AP42 Section:	9.10.1.2
Background Chapter	4
Reference:	4
Title:	Results of a Source Emission Compliance Test at Minn-Dak Farmers Cooperative, Wahpeton, North Dakota, MMT Environmental, Inc., St. Paul, MN, November 1, 1983.

APPENDIX D

REPORT EXCERPTS FROM REFERENCE 4

(Minn-Dak Farmers Cooperative, November 1, 1983)

Rec'd 10/25/94

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

RESULTS OF A SOURCE EMISSION COMPLIANCE TEST AT MINN-DAK FARMERS COOPERATIVE WAHPETON, NORTH DAKOTA OCTOBER, 1983

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Submitted to:

Minn-Dak Farmers Cooperative
Post Office Box 10
Wahpeton, ND 58075

Attention: Mr. John E. Groneman

Prepared by:

for Alan L. Trowbridge
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Approved by:

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President

Report Number 3531
Project Number 3915

November 1, 1983

RESULTS OF A SOURCE EMISSION COMPLIANCE TEST AT MINN-DAK FARMERS COOPERATIVE WAHPETON, NORTH DAKOTA OCTOBER, 1983

Report Number 3531
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1 INTRODUCTION

On October 18, 1983, MMT Environmental, Inc. performed a series of source emission tests at Minn-Dak Farmers Cooperative, Wahpeton, North Dakota. The tests were performed at the request of Mr. John Groneman of Minn-Dak Farmers Cooperative.

The cooperative processes sugar beets. Pressed beet pulp (80% moisture) is dried to less than 10% moisture in a rotary drum dryer. The heat source for the dryer is a spreader stoker, lignite coal fired furnace which can also burn waste gas from an anaerobic waste water treatment plant. The combustion gases come into direct contact with the beet pulp and then pass through an array of 28 cyclones. Prior to entering the discharge stack, a portion of the exhaust gas can be recycled to the furnace and another portion can be removed as a heat source for the flume water heater. A schematic of the process is presented in Figure 1.1.

Three replicate EPA Method 5 particulate and EPA Method 6 sulfur dioxide emission tests were performed simultaneously on the pulp dryer stack and on the flume water heater stack. The results generated by the test program are presented in this report.

The MMT sampling team consisted of Messrs. Alan Trowbridge, Robert Laska and Timothy Puffer. Mr. John Hauges represented Minn-Dak Farmers Cooperative. Messrs. Chuck McDonald and Joe Selnekovic of the North Dakota State Department of Health witnessed the on-site testing.

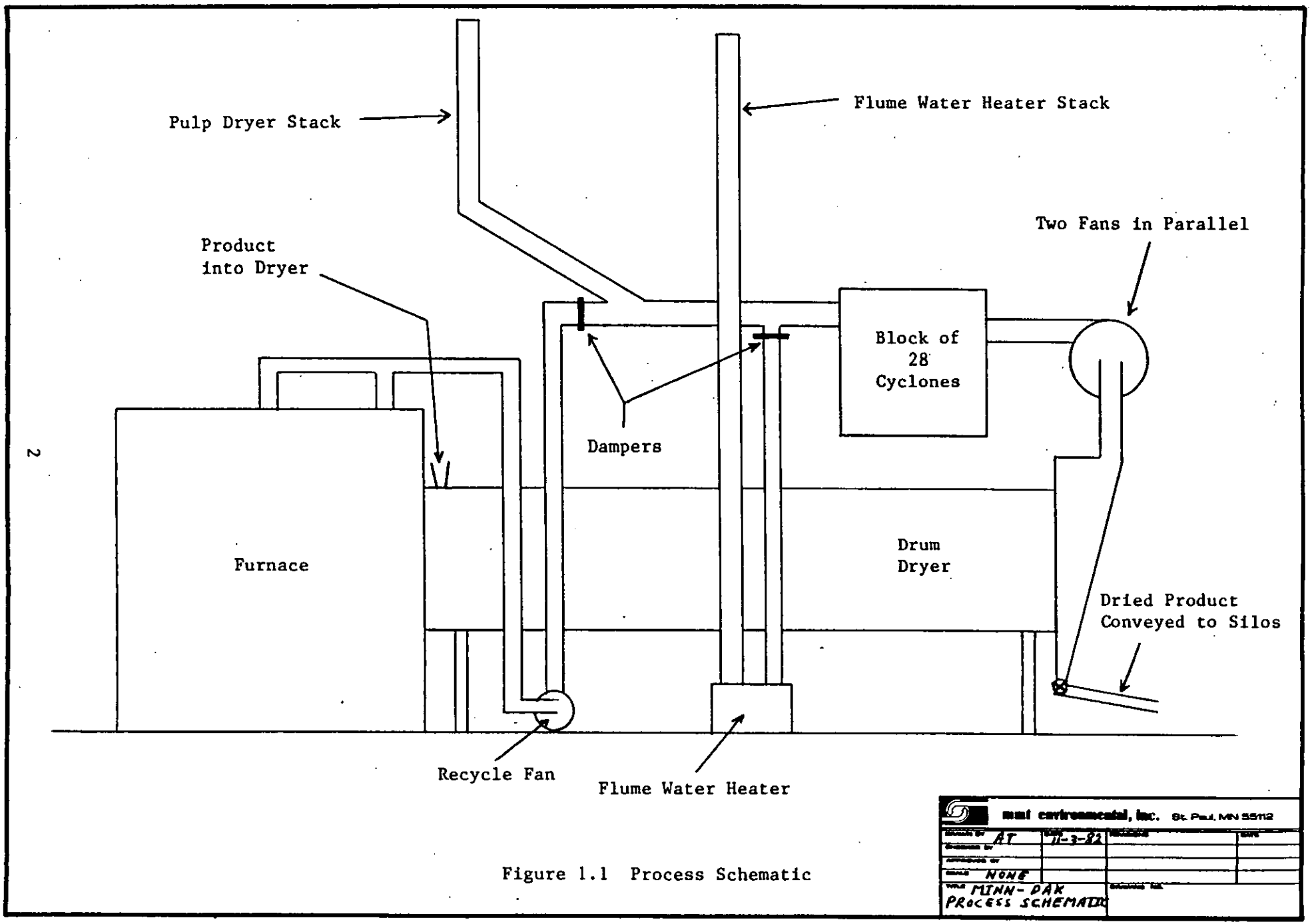

Figure 1.1 Process Schematic

TABLE 2.2 SUMMARY OF PARTICULATE EMISSION TEST RESULTS

PROJECT NUMBER: 3915 COMPANY: MINN-DAK FARMERS COOPERATIVE
TEST NUMBER: 1 SOURCE: PULP DRYER

TEST PARAMETER	RUN 1	RUN 2	RUN 3
TEST DATE	10/18/83	10/18/83	10/18/83
TIME OF TEST, HR:			
START	1019	1311	1606
FINISH	1157	1441	1741
EFFLUENT TEMPERATURE, DEGREES F	257	241	247
EFFLUENT MOISTURE CONTENT, % V/V	35.1	33.1	34.7
EFFLUENT COMPOSITION, % V/V DRY:			
CARBON DIOXIDE	5.1	5.6	5.3
OXYGEN	15.1	14.6	14.9
EFFLUENT VOLUMETRIC FLOW RATE:			
ACTUAL CONDITIONS, ACFM	148865	140178	140673
STANDARD CONDITIONS, SCFM	106967	103078	102478
DRY STANDARD CONDITIONS, DSCFM	69443	68937	66883
ISOKINETIC VARIATION, %	92.0	93.6	95.0
EFFLUENT PARTICULATE CONCENTRATION:			
ACTUAL CONDITIONS, GR/ACF	0.0625	0.0566	0.0513
STANDARD CONDITIONS, GR/SCF	0.0869	0.0770	0.0704
DRY STANDARD CONDITIONS, GR/DSCF	0.1339	0.1151	0.1078
SOURCE PARTICULATE EMISSION RATE:			
CLASSICAL METHOD, LB/HR	79.76	68.05	61.86
RATIO OF AREAS METHOD, LB/HR	73.31	63.69	58.72

PARTICULATE CONCENTRATION AND EMISSION RATES BASED ON ANALYSIS OF THE SAMPLING TRAIN FRONT CATCH ONLY.

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

TABLE 2.3 SUMMARY OF SULFUR DIOXIDE EMISSION TEST RESULTS

PROJECT NUMBER: 3915 COMPANY: MINN-DAK FARMERS COOPERATIVE
TEST NUMBER: 1 SOURCE: PULP DRYER

PARAMETER	RUN 1	RUN 2	RUN 3
SULFUR DIOXIDE CONCENTRATION:			
LB/DSCF	0.00002292	0.00002171	0.00002242
mg/DSCM	367	348	359
PPM	138	131	135
SULFUR DIOXIDE MASS EMISSION RATE:			
CLASSICAL METHOD, LB/HR	95.51	89.78	89.96
RATIO OF AREAS METHOD, LB/HR	87.78	84.01	85.40

TABLE 2.4 SUMMARY OF PARTICULATE EMISSION TEST RESULTS

PROJECT NUMBER: 3915 COMPANY: MINN-DAK FARMERS COOPERATIVE
TEST NUMBER: 2 SOURCE: FLUME WATER HEATER

TEST PARAMETER	RUN 1	RUN 2	RUN 3
TEST DATE	10/18/83	10/18/83	10/18/83
TIME OF TEST, HR:			
START	1018	1311	1605
FINISH	1154	1442	1741
EFFLUENT TEMPERATURE, DEGREES F	118	121	124
EFFLUENT MOISTURE CONTENT, % V/V	11.9	13.9	16.1
EFFLUENT COMPOSITION, % V/V DRY:			
CARBON DIOXIDE	5.1	5.6	5.3
OXYGEN	15.1	14.6	14.9
EFFLUENT VOLUMETRIC FLOW RATE:			
ACTUAL CONDITIONS, ACFM	22809	23424	22050
STANDARD CONDITIONS, SCFM	20363	20809	19484
DRY STANDARD CONDITIONS, DSCFM	17948	17925	16343
ISOKINETIC VARIATION, %	105.1	100.7	105.7
EFFLUENT PARTICULATE CONCENTRATION:			
ACTUAL CONDITIONS, GR/ACF	0.0480	0.1020	0.0297
STANDARD CONDITIONS, GR/SCF	0.0538	0.1148	0.0336
DRY STANDARD CONDITIONS, GR/DSCF	0.0610	0.1333	0.0401
SOURCE PARTICULATE EMISSION RATE:			
CLASSICAL METHOD, LB/HR	9.39	20.49	5.62
RATIO OF AREAS METHOD, LB/HR	9.87	20.62	5.94

PARTICULATE CONCENTRATION AND EMISSION RATES BASED ON ANALYSIS OF THE SAMPLING TRAIN FRONT CATCH ONLY.

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

TABLE 2.5 SUMMARY OF SULFUR DIOXIDE EMISSION TEST RESULTS

PROJECT NUMBER: 3915 COMPANY: MINN-DAK FARMERS COOPERATIVE
TEST NUMBER: 2 SOURCE: FLUME WATER HEATER

PARAMETER	RUN 1	RUN 2	RUN 3
SULFUR DIOXIDE CONCENTRATION:			
LB/DSCF	0.00000155	0.00000149	0.0000016
mg/DSCM	25	24	2
PPM	9	9	1
SULFUR DIOXIDE MASS EMISSION RATE:			
CLASSICAL METHOD, LB/HR	1.67	1.60	1.6
RATIO OF AREAS METHOD, LB/HR	1.75	1.61	1.7

Table 2.6 PROCESS DATA*

Test Number	Average Dryer Temperature, °F		Average Product Moisture Content, %		Average Dryer Through-Put, LB/HR	
	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet
1	1722	259	81.6	3.6	140000	26722
2	1675	258	82.4	3.6	133714	24413
3	1718	253	81.9	9.7	139625	27987
Average	1705	257	82.0	5.6	137780	26374

Note: Average coal feed rate: 14414 lb/hr (124.0 MBTU/HR)
Average gas feed rate: 3000 cf/hr (1.5 MBTU/HR)
Average furnace heat input rate: 125.5 MBTU/HR
Average process weight rate (beet pulp and coal): 76.1 tons/hr

* Data furnished by Mr. Hohn Hauges of Minn-Dak Farmers Cooperative

Filename: BEET4.WQ1
Date: 02-Dec-94
Facility: MINN-DAK Farmers Cooperative
Location: Wahpeton, North Dakota
Source: Coal- and supplemental waste gas- (1% of fuel) fired rotary drum beet pulp dryer Controlled by a bank of 28 cyclones, then exhaust goes to two separate stacks.
Test date: Oct. 18, 1983

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	257	241	247	
STACK 1	Pressure	in. HG	29.2	29.2	29.2	
	Moisture	%	35.1	33.1	34.7	
	Oxygen	%	15.1	14.6	14.9	
	Volumetric flow, actual	acfm	148865	140178	140673	
	Volumetric flow, standard*	dscfm	69443	68936	66883	
	Isokinetic variation	%	92	93.6	95	
Process rate: Beet pulp feed to dryer		TPH	70.00	66.86	69.81	
	Pollutant concentrations:					
	Filterable PM	G/dscf	0.1339	0.1151	0.1078	
	SO2	lb/dscf	2.292E-05	2.171E-05	2.242E-05	
	CO2	% dv	5.1	5.6	5.30	
	Pollutant mass flux rates:					
	Filterable PM	lb/hr	79.70	68.01	61.80	
	SO2	lb/hr	95.5	89.8	90.0	
	CO2	lb/hr	24272	26457	24294	
	Emission factors (ENGLISH UNITS):					AVERAGE
	Filterable PM	lb/ton	1.14	1.02	0.89	1.01
	SO2	lb/ton	1.36	1.34	1.29	1.33
	CO2	lb/ton	347	396	348	363
	Emission factors (METRIC UNITS):					AVERAGE
	Filterable PM	kg/Mg	0.569	0.509	0.443	0.507
	SO2	kg/Mg	0.682	0.672	0.644	0.666
	CO2	kg/Mg	173	198	174	182

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

TOTAL EMISSION FACTORS FOR BOTH STACKS

	Emission factors (ENGLISH UNITS):					AVERAGE
	Filterable PM	lb/ton	1.27	1.32	0.966	1.19
	SO2	lb/ton	1.39	1.37	1.31	1.36
	CO2	lb/ton	436	499	433	456
	Emission factors (METRIC UNITS):					AVERAGE
	Filterable PM	kg/Mg	0.636	0.662	0.483	0.594
	SO2	kg/Mg	0.694	0.684	0.656	0.678
	CO2	kg/Mg	218	249	217	228

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
2	Stack temperature	Deg F	118	121	124	
STACK 2	Pressure	in. HG				
	Moisture	%	11.9	13.9	16.1	
	Oxygen	%	15.1	14.6	14.9	
	Volumetric flow, actual	acfm	22809	23424	22050	
	Volumetric flow, standard*	dscfm	17948	17925	16343	
	Isokinetic variation	%	105.1	100.7	105.7	
Process rate: Beet pulp feed to dryer		TPH	70.00	66.86	69.81	
	Pollutant concentrations:					
	Filterable PM	G/dscf	0.061	0.1333	0.0401	
	SO2	lb/dscf	1.55E-06	1.49E-06	1.66E-06	
	CO2	% dv	5.1	5.6	5.30	
	Pollutant mass flux rates:					
	Filterable PM	lb/hr	9.38	20.48	5.62	
	SO2	lb/hr	1.67	1.60	1.63	
	CO2	lb/hr	6273	6879	5936	
	Emission factors (ENGLISH UNITS):					AVERAGE
	Filterable PM	lb/ton	0.134	0.306	0.0805	0.174
	SO2	lb/ton	0.0238	0.0240	0.0233	0.0237
	CO2	lb/ton	89.6	103	85.0	92.5
	Emission factors (METRIC UNITS):					AVERAGE
	Filterable PM	kg/Mg	0.0670	0.153	0.0402	0.0868
	SO2	kg/Mg	0.0119	0.0120	0.0117	0.0119
	CO2	kg/Mg	44.8	51.4	42.5	46.3

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

2 TEST RESULTS

The significant results generated by the test program are presented in this section.

2.1 Particulate Emissions

The results of the particulate emission tests are presented in Tables 2.1, 2.2 and 2.3. The data indicates an average total dryer emission rate of 79.56 pounds per hour.

Based on a total process weight rate of 76.1 tons per hour (Table 2.6), North Dakota Air Pollution Control Law 33-15-05 (Table 2.7) states that the particulate emission rate shall not exceed 48.58 pounds per hour. The test data indicates that the dryer emissions as tested are not in compliance with this standard.

2.2 Sulfur Dioxide Emissions

Tables 2.1, 2.4 and 2.5 present the results of the sulfur dioxide emission tests. The data indicates an average total dryer emission rate of 90.40 pounds per hour or 0.72 pounds per million BTU of heat imput.

2.3 Comments

No problems were encountered during the sample acquisition or evaluation. Based on this fact and on a review of the entire data, it is MMT's opinion that the results presented in this report are accurate and can be used for determining the compliance status of the source tested.

Table 2.1 SUMMARY OF TEST RESULTS

Project Number : 3915 Company: Minn-Dak Farmers Cooperative

Parameter	SOURCE: Pulp Dryer Stack	Flume Water Heater Stack	The Two Stacks Combined
Effluent volumetric flow rate; SCFM	104174	20219	124393
Particulate Emissions;			
LB/HR	67.57	11.99	79.56
LB/MBTU	0.54	0.10	0.64
Sulfur Dioxide Emissions;			
LB/HR	88.74	1.66	90.40
LB/MBTU	0.71	0.01	0.72

Note: Data for each stack is average of 3 test runs.

Thermal emission factors are based on a heat input rate of 125.5 MBTU/HR.

3 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, 1982. 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 (see Figures 3.1 through 3.4). 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 test run. Analysis of the samples was performed with a standard Orsat analyzer using commercially prepared solutions.