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.

AP42 Section:	9.10.1.2
Background Chapter	4
Reference:	8
Title:	Particulate Emission Testing Performed for Monitor Bay Sugar Company, Bay City, Michigan, on the Pulp Dryer 1 Exhaust, Network Environmental, Inc., Grand Rapids, MI, October 14, 1992.

APPENDIX H

REPORT EXCERPTS FROM REFERENCE 8

(Monitor Bay Sugar Company, October 14, 1992)

Report of...

Particulate Emission Testing

performed for...

Monitor Sugar Company
Bay City, Michigan

on the

Pulp Dryer 1 Exhaust

October 14, 1992

022.06

Network Environmental, Inc.
Grand Rapids, MI

Network Environmental, Inc.

SUMMARY OF PARTICULATE EMISSIONS

COMPANY NAME: MONITOR SUGAR COMPANY

TEST DATE: 10/14/92

COMPANY LOCATION: BAY CITY, MICHIGAN

SOURCE NAME: PULP DRYER #1

SAMPLING STAFF: CARGILL/SMITH

SAMPLE NUMBER	1	2	3
STANDARD ANALYSIS			
E1. TOTAL WEIGHT COLLECTED, grams	0.135	0.129	0.124
E2. LBS. PARTICULATE/1000 LBS. GAS, ACTUAL(1)	0.064	0.063	0.058
E3. LBS. PARTICULATE/1000 LBS. GAS, DRY(2)	0.064	0.063	0.058
E6. GRAINS/DSCF(4)	0.046	0.044	0.043
E7. LBS./HOUR	13.98	13.97	12.59

1. 'ACTUAL' MEANS AT THE CONDITIONS FOUND AT THE SAMPLING LOCATION.
2. 'DRY' INCLUDES ONLY THE NATURAL MOISTURE THAT WOULD BE EMITTED FROM THE PROCESS. MOISTURE ADDED OR SUBTRACTED BY THE COLLECTOR IS NOT INCLUDED.
3. 'WET' INCLUDES THE MOISTURE AS MEASURED AT THE SAMPLING LOCATION.
4. 'DSCF' IS UNDER TOTALLY DRY CONDITIONS, ALL MOISTURE REMOVED.

Network Environmental, Inc.

SUMMARY OF EXHAUST GAS PARAMETERS

COMPANY NAME: MONITOR SUGAR COMPANY

TEST DATE: 10/14/92

COMPANY LOCATION: BAY CITY, MICHIGAN

SOURCE NAME: PULP DRYER #1

SAMPLING STAFF: CARGILL/SMITH

	SAMPLE NUMBER	1	2	3
G1.	STACK RADIUS, inches	33.0	33.0	33.0
G2.	AREA OF STACK, sq. ft.	23.76	23.76	23.76
G3.	BAROMETRIC PRESSURE, in. HG.	28.86	28.86	28.86
G4.	STATIC PRESSURE IN STACK, in. H2O	1.05-	1.05-	1.05-
G5.	STACK GAS TEMPERATURE, deg. F	178	177	178
G6.	AVG. SQRT VELOCITY PRESSURE OF POINTS SAMPLED	0.711	0.718	0.715
G7.	PERCENT MOISTURE AT TEST LOCATION	37.08	34.48	39.92
G8.	PERCENT MOISTURE BEFORE COLLECTOR	37.08	34.48	39.92
G9.	DRY GAS COMPOSITION: % OXYGEN	15.33	16.07	15.93
	% CARBON DIOXIDE	3.60	2.93	3.00
	% CARBON MONOXIDE	0.00	0.00	0.00
	% NITROGEN	81.07	81.00	81.07
G10.	PERCENT EXCESS AIR AT TEST LOCATION			
	DENSITY AND MOLECULAR WEIGHT OF STACK GAS:			
G11.	DRY, @ STP, lbs./cu.ft.	0.0755	0.0753	0.0753
G12.	WET, @ STP, lbs./cu.ft.	0.0647	0.0653	0.0638
G13.	WET, @ STACK CONDITIONS, lbs./cu.ft.	0.0517	0.0523	0.0510
G14.	MOLECULAR WEIGHT, DRY, @ STP, lbs./mole	29.20	29.12	29.13
G15.	AVERAGE GAS VELOCITY, feet/min.	2947	2962	2985
	STACK GAS FLOW RATE:			
G16.	STACK CONDITIONS, ACFM	70,027	70,367	70,925
G17.	STANDARD CONDITIONS, SCFM	55,969	56,285	56,680
G18.	STANDARD CONDITIONS, DRY SCFM	35,214	36,876	34,051

STANDARD TEMPERATURE AND PRESSURE (STP) = 29.92 inches HG, 70 deg. F

Network Environmental, Inc.

SUMMARY OF PARTICULATE TRAIN PARAMETERS

COMPANY NAME: MONITOR SUGAR COMPANY TEST DATE: 10/14/92

COMPANY LOCATION: BAY CITY, MICHIGAN

SOURCE NAME: PULP DRYER #1

SAMPLING STAFF: CARGILL/SMITH

	SAMPLE NUMBER	1	2	3
P1.	NUMBER OF POINTS SAMPLED	12	12	12
P2.	DURATION OF SAMPLE, minutes	60.00	60.00	60.00
P3.	NOZZLE DIAMETER, inches	0.313	0.313	0.313
P4.	NOZZLE AREA, sq. ft.	0.00053	0.00053	0.00053
P5.	PITOT CALIBRATION FACTOR	0.860	0.860	0.860
P6.	METER CALIBRATION FACTOR	0.998	0.998	0.998
P7.	AVERAGE FILTER TEMPERATURE, deg. F	0	0	0
P8.	AVERAGE METER TEMPERATURE, deg. F	84.7	81.9	90.2
P9.	AVERAGE METER PRESSURE, inches of water	2.083	2.097	2.079
P10.	METER VOLUME, ACTUAL READING, cu.ft.	47.59	47.50	47.53
P11.	METER VOLUME, @ STP, cu.ft.	44.79	44.94	44.29
P12.	LIQUID VOLUME OF WATER CONDENSED, mls.	557.0	499.0	621.0
P13.	VAPOR VOLUME OF WATER CONDENSED, @ STP, cu.ft.	26.40	23.65	29.44
P14.	TOTAL GAS SAMPLED, @ STP, cu.ft.	71.20	68.59	73.73
P15.	WEIGHT OF GAS SAMPLED, DRY, lbs.	3.38	3.38	3.33
P16.	WEIGHT OF GAS SAMPLED, WET, lbs.	4.61	4.48	4.70
P17.	PERCENT ISOKINETICS	94.6	90.6	96.7

CONCENTRATION CONVERSION FACTORS:

P18.	50 % EXCESS AIR, AFTER COLLECTOR			
P19.	50 % EXCESS AIR, BEFORE COLLECTOR			
P20.	MOISTURE CONDITIONS BEFORE COLLECTOR	1.00	1.00	1.00

STANDARD TEMPERATURE AND PRESSURE (STP) = 29.92 inches Hg, 70 deg. F

DISCUSSION OF RESULTS

The particulate emission concentrations for the three samples were 0.064 Lbs/1000 Lbs for sample one, 0.063 Lbs/1000 Lbs for sample two, and 0.058 Lbs/1000 Lbs for sample three. The average exhaust particulate concentration was 0.0619 Lbs/1000 Lbs.

The particulate mass emission rates were 13.98 Lbs/Hr for sample one, 13.97 Lbs/Hr for sample two, and 12.59 Lbs/Hr for sample three. The average mass emission rate was 13.51 Lbs/Hr.

SOURCE DESCRIPTION

The source tested was the number one beet pulp dryer. The rotary dryer is fired by natural gas and dries the pulp with direct contact. The pulp is fed into the dryer at the beginning of the rotary section. The pulp is passed through the rotary dryer where most of the moisture is removed. The particulate laden exhaust is then passed through a multiclone collector and then a scrubber for particulate removal before it is exhausted to the atmosphere.

Process operating information for the day of the sampling can be found in Appendix A.

SAMPLING AND ANALYTICAL PROTOCOL

The sampling location was on the 66 inch I.D. exhaust stack at a distance that meets the eight duct diameter downstream two duct diameter upstream requirement of U.S. EPA Reference Method 1.

Particulate

The particulate sampling and analysis were performed in accordance with MDNR Reference Method 5B, and the methods referenced therein. Three (3) samples, each sixty (60) minutes in duration, were collected from the exhaust stack. All the quality control and quality assurance requirements specified in the methods were incorporated in the sampling and analysis. No alterations were incorporated in the testing or analysis. Figure 1 shows a schematic of the particulate sampling train.

Run
1 8:45-9:46
2 9:57-10:59
3 11:13-12:16

MONITOR SUGAR COMPANY

Operating Log
Pulp Driers Station

Day Ending: 10-14-92
Campaing Day: 21

Time	Inlet Temp. #1	Inlet Temp. #2	Inlet Temp. #3	Outlet Temp. #1	Outlet Temp. #2	Outlet Temp. #3	Moist. Plain #1	Moist. Plain #2	Moist. Plain #3	Moist. Pellets	Collectors Press. Drop #1	Collectors Press. Drop #2	Collectors Press. Drop #3	Collectors Press. Drop #4	Belt Scale Wet Pulp Ton/Hr.	Feed Conv. R.P.M. #1	Feed Conv. R.P.M. #2	Feed Conv. R.P.M. #3	Loading Scrolls % #1	Loading Scrolls % #2	Loading Scrolls % #3
7	850	900	830	170	145	125	13.2	10.1	10.6	10.6	4	4	4	4	69	240	180	100	61	41	52
8	870	1040	850	170	145	125	10.3	9.5	9.7	10.4	4	4	4	4	87	240	210	100	60	41	52
9	870	1010	830	170	145	125	14.0	11.6	10.1	10.4	4	4	4	4	74	240	210	100	60	41	50
10	860	1060	860	170	145	125	12.8	12.4	13.1	10.1	4	4	4	4	95	240	205	100	60	41	55
11	870	1040	880	170	145	125	12.4	11.0	12.6	9.9	4	4	4	4	90	240	195	100	60	41	45
12	860	1020	880	170	145	125	13.1	11.8	13.5	10.1	4	4	4	4	90	240	195	100	60	41	50
1	680	1000	860	170	145	125	10.1	10.1	11.8	10.3	4	4	4	4	85	240	195	100	58	41	50
2	830	1020	900	170	145	125	15.5	11.0	11.8	10.1	4	4	4	4	62	240	195	60	60	41	56
3	600	900	880	170	145	125	7.2	10.0	11.4	10.5	4	4	3	4	57	240	200	100	60	40	50
4	720	920	880	170	145	125	11.6	12.1	13.1	9.5	4	4	3	4	71	240	200	100	60	40	50
5	740	980	880	170	145	125	13.7	11.0	11.0	8.9	4	4	3	4	64	240	220	100	62	44	52
6	780	940	880	175	145	125	9.3	9.3	11.0	9.7	4	4	3	4	79	240	220	100	60	44	50
7	820	1000	840	175	145	125	10.0	10.2	9.5	9.5	4	4	3	4	75	240	220	100	60	44	50
8	760	940	820	175	145	125	8.5	11.4	11.0	9.2	4	4	3	4	78	240	220	100	60	44	50
9	740	980	800	175	145	125	8.7	9.3	10.8	9.2	4	4	3	4	82	240	220	100	60	44	50
10	760	940	840	175	145	125	8.7	9.5	11.0	9.9	4	4	3	4	71	240	220	100	60	44	50
11	600	940	820	165	145	125	8.7	9.1	11.0	10.1	4	4	4	4	75	240	220	100	60	44	50
12	560	820	900	165	145	125	10.2	11.1	12.1	10.3	4	4	4	4	62	240	220	100	60	44	52
1	700	820	840	165	145	125	10.0	10.3	11.0	9.9	4	4	4	4	52	240	220	100	60	44	52
2	800	940	820	165	145	125	8.9	10.8	10.3	9.8	4	4	4	4	77	240	200	100	60	42	50
3	780	920	800	165	145	125	9.2	10.8	9.8	10.0	4	4	4	4	76	240	200	100	60	42	52
4	780	920	840	165	145	125	10.1	11.0	9.6	10.1	4	4	4	4	88	240	200	100	60	42	52
5	740	900	820	165	145	125	9.9	11.3	10.2	9.6	4	4	4	4	85	240	200	100	60	42	52
6	760	920	840	165	145	125	10.8	8.2	10.2	9.9	4	4	4	4	75	240	200	100	60	[illegible]	52

FAC-042
(11-8[illegible])

Filename: BEET8.WQ1
Date: 07-Dec-94
Facility: Monitor Sugar Company
Location: Bay City, Michigan
Source: Pulp dryer 1
Natural gas-fired rotary drum beet pulp dryer controlled with a multiclone and wet scrubber in series
Test date: Oct. 14, 1992

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	178	177	178	
	Pressure	in. HG	28.86	28.86	28.86	
	Moisture	%	37.08	34.48	39.92	
	Oxygen	%	15.33	16.07	15.93	
	Volumetric flow, actual	acfm	70027	70367	70925	
	Volumetric flow, standard*	dscfm	35306	37001	34144	
	Isokinetic variation	%	94.6	90.6	96.7	
Circle: Production or feed rate Capacity:		TPH	77.20	93.98	90.00	
	Pollutant concentrations:					
	Filterable PM	G/dscf	0.046	0.044	0.043	
	CO2	% vol	3.60	2.93	3.00	
	Pollutant mass flux rates:					
	Filterable PM	lb/hr	13.92	13.95	12.58	
	CO2	lb/hr	8709	7428	7019	
	Emission factors (ENGLISH UNITS):					AVERAGE
	Filterable PM	lb/ton	0.180	0.148	0.140	0.156
	CO2	lb/ton	113	79.0	78.0	89.9
	Emission factors (METRIC UNITS):					AVERAGE
	Filterable PM	kg/Mg	0.0902	0.0742	0.0699	0.0781
	CO2	kg/Mg	56.4	39.5	39.0	45.0

*DSCFM BASED ON A STANDARD TEMPERATURE OF 70 DEGREES FAHRENHEIT

Network Environmental, Inc.

EMISSION SOURCE SUMMARY

STANDARD ANALYSIS

COMPANY NAME: MONITOR SUGAR COMPANY TEST DATE: 10/14/92

COMPANY LOCATION: BAY CITY, MICHIGAN

SOURCE NAME: PULP DRYER #1

SAMPLING STAFF: CARGILL/SMITH

STACK RADIUS, inches		33.0
AREA OF STACK, sq. ft.		23.76
STATIC PRESSURE IN STACK, in. H2O		1.05-
STACK GAS TEMPERATURE, deg. F		178
PERCENT MOISTURE AT TEST LOCATION		37.16
DRY GAS COMPOSITION:	% OXYGEN	15.78
	% CARBON DIOXIDE	3.18
	% CARBON MONOXIDE	0.00
	% NITROGEN	81.04
DENSITY, WET, @ STP, lbs./cu.ft.		0.0646
MOLECULAR WEIGHT, DRY, @ STP, lbs./mole		29.15
AVERAGE GAS VELOCITY, feet/min.		2965
STACK GAS FLOW RATE:	ACFM	70440
	SCFM	56311
	SCFM, DRY	35381

EMISSIONS:

LBS. PARTICULATE/1000 LBS. GAS, ACTUAL(1)	0.0619
LBS. PARTICULATE/1000 LBS. GAS, DRY(2)	0.0619
GRAINS/DSCF(4)	0.0445
LBS./HOUR	13.51

1. 'ACTUAL' MEANS AT THE CONDITIONS FOUND AT THE SAMPLING LOCATION.
2. 'DRY' INCLUDES ONLY THE NATURAL MOISTURE THAT WOULD BE EMITTED FROM THE PROCESS. MOISTURE ADDED OR SUBTRACTED BY THE COLLECTOR IS NOT INCLUDED.
3. 'WET' INCLUDES THE MOISTURE AS MEASURED AT THE SAMPLING LOCATION.
4. 'DSCF' IS UNDER TOTALLY DRY CONDITIONS, ALL MOISTURE REMOVED.

Exhaust Gas Parameters

The exhaust gas parameters (air flow rate, temperature, moisture, and density) were determined by employing U.S. EPA Reference Methods 1 through 4. All the quality control and quality assurance procedures specified in the methods were incorporated in the sampling and analysis. No alterations were incorporated in the sampling and analysis.

This report was prepared by:

David D. Engelhardt
Vice President

This report was reviewed by:

Stephan K. Byrd
President

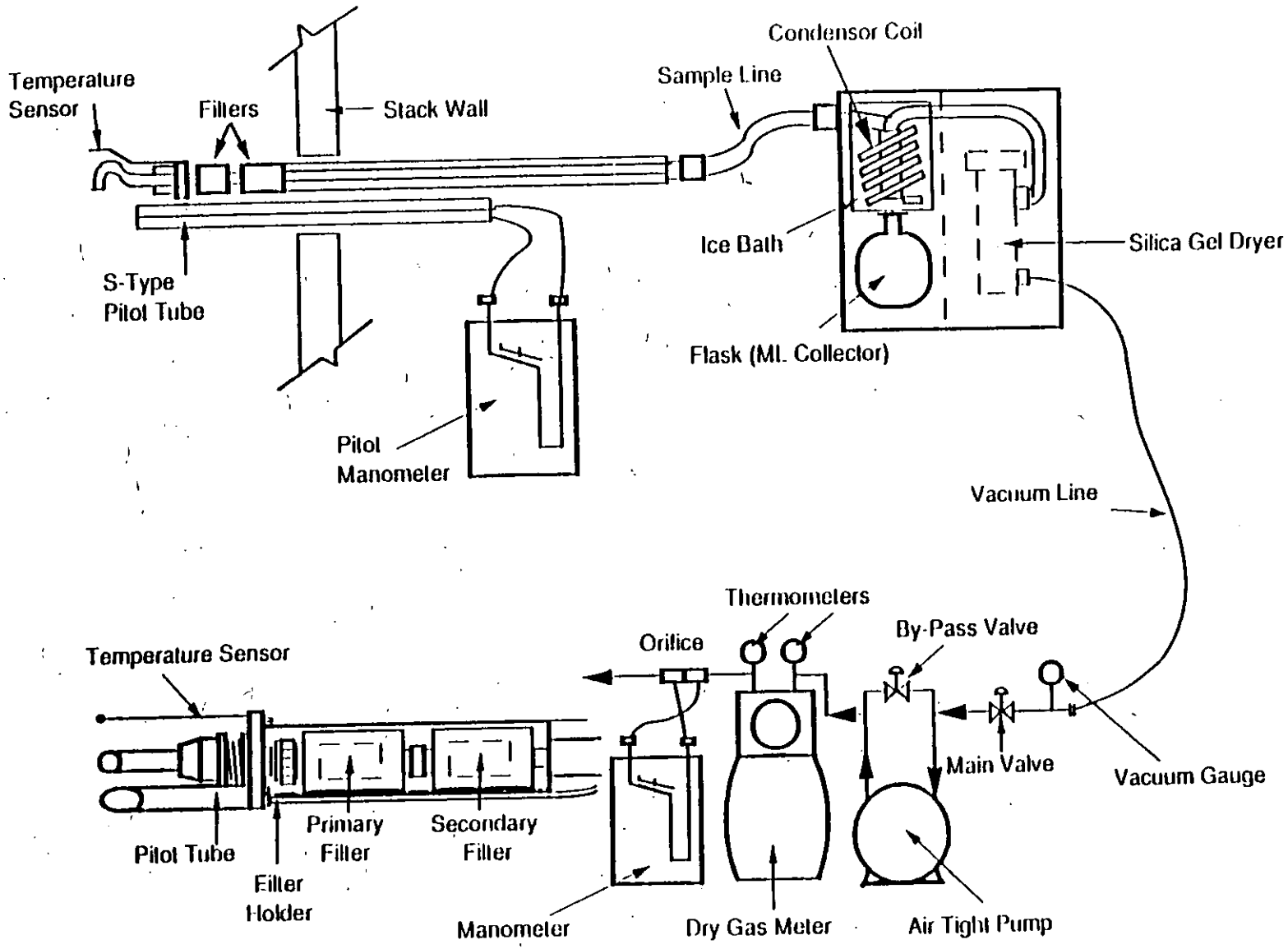

Figure 1

Particulate Sampling Train

NETWORK ENVIRONMENTAL, INC.

Date: 10-14-92
Client: MONITOR SUGAR

Plant: MONITOR SUGAR
Source: DRYER #1 Staff: CARGILL & SMITH

PITOT #1 = .86

Sample #: 1 Filter Set #: 25 Barometric Press: 28.86
Nozzle #: .3125 Primary Filter #: DH-368 Initial Gas Read: 451.93
Rate Meter #: 3072 Secondary Filter #: BH 368 Clock Meter Start: 8:45
Control Box #: 3072 Type Train: 5B Time Meter Start: 0
Condenser Box #: 1 Mls. H_2O Cond.: 540 Time Meter Stop: 1

Port	Point	Vel Press "H_2O	P Venturi "H_2O	Gas Meter Reading	Pump Vac. "Hg	Meter Temp °F In	Meter Temp °F Out	Stack Temp °F	Box Temp °F	Gas Bag #
2	1	.43	1.72	455.50	2	83	84	181		Dryer # 7
	2	.68	2.72	460.06	3	79	83	181		Notes
	3	.65	2.60	464.74	3	83	83	181		INITIAL LEAK CHECK 0.000 cu.ft. @ 17 in. Hg VACCUM
	4	.18	0.72	467.21	2	85	84	180		
	5	.52	2.08	470.95	3	87	83	177		
	6	.61	2.44	475.26	3	91	83	178		
1	1	.54	2.16	479.33	3	89	83	176		END OF TEST #1 @ 9:40
	2	.70	2.80	483.96	3.5	88	84	177		
	3	.65	2.60	488.52	3.5	88	83	176		FINAL LEAK CHECK 0.000 cu.ft. @ 7 in Hg VACCUM
	4	.31	1.24	491.74	2	88	82	176		
	5	.62	2.48	496.08	3	88	82	177		
	6	.36	1.44	499.52	2	88	82	175		

47.59 cu.ft.

NETWORK ENVIRONMENTAL, INC.

Date: 10-14-92
Client: MONITOR SUGAR

Plant MONITOR SUGAR
Source DRYER #1 Staff CARGILL & SMITH

PITOT #1 = .86

Sample # 2 Filter Set # 3 Barometric Press 28.66
Nozzle # .3125 Primary Filter # DH-372 Initial Gas Read 499.62
Rate Meter # Secondary Filter # BH-372 Clock Meter Start 9:57
Control Box # 3072 Type Train 5B Time Meter Start 0
Condenser Box # 1 Mls. H_2O Cond. 490 Time Meter Stop 1

Port	Point	Vel Press "H_2O	P Venturi "H_2O	Gas Meter Reading	Pump Vac. "Hg	Meter Temp °F In	Meter Temp °F Out	Stack Temp °F	Box Temp °F	Gas Bag #
1	1	.54	2.16	503.63	2.5	76	77	178		Dryer # 8
	2	.63	2.48	507.99	3.5	79	78	179		Notes
	3	.58	2.32	512.34	3.5	82	78	178		INITIAL LEAK CHECK = 0.000 cu.ft. @ 20 IN Hg VACCUM
	4	.48	1.92	516.05	3	84	78	178		
	5	.44	1.76	519.76	3	86	79	177		
	6	.58	2.32	523.92	3.5	87	79	175		
2	1	.51	2.04	527.87	3	83	79	177		END OF TEST #2 @ 10:59
	2	.68	2.72	532.48	4	86	79	177		
	3	.62	2.48	536.76	5	88	80	178		
	4	.21	0.84	539.17	2.5	88	80	179		FINAL LEAK CHECK = 0.000 cu.ft. @ 6 IN-Hg VACCUM
	5	.49	1.96	542.97	5	88	80	177		
	6	.54	2.16	547.18	5	91	81	176		

47.5 cu. ft.

NETWORK ENVIRONMENTAL, INC.

Date: 10-14-92
Client: MONITOR SUGAR

Plant: MONITOR SUGAR
Source: DRYER #1 Staff: CARGILL & SMITH
PITOT #1 = .86

Sample #: 3 Filter Set #: 13 Barometric Press: 28.86
Nozzle #: .3125 Primary Filter #: MH-381 Initial Gas Read: 547.33
Rate Meter #: Secondary Filter #: BH-381 Clock Meter Start: 11:13
Control Box #: 3072 Type Train: 5B Time Meter Start: 0
Condenser Box #: 1 Mls. H_2O Cond.: 610 Time Meter Stop: 1

Port	Point	Vel Press "H_2O	P Venturi "H_2O	Gas Meter Reading	Pump Vac. "Hg	Meter Temp °F In	Meter Temp °F Out	Stack Temp °F	Box Temp °F	Gas Bag #
2	1	.51	2.04	551.10	3	84	84	178		Dryer # 9
	2	.67	2.68	555.66	4	85	83	179		Notes
	3	.62	2.48	560.04	4	90	84	180		INITIAL LEAK CHECK 0.000 CU. ft. @ 18 IN. Hg VACCUM
	4	.22	0.88	562.76	2.5	93	85	180		
	5	.48	1.92	566.49	4	95	85	179		
	6	.54	2.16	570.545	4	97	85	178		
1	1	.47	1.88	574.24	4	96	85	179		END OF TEST #3 @ 12:16
	2	.70	2.80	578.81	5	96	88	177		
	3	.52	2.08	582.89	4	97	88	177		
	4	.51	2.04	586.83	4	97	89	177		
	5	.51	2.04	590.81	4	99	90	176		
	6	.48	1.95	594.865	4	100	90	176		FINAL LEAK CHECK 0.000 CU.FT. @ 6 IN. Hg VACCUM

47.005 cu. ft.