer arrive in Tarpon Springs with PEDCo van. R. Amick, F. Meadows, G. Forte, and J. Geiger arrive by air.
6/12/72	800-1700	Set up at site.
	1200	R. Gerstle arrives by air from Cincinnati.
6/13/72	830-1240	Continue preparation for testing at kiln. Calibrate and checkout Dynascience SO_2 monitor.
	1240-1500	Fluoride Test No. 1. Frequent plugging of inlet train. Changed to smaller nozzle at 1415.
	1430-1657	Kiln down due to lack of rock feed, also thunderstorm delayed testing.
	-1930	Finish Test 1 at inlet.
	1645-2010	Finish Test No. 1 at outlet.
	1830-2400	Clean up trains and prepare for next run.
6/14/72	800-1045	Set up for fluoride Test No. 2.
	1000	R. Gerstle leaves for Cincinnati.
	1045-1600	Fluoride Test No. 2. Fairly routine, difficult and time consuming to change ports at outlet sites.
	1600-1900	Clean up trains and prepare for next run.
6/15/72	800-1100	Preparation for Test No. 3 - fluorides.
	1100	Kiln down for rest of day. R. Zimmer, G. Parnell and G. Forte go back to Motel.

NODULIZING KILN

DATE	TIME	EVENT
6/15/72 (Cont'd)	1100-1616	R. Amick and F. Meadows prepare for fluoride test on CO line.
	1616-1625	Conduct one test on CO line for fluoride and P_2O_5. No velocity traverse due to dangerous working conditions.
6/16/72	800	Kiln still not operating. Move equipment to slag tap test sites and set up there.
	1344-1900	Test 1 at slag tap.
6/17 & 18/72		Weekend - no work.
6/19 & 20/72		No work - Hurricane Agnes
6/21/72	700-1030	Fluoride slag tap, scrubber Test No. 3.
	1250-1740	Fluoride Test No. 2 (Test Nos. assigned by J. Wilkens).
6/22/72	800-1400	Preparation for cold air velocity traverse and fluoride kiln Test No. 3.
	1400-1415	Dilution air inlet to calciner spray tower velocity traverse.
	Evening	PEDCo crew leaves for Cincinnati, decision to come back 7/17/72, if possible.

Personnel: EPA - Gene Riley, John Wilkens and Neil Sanders

Stauffer: R. Brown and L. Gabris

PEDCo - G. Forte, G. Parnell, D. Armentrout, R. Amick, and R. Zimmer

7/17/72	800	Plant arrival.
	800-1200	Set up for nodulizing kiln Test No. 3.
	1400	Kiln down - for I.D. fan repairs.
	1430	Leave.
	2230	F. Meadows arrives via air.

EPA - Bill King (morning), L. Evans, Gene Riley, and Neil Sanders
PEDCo - Crew above and F. Meadows

NODULIZING KILN

DATE	TIME	EVENT
7/18/72	700	Arrival.
	1115	Started kiln test - total fluorides - Test No. 3.
7/18/72	1615	Ended kiln test - many process breakdowns in between.
	1930	Left plant.
7/19/72	730	Arrival - Decision by EPA (Gene Riley) to scrap remaining two tests on CO line because of high possibility of injury.
	1030-1430	Three air return line (kiln) tests for fluorides and P_2O_5.
	1130-1245	One SO_2 kiln spray tower inlet and outlet test.
	1300-all afternoon	Rail and lightning - no work.
	1600	Leave plant.
7/20/72	700	Arrival.
	1030	Start particulate Test No. 1 on kiln.
	1230	Outlet moisture plugging filter. Decision by EPA (Gene Smith) to use rigid train with heated probe - no traverse and only one train used at lower sampling site.
7/20/72	1400-1615	Two SO_2 tests at kiln inlet and outlet.
	1530	Restart SO_2 test.
	1750	Finish SO_2 test.
	1930	Finish clean-up and leave plant.
7/21/72	730	Arrival at plant.
	830-1040	Particulate Test 2 at kiln inlet and outlet.
	1130-1430	Particulate Test 3 at kiln inlet and outlet.
	1430	Finish tests and begin clean-up.

NODULIZING KILN

DATE	TIME	EVENT
7/21/72 (Cont'd)	1530	G. Forte, G. Parnell, D. Armentrout and F. Meadows leave for airport.
	1700	R. Zimmer and R. Amick - pack truck, finish clean-up and leave.

APPENDIX H

PROJECT PARTICIPANTS AT STAUEFFER CHEMICAL CO.

TARPON SPRINGS, FLORIDA

EPA (OAP)

John Wilkens - Project Officer, EMB

Bill King - Chemical Engineer, SDID

Launeil Sanders - Chemical Engineer, EMB

Gene Riley - Technician, EMB

Stauffer:

R. Brown - Environmental Supervisor

L. Gabris - Plant Chemist, Tarpon Springs

PEDCo:

R. Gerstle, P.E. - Engineering Supervisor and Field Supervisor

R. Amick - Environmental Engineer and Field Supervisor

F. Meadows - Senior Technician

G. Forte - Technician

G. Parnell - Technician

R. Zimmer - Technician

D. Armentrout - Biologist/Technician

J. Geiger - Technician