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:	7
Title:	Particulate Emission Testing Performed for Monitor Bay Sugar Company, Bay City, Michigan, on the Pulp Dryer 2 Exhaust, Network Environmental, Inc., Grand Rapids, MI, October 13, 1992.

APPENDIX G

REPORT EXCERPTS FROM REFERENCE 7

(Monitor Bay Sugar Company, October 13, 1992)

Report of...

Particulate Emission Testing

performed for...

Monitor Sugar Company
Bay City, Michigan

on the

Pulp Dryer 2 Exhaust

October 13, 1992

022.06

Network Environmental, Inc.
Grand Rapids, MI

Network Environmental, Inc.

SUMMARY OF PARTICULATE EMISSIONS

COMPANY NAME: MONITOR SUGAR COMPANY

TEST DATE: 10/13/92

COMPANY LOCATION: BAY CITY, MICHIGAN

SOURCE NAME: PULP DRYER #2

SAMPLING STAFF: CARGILL/SMITH

SAMPLE NUMBER	1	2	3
STANDARD ANALYSIS			
E1. TOTAL WEIGHT COLLECTED, grams	0.125	0.125	0.126
E2. LBS. PARTICULATE/1000 LBS. GAS, ACTUAL(1)	0.061	0.063	0.060
E3. LBS. PARTICULATE/1000 LBS. GAS, DRY(2)	0.061	0.063	0.060
E6. GRAINS/DSCF(4)	0.044	0.047	0.045
E7. LBS./HOUR	12.68	13.34	13.24

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: 10/13/92

COMPANY LOCATION: BAY CITY, MICHIGAN

SOURCE NAME: PULP DRYER #2

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.	28.80	28.80	28.80
G4.	STATIC PRESSURE IN STACK, in. H2O	0.98-	0.98-	0.98-
G5.	STACK GAS TEMPERATURE, deg. F-	171	180	182
G6.	AVG. SQRT VELOCITY PRESSURE OF POINTS SAMPLED	0.685	0.698	0.726
G7.	PERCENT MOISTURE AT TEST LOCATION	38.54	39.55	39.63
G8.	PERCENT MOISTURE BEFORE COLLECTOR	38.54	39.55	39.63
G9.	DRY GAS COMPOSITION: % OXYGEN	16.40	16.60	16.00
	% CARBON DIOXIDE	2.20	2.47	2.93
	% CARBON MONOXIDE	0.00	0.00	0.00
	% NITROGEN	81.40	80.93	81.07
G10.	PERCENT EXCESS AIR AT TEST LOCATION			
	DENSITY AND MOLECULAR WEIGHT OF STACK GAS:			
G11.	DRY, @ STP, lbs./cu.ft.	0.0750	0.0751	0.0753
G12.	WET, @ STP, lbs./cu.ft.	0.0640	0.0638	0.0639
G13.	WET, @ STACK CONDITIONS, lbs./cu.ft.	0.0516	0.0507	0.0506
G14.	MOLECULAR WEIGHT, DRY, @ STP, lbs./mole	29.02	29.07	29.12
G15.	AVERAGE GAS VELOCITY, feet/min.	2842	2922	3040
	STACK GAS FLOW RATE:			
G16.	STACK CONDITIONS, ACFM	67,529	69,415	72,232
G17.	STANDARD CONDITIONS, SCFM	54,467	55,208	57,255
G18.	STANDARD CONDITIONS, DRY SCFM	33,475	33,376	34,565

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: 10/13/92

COMPANY LOCATION: BAY CITY, MICHIGAN

SOURCE NAME: PULP DRYER #2

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	69.7	70.6	71.1
P9.	AVERAGE METER PRESSURE, inches of water	1.963	1.871	2.001
P10.	METER VOLUME, ACTUAL READING, cu.ft.	45.09	42.78	44.98
P11.	METER VOLUME, @ STP, cu.ft.	43.54	41.23	43.32
P12.	LIQUID VOLUME OF WATER CONDENSED, mls.	576.0	569.0	600.0
P13.	VAPOR VOLUME OF WATER CONDENSED, @ STP, cu.ft.	27.30	26.97	28.44
P14.	TOTAL GAS SAMPLED, @ STP, cu.ft.	70.84	68.20	71.76
P15.	WEIGHT OF GAS SAMPLED, DRY, lbs.	3.27	3.10	3.26
P16.	WEIGHT OF GAS SAMPLED, WET, lbs.	4.53	4.35	4.58
P17.	PERCENT ISOKINETICS	96.7	91.8	93.2

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 0.061 Lbs/1000 Lbs for sample one, 0.063 Lbs/1000 Lbs for sample two, and 0.060 Lbs/1000 Lbs for sample three. The average exhaust particulate concentration was 0.0614 Lbs/1000 Lbs.

The particulate mass emission rates were 12.68 Lbs/Hr for sample one, 13.34 Lbs/Hr for sample two, and 13.24 Lbs/Hr for sample three. The average mass emission rate was 13.09 Lbs/Hr.

SOURCE DESCRIPTION

The source tested was the number two 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.

11:25 - 12:35
12:51 - 13:55
14:07 - 15:09

MONITOR SUGAR COMPANY

Operating Log
Pulp Driers Station

Day Ending: 10-13-92
Campaing Day: 20

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	Leading Scrolls % #1	Leading Scrolls % #2	Leading Scrolls % #3
7	720	860	820	170	145	125	9.5	9.7	10.1	10.3	4	4	4	4	80	240	195	95	60	41	53
8	780	920	820	170	145	125	9.5	11.0	8.6	10.1	4	4	4	4	63	240	192	95	60	[illegible]	53
9	460	1040	820	170	145	125	15.0	10.8	10.8	10.1	4	4	4	4	76	240	195	98	58	41	53
10	—	620	820	—	145	125	12.6	11.8	7.8	9.9	4	4	4	4	46	240	[illegible]	50	53	[illegible]	[illegible]
11	880	1000	880	170	145	125	11.8	12.3	8.6	10.3	4	4	4	4	55	240	200	100	60	41	51
12	820	930	860	170	145	125	11.8	13.4	10.1	10.5	4	4	4	4	85	240	[illegible]	[illegible]	60	41	51
1	800	910	880	170	145	125	13.2	11.3	13.6	9.9	4	4	[illegible]	4	85	[illegible]	[illegible]	80	60	41	52
2	760	880	900	170	145	125	12.0	13.2	13.5	10.0	4	4	4	4	87	[illegible]	[illegible]	[illegible]	60	41	53
3	580	920	900	170	145	125	10.5	10.6	11.0	10.8	4	4	3	3.75	70	240	200	100	60	40	56
4	680	900	800	170	145	125	10.8	11.0	9.6	9.5	4	4	3	3.75	61	240	200	96	60	40	56
5	780	800	800	170	145	125	10.2	11.8	10.0	9.2	4	4	3	3.75	69	240	200	92	60	40	58
6	700	880	820	170	145	125	9.8	12.4	10.2	9.2	4	4	3	3.75	67	[illegible]	190	[illegible]	[illegible]	[illegible]	50
7	720	940	840	170	145	125	8.5	10.8	11.8	9.5	4	4	3	3.75	71	240	[illegible]	[illegible]	[illegible]	42	50
8	700	920	880	170	145	125	7.6	10.3	8.2	9.7	4	4	3	3.75	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	54
9	720	900	840	170	145	125	11.0	11.4	10.8	9.2	4	4	3	3.75	67	[illegible]	180	90	58	42	54
10	800	940	900	170	145	125	8.9	11.0	11.3	9.9	4	4	3	3.75	53	240	200	[illegible]	57	42	54
11	780	920	860	170	145	125	10.0	9.8	9.6	10.1	4	4	3.5	3.75	71	240	200	98	60	42	50
12	720	940	880	170	145	125	10.6	12.2	9.8	9.9	4	4	3.5	[illegible]	65	[illegible]	200	98	60	42	50
1	780	900	860	170	145	125	11.8	11.6	11.3	10.[illegible]	4	4	3.5	3.75	81	240	200	[illegible]	[illegible]	42	50
2	800	920	880	170	145	[illegible]	11.3	9.8	10.6	10.1	4	4	3.5	3.75	76	240	200	98	[illegible]	[illegible]	54
3	820	920	880	170	145	125	10.3	10.1	9.9	9.5	4	4	3.5	3.75	79	240	200	97	58	42	54
4	820	960	860	170	145	[illegible]	10.2	9.8	11.0	9.5	4	4	3.5	[illegible]	83	240	200	[illegible]	[illegible]	[illegible]	54
5	820	960	860	170	145	125	9.5	10.1	8.6	9.7	4	4	3.5	3.75	69	240	200	98	58	42	54
6	800	960	860	170	145	125	10.0	11.1	9.8	10.3	4	4	3.5	3.75	67	240	200	95	60	42	56

FAC-042
(11-88)

Filename: BEET7.WQ1
Date: 07-Dec-94
Facility: Monitor Sugar Company
Location: Bay City, Michigan
Source: Pulp dryer 2
Natural gas-fired rotary drum beet pulp dryer controlled with a multiclone and wet scrubber in series
Test date: Oct. 13, 1992

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	171	180	182	
	Pressure	in. HG	28.80	28.80	28.80	
	Moisture	%	38.54	39.55	39.63	
	Oxygen	%	16.4	16.6	16	
	Volumetric flow, actual	acfm	67529	69415	72232	
	Volumetric flow, standard*	dscfm	33555	33448	34652	
	Isokinetic variation	%	96.7	91.8	93.2	
Circle: Production or feed rate Capacity:		TPH	70.00	85.00	85.39	
	Pollutant concentrations:					
	Filterable PM	G/dscf	0.044	0.047	0.045	
	CO2	% vol	2.2	2.47	2.93	
	Pollutant mass flux rates:					
	Filterable PM	lb/hr	12.68	13.36	13.25	
	CO2	lb/hr	5058	5661	6957	
	Emission factors (ENGLISH UNITS):					AVERAGE
	Filterable PM	lb/ton	0.181	0.157	0.155	0.165
	CO2	lb/ton	72.3	67	81.5	73.4
	Emission factors (METRIC UNITS):					AVERAGE
	Filterable PM	kg/Mg	0.0906	0.0786	0.0776	0.0823
	CO2	kg/Mg	36.1	33.3	40.7	36.7

*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: 10/13/92

COMPANY LOCATION: BAY CITY, MICHIGAN

SOURCE NAME: PULP DRYER #2

SAMPLING STAFF: CARGILL/SMITH

STACK RADIUS, inches		33.0
AREA OF STACK, sq. ft.		23.76
STATIC PRESSURE IN STACK, in. H2O		0.98-
STACK GAS TEMPERATURE, deg. F		178
PERCENT MOISTURE AT TEST LOCATION		39.24
DRY GAS COMPOSITION:	% OXYGEN	16.33
	% CARBON DIOXIDE	2.53
	% CARBON MONOXIDE	0.00
	% NITROGEN	81.13
DENSITY, WET, @ STP, lbs./cu.ft.		0.0639
MOLECULAR WEIGHT, DRY, @ STP, lbs./mole		29.07
AVERAGE GAS VELOCITY, feet/min.		2935
STACK GAS FLOW RATE:	ACFM	69725
	SCFM	55643
	SCFM, DRY	33805

EMISSIONS:

LBS. PARTICULATE/1000 LBS. GAS, ACTUAL(1)	0.0614
LBS. PARTICULATE/1000 LBS. GAS, DRY(2)	0.0614
GRAINS/DSCF(4)	0.0452
LBS./HOUR	13.09

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.

Date: 10-13-92
Client: MONITOR SUGAR

Plant: MONITOR SUGAR (BAY CITY)
Source: DRYER # 2 Staff: CARGILL & SMITH
Pitot #1

Sample #	#1	Filter Set #	89	Barometric Press	28.8
Nozzle #	.3125	Primary Filter #	DH-374	Initial Gas Read	301.11
Rate Meter #		Secondary Filter #	BH 374	Clock Meter Start	11:25
Control Box #	3072	Type Train	5B	Time Meter Start	0
Condenser Box #	1	Mls. H_2O Cond.	568	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	.53	2.15	304.87	2.5	67	67	180		Dryer # 1
	2	.52	2.05	308.81	3	64	66	180		Notes
	3	.31	.84	311.45	2.5	69	67	168		0.000 cu ft @ 5" in. Hg vaccum leak check
	4	.62	2.50	315.28	4.5	71	67	168		
	5	.76	3.07	320.25	5.5	74	67	169		
	6	.57	2.31	324.45	3.5	74	67	169		
2	1	.42	1.70	327.86	3	75	68	170		End of Test #1 @ 12:35 PM
	2	.61	2.48	332.00	4	72	68	168		
	3	.37	1.50	335.34	3	74	68	169		
	4	.20	.81	337.96	2.5	74	68	170		Final leak check 0.000 cu ft @ 5 in. Hg vaccum
	5	.38	1.54	341.33	3.5	75	68	170		
	6	.64	2.60	346.20	5	75	68	170		

45.09 cu ft

NETWORK ENVIRONMENTAL, INC.

Date: 10-13-92
Client: MONITOR SUGAR

Plant: MONITOR SUGAR
Source: DRYER #2 Staff: CARGILL & SMITH
PITOT #1

Sample #	2	Filter Set #	9	Barometric Press	28.9
Nozzle #	.3125	Primary Filter #	DH 379	Initial Gas Read	346.53
Rate Meter #		Secondary Filter #	BH-379	Clock Meter Start	12:51
Control Box #	30	Type Train	5e	Time Meter Start	0
Condenser Box #	1	Mls. H_2O Cond.	556	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	.42	1.57	349.92	2	68	69	173		Dryer # 4
	2	.62	2.33	353.77	2	69	68	168		Notes
	3	.40	1.50	357.21	33	72	68	183		INITIAL 0.000 cu. ft @ 28 in. Hg VACCUM LEAK CHECK
	4	.45	1.69	360.08	2.5	75	68	185		
	5	.33	1.24	363.79	2	75	69	182		
	6	.67	2.51	368.01	2	77	69	181		
1	1	.56	2.10	370.86	3.5	70	69	184		END OF TEST #2 @ 13:55
	2	.42	1.57	374.22	2.5	72	68	183		
	3	.21	.78	376.72	2	74	68	183		FINAL LEAK CHECK 0.000 cu. ft @ 5 in. Hg VACCUM
	4	.64	2.40	380.87	3	74	68	181		
	5	.67	2.51	386.25	3	74	68	180		
	6	.60	2.25	389.31	3	74	68	180		

42.78 cu.ft.

NETWORK ENVIRONMENTAL, INC.

Date: 10.13.92
Client: MONITOR SUGAR

Plant: MONITOR SUGAR
Source: DRYER # 2 Staff: CARGILL & SMITH
PITOT # 1

Sample # 3 Filter Set # 21 Barometric Press 28.8
Nozzle # .3125 Primary Filter # 385 Initial Gas Read 389.57
Rate Meter # Secondary Filter # 385 Clock Meter Start 14:07
Control Box # 3072 Type Train 5B Time Meter Start 0
Condenser Box # 1 Mls. H_2O Cond. 590 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	.60	2.25	393.42	~~2~~	~~66~~	~~66~~	~~183~~		Dryer # 6
	2	.64	2.40	397.64	3	70	65	181		Notes
	3	.21	.77	400.05	2	71	66	180		INITIAL LEAK CHECK 0.000 cu. ft. @ 27 in. Hg VACCUM
	4	.62	2.27	404.03	3	73	68	181		
	5	.72	2.64	408.04	3	75	67	180		
	6	.64	2.40	412.58	3	76	68	177		
2	1	.47	1.72	416.08	2.5	73	69	184		END OF TEST # 3 @ 15:9
	2	.62	2.27	420.22	3	75	69	183		
	3	.33	1.21	423.24	2	77	69	185		
	4	.29	1.06	426.46	2	77	70	186		FINAL LEAK CHECK .000 cu. ft. @ 7 in. Hg VACCUM ✓
	5	.63	2.31	430.14	3	77	70	183		
	6	.74	2.71	434.55	3	79	70	181		

44.98 cu ft.