Note: This is a reference cited in *AP 42, Compilation of Air Pollutant Emission Factors, Volume I Stationary Point and Area Sources.* AP42 is located on the EPA web site at www.epa.gov/ttn/chief/ap42/

The file name refers to the reference number, the AP42 chapter and section. The file name "ref02_c01s02.pdf" would mean the reference is from AP42 chapter 1 section 2. The reference may be from a previous version of the section and no longer cited. The primary source should always be checked.

Background Report Reference

AP-42 Section Number: 10.6.1

Background Report Section: 4

Reference Number: 93

Title: Results of The March 28, 1994 Oxides of Nitrogen Engineering Test on the Dryer Stack at the Louisiana Pacific Plant in Dungannon, VA

Interpoll Laboratories, Inc.

April 1994

58)

4-93)

Interpoll Laboratories, Inc.
4500 Ball Road N.E.
Circle Pines, Minnesota 55014-1819

TEL: (612) 786-6020
FAX: (612) 786-7854

RESULTS OF THE MARCH 28, 1994 OXIDES OF NITROGEN ENGINEERING TEST ON THE DRYER STACK AT THE LOUISIANA PACIFIC PLANT IN DUNGANNON, VIRGINIA

Submitted to:

LOUISIANA PACIFIC CORPORATION
Route 8, Box 8263
Hayward, Wisconsin 54843

Attention: Sue Somers

Reviewed by:

Daniel J. Despen
Manager
Stationary Source Testing Department

Report Number 4-2557E
April 20, 1994
SP/slp

TABLE OF CONTENTS

ABBREVIATIONS iii

1 INTRODUCTION 1

2 SUMMARY AND DISCUSSION 2

3 RESULTS 3

3.1 Results of Moisture Analyses 4

APPENDICES:

A - Volumetric Flow Rate Determination

B - Field Data Sheets

C - NO_x Computer Printouts

ABBREVIATIONS

ACFM	actual cubic feet per minute
cc (ml)	cubic centimeter (milliliter)
DSCFM	dry standard cubic foot of dry gas per minute
DSML	dry standard milliliter
DEG-F (°F)	degrees Fahrenheit
DIA.	diameter
FP	finished product for plant
FT/SEC	feet per second
g	gram
GPM	gallons per minute
GR/ACF	grains per actual cubic foot
GR/DSCF	grains per dry standard cubic foot
g/dscm	grams per dry standard cubic meter
HP	horsepower
HRS	hours
IN.	inches
IN.HG.	inches of mercury
IN.WC.	inches of water
LB	pound
LB/DSCF	pounds per dry standard cubic foot
LB/HR	pounds per hour
LB/10^6BTU	pounds per million British Thermal Units heat input
LB/MMBTU	pounds per million British Thermal Units heat input
LTPD	long tons per day
MW	megawatt
mg/Nm^3	milligrams per dry standard cubic meter
ug/Nm^3	micrograms per dry standard cubic meter
microns (um)	micrometer
MIN.	minutes
ng	nanograms
ohm-cm	ohm-centimeter
PM	particulate matter
PPH	pounds per hour
PPM	parts per million
ppmC	parts per million carbon
ppm,d	parts per million, dry
ppm,w	parts per million, wet
ppt	parts per trillion
PSI	pounds per square inch
SQ.FT.	square feet
TPD	tons per day
ug	micrograms
v/v	percent by volume
w/w	percent by weight
<	≤ (when following a number)

Standard conditions are defined as 68°F (20°C) and 29.92 IN. of mercury pressure.

g:\stack\wp\misc\abbrev.frm

1 INTRODUCTION

On March 28, 1994, Interpoll Laboratories personnel conducted an oxides of nitrogen emission engineering test on the dryer at the Louisiana Pacific Plant Located in Dungannon, Virginia. On-site testing was performed by Bob Aschenbach and Ken Neussmeier. Coordination between testing activities and plant operation was provided by Mike Mulling and Mark Becker of Louisiana Pacific. The tests were witnessed by Stanley Faggert of the Commonwealth of Virginia Department of Air Pollution Control.

Oxides of nitrogen, oxygen, and carbon dioxide concentrations were determined in accordance with Methods 7E and 3A (CFR Title 40, Part 60, Appendix A). A slip stream of sample gas was withdrawn from the exhaust gas stream using a heated stainless steel probe equipped with a filter to remove interfering particulate material. After passing through the filter, the gas passed through two chilled condenser-type moisture removal systems operating in series. The particulate-free dry gas was then transported to the analyzers with the excess exhausted to the atmosphere through a calibrated orifice which was used to ensure that the flow from the stack exceeds the requirements of the analyzers. A three-way valve on the probe was used to introduce standard gas for the "system bias check". The analog output of each analyzer was monitored with a computer datalogger and backed up with a stripchart recorder. A volumetric flow rate determination was conducted in accordance with EPA Method 2, CFR Title 40, Part 60, Appendix A (revised July 1, 1993) in order to calculate oxides of nitrogen mass rate.

The important results of the test are summarized in Section 2. Field data and all other supporting information are presented in the appendices.

2 SUMMARY AND DISCUSSION

The results of the NO_x test are summarized in the Table below. The measured oxides of nitrogen concentration averaged 32.9 ppm,d which corresponds to an average mass rate of 7.02 LB/HR.

TIME (HRS)	CONCENTRATION (ppm,d)	EMISSION RATE (LB/HR)
0815-0914	28.6	6.11
0915-1014	33.2	7.09
1015-1114	28.4	6.07
1115-1214	38.2	8.16
1235-1334	31.3	6.69
1335-1434	36.9	7.88
1435-1534	28.0	5.98
1535-1634	38.4	8.20
Average	32.9	7.02

No difficulties were encountered in the field or in the data reduction. On the basis of this fact and a complete review of the entire data and results, it is our opinion that the results reported herein are accurate and closely reflect the actual values which existed at the time the test was performed.

3 RESULTS

The results of the gas composition (orsat) are presented in Section 3.1. The results have been calculated on a personal computer using programs written in Extended BASIC specifically for source testing calculations. EPA-published equations have been used as the basis of the calculation techniques in these programs.

3.1 Results of Moisture Analyses

Test No. 1
Dryer Stack

Results of Orsat & Moisture Analyses-----Methods 3 & 4(%v/v)

	Run 1	Run 2	Run 3
Date of run	03-28-94	03-28-94	03-28-94
Dry basis (orsat)			
carbon dioxide.....	3.18	3.42	1.90
oxygen.....	17.16	16.99	18.56
nitrogen.....	79.66	79.59	79.54
Wet basis (orsat)			
carbon dioxide.....	2.54	2.74	1.52
oxygen.....	13.73	13.59	14.85
nitrogen.....	63.73	63.67	63.63
water vapor.....	20.00	20.00	20.00
Dry molecular weight.....	29.20	29.23	29.05
Wet molecular weight.....	26.96	26.98	26.84
Specific gravity.....	0.931	0.932	0.927
FO	1.176	1.143	1.232

Test No. 1
Dryer Stack

Results of Orsat & Moisture Analyses-----Methods 3 & 4(%v/v)

	Run 4	Run 5	Run 6
Date of run	03-28-94	03-28-94	03-28-94
Dry basis (orsat)			
carbon dioxide.....	3.67	2.24	2.35
oxygen.....	16.65	18.13	18.08
nitrogen.....	79.68	79.63	79.57
Wet basis (orsat)			
carbon dioxide.....	2.94	1.79	1.88
oxygen.....	13.32	14.50	14.46
nitrogen.....	63.74	63.70	63.66
water vapor.....	20.00	20.00	20.00
Dry molecular weight.....	29.25	29.08	29.10
Wet molecular weight.....	27.00	26.87	26.88
Specific gravity.....	0.933	0.928	0.928
FO	1.158	1.237	1.200

Test No. 1
Dryer Stack

Results of Orsat & Moisture Analyses-----Methods 3 & 4(%v/v)

	Run 7	Run 8
Date of run	03-28-94	03-28-94
Dry basis (orsat)		
carbon dioxide.....	1.59	2.75
oxygen.....	18.80	17.56
carbon monoxide.....	0.00	0.00
nitrogen.....	79.61	79.69
Wet basis (orsat)		
carbon dioxide.....	1.27	2.20
oxygen.....	15.04	14.05
carbon monoxide.....	0.00	0.00
nitrogen.....	63.69	63.75
water vapor.....	20.00	20.00
Dry molecular weight.....	29.01	29.14
Wet molecular weight.....	26.81	26.91
Specific gravity.....	0.926	0.930
FO	1.321	1.215

APPENDIX A

VOLUMETRIC FLOW RATE DETERMINATION

Test No. 1
Dryer Stack

Results of Volumetric Flow Rate Determination-------Method 2

Date of Determination.....	03-28-94
Time of Determination.....(HRS)	1135
Barometric pressure.....(IN.HG)	28.46
Pitot tube coefficient.....	.84
Number of sampling ports.....	2
Total number of points.....	12
Shape of duct.....	Round
Stack diameter.....(IN)	48
Duct area.....(SQ.FT)	12.57
Direction of flow.....	UP
Static pressure.....(IN.WC)	.5
Avg. gas temp.....(DEG-F)	194
Moisture content.....(% V/V)	20.00
Avg. linear velocity.....(FT/SEC)	64.3
Gas density.....(LB/ACF)	.05394
Molecular weight.....(LB/LBMOLE)	29.27
Mass flow of gas.....(LB/HR)	156892
Volumetric flow rate.....	
actual.....(ACFM)	48477
dry standard.....(DSCFM)	29820

APPENDIX B

FIELD DATA SHEETS

INTERPOLL LABORATORIES EPA METHOD 2 FIELD DATA SHEET

Job LP / Dungannon

Source Dryer Stack

Test 1 Run 0 Date 3-28-95

Stack dimen. 48.0 IN.

Dry bulb 194 °F Wet bulb 140 °F

Manometer: ☐ Reg. ☐ Exp. ☒ Elec.

Barometric pressure 28.46 in Hg

Static pressure -.50 in WC

Operators BT KN

Pitot No. 31v- Cp .84

Schematic of Cross Section

Plant DUFO

Traverse Point No.		Fraction of Diameter	Distance from Stack Wall (in)	Distance from End of Port (in)	Velocity Pressure (in WC)	Temperature of gas (°F)
			Port length: 6.0 in.		Time start: 1135 hrs	
B	1				.65	
	2				1.10	194
	3				1.24	
	4				.95	194
	5				1.00	
	6				.70	194
A	1				.50	
	2				1.14	194
	3				1.17	
	4				1.20	194
	5				1.25	
	6				.65	194
	MC: ~2%			FT/SEC	64.25	
	O_2 = ~17%			ACFM	48,445	
				DSCFM	29,801	
Temp. meas. tool & S/N: PDT 16					Time end: 1145 hrs	

R or nothing= reg. manometer; S= expanded; E = electronic S-392.1

APPENDIX C

NO_x COMPUTER PRINTOUTS

Interpoll Laboratories, Inc.

(612) 786-6020

Printout of ESC Model 80 DAS
for CEM Trailer No. 2
- 1994 -

File Name: LPDE1
Job Number: 4-2557
Client: Louisiana Pacific - Dungannon
Location: Dungannon, Virginia

Dryer Stack -- Run 1

Julian Date	Time (Hrs)	Conc. (dry basis unless noted) NOx (ppmv)	CO2 (%v/v)	O2 (%v/v)
087	08:16:00	27.5	3.21	16.93
087	08:17:00	27.3	3.15	17.01
087	08:18:00	27.2	3.02	17.15
087	08:19:00	27.4	3.07	17.18
087	08:20:00	26.8	3.12	17.10
087	08:21:00	26.6	3.06	17.21
087	08:22:00	26.4	3.03	17.22
087	08:23:00	25.8	3.01	17.28
087	08:24:00	25.9	3.00	17.30
087	08:25:00	26.2	3.02	17.27
087	08:26:00	26.3	3.01	17.31
087	08:27:00	26.4	3.07	17.25
087	08:28:00	26.7	3.08	17.23
087	08:29:00	26.5	3.10	17.22
087	08:30:00	26.8	3.05	17.27
087	08:31:00	26.8	3.05	17.26
087	08:32:00	26.8	3.08	17.27
087	08:33:00	27.0	3.10	17.23
087	08:34:00	27.3	3.15	17.20
087	08:35:00	27.4	3.12	17.20
087	08:36:00	27.6	3.11	17.23
087	08:37:00	27.9	3.13	17.24
087	08:38:00	27.7	3.08	17.25
087	08:39:00	27.4	3.18	17.17
087	08:40:00	27.8	3.17	17.15
087	08:41:00	28.3	3.20	17.13
087	08:42:00	28.4	3.09	17.23
087	08:43:00	28.0	3.01	17.35
087	08:44:00	27.4	3.06	17.27
087	08:45:00	27.9	3.02	17.33
087	08:46:00	27.8	3.10	17.25
087	08:47:00	27.3	3.20	17.15
087	08:48:00	27.8	3.45	16.91
087	08:49:00	28.9	3.71	16.62

Interpoll Laboratories, Inc.

(612) 786-6020

Printout of ESC Model 80 DAS
for CEM Trailer No. 2
- 1994 -

File Name: LPDE1
Job Number: 4-2557
Client: Louisiana Pacific - Dungannon
Location: Dungannon, Virginia

Dryer Stack -- Run 1

Julian Date	Time (Hrs)	Conc. (dry basis unless noted) NOx (ppmv)	CO2 (%v/v)	O2 (%v/v)
087	08:50:00	30.7	4.01	16.28
087	08:51:00	32.4	3.98	16.29
087	08:52:00	32.8	3.88	16.40
087	08:53:00	32.2	3.54	16.72
087	08:54:00	30.0	3.23	17.07
087	08:55:00	29.0	3.00	17.35
087	08:56:00	29.0	2.93	17.42
087	08:57:00	29.6	2.74	17.63
087	08:58:00	29.1	2.68	17.71
087	08:59:00	27.8	2.78	17.62
087	09:00:00	25.5	3.06	17.35
087	09:01:00	25.8	3.40	16.98
087	09:02:00	28.3	3.51	16.90
087	09:03:00	30.1	3.64	16.77
087	09:04:00	32.1	3.79	16.62
087	09:05:00	34.1	3.87	16.50
087	09:06:00	35.5	3.87	16.48
087	09:07:00	35.0	3.56	16.78
087	09:08:00	32.6	3.12	17.26
087	09:09:00	31.8	2.78	17.65
087	09:10:00	33.2	2.57	17.89
087	09:11:00	32.6	2.50	18.01
087	09:12:00	29.1	2.70	17.82
087	09:13:00	25.5	3.08	17.42
087	09:14:00	26.9	3.54	16.92
	Run Average	28.6	3.18	17.16

Interpoll Laboratories, Inc.

(612) 786-6020

Printout of ESC Model 80 DAS
for CEM Trailer No. 2
- 1994 -

File Name: LPDE2
Job Number: 4-2557
Client: Louisiana Pacific - Dungannon
Location: Dungannon, Virginia

Dryer Stack -- Run 2

Julian Date	Time (Hrs)	Conc. (dry basis unless noted) NOx (ppmv)	CO2 (%v/v)	O2 (%v/v)
087	09:15:00	29.8	3.79	16.55
087	09:16:00	29.9	3.64	16.81
087	09:17:00	32.4	3.99	16.41
087	09:18:00	33.6	3.64	16.65
087	09:19:00	32.0	3.57	16.86
087	09:20:00	31.9	3.54	16.87
087	09:21:00	31.8	3.51	16.90
087	09:22:00	31.3	3.43	16.98
087	09:23:00	30.9	3.26	17.17
087	09:24:00	30.2	3.20	17.23
087	09:25:00	29.5	3.26	17.22
087	09:26:00	29.1	3.47	17.00
087	09:27:00	30.0	3.56	16.82
087	09:28:00	30.2	3.58	16.93
087	09:29:00	31.3	4.03	16.42
087	09:30:00	33.1	4.26	16.14
087	09:31:00	35.0	4.44	15.94
087	09:32:00	36.7	4.55	15.78
087	09:33:00	38.2	4.39	15.93
087	09:34:00	38.4	4.14	16.18
087	09:35:00	37.2	3.80	16.58
087	09:36:00	35.0	3.49	16.91
087	09:37:00	34.1	3.30	17.11
087	09:38:00	34.4	2.95	17.47
087	09:39:00	33.6	2.91	17.57
087	09:40:00	31.4	3.02	17.45
087	09:41:00	29.6	3.25	17.22
087	09:42:00	28.7	3.46	16.98
087	09:43:00	30.5	3.69	16.76
087	09:44:00	32.5	3.77	16.64
087	09:45:00	33.9	3.66	16.72
087	09:46:00	34.3	3.39	16.99
087	09:47:00	34.9	3.09	17.30
087	09:48:00	35.6	2.84	17.58

Interpoll Laboratories, Inc.

(612) 786-6020

Printout of ESC Model 80 DAS
for CEM Trailer No. 2
- 1994 -

File Name: LPDE2
Job Number: 4-2557
Client: Louisiana Pacific - Dungannon
Location: Dungannon, Virginia

Dryer Stack -- Run 2

Julian Date	Time (Hrs)	Conc. (dry basis unless noted) NOx (ppmv)	CO2 (%v/v)	O2 (%v/v)
087	09:49:00	37.9	2.63	17.83
087	09:50:00	36.3	2.57	17.90
087	09:51:00	34.7	2.62	17.87
087	09:52:00	31.5	2.88	17.58
087	09:53:00	30.0	3.26	17.21
087	09:54:00	30.2	3.66	16.77
087	09:55:00	32.5	3.92	16.48
087	09:56:00	35.1	4.16	16.21
087	09:57:00	37.3	4.02	16.29
087	09:58:00	37.4	3.72	16.64
087	09:59:00	36.6	3.66	16.75
087	10:00:00	35.9	3.22	17.10
087	10:01:00	35.8	2.82	17.60
087	10:02:00	34.7	2.72	17.73
087	10:03:00	34.0	2.68	17.80
087	10:04:00	31.7	2.71	17.77
087	10:05:00	30.2	2.97	17.53
087	10:06:00	29.5	3.42	17.07
087	10:07:00	31.3	3.76	16.66
087	10:08:00	33.9	3.84	16.57
087	10:09:00	35.1	3.77	16.60
087	10:10:00	35.2	3.29	17.02
087	10:11:00	33.0	3.14	17.29
087	10:12:00	32.7	2.99	17.41
087	10:13:00	34.3	2.70	17.72
087	10:14:00	35.4	2.56	17.91
	Run Average	33.2	3.42	16.99

Interpoll Laboratories, Inc.

(612) 786-6020

Printout of ESC Model 80 DAS
for CEM Trailer No. 2
- 1994 -

File Name: LPDE3
Job Number: 4-2557
Client: Louisiana Pacific - Dungannon
Location: Dungannon, Virginia

Dryer Stack -- Run 3

Julian Date	Time (Hrs)	Conc. (dry basis unless noted) NOx (ppmv)	CO2 (%v/v)	O2 (%v/v)
087	10:15:00	34.2	2.59	17.89
087	10:16:00	31.8	2.71	17.78
087	10:17:00	28.8	2.92	17.56
087	10:18:00	28.1	3.14	17.30
087	10:19:00	29.7	3.13	17.28
087	10:20:00	30.6	3.09	17.33
087	10:21:00	31.5	3.01	17.38
087	10:22:00	32.1	2.96	17.49
087	10:23:00	31.4	2.98	17.36
087	10:24:00	35.5	2.56	17.85
087	10:25:00	35.3	2.47	17.99
087	10:26:00	34.3	2.42	18.04
087	10:27:00	33.6	2.41	18.08
087	10:28:00	34.5	2.34	18.13
087	10:29:00	36.3	2.26	18.24
087	10:30:00	37.4	2.13	18.37
087	10:31:00	39.6	1.84	18.69
087	10:32:00	37.7	1.63	18.97
087	10:33:00	35.4	1.53	19.08
087	10:34:00	34.2	1.44	19.18
087	10:35:00	33.4	1.42	19.20
087	10:36:00	32.5	1.36	19.26
087	10:37:00	33.6	1.46	19.16
087	10:38:00	34.7	1.57	19.06
087	10:39:00	33.4	2.28	18.20
087	10:40:00	37.0	1.85	18.57
087	10:41:00	37.6	2.05	18.46
087	10:42:00	36.4	2.11	18.29
087	10:43:00	38.5	2.02	18.43
087	10:44:00	38.7	2.10	18.34
087	10:45:00	38.3	2.10	18.37
087	10:46:00	37.7	2.16	18.27
087	10:47:00	37.3	2.26	18.18
087	10:48:00	30.3	1.40	18.75

Interpoll Laboratories, Inc.

(612) 786-6020

Printout of ESC Model 80 DAS
for CEM Trailer No. 2
- 1994 -

File Name: LPDE3
Job Number: 4-2557
Client: Louisiana Pacific - Dungannon
Location: Dungannon, Virginia

Dryer Stack -- Run 3

Julian Date	Time (Hrs)	Conc. (dry basis unless noted) NOx (ppmv)	CO2 (%v/v)	O2 (%v/v)
087	10:49:00	6.6	0.06	20.58
087	10:50:00	3.8	-0.02	20.66
087	10:51:00	3.4	-0.05	20.68
087	10:52:00	3.2	-0.08	20.68
087	10:53:00	2.5	-0.10	20.68
087	10:54:00	2.4	-0.12	20.69
087	10:55:00	2.1	-0.14	20.69
087	10:56:00	2.0	-0.14	20.69
087	10:57:00	16.0	1.16	19.64
087	10:58:00	33.6	2.55	17.81
087	10:59:00	26.6	3.36	16.80
087	11:00:00	32.8	2.37	17.48
087	11:01:00	28.0	1.07	19.36
087	11:02:00	23.8	0.95	19.55
087	11:03:00	26.4	1.43	19.26
087	11:04:00	21.3	3.54	16.84
087	11:05:00	22.9	3.94	16.19
087	11:06:00	27.5	3.90	16.30
087	11:07:00	39.9	4.70	15.44
087	11:08:00	40.0	2.73	17.04
087	11:09:00	35.3	1.26	19.21
087	11:10:00	27.5	1.03	19.52
087	11:11:00	23.1	0.83	19.73
087	11:12:00	21.7	0.84	19.75
087	11:13:00	26.3	1.38	19.33
087	11:14:00	32.8	2.10	18.21
	Run Average	28.4	1.90	18.56

Interpoll Laboratories, Inc.

(612) 786-6020

Printout of ESC Model 80 DAS
for CEM Trailer No. 2
- 1994 -

File Name: LPDE4
Job Number: 4-2557
Client: Louisiana Pacific - Dungannon
Location: Dungannon, Virginia

Dryer Stack -- Run 4

Julian Date	Time (Hrs)	Conc. (dry basis unless noted) NOx (ppmv)	CO2 (%v/v)	O2 (%v/v)
087	11:15:00	33.5	1.85	18.60
087	11:16:00	32.0	2.33	18.05
087	11:17:00	25.1	3.40	17.04
087	11:18:00	34.1	3.59	16.28
087	11:19:00	40.5	2.16	18.10
087	11:20:00	38.8	2.25	18.22
087	11:21:00	27.3	3.88	16.48
087	11:22:00	32.6	3.88	16.25
087	11:23:00	35.2	3.92	16.24
087	11:24:00	37.2	3.82	16.27
087	11:25:00	35.9	3.47	16.78
087	11:26:00	36.5	3.34	16.84
087	11:27:00	35.7	3.05	17.19
087	11:28:00	34.5	3.05	17.24
087	11:29:00	34.7	3.48	16.79
087	11:30:00	34.5	3.34	16.91
087	11:31:00	34.3	3.44	16.83
087	11:32:00	35.3	3.65	16.63
087	11:33:00	36.1	3.62	16.64
087	11:34:00	37.6	3.91	16.36
087	11:35:00	38.2	3.83	16.40
087	11:36:00	37.9	3.87	16.38
087	11:37:00	37.4	3.57	16.67
087	11:38:00	37.5	3.86	16.54
087	11:39:00	38.7	4.11	16.13
087	11:40:00	38.7	3.85	16.35
087	11:41:00	37.2	3.82	16.50
087	11:42:00	37.7	3.89	16.39
087	11:43:00	37.4	3.72	16.55
087	11:44:00	37.0	3.59	16.79
087	11:45:00	37.2	3.58	16.78
087	11:46:00	37.1	3.55	16.82
087	11:47:00	36.8	3.59	16.80
087	11:48:00	37.5	3.69	16.72

Interpoll Laboratories, Inc.

(612) 786-6020

Printout of ESC Model 80 DAS
for CEM Trailer No. 2
- 1994 -

File Name: LPDE4
Job Number: 4-2557
Client: Louisiana Pacific - Dungannon
Location: Dungannon, Virginia

Dryer Stack -- Run 4

Julian Date	Time (Hrs)	Conc. (dry basis unless noted) NOx (ppmv)	CO2 (%v/v)	O2 (%v/v)
087	11:49:00	38.2	3.93	16.45
087	11:50:00	38.2	3.93	16.45
087	11:51:00	39.8	4.12	16.24
087	11:52:00	40.9	4.10	16.19
087	11:53:00	40.3	3.91	16.46
087	11:54:00	40.9	4.09	16.28
087	11:55:00	41.8	3.98	16.34
087	11:56:00	41.1	3.90	16.47
087	11:57:00	41.1	3.84	16.51
087	11:58:00	41.1	3.86	16.52
087	11:59:00	41.6	3.79	16.56
087	12:00:00	41.1	3.76	16.60
087	12:01:00	40.8	3.66	16.72
087	12:02:00	40.8	3.76	16.63
087	12:03:00	41.6	3.83	16.56
087	12:04:00	41.9	3.89	16.47
087	12:05:00	41.5	4.00	16.41
087	12:06:00	42.9	4.06	16.27
087	12:07:00	42.2	3.96	16.39
087	12:08:00	42.8	4.12	16.26
087	12:09:00	42.1	3.77	16.58
087	12:10:00	42.4	4.07	16.29
087	12:11:00	42.9	4.11	16.25
087	12:12:00	43.6	4.06	16.22
087	12:13:00	43.0	3.78	16.57
087	12:14:00	42.1	3.78	16.56
	Run Average	38.2	3.67	16.65

Interpoll Laboratories, Inc.

(612) 786-6020

Printout of ESC Model 80 DAS
for CEM Trailer No. 2
- 1994 -

File Name: LPDE5
Job Number: 4-2557
Client: Louisiana Pacific - Dungannon
Location: Dungannon, Virginia

Dryer Stack -- Run 5

Julian Date	Time (Hrs)	Conc. (dry basis unless noted) NOx (ppmv)	CO2 (%v/v)	O2 (%v/v)
087	12:35:00	39.4	3.89	16.24
087	12:36:00	41.8	4.21	15.91
087	12:37:00	46.6	2.03	17.87
087	12:38:00	37.9	1.85	18.94
087	12:39:00	28.3	3.89	16.40
087	12:40:00	30.7	3.04	17.10
087	12:41:00	31.6	2.84	17.36
087	12:42:00	38.8	2.02	18.34
087	12:43:00	25.5	1.00	19.37
087	12:44:00	17.3	0.90	19.69
087	12:45:00	20.4	2.36	18.75
087	12:46:00	34.3	3.34	16.20
087	12:47:00	18.5	0.81	19.81
087	12:48:00	30.2	2.62	18.01
087	12:49:00	30.3	5.12	15.41
087	12:50:00	42.0	4.51	15.26
087	12:51:00	42.8	3.03	17.02
087	12:52:00	49.9	1.92	18.42
087	12:53:00	31.3	1.05	19.50
087	12:54:00	21.9	0.86	19.75
087	12:55:00	19.1	0.81	19.82
087	12:56:00	19.0	0.91	19.78
087	12:57:00	36.5	1.86	18.72
087	12:58:00	39.8	2.17	18.26
087	12:59:00	34.4	2.35	17.91
087	13:00:00	28.8	1.09	19.28
087	13:01:00	19.5	0.77	19.80
087	13:02:00	17.3	0.73	19.86
087	13:03:00	16.7	0.72	19.87
087	13:04:00	19.1	1.02	19.70
087	13:05:00	27.8	2.75	17.68
087	13:06:00	24.2	2.80	17.32
087	13:07:00	35.3	2.42	17.82
087	13:08:00	32.1	2.71	17.63

Interpoll Laboratories, Inc.

(612) 786-6020

Printout of ESC Model 80 DAS
for CEM Trailer No. 2
- 1994 -

File Name: LPDE5
Job Number: 4-2557
Client: Louisiana Pacific - Dungannon
Location: Dungannon, Virginia

Dryer Stack -- Run 5

Julian Date	Time (Hrs)	Conc. (dry basis unless noted) NOx (ppmv)	CO2 (%v/v)	O2 (%v/v)
087	13:09:00	29.1	3.11	17.09
087	13:10:00	35.4	3.14	17.04
087	13:11:00	43.5	1.71	18.40
087	13:12:00	28.9	0.93	19.59
087	13:13:00	20.8	0.79	19.77
087	13:14:00	20.0	0.90	19.74
087	13:15:00	32.8	2.09	18.58
087	13:16:00	36.8	3.07	17.16
087	13:17:00	36.9	3.08	17.11
087	13:18:00	44.8	2.13	17.88
087	13:19:00	32.1	0.92	19.58
087	13:20:00	20.2	0.74	19.83
087	13:21:00	21.6	0.90	19.68
087	13:22:00	33.4	1.93	18.80
087	13:23:00	42.3	2.10	17.91
087	13:24:00	24.3	0.87	19.61
087	13:25:00	25.3	1.31	19.40
087	13:26:00	37.6	3.08	17.33
087	13:27:00	33.2	3.24	16.91
087	13:28:00	32.2	3.45	16.78
087	13:29:00	31.9	3.39	16.79
087	13:30:00	32.7	3.32	16.90
087	13:31:00	35.6	3.35	16.87
087	13:32:00	37.3	3.40	16.84
087	13:33:00	38.8	3.38	16.86
087	13:34:00	42.5	3.48	16.78
	Run Average	31.3	2.24	18.13

Interpoll Laboratories, Inc.

(612) 786-6020

Printout of ESC Model 80 DAS
for CEM Trailer No. 2
- 1994 -

File Name: LPDE6
Job Number: 4-2557
Client: Louisiana Pacific - Dungannon
Location: Dungannon, Virginia

Dryer Stack -- Run 6

Julian Date	Time (Hrs)	Conc. (dry basis unless noted) NOx (ppmv)	CO2 (%v/v)	O2 (%v/v)
087	13:35:00	44.7	3.56	16.69
087	13:36:00	46.3	3.65	16.62
087	13:37:00	46.3	3.74	16.54
087	13:38:00	47.5	3.76	16.51
087	13:39:00	47.3	3.78	16.51
087	13:40:00	47.5	3.82	16.48
087	13:41:00	46.9	3.84	16.45
087	13:42:00	46.9	3.89	16.41
087	13:43:00	46.7	3.91	16.39
087	13:44:00	47.6	3.97	16.33
087	13:45:00	47.8	4.00	16.29
087	13:46:00	47.6	3.90	16.39
087	13:47:00	48.1	3.89	16.42
087	13:48:00	48.0	3.95	16.37
087	13:49:00	47.7	3.90	16.40
087	13:50:00	46.5	3.87	16.46
087	13:51:00	45.5	3.78	16.52
087	13:52:00	43.7	3.43	16.86
087	13:53:00	42.9	3.37	16.99
087	13:54:00	41.7	3.17	17.13
087	13:55:00	42.2	2.74	17.59
087	13:56:00	43.5	2.50	17.86
087	13:57:00	45.1	2.18	18.24
087	13:58:00	43.0	1.97	18.54
087	13:59:00	40.6	1.93	18.62
087	14:00:00	39.1	1.91	18.64
087	14:01:00	37.7	1.88	18.66
087	14:02:00	36.6	1.86	18.66
087	14:03:00	36.2	1.88	18.63
087	14:04:00	36.7	1.95	18.55
087	14:05:00	37.4	2.01	18.47
087	14:06:00	37.8	2.01	18.44
087	14:07:00	37.4	2.01	18.45
087	14:08:00	36.6	1.99	18.45

Interpoll Laboratories, Inc.

(612) 786-6020

Printout of ESC Model 80 DAS
for CEM Trailer No. 2
- 1994 -

File Name: LPDE6
Job Number: 4-2557
Client: Louisiana Pacific - Dungannon
Location: Dungannon, Virginia

Dryer Stack -- Run 6

Julian Date	Time (Hrs)	Conc. (dry basis unless noted) NOx (ppmv)	CO2 (%v/v)	O2 (%v/v)
087	14:09:00	36.0	1.93	18.53
087	14:10:00	34.9	1.84	18.65
087	14:11:00	34.6	1.83	18.66
087	14:12:00	33.8	1.70	18.77
087	14:13:00	31.1	1.54	18.99
087	14:14:00	29.9	1.47	19.06
087	14:15:00	29.0	1.43	19.11
087	14:16:00	28.7	1.42	19.13
087	14:17:00	28.1	1.36	19.17
087	14:18:00	27.5	1.32	19.22
087	14:19:00	26.9	1.31	19.23
087	14:20:00	27.0	1.32	19.21
087	14:21:00	27.3	1.37	19.17
087	14:22:00	26.6	1.33	19.18
087	14:23:00	26.6	1.32	19.20
087	14:24:00	26.0	1.27	19.23
087	14:25:00	24.9	1.21	19.31
087	14:26:00	24.5	1.18	19.34
087	14:27:00	23.5	1.11	19.41
087	14:28:00	23.2	1.12	19.42
087	14:29:00	24.2	1.19	19.34
087	14:30:00	26.4	1.33	19.19
087	14:31:00	28.8	1.52	18.98
087	14:32:00	29.4	1.52	18.91
087	14:33:00	28.5	1.45	19.00
087	14:34:00	28.2	1.42	19.02
	Run Average	36.9	2.35	18.08

Interpoll Laboratories, Inc.

(612) 786-6020

Printout of ESC Model 80 DAS
for CEM Trailer No. 2
- 1994 -

File Name: LPDE7
Job Number: 4-2557
Client: Louisiana Pacific - Dungannon
Location: Dungannon, Virginia

Dryer Stack -- Run 7

Julian Date	Time (Hrs)	Conc. (dry basis unless noted) NOx (ppmv)	CO2 (%v/v)	O2 (%v/v)
087	14:35:00	25.9	1.27	19.20
087	14:36:00	22.4	1.02	19.46
087	14:37:00	19.5	0.86	19.64
087	14:38:00	16.6	0.72	19.79
087	14:39:00	15.6	0.70	19.83
087	14:40:00	16.0	0.71	19.80
087	14:41:00	16.1	0.70	19.81
087	14:42:00	16.2	0.69	19.81
087	14:43:00	17.6	0.75	19.75
087	14:44:00	18.6	0.75	19.73
087	14:45:00	18.1	0.74	19.76
087	14:46:00	18.4	0.77	19.73
087	14:47:00	18.4	0.77	19.71
087	14:48:00	19.3	0.85	19.66
087	14:49:00	21.3	0.99	19.51
087	14:50:00	21.9	0.96	19.46
087	14:51:00	20.4	0.90	19.56
087	14:52:00	20.4	0.91	19.54
087	14:53:00	20.3	0.93	19.54
087	14:54:00	20.3	0.91	19.54
087	14:55:00	20.3	0.93	19.53
087	14:56:00	21.5	1.01	19.45
087	14:57:00	22.8	1.08	19.38
087	14:58:00	23.9	1.11	19.34
087	14:59:00	24.7	1.15	19.30
087	15:00:00	25.1	1.20	19.26
087	15:01:00	26.1	1.26	19.19
087	15:02:00	27.0	1.34	19.10
087	15:03:00	28.1	1.41	19.03
087	15:04:00	28.5	1.42	19.00
087	15:05:00	29.2	1.48	18.95
087	15:06:00	29.9	1.51	18.92
087	15:07:00	30.2	1.51	18.92
087	15:08:00	30.7	1.55	18.86

Interpoll Laboratories, Inc.

(612) 786-6020

Printout of ESC Model 80 DAS
for CEM Trailer No. 2
- 1994 -

File Name: LPDE7
Job Number: 4-2557
Client: Louisiana Pacific - Dungannon
Location: Dungannon, Virginia

Dryer Stack -- Run 7

Julian Date	Time (Hrs)	Conc. (dry basis unless noted) NOx (ppmv)	CO2 (%v/v)	O2 (%v/v)
087	15:09:00	30.7	1.58	18.86
087	15:10:00	31.7	1.61	18.79
087	15:11:00	31.6	1.61	18.80
087	15:12:00	32.6	1.68	18.74
087	15:13:00	33.4	1.71	18.72
087	15:14:00	35.8	1.90	18.48
087	15:15:00	37.6	1.98	18.37
087	15:16:00	38.1	2.05	18.29
087	15:17:00	38.1	2.16	18.14
087	15:18:00	36.0	2.39	17.90
087	15:19:00	32.0	2.53	17.69
087	15:20:00	32.8	2.51	17.69
087	15:21:00	35.6	2.47	17.75
087	15:22:00	36.4	2.48	17.76
087	15:23:00	39.1	2.43	17.81
087	15:24:00	39.6	2.45	17.82
087	15:25:00	37.9	2.56	17.68
087	15:26:00	38.1	2.56	17.70
087	15:27:00	36.9	2.62	17.61
087	15:28:00	36.6	2.69	17.55
087	15:29:00	33.8	2.89	17.36
087	15:30:00	33.5	2.95	17.26
087	15:31:00	34.0	2.90	17.32
087	15:32:00	35.7	2.80	17.43
087	15:33:00	39.1	2.60	17.63
087	15:34:00	43.0	2.43	17.85
	Run Average	28.0	1.59	18.80

Interpoll Laboratories, Inc.

(612) 786-6020

Printout of ESC Model 80 DAS
for CEM Trailer No. 2
- 1994 -

File Name: LPDE8
Job Number: 4-2557
Client: Louisiana Pacific - Dungannon
Location: Dungannon, Virginia

Dryer Stack -- Run 8

Julian Date	Time (Hrs)	Conc. (dry basis unless noted) NOx (ppmv)	CO2 (%v/v)	O2 (%v/v)
087	15:35:00	43.9	2.31	18.01
087	15:36:00	43.3	2.32	18.04
087	15:37:00	40.0	2.46	17.86
087	15:38:00	37.5	2.60	17.69
087	15:39:00	35.2	2.78	17.49
087	15:40:00	33.7	3.06	17.22
087	15:41:00	35.4	3.04	17.19
087	15:42:00	37.1	3.02	17.23
087	15:43:00	38.5	2.83	17.38
087	15:44:00	41.4	2.67	17.61
087	15:45:00	41.2	2.67	17.62
087	15:46:00	38.2	2.85	17.45
087	15:47:00	37.1	2.93	17.33
087	15:48:00	36.9	2.93	17.33
087	15:49:00	37.4	2.94	17.35
087	15:50:00	37.1	3.06	17.22
087	15:51:00	36.6	3.11	17.13
087	15:52:00	36.0	3.07	17.20
087	15:53:00	37.5	3.09	17.18
087	15:54:00	36.9	3.19	17.08
087	15:55:00	37.1	3.04	17.20
087	15:56:00	38.9	2.88	17.39
087	15:57:00	40.1	2.73	17.55
087	15:58:00	39.8	2.63	17.68
087	15:59:00	38.4	2.71	17.61
087	16:00:00	38.0	2.75	17.57
087	16:01:00	36.9	2.77	17.54
087	16:02:00	35.6	2.93	17.38
087	16:03:00	34.9	3.08	17.19
087	16:04:00	35.6	3.11	17.19
087	16:05:00	37.6	4.59	15.94
087	16:06:00	44.8	4.93	14.99
087	16:07:00	41.7	2.83	17.23
087	16:08:00	38.9	2.95	17.40

Interpoll Laboratories, Inc.

(612) 786-6020

Printout of ESC Model 80 DAS
for CEM Trailer No. 2
- 1994 -

File Name: LPDE8
Job Number: 4-2557
Client: Louisiana Pacific - Dungannon
Location: Dungannon, Virginia

Dryer Stack -- Run 8

Julian Date	Time (Hrs)	Conc. (dry basis unless noted) NOx (ppmv)	CO2 (%v/v)	O2 (%v/v)
087	16:09:00	38.8	3.52	16.88
087	16:10:00	40.1	3.28	16.90
087	16:11:00	43.2	2.54	17.68
087	16:12:00	46.9	2.26	18.19
087	16:13:00	39.1	2.51	17.86
087	16:14:00	36.6	2.60	17.75
087	16:15:00	33.6	2.83	17.49
087	16:16:00	33.5	3.06	17.26
087	16:17:00	33.3	3.10	17.15
087	16:18:00	35.5	3.01	17.27
087	16:19:00	35.5	3.02	17.27
087	16:20:00	35.4	3.00	17.26
087	16:21:00	36.4	2.90	17.36
087	16:22:00	36.3	2.70	17.55
087	16:23:00	38.7	2.46	17.85
087	16:24:00	43.0	2.26	18.09
087	16:25:00	44.7	2.08	18.32
087	16:26:00	44.8	1.93	18.55
087	16:27:00	33.4	2.80	17.72
087	16:28:00	37.8	1.79	18.35
087	16:29:00	39.3	1.56	19.03
087	16:30:00	41.6	1.95	18.55
087	16:31:00	40.4	2.08	18.33
087	16:32:00	41.3	1.80	18.59
087	16:33:00	39.0	1.65	18.82
087	16:34:00	37.0	1.58	18.91
	Run Average	38.4	2.75	17.56

		LP - Dungannon			Report No. 4-2557E				
		Oxides of Nitrogen							
		LB/HR Calculations							
RUN	NOx ppm	Flow	LB/DSCF	LB/HR					
1	28.6	29820	3.41E-06	6.11					
2	33.2	29820	3.96E-06	7.09			M	(MOLECULAR WT)	
3	28.4	29820	3.39E-06	6.07		NO2	46.01		
4	38.2	29820	4.56E-06	8.16		HCL	36.458		
5	31.3	29820	3.74E-06	6.69		SO2	64.06		
6	36.9	29820	4.41E-06	7.88		CO	28		
7	28.0	29820	3.34E-06	5.98		CO2	44		
8	38.4	29820	4.58E-06	8.20		CH4	16		
Average	32.875			7.02		Ammonia	17.031		