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:	2
Title:	Results of an Emission Compliance Test on the North Dryer #2 at Southern Minnesota Beet Sugar Cooperative, Renville, Minnesota, MMT Environmental, Inc., St. Paul, MN, December 14, 1988.

APPENDIX B

REPORT EXCERPTS FROM REFERENCE 2

(Southern Minnesota Beet Sugar Cooperative, December 14, 1988)

Rec'd 11/9/94
TR

MMT Environmental Services, Inc.
4643 North Chatsworth Street
St. Paul, MN 55112

RESULTS OF AN EMISSION COMPLIANCE TEST ON THE NORTH DRYER #2 AT SOUTHERN MINNESOTA BEET SUGAR COOPERATIVE RENVILLE, MINNESOTA 56284

December 14, 1988

Submitted to:

Southern Minnesota Beet Sugar
Cooperative
P. O. Box 500
Renville, Minnesota 56284

Attention: Mr. W. D. DeBelly

Prepared by:

Clifford E. Mohs
Manager, Technical Services

Approved by:

for Milos Tomaides, Ph.D.,P.E.

Report Number 8722
Project Number 8202

TABLE 2.1 SUMMARY OF PARTICULATE EMISSION TEST RESULTS

PROJECT NUMBER: 8202 COMPANY: SOUTHERN MN SUGAR BEET COOP
TEST NUMBER: 1 SOURCE: NORTH CYCLONE DRYER #2

TEST PARAMETER	RUN 1	RUN 2	RUN 3	
TEST DATE	12/14/88	12/14/88	12/14/88	
TIME OF TEST, HR:				
START	0928	1044	1204	
FINISH	1029	1147	1310	
EFFLUENT TEMPERATURE, °DEGREES F	292	279	259	
EFFLUENT MOISTURE CONTENT, % V/V	29.8	30.6	30.5	
EFFLUENT COMPOSITION, % V/V DRY:				
CARBON DIOXIDE	5.2	5.2	5.2	
OXYGEN	14.9	14.9	14.9	
CARBON MONOXIDE	0.0	0.0	0.0	
EFFLUENT VOLUMETRIC FLOW RATE:				
ACTUAL CONDITIONS, ACFM	20741	20401	20739	
STANDARD CONDITIONS, SCFM	14031	14025	14657	
DRY STANDARD CONDITIONS, DSCFM	9847	9733	10183	9921
ISOKINETIC VARIATION, %	96.6	99.4	95.0	
EFFLUENT PARTICULATE CONCENTRATION:				
ACTUAL CONDITIONS, GR/ACF	0.0424	0.0400	0.0462	
STANDARD CONDITIONS, GR/SCF	0.0627	0.0582	0.0654	
DRY STANDARD CONDITIONS, GR/DSCF	0.0894	0.0839	0.0941	0.0891 1 sample
SOURCE PARTICULATE EMISSION RATE:				
CLASSICAL METHOD, LB/HR	7.55	7.01	8.22	7.59
RATIO OF AREAS METHOD, LB/HR	7.29	6.96	7.80	7.35

PARTICULATE CONCENTRATION AND EMISSION RATES BASED ON ANALYSIS OF THE SAMPLING TRAIN FRONT AND BACK CATCHES.

STANDARD CONDITIONS: 68 DEGREES FAHRENHEIT, 29.92 INCHES OF MERCURY.

700 5.0520 - [illegible] 0.0892

SUMMARY OF PARTICULATE EMISSION TEST LABORATORY DATA

PROJECT NUMBER: 8202 COMPANY: SOUTHERN MN SUGAR BEET COOP
TEST NUMBER: 1 SOURCE: NORTH CYCLONE DRYER #2

	MASS OF PARTICULATE MATTER COLLECTED, GRAMS							
	FRONT CATCH				BACK CATCH			TOTAL PARTICULATE MASS COLLECTED
RUN NUMBER	FRONT WASH	CYCLONE CATCH	FILTER CATCH	FRONT TOTAL	IMPINGER CATCH **	IMPINGER WASH	BACK TOTAL	
1	0.0429	0.0000	0.1237	0.1666	0.0235	0.0139	0.0374	0.2040
2	0.0225	0.0000	0.1326	0.1551	0.0221	0.0175	0.0396	0.1947
3	0.0465	0.0000	0.1400	0.1865	0.0103	0.0214	0.0317	0.2182

* NOT APPLICABLE

** CHLOROFORM/ETHYL ETHER EXTRACTION

DEC 15 1988

SOUTHERN MINNESOTA SUGAR CO-OP

DRYER REPORT

FORM 12 Rev. 6-57

OPERATOR — BEET END 4MAN

SHIFT 1 Larry Mogh

SHIFT 2 [illegible] R.E. Kennedy

SHIFT 3 [illegible]

DAY ENDING 12/14/88 8 A.M.

TIME	A.M. 9	10	11	12	P.M. 1	2	3	4	5	6	7	8	9	10	11	12	A.M. 1	2	3	4	5	6	7	8
FEED RATE % NORTH	35	40	20	20	20	35	40	40	35	35	35	35	35	30	35	35	40	40	40	40	40	40	30	40
FEED RATE % SOUTH	35	20	40	40	40	40	40	40	40	40	40	40	40	35	40	40	40	40	40	40	40	40	40	40
FURNACE TEMP. NORTH	1050	800	800	800	750	950	1050	1050	1050	1000	1000	1000	950	950	1000	950	1000	1600	1000	1000	1000	1000	1000	1000
FURNACE TEMP. SOUTH	1250	1300	1300	1300	1200	1200	1200	1200	1200	1250	1200	1200	1200	1150	1150	1200	1150	1150	1100	1100	1100	1100	1100	1100
EXIT TEMP. NORTH	310	280	270	270	270	300	310	310	310	310	310	310	305	305	305	305	310	310	310	310	310	310	310	310
EXIT TEMP. SOUTH	325	335	335	335	335	330	330	330	330	330	330	330	330	325	325	325	325	325	320	320	320	320	320	320
MOISTURES PRESSED P.	74.2	74.2	73.8	73.6	75.0	74.4	74.0	74.2	X 73.8	X 69.8	X 73.6	X 72.2	X 72.0	X 73.6	X 72.0	X 72.4	74.2	73.6	73.4	M 73.6	73.4	73.6	73.6	M 73.4
MOISTURES DRIED P.	8.4	9.2	9.4	8.8	10.2	8.2	10.0	9.8	9.6	9.0	8.4	8.2	8.4	8.0	8.8	8.4	10.0	9.4	8.6	8.8	8.8	9.0	9.2	9.4
MOISTURES PELLETS	12.2	11.4	11.6	11.2	11.8	10.6	11.6	11.4	11.0	11.2	11.0	10.8	11.8	11.4	12.0	11.8	12.8	12.0	11.8	11.6	12.2	12.0	11.8	12.0

FUEL OIL USED

NORTH METER: 8 A.M. 220665 — 4 P.M. 222975 — 12 MID. 225894 — 8 A.M. 22[illegible].35

SOUTH METER: 8 A.M. 861755 — 4 P.M. 865420 — 12 MID. 869138 — 8 A.M. 87[illegible].35

STORAGE BIN (E) OR (W)																								
PYROMETER NORTH	1050	800	800	800	750	950	1050	1050	1000	1000	1000	950	950	950	950	950	1000	1000	1000	1000	1000	1000	1000	1000
PYROMETER SOUTH	1300	1350	1350	1350	1250	1250	1250	1250	1250	1300	1250	1250	1250	1200	1200	1250	1200	1200	1150	1150	1150	1150	1150	1150
FIRE VISIBLE EXIT END NORTH	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
FIRE VISIBLE EXIT END SOUTH	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
CHEMICALS TO WATER TANK										X		X		X		X								

~~REASON FOR PUSH TO FLOOR:~~

* COMMENTS:

* NOTE TIMES FOR INSTALLATION OF NEW DIES AND ROLLERS.

Filename: BEET2.WQ1
Date: 02-Dec-94
Facility: Southern Minnesota Beet Sugar Cooperative
Location: Renville, Minnesota
Source: Fuel oil-fired drum pulp dryer (North dryer)
Test date: Dec. 14, 1988

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	292	279	259	
	Pressure	in. HG	28.82	28.8	28.8	
	Moisture	%	29.82	30.6	30.52	
	Oxygen	%	14.9	14.9	14.9	
	Volumetric flow, actual	acfm	20741	20401	20739	
	Volumetric flow, standard*	dscfm	9844	9737	10186	
	Isokinetic variation	%	96.63	99.41	94.95	
	Wet pulp feed rate North Dryer	TPH	37.5	25.3	20	
	Pollutant concentrations:					
	Filterable PM	G/dscf	0.073	0.0668	0.159	
	Condensible PM	G/dscf	0.0164	0.0171	0.007	
	CO2	% dv	5.2	5.2	5.2	
	Condensible organic PM	% of CPM	62.8%	55.8%	32.5%	
	Condensible inorganic PM	% of CPM	37.2%	44.2%	67.5%	
	Multiply all conc. by 4 because only one of four stacks was tested.					
	Pollutant mass flux rates:					
	Filterable PM	lb/hr	24.6	22.3	55.5	
	Condensible PM	lb/hr	5.54	5.71	2.44	
	CO2	lb/hr	14033	13880	14519	
	Condensible organic PM	lb/hr	3.48	3.19	0.79	
	Condensible inorganic PM	lb/hr	2.06	2.52	1.65	
	Emission factors (ENGLISH UNITS):					AVERAGE
	Filterable PM	lb/ton	0.657	0.880	2.78	1.44
	Condensible PM	lb/ton	0.148	0.225	0.122	0.165
	CO2	lb/ton	374	548	726	549
	Condensible organic PM	lb/ton	0.0927	0.126	0.0397	0.0861
	Condensible inorganic PM	lb/ton	0.0549	0.0996	0.0825	0.0790
	Emission factors (METRIC UNITS):					AVERAGE
	Filterable PM	kg/Mg	0.329	0.440	1.39	0.719
	Condensible PM	kg/Mg	0.0738	0.113	0.0611	0.0825
	CO2	kg/Mg	187	274	363	275
	Condensible organic PM	kg/Mg	0.0464	0.0629	0.0199	0.0430
	Condensible inorganic PM	kg/Mg	0.0274	0.0498	0.0413	0.0395

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

3 EMISSION TEST PROCEDURES

3.1 General

In order to determine the pollutant emission rate from stationary sources, the Environmental Protection Agency (EPA) has established a series of reference methods which specify the manner in which tests must be performed. These reference methods are found in the Code of Federal Regulations under Title 40 - Protection of Environment; Chapter 1 - Environmental Protection Agency; Subchapter C - Air Programs; Part 60 - Standards of Performance for New Stationary Sources; Appendix A - Reference Methods. Unless otherwise noted, the tests presented in this report were performed according to the EPA Reference Methods as revised on July 1, 1985. A brief description of the test procedures used follows.

3.2 Sampling Points

The sampling required for EPA Methods 2 and 5 was performed at numerous points across the duct cross-section. The number of sampling points and their locations within the duct were determined according to EPA Method 1 (Figure 3.1). The number of points required is based on the distance of undisturbed flow both up and downstream of the sampling location.

3.3 Effluent Flow Rate

The effluent volumetric flow rate was determined per EPA Method 2. The effluent velocity pressure and temperature were measured at numerous points across the duct cross-section using an S-type pitot tube and a chromel-alumel thermocouple. The flow rate measurements were made simultaneously with each particulate concentration test run.

3.4 Effluent Composition (CO_2, O_2)

The carbon dioxide and oxygen content of the effluent was determined per EPA Method 3. One (1) multi-point integrated sample was collected simultaneously with each particulate test run. Analysis of the sample was performed with a standard Orsat analyzer using commercially prepared solutions.

Figure 3.1 Description of Sampling Location

Duct cross-sectional dimensions at the sampling location: 47.5

Equivalent diameter (rectangular duct only): _____

Distance from sampling ports to the nearest flow disturbance;

Before sampling ports: 5.6 = _____ duct diameters

After sampling ports: 2.0 = _____ duct diameters

Number of sampling points;

Required by EPA Method 1: 26

Actually used: Only used 20 because straightening vanes were installed

Number of ports: 2

Points per port: 10

Sketch of sampling location: Not to Scale

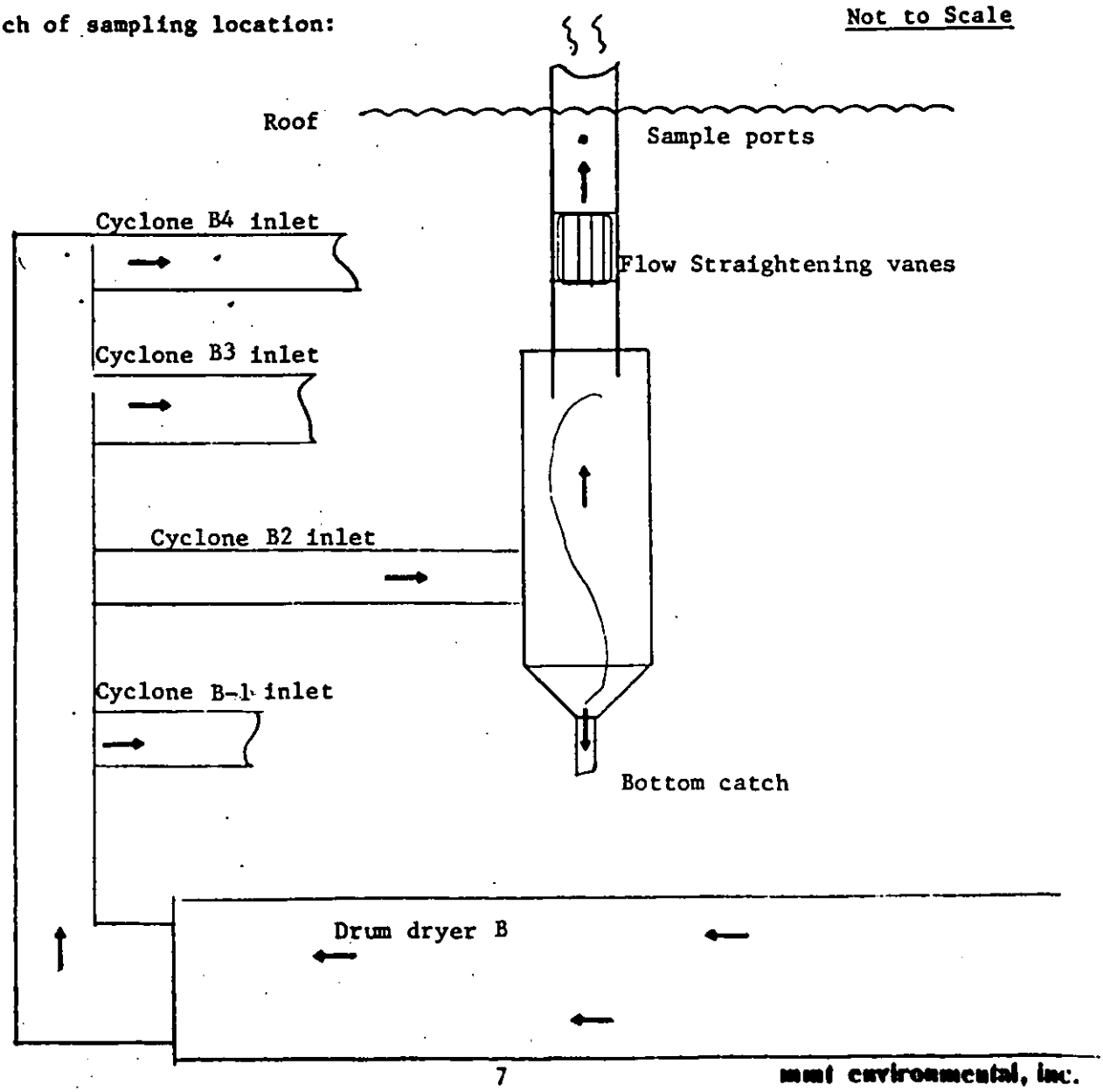
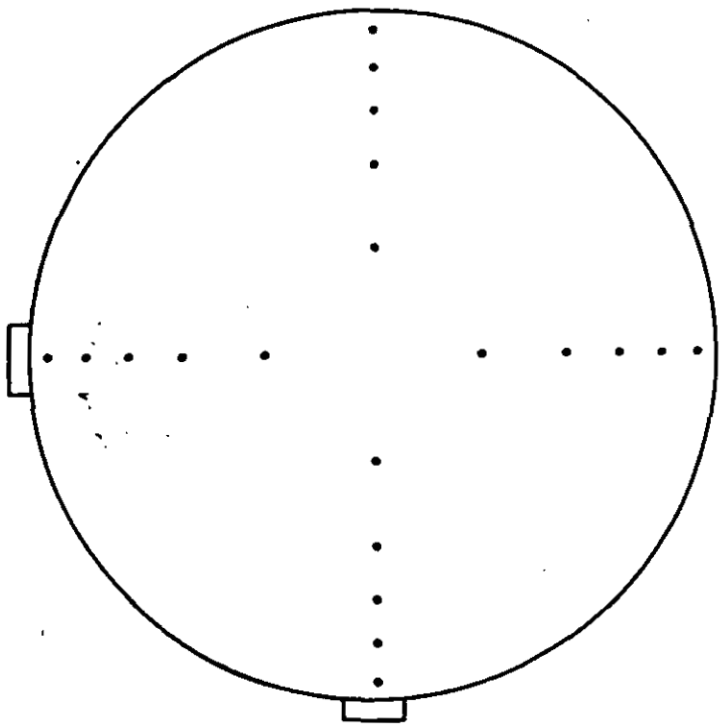


Figure 3.2 Sampling Point Locations Within the Duct

Sketch: Not to Scale



Location of sampling points within each port:

Point Number	Distance From Duct Inside Wall (by Port) to the Sampling Point: % of Duct Diameter	Inches	Point Number	Distance From Duct Inside Wall (by Port) to the Sampling Point: % of Duct Diameter	Inches
1	2.53	1.2	13		
2	8.21	3.9	14		
3	14.5	6.9	15		
4	22.5	10.7	16		
5	34.1	16.2	17		
6	65.9	31.3	18		
7	77.5	36.8	19		
8	85.5	40.6	20		
9	91.8	43.6	21		
10	97.5	46.3	22		
11			23		
12			24		

3.5 Effluent Moisture Content

The effluent moisture content during each test run was determined simultaneously with the particulate concentration determination as per EPA Method 5. The moisture content was calculated from the volume and/or mass of condensed water collected in the cold box impingers and the volume of gas sampled. (See Comment Section)

3.6 Effluent Particulate Concentration

The effluent particulate concentration was determined per EPA Method 5. In this procedure, particulate matter is isokinetically withdrawn from the source and collected on a glass-fiber filter. Organic vapors and other condensibles which pass through the filter are collected in an ice-cooled impinger trap. The particulate mass, which includes any material which condenses at the filtration temperature, is determined gravimetrically after removal of any uncombined water.

The sampling train (Figure 3.3) consists of a heated sampling probe with attached thermocouple and S-type pitot tube. The probe attaches to the front sample case (hot box) which houses a glass cyclone and an all-glass in-line filter holder in a temperature controlled environment. The back sample case (cold box) houses a series of impingers and a desiccant column in an ice bath. The sample case is connected via an umbilical cord to the control unit which contains the vacuum pump, pressure indicator and all operating controls. The thermocouple is connected to a separately housed temperature readout.

A representative particulate sample was acquired by sampling for equal periods of time at the center of a number of equal area regions in the duct. At each sampling point the gas velocity head and temperature were measured and the sampling rate rapidly adjusted to isokinetic conditions with the aid of a nomograph. Sample gas drawn into the nozzle flowed through the probe to the glass fiber filter where the particulates were collected. The gases then passed through the ice-cooled condenser (impingers and desiccant column) which quantitatively sorbed all moisture from the gas stream. The gas then passed through the vacuum pump, the dry test meter and the calibrated orifice.

PARTICULATE EMISSION TEST CALCULATIONS

PROJECT NUMBER: 8202 COMPANY: SOUTHERN MN SUGAR BEET COOP
TEST NUMBER: 1 SOURCE: NORTH CYCLONE DRYER #2
RUN NUMBER: 1 TIME: 12/14/88 0928-1029

TEST DATA

GAS METER COEFFICIENT	0.9985 Y	VOLUME OF LIQUID COLLECTED, ML	317.6 Vl
PITOT TUBE COEFFICIENT	0.833 Cp		
		GAS COMPOSITION, % V/V DRY:	
NOZZLE DIMENSIONS:		CARBON DIOXIDE	5.20 CD
DIAMETER, IN	0.373 Dn	OXYGEN	14.90 OX
AREA, SF	0.000759 An	CARBON MONOXIDE	0.00 CM
		NITROGEN (BY DIFFERENCE)	79.90 NI
STACK DIMENSIONS:			
DIAMETER/LENGTH, IN	47.50 Sl	AVE. TRAVERSE POINT DATA:	
WIDTH, IN	0.00 Sw	STACK TEMP., DEG F	292 Ts
AREA, SF	12.306 As	METER TEMP., DEG F	101 Tm
		ORIFICE PRESSURE, IN WC	1.188 Po
BAROMETRIC PRESSURE, IN HG	28.82 Pb	SQRT VELOCITY P., IN WC	0.394 Pv
STACK PRESSURES:		MASS OF PARTICULATE MATTER COLLECTED, G:	
STATIC, IN WC	0.00 Pg		
ABSOLUTE, IN HG	28.82 Ps	FRONT CATCH (81.7%)	0.1666 Wf
		BACK CATCH (18.3%)	0.0374 Wb
SAMPLING TIME, MIN	60.00 Ti	TOTAL CATCH	0.2040 Wt
VOLUME OF GAS SAMPLED AT METER, DCF	38.732 Vm		

CALCULATED RESULTS

VOLUME OF GAS SAMPLED AT METER, DSCF	35.184 Vms	GAS MOLECULAR WEIGHT:	
		DRY BASIS, LB/LB-MOLE	29.43 Md
		WET BASIS, LB/LB-MOLE	26.02 Ms
EQUIVALENT VOLUME OF WATER VAPOR COLLECTED, SCF	14.949 Vw	AVERAGE GAS VELOCITY, FPS	28.09 Vs
GAS MOISTURE CONTENT:		GAS VOLUMETRIC FLOW RATE:	
VOLUME FRACTION	0.2982 Bws	ACTUAL, ACFM	20741 Qa
PERCENT BY VOLUME	29.82 Bwp	STANDARD, SCFM	14031 Qs
		DRY STANDARD, DSCFM	9847 Qsd
		ISOKINETIC VARIATION, %	96.63 I

PARTICULATE EMISSION PARAMETER	FRONT CATCH	BACK CATCH	TOTAL CATCH
PARTICULATE CONCENTRATION			
ACTUAL, GR/ACF	0.0347 Caf	0.0078 Cab	0.0424 Cat
STANDARD, GR/SCF	0.0512 Csf	0.0115 Csb	0.0627 Cst
DRY STANDARD, GR/DSCF	0.0730 Csf	0.0164 Csb	0.0894 Cst
PARTICULATE EMISSION RATE, LB/HR			
CLASSICAL METHOD	6.17 Rcf	1.38 Rcb	7.55 Rct
RATIO OF AREAS METHOD	5.96 Rrf	1.34 Rrb	7.29 Rrt

STANDARD CONDITIONS: 68 DEG F, 29.92 IN HG * NON-APPLICABLE DATA

TRAVERSE POINT DATA SUMMARY AND VELOCITY PROFILE

PROJECT NUMBER: 8202 COMPANY: SOUTHERN MN SUGAR BEET COOP
TEST NUMBER: 1 SOURCE: NORTH CYCLONE DRYER #2
RUN NUMBER: 1 TIME: 12/14/88 0928-1029

SAMPLING LOCATION PORT	POINT	TRAVERSE POINT DATA: VELOCITY PRESSURE IN WC	ORIFICE PRESSURE IN WC	TEMPERATURE, DEG.F STACK GAS	METER INLET	METER OUTLET	VELOCITY PROFILE: SQRT VELOCITY PRESSURE	GAS VELOCITY FT/SEC
A	1	0.160	1.220	295	88	88	0.400	28.58
A	2	0.160	1.220	295	87	92	0.400	28.58
A	3	0.170	1.290	295	88	92	0.412	29.46
A	4	0.160	1.220	295	88	97	0.400	28.58
A	5	0.150	1.140	295	90	101	0.387	27.67
A	6	0.150	1.140	291	90	102	0.387	27.60
A	7	0.150	1.140	290	92	105	0.387	27.58
A	8	0.140	1.070	290	93	105	0.374	26.65
A	9	0.130	0.990	289	94	106	0.361	25.66
A	10	0.100	0.760	288	95	107	0.316	22.49
B	1	0.160	1.220	289	96	102	0.400	28.47
B	2	0.180	1.370	290	97	108	0.424	30.22
B	3	0.180	1.370	295	99	111	0.424	30.32
B	4	0.180	1.370	296	99	114	0.424	30.34
B	5	0.180	1.370	298	101	112	0.424	30.38
B	6	0.180	1.370	299	102	114	0.424	30.40
B	7	0.170	1.290	298	103	115	0.412	29.52
B	8	0.160	1.220	294	103	115	0.400	28.56
B	9	0.140	1.070	283	104	115	0.374	26.52
B	10	0.120	0.910	271	104	115	0.346	24.36
AVERAGE		0.156	1.188	292	96	106	0.394	28.09

PARTICULATE EMISSION TEST CALCULATIONS

PROJECT NUMBER: 8202 COMPANY: SOUTHERN MN SUGAR BEET COOP
TEST NUMBER: 1 SOURCE: NORTH CYCLONE DRYER #2
RUN NUMBER: 2 TIME: 12/14/88 1044-1147

TEST DATA

GAS METER COEFFICIENT	0.9985	Y	VOLUME OF LIQUID COLLECTED, ML	335.2	Vl
PITOT TUBE COEFFICIENT	0.833	Cp			
			GAS COMPOSITION, % V/V DRY;		
NOZZLE DIMENSIONS;			CARBON DIOXIDE	5.20	CD
DIAMETER, IN	0.373	Dn	OXYGEN	14.90	OX
AREA, SF	0.000759	An	CARBON MONOXIDE	0.00	CM
			NITROGEN (BY DIFFERENCE)	79.90	NI
STACK DIMENSIONS;					
DIAMETER/LENGTH, IN	47.50	Sl	AVE. TRAVERSE POINT DATA;		
WIDTH, IN	0.00	Sw	STACK TEMP., DEG F	279	Ts
AREA, SF	12.306	As	METER TEMP., DEG F	104	Tm
			ORIFICE PRESSURE, IN WC	1.244	Po
BAROMETRIC PRESSURE, IN HG	28.80	Pb	SQRT VELOCITY P., IN WC	0.390	Pv
STACK PRESSURES;			MASS OF PARTICULATE MATTER		
STATIC, IN WC	0.00	Pg	COLLECTED, G;		
ABSOLUTE, IN HG	28.80	Ps	FRONT CATCH (79.7%)	0.1551	Wf
			BACK CATCH (20.3%)	0.0396	Wb
SAMPLING TIME, MIN	60.00	Ti	TOTAL CATCH	0.1947	Wt
VOLUME OF GAS SAMPLED AT METER, DCF	39.643	Vm			

CALCULATED RESULTS

VOLUME OF GAS SAMPLED AT METER, DSCF	35.778	Vms	GAS MOLECULAR WEIGHT;		
			DRY BASIS, LB/LB-MOLE	29.43	Md
			WET BASIS, LB/LB-MOLE	25.93	Ms
EQUIVALENT VOLUME OF WATER VAPOR COLLECTED, SCF	15.778	Vw	AVERAGE GAS VELOCITY, FPS	27.63	Vs
GAS MOISTURE CONTENT;			GAS VOLUMETRIC FLOW RATE;		
VOLUME FRACTION	0.3060	Bws	ACTUAL, ACFM	20401	Qa
PERCENT BY VOLUME	30.60	Bwp	STANDARD, SCFM	14025	Qs
			DRY STANDARD, DSCFM	9733	Qsd
			ISOKINETIC VARIATION, %	99.41	I

PARTICULATE EMISSION PARAMETER	FRONT CATCH	BACK CATCH	TOTAL CATCH
PARTICULATE CONCENTRATION			
ACTUAL, GR/ACF	0.0319 Caf	0.0081 Cab	0.0400 Cat
STANDARD, GR/SCF	0.0464 Csf	0.0118 Csb	0.0582 Cst
DRY STANDARD, GR/DSCF	0.0668 Cdf	0.0171 Cdb	0.0839 Cdt
PARTICULATE EMISSION RATE, LB/HR			
CLASSICAL METHOD	5.58 Rcf	1.42 Rcb	7.01 Rct
RATIO OF AREAS METHOD	5.54 Rrf	1.42 Rrb	6.96 Rrt

STANDARD CONDITIONS: 68 DEG F, 29.92 IN HG * NON-APPLICABLE DATA

TRAVERSE POINT DATA SUMMARY AND VELOCITY PROFILE

PROJECT NUMBER: 8202 COMPANY: SOUTHERN MN SUGAR BEET COOP
TEST NUMBER: 1 SOURCE: NORTH CYCLONE DRYER #2
RUN NUMBER: 2 TIME: 12/14/88 1044-1147

		TRAVERSE POINT DATA					VELOCITY PROFILE	
SAMPLING LOCATION PORT	POINT	VELOCITY PRESSURE IN WC	ORIFICE PRESSURE IN WC	TEMPERATURE, DEG.F STACK GAS	METER INLET	METER OUTLET	SQRT VELOCITY PRESSURE	GAS VELOCITY FT/SEC
A	1	0.190	1.560	284	100	98	0.436	30.98
A	2	0.160	1.300	288	99	107	0.400	28.51
A	3	0.170	1.380	285	99	108	0.412	29.33
A	4	0.160	1.300	287	100	108	0.400	28.49
A	5	0.170	1.380	289	100	108	0.412	29.41
A	6	0.170	1.380	291	100	108	0.412	29.44
A	7	0.160	1.300	290	101	108	0.400	28.55
A	8	0.170	1.380	284	102	108	0.412	29.31
A	9	0.150	1.220	280	102	106	0.387	27.45
A	10	0.150	1.220	270	103	108	0.387	27.27
B	1	0.150	1.220	285	102	102	0.387	27.55
B	2	0.150	1.220	286	101	110	0.387	27.57
B	3	0.150	1.220	282	101	108	0.387	27.49
B	4	0.160	1.300	279	101	108	0.400	28.34
B	5	0.170	1.380	274	101	108	0.412	29.11
B	6	0.160	1.300	270	101	109	0.400	28.16
B	7	0.150	1.220	270	101	109	0.387	27.27
B	8	0.120	0.980	268	101	109	0.346	24.36
B	9	0.110	0.890	264	101	108	0.332	23.26
B	10	0.090	0.730	260	102	107	0.300	20.98
AVERAGE		0.153	1.244	279	101	107	0.390	27.63

PARTICULATE EMISSION TEST CALCULATIONS

PROJECT NUMBER: 8202 COMPANY: SOUTHERN MN SUGAR BEET COOP
TEST NUMBER: 1 SOURCE: NORTH CYCLONE DRYER #2
RUN NUMBER: 3 TIME: 12/14/88 1204-1310

TEST DATA

GAS METER COEFFICIENT	0.9985	Y	VOLUME OF LIQUID COLLECTED, ML	333.7	Vl
PITOT TUBE COEFFICIENT	0.833	Cp			
NOZZLE DIMENSIONS:			GAS COMPOSITION, % V/V DRY:		
DIAMETER, IN	0.373	Dn	CARBON DIOXIDE	5.20	CD
AREA, SF	0.000759	An	OXYGEN	14.90	OX
			CARBON MONOXIDE	0.00	CM
			NITROGEN (BY DIFFERENCE)	79.90	NI
STACK DIMENSIONS:					
DIAMETER/LENGTH, IN	47.50	Sl	AVE. TRAVERSE POINT DATA:		
WIDTH, IN	0.00	Sw	STACK TEMP., DEG F	259	Ts
AREA, SF	12.306	As	METER TEMP., DEG F	104	Tm
			ORIFICE PRESSURE, IN WC	1.255	Po
BAROMETRIC PRESSURE, IN HG	28.80	Pb	SQRT VELOCITY P., IN WC	0.402	Pv
STACK PRESSURES:			MASS OF PARTICULATE MATTER COLLECTED, G:		
STATIC, IN WC	0.00	Pg	FRONT CATCH (85.5%)	0.1865	Wf
ABSOLUTE, IN HG	28.80	Ps	BACK CATCH (14.5%)	0.0317	Wb
SAMPLING TIME, MIN	60.00	Ti	TOTAL CATCH	0.2182	Wt
VOLUME OF GAS SAMPLED AT METER, DCF	39.633	Vm			

CALCULATED RESULTS

VOLUME OF GAS SAMPLED AT METER, DSCF	35.751	Vms	GAS MOLECULAR WEIGHT:		
			DRY BASIS, LB/LB-MOLE	29.43	Md
			WET BASIS, LB/LB-MOLE	25.94	Ms
EQUIVALENT VOLUME OF WATER VAPOR COLLECTED, SCF	15.707	Vw	AVERAGE GAS VELOCITY, FPS	28.09	Vs
GAS MOISTURE CONTENT:			GAS VOLUMETRIC FLOW RATE:		
VOLUME FRACTION	0.3052	Bws	ACTUAL, ACFM	20739	Qa
PERCENT BY VOLUME	30.52	Bwp	STANDARD, SCFM	14657	Qs
			DRY STANDARD, DSCFM	10183	Qsd
			ISOKINETIC VARIATION, %	94.95	I

PARTICULATE EMISSION PARAMETER	FRONT CATCH	BACK CATCH	TOTAL CATCH
PARTICULATE CONCENTRATION			
ACTUAL, GR/ACF	0.0395 Caf	0.0067 Cab	0.0462 Cat
STANDARD, GR/SCF	0.0559 Csf	0.0095 Csb	0.0654 Cst
DRY STANDARD, GR/DSCF	0.0804 Cdf	0.0137 Cdb	0.0941 Cdt
PARTICULATE EMISSION RATE, LB/HR			
CLASSICAL METHOD	7.03 Rcf	1.19 Rcb	8.22 Rct
RATIO OF AREAS METHOD	6.67 Rrf	1.13 Rrb	7.80 Rrt

STANDARD CONDITIONS: 68 DEG F, 29.92 IN HG * NON-APPLICABLE DATA

TRAVERSE POINT DATA SUMMARY AND VELOCITY PROFILE

PROJECT NUMBER: 8202 COMPANY: SOUTHERN MN SUGAR BEET COOP
TEST NUMBER: 1 SOURCE: NORTH CYCLONE DRYER #2
RUN NUMBER: 3 TIME: 12/14/88 1204-1310

SAMPLING LOCATION		TRAVERSE POINT DATA					VELOCITY PROFILE	
PORT	POINT	VELOCITY PRESSURE IN WC	ORIFICE PRESSURE IN WC	TEMPERATURE, DEG.F STACK GAS	METER INLET	METER OUTLET	SQRT VELOCITY PRESSURE	GAS VELOCITY FT/SEC
A	1	0.170	1.310	265	97	97	0.412	28.93
A	2	0.170	1.310	268	98	101	0.412	28.98
A	3	0.170	1.310	264	98	101	0.412	28.91
A	4	0.180	1.390	260	97	101	0.424	29.66
A	5	0.160	1.240	260	97	99	0.400	27.96
A	6	0.150	1.160	260	98	100	0.387	27.08
A	7	0.150	1.160	260	97	101	0.387	27.08
A	8	0.130	1.000	256	97	107	0.361	25.14
A	9	0.130	1.000	250	97	108	0.361	25.03
A	10	0.120	0.930	240	98	109	0.346	23.88
B	1	0.190	1.470	260	98	106	0.436	30.47
B	2	0.180	1.390	265	101	114	0.424	29.76
B	3	0.180	1.390	265	101	115	0.424	29.76
B	4	0.190	1.470	265	102	116	0.436	30.58
B	5	0.170	1.310	266	103	117	0.412	28.95
B	6	0.180	1.390	266	103	117	0.424	29.78
B	7	0.190	1.470	260	104	117	0.436	30.47
B	8	0.160	1.240	255	105	116	0.400	27.87
B	9	0.170	1.310	250	105	117	0.412	28.62
B	10	0.110	0.850	248	106	114	0.332	22.99
AVERAGE		0.163	1.255	259	100	109	0.402	28.09

Scale weights 1# Heavy - when empty

Cart	Weight
#1 -	47 #
#2 =	48 Lbs

12-14-88 Pulp wts.

9:20	#1	77 #
9:35	#2	78 #
9:42	#1	77 #
9:50	#2	78 #
10:00	#1	76 #
10:07	#2	78 #
10:16	#1	77 #
1020	#2	78 #
10:27	#1	77 #
1035	#2	78 #
10:46	#1	79 #
1055	#2	84 #
11:05	#1	84 #
11:15	#2	81 #
11:30	#1	83 #
11:39	#2	86 #
11:50	#1	82 #
12:00	#2	83 #
12:13	#1	82 #
12:29	#2	88 #
12:44	#1	94 #
12:58	#2	96 #
106	#1	76 #