Background Report Reference

AP-42 Section Number: 10.6.1

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Title: Results Of A Series Of Source Emission Tests Performed on Three Huntington Energy Systems Inc. Regenerative Thermal Oxidizers At Louisiana Pacific Corp., Hayward Wisconsin, February 16-18, 1994

Environmental Source Samplers, Inc

June 1987

MMT Environmental Services, Inc.
4610 North Churchill Street
St. Paul, MN 55126-5892
Phone (612) 483-9595 Fax (612) 483-2699

4-67)

RESULTS OF A SERIES OF SOURCE EMISSION TESTS PERFORMED ON THREE HUNTINGTON ENERGY SYSTEMS INC. REGENERATIVE THERMAL OXIDIZERS AT LOUISIANA-PACIFIC CORPORATION HAYWARD, WISCONSIN

February 16-18, 1994

Submitted to:

Huntington Energy Systems Inc.
1501 E. Woodfield Road
Suite 200 West
Schaumburg, IL 60173
Attn: Mr. Gary Geisler

Prepared by:

Ted Gibbons
Sampling Team Leader

Approved by:

Alan L. Trowbridge
Director of Technical Services

MMT Report Number: 10057
MMT Project Number: 9531
Report Issued: March 23, 1994

TABLE OF CONTENTS

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1 INTRODUCTION

MMT Environmental Services, Inc. (MMT) was contracted by Huntington Energy Systems Inc. to perform a series of source emission tests on three Huntington regenerative thermal oxidizers (RTO) installed at the Louisiana-Pacific Corporation facility in Hayward, Wisconsin. This report presents the results of the test program along with all substantiating documentation.

The test program was performed at the request of Mr. Gary Geisler of Huntington Energy Systems Inc., Schaumburg, Illinois. Mr. Darr Pace represented Huntington Energy Systems Inc. at the Hayward, Wisconsin test site. Mr. Pace was responsible for determining when the tests would be performed and also for documenting the process operation during the various test periods. No process data is included in this report. The MMT sampling team consisted of Messrs. Ted Gibbons, Bill Anderson and Alan Trowbridge.

No problems were encountered during sample acquisition or analysis. Based on a review of the entire test proceedings, it is MMT's opinion that the results presented herein are accurate and can be used for engineering purposes.

2 TEST RESULTS

The RTO installed on the Line #1 Dryer was tested for particulate destruction efficiency on February 16, 1994. The results of this test are summarized Table 2.1.

On February 18, 1994, volumetric flow rate tests were performed at the inlet and outlet of the RTO's installed on the Line #2 Dryer and the Line #2 Press. Table 2.2 presents the results of the volumetric flow rate measurements.

The solid particulate matter collected during each of the three particulate emission tests performed at the Line #1 Dryer, RTO inlet was analyzed for sulfur and salt (calcium, magnesium, sodium and potassium) content. The results of the sulfur analyses are presented in Table 2.3 and the salt content results are presented in Table 2.4.

Table 2.1: Particulate Emission Test Results
Louisiana Pacific Corporation, Hayward, Wisconsin
Regenerative Thermal Oxidizer on Line #1 Dryer
February 16, 1994

Parameter	Run #1		Run #2		Run #3		Average	
	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet
Time of Test, hr								
Start	13:02	13:00	15:01	15:00	17:15	17:15	---	---
Finish	14:15	14:07	16:10	16:07	18:24	18:22	---	---
Effluent Temperature, °F	244	343	241	322	240	346	242	337
Effluent Moisture Content, % v/v	20.9	21.0	22.5	21.3	23.7	24.7	22.4	22.3
Effluent Composition, % v/v dry:								
Carbon Dioxide Content	3.2	3.2	3.5	4.3	3.4	4.3	3.4	3.9
Oxygen Content	15.2	15.4	15.2	13.1	15.1	13.3	15.2	13.9
Effluent Volumetric Flow Rate:								
Actual Conditions, acfm	121,509	132,135	118,612	136,349	120,180	139,805	120,180	136,096
Standard Conditions, scfm	86,132	83,507	84,259	88,172	85,586	87,739	85,326	86,473
Dry Standard Conditions, dscfm	68,108	66,005	65,264	69,360	65,305	66,069	66,305	67,145
Sampling Isokinetic Variation, %	95.5	98.7	96.6	102.5	99.7	101.7	97.3	101.0
Effluent Particulate Concentration:								
Front Catch, gr/dscf	0.0444	0.0075	0.0460	0.0078	0.0474	0.0044	0.0459	0.0066
Back Catch, gr/dscf	0.0442	0.0036	0.0487	0.0056	0.0369	0.0039	0.0433	0.0044
Total Catch, gr/dscf	0.0885	0.0111	0.0947	0.0133	0.0842	0.0083	0.0891	0.0109
Source Mass Emission Rate:								
Classical Method, lb/hr	51.72	6.28	53.00	7.93	47.19	4.71	50.64	6.31
Ratio of Areas Method, lb/hr	49.35	6.20	51.17	8.12	47.04	4.78	49.18	6.37
Average of Two Methods, lb/hr	50.54	6.24	52.09	8.03	47.12	4.75	49.91	6.34
Particulate Destruction Efficiency								
Concentration Based, %	87.45		85.96		90.14		87.85	
Mass Flow Based, %	87.65		84.58		89.92		87.38	

Standard Conditions: 68°F, 29.92 in. Hg

Table 2.2
Volumetric Flow Rate Test Results
Louisiana Pacific Corporation, Hayward, Wisconsin

Parameter	Line #1 Dryer RTO		Line #2 Dryer RTO		Line #2 Press RTO	
	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet
Time of Test:						
Date	2/16/94		2/18/94		2/18/94	
Start Time, hr	13:00*		08:45		11:30	
Finish Time, hr	18:24*		09:15		12:00	
Effluent Temperature, °F	242	337	204	321	102	222
Effluent Moisture Content, % v/v	22.4	22.3	25.1	33.1	2.4	5.1
Effluent Composition, % v/v dry:						
Carbon Dioxide Content	3.4	3.9	3.2	3.4	0.0	3.4
Oxygen Content	15.2	13.9	15.2	15.3	20.9	15.3
Effluent Volumetric Flow Rate*:						
Actual Conditions, acfm	120,180	136,096	107,955	132,265	76,258	100,218
Standard Conditions, scfm	85,326	86,473	80,496	84,974	67,649	73,747
Dry Standard Conditions, dscfm	66,305	67,145	60,289	56,855	66,014	69,976

Standard Conditions: 68°F, 29.92 in. Hg
* Average of three measurements during particulate tests.

Table 2.3: Sulfur Emission Test Results
Louisiana Pacific Corporation, Hayward, Wisconsin
Line #1 Dryer, RTO Inlet, February 16, 1994

Parameter	Run #1	Run #2	Run #3	Average
Effluent Flow Rate, dscfm	68,108	65,265	65,305	66,226
Dryer Effluent Sulfur Concentration:				
grains per dry std. cubic foot	0.00046	0.00034	0.00043	0.00041
micrograms per dry std. cubic meter	1046	771	1027	948
Dryer Sulfur Mass Emission Rate, lb/hr	0.27	0.19	0.25	0.24

Table 2.4: Salts Emission Test Results
Louisiana Pacific Corporation, Hayward, Wisconsin
Line #1 Dryer, RTO Inlet, February 16, 1994

Parameter	Run #1	Run #2	Run #3	Average
Effluent Flow Rate, dscfm	68,108	65,265	65,305	66,226
Dryer Effluent Salt Concentration:				
Calcium, gr/dscf	0.00081	0.00083	0.00117	0.00094
Magnesium, gr/dscf	0.00015	0.00016	0.00015	0.00015
Sodium, gr/dscf	0.00479	0.00471	0.00434	0.00461
Potassium, gr/dscf	0.00435	0.00471	0.00413	0.00440
Dryer Effluent Salt Concentration:				
Calcium, µg/dscm	1,843	1,840	2,774	2,152
Magnesium, µg/dscm	349	360	360	356
Sodium, µg/dscm	10,957	10,789	10,275	10,674
Potassium, µg/dscm	9,961	10,789	9,761	10,170
Dryer Salt Mass Emission Rate:				
Calcium, lb/hr	0.47	0.45	0.68	0.53
Magnesium, lb/hr	0.09	0.09	0.09	0.09
Sodium, lb/hr	2.80	2.64	2.51	2.65
Potassium, lb/hr	2.54	2.64	2.39	2.52

3 TEST PROCEDURES

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 (40 CFR 60) under Title 40 "Protection of the 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, 1992. A brief description of the test procedures used follows.

3.1 SAMPLING POINTS

The number of sampling points and their location with in the source stack/duct was determined per EPA Method 1 which is entitled "Sample and velocity traverses for stationary sources". In this method the number of sampling points is based on the length of straight, undisturbed flow both before and after the sampling port location. Site specific data is presented in Figures 3.1 through 3.6.

3.2 EFFLUENT VOLUMETRIC FLOW RATE

The effluent volumetric flow rate was determined per EPA Method 2 which is entitled "Determination of stack gas velocity and volumetric flow rate (Type S pitot tube)". Gas velocity pressure (head) and temperature data were obtained by traversing each of the sampling points defined by EPA Method 1. This data along with gas density (EPA Method 3) and moisture content (EPA Method 4) data was used to calculate the gas velocity at each sampling point. The source volumetric flow rate was calculated by multiplying the average gas velocity by the stack/duct cross-sectional area at the point of measurement.

3.3 EFFLUENT COMPOSITION AND MOLECULAR WEIGHT

The density of the effluent was determined per EPA Method 3 which is entitled "Gas analysis for the determination of dry molecular weight". One gas sample was collected during each test run. The gas samples were analyzed for carbon dioxide and oxygen concentrations with a standard Orsat analyzer using commercially prepared solutions. For calculations of gas density the balance of the gas was assumed to be nitrogen and carbon monoxide.

3.4 EFFLUENT MOISTURE CONTENT

The effluent moisture content was determined per EPA Method 4 which is entitled "Determination of moisture content in stack gases". Data for making the gas moisture content determinations was collected simultaneously with each EPA Method 5 particulate test run. The gas moisture content was calculated from the mass and/or volume of liquid collected in the Method 5 sampling train cold box impingers and the volume of gas sampled.

The moisture content for non-particulate tests was determined from wet and dry bulb temperatures using standard psychometric techniques (EPA Method 4 alternate method).

Figure 3.1 Site Description Form
Louisiana-Pacific Corporation, Hayward, Wisconsin
Line #1 Dryer, RTO Inlet Particulate Test, February 16, 1994

SAMPLING LOCATION DATA

Stack Cross-Sectional Dimension;
- Traverse diameter, inches..... 66.0

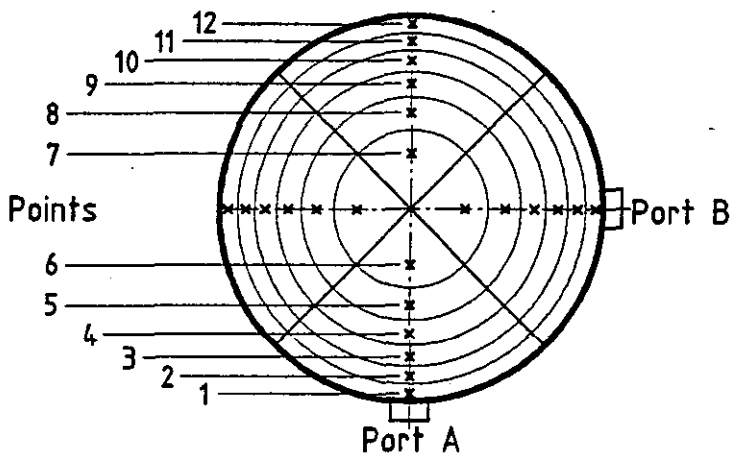
Length of straight, undisturbed flow;
- Before ports, inch..... 170
- After ports, inch 72
- Before ports, stack diameters..... 2.6
- After ports, stack diameters 1.1

Number of particulate sampling points;
- Required by EPA Method 1..... 24
- Actually used..... 24
  - Number of ports 2
  - Number of points per port..... 12

Particulate test sampling time;
- Minutes per point 2.5
- Minutes per test run..... 60.0

SAMPLING POINT LOCATION WITHIN STACK CROSS-SECTION

Point Number	Percent of Traverse	Inches from Inside Wall
1	2.1	1.4
2	6.7	4.4
3	11.8	7.8
4	17.7	11.7
5	25.0	16.5
6	35.6	23.4
7	64.4	42.6
8	75.0	49.5
9	82.3	54.3
10	88.2	58.2
11	93.3	61.6
12	97.9	64.6



SAMPLING SITE SCHEMATIC

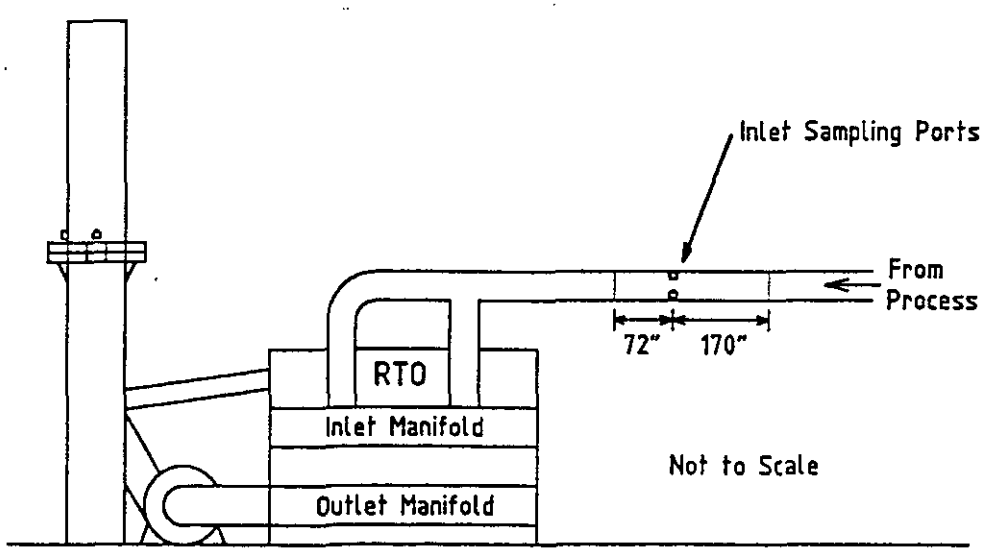


Figure 3.2 Site Description Form
Louisiana-Pacific Corporation, Hayward, Wisconsin
Line #1 Dryer, RTO Outlet Particulate Test, February 16, 1994

SAMPLING LOCATION DATA

Stack Cross-Sectional Dimension;
- Traverse diameter, inches..... 81.5

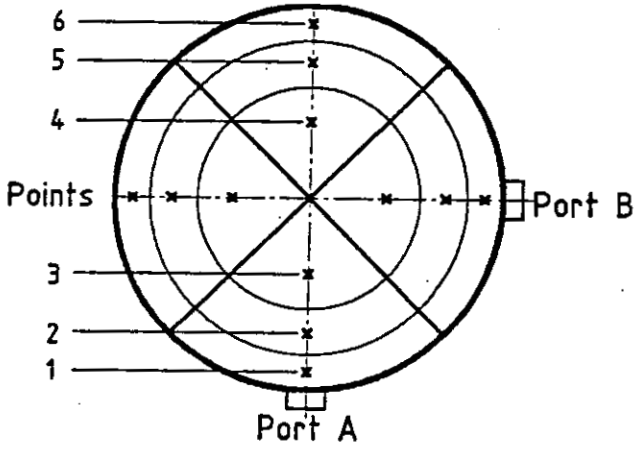
Length of straight, undisturbed flow;
- Before ports, feet..... 46
- After ports, feet..... 35
- Before ports, stack diameters..... 6.8
- After ports, stack diameters..... 5.1

Number of particulate sampling points;
- Required by EPA Method 1..... 16
- Actually used..... 12
  - Number of ports..... 2
  - Number of points per port..... 6

Particulate test sampling time;
- Minutes per point..... 5.0
- Minutes per test run..... 60.0

SAMPLING POINT LOCATION WITHIN STACK CROSS-SECTION

Point Number	Percent of Traverse	Inches from Inside Walls
1	4.4	3.6
2	14.6	11.9
3	29.6	24.1
4	70.4	57.4
5	85.4	69.9
6	95.6	77.9



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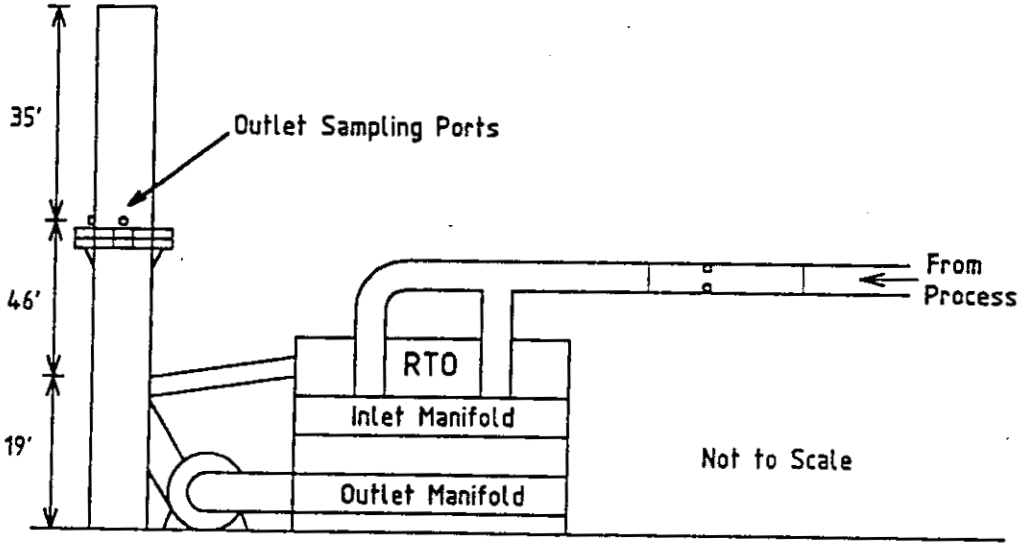


Figure 3.3 Site Description Form
Louisiana-Pacific Corporation, Hayward, Wisconsin
Line #2 Dryer, RTO Inlet Flow Rate Test, February 18, 1994

SAMPLING LOCATION DATA

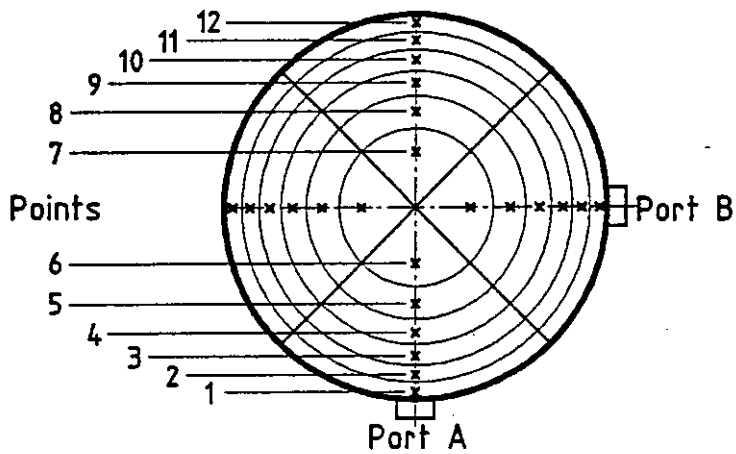
Stack Cross-Sectional Dimension;
- Traverse diameter, inches..... 66.0

Length of straight, undisturbed flow;
- Before ports, feet..... 25
- After ports, feet..... 76
- Before ports, stack diameters..... 4.5
- After ports, stack diameters..... 13.8

Number of velocity sampling points;
- Required by EPA Method 1..... 16
- Actually used..... 24
  - Number of ports..... 2
  - Number of points per port..... 12

SAMPLING POINT LOCATION WITHIN STACK CROSS-SECTION

Point Number	Percent of Traverse	Inches from Inside Wall
1	2.1	1.4
2	6.7	4.4
3	11.8	7.8
4	17.7	11.7
5	25.0	16.5
6	35.6	23.4
7	64.4	42.6
8	75.0	49.5
9	82.3	54.3
10	88.2	58.2
11	93.3	61.6
12	97.9	64.6



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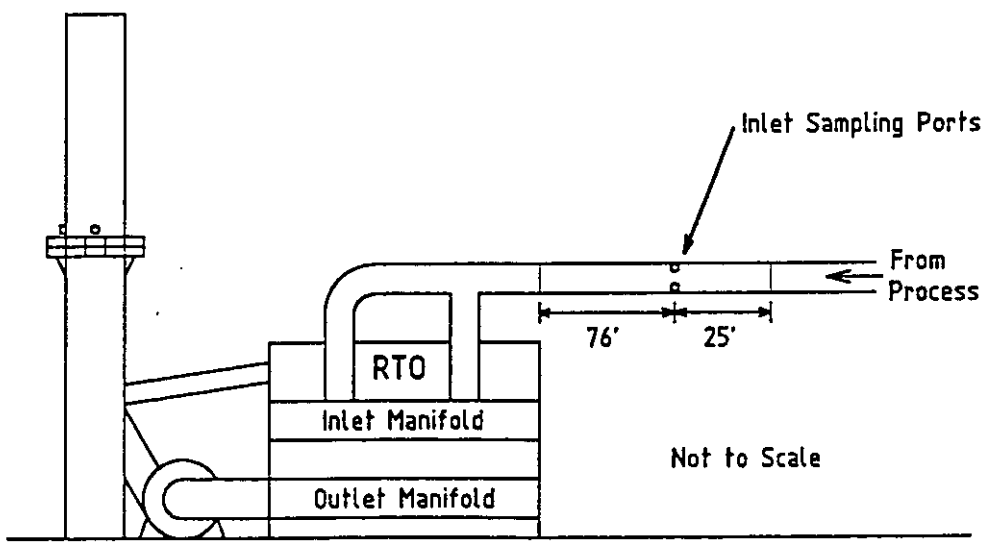


Figure 3.4 Site Description Form
Louisiana-Pacific Corporation, Hayward, Wisconsin
Line #2 Dryer, RTO Outlet Flow Rate Test, February 18, 1994

SAMPLING LOCATION DATA

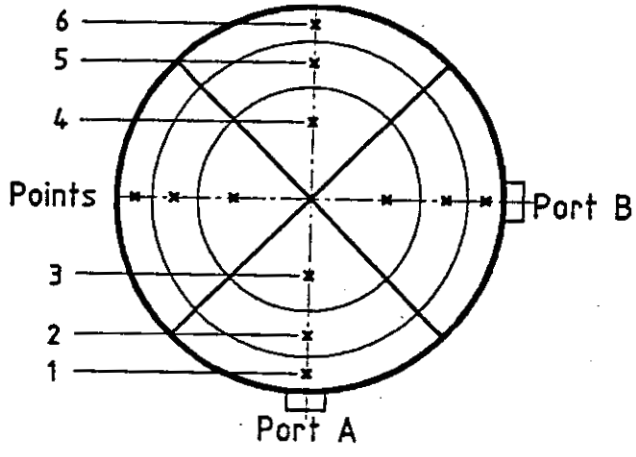
Stack Cross-Sectional Dimension;
- Traverse diameter, inches..... 81.5

Length of straight, undisturbed flow;
- Before ports, feet..... 46
- After ports, feet..... 35
- Before ports, stack diameters..... 6.8
- After ports, stack diameters..... 5.1

Number of velocity sampling points;
- Required by EPA Method 1..... 12
- Actually used..... 12
  - Number of ports..... 2
  - Number of points per port..... 6

SAMPLING POINT LOCATION WITHIN STACK CROSS-SECTION

Point Number	Percent of Traverse	Inches from Inside Walls
1	4.4	3.6
2	14.6	11.9
3	29.6	24.1
4	70.4	57.4
5	85.4	69.9
6	95.6	77.9



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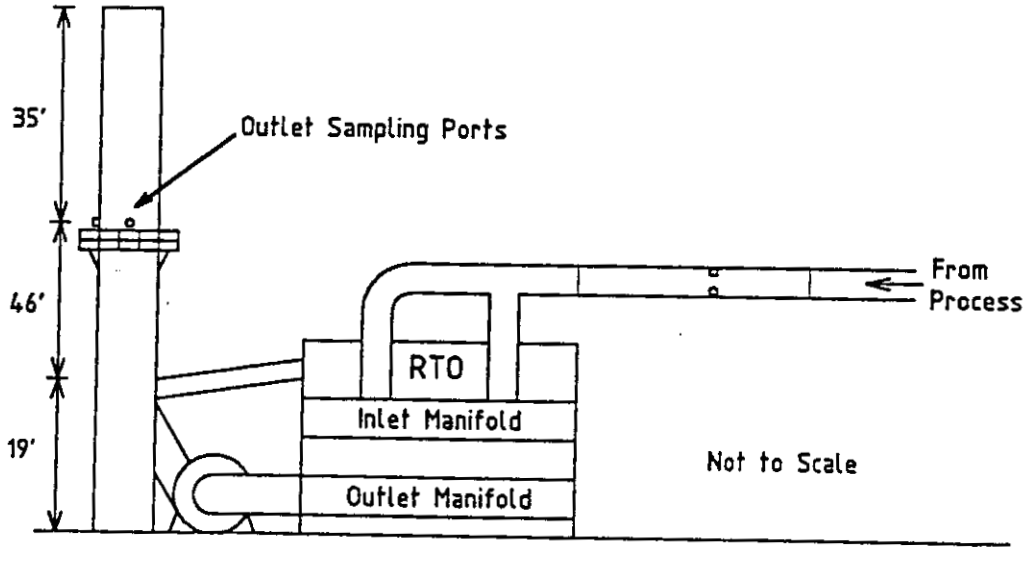


Figure 3.5 Site Description Form
Louisiana-Pacific Corporation, Hayward, Wisconsin
Line #2 Press, RTO Inlet Flow Rate Test, February 18, 1994

SAMPLING LOCATION DATA

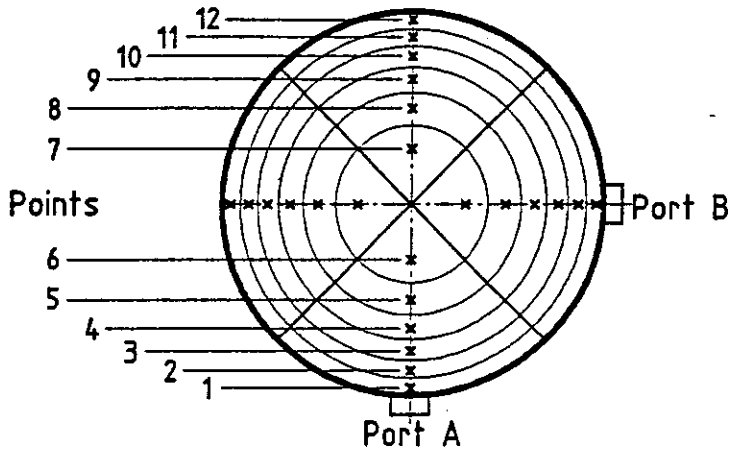
Stack Cross-Sectional Dimension;
- Traverse diameter, inches..... 53.5

Length of straight, undisturbed flow;
- Before ports, feet..... 25
- After ports, feet..... 38
- Before ports, stack diameters..... 5.6
- After ports, stack diameters..... 8.5

Number of velocity sampling points;
- Required by EPA Method 1..... 16
- Actually used..... 24
  - Number of ports 2
  - Number of points per port..... 12

SAMPLING POINT LOCATION WITHIN STACK CROSS-SECTION

Point Number	Percent of Traverse	Inches from Inside Wall
1	2.1	1.1
2	6.7	3.6
3	11.8	6.3
4	17.7	9.5
5	25.0	13.4
6	35.6	19.0
7	64.4	34.5
8	75.0	40.1
9	82.3	44.0
10	88.2	47.2
11	93.3	49.9
12	97.9	52.4



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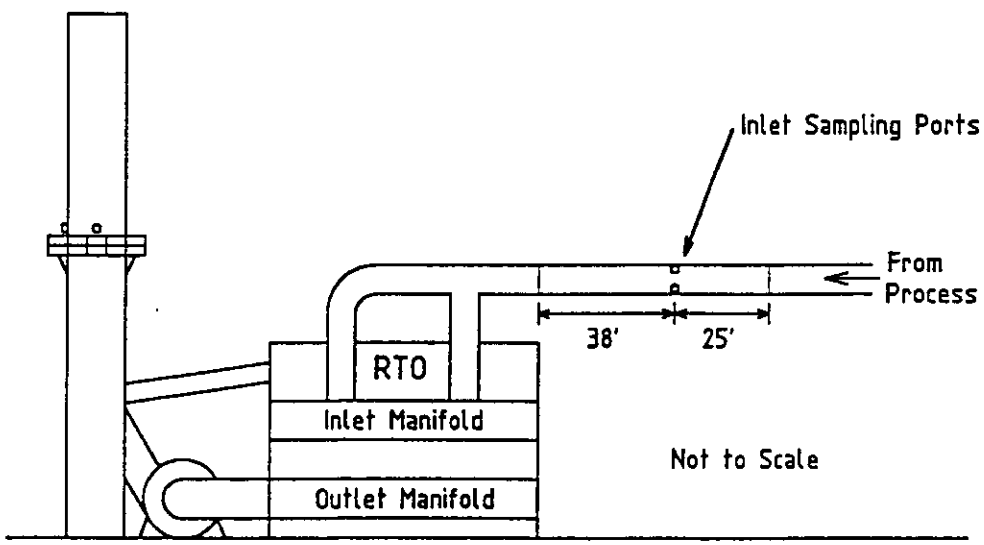


Figure 3.6 Site Description Form
Louisiana-Pacific Corporation, Hayward, Wisconsin
Line #2 Press, RTO Outlet Flow Rate Test, February 18, 1994

SAMPLING LOCATION DATA

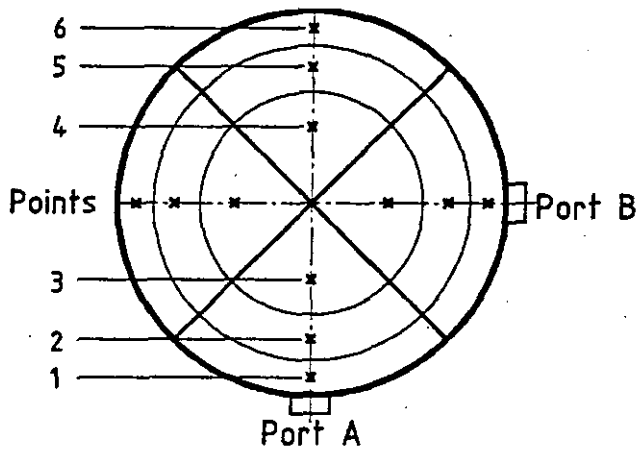
Stack Cross-Sectional Dimension;
- Traverse diameter, inches..... 76.0

Length of straight, undisturbed flow;
- Before ports, feet..... 33
- After ports, feet..... 35
- Before ports, stack diameters..... 5.2
- After ports, stack diameters..... 5.5

Number of velocity sampling points;
- Required by EPA Method 1..... 16
- Actually used..... 12
  - Number of ports 2
  - Number of points per port..... 6

SAMPLING POINT LOCATION WITHIN STACK CROSS-SECTION

Point Number	Percent of Traverse	Inches from Inside Walls
1	4.4	3.4
2	14.6	11.2
3	29.6	22.4
4	70.4	53.6
5	85.4	64.8
6	95.6	72.6



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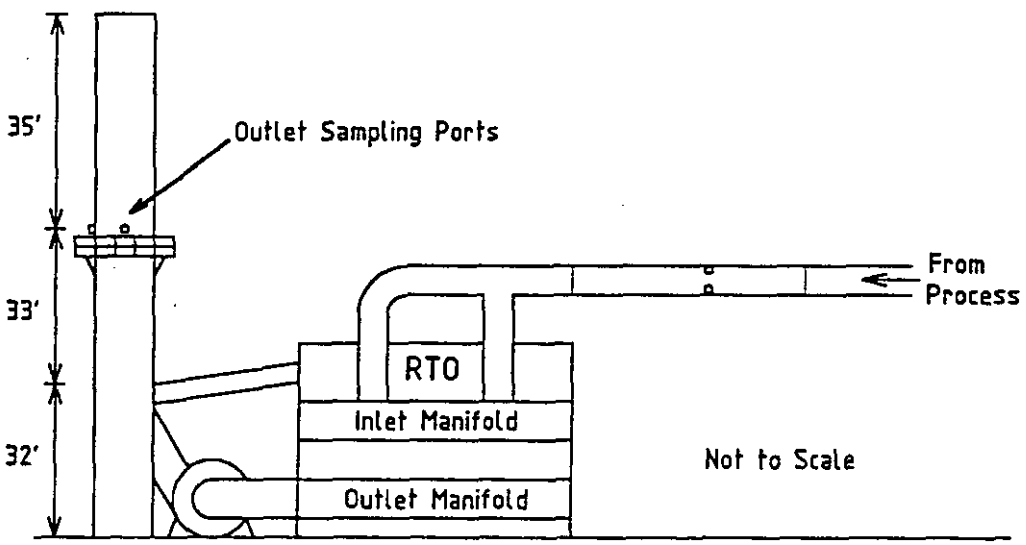


3.5 EFFLUENT PARTICULATE CONCENTRATION

The effluent particulate concentration was determined per EPA Method 5 which is entitled "Determination of particulate emissions from stationary sources". For each test run, particulate matter was isokinetically withdrawn from the gas stream at each of the EPA Method 1 defined sampling points and collected on a glass fiber filter which was maintained at constant temperature (248±25°F). Water vapor, organic vapors and inorganic vapors which passed through the filter were collected in an impinger trap which was ice-cooled to maintain an exit temperature of not more than 68°F.

The EPA Method 5 sampling train (Figure 3.7) includes a heated sampling probe with attached nozzle, thermocouple and S-type pitot tube. The probe attaches to the front sample case (hot box) which houses a glass cyclone (optional) and an all-glass in-line filter holder in a temperature controlled environment. The front sample case is connected to the back sample case (cold box) which houses a series of glass impingers and a desiccant column in an ice bath. The back sample case is connected to the control unit which contains the sample vacuum pump, gas meter, pressure and temperature indicators and all operating controls.

A representative particulate sample was acquired by sampling for equal periods of time at the center of a number of equal area regions within the stack/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 or programmable computing device. Sample gas drawn into the nozzle flowed through the probe to the glass fiber filter where the solid particulate matter was collected. The gases then passed through the ice-cooled condenser (impingers and desiccant column) which quantitatively removed all moisture and condensable particulate matter from the gas stream. The gas then passed through the vacuum pump, the dry test gas meter and the calibrated orifice.

Leak checks to detect any dilution air being pulled into the sampling line were performed at the beginning and end of each test run and also when and if any sample line connections were broken.

After completion of each test run, the sampling train was removed to the clean-up area for sample recovery. The filter was removed from the filter holder and placed in Container #1. Particulate matter collected in the nozzle, probe and all connecting glassware in front of the filter was quantitatively transferred to Container #2 by means of a distilled water wash followed by an acetone wash. A stiff brush was used in the probe cleaning step to help dislodge deposits.

The liquid collected in each of the impingers (desiccant column excluded) was measured and transferred to Container #3. The impingers and all connecting pieces between the filter paper and the desiccant column were then rinsed twice with distilled water and these rinsings were added to Container #3. These same pieces were then rinsed twice with acetone and these rinsings were placed in Container #4. The desiccant column was then weighed and its contents transferred to a waste desiccant container. Samples of the rinse solutions (water and acetone) were retained as analytical blanks.

3.7
Figure ~~3.2~~ Particulate Sampling Train Description
Louisiana-Pacific Corporation, Hayward, Wisconsin
Line #1 Dryer, RTO Inlet & Outlet Particulate Test, February 16, 1994

PARTICULATE SAMPLING TRAIN IDENTIFICATION

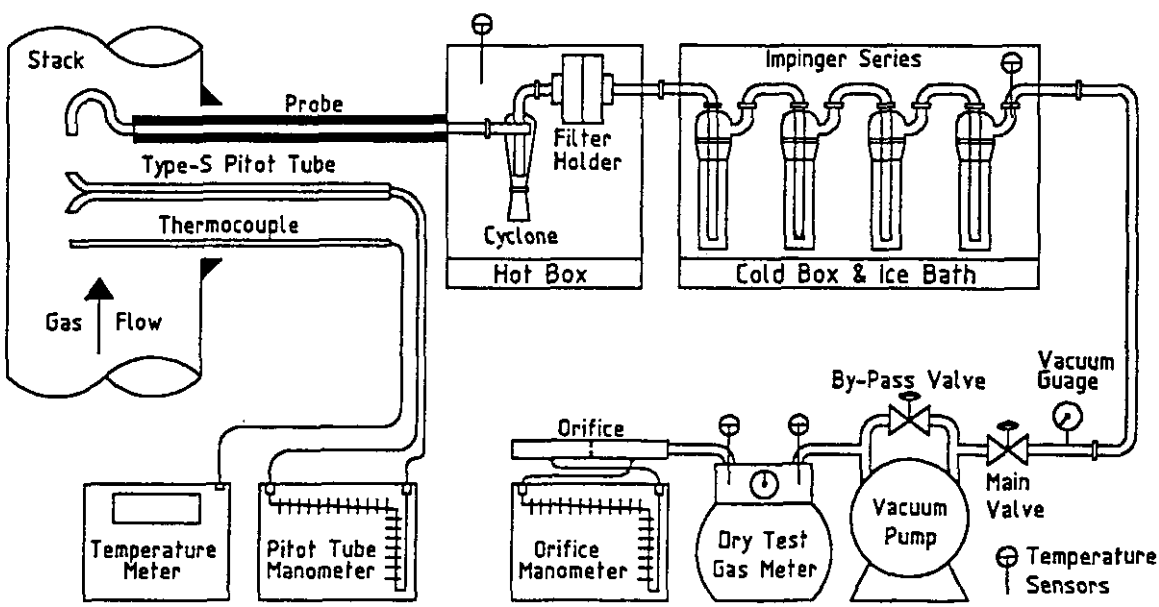
Sampling Train Manufacturer: ..... MMT Environmental Services, Inc.
Sampling Train Model: ..... Inlet: MMT #4 Outlet: MMT #5

Hot Box Set-up and Operating Temperature;
- Cyclone used: ..... No
- Filter Media: ..... Glass Fiber Filter, Whatman GF/C, 11.0 cm diameter
- Filtration Temperature: ..... 248 ± 25 degrees Fahrenheit

Cold Box Set-up; Impinger Type and Initial Contents
- Impinger #1: ..... Modified Greenburg-Smith design, 100 ml deionized, distilled water
- Impinger #2: ..... Standard Greenburg-Smith design, 100 ml deionized, distilled water
- Impinger #3: ..... Modified Greenburg-Smith design, empty
- Impinger #4: ..... Modified Greenburg-Smith design, ≈ 250 grams silica gel, indicating type

Nozzles Used: ..... Inlet: L14 (0.199"), Outlet: S8 (0.245"), stainless steel
Sampling Probe Used: .... Inlet: #87, Outlet: #103, stainless steel liners
Pitot Tube Used: ..... Inlet: #85B (0.838), Outlet: #96B (0.830), S-type

PARTICULATE SAMPLING TRAIN SCHEMATIC



Sample analysis was performed at MMT's laboratory. The filter was dried in a 105°C oven for three hours and then desiccated to constant weight. The contents of Container #2 were quantitatively transferred to a tared beaker, evaporated at ambient temperature and pressure to near dryness, and then desiccated to a constant weight.

The contents of Container #3 were quantitatively transferred to a separatory funnel. Container #3 was then rinsed with distilled water and the rinsings were added to the separatory funnel. Container #3 was then rinsed with acetone and the rinsings were added to Container #4. Fifty (50) ml of methylene chloride was then added to the separatory funnel and the contents were mixed by shaking the funnel for at least one minute. After separation, the lower organic phase was drained off into a beaker and set aside. The aqueous phase was extracted two more times using 50 ml of $MeCl_2$ for each extraction. The three organic extract fractions were combined in a tared beaker, evaporated at ambient temperature and pressure to near dryness, and then desiccated to a constant weight. The aqueous inorganic fraction was transferred to a tared beaker, evaporated in a 105°C oven to near dryness, and then desiccated to a constant weight.

The contents of Container #4 were quantitatively transferred to a tared beaker, evaporated at ambient temperature and pressure to near dryness, and then desiccated to a constant weight.

The mass of particulate matter collected and the volume of gas sampled was used to calculate the effluent particulate concentration. The source particulate mass emission rate was calculated by multiplying the effluent particulate concentration by the source volumetric flow rate. Separate calculations were performed for total catch, front catch only (Containers 1 & 2) and back catch only (Containers 3 & 4).

Note: The front catch particulate matter from each of the three tests performed at the RTO inlet was submitted to Spectrum Labs, Inc., St. Paul, Minnesota for sulfur and salts (calcium, magnesium, sodium & potassium) analyses.

4 QUALITY ASSURANCE

The project manager is responsible for implementation of the quality assurance program as applied to any specific project.

4.1 SAMPLING QUALITY ASSURANCE

Source sampling quality assurance procedures are implemented to ensure work is performed:

- by competent, trained individuals experienced on the specific methodologies being used
- using properly calibrated equipment
- using approved procedures for sample handling and documentation

All measuring devices (pitot tubes, dry gas meters, thermocouples, portable gas analyzers, etc.) are uniquely identified and calibrated with documented procedures and acceptance criteria before and after each field effort. Records of all calibration data are maintained in the files. Prior to the test program, MMT provides the following:

- filter numbers and tare weights of all filters available for the test
- results of an acetone residue analysis on the acetone to be used during the test
- calibrations of all pitot tubes, dry gas meters, orifice meters, thermocouples and probes

Specific details of MMT's QA program for stationary air pollution sources may be found in "Quality Assurance Handbook for Air Pollution Measurement Systems", Volume III (EPA-600/4-7-027b).

4.2 ANALYTICAL QUALITY CONTROL

MMT maintains a vigorous quality control program for all sample analyses. This program is based on the general guidelines given in "Handbook for Analytical Quality Control in Water and Waste water Laboratories" (EPA-600/4-79-019); March 1979 . This program suggests guidelines in the areas of:

- Laboratory services
- Glassware
- Solvents
- Analytical performance
- Instrument selection
- Reagents
- Gases
- Laboratory safety

Standards and curves are determined for each analysis using the appropriate standard. Least square linear regression calculations are used in determining "best fit" to the data. Correlation coefficients are also calculated.

4.3 CALIBRATION GASES

MMT uses either EPA Protocol 1 or Acublend Certified Master gases (Scott Specialty Gases) when performing all calibrations in order to ensure tolerances on gas concentrations have been verified and are negligible. Certifications of all calibration gas bottles used during testing are presented in each report.

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APPENDIX A: CALCULATIONS

APPENDIX A1: CALCULATIONS

LINE #1 DRYER - RTO INLET PARTICULATE EMISSION TEST

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TABLE SUMMARY OF PARTICULATE EMISSION TEST RESULTS

PROJECT NUMBER: 9531 COMPANY: LOUISIANA PACIFIC CORP.
TEST NUMBER: 1 SOURCE: LINE # 1 INLET

TEST PARAMETER	RUN 1	RUN 2	RUN
TEST DATE	2/16/94	2/16/94	2/16/9
TIME OF TEST, HR:			
START	1302	1501	1715
FINISH	1415	1610	1824
EFFLUENT TEMPERATURE, DEGREES F	244	241	240
BAROMETRIC PRESSURE, IN HG	28.78	28.74	28.75
EFFLUENT MOISTURE CONTENT, % V/V	20.9	22.5	23.7
EFFLUENT COMPOSITION, % V/V DRY:			
CARBON DIOXIDE	3.2	3.5	3.4
OXYGEN	15.2	15.2	15.1
CARBON MONOXIDE	0.0	0.0	0.0
EFFLUENT VOLUMETRIC FLOW RATE:			
ACTUAL CONDITIONS, ACFM	121509	118612	120180
STANDARD CONDITIONS, SCFM	86132	84259	85586
DRY STANDARD CONDITIONS, DSCFM	68108	65264	65305
ISOKINETIC VARIATION, %	95.5	96.6	99.7
EFFLUENT PARTICULATE CONCENTRATION:			
EFFLUENT FRONT HALF PARTICULATE CONCENTRATION:			
ACTUAL CONDITIONS, GR/ACF	0.0249	0.0253	0.0257
STANDARD CONDITIONS, GR/SCF	0.0351	0.0356	0.0361
DRY STANDARD CONDITIONS, GR/DSCF	0.0444	0.0460	0.0474
EFFLUENT BACK HALF PARTICULATE CONCENTRATION:			
ACTUAL CONDITIONS, GR/ACF	0.0247	0.0268	0.0200
STANDARD CONDITIONS, GR/SCF	0.0349	0.0377	0.0281
DRY STANDARD CONDITIONS, GR/DSCF	0.0442	0.0487	0.0369
EFFLUENT TOTAL PARTICULATE CONCENTRATION:			
ACTUAL CONDITIONS, GR/ACF	0.0496	0.0521	0.0458
STANDARD CONDITIONS, GR/SCF	0.0700	0.0733	0.0643
DRY STANDARD CONDITIONS, GR/DSCF	0.0885	0.0947	0.0842
SOURCE PARTICULATE EMISSION RATE:			
CLASSICAL METHOD, LB/HR	51.72	53.00	47.19
RATIO OF AREAS METHOD, LB/HR	49.35	51.17	47.04

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.

TRAVERSE POINT DATA SUMMARY AND VELOCITY PROFILE

PROJECT NUMBER: 9531 COMPANY: LOUISIANA PACIFIC CORP.
TEST NUMBER: 1 SOURCE: LINE # 1 INLET
RUN NUMBER: 1 TIME: 2/16/94 1302-1415

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	2.050	1.400	242	36	35	1.432	98.76
A	2	1.950	1.400	245	36	35	1.396	96.52
A	3	1.900	1.300	245	38	35	1.378	95.28
A	4	1.600	1.100	246	39	35	1.265	87.50
A	5	1.300	0.900	247	41	35	1.140	78.92
A	6	0.940	0.650	247	42	35	0.970	67.11
A	7	0.740	0.510	247	44	36	0.860	59.55
A	8	1.700	1.200	246	46	36	1.304	90.19
A	9	2.150	1.500	246	48	36	1.466	101.42
A	10	1.900	1.300	246	47	36	1.378	95.35
A	11	2.150	1.500	246	47	37	1.466	101.42
A	12	2.300	1.600	246	47	37	1.517	104.90
B	1	2.350	1.600	240	38	37	1.533	105.59
B	2	2.500	1.700	239	39	37	1.581	108.83
B	3	2.400	1.700	238	39	37	1.549	106.55
B	4	2.200	1.500	242	40	37	1.483	102.31
B	5	1.650	1.100	243	41	37	1.285	88.66
B	6	0.880	0.610	243	43	37	0.938	64.75
B	7	0.680	0.470	246	45	37	0.825	57.04
B	8	0.760	0.530	244	46	37	0.872	60.22
B	9	0.970	0.670	240	48	37	0.985	67.84
B	10	1.100	0.760	243	49	38	1.049	72.39
B	11	1.050	0.730	241	51	38	1.025	70.63
B	12	0.860	0.590	240	51	38	0.927	63.87
AVERAGE		1.587	1.097	244	43	36	1.234	85.24

PARTICULATE EMISSION TEST CALCULATIONS

PROJECT NUMBER: 9531 COMPANY: LOUISIANA PACIFIC CORP.
TEST NUMBER: 1 SOURCE: LINE # 1 INLET
RUN NUMBER: 1 TIME: 2/16/94 1302-1415

TEST DATA

GAS METER COEFFICIENT	1.0262 Y	VOLUME OF LIQUID COLLECTED, ML	19
PITOT TUBE COEFFICIENT	0.838 Cp		
NOZZLE DIMENSIONS:		GAS COMPOSITION, % V/V DRY:	
DIAMETER, IN	0.199 Dn	CARBON DIOXIDE	3
AREA, SF	0.000216 An	OXYGEN	15.
		CARBON MONOXIDE	0.
STACK DIMENSIONS:		NITROGEN (BY DIFFERENCE)	81.
DIAMETER/LENGTH, IN	66.00 Sl	AVE. TRAVERSE POINT DATA:	
WIDTH, IN	0.00 Sw	STACK TEMP., DEG F	2
AREA, SF	23.758 As	METER TEMP., DEG F	
		ORIFICE PRESSURE, IN WC	1.8
BAROMETRIC PRESSURE, IN HG	28.78 Pb	SQRT VELOCITY P., IN WC	1.2
STACK PRESSURES:		MASS OF PARTICULATE MATTER	
STATIC, IN WC	-7.00 Ps	COLLECTED, G:	
ABSOLUTE, IN HG	28.27 Ps	FRONT CATCH (50.1%)	0.102
		BACK CATCH (49.9%)	0.101
SAMPLING TIME, MIN	60.00 Ti	TOTAL CATCH	0.203
VOLUME OF GAS SAMPLED AT METER, DCF	33.906 Vm		

CALCULATED RESULTS

VOLUME OF GAS SAMPLED AT METER, DSCF	35.448 Vms	GAS MOLECULAR WEIGHT:	
		DRY BASIS, LB/LB-MOLE	29.12
EQUIVALENT VOLUME OF WATER		WET BASIS, LB/LB-MOLE	26.79
VAPOR COLLECTED, SCF	9.381 Vw	AVERAGE GAS VELOCITY, FPS	85.24
GAS MOISTURE CONTENT:		GAS VOLUMETRIC FLOW RATE:	
VOLUME FRACTION	0.2093 Bws	ACTUAL, ACFM	121509
PERCENT BY VOLUME	20.93 Bwp	STANDARD, SCFM	86152
		DRY STANDARD, DSCFM	68108
		ISOKINETIC VARIATION, %	95.47

PARTICULATE EMISSION PARAMETER	FRONT CATCH	BACK CATCH	TOTAL CA
PARTICULATE CONCENTRATION			
ACTUAL, GR/ACF	0.0249 Caf	0.0247 Cab	0.0496 C
STANDARD, GR/SCF	0.0351 Cwf	0.0349 Cwb	0.0700 C
DRY STANDARD, GR/DSCF	0.0444 Csf	0.0442 Csb	0.0885 C
PARTICULATE EMISSION RATE, LB/HR			
CLASSICAL METHOD	25.92 Rcf	25.80 Rcb	51.72 R
RATIO OF AREAS METHOD	24.73 Rrf	24.61 Rrb	49.35 R

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

TRAVERSE POINT DATA SUMMARY AND VELOCITY PROFILE

PROJECT NUMBER: 9531 COMPANY: LOUISIANA PACIFIC CORP.
TEST NUMBER: 1 SOURCE: LINE # 1 INLET
RUN NUMBER: 2 TIME: 2/16/94 1501-1610

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	2.500	1.700	241	37	37	1.581	109.35
A	2	2.500	1.700	241	38	37	1.581	109.35
A	3	2.350	1.600	241	38	37	1.533	106.02
A	4	2.150	1.500	240	38	37	1.466	101.34
A	5	1.700	1.200	240	39	38	1.304	90.11
A	6	0.980	0.680	240	39	38	0.990	68.42
A	7	0.690	0.480	241	39	38	0.831	57.45
A	8	0.700	0.480	242	40	38	0.837	57.91
A	9	0.770	0.530	242	40	38	0.877	60.73
A	10	0.920	0.640	242	40	38	0.959	66.38
A	11	1.100	0.760	240	41	39	1.049	72.48
A	12	0.760	0.530	238	41	39	0.872	60.16
B	1	1.400	0.970	228	39	39	1.183	81.87
B	2	1.900	1.300	236	39	39	1.378	94.99
B	3	2.150	1.500	241	40	39	1.466	101.41
B	4	1.800	1.200	244	40	39	1.342	92.99
B	5	1.250	0.860	245	41	39	1.118	77.54
B	6	0.910	0.630	245	41	39	0.954	66.16
B	7	0.800	0.550	245	41	39	0.894	62.04
B	8	1.200	0.830	244	41	39	1.095	75.92
B	9	1.600	1.100	243	41	39	1.265	87.61
B	10	1.950	1.400	243	41	39	1.396	96.72
B	11	2.100	1.500	243	41	39	1.449	100.37
B	12	2.100	1.500	243	42	40	1.449	100.37
AVERAGE		1.512	1.048	241	40	38	1.203	83.21

PARTICULATE EMISSION TEST CALCULATIONS

PROJECT NUMBER: 9531 COMPANY: LOUISIANA PACIFIC CORP.
TEST NUMBER: 1 SOURCE: LINE # 1 INLET
RUN NUMBER: 2 TIME: 2/16/94 1501-1610

TEST DATA

GAS METER COEFFICIENT	1.0262 Y	VOLUME OF LIQUID COLLECTED, ML	212.5
PITOT TUBE COEFFICIENT	0.838 Cp		
NOZZLE DIMENSIONS;		GAS COMPOSITION, % V/V DRY;	
DIAMETER, IN	0.199 Dn	CARBON DIOXIDE	3.50
AREA, SF	0.000216 An	OXYGEN	15.15
		CARBON MONOXIDE	0.00
STACK DIMENSIONS;		NITROGEN (BY DIFFERENCE)	81.35
DIAMETER/LENGTH, IN	66.00 Sl	AVE. TRAVERSE POINT DATA;	
WIDTH, IN	0.00 Sw	STACK TEMP., DEG F	241 T
AREA, SF	23.758 As	METER TEMP., DEG F	39 T
		ORIFICE PRESSURE, IN WC	1.048 P
BAROMETRIC PRESSURE, IN HG	28.74 Pb	SQRT VELOCITY P., IN WC	1.203 P
STACK PRESSURES;		MASS OF PARTICULATE MATTER	
STATIC, IN WC	-7.00 Pg	COLLECTED, G:	
ABSOLUTE, IN HG	28.23 Ps	FRONT CATCH (48.6%)	0.1025 Wf
		BACK CATCH (51.4%)	0.1085 Wb
SAMPLING TIME, MIN	60.00 Ti	TOTAL CATCH	0.2110 Wt
VOLUME OF GAS SAMPLED AT METER, DCF	32.872 Vm		

CALCULATED RESULTS

VOLUME OF GAS SAMPLED AT METER, DSCF	34.366 Vms	GAS MOLECULAR WEIGHT;	
		DRY BASIS, LB/LB-MOLE	29.17 Md
		WET BASIS, LB/LB-MOLE	26.65 Ms
EQUIVALENT VOLUME OF WATER VAPOR COLLECTED, SCF	10.002 Vw	AVERAGE GAS VELOCITY, FPS	83.21 Vs
GAS MOISTURE CONTENT;		GAS VOLUMETRIC FLOW RATE;	
VOLUME FRACTION	0.2254 Bws	ACTUAL, ACFM	118612 Qa
PERCENT BY VOLUME	22.54 Bwp	STANDARD, SCFM	84259 Qs
		DRY STANDARD, DSCFM	65264 Qsd
		ISOKINETIC VARIATION, %	96.59 I

PARTICULATE EMISSION PARAMETER	FRONT CATCH	BACK CATCH	TOTAL CATCH
PARTICULATE CONCENTRATION			
ACTUAL, GR/ACF	0.0253 Caf	0.0268 Cab	0.0521 Cat
STANDARD, GR/SCF	0.0356 Cwf	0.0377 Cwb	0.0733 Cwt
DRY STANDARD, GR/DSCF	0.0460 Csf	0.0487 Csb	0.0947 Cst
PARTICULATE EMISSION RATE, LB/HR			
CLASSICAL METHOD	25.75 Rcf	27.25 Rcb	53.00 Rct
RATIO OF AREAS METHOD	24.86 Rrf	26.31 Rrb	51.17 Rrt

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

TRAVERSE POINT DATA SUMMARY AND VELOCITY PROFILE

PROJECT NUMBER: 9531
TEST NUMBER: 1
RUN NUMBER: 3

COMPANY: LOUISIANA PACIFIC CORP.
SOURCE: LINE # 1 INLET
TIME: 2/16/94 1715-1824

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	2.400	1.700	241	37	37	1.549	107.41
A	2	2.600	1.900	240	39	37	1.673	115.93
A	3	2.550	1.800	240	39	37	1.597	110.63
A	4	2.250	1.600	240	39	37	1.500	103.92
A	5	1.550	1.100	239	40	37	1.245	86.19
A	6	0.840	0.580	240	40	37	0.917	63.50
A	7	0.700	0.480	242	41	37	0.837	58.05
A	8	0.820	0.570	241	42	37	0.906	62.78
A	9	0.950	0.660	240	45	37	0.975	67.53
A	10	1.050	0.730	240	46	37	1.025	70.99
A	11	0.960	0.660	238	48	37	0.980	67.78
A	12	0.780	0.540	234	48	37	0.883	60.93
B	1	1.550	1.100	228	39	37	1.245	85.51
B	2	1.600	1.100	236	41	37	1.265	87.38
B	3	1.900	1.300	241	44	37	1.378	95.57
B	4	1.700	1.200	242	44	37	1.304	90.46
B	5	1.350	0.930	242	45	37	1.162	80.61
B	6	0.890	0.610	242	46	37	0.943	65.45
B	7	0.820	0.570	242	46	37	0.906	62.83
B	8	1.150	0.790	242	46	37	1.072	74.40
B	9	1.700	1.200	241	48	36	1.304	90.40
B	10	2.100	1.500	241	48	36	1.449	100.47
B	11	2.450	1.600	240	45	36	1.565	108.44
B	12	2.350	1.600	240	44	35	1.533	106.21
AVERAGE		1.550	1.076	240	43	37	1.217	84.31

PARTICULATE EMISSION TEST CALCULATIONS

PROJECT NUMBER: 9531 COMPANY: LOUISIANA PACIFIC CORP.
TEST NUMBER: 1 SOURCE: LINE # 1 INLET
RUN NUMBER: 3 TIME: 2/16/94 1715-1824

TEST DATA

GAS METER COEFFICIENT	1.0262 Y	VOLUME OF LIQUID COLLECTED, ML	
PITOT TUBE COEFFICIENT	0.838 Cp		
NOZZLE DIMENSIONS;		GAS COMPOSITION, % V/V DRY;	
DIAMETER, IN	0.199 Dn	CARBON DIOXIDE	
AREA, SF	0.000216 An	OXYGEN	
		CARBON MONOXIDE	
		NITROGEN (BY DIFFERENCE)	
STACK DIMENSIONS;			
DIAMETER/LENGTH, IN	66.00 Sl	AVE. TRAVERSE POINT DATA;	
WIDTH, IN	0.00 Sw	STACK TEMP., DEG F	
AREA, SF	23.758 As	METER TEMP., DEG F	
		ORIFICE PRESSURE, IN WC	
BAROMETRIC PRESSURE, IN HG	28.75 Pb	SQRT VELOCITY P., IN WC	
STACK PRESSURES;		MASS OF PARTICULATE MATTER	
STATIC, IN WC	-7.00 Pg	COLLECTED, G;	
ABSOLUTE, IN HG	28.24 Ps	FRONT CATCH (56.2%)	0.
		BACK CATCH (43.8%)	0.
SAMPLING TIME, MIN	60.00 Ti	TOTAL CATCH	0.
VOLUME OF GAS SAMPLED AT METER, DCF	34.013 Vm		

CALCULATED RESULTS

VOLUME OF GAS SAMPLED AT METER, DSCF	35.510 Vms	GAS MOLECULAR WEIGHT;	
		DRY BASIS, LB/LB-MOLE	2
		WET BASIS, LB/LB-MOLE	2
EQUIVALENT VOLUME OF WATER VAPOR COLLECTED, SCF	11.029 Vw	AVERAGE GAS VELOCITY, FPS	8
GAS MOISTURE CONTENT;		GAS VOLUMETRIC FLOW RATE;	
VOLUME FRACTION	0.2370 Bws	ACTUAL, ACFM	12
PERCENT BY VOLUME	23.70 Bwp	STANDARD, SCFM	8
		DRY STANDARD, DSCFM	6
		ISOKINETIC VARIATION, %	99.

PARTICULATE EMISSION PARAMETER	FRONT CATCH	BACK CATCH	TOTAL
PARTICULATE CONCENTRATION			
ACTUAL, GR/ACF	0.0257 Caf	0.0200 Cab	0.04
STANDARD, GR/SCF	0.0361 Cwf	0.0281 Cwb	0.06
DRY STANDARD, GR/DSCF	0.0474 Csf	0.0369 Csb	0.08
PARTICULATE EMISSION RATE, LB/HR			
CLASSICAL METHOD	26.54 Rcf	20.65 Rcb	47.
RATIO OF AREAS METHOD	26.46 Rrf	20.59 Rrb	47.

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

DEFINITION OF UNIT ABBREVIATIONS

ACFM ..... ACTUAL CUBIC FEET PER MINUTE

DEG F ..... DEGREES FAHRENHEIT

DCF ..... DRY CUBIC FEET

DSCF ..... DRY STANDARD CUBIC FEET

DSCFM ..... DRY STANDARD CUBIC FEET PER MINUTE

FPS ..... FEET PER SECOND

G ..... GRAMS

GR/ACF ..... GRAINS PER ACTUAL CUBIC FOOT

GR/DSCF ..... GRAINS PER DRY STANDARD CUBIC FOOT

GR/SCF ..... GRAINS PER STANDARD CUBIC FOOT

IN ..... INCHES

IN HG ..... INCHES OF MERCURY

IN WC ..... INCHES OF WATER

LB/HR ..... POUNDS PER HOUR

LB/LB-MOLE .. POUND PER POUND-MOLE

MIN ..... MINUTES

ML ..... MILLILITERS

SCF ..... STANDARD CUBIC FEET

SCFM ..... STANDARD CUBIC FEET PER MINUTE

SF ..... SQUARE FEET

% V/V DRY ... PERCENT BY VOLUME, DRY BASIS

DEFINITION OF STANDARD CONDITIONS

STANDARD TEMPERATURE ..... 68 DEGREES FAHRENHEIT

STANDARD PRESSURE ..... 29.92 INCHES OF MERCURY

DEFINITION OF VARIABLES

An .... CROSS-SECTIONAL AREA OF NOZZLE, SF
As .... CROSS-SECTIONAL AREA OF STACK, SF
Bwp ... EFFLUENT MOISTURE CONTENT, PERCENT BY VOLUME
Bws ... EFFLUENT MOISTURE CONTENT, PROPORTION BY VOLUME
Ca* ... EFFLUENT PARTICULATE CONCENTRATION AT ACTUAL CONDITIONS, GR/ACF; *=f,b,t; Caf: FRONT CATCH ONLY; Cab: BACK CATCH ONLY; Cat: TOTAL CATCH
CD .... EFFLUENT CARBON DIOXIDE CONCENTRATION, % V/V DRY
CM .... EFFLUENT CARBON MONOXIDE CONCENTRATION, % V/V DRY
Cp .... PITOT TUBE COEFFICIENT, DIMENSIONLESS
Cs* ... EFFLUENT PARTICULATE CONCENTRATION AT DRY STANDARD CONDITIONS, GR/DSCF; *=f,b,t; Csf: FRONT CATCH ONLY; Csb: BACK CATCH ONLY; Cst: TOTAL CATCH
Cw* ... EFFLUENT PARTICULATE CONCENTRATION AT STANDARD CONDITIONS, GR/SCF; *=f,b,t; Cwf: FRONT CATCH ONLY; Cwb: BACK CATCH ONLY; Cwt: TOTAL CATCH
Dn .... NOZZLE DIAMETER, IN
I ..... ISOKINETIC VARIATION, %
Md .... EFFLUENT MOLECULAR WEIGHT, LB/LB-MOLE, DRY BASIS
Ms .... EFFLUENT MOLECULAR WEIGHT, LB/LB-MOLE, WET BASIS
NI .... EFFLUENT NITROGEN CONCENTRATION, % V/V DRY
OX .... EFFLUENT OXYGEN CONCENTRATION, % V/V DRY
Pb .... BAROMETRIC PRESSURE, IN HG
Pg .... STACK STATIC PRESSURE, IN WC
Po .... AVERAGE PRESSURE DROP ACROSS THE METERING ORIFICE, IN WC
Ps .... STACK ABSOLUTE PRESSURE, IN HG
Pv .... AVERAGE SQUARE-ROOT VELOCITY PRESSURE, IN WC
Qa .... EFFLUENT FLOW RATE AT ACTUAL CONDITIONS, ACFM
Qs .... EFFLUENT FLOW RATE AT STANDARD CONDITIONS, SCFM
Qsd ... EFFLUENT FLOW RATE AT STANDARD CONDITIONS, DRY BASIS, DSCFM
Rc* ... SOURCE PARTICULATE EMISSION RATE, CLASSICAL METHOD, LB/HR; *=f,b,t; Rcf: FRONT CATCH ONLY; Rcb: BACK CATCH ONLY; Rct: TOTAL CATCH
Rr* ... SOURCE PARTICULATE EMISSION RATE, RATIO OF AREAS METHOD, LB/HR; *=f,b,t; Rrf: FRONT CATCH ONLY; Rrb: BACK CATCH ONLY; Rrt: TOTAL CATCH
Sl .... STACK DIAMETER OR LENGTH, IN
Sw .... STACK WIDTH, IN
Ti .... TOTAL SAMPLING TIME, MIN
Tm .... AVERAGE DRY GAS METER TEMPERATURE, DEG F
Ts .... AVERAGE EFFLUENT TEMPERATURE, DEG F
Vl .... VOLUME OF LIQUID COLLECTED, ML
Vm .... VOLUME OF GAS SAMPLED AT METER CONDITIONS, DCF
Vms ... VOLUME OF GAS SAMPLED AT STANDARD CONDITIONS, DSCF
Vs .... AVERAGE EFFLUENT VELOCITY, FPS
Vw .... VOLUME OF WATER VAPOR COLLECTED AT STANDARD CONDITIONS, SCF
Wb .... MASS OF PARTICULATE MATTER COLLECTED IN THE BACK (WET) CATCH, G
Wf .... MASS OF PARTICULATE MATTER COLLECTED IN THE FRONT (DRY) CATCH, G
Wt .... TOTAL MASS OF PARTICULATE MATTER COLLECTED, G
Y ..... DRY GAS METER COEFFICIENT, DIMENSIONLESS

EQUATIONS USED TO CALCULATE PARTICULATE EMISSIONS

An = 0.005454154 * Dn * Dn

As = 0.005454154 * Sl * Sl (FOR ROUND STACKS)

As = Sl * Sw / 144.0 (FOR RECTANGULAR STACKS)

Ps = Pb + Pg/13.6

NI = 100.0 - CD - OX - CM

Wt = Wf + Wb

Vms = (528/29.92) * Vm * Y * (Pb + Po/13.6) / (Tm + 460.0)

Vw = 0.04707 * Vl

Bws = Vw / (Vw + Vms)

Bwp = 100.0 * Bws

Md = 0.440 * CD + 0.320 * OX + 0.280 * (NI + CM)

Ms = Md * (1.0 - Bws) + 18.0 * Bws

Vs = 85.49 * Cp * Pv * SQRT((Ts+460.0)/(Ms*Ps))

Qa = 60.0 * Vs * As

Qs = Qa * (528/29.92) * Ps / (Ts + 460.0)

Qsd = Qs * (1.0 - Bws)

I = 0.09450 * (Ts+460.0) * Vms / (Ps * Vs * An * Ti * (1.0-Bws))

Csf = 15.42 * Wf / Vws
Csb = 15.42 * Wb / Vws
Cst = 15.42 * Wt / Vws

Cwf = Csf / (1.0 - Bws)
Cwb = Csb / (1.0 - Bws)
Cwt = Cst / (1.0 - Bws)

Caf = Cwf * (29.92/528.0) * (Ts+460.0) / Ps
Cab = Cwb * (29.92/528.0) * (Ts+460.0) / Ps
Cat = Cwt * (29.92/528.0) * (Ts+460.0) / Ps

Rcf = 0.008578 * Csf * Qsd
Rcb = 0.008578 * Csb * Qsd
Rct = 0.008578 * Cst * Qsd

Rrf = 0.008578 * Csf * (Vms/Ti) * (As/An)
Rrb = 0.008578 * Csb * (Vms/Ti) * (As/An)
Rrt = 0.008578 * Cst * (Vms/Ti) * (As/An)

APPENDIX A2: CALCULATIONS

LINE #1 DRYER - RTO OUTLET PARTICULATE EMISSION TEST

TABLE SUMMARY OF PARTICULATE EMISSION TEST RESULTS

PROJECT NUMBER: 9531 COMPANY: LOUISIANA PACIFIC CORP.
TEST NUMBER: 2 SOURCE: LINE # 1 OUTLET

TEST PARAMETER	RUN 1	RUN 2	RUN 3
TEST DATE	2/16/94	2/16/94	2/16/94
TIME OF TEST, HR:			
START	1300	1500	1715
FINISH	1407	1607	1822
EFFLUENT TEMPERATURE, DEGREES F	343	322	346
BAROMETRIC PRESSURE, IN HG	28.80	28.70	28.71
EFFLUENT MOISTURE CONTENT, % V/V	21.0	21.3	24.7
EFFLUENT COMPOSITION, % V/V DRY:			
CARBON DIOXIDE	3.2	4.3	4.3
OXYGEN	15.4	13.1	13.3
CARBON MONOXIDE	0.0	0.0	0.0
EFFLUENT VOLUMETRIC FLOW RATE:			
ACTUAL CONDITIONS, ACFM	132135	136349	139805
STANDARD CONDITIONS, SCFM	83507	88172	87739
DRY STANDARD CONDITIONS, DSCFM	66005	69360	66069
ISOKINETIC VARIATION, %	98.7	102.5	101.7
EFFLUENT PARTICULATE CONCENTRATION:			
EFFLUENT FRONT HALF PARTICULATE CONCENTRATION:			
ACTUAL CONDITIONS, GR/ACF	0.0037	0.0040	0.0021
STANDARD CONDITIONS, GR/SCF	0.0059	0.0061	0.0033
DRY STANDARD CONDITIONS, GR/DSCF	0.0075	0.0078	0.0044
EFFLUENT BACK HALF PARTICULATE CONCENTRATION:			
ACTUAL CONDITIONS, GR/ACF	0.0018	0.0028	0.0019
STANDARD CONDITIONS, GR/SCF	0.0029	0.0044	0.0030
DRY STANDARD CONDITIONS, GR/DSCF	0.0036	0.0056	0.0039
EFFLUENT TOTAL PARTICULATE CONCENTRATION:			
ACTUAL CONDITIONS, GR/ACF	0.0055	0.0068	0.0039
STANDARD CONDITIONS, GR/SCF	0.0088	0.0105	0.0063
DRY STANDARD CONDITIONS, GR/DSCF	0.0111	0.0133	0.0083
SOURCE PARTICULATE EMISSION RATE:			
CLASSICAL METHOD, LB/HR	6.28	7.93	4.71
RATIO OF AREAS METHOD, LB/HR	6.20	8.12	4.78

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.

TRAVERSE POINT DATA SUMMARY AND VELOCITY PROFILE

PROJECT NUMBER: 9531 COMPANY: LOUISIANA PACIFIC CORP.
TEST NUMBER: 2 SOURCE: LINE # 1 OUTLET
RUN NUMBER: 1 TIME: 2/16/94 1300-1407

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	0.670	0.980	342	37	40	0.819	59.25
A	2	0.700	1.030	343	39	40	0.837	60.60
A	3	0.700	1.030	344	45	39	0.837	60.64
A	4	0.710	1.040	344	46	39	0.843	61.07
A	5	0.690	1.010	341	47	39	0.831	60.09
A	6	0.700	1.030	345	47	39	0.837	60.67
B	1	0.740	1.090	346	43	41	0.860	62.42
B	2	0.800	1.180	348	46	41	0.894	64.98
B	3	0.780	1.180	345	48	41	0.883	64.05
B	4	0.680	0.990	336	50	41	0.825	59.47
B	5	0.660	0.970	338	52	41	0.812	58.66
B	6	0.630	0.930	346	49	43	0.794	57.60
AVERAGE		0.705	1.038	343	46	40	0.839	60.79

PARTICULATE EMISSION TEST CALCULATIONS

PROJECT NUMBER: 9531 COMPANY: LOUISIANA PACIFIC CORP.
TEST NUMBER: 2 SOURCE: LINE # 1 OUTLET
RUN NUMBER: 1 TIME: 2/16/94 1300-1407

TEST DATA

GAS METER COEFFICIENT	0.9654 Y	VOLUME OF LIQUID COLLECTED, ML	198.8
PITOT TUBE COEFFICIENT	0.830 Cp		
NOZZLE DIMENSIONS;		GAS COMPOSITION, % V/V DRY;	
DIAMETER, IN	0.245 Dn	CARBON DIOXIDE	3.18
AREA, SF	0.000327 An	OXYGEN	15.42
		CARBON MONOXIDE	0.00
STACK DIMENSIONS;		NITROGEN (BY DIFFERENCE)	81.40
DIAMETER/LENGTH, IN	81.50 Sl	AVE. TRAVERSE POINT DATA;	
WIDTH, IN	0.00 Sw	STACK TEMP., DEG F	343
AREA, SF	36.228 As	METER TEMP., DEG F	43
		ORIFICE PRESSURE, IN WC	1.038
BAROMETRIC PRESSURE, IN HG	28.80 Pb	SQRT VELOCITY P., IN WC	0.839
STACK PRESSURES;		MASS OF PARTICULATE MATTER	
STATIC, IN WC	-0.50 Ps	COLLECTED, G;	
ABSOLUTE, IN HG	28.76 Ps	FRONT CATCH (67.3%)	0.0171
		BACK CATCH (32.7%)	0.0083
SAMPLING TIME, MIN	60.00 Ti	TOTAL CATCH	0.0254
VOLUME OF GAS SAMPLED AT METER, DCF	36.086 Vm		

CALCULATED RESULTS

VOLUME OF GAS SAMPLED AT METER, DSCF	35.290 Vms	GAS MOLECULAR WEIGHT;	
		DRY BASIS, LB/LB-MOLE	29.13
		WET BASIS, LB/LB-MOLE	26.79
EQUIVALENT VOLUME OF WATER VAPOR COLLECTED, SCF	9.358 Vw	AVERAGE GAS VELOCITY, FPS	60.79 V
GAS MOISTURE CONTENT;		GAS VOLUMETRIC FLOW RATE;	
VOLUME FRACTION	0.2096 Bws	ACTUAL, ACFM	132135
PERCENT BY VOLUME	20.96 Bwp	STANDARD, SCFM	83587
		DRY STANDARD, DSCFM	66005
		ISOKINETIC VARIATION, %	98.67 I

PARTICULATE EMISSION PARAMETER	FRONT CATCH	BACK CATCH	TOTAL CATCH
PARTICULATE CONCENTRATION			
ACTUAL, GR/ACF	0.0037 Caf	0.0018 Cab	0.0055 Ca
STANDARD, GR/SCF	0.0059 Cwf	0.0029 Cwb	0.0088 Cs
DRY STANDARD, GR/DSCF	0.0075 Csf	0.0036 Csb	0.0111 Cs
PARTICULATE EMISSION RATE, LB/HR			
CLASSICAL METHOD	4.23 Rcf	2.05 Rcb	6.28 Rc
RATIO OF AREAS METHOD	4.17 Rrf	2.02 Rrb	6.20 Rr

STANDARD CONDITIONS: 68 DEG F, 29.92 IN HG • NON-APPLICABLE DAT

TRAVERSE POINT DATA SUMMARY AND VELOCITY PROFILE

PROJECT NUMBER: 9531 COMPANY: LOUISIANA PACIFIC CORP.
TEST NUMBER: 2 SOURCE: LINE # 1 OUTLET
RUN NUMBER: 2 TIME: 2/16/94 1500-1607

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	0.790	1.170	341	44	44	0.889	64.39
A	2	0.870	1.280	356	48	44	0.933	68.20
A	3	0.840	1.240	357	52	45	0.917	67.05
A	4	0.750	1.110	332	53	45	0.866	62.38
A	5	0.720	1.060	346	53	45	0.849	61.66
A	6	0.640	0.940	345	55	46	0.800	58.10
B	1	0.720	1.060	350	49	46	0.849	61.81
B	2	0.770	1.140	337	51	46	0.877	63.41
B	3	0.810	1.190	358	53	46	0.900	65.88
B	4	0.760	1.120	348	54	46	0.872	63.43
B	5	0.760	1.180	345	55	46	0.872	63.31
B	6	0.800	7332.000	49	49	47	0.894	51.65
AVERAGE		0.769	28.707	322	51	46	0.876	62.73

PARTICULATE EMISSION TEST CALCULATIONS

PROJECT NUMBER: 9531 COMPANY: LOUISIANA PACIFIC CORP.
TEST NUMBER: 2 SOURCE: LINE # 1 OUTLET
RUN NUMBER: 2 TIME: 2/16/94 1500-1607

TEST DATA

GAS METER COEFFICIENT	0.9654 Y	VOLUME OF LIQUID COLLECTED, ML	221.9 Vl
PITOT TUBE COEFFICIENT	0.838 Cp		
NOZZLE DIMENSIONS;		GAS COMPOSITION, % V/V DRY;	
DIAMETER, IN	0.245 Dn	CARBON DIOXIDE	4.30 CD
AREA, SF	0.000327 An	OXYGEN	13.10 OX
		CARBON MONOXIDE	0.00 CM
STACK DIMENSIONS;		NITROGEN (BY DIFFERENCE)	82.60 NI
DIAMETER/LENGTH, IN	81.50 Sl	AVE. TRAVERSE POINT DATA;	
WIDTH, IN	0.00 Sw	STACK TEMP., DEG F	322 Ts
AREA, SF	36.228 As	METER TEMP., DEG F	48 Tm
		ORIFICE PRESSURE, IN WC	28.707 Po
BAROMETRIC PRESSURE, IN HG	28.70 Pb	SQRT VELOCITY P., IN WC	0.876 Pv
STACK PRESSURES;		MASS OF PARTICULATE MATTER	
STATIC, IN WC	-0.60 Pg	COLLECTED, G;	
ABSOLUTE, IN HG	28.66 Ps	FRONT CATCH (58.3%)	0.0194 Wf
		BACK CATCH (41.7%)	0.0139 Wb
SAMPLING TIME, MIN	60.00 Ti	TOTAL CATCH	0.0333 Wt
VOLUME OF GAS SAMPLED AT METER, DCF	37.301 Vm		

CALCULATED RESULTS

VOLUME OF GAS SAMPLED AT METER, DSCF	38.511 Vms	GAS MOLECULAR WEIGHT;	
		DRY BASIS, LB/LB-MOLE	29.21 Md
EQUIVALENT VOLUME OF WATER VAPOR COLLECTED, SCF	10.445 Vw	WET BASIS, LB/LB-MOLE	26.82 Ms
		AVERAGE GAS VELOCITY, FPS	62.73 Vs
GAS MOISTURE CONTENT;		GAS VOLUMETRIC FLOW RATE;	
VOLUME FRACTION	0.2134 Bws	ACTUAL, ACFM	136349 Qa
PERCENT BY VOLUME	21.34 Bwp	STANDARD, SCFM	88172 Qs
		DRY STANDARD, DSCFM	69360 Qsd
		ISOKINETIC VARIATION, %	102.46 I

PARTICULATE EMISSION PARAMETER	FRONT CATCH	BACK CATCH	TOTAL CATCH
PARTICULATE CONCENTRATION			
ACTUAL, GR/ACF	0.0040 Caf	0.0028 Cab	0.0068 Cat
STANDARD, GR/SCF	0.0061 Cwf	0.0044 Cwb	0.0105 Cwt
DRY STANDARD, GR/DSCF	0.0078 Csf	0.0056 Csb	0.0133 Cst
PARTICULATE EMISSION RATE, LB/HR			
CLASSICAL METHOD	4.62 Rcf	3.31 Rcb	7.93 Rct
RATIO OF AREAS METHOD	4.73 Rrf	3.39 Rrb	8.12 Rrt

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

TRAVERSE POINT DATA SUMMARY AND VELOCITY PROFILE

PROJECT NUMBER: 9531 COMPANY: LOUISIANA PACIFIC CORP.
TEST NUMBER: 2 SOURCE: LINE # 1 OUTLET
RUN NUMBER: 3 TIME: 2/16/94 1715-1822

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	0.770	1.130	342	45	45	0.877	64.04
A	2	0.810	1.210	338	47	43	0.900	65.52
A	3	0.800	1.180	352	48	42	0.894	65.68
A	4	0.780	1.150	347	48	43	0.883	64.65
A	5	0.740	1.090	339	49	43	0.860	62.66
A	6	0.700	1.030	348	49	43	0.837	61.29
B	1	0.870	1.300	354	43	42	0.933	68.58
B	2	0.880	1.300	347	47	43	0.938	68.67
B	3	0.830	1.200	345	48	43	0.911	66.61
B	4	0.730	1.100	339	48	42	0.854	62.24
B	5	0.720	1.060	357	49	42	0.849	62.50
B	6	0.660	0.970	345	49	42	0.812	59.40
AVERAGE		0.774	1.143	346	48	43	0.879	64.32

PARTICULATE EMISSION TEST CALCULATIONS

PROJECT NUMBER: 9531 COMPANY: LOUISIANA PACIFIC CORP.
TEST NUMBER: 2 SOURCE: LINE # 1 OUTLET
RUN NUMBER: 3 TIME: 2/16/94 1715-1822

TEST DATA

GAS METER COEFFICIENT	0.9654 Y	VOLUME OF LIQUID COLLECTED, ML	253.6 Vl
PITOT TUBE COEFFICIENT	0.830 Cp	GAS COMPOSITION, % V/V DRY;	
NOZZLE DIMENSIONS;		CARBON DIOXIDE	4.30 CD
DIAMETER, IN	0.245 Dn	OXYGEN	13.30 OX
AREA, SF	0.000327 An	CARBON MONOXIDE	0.00 CM
STACK DIMENSIONS;		NITROGEN (BY DIFFERENCE)	82.40 NI
DIAMETER/LENGTH, IN	81.50 Sl	AVE. TRAVERSE POINT DATA;	
WIDTH, IN	0.00 Sw	STACK TEMP., DEG F	346 Ts
AREA, SF	36.228 As	METER TEMP., DEG F	45 Tm
BAROMETRIC PRESSURE, IN HG	28.71 Pb	ORIFICE PRESSURE, IN WC	1.143 Po
		SQRT VELOCITY P., IN WC	0.879 Pv
STACK PRESSURES;		MASS OF PARTICULATE MATTER	
STATIC, IN WC	-0.59 Pg	COLLECTED, G;	
ABSOLUTE, IN HG	28.67 Ps	FRONT CATCH (52.6%)	0.0103 Wf
SAMPLING TIME, MIN	60.00 Ti	BACK CATCH (47.4%)	0.0093 Wb
		TOTAL CATCH	0.0196 Wt
VOLUME OF GAS SAMPLED AT METER, DCF	37.476 Vm		

CALCULATED RESULTS

VOLUME OF GAS SAMPLED AT METER, DSCF	36.395 Vms	GAS MOLECULAR WEIGHT;	
		DRY BASIS, LB/LB-MOLE	29.22 Md
EQUIVALENT VOLUME OF WATER VAPOR COLLECTED, SCF	11.937 Vw	WET BASIS, LB/LB-MOLE	28.45 Ms
		AVERAGE GAS VELOCITY, FPS	64.32 Vs
GAS MOISTURE CONTENT;			
VOLUME FRACTION	0.2470 Bws	GAS VOLUMETRIC FLOW RATE;	
PERCENT BY VOLUME	24.70 Bwp	ACTUAL, ACFM	139805 Qa
		STANDARD, SCFM	87739 Qs
		DRY STANDARD, DSCFM	66069 Qsd
		ISOKINETIC VARIATION, %	101.65 I

PARTICULATE EMISSION PARAMETER	FRONT CATCH	BACK CATCH	TOTAL CATCH
PARTICULATE CONCENTRATION			
ACTUAL, GR/ACF	0.0021 Caf	0.0019 Cab	0.0039 Cat
STANDARD, GR/SCF	0.0033 Cwf	0.0030 Cwb	0.0063 Cwt
DRY STANDARD, GR/DSCF	0.0044 Csf	0.0039 Csb	0.0083 Cst
PARTICULATE EMISSION RATE, LB/HR			
CLASSICAL METHOD	2.47 Rcf	2.23 Rcb	4.71 Rct
RATIO OF AREAS METHOD	2.51 Rrf	2.27 Rrb	4.78 Rrt

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

DEFINITION OF UNIT ABBREVIATIONS

ACFM ..... ACTUAL CUBIC FEET PER MINUTE

DEG F ..... DEGREES FAHRENHEIT

DCF ..... DRY CUBIC FEET

DSCF ..... DRY STANDARD CUBIC FEET

DSCFM ..... DRY STANDARD CUBIC FEET PER MINUTE

FPS ..... FEET PER SECOND

G ..... GRAMS

GR/ACF ..... GRAINS PER ACTUAL CUBIC FOOT

GR/DSCF ..... GRAINS PER DRY STANDARD CUBIC FOOT

GR/SCF ..... GRAINS PER STANDARD CUBIC FOOT

IN ..... INCHES

IN HG ..... INCHES OF MERCURY

IN WC ..... INCHES OF WATER

LB/HR ..... POUNDS PER HOUR

LB/LB-MOLE .. POUND PER POUND-MOLE

MIN ..... MINUTES

ML ..... MILLILITERS

SCF ..... STANDARD CUBIC FEET

SCFM ..... STANDARD CUBIC FEET PER MINUTE

SF ..... SQUARE FEET

% V/V DRY ... PERCENT BY VOLUME, DRY BASIS

DEFINITION OF STANDARD CONDITIONS

STANDARD TEMPERATURE ..... 68 DEGREES FAHRENHEIT

STANDARD PRESSURE ..... 29.92 INCHES OF MERCURY

DEFINITION OF VARIABLES

An .... CROSS-SECTIONAL AREA OF NOZZLE, SF
As .... CROSS-SECTIONAL AREA OF STACK, SF
Bwp ... EFFLUENT MOISTURE CONTENT, PERCENT BY VOLUME
Bws ... EFFLUENT MOISTURE CONTENT, PROPORTION BY VOLUME
Ca* ... EFFLUENT PARTICULATE CONCENTRATION AT ACTUAL CONDITIONS, GR/ACF; *=f,b,t; Caf: FRONT CATCH ONLY; Cab: BACK CATCH ONLY; Cat: TOTAL CATCH
CD .... EFFLUENT CARBON DIOXIDE CONCENTRATION, % V/V DRY
CM .... EFFLUENT CARBON MONOXIDE CONCENTRATION, % V/V DRY
Cp .... PITOT TUBE COEFFICIENT, DIMENSIONLESS
Cs* ... EFFLUENT PARTICULATE CONCENTRATION AT DRY STANDARD CONDITIONS, GR/DSCF; *=f,b,t; Csf: FRONT CATCH ONLY; Csb: BACK CATCH ONLY; Cst: TOTAL CATCH
Cw* ... EFFLUENT PARTICULATE CONCENTRATION AT STANDARD CONDITIONS, GR/SCF; *=f,b,t; Cwf: FRONT CATCH ONLY; Cwb: BACK CATCH ONLY; Cwt: TOTAL CATCH
Dn .... NOZZLE DIAMETER, IN
I ..... ISOKINETIC VARIATION, %
Md .... EFFLUENT MOLECULAR WEIGHT, LB/LB-MOLE, DRY BASIS
Ms .... EFFLUENT MOLECULAR WEIGHT, LB/LB-MOLE, WET BASIS
NI .... EFFLUENT NITROGEN CONCENTRATION, % V/V DRY
OX .... EFFLUENT OXYGEN CONCENTRATION, % V/V DRY
Pb .... BAROMETRIC PRESSURE, IN HG
Pg .... STACK STATIC PRESSURE, IN WC
Po .... AVERAGE PRESSURE DROP ACROSS THE METERING ORIFICE, IN WC
Ps .... STACK ABSOLUTE PRESSURE, IN HG
Pv .... AVERAGE SQUARE-ROOT VELOCITY PRESSURE, IN WC
Qa .... EFFLUENT FLOW RATE AT ACTUAL CONDITIONS, ACFM
Qs .... EFFLUENT FLOW RATE AT STANDARD CONDITIONS, SCFM
Qsd ... EFFLUENT FLOW RATE AT STANDARD CONDITIONS, DRY BASIS, DSCFM
Rc* ... SOURCE PARTICULATE EMISSION RATE, CLASSICAL METHOD, LB/HR; *=f,b,t; Rcf: FRONT CATCH ONLY; Rcb: BACK CATCH ONLY; Rct: TOTAL CATCH
Rr* ... SOURCE PARTICULATE EMISSION RATE, RATIO OF AREAS METHOD, LB/HR; *=f,b,t; Rrf: FRONT CATCH ONLY; Rrb: BACK CATCH ONLY; Rrt: TOTAL CATCH
Sl .... STACK DIAMETER OR LENGTH, IN
Sw .... STACK WIDTH, IN
Ti .... TOTAL SAMPLING TIME, MIN
Tm .... AVERAGE DRY GAS METER TEMPERATURE, DEG F
Ts .... AVERAGE EFFLUENT TEMPERATURE, DEG F
Vl .... VOLUME OF LIQUID COLLECTED, ML
Vm .... VOLUME OF GAS SAMPLED AT METER CONDITIONS, DCF
Vms ... VOLUME OF GAS SAMPLED AT STANDARD CONDITIONS, DSCF
Vs .... AVERAGE EFFLUENT VELOCITY, FPS
Vw .... VOLUME OF WATER VAPOR COLLECTED AT STANDARD CONDITIONS, SCF
Wb .... MASS OF PARTICULATE MATTER COLLECTED IN THE BACK (WET) CATCH, G
Wf .... MASS OF PARTICULATE MATTER COLLECTED IN THE FRONT (DRY) CATCH, G
Wt .... TOTAL MASS OF PARTICULATE MATTER COLLECTED, G
Y ..... DRY GAS METER COEFFICIENT, DIMENSIONLESS

EQUATIONS USED TO CALCULATE PARTICULATE EMISSIONS

```
An = 0.005454154 * Dn * Dn

As = 0.005454154 * Sl * Sl      (FOR ROUND STACKS)

As = Sl * Sw / 144.0      (FOR RECTANGULAR STACKS)

Ps = Pb + Pg/13.6

NI = 100.0 - CD - OX - CM

Wt = Wf + Wb

Vms = (528/29.92) * Vm * Y * (Pb + Po/13.6) / (Tm + 460.0)

Vw = 0.04707 * Vl

Bws = Vw / (Vw + Vms)

Bwp = 100.0 * Bws

Md = 0.440 * CD  +  0.320 * OX  + 0.280 * (NI + CM)

Ms = Md * (1.0 - Bws)  +  18.0 * Bws

Vs = 85.49 * Cp * Pv * SQRT( (Ts+460.0)/(Ms*Ps) )

Qa = 60.0 * Vs * As

Qs = Qa * (528/29.92) * Ps / (Ts + 460.0)

Qsd = Qs * (1.0 - Bws)

I = 0.09450 * (Ts+460.0) * Vms / (Ps * Vs * An * Ti * (1.0-Bws) )

Csf = 15.42 * Wf / Vws
Csb = 15.42 * Wb / Vws
Cst = 15.42 * Wt / Vws

Cwf = Csf / (1.0 - Bws)
Cwb = Csb / (1.0 - Bws)
Cwt = Cst / (1.0 - Bws)

Caf = Cwf * (29.92/528.0) * (Ts+460.0) / Ps
Cab = Cwb * (29.92/528.0) * (Ts+460.0) / Ps
Cat = Cwt * (29.92/528.0) * (Ts+460.0) / Ps

Rcf = 0.008578 * Csf * Qsd
Rcb = 0.008578 * Csb * Qsd
Rct = 0.008578 * Cst * Qsd

Rrf = 0.008578 * Csf * (Vms/Ti) * (As/An)
Rrb = 0.008578 * Csb * (Vms/Ti) * (As/An)
Rrt = 0.008578 * Cst * (Vms/Ti) * (As/An)
```

Salt Sulfur Emission Calculations
Louisiana-Pacific Corporation, Hayward, WI
Line #1 Dryer, RTO Inlet Test, February 16, 1994

Parameter	Sym	Run #1	Run #2	Run #3	Average
Volume of Gas Sampled:					
dry standard cubic feet, dscf	V1	35.448	34.366	35.510	
dry standard cubic meters, dscm	V2	1.0039	0.9732	1.0056	
Mass of Salt/Sulfur Collected:					
Calcium, ug	M1	1,850	1,850	2,700	
Magnesium, ug	M2	350	350	350	
Sodium, ug	M3	11,000	10,500	10,000	
Potassium, ug	M4	10,000	10,500	9,500	
Sulfur, ug	M5	1,050	750	1,000	
Effluent Salt/Sulfur Concentration:					
Calcium, gr/dscf	C1a	0.000805	0.000830	0.001172	0.000936
Magnesium, gr/dscf	C2a	0.000152	0.000157	0.000152	0.000154
Sodium, gr/dscf	C3a	0.004785	0.004711	0.004342	0.004613
Potassium, gr/dscf	C4a	0.004350	0.004711	0.004125	0.004396
Sulfur, gr/dscf	C5a	0.000457	0.000337	0.000434	0.000409
Effluent Salt/Sulfur Concentration:					
Calcium, ug/dscm	C1b	1,843	1,840	2,774	2,152
Magnesium, ug/dscm	C2b	349	360	360	356
Sodium, ug/dscm	C3b	10,957	10,789	10,275	10,674
Potassium, ug/dscm	C4b	9,961	10,789	9,761	10,170
Sulfur, ug/dscm	C5b	1,046	771	1,027	948
Effluent Flow Rate:					
dry standard cubic feet per minute, dscfm	F1	68,108	65,264	65,305	66,226
dry standard cubic meters per minute. dscmm	F2	1,929	1,848	1,849	1,876
Source Salt/Sulfur Mass Emission Rate:					
Calcium, lb/hr	R1	0.470	0.450	0.679	0.533
Magnesium, lb/hr	R2	0.089	0.088	0.088	0.088
Sodium, lb/hr	R3	2.796	2.638	2.514	2.649
Potassium, lb/hr	R4	2.541	2.638	2.388	2.522
Sulfur, lb/hr	R5	0.267	0.188	0.251	0.236
Equations:	V2 = V1 * 0.02832		F2 = F1 * 0.02832		
C1a = 15.42 * M1 / (V1 * 1,000,000)	C1b = M1 / V2		R1 = 60 * C1b * F2 / (1,000,000 * 453.6)		
C2a = 15.42 * M2 / (V1 * 1,000,000)	C2b = M2 / V2		R2 = 60 * C2b * F2 / (1,000,000 * 453.6)		
C3a = 15.42 * M3 / (V1 * 1,000,000)	C3b = M3 / V2		R3 = 60 * C3b * F2 / (1,000,000 * 453.6)		
C4a = 15.42 * M4 / (V1 * 1,000,000)	C4b = M4 / V2		R4 = 60 * C4b * F2 / (1,000,000 * 453.6)		
C5a = 15.42 * M5 / (V1 * 1,000,000)	C5b = M5 / V2		R5 = 60 * C5b * F2 / (1,000,000 * 453.6)		

APPENDIX A3: CALCULATIONS

LINE #2 DRYER - RTO FLOW RATE TESTS

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VOLUMETRIC FLOW RATE CALCULATION

PROJECT NUMBER: 9531 COMPANY: LOUISIANA PACIFIC CORP.
TEST DATE: 2-18-94 SOURCE: LINE # 2 RTO INLET

DUCT DIMENSIONS;		
DIAMETER, INCHES	66.00	DM
CROSS-SECTIONAL AREA, SQ FT	23.758	AR
EFFLUENT TEMPERATURE, DEG F	204	TS
MOISTURE CONTENT DETERMINATION:		
EFFLUENT WET BULB TEMPERATURE, DEG F	150	TW
EFFLUENT DEW POINT TEMPERATURE, DEG F	148	TD
EFFLUENT RELATIVE HUMIDITY, %	28.3	RH
EFFLUENT MOISTURE CONTENT, % V/V	25.1	MC
DUCT PRESSURES;		
BAROMETRIC PRESSURE, IN HG	28.50	PB
STATIC PRESSURE, IN WC	-6.10	PS
ABSOLUTE PRESSURE, IN WC	28.05	PA
EFFLUENT COMPOSITION;		
CARBON DIOXIDE CONTENT, % V/V DRY	3.2	CD
OXYGEN CONTENT, % V/V DRY	15.2	OX
EFFLUENT MOLECULAR WEIGHT;		
DRY BASIS, LB/LB-MOLE	29.12	MD
WET BASIS, LB/LB-MOLE	26.33	MS
PITOT TUBE COEFFICIENT	0.838	CP

EFFLUENT VELOCITY PRESSURES, IN WC;

POINT	PORT A	PORT B
1	1.250	1.200
2	1.350	1.150
3	1.350	1.150
4	1.350	1.150
5	1.300	1.150
6	1.250	1.100
7	1.150	1.150
8	1.250	1.150
9	1.350	1.200
10	1.500	1.250
11	1.450	1.200

AVE. SQUARE-ROOT VELOCITY PRESSURE, IN WC ..	1.12	PV
EFFLUENT AVERAGE VELOCITY, FT/SEC	75.733	VS
EFFLUENT VOLUMETRIC FLOW RATE;		
ACTUAL, ACFM	107955	FA
STANDARD, SCFM	80496	FW
DRY STANDARD, DSCFM	60289	FD

EQUATIONS USED TO CALCULATE THE VOLUMETRIC FLOW RATE

AR = 0.004545 * DM * DM

PA = PB + PS/13.6

MD = 0.44*CD + 0.32*OX + 0.28*(100-CD-OX)

MS = MD*(1-MC/100) + 0.18*MC

VS = 85.48 * CP * PV * SQRT((460+TS)/(MS*PA))

FA = 60 * VS * AR

FW = 17.65 * FA * PA / (TS+460)

FD = FW * (1-MC/100)

STANDARD CONDITIONS: 68 DEG F, 29.92 IN HG

VOLUMETRIC FLOW RATE CALCULATION

PROJECT NUMBER: 9531 COMPANY: LOUISIANA PACIFIC CORP.
TEST DATE: 2-18-94 SOURCE: LINE # 2 RTO OUTLET

DUCT DIMENSIONS;		
DIAMETER, INCHES	81.50	DM
CROSS-SECTIONAL AREA, SQ FT	36.227	AR
EFFLUENT TEMPERATURE, DEG F	321	TS
MOISTURE CONTENT DETERMINATION:		
EFFLUENT WET BULB TEMPERATURE, DEG F	165	TW
EFFLUENT DEW POINT TEMPERATURE, DEG F	159	TD
EFFLUENT RELATIVE HUMIDITY, %	5.1	RH
EFFLUENT MOISTURE CONTENT, % V/V	33.1	MC
DUCT PRESSURES;		
BAROMETRIC PRESSURE, IN HG	28.47	PB
STATIC PRESSURE, IN WC	-0.57	PS
ABSOLUTE PRESSURE, IN WC	28.43	PA
EFFLUENT COMPOSITION;		
CARBON DIOXIDE CONTENT, % V/V DRY	3.4	CD
OXYGEN CONTENT, % V/V DRY	15.3	OX
EFFLUENT MOLECULAR WEIGHT;		
DRY BASIS, LB/LB-MOLE	29.16	MD
WET BASIS, LB/LB-MOLE	25.46	MS
PITOT TUBE COEFFICIENT	0.830	CP

EFFLUENT VELOCITY PRESSURES, IN WC;

POINT	PORT A	PORT B
1	0.610	0.600
2	0.720	0.650
3	0.680	0.670
4	0.670	0.700
5	0.720	0.710
6	0.730	0.730

AVE. SQUARE-ROOT VELOCITY PRESSURE, IN WC ..	0.83	PV
EFFLUENT AVERAGE VELOCITY, FT/SEC	60.850	VS
EFFLUENT VOLUMETRIC FLOW RATE;		
ACTUAL, ACFM	132265	FA
STANDARD, SCFM	84974	FW
DRY STANDARD, DSCFM	56855	FD

EQUATIONS USED TO CALCULATE THE VOLUMETRIC FLOW RATE

AR = 0.004545 * DM * DM

PA = PB + PS/13.6

MD = 0.44*CD + 0.32*OX + 0.28*(100-CD-OX)

MS = MD*(1-MC/100) + 0.18*MC

VS = 85.48 * CP * PV * SQRT((460+TS)/(MS*PA))

FA = 60 * VS * AR

FW = 17.65 * FA * PA / (TS+460)

FD = FW * (1-MC/100)

STANDARD CONDITIONS: 68 DEG F, 29.92 IN HG

APPENDIX A4: CALCULATIONS

LINE #2 PRESS - RTO FLOW RATE TESTS

VOLUMETRIC FLOW RATE CALCULATION

PROJECT NUMBER: 9531 COMPANY: LOUISIANA PACIFIC
TEST DATE: 2-18-94 SOURCE: PRESS # 2 INLET

DUCT DIMENSIONS;		
DIAMETER, INCHES	53.50	DM
CROSS-SECTIONAL AREA, SQ FT	15.611	AR
EFFLUENT TEMPERATURE, DEG F	102	TS
MOISTURE CONTENT DETERMINATION:		
EFFLUENT WET BULB TEMPERATURE, DEG F	77	TW
EFFLUENT DEW POINT TEMPERATURE, DEG F	68	TD
EFFLUENT RELATIVE HUMIDITY, %	33.6	RH
EFFLUENT MOISTURE CONTENT, % V/V	2.4	MC
DUCT PRESSURES;		
BAROMETRIC PRESSURE, IN HG	28.46	PB
STATIC PRESSURE, IN WC	-2.90	PS
ABSOLUTE PRESSURE, IN WC	28.25	PA
EFFLUENT COMPOSITION;		
CARBON DIOXIDE CONTENT, % V/V DRY	0.0	CD
OXYGEN CONTENT, % V/V DRY	20.9	OX
EFFLUENT MOLECULAR WEIGHT;		
DRY BASIS, LB/LB-MOLE	28.84	MD
WET BASIS, LB/LB-MOLE	28.57	MS
PITOT TUBE COEFFICIENT	0.838	CP

EFFLUENT VELOCITY PRESSURES, IN WC;

POINT	PORT A	PORT B
1	1.650	1.750
2	2.100	1.700
3	2.100	2.150
4	2.150	2.100
5	2.000	2.150
6	2.000	1.900
7	2.100	2.000
8	1.950	2.150
9	1.600	2.150
10	1.500	1.900
11	1.450	1.700
12	1.200	1.350

AVE. SQUARE-ROOT VELOCITY PRESSURE, IN WC	1.36	PV
EFFLUENT AVERAGE VELOCITY, FT/SEC	81.416	VS
EFFLUENT VOLUMETRIC FLOW RATE;		
ACTUAL, ACFM	76258	FA
STANDARD, SCFM	67649	FW
DRY STANDARD, DSCFM	66014	FD

EQUATIONS USED TO CALCULATE THE VOLUMETRIC FLOW RATE

AR = 0.004545 * DM * DM

PA = PB + PS/13.6

MD = 0.44*CD + 0.32*OX + 0.28*(100-CD-OX)

MS = MD*(1-MC/100) + 0.18*MC

VS = 85.48 * CP * PV * SQRT((460+TS)/(MS*PA))

FA = 60 * VS * AR

FW = 17.65 * FA * PA / (TS+460)

FD = FW * (1-MC/100)

STANDARD CONDITIONS: 68 DEG F, 29.92 IN HG

VOLUMETRIC FLOW RATE CALCULATION

PROJECT NUMBER: 9531 COMPANY: LOUISIANA PACIFIC CORP.
TEST DATE: 2-18-94 SOURCE: PRESS # 2 OUTLET

DUCT DIMENSIONS:		
DIAMETER, INCHES	76.00	DM
CROSS-SECTIONAL AREA, SQ FT	31.502	AR
EFFLUENT TEMPERATURE, DEG F	222	TS
MOISTURE CONTENT DETERMINATION:		
EFFLUENT WET BULB TEMPERATURE, DEG F	109	TW
EFFLUENT DEW POINT TEMPERATURE, DEG F	91	TD
EFFLUENT RELATIVE HUMIDITY, %	4.0	RH
EFFLUENT MOISTURE CONTENT, % V/V	5.1	MC
DUCT PRESSURES:		
BAROMETRIC PRESSURE, IN HG	28.46	PB
STATIC PRESSURE, IN WC	-0.36	PS
ABSOLUTE PRESSURE, IN WC	28.43	PA
EFFLUENT COMPOSITION:		
CARBON DIOXIDE CONTENT, % V/V DRY	3.4	CD
OXYGEN CONTENT, % V/V DRY	15.3	OX
EFFLUENT MOLECULAR WEIGHT:		
DRY BASIS, LB/LB-MOLE	29.16	MD
WET BASIS, LB/LB-MOLE	28.59	MS
PITOT TUBE COEFFICIENT	0.830	CP

EFFLUENT VELOCITY PRESSURES, IN WC:

POINT	PORT A	PORT B
1	0.560	0.580
2	0.640	0.630
3	0.650	0.670
4	0.680	0.700
5	0.830	0.760
6	0.700	0.610

AVE. SQUARE-ROOT VELOCITY PRESSURE, IN WC ..	0.82	PV
EFFLUENT AVERAGE VELOCITY, FT/SEC	53.022	VS
EFFLUENT VOLUMETRIC FLOW RATE:		
ACTUAL, ACFM	100218	FA
STANDARD, SCFM	73747	FW
DRY STANDARD, DSCFM	69976	FD

EQUATIONS USED TO CALCULATE THE VOLUMETRIC FLOW RATE

AR = 0.004545 * DM * DM

PA = PB + PS/13.6

MD = 0.44*CD + 0.32*OX + 0.28*(100-CD-OX)

MS = MD*(1-MC/100) + 0.18*MC

VS = 85.48 * CP * PV * SQRT((460+TS)/(MS*PA))

FA = 60 * VS * AR

FW = 17.65 * FA * PA / (TS+460)

FD = FW * (1-MC/100)

STANDARD CONDITIONS: 68 DEG F, 29.92 IN HG

APPENDIX B: FIELD DATA FORMS

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APPENDIX B1: FIELD DATA FORMS

LINE #1 DRYER - RTO INLET PARTICULATE EMISSION TEST

SOURCE EMISSION TEST
SITE DESCRIPTION DATA SHEET

TRAVERSE POINT LOCATION		
Traverse Point Number	Port Length: 8½ Inches From Wall	Inches From Port
1	1.4	9.9
2	4.4	12.9
3	7.8	16.3
4	11.7	20.2
5	16.5	25.0
6	23.4	31.9
7	42.6	51.1
8	49.5	58.0
9	54.3	62.8
10	59.2	66.7
11	61.2	70.1
12	64.2	73.1
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		

PRELIMINARY TRAVERSE DATA	
Effluent Temperature, °F:	
Ave. Velocity Pressure, IN WC:	

MMT Job Number: 9531 Date: Feb. 94

Company: Louisiana Pacific Corp.

Address: Hayward, WI

Source: Line # 1 Dryer RTO Inlet

Source Cross-sectional Dimensions

Round Duct; diameter: 66.0"

Rectangular Duct;

Length: X

Width: X

Equivalent diameter: X

$D_e = 2LW/(L+W)$

Distance to Nearest Flow Disturbance;

Before Ports: 170" = 2.57 diameters

After Ports: 72" = 1.09 diameters

Number of Sampling Points;

Required by EPA Method 1: 24

Actually Used: 24

Number of ports: 2

Points per port: 12

Sampling Time;

Minutes per Point: 2.5

Minutes per Test Run: 60

SITE SKETCH AND COMMENTS

74½
8½ port
66"

ideal manifold 0.20"

static −7.0

2.15
2.10
1.75
1.55
1.20
0.87
0.88
1.20
1.80
1.95
1.75
0.88

245°F

81 → M5
Run 150 in H2O
Run 240 in H2O

db 235
wb 150

FORM: S-FD-1c

SOURCE EMISSION TEST
FIELD DATA SHEET

TEST: 1	RUN: 1
Page 1 of 1	

TEST IDENTIFICATION	EQUIPMENT IDENTIFICATION	NOMOGRAPH PARAMETE
MMT Job Number: 9531	Control Unit No.: 4	ΔH@ 1.
Date: Wed 2.16.94	Gas Meter Coefficient: 1.025	TM 4
Company: Louisiana Pacific Corporation	Sample Box No.: 4	MC 25
Source: Line #1 Dryer Inlet	Probe No.: 87 Length: 87"	PS/PM = 1.0
Source Dimensions: 66.0" ϕ	Pitot No.: 85 Coefficient: B=.838	C = ~~.025~~
Test Team: AT - BA - TG	Nozzle No.: 114 Diameter: 0.199	TS 245
Test Procedure: EPA 1-5 per WI M5	Filter No.: 8853	R
Ambient Temp., °F: 36	Barometric Pressure, in.Hg: 28.77	Static Pressure, in.WC: -7.0

CLOCK TIME hours	TRAVERSE POINT NUMBER	SAMPLE TIME min.	SAMPLE VOLUME cu.ft.	VELOCITY HEAD in.WC	ORIFICE ΔH, in.WC REQ.	ORIFICE ΔH, in.WC ACT.	PUMP VAC. inHG	TEMPERATURE, DEG F STACK GAS	GAS METER IN	GAS METER OUT	OVEN	PROBE	LAST IMP
1302	A-1	0	681.216	2.05	1.42	1.4	14	242	36	35	232	251	3
—	2	2.5	682.7	1.95	1.35	1.4	14	245	36	35	228	252	36
1307	3	5	684.3	1.90	1.31	1.3	14	245	38	35	233	252	37
—	4	7.5	686.0	1.60	1.11	1.1	13	246	39	35	226	252	3
1312	5	10	687.6	1.30	0.90	0.90	11	247	41	35	242	250	3
—	6	12.5	688.9	0.94	0.65	0.65	8	247	42	35	228	251	38
1317	7	15	690.0	0.74	0.51	0.51	7	247	44	36	230	253	40
—	8	17.5	691.0	1.70	1.17	1.2	13	246	46	36	232	252	4
1322	9	20	692.4	2.15	1.49	1.5	16	246	48	36	235	253	42
—	10	22.5	694.0	1.90	1.31	1.3	14	246	47	36	236	253	44
1327	11	25	695.6	2.15	1.49	1.5	16	246	47	37	245	252	4
—	12	27.5	697.3	2.30	1.59	1.6	17	246	47	37	253	252	4
1332	end A	30	699.102										
1345	B-1	0	699.102	2.35	1.62	1.6	17	240	38	37	258	252	
—	2	2.5	700.7	2.50	1.73	1.7	18	239	39	37	260	253	
1350	3	5	702.6	2.40	1.66	1.7	18	238	39	37	262	250	44
—	4	7.5	704.3	2.20	1.52	1.5	17	242	40	37	264	255	45
1955	5	10	706.0	1.65	1.14	1.1	15	243	41	37	267	253	46
—	6	12.5	707.5	0.88	0.61	0.61	9	243	43	37	265	251	46
1400	7	15	708.6	0.68	0.47	0.47	7	246	45	37	265	253	46
—	8	17.5	709.6	0.76	0.53	0.53	8	244	46	37	262	252	4
1405	9	20	710.7	0.97	0.67	0.67	10	240	48	37	264	249	4
—	10	22.5	711.6	1.10	0.76	0.76	11	243	49	38	259	253	49
1410	11	25	712.9	1.05	0.73	0.73	11	241	51	38	263	251	52
—	12	27.5	714.1	0.86	0.59	0.59	7	240	51	38	261	251	54
1415	end B	30	715.122										

652.9
654.5
656.0
657.5

A side B top

MOISTURE DETERMINATION					
IMPINGER	1	2	3	4	5
Final					
Initial	100	100	0	738.5	
Difference					
Total Moisture Collected: 199.3					

SYSTEM LEAK CHECKS		
Time	Rate (cfm)	Vac. (in.Hg)
1243	0.007	18
1417	0.004	20

Impinger Catch Description:

DETERMINATION OF GAS COMPOSITION BY ORSAT ANALYSIS								
Sample Id:	Replicate 1		Replicate 2		Replicate 3		Average	
1-1	Buret Reading	Percent Volume	Buret Reading	Percent Volume	Buret Reading	Percent Volume	Compound	Percent Volume
Initial Reading								
Carbon Dioxide						3.20	CO_2	
Oxygen						15.20	O_2	
Carbon Monoxide							CO	

Total Sampling Time, min.: 60
Volume of Gas Sampled, DCF: 33.906

FORM: S-FD-5

SOURCE EMISSION TEST
FIELD DATA SHEET

TEST: 1	RUN: 2
Page 1 of 1	

TEST IDENTIFICATION	EQUIPMENT IDENTIFICATION	NOMOGRAPH PARAMETERS
MMT Job Number: 9531	Control Unit No.: 4	ΔH@ 1.77
Date: Wed 2.16.94	Gas Meter Coefficient: 1.025	TM 40
Company: Louisiana Pacific Corporation	Sample Box No.: 4	MC 25
Source: Line #1 Dryer Inlet	Probe No.: 87 Length: 87"	PS/PM ≈ 1.0
Source Dimensions: 66.0" Ø	Pitot No.: 85 Coefficient: B=.838	C = ~~.025~~
Test Team: AT - BA - TG	Nozzle No.: L/4 Diameter: 0.199	TS 245
Test Procedure: EPA 1-5 per WI M5	Filter No.: ~~4~~ 9855	R —
Ambient Temp., °F:	Barometric Pressure, in.Hg: 28.74 Static Pressure, in.WC: -7.0	

CLOCK TIME hours	TRAVERSE POINT NUMBER	SAMPLE TIME min.	SAMPLE VOLUME cu.ft.	VELOCITY HEAD in.WC	ORIFICE ΔH, in.WC REQ.	ORIFICE ΔH, in.WC ACT.	PUMP VAC. inHG	TEMPERATURE, DEG F STACK GAS	GAS METER IN	GAS METER OUT	OVEN	PROBE	LAST IMP.
1501	B-1	0	715.609	2.50	1.73	1.7	14	241	37	37	267	252	37
—	2	2.5	717.4	2.50	1.73	1.7	19	241	38	37	269	250	39
1506	3	5	719.2	2.35	1.62	1.6	18	241	38	37	270	249	42
—	4	7.5	720.9	2.15	1.49	1.5	17	240	38	37	267	251	43
1511	5	10	722.6	1.70	1.17	1.2	14	240	39	38	271	254	43
—	6	12.5	724.1	0.93	0.68	0.68	8	240	39	38	270	253	44
1516	7	15	725.2	0.69	0.48	0.48	8	241	39	38	273	251	44
—	8	17.5	726.2	0.70	0.48	0.48	8	242	40	38	267	251	44
1521	9	20	727.1	0.77	0.53	0.53	8	242	40	38	269	253	45
—	10	22.5	728.1	0.92	0.64	0.64	9	242	40	38	271	253	45
1526	11	25	729.2	1.10	0.76	0.76	10	240	41	39	272	257	45
—	12	27.5	730.5	0.76	0.53	0.53	9	238	41	39	268	257	46
1531	end B	30	731.581										
1540	A-1	0	731.581	1.40	0.97	0.97	12	228	39	39	266	251	42
—	2	2.5	732.9	1.90	1.31	1.3	16	236	39	39	269	251	44
1545	3	5	734.3	2.15	1.49	1.5	18	241	40	39	267	252	45
—	4	7.5	736.0	1.80	1.24	1.2	16	244	40	39	266	250	46
1550	5	10	737.5	1.25	0.86	0.86	11	245	41	39	271	252	46
—	6	12.5	738.8	0.91	0.63	0.63	10	245	41	39	274	250	47
1555	7	15	739.9	0.80	0.55	0.55	10	245	41	39	273	241	47
—	8	17.5	740.9	1.20	0.83	0.83	12	244	41	39	252	238	46
1600	9	20	742.2	1.60	1.11	1.1	16	243	41	39	258	235	46
—	10	22.5	743.6	1.95	1.35	1.4	18	243	41	39	264	249	47
1605	11	25	745.2	2.10	1.45	1.5	19	243	41	39	267	253	47
—	12	27.5	746.9	2.10	1.45	1.5	19	243	42	40	271	251	47
1610	end A	30	748.481										

748.481

MOISTURE DETERMINATION					
IMPINGER	1	2	3	4	5
Final					
Initial	100	100	0	717.4	
Difference					
Total Moisture Collected: 210.5					

SYSTEM LEAK CHECKS		
Time	Rate (cfm)	Vac. (in.Hg)
1451	0.005	18
1613	0.002	20
X	X	X
X	X	X

Impinger Catch Description:

DETERMINATION OF GAS COMPOSITION BY ORSAT ANALYSIS								
Sample Id:	Replicate 1		Replicate 2		Replicate 3		Average	
1-2	Buret Reading	Percent Volume	Buret Reading	Percent Volume	Buret Reading	Percent Volume	Compound	Percent Volume
Initial Reading								
Carbon Dioxide						3.50	CO2	
Oxygen						15.15	O2	
Carbon Monoxide							CO	

Total Sampling Time, min.: 60

FORM: S-FD-5

Volume of Gas Sampled, DCF: 32.872

SOURCE EMISSION TEST
FIELD DATA SHEET

TEST: 1	RUN: 5
Page 1 of 1	

TEST IDENTIFICATION	EQUIPMENT IDENTIFICATION	NOMOGRAPH PARAMETER
MMT Job Number: 9531	Control Unit No.: 4	ΔH@ 1.7
Date: Wed 2.16.94	Gas Meter Coefficient: 1.025	TM 9
Company: Louisiana Pacific Corporation	Sample Box No.: 4	MC 25
Source: Line #1 Dryer Inlet	Probe No.: 87 Length: 87"	PS/PM = 1.0
Source Dimensions: 66.0" Ø	Pitot No.: 85 Coefficient: B=.838	C = ~~1.026~~
Test Team: AT - BA - TG	Nozzle No.: L14 Diameter: 0.199	TS 245
Test Procedure: EPA 1-5 w/ WI M5	Filter No.: ~~8845~~ 8845	R
Ambient Temp., °F:	Barometric Pressure, in.Hg: 25.75	Static Pressure, in.WC: -7.0

CLOCK TIME hours	TRAVERSE POINT NUMBER	SAMPLE TIME min.	SAMPLE VOLUME cu.ft.	VELOCITY HEAD in.WC	ORIFICE ΔH, in.WC REQ.	ORIFICE ΔH, in.WC ACT.	PUMP VAC. inHG	TEMPERATURE, DEG F STACK GAS	GAS METER IN	GAS METER OUT	OVEN	PROBE	LAST IMP.
1715	B-1	0	749.205	2.40	1.66	1.7	17	241	37	37	274	251	37
—	2	2.5	751.0	2.30	1.93	1.9	18	240	37	37	268	252	46
1720	3	5	752.9	2.55	1.76	1.8	18	240	39	37	273	253	42
—	4	7.5	755.6	2.25	1.55	1.6	17	240	39	37	274	253	4[illegible]
1725	5	10	757.3	1.55	1.07	1.1	12	239	40	37	270	252	4[illegible]
—	6	12.5	758.7	0.84	0.58	0.58	7	240	40	37	272	251	44
1730	7	15	759.8	0.70	0.48	0.48	7	242	41	37	277	253	4[illegible]
—	8	17.5	760.7	0.82	0.57	0.57	7	241	42	37	273	254	4[illegible]
1735	9	20	761.7	0.95	0.66	0.66	9	240	43	37	274	253	43
—	10	22.5	762.8	1.05	0.73	0.73	10	240	46	37	272	249	52
1740	11	25	764.0	0.96	0.66	0.66	10	238	43	37	271	252	54
—	12	27.5	765.2	0.78	0.54	0.54	9	234	48	37	276	253	53
1745	end B	30	766.049	[illegible]									
1754	A-1	0	766.049	1.55	1.07	1.1	13	228	39	37	266	254	4[illegible]
—	2	2.5	767.5	1.60	1.11	1.1	13	236	41	37	268	252	[illegible]
1759	3	5	768.9	1.90	1.31	1.3	16	241	44	37	273	252	51
—	4	7.5	770.5	1.70	1.17	1.2	16	242	44	37	272	250	52
1804	5	10	772.0	1.35	0.93	0.93	13	242	45	37	270	249	54
—	6	12.5	773.3	0.89	0.61	0.61	10	242	46	37	271	253	54
1809	7	15	774.4	0.82	0.57	0.57	9	242	46	37	268	252	54
—	8	17.5	775.4	1.15	0.79	0.79	12	242	46	37	247	254	5[illegible]
1814	9	20	776.7	1.70	1.17	1.2	16	241	48	36	271	252	54
—	10	22.5	778.1	2.10	1.45	1.5	19	241	48	36	271	254	55
1819	11	25	779.8	2.45	1.69	1.6	20	240	45	36	266	253	54
—	12	27.5	781.4	2.35	1.62	1.6	20	240	44	35	271	254	52
1824	end A	30	783.218	[illegible]									

MOISTURE DETERMINATION					
IMPINGER	1	2	3	4	5
Final					
Initial	100	100	0	752.2	
Difference					
Total Moisture Collected: 234.3					

SYSTEM LEAK CHECKS		
Time	Rate (cfm)	Vac. (in.Hg)
1706	0.002	17
1827	0.003	24

Impinger Catch Description:

DETERMINATION OF GAS COMPOSITION BY ORSAT ANALYSIS								
Sample Id:	Replicate 1		Replicate 2		Replicate 3		Average	
1-3	Buret Reading	Percent Volume	Buret Reading	Percent Volume	Buret Reading	Percent Volume	Compound	Percent Volume
Initial Reading								
Carbon Dioxide						3.42	CO2	
Oxygen						15.10	O2	
Carbon Monoxide							CO	

FORM: S-FD-5

Total Sampling Time, min.: 60
Volume of Gas Sampled, DCF: 34.013

APPENDIX B2: FIELD DATA FORMS

LINE #1 DRYER - RTO OUTLET PARTICULATE EMISSION TEST

SOURCE EMISSION TEST
SITE DESCRIPTION DATA SHEET

TRAVERSE POINT LOCATION		
Traverse Point Number	Port Length: 6 Inches From Wall	Inches From Port
1	3.0	9
2	10.9	17.9
3	24.7	30.7
4	57.8	63.8
5	69.9	75.9
6	77.9	83.9
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		

PRELIMINARY TRAVERSE DATA	
Effluent Temperature, °F:	
Ave. Velocity Pressure, IN WC:	

MMT Job Number: 9531 Date: Feb. 94

Company: Lousiana Pacific Corp.

Address: Hayward, WI

Source: Line #1 Dryer R.T.O. Outlet

Source Cross-sectional Dimensions

Round Duct; diameter: [illegible]" @ 81.9

Rectangular Duct;

Length: — — —

Width: — — —

Equivalent diameter: — —

$D_e = 2LW/(L+W)$

Distance to Nearest Flow Disturbance;

Before Ports: 50' = 7.32 diameters

After Ports: 35 = 5.12 diameters

Number of Sampling Points;

Required by EPA Method 1: 16 or 12

Actually Used: 12

Number of ports: 2

Points per port: 6

Sampling Time;

Minutes per Point: 5

Minutes per Test Run: 60

SITE SKETCH AND COMMENTS

Should have been 46' 6.9 diameters

FORM: S-FD-1c

SOURCE EMISSION TEST
FIELD DATA SHEET

TEST: 2	RUN: 4
Page 1 of 1	

TEST IDENTIFICATION	EQUIPMENT IDENTIFICATION	NOMOGRAPH PARAMETERS
MMT Job Number: 9531	Control Unit No.: 5	ΔH@ 1
Date: Wed 2.16.94	Gas Meter Coefficient: .967	TM 48
Company: Lousiana Pacific Corp.	Sample Box No.: 5	MC 23
Source: Line #1 Dryer Outlet	Probe No.: 103 Length: 103"	Ps/Pm ≤ 1
Source Dimensions: (" Ø dia. 81.5	Pitot No.: 96 Coefficient: B=.830	C = .967
Test Team: AT - BA - TE	Nozzle No.: 58 Diameter: .275	Ts 340
Test Procedure: EPA 1-5 per WI MS	Filter No.: 5855	R

Ambient Temp., °F: 30 | Barometric Pressure, in.Hg: 28.50 | Static Pressure, in.WC: -.48

($\bar{x}$ -.5) -.52

CLOCK TIME hours	TRAVERSE POINT NUMBER	SAMPLE TIME min.	SAMPLE VOLUME cu.ft.	VELOCITY HEAD in.WC	ORIFICE ΔH, in.WC REQ.	ORIFICE ΔH, in.WC ACT.	PUMP VAC. inHG	TEMPERATURE, DEG F STACK GAS	GAS METER IN	GAS METER OUT	OVEN	PROBE	LAST IMP.
1300	1	0	648.163	.67	.98	.98	4	342	37	40	241	259	4
1305	2	5	650	.70	1.03	1.03	4	343	39	40	248	260	4
1310	3	10	653	.70	1.03	1.03	4	344	45	39	251	255	44
1315	4	15	657	.71	1.04	1.04	4	344	46	39	250	259	4
1320	5	20	662.5	.69	1.01	1.01	4	341	47	39	252	261	4
1325	6	25	663	.70	1.03	1.03	4	345	41	39	255	260	48
1330	End	30	666										
1337	1	30	X	.74	1.09	1.09	4	346	43	41	251	262	4
1342	2	35	669	.80	1.18	1.18	4	348	46	41	252	261	50
1347	3	40	672.4	.78	1.15	1.15	4	345	48	41	251	260	51
1352	4	45	675.7	.68	.99	.99	4	336	50	41	250	257	5
1357	5	50	678.3	.66	.97	.97	4	338	52	41	248	249	5
1402	6	55	681.1	.63	.93	.93	4	346	49	43	249	252	51
1407	End	60	684.749										

666.3
684.20

36.086 dcf

15 % MC - R1 ≈ 92
20 % MC
20 % MC

MOISTURE DETERMINATION					
IMPINGER	1	2	3	4	5
Final					X
Initial	100	100	0	776.7	X
Difference					X
Total Moisture Collected: 198.8					

SYSTEM LEAK CHECKS		
Time	Rate (cfm)	Vac. (in.Hg)
1250	.001	21
1413	.005	18

Impinger Catch Description:

DETERMINATION OF GAS COMPOSITION BY ORSAT ANALYSIS

Sample Id: 2-1 ✓	Replicate 1 Buret Reading	Replicate 1 Percent Volume	Replicate 2 Buret Reading	Replicate 2 Percent Volume	Replicate 3 Buret Reading	Replicate 3 Percent Volume	Average Compound	Average Percent Volume
Initial Reading		X		X		X	X	X
Carbon Dioxide							CO_2	3.18
Oxygen							O_2	15.42
Carbon Monoxide							CO	

Total Sampling Time, min.: 60
Volume of Gas Sampled, DCF:

FORM: S-FD-5

SOURCE EMISSION TEST
FIELD DATA SHEET

TEST: 2	RUN: 2
Page 1 of 1	

TEST IDENTIFICATION	EQUIPMENT IDENTIFICATION	NOMOGRAPH PARAMETER
MMT Job Number: 9531	Control Unit No.: 5	ΔH@ 1.78
Date: Wed 2.16.94	Gas Meter Coefficient: .967	TM 46
Company: Louisiana Pacific Corp.	Sample Box No.: 5	MC 23
Source: Line #1 Dryer Outlet	Probe No.: 103 Length: 103"	PS/PM = 1.0
Source Dimensions: 82" ⌀ dia.	Pitot No.: 96 Coefficient: B = .830	C = .967
Test Team: AT - BA - TE	Nozzle No.: 58 Diameter: .245	TS 341
Test Procedure: EPA 1-5 per WI MS	Filter No.: 5852	R
Ambient Temp., °F: 32	Barometric Pressure, in.Hg: 28.70	Static Pressure, in.WC: -.65

-X = -.60) -.5

CLOCK TIME hours	TRAVERSE POINT NUMBER	SAMPLE TIME min.	SAMPLE VOLUME cu.ft.	VELOCITY HEAD in.WC	ORIFICE ΔH, in.WC REQ.	ORIFICE ΔH, in.WC ACT.	PUMP VAC. inHG	TEMPERATURE, DEG F STACK GAS	GAS METER IN	GAS METER OUT	OVEN	PROBE	LAST IMP.
1500	1	0	686.301	.79	1.17	1.17	4	341	44	44	249	262	48
1506	2	5	689.6	.87	1.28	1.28	4	336	48	44	256	259	47
1510	3	10	692.9	.84	1.24	1.24	4	357	52	45	251	262	49
1515	4	15	696.0	.75	1.11	1.11	4	332	53	45	257	261	50
1520	5	20	699.0	.72	1.06	1.06	4	346	53	45	261	260	51
1525	6	25	701.9	.64	.94	.94	4	345	55	46	249	255	52
1530	End	30	704.8										
1537	1	30	X	.72	1.06	1.06	4	332	49	46	258	257	48
1542	2	35	707.9	.77	1.14	1.14	4	350	51	46	262	251	48
1547	3	40	711.1	.81	1.19	1.19	4	337	51	46	264	258	47
1552	4	45	714.2	.76	1.12	1.12	4	358	53	46	20	249	48
1557	5	50	~~[illegible]~~	.76	1.12	1.12	4	348	54	46	265	254	48
1602	6	55	720.4	.80	1.18	1.18	4	345	55	47	256	252	48
1607	End	60	723.602										

22 + 20% MC = 42 ÷ 60 = .7

57.30 1 dd

MOISTURE DETERMINATION					
IMPINGER	1	2	3	4	5
Final					
Initial	100	100	0	738.2	
Difference					
Total Moisture Collected: 221.9					

SYSTEM LEAK CHECKS		
Time	Rate (cfm)	Vac. (in.Hg)
1449	.014	21
1614	.015	22

Impinger Catch Description:

DETERMINATION OF GAS COMPOSITION BY ORSAT ANALYSIS								
Sample Id:	Replicate 1		Replicate 2		Replicate 3		Average	
2-2	Buret Reading	Percent Volume	Buret Reading	Percent Volume	Buret Reading	Percent Volume	Compound	Percent Volume
Initial Reading								
Carbon Dioxide							CO_2	4.30
Oxygen							O_2	13.10
Carbon Monoxide							CO	

Total Sampling Time, min.: 60

FORM: S-FD-5

Volume of Gas Sampled, DCF: _____

SOURCE EMISSION TEST
FIELD DATA SHEET

TEST: 2 | RUN:
Page 1 of 1

TEST IDENTIFICATION	EQUIPMENT IDENTIFICATION	NOMOGRA PARAMET
MMT Job Number: 9531	Control Unit No.: 5	ΔH@
Date: Wed 2.16.94	Gas Meter Coefficient: .967	TM 4
Company: Louisiana Pacific Corp.	Sample Box No.: 5	MC 23
Source: Line #1 Dryer Outlet	Probe No.: 103 Length: 103"	PS/PM = 1.0
Source Dimensions: 82" ø dia.	Pitot No.: 96 Coefficient: B = .830	C = .967
Test Team: AT - BA - TG	Nozzle No.: 5S Diameter: .245 " ø	TS 4/5
Test Procedure: EPA 1-5 per WI MS	Filter No.: 8554	R
Ambient Temp., °F: 32	Barometric Pressure, in.Hg: 28.71 42	Static Pressure, in.WC: -.58 -.6

CLOCK TIME hours	TRAVERSE POINT NUMBER	SAMPLE TIME min.	SAMPLE VOLUME cu.ft.	VELOCITY HEAD in.WC	ORIFICE ΔH, in.WC REQ.	ORIFICE ΔH, in.WC ACT.	PUMP VAC. inHG	TEMPERATURE, DEG F STACK GAS	GAS METER IN	GAS METER OUT	OVEN	PROBE	LAST IN
1715	1 South	0	724.533	.77	1.13	1.13	5	342	45	45	229	267	4
1720	2 West	5	727.5	.81	1.21	1.21	5	338	47	43	232	261	42
1725	3	10	730.8	.80	1.18	1.18	5	352	48	48	239	258	44
1730	4	15	733.8	.78	1.15	1.15	5	347	48	43	255	260	4
1735	5	20	737.7	.74	1.09	1.09	5	339	49	43	265	261	45
1740	6	25	740.1	.70	1.03	1.03	5	348	49	43	277	260	46
1745	End	30	743.2										2
1752	1	30	X	.87	1.28	1.30	6	354	43	42	270	261	4
1757	2	35	746.6	.88	1.29	1.30	6	347	47	43	349	257	46
1802	3 NW	40	749.8	.83	1.22	1.20	6	345	48	43	262	259	47
1807	4	45	753.2	.73	1.08	1.10	5	339	48	42	265	261	4
1812	5	50	756.2	.72	1.06	1.06	5	357	49	42	269	260	47
1817	6	55	759.1	.66	.97	.97	6	345	49	42	271	265	46
1822	End	60	762.009										
								X 346					
			37.47%										

MOISTURE DETERMINATION					
IMPINGER	1	2	3	4	5
Final					
Initial	100	100	0	723.1	
Difference					
Total Moisture Collected:	253.6				

SYSTEM LEAK CHECKS		
Time	Rate (cfm)	Vac. (in.Hg)
1642	.008	22
1828	.007	18

Impinger Catch Description:

DETERMINATION OF GAS COMPOSITION BY ORSAT ANALYSIS								
Sample Id:	Replicate 1		Replicate 2		Replicate 3		Average	
2-3	Buret Reading	Percent Volume	Buret Reading	Percent Volume	Buret Reading	Percent Volume	Compound	Percent Volume
Initial Reading								
Carbon Dioxide							CO2	9.3
Oxygen							O2	13.30
Carbon Monoxide							CO	

Total Sampling Time, min.: 60
Volume of Gas Sampled, DCF:

FORM: S-FD-5

APPENDIX B3: FIELD DATA FORMS

LINE #2 DRYER - RTO FLOW RATE TESTS

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SOURCE EMISSION TEST
SITE DESCRIPTION DATA SHEET

TRAVERSE POINT LOCATION		
Traverse Point Number	Port Length: 6" Inches From Wall	Inches From Port
1	1.4	7.4
2	4.4	10.4
3	7.8	13.8
4	11.7	17.8
5	16.5	22.5
6	23.4	29.4
7	42.6	48.6
8	49.5	54.5
9	54.3	60.3
10	55.2	64.2
11	61.6	67.6
12	64.6	70.6
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		

PRELIMINARY TRAVERSE DATA	
Effluent Temperature, °F:	
Ave. Velocity Pressure, IN WC:	

MMT Job Number: 9531 Date: 2/18/94

Company: Louisiana-Pacific

Address: Hayward, WI

Source: #2 Dryer RTO Inlet

Source Cross-sectional Dimensions

Round Duct; diameter: 66.0"

Rectangular Duct;

Length: —

Width: —

Equivalent diameter: —

$D_e = 2LW/(L+W)$

Distance to Nearest Flow Disturbance;

Before Ports: 24'8" = 4.48 diameters

After Ports: ≈76' = 13.82 diameters

Number of Sampling Points;

Required by EPA Method 1: 16

Actually Used: 24

Number of ports: 2

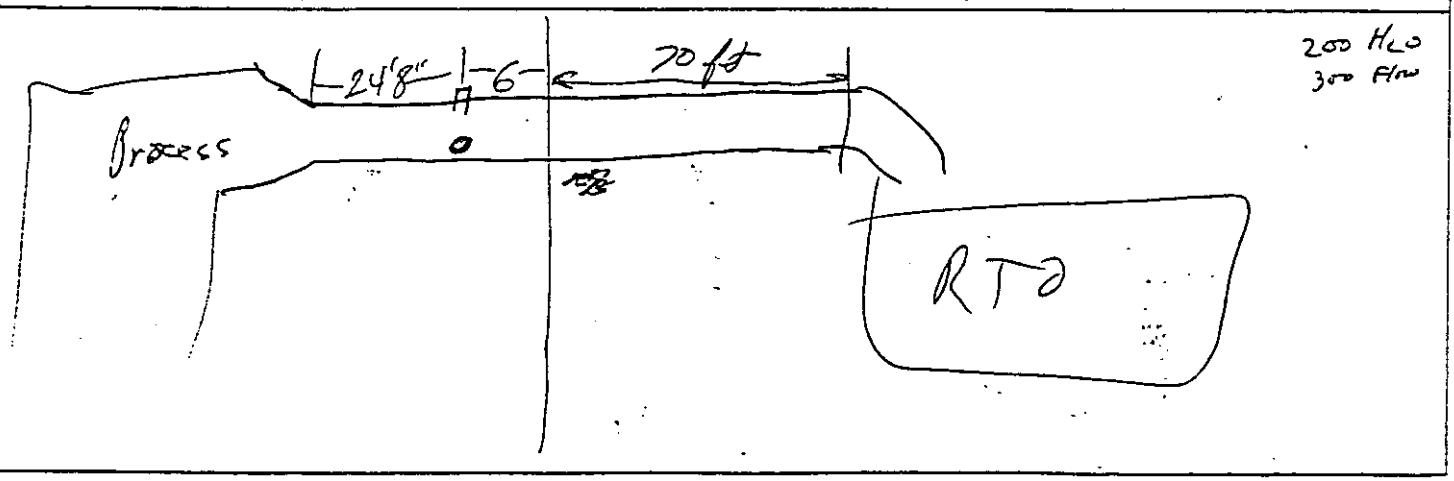
Points per port: 12

Sampling Time;

Minutes per Point: —

Minutes per Test Run: —

SITE SKETCH AND COMMENTS



FORM: S-FD-1c

EPA METHOD 2: VOLUMETRIC FLOW RATE DETERMINATION

Field Data Sheet

MMT Job Number: 9531 | Ambient Temperature, °F: -40

Date: 2/18/94 | Barometric Pressure, in. Hg.: 28.50

Company: Louisiana Pacific | Static Pressure, in. WC: -6.1

Source: Dryer #2 RTO Inlet (LINE #2) | Dry Bulb Temp., °F: 200 / 202 / 202

Dimensions, inches: 66.0" Ø | Wet Bulb Temp., °F: 153 / 148 / 149

Test Team Members: AT / BA | Relative Humidity, %: $\bar{x}$ = 150

Test No.: 3 Run No.: 1 | Moisture Content, %: 24.60

VELOCITY TRAVERSE: Time: 0845 – 0915 Pitot Tube No: 85" Coefficient: .838 = 3

Traverse Point Number	Inches From Wall	Inches From Port	PORT A side		PORT B bp		PORT C		PORT D	
			ΔP in. H2O	Temp. °F	ΔP in. H2O	Temp. °F	ΔP in. H2O	Temp. °F	ΔP in. H2O	Te ° p
1			1.25	200	1.15	204				
2			1.35	202	1.15	205				
3			1.35	203	1.15	205				
4			1.35	204	1.15	205				
5			1.30	204	1.10	205		107,890 acfm		
6			1.25	204	1.15	205		80,434 scf		
7			1.15	204	1.15	205				
8			1.25	204	1.20	205				
9			1.35	204	1.25	205				
10			1.50	204	1.20	205				
11			1.45	203	—	—				
12			1.20	202	—	—				
2*11										
$\bar{x}\sqrt{p}$ =	1.2455									
$\bar{x}\ T_s$ =	204									

started all the way in and backed out 2 further test ports could not get to because of top post of building roof

FORM: S-FD-2b

SOURCE EMISSION TEST
SITE DESCRIPTION DATA SHEET

TRAVERSE POINT LOCATION		
Traverse Point Number	Port Length: 6.0 Inches From Wall	Inches From Port
1	3.6	9.6
2	6.1	12.1
3	12.0	18.0
4	57.6	63.6
5	69.5	75.5
6	77.0	83.0
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		

PRELIMINARY TRAVERSE DATA	
Effluent Temperature, °F:	
Ave. Velocity Pressure, IN WC:	

MMT Job Number: 9531 Date: Feb 94

Company: Louisiana Pacific Corporatio

Address: Hayward, Wisconsin

Source: Line #2 R.T.O. Outlet

Source Cross-sectional Dimensions

Round Duct; diameter: 81.5" Ø

Rectangular Duct;

Length: — — —

Width: — — —

Equivalent diameter: — —

$D_e = 2LW/(L+W)$

Distance to Nearest Flow Disturbance;

Before Ports: 50' = 7.32 diameters

After Ports: 35' = 5.12 diameters

Number of Sampling Points;

Required by EPA Method 1: 12

Actually Used: 12

Number of ports: 2

Points per port: 6

Sampling Time;

Minutes per Point: — — —

Minutes per Test Run: — — —

SITE SKETCH AND COMMENTS

Oxidizer on ground at NW corner of Plant - Bldg Property

Stack Inner Diam 46 feet
6.8 diameters

FORM: S-FD-1c

EPA METHOD 2: VOLUMETRIC FLOW RATE DETERMINATION

Field Data Sheet

MMT Job Number: 9531 | Ambient Temperature, °F: ~~38~~ 40

Date: Friday 2.18.94 | Barometric Pressure, in. Hg.: ~~29.50~~ 28.7

Company: Louisiana Pacific Corp | Static Pressure, in. WC: -.57

Source: Line # 2 Divider Outlet | Wet Bulb Temp., °F: 165 / 164 x̄ = 16[illegible]

Dimensions, inches: 81.5" ø | Dry Bulb Temp., °F: x̄ = 321

Test Team Members: AT BA - TG | Relative Humidity, %:

Test No.: 0 Run No.: 1 | Moisture Content, %: 32.70

VELOCITY TRAVERSE: Time: ~~845~~-915 pm Pitot Tube No: 96" Coefficient: B = .8[illegible]

Traverse Point Number	Inches From Wall	Inches From Port	PORT A ΔP in. H2O	PORT A Temp. °F	PORT B ΔP in. H2O	PORT B Temp. °F	PORT C ΔP in. H2O	PORT C Temp. °F	PORT D ΔP in. H2O	PORT D Te °[illegible]
1	3.6	9.6	.61	.60	337	327				
2	6.1	12.1	.72	.65	336	328				
3	12.0	18.0	.68	.67	329	310				
4	57.6	63.6	.67	.70	310	304				
5	69.5	75.5	.72	.71	304	312				
6	77.0	83.0	.73	.73	320	337				
			SE	SW	SE	SW				
				actm		132,221				
				scfm		84,932				
						x̄ V_p = .6826				
3.40% CO_2										
			T_b =	Nat Gas						
15.30 % O_2										

FORM: S-FD-2b

APPENDIX B4: FIELD DATA FORMS

LINE #2 PRESS - RTO FLOW RATE TESTS

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SOURCE EMISSION TEST
SITE DESCRIPTION DATA SHEET

TRAVERSE POINT LOCATION		
Traverse Point Number	Port Length: 6 Inches From Wall	Inches From Port
1	1.1	7.1
2	3.6	9.6
3	6.3	12.6
4	9.5	15.5
5	13.4	19.4
6	19.0	25.0
7	34.5	40.5
8	40.1	46.1
9	44.0	50.0
10	47.2	53.2
11	49.9	55.9
12	52.4	58.4
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		

PRELIMINARY TRAVERSE DATA
Effluent Temperature, °F:
Ave. Velocity Pressure, IN WC:

MMT Job Number: 9531 Date: 2/18/94

Company: Louisiana-Pacific

Address: Hayward, WI

Source: #2 Press RTO Inlet

Source Cross-sectional Dimensions

Round Duct; diameter: 53½"

Rectangular Duct;

Length: —

Width: —

Equivalent diameter: —

$D_e = 2LW/(L+W)$

Distance to Nearest Flow Disturbance;

Before Ports: 25'0" = 5.61 diameters

After Ports: ≥ 38' = 8.52 diameters

Number of Sampling Points;

Required by EPA Method 1: 16

Actually Used: 24

Number of ports: 2

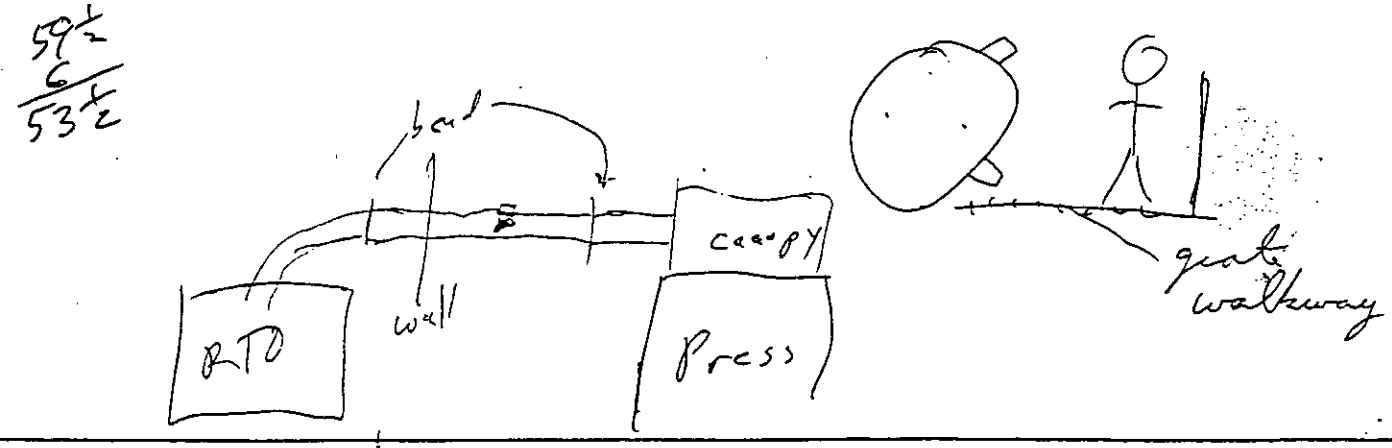
Points per port: 12

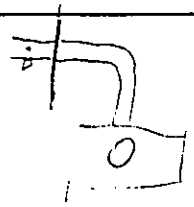
Sampling Time;

Minutes per Point: NA

Minutes per Test Run: NA

SITE SKETCH AND COMMENTS





FORM: S-FD-1c

EPA METHOD 2: VOLUMETRIC FLOW RATE DETERMINATION

Field Data Sheet

MMT Job Number: 9531 | Ambient Temperature, °F: 41

Date: 2/18/94 | Barometric Pressure, in. Hg.: 28.46

Company: Louisiana Pacific | Static Pressure, in. WC: -2.9

Source: Press #2 RTO Inlet | Dry Bulb Temp., °F: 107 / 107

Dimensions, inches: 53.5" Ø | Wet Bulb Temp., °F: 77 / 77

Test Team Members: AS / BA | Relative Humidity, %:

Test No.: 5 Run No.: 1 | Moisture Content, %: 2.24

VELOCITY TRAVERSE: Time: 1130 — 1200 Pitot Tube No: 85 Coefficient: B=.83

Traverse Point Number	Inches From Wall	Inches From Port	PORT A Top ΔP in. H2O	PORT A Top Temp. °F	PORT B Side ΔP in. H2O	PORT B Side Temp. °F	PORT C ΔP in. H2O	PORT C Temp. °F	PORT D ΔP in. H2O	PORT D Temp. °F
1			1.65	104	1.75	104				
2			2.10	102	1.70	104				
3			2.10	101	2.15	103				
4			2.15	101	2.10	105				
5			2.00	103	2.15	103				
6			2.00	105	1.90	102				
7			2.10	106	2.00	101				
8			1.95	105	2.15	100				
9			1.60	103	2.15	101				
10			1.50	101	1.90	100				
11			1.45	101	1.70	99				
12			1.20	100	1.35	99				
					T_s =	102				
					75962					
					67375					

FORM: S-FD-2b

SOURCE EMISSION TEST
SITE DESCRIPTION DATA SHEET

TRAVERSE POINT LOCATION	Port Length: 6	
Traverse Point Number	Inches From Wall	Inches From Port
1	3.4	9.4
2	11.2	17.2
3	22.4	29.4
4	53.6	59.6
5	64.8	70.8
6	72.6	80.6
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		

PRELIMINARY TRAVERSE DATA	
Effluent Temperature, °F:	
Ave. Velocity Pressure, IN WC:	

MMT Job Number: 9531 Date: Feb 94

Company: Louisiana Pacific Corp

Address: Hayward, WI

Source: ~~Kiln~~ Press #2 RTO Out

Source Cross-sectional Dimensions

Round Duct; diameter: 76" ø

Rectangular Duct;

Length: —

Width: —

Equivalent diameter: —

$D_e = 2LW/(L+W)$

Distance to Nearest Flow Disturbance;

Before Ports: _____ = _____ diameters

After Ports: _____ = _____ diameters

Number of Sampling Points;

Required by EPA Method 1: _____

Actually Used: 12

Number of ports: 2

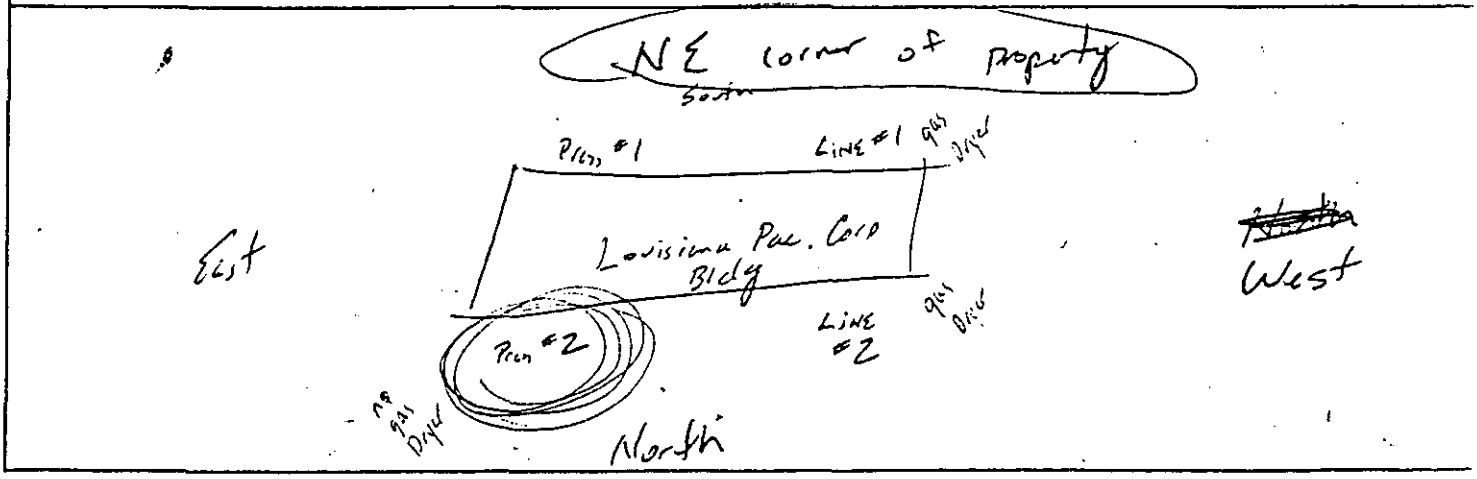
Points per port: 6

Sampling Time;

Minutes per Point: — —

Minutes per Test Run: — —

SITE SKETCH AND COMMENTS



FORM: S-FD-1c

EPA METHOD 2: VOLUMETRIC FLOW RATE DETERMINATION

Field Data Sheet

MMT Job Number: 9531 Ambient Temperature, °F: 41

Date: Fri 2.18.94 Barometric Pressure, in. Hg.: 28.46

Company: Louisiana Pacific Static Pressure, in. WC: -.38 -.33 x̄ = -.35

Source: Dress #2 Outfall Dry Bulb Temp., °F: x̄ = 222

Dimensions, inches: 76" ⌀ Wet Bulb Temp., °F: 105 / 112 x̄ = 108.5

Test Team Members: AT BA TG Relative Humidity, %:

Test No.: 0 Run No.: 1 Moisture Content, %: 5.16

VELOCITY TRAVERSE: Time: 1130 - Noon Pitot Tube No: 96 Coefficient: B = .83

Traverse Point Number	Inches From Wall	Inches From Port	PORT A ΔP in. H2O	PORT A Temp. °F	PORT B ΔP in. H2O	PORT B Temp. °F	PORT C ΔP in. H2O	PORT C Temp. °F	PORT D ΔP in. H2O	PORT D T
1	3.4	9.4		.56	228		.58	217		
2	11.2	17.2		.64	226		.63	219		
3	22.4	28.4		.65	221		.67	222		
4	53.6	59.6		.68	221		.70	219		
5	64.8	70.8		.83	216		.76	223		
6	72.6	80.6		.70	228		.61	229		
				NW	NW		NE	NE		
					100, 194 after					
					73 713 after					

FORM: S-FD-2b

APPENDIX C: LABORATORY REPORTS

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SUMMARY OF PARTICULATE EMISSION TEST LABORATORY DATA

PROJECT NUMBER: 9531
TEST NUMBER: 1

COMPANY: LOUISIANA PACIFIC CORP.
SOURCE: LINE # 1 INLET

	MASS OF PARTICULATE MATTER COLLECTED, GRAMS						
	FRONT CATCH				BACK CATCH		
RUN NUMBER	FRONT WASH	CYCLONE CATCH	FILTER CATCH	FRONT TOTAL	IMPINGER CATCH **	IMPINGER WASH	BACK TOTAL
1	0.0198	0.0000	0.0822	0.1020	0.0310	0.0705	0.1015
2	0.0105	0.0000	0.0920	0.1025	0.0276	0.0609	0.1085
3	0.0095	0.0000	0.0996	0.1091	0.0384	0.0465	0.0849

* NOT APPLICABLE

** CHLOROFORM/ETHYL ETHE

LABORATORY REPORT: EPA Method 5

Project Number: 9531 Company: Louisiana Pacific - Hayward, WI (INLET)

Frontwashes

Test-Run	1-1	1-2	1-3	Date
Dish #	1068	1072	1076	- - - - -
1	0.3204	0.2852	0.2837	3-24-94
2	0.3207	0.2853	0.2836	3-28-94
3	0.3205	0.2852	0.2838	3-3-94
Tare	0.3003	0.2744	0.2739	8-3-93
Blank	0.0003	0.0003	0.0003	- - - - -
Net	0.0198	0.0105	0.0095	- - - - -

Solvent Blanks

Solvents	Acetone	MeCl	Ether	H_2O
Dish #	1064	1065	1066	1067
1	0.2917	0.2957	0.3061	0.2992
2	0.2917	0.2956	0.3062	0.2992
3	0.2917	0.2956	0.3062	0.2992
Tare	0.2914	0.2955	0.3057	0.2990
Net	0.0003	0.0001	0.0004	0.0002

Backwashes

Test-Run	1-1	1-2	1-3	Date
Dish #	1069	1073	1077	- - - - -
1	0.3127	0.3268	0.2888	3-24-94
2	0.3124	0.3270	0.2887	3-28-94
3	0.3125	0.3269	0.2889	3-3-94
Tare	0.3053	0.3202	0.2818	8-3-93
Blank	0.0003	0.0003	0.0003	- - - - -
Net	0.0069	0.0063	0.0066	- - - - -

Glass Filters

Test-Run	1-1	1-2	1-3	Date
Filter #	8853	8855	8845	- - - - -
1	0.5830	0.6080	0.6135	3-24-94
2	0.5879	0.6078	0.6134	3-28-94
3	0.5878	0.6079	0.6136	3-3-94
Tare	0.5056	0.5158	0.5138	1-18-94
Net	0.0822	0.0920	0.0996	- - - - -

Extractions

Test-Run	1-1	1-2	1-3	Date
Dish #	1070	1074	1078	- - - - -
1	0.3134	0.3445	0.3323	3-24-94
2	0.3132	0.3445	0.3322	3-28-94
3	0.3132	0.3443	0.3321	3-3-94
Tare	0.2817	0.3162	0.2932	8-3-94
Blank	0.0005	0.0005	0.0005	- - - - -
Net	0.0310	0.0276	0.0384	- - - - -

Impinger Liquid

Test-Run	1-1	1-2	1-3	Date
Dish #	1071	1075	1079	- - - - -
1	0.3499	0.3765	0.3217	3-24-94
2	0.3498	0.3763	0.3217	3-28-94
3	0.3497	0.3764	0.3215	3-3-94
Tare	0.2859	0.3015	0.2814	8-3-94
Blank	0.0002	0.0002	0.0002	- - - - -
Net	0.0636	0.0746	0.0399	- - - - -

Signature Bill Olson Date 3-3-94

PROJECT # 9531 COMPANY Louisiana Pacific Corporati
TEST DATE(s) 2.16.94 SOURCE Line II RTO Inle
Dryer

EPA METHOD 4 LABORATORY REPORT

Filter #	TEST-RUN #	IMPINGER #	INITIAL	FINAL	GAIN	DESCRIPTION
8853	1-1	1	100	203	103	
		2	100	172	72	
		3	0	10	10	Yellow
		4	738.5	752.8	14.3	
		5				
		TOTAL MOISTURE GAIN, ML =			199.3	
8855	1-2	1	100	221	121	
		2	100	147	47	
		3	0	25	25	Yellow
		4	717.4	736.9	19.5	
		5				
		TOTAL MOISTURE GAIN, ML =			212.5	
8845	1-3	1	100	184	84	
		2	100	203	103	
		3	0	26	26	Yellow
		4	752.2	773.5	21.3	
		5				
		TOTAL MOISTURE GAIN, ML =			234.3	

SUMMARY OF PARTICULATE EMISSION TEST LABORATORY DATA

PROJECT NUMBER: 9531 COMPANY: LOUISIANA PACIFIC CORP.
TEST NUMBER: 2 SOURCE: LINE # 1 OUTLET

	MASS OF PARTICULATE MATTER COLLECTED, GRAMS							
	FRONT CATCH				BACK CATCH			TOTAL PARTICUL
RUN NUMBER	FRONT WASH	CYCLONE CATCH	FILTER CATCH	FRONT TOTAL	IMPINGER CATCH **	IMPINGER WASH	BACK TOTAL	M COL S CT
1	0.0064	0.0000	0.0107	0.0171	0.0023	0.0060	0.0083	0 025
2	0.0090	0.0000	0.0104	0.0194	0.0029	0.0110	0.0139	0 33
3	0.0014	0.0000	0.0089	0.0103	0.0011	0.0082	0.0093	0.019

• NOT APPLICABLE

** CHLOROFORM/ETHYL ETHER EXTRACT

LABORATORY REPORT: EPA Method 5

Project Number: 0531 Company: Louisiana Pacific - Hayward, WI (OUTLET)

Frontwashes

Test-Run	1-1	1-2	1-3	Date
Dish #	1080	1084	1088	- - - - -
1	2.3025	2.3120	2.2740	2-24-94
2	2.3027	2.3119	2.2738	2-28-94
3	2.3025	2.3119	2.2738	3-2-94
Tare	2.2958	2.3026	2.2721	8-2-93
Blank	0.0003	0.0003	0.0003	- - - - -
Net	0.0064	0.0090	0.0014	- - - - -

Solvent Blanks

Solvents	Acetone	MeCl	Ether	H_2O
Dish #				
1				
2				
3				
Tare				
Net				

- SEE INLET LABORATORY REPORT

Backwashes

Test-Run	1-1	1-2	1-3	Date
Dish #	1081	1085	1089	- - - - -
1	2.2944	2.3075	2.2971	2-24-94
2	2.2942	2.3074	2.2973	2-28-94
3	2.2943	2.3075	2.2973	3-2-94
Tare	2.2921	2.3005	2.2943	8-2-93
Blank	0.0003	0.0003	0.0003	- - - - -
Net	0.0018	0.0066	0.0025	- - - - -

Glass Filters

Test-Run	1-1	1-2	1-3	Date
Filter #	8851	8852	8854	- - - - -
1	0.5224	0.5180	0.5197	2-24-94
2	0.5220	0.5179	0.5195	2-28-94
3	0.5222	0.5181	0.5195	3-2-94
Tare	0.5113	0.5075	0.5106	8-2-93
Net	0.0107	0.0104	0.0089	- - - - -

Extractions

Test-Run	1-1	1-2	1-3	Date
Dish #	1083	1086	1090	- - - - -
1	2.3175	2.2848	2.2938	2-24-94
2	2.3174	2.2850	2.2937	2-28-94
3	2.3176	2.2850	2.2939	3-2-94
Tare	2.3146	2.2814	2.2921	8-2-93
Blank	0.0005	0.0005	0.0005	- - - - -
Net	0.0023	0.0029	0.0011	- - - - -

Impinger Liquid

Test-Run	1-1	1-2	1-3	Date
Dish #	1083	1087	1091	- - - - -
1	2.3009	2.3025	2.2949	2-24-94
2	2.3007	2.3027	2.2949	2-28-94
3	2.3008	2.3026	2.2948	3-2-94
Tare	2.2963	2.2979	2.2889	8-2-93
Blank	0.0002	0.0002	0.0002	- - - - -
Net	0.0042	0.0044	0.0057	- - - - -

Signature Bill Anderson Date 3-2-94

PROJECT # 9531 COMPANY Louisiana Pacific Corporation
TEST DATE(s) 2.16.94 SOURCE Line # 4 Dryer RTO ~~Inlet~~ Outlet

EPA METHOD 4 LABORATORY REPORT

Filter #

TEST-RUN #	IMPINGER #	INITIAL	FINAL	GAIN	DESCRIPTION
8851 2-1	1	100	335	235	
	2	100	58	(-42)	
	3	0	0	0	clear
	4	776.7	782.5	5.8	
	5				
	TOTAL MOISTURE GAIN, ML =			198.8	
8852 2-2	1	100	305	205	
	2	100	110	10	
	3	0	0	0	clear
	4	738.2	745.1	6.9	
	5				
	TOTAL MOISTURE GAIN, ML =			221.9	
8854 2-3	1	100	337	237	
	2	100	109	9	
	3	0	0	0	clear
	4	723.1	730.7	7.6	
	5				
	TOTAL MOISTURE GAIN, ML =			253.6	

21.0 % Moisture

22.4 % Moisture

Fuel type	F_o range
Coal:	
Anthracite and lignite	1.016–1.130
Bituminous	1.083–1.230
Oil:	
Distillate	1.260–1.413
Residual	1.210–1.370
Gas:	
Natural	1.600–1.836
Propane	1.434–1.586
Butane	1.405–1.553
Wood	1.000–1.120
Wood bark	1.003–1.130

ORSAT ANALYSIS

Job Number: 9531 Company: Lousiana Pacific Corporation

SAMPLE DESCRIPTION: R.T.O. Inlet Line # 1 Dryer

Sample Id	Parameter Measured	Replicate 1 Buret Reading	Replicate 1 Percent Volume	Replicate 2 Buret Reading	Replicate 2 Percent Volume	Replicate 3 Buret Reading	Replicate 3 Percent Volume	Averages
1-1	Initial Reading	0.0	/	0.0	/	0.0	/	
Collected By: BA	Carbon Dioxide	3.2	3.2	3.2	3.2	3.20	3.20	3.20
Date Collected: 2.16.94	Oxygen	18.4	15.2	18.4	15.2	18.4	15.2	15.20
Analyzed By: TG							F_o =	1.78
Date Analyzed: 2.16.94								
1-2	Initial Reading	0.0	/	0.0	/	0.0	/	
Collected By: BA	Carbon Dioxide	3.5	3.5	3.5	3.50	3.5	3.5	3.5
Date Collected: 2.16.94	Oxygen	18.65	15.15	18.65	15.15	18.65	15.15	15.15
Analyzed By: TG							F_o =	1.64
Date Analyzed: 2.16.94								
1-3	Initial Reading	0.0	/	0.0	/	0.0	/	
Collected By: BA	Carbon Dioxide	3.42	3.42	3.40	3.40	3.44	3.44	3.42
Dated Collected: 2.16.94	Oxygen	18.52	15.10	18.55	15.15	18.49	15.05	15.10
Analyzed By: TG							F_o =	1.70
Date Analyzed: 2.16.94								

87

Fuel = Nat. gas

ORSAT ANALYSIS

Job Number: 9531 Company: LPC HES

Fuel type	F_o range
Coal:	
Anthracite and lignite	1.018–1.130
Bituminous	1.083–1.230
Oil:	
Distillate	1.260–1.413
Residual	1.210–1.370
Gas:	
Natural	1.600–1.836
Propane	1.434–1.586
Butane	1.405–1.553
Wood	1.000–1.120
Wood bark	1.003–1.130

SAMPLE DESCRIPTION		SAMPLE ANALYSIS						
		Replicate 1		Replicate 2		Replicate 3		
	Parameter Measured	Buret Reading	Percent Volume	Buret Reading	Percent Volume	Buret Reading	Percent Volume	
RTO Outlet Line #1								Average
Sample Id: 2-1								
Collected By: TG	Initial Reading	0.0	/	0.0	/	0.0	/	
Date Collected: 2.16.94	Carbon Dioxide	3.18	3.18	3.20	3.20	3.16	3.16	3.18
Analyzed By: TG	Oxygen	18.60	15.42	18.60	15.4	18.62	15.44	15.42
Date Analyzed: 2.16.94	Carbon Monoxide							F_o = 1.72
Sample Id: 2-2								
Collected By: TG	Initial Reading	0.0	/	0.0	/	0.0	/	
Date Collected: 2.16.94	Carbon Dioxide	4.3	4.3	4.3	4.3	4.3	4.3	4.30
Analyzed By: TG	Oxygen	17.4	13.1	17.4	13.1	17.4	13.1	13.10
Date Analyzed: 2.16.94	Carbon Monoxide							F_o = 1.81
Sample Id: 2-3								
Collected By: TG	Initial Reading	0.0	/	0.0	/	0.0	/	
Dated Collected: 2.16.94	Carbon Dioxide	4.3	4.3	4.3	4.3	4.3	4.3	4.30
Analyzed By: TG	Oxygen	17.6	13.3	17.6	13.3	17.6	13.3	13.30
Date Analyzed: 2.16.94	Carbon Monoxide							F_o = 1.77

88

FORM S-1.B-3

Fuel by:	F_o range
Coal:	
Anthracite and lignite	1.016–1.130
Bituminous	1.083–1.230
Oil:	
Distillate	1.260–1.413
Residual	1.210–1.370
Gas:	
Natural	1.600–1.836
Propane	1.434–1.586
Butane	1.405–1.553
Wood	1.000–1.120
Wood bark	1.003–1.130

ORSAT ANALYSIS

Job Number: 9531 Company: Louisiana Pacific Corp

SAMPLE DESCRIPTION	Parameter Measured	SAMPLE ANALYSIS Replicate 1 Buret Reading	Replicate 1 Percent Volume	Replicate 2 Buret Reading	Replicate 2 Percent Volume	Replicate 3 Buret Reading	Replicate 3 Percent Volume	Average
Line #2								
Sample Id: Line #2 outlet	Initial Reading	0.0	/	0.0	/	0.0	/	
Collected By: 2.18.94	Carbon Dioxide	3.4	3.4	3.4	3.4	3.4	3.4	3.40
Date Collected: TG	Oxygen	18.7	15.3	18.7	15.3	18.7	15.3	15.30
Analyzed By: TG	Carbon Monoxide							
Date Analyzed: 2.18.94								F_o = 1.65
Sample Id: Line #2 Inlet	Initial Reading	0.0	/	0.0	/	0.0	/	
Collected By: TG	Carbon Dioxide	3.2	3.20	3.2	3.2	3.2	3.2	3.20
Date Collected: 2.18.94	Oxygen	18.4	15.20	18.4	15.2	18.4	15.2	15.20
Analyzed By: TG	Carbon Monoxide							
Date Analyzed: 2.18.94								F_o = 1.78
Sample Id:	Initial Reading	0.0	/	0.0	/	0.0	/	
Collected By: TG	Carbon Dioxide							
Dated Collected: 2.18.94	Oxygen							
Analyzed By: TG	Carbon Monoxide							
Date Analyzed: 2.18.94								F_o =

68

FOR: [illegible]

Fuel type	F$_o$ range
Coal:	
Anthracite and lignite	1.016–1.130
Bituminous	1.083–1.230
Oil:	
Distillate	1.260–1.413
Residual	1.210–1.370
Gas:	
Natural	1.600–1.836
Propane	1.434–1.586
Butane	1.405–1.553
Wood	1.000–1.120
Wood bark	1.003–1.130

ORSAT ANALYSIS

Job Number: 9531 Company: Louisiana Pacific Corp

SAMPLE DESCRIPTION	Parameter Measured	Replicate 1 Buret Reading	Replicate 1 Percent Volume	Replicate 2 Buret Reading	Replicate 2 Percent Volume	Replicate 3 Buret Reading	Replicate 3 Percent Volume	Averages
Line #2 Inlet ↓								
Sample Id: Line #2 Inlet								
Collected By: BA	Initial Reading	0.0	✓	0.0	✓	0.0	✓	
Date Collected: 2.18.94	Carbon Dioxide	3.40	3.40	3.40	3.40	3.4	3.4	3.40
Analyzed By: TG	Oxygen	18.60	15.20	18.60	15.20	18.60	15.20	15.20
Date Analyzed: 2.18.94	Carbon Monoxide						F_o =	1.68
Sample Id: Press #2 Inlet								
Collected By: BA	Initial Reading	0.0	✓	0.0	✓	0.0	✓	
Date Collected: 2.18.94	Carbon Dioxide	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Analyzed By: TG	Oxygen	20.9	20.9	20.9	20.9	20.9	20.9	20.9
Date Analyzed: 2.18.94	Carbon Monoxide						F_o =	X
Sample Id: Press #2 Outlet								
Collected By: TG	Initial Reading	0.0	✓	0.0	✓	0.0	✓	
Dated Collected: 2.18.94	Carbon Dioxide	3.40	3.40	3.4	3.40	3.40	3.40	3.40
Analyzed By: TG	Oxygen	18.70	15.3	18.7	15.30	18.7	15.30	15.30
Date Analyzed: 2.18.94	Carbon Monoxide						F_o =	X

FORM S-LB-3

SPECTRUM LABS INC
301 West County Road E2 • St. Paul, MN 55112
(612) 633-0101 • FAX (612) 633-1402

RECEIVED MAR 2 1 1994

LABORATORY ANALYSIS REPORT

DATE: *March 17, 1994*

PAGE: *1 Of 2*

CLIENT: *MMT Environmental*
4610 N. Churchill St.
St.Paul, MN 55126

PROJECT NO.: *030294-200611*
COLLECTION DATE: *unidentified*
COLLECTED BY: *Client*
RECEIVED DATE: *3/02/94*

CONTACT: *Al Towbridge*

	Sample No.:		9403006954	
	Sample ID.:		1-1 Inlet	ANALYSIS
ANALYSIS	UNITS	MDL	RESULTS	DATE
EPA 6010				
Calcium	ug	50	1850	3/08/94
Magnesium	ug	50	350	3/08/94
Sodium	ug	50	11000	3/08/94
Potassium	ug	50	10000	3/08/94
Sulfur	ug	10	1050	3/14/94

	Sample No.:		9403006955	
	Sample ID.:		1-2 Inlet	ANALYSIS
ANALYSIS	UNITS	MDL	RESULTS	DATE
EPA 6010				
Calcium	ug	50	1850	3/08/94
Magnesium	ug	50	350	3/08/94
Sodium	ug	50	10500	3/08/94
Potassium	ug	50	10500	3/08/94
Sulfur	ug	10	750	3/14/94

	Sample No.:		9403006956	
	Sample ID.:		1-3 Inlet	ANALYSIS
ANALYSIS	UNITS	MDL	RESULTS	DATE
EPA 6010				
Calcium	ug	50	2700	3/08/94
Magnesium	ug	50	350	3/08/94
Sodium	ug	50	10000	3/08/94
Potassium	ug	50	9500	3/08/94
Sulfur	ug	10	1000	3/14/94

ND means Not Detected
MDL means Method Detection Limit
ug means Micrograms

SPECTRUM LABS INC
301 West County Road E2 • St. Paul, MN 55112
(612) 633-0101 • FAX (612) 633-1402

LABORATORY ANALYSIS REPORT

DATE:	*March 17, 1994*	*PAGE:*	*2 Of 2*
CLIENT:	*MMT Environmental* *4610 N. Churchill St.* *St.Paul, MN 55126*	*PROJECT NO.:* *COLLECTION DATE:* *COLLECTED BY:* *RECEIVED DATE:*	*030294-200611* *unidentified* *Client* *3/02/94*
CONTACT:	*Al Towbridge*		

This report has been reviewed by me for technical accuracy and completeness. The analyses were performed using EPA or other approved methodologies and the results were reported on an "as received" basis unless otherwise noted. Please contact me if you have any questions or comments regarding this report. Spectrum Labs, Inc. appreciates the opportunity to provide this analytical service for you.

Report Submitted By,

Thomas L. Halverson
Laboratory Manager

TLH:wmh
mmt076-1

APPENDIX D: CALIBRATION DATA

Friday

CALIBRATION
DRY TEST METER/ORIFICE METER

Date: 2.4.94

Barometric Pressure, in. Hg. (Pb): 28.61

EQUIPMENT IDENTIFICATION			
Control Unit 4	Dry Test Meter	Wet Test Meter	Calibration Type
Mfg: Andersen	Mfg: rockwell	Mfg: GCA Corporation	General: x
Model: Universal	Model: S-175	Model: Precision	Post-test: x
SN: 591-544	SN: 83	SN: 11 AH 12	

EQUIPMENT CALIBRATION

Orifice Pressure Drop in. WC H	Pump Vac. in.Hg	Wet Test Meter Volume, CF Initial V_{wi}	Wet Test Meter Volume, CF Final V_{wf}	Wet Test Meter Temp. °F T_w	Dry Test Meter Volume, CF Initial V_{di}	Dry Test Meter Volume, CF Final V_{df}	Dry Test Meter Temperature, °F Inlet Initial T_{ii}	Dry Test Meter Temperature, °F Inlet Final T_{if}	Dry Test Meter Temperature, °F Outlet Initial T_{oi}	Dry Test Meter Temperature, °F Outlet Final T_{of}	Elapsed Time, min. Q
0.5	0	ZERO	3.743	71	655.631	659.271	67	67	69	72	9
1.0	0	3.743	7.212	71	659.271	662.673	72	69	78	70	6
2.0	0	7.212	12.039	71	662.673	667.395	77	70	84	71	6
3.0	0	12.039	23.727	71	667.395	678.810	71	83	92	74	12

COMPUTER PRINTOUT

Inlet Gasok

Pre-test

H	Vw	Tw	Vd	Td	Q	C	Ha
0.5	3.743	71	3.640	68.8	9.0	1.0226	1.7060
1.0	3.469	71	3.402	72.3	6.0	1.0195	1.7559
2.0	4.827	71	4.722	75.5	6.0	1.0256	1.8028
3.0	11.688	71	11.415	80.0	12.0	1.0333	1.8295

AVERAGE CORRECTION FACTOR: C = 1.0253
AVERAGE ORIFICE CONSTANT: Ha = 1.7741

EQUATIONS:

$Vw = Vwf - Vwi$

$Vd = Vdf - Vdi$

$Td = (Tii + Tif + Toi + Tof) / 4$

$C = Vw * Pb * (Td+460) / (Vd * (Pb+H/13.6) * (Tw+460))$

$Ha = 0.0317 * H * ((Tw+460)*Q/Vw)^2 / (Pb * (Td+460))$

Calibrated by: Ted Gibbons

95 (Print) Ted Gibbons

CALIBRATION
DRY TEST METER/ORIFICE METER

Date: Friday 2-25-94 Barometric Pressure, in. Hg. (Pb): 28.52

EQUIPMENT IDENTIFICATION			
Control Unit 4	Dry Test Meter	Wet Test Meter	Calibration Type
Mfg: Andersen	Mfg: rockwell	Mfg: GCA Corporation	General: x
Model: Universal	Model: S-175	Model: Precision	Post-test: x
SN: 591-544	SN: 83	SN: 11 AH 12	

EQUIPMENT CALIBRATION

Orifice Pressure Drop in. WC H	Pump Vac. in.Hg	Wet Test Meter Volume, CF Initial V_{wi}	Wet Test Meter Volume, CF Final V_{wf}	Wet Test Meter Temp. °F T_w	Dry Test Meter Volume, CF Initial V_{di}	Dry Test Meter Volume, CF Final V_{df}	Dry Test Meter Temperature, °F Inlet Initial T_{ii}	Dry Test Meter Temperature, °F Inlet Final T_{if}	Dry Test Meter Temperature, °F Outlet Initial T_{oi}	Dry Test Meter Temperature, °F Outlet Final T_{of}	Elaps Time min. Q
0.5	0	ZERO	3.404	72	783.736	787.035	66	66	71	67	8
1.0	0	3.404	9.226	72	787.035	792.707	67	70	79	69	10
2.0	0	9.226	17.278	72	792.707	800.587	76	69	70	85	10
3.0	0	17.278	25.116	72	800.587	808.207	82	70	71	89	8

COMPUTER PRINTOUT

Inlet Console

Post-Test

H	V_w	T_w	V_d	T_d	Q	C	Ha
0.5	3.404	72	3.269	67.5	0.0	1.0312	1.6470
1.0	5.822	72	5.672	71.3	10.0	1.0224	1.7470
2.0	8.052	72	7.880	75.0	10.0	1.0223	1.8139
3.0	7.838	72	7.620	78.0	8.0	1.0322	1.8274

AVERAGE CORRECTION FACTOR: C = 1.0270
AVERAGE ORIFICE CONSTANT: Ha = 1.7588

EQUATIONS:

$V_w = V_{wf} - V_{wi}$
$V_d = V_{df} - V_{di}$
$T_d = (T_{ii} + T_{if} + T_{oi} + T_{of}) / 4$
$C = V_w * P_b * (T_d+460) / (V_d * (P_b+H/13.6) * (T_w+460))$
$Ha = 0.0317 * H * ((T_w+460)*Q/V_w)^2 / (P_b * (T_d+460))$

Average C = 1.0262

Calibration ~~Performed~~ by:

(Print) [illegible]

CALIBRATION
DRY TEST METER/ORIFICE METER

Mon.

Date: 1.17.94 Barometric Pressure, in. Hg. (Pb): 28.97

EQUIPMENT IDENTIFICATION			
Control Unit 5	Dry Test Meter	Wet Test Meter	Calibration Type
Mfg: mmt	Mfg: Rockwell	Mfg: GCA Corporation	General: X
Model: Universal	Model:	Model: Precision	Post-test: X
SN: 92-9093	SN: [redacted]	SN: 11 AH 12	

EQUIPMENT CALIBRATION

Orifice Pressure Drop in. WC H	Pump Vac. in.Hg	Wet Test Meter Volume, CF Initial V_{wi}	Wet Test Meter Volume, CF Final V_{wf}	Wet Test Meter Temp. °F T_w	Dry Test Meter Volume, CF Initial V_{di}	Dry Test Meter Volume, CF Final V_{df}	Dry Test Meter Temperature, °F Inlet Initial T_{ii}	Dry Test Meter Temperature, °F Inlet Final T_{if}	Dry Test Meter Temperature, °F Outlet Initial T_{oi}	Dry Test Meter Temperature, °F Outlet Final T_{of}	Elapsed Time, min. Q
0.5	0	zero	4.042	66	627.393	631.557	62	69	62	63	10
1.0	0	4.042	6.323	66	631.557	633.918	63	69	74	64	4
2.0	0	6.323	11.104	66	633.918	638.894	64	74	83	66	6
3.0	0	11.104	19.846	66	638.894	648.047	82	66	68	91	9

COMPUTER PRINTOUT

Hg Conde

Outlet

Pre-Test

H	Vw	Tw	Vd	Td	Q	C	Ha
0.5	4.042	66	4.164	64.0	10.0	0.9658	1.7682
1.0	2.281	66	2.361	67.5	4.0	0.9664	1.7649
2.0	4.781	66	4.976	71.8	6.0	0.9664	1.7934
3.0	8.742	66	9.153	76.8	9.0	0.9672	1.7935

AVERAGE CORRECTION FACTOR: C = 0.9665
AVERAGE ORIFICE CONSTANT: Ha = 1.7800

EQUATIONS:

$V_w = V_{wf} - V_{wi}$

$V_d = V_{df} - V_{di}$

$T_d = (T_{ii} + T_{if} + T_{oi} + T_{of}) / 4$

$C = V_w * P_b * (T_d+460) / (V_d * (P_b+H/13.6) * (T_w+460))$

$H_a = 0.0317 * H * ((T_w+460)*Q/V_w)^2 / (P_b * (T_d+460))$

Calibration Performed by:

(Print) Ted Gibbons

CALIBRATION

DRY TEST METER/ORIFICE METER

Date: Friday 2.25.94 Barometric Pressure, in. Hg. (Pb): 28.52

EQUIPMENT IDENTIFICATION			
Control Unit 5	Dry Test Meter	Wet Test Meter	Calibration Type
Mfg: mmt	Mfg: Rockwell	Mfg: GCA Corporation	General: X
Model: Universal	Model:	Model: Precision	Post-test: X
SN: 92-9093	SN: [redacted]	SN: 11 AH 12	

EQUIPMENT CALIBRATION

Orifice Pressure Drop in. WC H	Pump Vac. in.Hg	Wet Test Meter Volume, CF Initial V_{wi}	Wet Test Meter Volume, CF Final V_{wf}	Temp. °F T_w	Dry Test Meter Volume, CF Initial V_{di}	Dry Test Meter Volume, CF Final V_{df}	Temperature, °F Inlet Initial T_{ii}	Inlet Final T_{if}	Outlet Initial T_{oi}	Outlet Final T_{of}	Elapsed Time, min. Q
0.5	0	zero	3.312	72	762.563	766.018	70	70	71	80	8
1.0	0	3.312	8.402	72	766.018	771.347	80	71	91	73	9
2.0	0	8.402	13.167	72	771.347	776.348	89	72	74	96	6
3.0	0	13.167	21.012	72	776.348	784.628	95	74	77	101	8

COMPUTER PRINTOUT

Outlet

Post-Test

H	Vw	Tw	Vd	Td	Q	C	Hg
0.5	3.312	72	3.455	72.8	8.0	0.9587	1.7226
1.0	5.090	72	5.329	78.8	9.0	0.9648	1.8256
2.0	4.765	72	5.001	82.8	6.0	0.9671	1.8380
3.0	7.845	72	8.280	86.8	8.0	0.9663	1.7950

AVERAGE CORRECTION FACTOR: C = 0.9642
AVERAGE ORIFICE CONSTANT: Hg = 1.7953

EQUATIONS:

$V_w = V_{wf} - V_{wi}$

$V_d = V_{df} - V_{di}$

$T_d = (T_{ii} + T_{if} + T_{oi} + T_{of}) / 4$

$C = V_w * P_b * (T_d+460) / (V_d * (P_b+H/13.6) * (T_w+460))$

$H_g = 0.0317 * H * ((T_w+460)*Q/V_w)^2 / (P_b * (T_d+460))$

Average C= .9654

Calibration performed by:

98 (Print) Ted Gibbons

CALIBRATION

S-TYPE PITOT TUBE Probe ID: 84" S.S.

Date: 10-8-93 S-Type Pitot Tube ID No.: 85"

Ambient Temperature, °F: 63 Standard Pitot Tube ID No.: 1,5 ft.

Barometric Pressure, in. Hg.: 28.65 Standard Pitot Tube Coefficient: 0,990

Stock Thermocouple 85" inflex & 24" flex

PITOT TUBE EXAMINATION

Alignment Check	Pitot Tube Dimensions	Pitot Assembly Intercomponent Spacings
✓ α1<10°	External tubing diameter (D_t): 3/8	Pitot to ____ nozzle (X): ____
✓ α2<10°	Base to Side A opening plane (P_A): .58	Pitot to probe sheath (Y): ____
✓ β1< 5°	Base to Side B opening plane (P_B): .56	Pitot to thermocouple, along probe (W): ____
✓ β2< 5°		Pitot to thermocouple, perpendicular to probe (Z): ____
✓ Q<1/8 in.		
✓ R<1/32 in.		

DESIRED CALIBRATION POINT		SIDE A CALIBRATION		SIDE B CALIBRATION	
Velocity ft/sec	P_{std} in. WC	P_{std} in. WC	P_s in. WC	P_{std} in. WC	P_s in. WC
20	0.09	0.140	0.200	0.170	0.240
40	0.37	0.380	0.540	0.400	0.550
60	0.82	0.820	1.140	0.900	1.250
80	1.45	1.400	2.000	1.380	1.950
100	2.30				

COMPUTER PRINTOUT

SIDE A CALIBRATION				SIDE B CALIBRATION			
Pstd	Ps	Cp	Cp-Cp(A)	Pstd	Ps	Cp	Cp-Cp(B)
0.140	0.200	0.828	-0.003	0.170	0.240	0.833	-0.004
0.380	0.540	0.830	-0.001	0.400	0.550	0.844	0.007
0.820	1.140	0.840	0.008	0.900	1.250	0.840	0.002
1.400	2.000	0.828	-0.003	1.380	1.950	0.833	-0.005
Cp(A) = 0.832				Cp(B) = 0.838			

Side A (±n) - .005 Side B (±n) = .005

Calibration Performed by:

(Print) Bill & Ted

(Signature) Bill & Ted

FORM: SSOA-2

CALIBRATION
S-TYPE PITOT TUBE

Date: 10-8-93 | S-Type Pitot Tube ID No.: 96"

Ambient Temperature, °F: 63 | Standard Pitot Tube ID No.: 1.5 ft.

Barometric Pressure, in. Hg.: 28.65 | Standard Pitot Tube Coefficient: 0.990

103" ss Probe 99" std in-flex thermocouple

PITOT TUBE EXAMINATION

Alignment Check	Pitot Tube Dimensions	Pitot Assembly Intercomponent Spacings
✓ α1<10°	External tubing diameter (D_t): 3/8	Pitot to _____ nozzle (X): _____
✓ α2<10°	Base to Side A opening plane (P_A): .56	Pitot to probe sheath (Y): _____
✓ β1< 5°	Base to Side B opening plane (P_B): .56	Pitot to thermocouple, along probe (W): _____
✓ β2< 5°		Pitot to thermocouple, perpendicular to probe (Z): _____
✓ Q<1/8 in.		
✓ R<1/32 in.		

DESIRED CALIBRATION POINT		SIDE A CALIBRATION		SIDE B CALIBRATION	
Velocity ft/sec	P_{std} in. WC	P_{std} in. WC	P_s in. WC	P_{std} in. WC	P_s in. WC
20	0.09	0.135	0.190	0.145	0.205
40	0.37	0.380	0.550	0.390	0.550
60	0.82	0.900	1.300	0.880	1.250
80	1.45	1.500	2.180	1.420	2.050
100	2.30				

COMPUTER PRINTOUT

SIDE A CALIBRATION				SIDE B CALIBRATION			
Pstd	Ps	Cp	Cp-Cp(A)	Pstd	Ps	Cp	Cp-Cp(B)
0.135	0.190	0.834	0.009	0.145	0.205	0.833	0.002
0.380	0.550	0.823	-0.003	0.390	0.550	0.834	0.003
0.900	1.300	0.824	-0.002	0.880	1.250	0.831	0.000
1.500	2.180	0.821	-0.004	1.420	2.050	0.824	-0.006
Cp(A) = 0.826				Cp(B) = 0.830			

Side A (on) = .005

Side B (on) = .004

Calibration Performed by:

(Print) Bill & Ted

(Signature) Bill & Ted

CALIBRATION

NOZZLE DIAMETER

Nozzle Number	Nominal Diameter, in.	Measured Diameter, in. D1	D2	D3	Nozzle* Diameter, in.
S-1		.745	.744	.744	.744
S-2		.299	.299	.300	.299
S-3		.375	.374	.374	.374
S-4		.499	.499	.499	.499
S-5		.373	.374	.374	.374
S-6		.363	.364	.365	.364
S-7		.181	.181	.182	.181
S-8		.245	.245	.245	.245
2		.123	.123	.122	.123
4		.177	.177	.177	.177
13		.313	.313	.313	.313
14	Bud threads as of 1.3.94	.315	.315	.316	.315
17		.369	.370	.370	.370
18		.435	.437	.436	.436
19		.485	.485	.484	.485

* Nozzle diameter = (D1 + D2 + D3)/3

Calibration Performed by:

(Print) Bill Anderson

(Signature) Bill Anderson

Date: 10-7-93

CALIBRATION

NOZZLE DIAMETER

Nozzle Number	Nominal Diameter, in.	Measured Diameter, in. D1	D2	D3	Nozzle* Diameter, in.
L-1		.174	.175	.175	.175
L-2		.249	.249	.248	.249
L-3		.359	.358	.358	.358
L-4		.497	.495	.498	.497
L-5		.125	.124	.125	.125
L-6		.300	.300	.301	.300
L-7		.179	.179	.179	.179
L-8		.489	.490	.490	.490
~~L-9~~		~~.744~~	~~.746~~	~~.745~~	~~.745~~
L-10		.247	.247	.246	.247
L-11		.250	.250	.250	.250
L-12		.248	.247	.245	.247
L-13		.240	.241	.240	.240
L-14		.199	.199	.199	.199
L-15	Bad thread '93 10.6	.369	.369	.369	.369
~~L-81~~		~~.570~~	~~.571~~	.570	.570

* Nozzle diameter = (D1 + D2 + D3)/3

Calibration Performed by:

(Print) Bill Anderson

(Signature) Bill Anderson

Date: 10-7-93