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Draft 3/22/96

VALID RESULTS, INC.: Gaseous Air Emission Test Result Summary (%AS)

Client:	Longview Fibre
Date:	3/20/96 & 3/21/1996
Operator:	T. P., M. R.
Plant Location:	Seattle, WA
Source:	Boiler #1
Standard Pressure (Pstd):	29.92
Standard Temperature (Tstd):	68

Natural Gas Fired

Test Parameter	Applicable Standard (lbs/MMBtu)	Test Result (lbs/MMBtu)	Compliance Result (Percent of AS)
Sulfur Dioxide Emissions	0.01	0.00043	4.3%
Oxides of Nitrogen Emissions	0.05	0.0285	57.0%
Carbon Monoxide Emissions	0.05	0.0058	11.6%
Volatile Organic Emissions	0.02	0.0043	21.5%

#2 Fuel Oil Fired

Test Parameter	Applicable Standard (lbs/MMBtu)	Test Result (lbs/MMBtu)	Compliance Result (Percent of AS)
Sulfur Dioxide Emissions	0.60	0.1361	22.7%
Oxides of Nitrogen Emissions	0.20	0.0494	24.7%
Carbon Monoxide Emissions	0.10	0.0003	0.3%
Volatile Organic Emissions	0.05	0.0011	2.2%

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Draft 3/22/96

VALID RESULTS, INC.: Gaseous Air Emission Test Result Summary

Client:	Longview Fibre
Date:	3/21/96
Operator:	T. P., M. R.
Plant Location:	Seattle, WA
Source:	Boiler #1 (#2 Fuel Oil)
Standard Pressure (Pstd):	29.92
Standard Temperature (Tstd):	68

Sulfur Dioxide Emissions

Test Run Number	Stack Gas Volumetric Flow Rate (dscf/m)	SO2 Concentration (ppm)	SO2 Concentration (mg/dscm)	SO2 Concentration (lb/dscf)	SO2 Emission Rate (lb/hour)	SO2 Emission Rate (tons/year)	SO2 Emission Rate (lbs/MMBtu)
1	1,191	153.3	203.7	1.27E-05	0.907	3.973	0.1353
2	1,496	157.5	209.4	1.30E-05	1.170	5.125	0.1360
3	1,493	157.3	209.1	1.30E-05	1.166	5.107	0.1370
<Average>	<1,393>	<156.0>	<207.4>	<1.29E-05>	<1.081>	<4.735>	<0.1361>

Oxides of Nitrogen Emissions

Test Run Number	Stack Gas Volumetric Flow Rate (dscf/m)	NO_x Concentration (ppm)	NO_x Concentration (mg/dscm)	NO_x Concentration (lb/dscf)	NO_x Emission Rate (lb/hour)	NO_x Emission Rate (tons/year)	NOx Emission Rate (lbs/MMBtu)
1	1,191	40.5	77.3	4.81E-06	0.344	1.507	0.05124
2	1,496	33.7	64.3	4.01E-06	0.360	1.577	0.04195
3	1,493	43.8	83.6	5.21E-06	0.467	2.045	0.05492
<Average>	<1,393>	<39.3>	<75.1>	<4.68E-06>	< 0.390 >	< 1.710 >	<0.0494>

Carbon Monoxide Emissions

Test Run Number	Stack Gas Volumetric Flow Rate (dscf/m)	CO Concentration (ppm)	CO Concentration (mg/dscm)	CO Concentration (lb/dscf)	CO Emission Rate (lb/hour)	CO Emission Rate (tons/year)	CO Emission Rate (lbs/MMBtu)
1	1,191	0.31	0.36	2.24E-08	0.002	0.009	0.00024
2	1,496	0.43	0.50	3.11E-08	0.003	0.013	0.00033
3	1,493	0.42	0.49	3.05E-08	0.003	0.013	0.00032
<Average>	<1,393>	< 0.39 >	< 0.45 >	<2.80E-08>	<0.003>	<0.012>	<0.00030>

Volatile Organic Emissions (as TOC)

Test Run Number	Stack Gas Volumetric Flow Rate (dscf/m)	TOC Concentration (ppm)	TOC Concentration (mg/dscm)	TOC Concentration (lb/dscf)	TOC Emission Rate (lb/hour)	TOC Emission Rate (tons/year)	TOC Emission Rate (lbs/MMBtu)
1	1,191	0.80	1.50	9.34E-08	0.007	0.031	0.00099
2	1,496	0.90	1.60	9.97E-08	0.009	0.039	0.00104
3	1,493	1.10	2.00	1.25E-07	0.011	0.048	0.00132
<Average>	<1,393>	< 0.93 >	< 1.70 >	<1.06E-07>	<0.009>	<0.039>	<0.00112>

NO$_x$ Concentration (ppm) = bias calibration corrected value

NO$_x$ Concentration (mg/dscm) = ((ppm)(46.01 g/g-mole)*(41,500)/(1,000,000))*

NO$_x$ Concentration (lb/dscf) = ((mg/dscm)(0.01543 grains/mg)/((7000 grains/lb)*(35.32 cubic feet/cubic meter)))*

NO$_x$ Emission (lb/hr) = ((lb/dscf)(dscf/m)*60 min/hr))*

NO$_x$ Emission (tons/yr) = ((lb/hr)(24 hr/day)*(365 day/yr)/(2000 lb/ton))*

NO$_x$ Emission (lbs/MMBtu) = ((lb/dscf)(8710)*(20.9)/(20.9 - Stack Oxygen)*

Draft 3/22/96

VALID RESULTS, INC.: Gaseous Air Emission Test Result Summary

Client: Longview Fibre
Date: 3/20/96
Operator: T. P., M. R.
Plant Location: Seattle, WA
Source: Boiler #1 (Natural Gas)
Standard Pressure (Pstd): 29.92
Standard Temperature (Tstd): 68

Sulfur Dioxide Emissions

Test Run Number	Stack Gas Volumetric Flow Rate (dscf/m)	SO2 Concentration (ppm)	SO2 Concentration (mg/dscm)	SO2 Concentration (lb/dscf)	SO2 Emission Rate (lb/hour)	SO2 Emission Rate (tons/year)	SO2 Emission Rate (lbs/MMBtu)
1	1,132	0.08	0.11	6.85E-09	0.00047	0.00206	0.00009
2	1,541	0.81	1.08	6.73E-08	0.00622	0.02724	0.00074
3	1,681	0.48	0.64	3.99E-08	0.00402	0.01761	0.00045
<Average>	<1,451>	<0.46>	<0.61>	<3.80E-08>	<0.00357>	<0.01564>	<0.00043>

Oxides of Nitrogen Emissions

Test Run Number	Stack Gas Volumetric Flow Rate (dscf/m)	NO_x Concentration (ppm)	NO_x Concentration (mg/dscm)	NO_x Concentration (lb/dscf)	NO_x Emission Rate (lb/hour)	NO_x Emission Rate (tons/year)	NOx Emission Rate (lbs/MMBtu)
1	1,132	20.7	39.5	2.46E-06	0.167	0.731	0.03252
2	1,541	20.1	38.4	2.39E-06	0.221	0.968	0.02638
3	1,681	19.9	38.0	2.37E-06	0.239	1.047	0.02670
<Average>	<1,451>	<20.2>	<38.6>	<2.41E-06>	< 0.209 >	< 0.915 >	<0.0285>

Carbon Monoxide Emissions

Test Run Number	Stack Gas Volumetric Flow Rate (dscf/m)	CO Concentration (ppm)	CO Concentration (mg/dscm)	CO Concentration (lb/dscf)	CO Emission Rate (lb/hour)	CO Emission Rate (tons/year)	CO Emission Rate (lbs/MMBtu)
1	1,132	8.23	9.57	5.96E-07	0.040	0.175	0.00788
2	1,541	7.80	9.07	5.65E-07	0.052	0.228	0.00624
3	1,681	4.01	4.66	2.90E-07	0.029	0.127	0.00327
<Average>	<1,451>	< 6.68 >	< 7.77 >	<4.84E-07>	<0.040>	<0.177>	<0.0058>

Volatile Organic Emissions (as TOC)

Test Run Number	Stack Gas Volumetric Flow Rate (dscf/m)	TOC Concentration (ppm)	TOC Concentration (mg/dscm)	TOC Concentration (lb/dscf)	TOC Emission Rate (lb/hour)	TOC Emission Rate (tons/year)	TOC Emission Rate (lbs/MMBtu)
1	1,132	3.60	6.60	4.11E-07	0.028	0.123	0.00543
2	1,541	2.80	5.10	3.18E-07	0.029	0.127	0.00351
3	1,681	3.10	5.70	3.55E-07	0.036	0.158	0.00400
<Average>	<1,451>	< 3.17 >	< 5.80 >	<3.61E-07>	<0.031>	<0.136>	<0.0043>

NO_x Concentration (ppm) = bias calibration corrected value

NO_x Concentration (mg/dscm) = ((ppm)(46.01 g/g-mole)*(41.500)/(1,000,000))*

NO_x Concentration (lb/dscf) = ((mg/dscm)(0.01543 grains/mg)/((7000 grains/lb)*(35.32 cubic feet/cubic meter)))*

NO_x Emission (lb/hr) = ((lb/dscf)(dscf/m)*60 min/hr))*

NO_x Emission (tons/yr) = ((lb/hr)(24 hr/day)*(365 day/yr)/(2000 lb/ton))*

NO_x Emission (lbs/MMBtu) = ((lb/dscf)(8710)*(20.9)/(20.9 - Stack Oxygen)*

VALID RESULTS, INC.: Gaseous Test Result Summary Sheet

Client: Longview Fibre
Date: 3/21/96
Operator: T. P., M. B.
Plant Location: Seattle, WA
Source: Boiler #1
Standard Pressure (Pstd): 29.92
Standard Temperature (Tstd): 68

Sulfur Dioxide Emissions

Test Run Number	Stack Gas Volumetric Flow Rate (dscf/m)	SO2 Concentration (ppm)	SO2 Concentration (mg/dscm)	SO2 Concentration (lb/dscf)	SO2 Emission Rate (lb/hour)	SO2 Emission Rate (tons/year)	SO2 Emission Rate (lbs/MMBtu)
1	1,132	0.08	0.11	6.85E-09	0.00047	0.00206	0.00029
2	1,541	0.81	1.08	6.73E-08	0.00622	0.02724	0.00216
3	1,681	0.48	0.64	3.99E-08	0.00402	0.01761	0.00137
<Average>	<1,451>	<0.46>	<0.61>	<3.80E-08>	<0.00357>	<0.01564>	<0.00127>

Oxides of Nitrogen Emissions

Test Run Number	Stack Gas Volumetric Flow Rate (dscf/m)	NO_x Concentration (ppm)	NO_x Concentration (mg/dscm)	NO_x Concentration (lb/dscf)	NO_x Emission Rate (lb/hour)	NO_x Emission Rate (tons/year)	NOx Emission Rate (lbs/MMBtu)
1	1,132	20.7	39.5	2.46E-06	0.167	0.731	0.1031
2	1,541	20.1	38.4	2.39E-06	0.221	0.968	0.0767
3	1,681	19.9	38.0	2.37E-06	0.239	1.047	0.0813
<Average>	<1,451>	<20.2>	<38.6>	<2.41E-06>	< 0.209 >	< 0.915 >	<0.0870>

Carbon Monoxide Emissions

Test Run Number	Stack Gas Volumetric Flow Rate (dscf/m)	CO Concentration (ppm)	CO Concentration (mg/dscm)	CO Concentration (lb/dscf)	CO Emission Rate (lb/hour)	CO Emission Rate (tons/year)	CO Emission Rate (lbs/MMBtu)
1	1,132	8.23	9.57	5.96E-07	0.040	0.175	0.025
2	1,541	7.80	9.07	5.65E-07	0.052	0.228	0.018
3	1,681	4.01	4.66	2.90E-07	0.029	0.127	0.010
<Average>	<1,451>	< 6.68 >	< 7.77 >	<4.84E-07>	<0.040>	<0.177>	<0.0177>

Volatile Organic Emissions (as TOC)

Test Run Number	Stack Gas Volumetric Flow Rate (dscf/m)	TOC Concentration (ppm)	TOC Concentration (mg/dscm)	TOC Concentration (lb/dscf)	TOC Emission Rate (lb/hour)	TOC Emission Rate (tons/year)	TOC Emission Rate (lbs/MMBtu)
1	1,132	3.60	6.60	4.11E-07	0.028	0.123	0.017
2	1,541	2.80	5.10	3.18E-07	0.029	0.127	0.010
3	1,681	3.10	5.70	3.55E-07	0.036	0.158	0.012
<Average>	<1,451>	< 3.17 >	< 5.80 >	<3.61E-07>	<0.031>	<0.136>	<0.0130>

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Air Emission Compliance Test Report

Total Particulate Matter (PM-10), Oxygen (O_2), Carbon Dioxide (CO_2), Sulfur Dioxide (SO_2), Oxides of Nitrogen (NO_x), Carbon Monoxide (CO) and Total Organic Carbon (TOC).

Cleaver-Brooks Boiler

(3/20/96 & 3/21/96)

Longview Fibre Company, Inc.
P. O. Box 24867
Seattle, WA 98124
(206) 762-7170

Prepared By:

VALID RESULTS, INC.
5223 22nd Ave. N. E., Suite B
Seattle, WA 98105-5746
Tel: (206) 522-5665
Fax: (206) 524-4710

Air Emission Compliance Test Report

Particulate Matter (PM-10) and Continuous SO_2, NO_x, CO & VOC Emission Monitoring

LONGVIEW FIBRE COMPANY, INC.
Western Container Division
5901 East Marginal Way South
Seattle, WA 98134
(206) 762-7170

SOURCE: Main stack outlet of a Cleaver-Brooks boiler located in Seattle, Washington.

TEST PARAMETERS:

Oxygen (O_2), Carbon Dioxide (CO_2), Sulfur Dioxide (SO_2), Oxides of Nitrogen (NO_x), Carbon Monoxide (CO) and Total Organic Carbon (TOC).

TEST PURPOSE: Compliance Air Emissions Testing.

TEST DATE: March 20th & 21st, 1996.

TEST RESULTS:

Natural Gas Fired

Test Parameter	Applicable Standard (AS)	Test Result	Percent of AS
Sulfur Dioxide	0.01 (lbs/MMBtu)	0.00043	4.3%
Oxides of Nitrogen	0.05 (lbs/MMBtu)	0.0285	57.0%
Carbon Monoxide	0.05 (lbs/MMBtu)	0.0054	10.8%
Volatile Organics	0.02 (lbs/MMBtu)	0.0043	21.5%

#2 Fuel Oil Fired

Test Parameter	Applicable Standard (AS)	Test Result	Percent of AS
Particulate Matter (PM-10)	0.02 (grains/dscf@7% O_2)	0.00532	26.6%
Sulfur Dioxide	0.60 (lbs/MMBtu)	0.144	24.0%
Oxides of Nitrogen	0.20 (lbs/MMBtu)	0.0521	26.1%
Carbon Monoxide	0.10 (lbs/MMBtu)	0.0008	0.1%
Volatile Organics	0.05 (lbs/MMBtu)	0.0013	2.3%

CERTIFICATION:

Mr. Mark W. Anderson, P.E.
Independent Consultant
AERCO, INC., P.S.

Mr. Tracy A. Prevo
Project Manager
VALID RESULTS, INC.

We certify that the information contained within is accurate and complete to the best of our knowledge.

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PURPOSE:

On March 20th and 21st, Valid Results, Incorporated performed United States Environmental Protection Agency (EPA) Title 40, Code of Federal Regulations, Part 60 (40CFR60), Appendix A, tests to quantify the stack gas outlet opacity and concentration and emission rate of Total Particulate Matter with a diameter of less than ten microns (PM - 10), Oxygen (O_2), Carbon Dioxide (CO_2), Sulfur Dioxide (SO_2), Oxides of Nitrogen (NO_x), Carbon Monoxide (CO) and Volatile Organic Compounds (VOC) from the Natural Gas and Number 2 Fuel Oil Fired Cleaver-Brooks Boiler rated at twenty Million British Thermal Units (20 MMBtu) of heat input located at the Longview Fibre Company facility on East Marginal Way South in Seattle, Washington.

PM-10 test results are presented in concentration units of grains per dry standard cubic feet corrected to seven percent oxygen (grains/dscf @7% O_2) for comparison with the Applicable Standard (AS) listed in PSAPCA NOC# 6264. Diluent O_2 and CO_2 test results are presented in units of percent by volume ($\%_{/v}$). Pollutant SO_2, NO_x, CO and VOC test results are presented in concentration units of parts per million by volume ($ppm_{/v}$) and emission rate units of pounds per Million British Thermal Units (lbs/MMBtu) of heat input. VOCs have been measured as Propane (C_3H_8) and reported as Total Organic Carbon (TOC) less Methane (CH_4).

PROCEDURE:

Valid Results, Incorporated performed the following Environmental Protection Agency (EPA) Title 40 Code of Federal Regulations Part 60 (40CFR60) Chapter I Appendix A Test Methods.

Method	Parameter	Analysis	Duration	Application
• 1	Sample Point Locations	tape measure	once	Inside Stack Diameter (D_{eq})
• 2	Volumetric Flow Rate	pressure-temp	3- 15 minute	Pitot, Manometer & Thermocouple
• 3A	Molecular Weight (O_2, CO_2)	analyzer	3 one-hour	Paramagnetic-O_2 / IR-CO_2
• 4	Moisture Content	gravimetric	3 half-hour	Weight Gain - Sample Volume Ratio
• 5	Particulate Matter (PM-10)	gravimetric	3 one-hour	Front And Back Half Analysis
• 6C	Sulfur Dioxide (SO_2)	analyzer	3 one-hour	UltraViolet Photometric (UV)
• 7E	Oxides of Nitrogen (NO_x)	analyzer	3 one-hour	Chemiluminescent (CHEM)
• 9	Visible Emissions	opacity	1 six-minute	WA DEQ Certified Observer
• 10	Carbon Monoxide (CO)	analyzer	3 one-hour	Non-Dispersive Infrared (NDIR
• 25A	Hydrocarbons (TOC - CH4)	analyzer	3 one-hour	Flame Ionization Detection (FID)

Test Methods 1, 2, 3A and 4 were performed in conjunction with the Method 5 PM-10 tests to determine the stack gas volumetric flow rate in dry standard cubic feet per minute (DSCF/M) for calculation of representative emission rates. Test Method 6C was performed to determine the parts per million by volume ($ppm_{/v}$) concentration of gaseous Sulfur Dioxide (SO_2) by ultraviolet photoluminescence (UV). Test Method 7E was performed to determine the $ppm_{/v}$ concentration of gaseous Oxides of Nitrogen (NO_x) by Chemiluminescence. Test Method 10 was performed to determine the $ppm_{/v}$ concentration of gaseous Carbon Monoxide (CO) by Non-Dispersive Infrared Detection (NDIR). Test Method 25A was performed to determine the $ppm_{/v}$ concentration of gaseous Total Non-Methane Hydrocarbons (TOC - CH4) by Flame Ionization Detection (FID).

Source Test Methods:

METHOD 1: *Selection of Traverse Points*

EPA Method 1 was used to determine the location of sample points for the velocity and particulate matter traverses. The number of sample points used was determined by the number of equivalent inside stack diameters that the sample ports were located from the nearest upstream and downstream flow disturbances. The specific sample point locations were determined by splitting the stack into a number (determined above) of equal concentric areas and locating each sample point at the centroid of the respective area.

METHOD 2: *Stack Gas Velocity and Volumetric Flow Rate*

EPA Method 2 was used to determine the stack gas velocity and volumetric flow rate of the effluent gas stream. Pressure and temperature reading were taken at the sample points determined by Method 1. Pressure readings were measured using a "Standard-type" Pitot tube and an inclined manometer connected to the Pitot tube through quarter inch tubing. Pitot tube leak checks were performed before and after every test run. The stack gas temperature was measured using a calibrated (+/- 1 degree Fahrenheit) type-K thermocouple attached to the Pitot to provide the sampling point temperature simultaneously with the velocity measurement.

During the velocity traverse a stack static pressure was taken by turning the pitot perpendicular to the gas flow (zero delta P) and removing the appropriate side of the pitot from the manometer (+ or -).

The other data necessary for the calculation of the volumetric flow rate are the barometric pressure, moisture content of the effluent, and the stack gas composition (O_2 and CO_2).

METHOD 3A: *Molecular Weight Determination*

EPA Method 3A was used to determine the percentage by volume of oxygen (O_2) and carbon dioxide (CO_2) in the effluent stream. These concentrations were used to determine the dry and wet stack gas molecular weights. Method 3A (continuous emission monitoring - paramagnetic oxygen and infrared carbon dioxide analyzers) was used to correct the Method 5 PM-10 concentration test results to seven percent oxygen.

A representative sample of the effluent gas was extracted using a "rake" type stainless steel probe (described in Method 25) containing an in-stack quartz glass wool filter at the analyzer (closed) end of the probe tip. Calibration gas were applied to front of the quart glass wool filter. The sample was dried by condensation near the sample ports and then drawn through a Teflon® sample line to the vacuum side of a Teflon head sample pump. After leaving the pressure side of the pump, the sample was passed through a heated 5 μm filter and delivered to a sample manifold under constant pressure. As required, the sample was delivered from the sample manifold to a paramagnetic oxygen and nondispersive infrared carbon dioxide analyzer. The analyzer output voltages were recorded by a Data Acquisition System (DAS) and back-up strip chart recorder that were operated continuously throughout the test.

A Sample/Calibration Gas Control Module was used to direct and control the flow of sample and calibration gases to the analyzers. In addition to providing samples of the effluent gas to an analyzer, the Control Module permits direct (internal) calibration of the analyzers, or calibration of the analyzers through the sample system (external). The Control Module employs a by-pass valve to maintain a constant sample (or calibration gas) pressure at the sample manifold. Flow meters monitor bypass flows from the back-pressure regulator and sample ports on each analyzer. The probe-to-manifold sample line consists of 3/8-inch Teflon® tubing. 1/4-inch Teflon® tubing delivers sample to the analyzers from the sample manifold.

METHOD 3A: *Molecular Weight Determination (continued)*

Leak checks of the sample system were conducted before and after each test sequence. Leak checks were performed by capping the sample probe in front of the filter and using the sample pump to draw a vacuum on the sample system. Sample system integrity was verified by the total sample flow rate meter dropping to zero (except for the inherent sample pump oscillation).

The calibration of each analyzer (including the sample system) was verified before and after each test run using EPA Protocol 1 gases. A selector valve at the Gas Control Module directed the flow of different calibration gases to the front end of the sample probe or to the sample manifold as needed. At the probe, a pressure activated valve was used to select either a gas sample from the sample probe or calibration gas supplied to the probe through a calibration gas line.

EPA Protocol 1 calibration gas blends were utilized with Method 3A to perform low and high range external calibrations for both the O_2 and CO_2 analyzers. Oxides of nitrogen and carbon monoxide blended with nitrogen ($NO_2/CO/N_2$) were used for the "zero" gas.

METHOD 4: *Stack Gas Moisture Content Determination*

EPA Method 4 was used to determine the moisture content of the stack gas. A condenser assembly comprised of four glass impingers set in an ice bath was used to extract and collect the moisture from the effluent gas sample. The first two impingers contained 100 ml of deionized water. The third impinger was left empty to collect any potential condensate carryover, and a fourth impinger contained a pre-weighed amount of silica gel to act as the "absolute" collector of residual condensate.

A known volume of effluent gas, as measured by a calibrated metering system connected to the extraction pump, was passed through a stainless steel sample probe to the condenser assembly for a specific period of time. After the extraction was complete, the amount of liquid (condensate) in the first three impingers was measured volumetrically. The amount of liquid collected in the silica gel was then determined gravimetrically. The total condensate gain of the condenser assembly was determined and recorded with the calculated volume of gas that was directed through the system. The subsequent moisture content of the stack gas was then determined from these collected variables.

METHOD 5: *Particulate Matter Determination (PSAPCA)*

EPA Method 5 was used to determine the concentration and emission rate of total (front and back half) particulate matter in the stack effluent. The Method 5 back half impinger catch was analyzed for condensible and organic compounds (water, acetone and methylene chloride fractions). The total front and back half particulate matter was assumed to be particulate matter less than ten microns in diameter (PM-10). The sampling was performed utilizing a Nutech 2010 Isokinetic Stack Sampling System (glass nozzles, probe liners and filters).

Method 5 provides for a sample of stack gas to be extracted isokinetically through a quartz glass nozzle from points located within equal cross-sectional areas of the stack. The sample was maintained in the vapor phase and drawn through a heated, quartz glass probe liner into a heated glass filter assembly containing a glass fiber filter. The sample was then drawn through Teflon® tubing into a chilled condensing unit consisting of four glass impingers as described in the Method 4 description above. The condensing unit effectively removed all moisture from the sample gas being collected before it entered the sample pump and dry gas volume measuring system.

METHOD 5: *Particulate Matter Determination (continued)*

The sampling system was leak-checked at the nozzle before every test run using 15 inches of vacuum, and after every test run at a vacuum equal to the highest vacuum reached during that test run. After the successful completion of each test sequence, the "Front half" (before the filter) particulate emissions were collected by triple rinsing and brushing the probe liner and nozzle with acetone. The glass fiber filter holder and back-half impingers were then sealed with aluminum foil for subsequent sample recovery following the test sequence.

PM-10 emissions were calculated from the weight gain of Total (front and back half) Particulate Matter. The particulate matter weight gain was determined utilizing the procedures described below. Emission rates were calculated using the equations provided in 40CFR60 Chapter I Appendix A Test Method 5.

Filters were initially conditioned by desiccating for 24 hours. The filters were then weighed repeatedly every six hours until a constant weight was achieved. A constant weight was reached when the difference of three consecutive weights from the average did not deviate by more than ± 0.5 milligrams. Two filters "field blank and trip blank" were also weighed for post-test analysis validation that the test samples had not been contaminated.

The post-test filters were desiccated for at least 24 hours before being weighed. A filter "blank", which was handled in the same manner as the filter samples, was also conditioned and weighed. The net gain from the filter blank was subtracted from the particulate gain of the total sample.

The front half of the filter holder was triple rinsed and brushed with acetone into the "front-half" sample jar. The "front-half" washes were then transferred to a desiccated and tare weighed aluminum weighing tin. The weighing tins were then evaporated to dryness, desiccated and weighed to a constant weight. A "reagent blank" sample was retained from the acetone lot. The net gain from the reagent blank was also subtracted from the particulate gain of the total sample if the blank residue was less than 0.01 mg/g or 0.001% of the weight of the reagent used.

The "Back half" sample (water, acetone and methylene chloride) was recovered by extracting the organic compounds from the impinger water with methylene chloride. This methylene chloride fraction was then placed in a tare weighed glass beaker for evaporation at room temperature. The remaining impinger water was then placed in an additional tare weighed glass beaker and evaporated to dryness at 150 degrees Fahrenheit. The impingers and separation funnel were then triple rinsed with acetone and placed into a tare weighed aluminum dish for evaporation.

The "Back half" particulate emissions were calculated using the weight gain from the impinger water, final acetone impinger rinse and methylene chloride organic extraction fractions.

METHOD 6C: *Sulfur Dioxide Determination*

EPA Method 6C was used for the continuous measurement of SO_2 concentrations in the effluent gas utilizing an ultraviolet photometric analyzer.

The SO_2 analyzer was calibrated using a nitrogen "zero Gas" and EPA Protocol 1 "equivalent" blends of Sulfur Dioxide/nitrogen (SO_2/N_2) to provide span concentrations of approximately 40 to 60%, and 80 to 100% of the SO_2 analyzers' full scale range. EPA Protocol 1 "equivalent" blends are defined in 40CFR60 Chapter 1 Appendix A Test Method 6C Section 6.1.2 Alternative #2 as certified standards that have been triple analyzed within six months of their use by Method 6 and shown to be within 5% of the certification value. All zero and span checks were recorded and annotated on the strip chart recordings. Copies of the strip chart recordings are contained in appendix B. Copies of the calibration gas certifications are contained in appendix E.

METHOD 7E: *Oxides of Nitrogen Determination*

EPA Method 7E was used for the continuous measurement of NO_X concentrations in the effluent gas. Method 7E utilizes a chemiluminescent analyzer containing an in-line converter which converts all nitrogen dioxide (NO_2) in the sample to nitric oxide (NO). Method 7E utilizes the same sample system (probe, filter, moisture removal, transfer, pumping, secondary filtration, manifold and calibration gas control module) described in Method 3A. The analyzer output was continuously recorded throughout the test by a DAS and a strip chart recorder.

The NO_X analyzer was calibrated using a "zero gas" consisting of oxygen and carbon dioxide blended in nitrogen or ambient air scrubbed free of NO_X. EPA Protocol 1 blends of nitric oxide in nitrogen (NO/N_2) were used to provide span concentrations of approximately 40 to 60%, and 80 to 100% of the NOx analyzers' full scale range. All zero and span checks were recorded and annotated on the strip chart recordings contained in appendix B.

METHOD 9: *Visual Opacity Determination*

One hour of EPA Method 9 opacity readings were taken while the boiler was fired on #2 fuel oil.

METHOD 10: *Carbon Monoxide Determination*

EPA Method 10 was used for the continuous measurement of CO concentrations in the effluent gas. Method 10 utilizes an infrared analyzer and the same sample system (probe, filter, moisture removal, transfer, pumping, secondary filtration, manifold and calibration gas control module) described in Method 3A. The analyzer output was recorded by a DAS and a strip chart recorder that were operated continuously throughout the test.

The CO analyzer was calibrated using a "zero gas" consisting of oxygen and carbon dioxide blended in nitrogen ($O_2/CO_2/N_2$). EPA Protocol 1 blends of carbon monoxide / nitric oxide / nitrogen ($CO/NO_x/N_2$) were used to provide span concentrations of approximately 40 to 60%, and 80 to 100% of the CO analyzers' full scale range. All zero and span checks were recorded and annotated on the chart recordings included in appendix B.

METHOD 25A: Volatile Organic Carbon (VOC) Determination (TOC-CH_4)

EPA Method 25A was used to determine the emissions of volatile organic carbon (VOC) measured as total organic carbon less methane (TOC - CH4) by flame ionization. Prior to testing a stratification check was performed to verify that the pollutant concentration was uniformly distributed across the stack. For each test run conducted the end of a "rake" type stainless steel sample probe (described in Method 25) was placed across the stack flow to provide simultaneous gaseous sampling from three points across the stack.

The sample was drawn through a probe with a glass or quartz wool filter into a heated Teflon® sample line and directly into the hydrocarbon analyzer by an internal heated sample pump at a constant pressure and flow rate. The analyzer output voltage was recorded by a data acquisition system and a back up strip chart recorder which were operated continuously throughout the test.

The calibration of the TOC FID analyzer was verified before and after each test run using three EPA Protocol 1 calibration gas standards. The hydrocarbon analyzer was calibrated using a "zero gas" consisting of "oxygen-free" nitrogen or scrubbed ambient air. Three blends of propane in nitrogen (C_3H_8/N_2) or propane in air were used to provide span concentrations in the approximate ranges of 25-35%, 45-55%, and 80-90% of the analyzer's full scale range. All zero, span and test run averages are annotated on the strip chart recording included in appendix B.

APPARATUS:

Isokinetic Particulate Tests - Nutech Model 522

316 stainless steel (316 SS) s-type pitot tube, type-K thermocouple, quartz nozzle and probe liner, heated four inch glass filter holder containing glass fiber filters on a glass frit, Teflon® sample transfer lines, four Greenburg-Smith® impingers (two containing high performance liquid chromatography (HPLC) grade distilled deionized (DI) water, one empty and one containing indicating silica gel), Teflon® head diaphragm pump with bypass and shut-off valve, Rockwell T110 dry gas meter, critical orifice, dual inclined manometer, type K thermocouples and readout and solid state temperature controllers. All "sample contacting" surfaces were rinsed with methylene chloride prior to testing.

CEM Test Van

Valid Results, Incorporated's dry extractive Continuous Emissions Monitoring (CEM) system is contained in an insulated and air conditioned Ford E350 14' Box Van. The CEM system analyzers, data logger and computer are electrically protected by a power line conditioner with true sine-wave voltage output.

CEM Analyzers

Parameter	*Method*	*Analyzer*	*Technology*
O_2	3A	Siemens Oxymat 5E	Paramagnetic
CO_2	3A	Siemens Ultramat 5E	Infrared
SO_2	6C	BOVAR 721ATM	UV Photometric
NO_x	7E	TECO 42H	Chemiluminescence
CO	10	TECO 48	Infrared
VOC	25A	TECO 51-HT	Flame Ionization

Data Acquisition System (DAS)

CEM analyzer output voltage data were recorded by a Fluke Hydra Data Logger with Trend-Link® and Excel® spreadsheet data export software and a Honeywell DPR3000 strip chart recorder. CEM analyzer zero, calibration and test interval averages were recorded on the strip chart recording, which was submitted as a field data sheet in appendix B.

DATA:

Copies of all field data sheets (appendix B), analysis data sheets (appendix C), strip chart recordings (appendix B), source operating conditions data sheets (appendix D) and manual calculation verification sheets (appendix F) are included in this final test report.

CALCULATIONS:

All calculations associated with this project have been performed in accordance with the applicable EPA testing and analysis methodology. A dimensional analysis summary of all equations used is included in the attached Tables 1 - 4. Calculation tables for the stack gas volumetric flow rate (SDCF/M), stack gas moisture content (B_{ws}), CEM analyzer bias calibration corrections and pounds per million BTU emission rates are included in Appendix A.

Table 1

Volumetric Flow Rate Equations

Equation:	Dimension:
Dry Gas Molecular Weight $M_d = 0.44*(\%CO_2)+0.32*(\%O_2)+0.28(100-((\%CO_2)+(\%O_2)))$	*gm/gm-mole*
Stack gas Moisture Content $B_{ws} = (V_{wc} + V_{wsg})/(V_{wc} + V_{wsg} + V_{mstd})$	*decimal fraction*
Impinger Volume Gain $V_{wc} = 0.04707*(\text{Final Volume - Initial Volume})$	*milliliters*
Silica Gel Weight Gain $V_{wsg} = 0.04715*(\text{Final Weight - Initial Weight})$	*grams*
Method 4 Corrected Sample Volume $V_{m(std)} = (V_m*Y*((T_{std}+460)/(T_m+460))*(P_m/P_{std})$	*dscf*
Wet Gas Molecular Weight $M_s = M_d*(1-B_{ws}) + 18.0*B_{ws}$	*gm/gm-mole*
Stack Gas Velocity $V_s = 85.49*C_p*SQRT(DeltaP)*SQRT((T_s+460)/((P_{bar}+(P_{static}/13.6))*M_s))$	*feet/second*
Corrected Stack Gas Volumetric Flow Rate $Q_{s(std)} = 60*(1-B_{ws})*V_s*A_s*((T_{std}+460)/(T_s+460))*((P_{bar}+(P_{static}/13.6))/P_{std})$	*dscf/m*
Stack Area $A_s = ((1/4)*(3.1416)*(D_{eq}^2)/(144))$	*square feet*
Actual Stack Gas Volumetric Flow Rate $Q_{s(actual)} = 60*V_s*A_s$	*acf/m*

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Table 2

Emission Rate Equations

Equation:	Dimension:
Bias Calibration Correction $ppm_{BC} = ((ppm_{/v\ one\text{-}hour\ average} - C_o)*C_{ma}/(C_m - C_o))$	*ppm*
Pollutant Correction to Seven Percent Oxygen $ppm_{BC}\ @7\%\ O_2 = ((ppm_{BC})*(20.9 - 7.0)/(20.9 - O_{2\ STACK}))$	*ppm @7% O_2*
Gaseous Concentration $XX\ mg/dscm = ((XX\ ppm)*(MW_{pollutant}\ g/g\text{-}mole)*(41500)/(1{,}000{,}000\ ng/mg))$	*mg/dscm*
Gaseous Concentration $XX\ gm/dscm = ((XX\ mg/dscm)/(1000\ mg/gm))$	*gm/dscm*
Gaseous Concentration $XX\ grains/dscf = ((XX\ mg/dscm)*(0.0154\ grains/mg)/(35.32\ cubic\ feet/cubic\ meter))$	*gr/dscf*
Gaseous Emission Rate $XX\ lb/hr = ((XX\ grains/dscf)*(Q_{s(std)}\ dscf/m)*(60\ min/hr)/(7000\ grains/lb))$	*lb/hr*
Gaseous Emission Rate $XX\ tons/year = ((XX\ lb/hr)*(24\ hr/day)*(365\ days/year)/(2000\ lb/ton))$	*tons/year*
Gaseous Emission Rate - Heat Input Rate $XX\ lb/MMBtu = ((XX\ lb/hr)/(YY\ MMBtu/hr))$	*lb/MMBtu*
Gaseous Emission Rate - Fuel Use Rate - EPA Method 19 option $XX\ lb/MMBtu = ((XX\ lbs/dscf)*(F_d\ dscf/MMBtu)*(20.9/(20.9 - \%O_{2\ STACK})))$	*lb/MMBtu*

Table 3

Variables

Variable:	Name:	Dimension:
$\%CO_2$	stack gas carbon dioxide content ($CO_{2\ STACK}$)	*percent*
$\%O_2$	stack gas oxygen content ($O_{2\ STACK}$)	*percent*
M_d	stack gas dry molecular weight	*gm/gm-mole*
V_{wc}	impinger water volume gain (ml)	*cubic feet*
V_{wsg}	silica gel weight gain (mg)	*cubic feet*
V_m	Method 4 dry gas meter volume	*cubic feet*
$V_{m(std)}$	Method 4 corrected dry gas meter volume	*dry standard cubic feet*
Y	dry gas meter correction coefficient	*dimensionless*
T_{std}	standard temperature (68)	*degrees Fahrenheit*
T_m	measured meter temperature	*degrees Fahrenheit*
P_{std}	standard pressure (29.92)	*inches Mercury*
P_m	dry gas meter pressure	*inches water*
P_{bar}	barometric pressure	*inches Mercury*
delta H	average critical orifice pressure drop	*inches water*
B_{ws}	stack gas moisture content	*decimal fraction*
Ms	wet stack gas molecular weight	*gm/gm-mole*
V_s	stack gas velocity	*feet per second*
C_p	pitot tube coefficient	*dimensionless*
SQRT(Delta P)	The average square root of the pitot tube pressure drop	*inches water*
T_s	stack gas temperature	*degrees Fahrenheit*
P_{static}	stack static pressure	*inches water*
$Q_{s(std)}$	standard volumetric flow rate	*dscf/m*
A_s	stack area at sample ports	*square feet*
π	ratio of circle circumference to diameter	*dimensionless*
D_{eq}	inside stack diameter at sample ports	*inches*
$Q_{s(actual)}$	actual volumetric flow rate	*acf/m*
$MW_{(pollutant)}$	molecular weight of pollutant	*gm/gm-mole*
C	average reference method value	*% or ppm*
C_o	average measured bias calibration zero value	*% or ppm*
C_m	average measured bias calibration value	*% or ppm*
C_{ma}	actual bias calibration gas value	*% or ppm*
$ppm_{/v}$	one hour average pollutant concentration	*ppm*
ppm_{BC}	pollutant concentration bias calibration correction	*ppm_{BC}*
ppm_{BC} @7% O_2	pollutant concentration corrected to 7% oxygen	*ppm @7% O_2*
F_d	fuel oil F-factor (9,190 for oil)	*dscf/MMBtu*
$Q_{HEAT\ INPUT\ RATE}$	fuel use rate and heat capacity (provided by source)	*MMBtu/hr*

Table 4
Nomenclature

Nomenclature:	Description:
gm/gm-mole	*gram per gram-mole*
ft/s	*feet per second*
dscf/m	*dry standard cubic feet per minute*
acf/m	*actual cubic feet per minute*
dscm	*dry standard cubic meter*
dscf	*dry standard cubic feet*
gr	*grains*
mg	*milligram*
ml	*milliliter*
$\%_{/v}$	*percent by volume*
$ppm_{/v}$	*parts per million by volume*
ppm_{BC}	*bias calibration corrected parts per million*
ppm @7% O_2	*parts per million corrected to seven percent oxygen*
mg/dscm	*milligrams per dry standard cubic meter*
gm/dscm	*grams per dry standard cubic meter*
gr/dscf	*grains per dry standard cubic foot*
lb/hr	*pounds per hour*
ton/yr	*tons per year*
lb/MMBtu	*pounds per million Btu of heat input*
MMBtu/hr	*million Btu per hour*
dscf/MMBtu	*dry standard cubic feet per million Btu*
Btu	*British thermal unit of heat input*

VALID RESULTS, INC.: Gaseous Air Emission Test Result Summary

Client:	Longview Fibre
Date:	3/20/96 & 3/21/1996
Operator:	T. P., M. R.
Plant Location:	Seattle, WA
Source:	Boiler #1
Standard Pressure (Pstd):	29.92
Standard Temperature (Tstd):	68

Natural Gas Fired

Test Parameter	Applicable Standard (AS) (lbs/MMBtu)	Test Result (lbs/MMBtu)	Compliance Result (Percent of AS)
Sulfur Dioxide Emissions	0.01	0.00043	4.3%
Oxides of Nitrogen Emissions	0.05	0.0285	57.0%
Carbon Monoxide Emissions	0.05	0.0054	10.8%
Volatile Organic Emissions	0.02	0.0043	21.5%

#2 Fuel Oil Fired

Test Parameter	Applicable Standard (AS) (lbs/MMBtu)	Test Result (lbs/MMBtu)	Compliance Result (Percent of AS)
Sulfur Dioxide Emissions	0.60	0.144	24.0%
Oxides of Nitrogen Emissions	0.20	0.0521	26.1%
Carbon Monoxide Emissions	0.10	0.00008	0.1%
Volatile Organic Emissions	0.05	0.00113	2.3%

VALID RESULTS, INC.: Gaseous Air Emission Test Result Summary

Client: Longview Fibre
Date: 3/20/96
Operator: T. P., M. R.
Plant Location: Seattle, WA
Source: Boiler #1 (Natural Gas)
Standard Pressure (Pstd): 29.92
Standard Temperature (Tstd): 68

Sulfur Dioxide Emissions

Test Run Number	Stack Gas Volumetric Flow Rate (dscf/m)	SO2 Concentration (ppm)	SO2 Concentration (mg/dscm)	SO2 Concentration (lb/dscf)	SO2 Emission Rate (lb/hour)	SO2 Emission Rate (tons/year)	SO2 Emission Rate (lbs/MMBtu)
1	1,131	0.09	0.12	7.47E-09	0.00051	0.00223	0.00010
2	1,540	0.81	1.08	6.73E-08	0.00622	0.02724	0.00074
3	1,699	0.48	0.64	3.99E-08	0.00407	0.01783	0.00045
<Average>	<1,457>	<0.46>	<0.61>	<3.82E-08>	<0.00360>	<0.01577>	<0.00043>

Oxides of Nitrogen Emissions

Test Run Number	Stack Gas Volumetric Flow Rate (dscf/m)	NO, Concentration (ppm)	NO, Concentration (mg/dscm)	NO, Concentration (lb/dscf)	NO, Emission Rate (lb/hour)	NO, Emission Rate (tons/year)	NOx Emission Rate (lbs/MMBtu)
1	1,131	20.7	39.5	2.46E-06	0.167	0.731	0.03252
2	1,540	20.1	38.4	2.39E-06	0.221	0.968	0.02638
3	1,699	19.9	38.0	2.37E-06	0.242	1.060	0.02670
<Average>	<1,457>	<20.2>	<38.6>	<2.41E-06>	< 0.210 >	< 0.920 >	<0.0285>

Carbon Monoxide Emissions

Test Run Number	Stack Gas Volumetric Flow Rate (dscf/m)	CO Concentration (ppm)	CO Concentration (mg/dscm)	CO Concentration (lb/dscf)	CO Emission Rate (lb/hour)	CO Emission Rate (tons/year)	CO Emission Rate (lbs/MMBtu)
1	1,131	7.66	8.90	5.54E-07	0.038	0.166	0.00732
2	1,540	7.25	8.43	5.25E-07	0.049	0.215	0.00580
3	1,699	3.73	4.34	2.70E-07	0.028	0.123	0.00304
<Average>	<1,457>	< 6.21 >	< 7.22 >	<4.50E-07>	<0.038>	<0.168>	<0.0054>

Volatile Organic Emissions (reported as TOC (3*bias calibration corrected value)))

Test Run Number	Stack Gas Volumetric Flow Rate (dscf/m)	TOC Concentration (ppm)	TOC Concentration (mg/dscm)	TOC Concentration (lb/dscf)	TOC Emission Rate (lb/hour)	TOC Emission Rate (tons/year)	TOC Emission Rate (lbs/MMBtu)
1	1,131	3.30	6.00	3.74E-07	0.025	0.110	0.00494
2	1,540	2.80	5.10	3.18E-07	0.029	0.127	0.00351
3	1,699	3.50	6.40	3.99E-07	0.041	0.180	0.00449
<Average>	<1,457>	< 3.20 >	< 5.83 >	<3.64E-07>	<0.032>	<0.139>	<0.0043>

Concentration (ppm) = bias calibration corrected value (except VOC)

Concentration (mg/dscm) = ((ppm)(MW(pollutant) g/g-mole)*(41,500)/(1,000,000))*

Concentration (lb/dscf) = ((mg/dscm)(0.01543 grains/mg)/((7,000 grains/lb)*(35.32 cubic feet/cubic meter)))*

Emission Rate (lb/hr) = ((lb/dscf)(dscf/m)*60 min/hr))*

Emission Rate (tons/yr) = ((lb/hr)(24 hr/day)*(365 day/yr)/(2,000 lb/ton))*

Emission Rate (lbs/MMBtu) = ((lb/dscf)(8,710)*(20.9)/(20.9 - Stack Oxygen)*

VALID RESULTS, INC.: Gaseous Air Emission Test Result Summary

Client: Longview Fibre
Date: 3/21/96
Operator: T. P. M. R.
Plant Location: Seattle, WA
Source: Boiler #1 (#2 Fuel Oil)
Standard Pressure (Pstd): 29.92
Standard Temperature (Tstd): 68

Sulfur Dioxide Emissions

Test Run Number	Stack Gas Volumetric Flow Rate (dscf/m)	SO2 Concentration (ppm)	SO2 Concentration (mg/dscm)	SO2 Concentration (lb/dscf)	SO2 Emission Rate (lb/hour)	SO2 Emission Rate (tons/year)	SO2 Emission Rate (lbs/MMBtu)
1	1,185	153.3	203.7	1.27E-05	0.903	3.955	0.1427
2	1,465	157.5	209.4	1.30E-05	1.143	5.006	0.1435
3	1,949	159.2	210.2	1.31E-05	1.532	6.710	0.1457
<Average>	<1,533>	<156.3>	<207.8>	<1.29E-05>	<1.193>	<5.224>	<0.1440>

Oxides of Nitrogen Emissions

Test Run Number	Stack Gas Volumetric Flow Rate (dscf/m)	NO_x Concentration (ppm)	NO_x Concentration (mg/dscm)	NO_x Concentration (lb/dscf)	NO_x Emission Rate (lb/hour)	NO_x Emission Rate (tons/year)	NOx Emission Rate (lbs/MMBtu)
1	1,185	40.5	77.3	4.81E-06	0.342	1.498	0.05406
2	1,465	33.7	64.3	4.01E-06	0.252	1.542	0.04426
3	1,949	43.8	83.6	5.21E-06	0.609	2.667	0.05794
<Average>	<1,533>	<39.3>	<75.1>	<4.68E-06>	< 0.434 >	< 1.902 >	<0.0521>

Carbon Monoxide Emissions

Test Run Number	Stack Gas Volumetric Flow Rate (dscf/m)	CO Concentration (ppm)	CO Concentration (mg/dscm)	CO Concentration (lb/dscf)	CO Emission Rate (lb/hour)	CO Emission Rate (tons/year)	CO Emission Rate (lbs/MMBtu)
1	1,185	0.10	0.12	7.47E-09	0.001	0.004	0.00008
2	1,465	0.10	0.12	7.47E-09	0.001	0.004	0.00008
3	1,949	0.10	0.12	7.47E-09	0.001	0.004	0.00008
<Average>	<1,533>	< 0.10 >	< 0.12 >	<7.47E-09>	<0.001>	<0.004>	<0.00008>

Volatile Organic Emissions (reported as TOC (3*bias calibration corrected value))

Test Run Number	Stack Gas Volumetric Flow Rate (dscf/m)	TOC Concentration (ppm)	TOC Concentration (mg/dscm)	TOC Concentration (lb/dscf)	TOC Emission Rate (lb/hour)	TOC Emission Rate (tons/year)	TOC Emission Rate (lbs/MMBtu)
1	1,185	0.70	1.30	8.10E-08	0.006	0.025	0.00091
2	1,465	0.90	1.60	9.97E-08	0.009	0.039	0.00110
3	1,949	1.10	2.00	1.25E-07	0.015	0.066	0.00139
<Average>	<1,533>	< 0.90 >	< 1.63 >	<1.02E-07>	<0.010>	<0.044>	<0.00113>

Concentration (ppm) = bias calibration corrected value (except VOC)

Concentration (mg/dscm) = ((ppm)(MW(pollutant) g/g-mole)*(41,500)/(1,000,000))*

Concentration (lb/dscf) = ((mg/dscm)(0.01543 grains/mg)/((7,000 grains/lb)*(35.32 cubic feet/cubic meter)))*

Emission Rate (lb/hr) = ((lb/dscf)(dscf/m)*60 min/hr))*

Emission Rate (tons/yr) = ((lb/hr)(24 hr/day)*(365 day/yr)/(2,000 lb/ton))*

Emission Rate (lbs/MMBtu) = ((lb/dscf)(9,190)*(20.9)/(20.9 - Stack Oxygen)*

VALID RESULTS, INC.: Particulate Matter Emission Rate Calculation Form

Client:	Longview Fibre Co.	Standard Temperature:	528	degrees Rankine
Operator:	M. Regan	Standard Pressure:	29.92	inches mercury
Plant Location:	Seattle, WA	Pitot Tube Coefficient (Cp):	0.84	dimensionless
Source:	Boiler	Meter Coefficient (Yd):	1.0003	dimensionless
Control Equip:	LO NOx Burner	Stack Diameter:	23.75	inches
Permit Limit:	0.02 grains/dscf @7% Oxygen	Stack Outlet Area (As):	3.076	square feet

	Symbol	Dimension	Run 1	Run 2	Run 3	<Averages>
Test Date			3/21/96	3/21/96	3/21/96	
Test Time			1338-1502	1554-1742	1850-2004	
Load						
Total Emission Rate	ER(t)	lbs/hour	0.10	0.07	0.06	<0.08>
Total Cor. Emission Rate	Erc(t)	grains/dscf @7%O2	0.00826	0.00459	0.00311	<0.00532>
Total Emission Rate	Er(t)	grains/dscf	0.01016	0.00574	0.00386	<0.00659>
Total Emission Rate	er(t)	mg/dscm	23.24	13.13	8.84	<15.07>
Total sample weight gain	Tmg	milligrams	33.3	21.8	19.4	<24.8>
Front Half Emission Rate	ER(f)	lbs/hour	0.03	0.02	0.03	<0.03>
Front Half Emission Rate	Er(f)	grains/dscf	0.00329	0.00182	0.00177	<0.00229>
Front Half Emission Rate	er(f)	mg/dscm	7.54	4.16	4.05	<5.25>
Front Half weight gain	FHmg	milligrams	10.8	6.9	8.9	<8.9>
Corrected Sample Volume	Vm(std)	dscf	50.586	58.619	77.509	<62.238>
Corrected Sample Volume		dscm	1.433	1.660	2.195	<1.763>
Stack Gas Flow Rate	Qs(std)	dscf/min	1.186E+03	1.465E+03	1.949E+03	<1.53E+03>
Stack Gas Flow Rate	Qs(Act)	acf/min	1.969E+03	2.344E+03	3.187E+03	<2.50E+03>
Stack Gas Moisture	Bws	%/100	0.1064	0.0862	0.0771	<0.0817>
Stack Gas Velocity	Vs	feet/sec	10.67	12.70	17.27	<13.55>
Stack Pressure	Ps	inches HG	30.45	30.40	30.45	<30.43>
Stack Temperature	Ts	degrees R	797.6	784.5	811.0	<797.7>
Stack Oxygen	%O2	percent	3.81	3.50	3.63	<3.6>
Isokinetic Sample Rate	ISOK	percent	101.4	95.1	94.5	<97.0>

Where:

lbs/hour = (grains/dscf)*(dscf/minute)*(60 minutes/hour)*(1 lb/ 7000 grains)
grains/dscf = (0.001 grams/milligram)*(15.43 grains/gram)*(mg)/(Vm(std))
milligrams/dscm = (35.31 dscf/dscm)*(mg)/(Vm(std))
dscf/minute = 3600*(hour/60 minutes)*(1-Bws)*Vs*As*Tstd*Ps/(Ts*Pstd)
acfm = Vs*As*(60 sec/minute)
Stack Gas Velocity (Vs) is calculated on each individual test run isokinetic calculation form.

RESULTS:

Test results are presented as the arithmetic averages of three one hour test runs.

PM-10 test results are presented in concentration units of grains per dry standard cubic feet corrected to seven percent oxygen (grains/dscf @7% O_2). Diluent O_2, CO_2, test results are presented in concentration units of percent by volume ($\%_{/v}$). Pollutant SO_2, NO_x, CO and VOC test results are presented in concentration units of parts per million by volume ($ppm_{/v}$) and emission rate units of pounds per Million British Thermal Units (lbs/MMBtu) of heat input. VOCs have been measured as Propane (C_3H_8) and reported as Total Organic Carbon less Methane (TOC-CH_4).

QUALITY ASSURANCE:

VALID RESULTS has developed procedural outline checklists (field sampling, sample chain of custody, equipment calibration and manual emission rate calculation sheets) for each test method designed to document adherence to the applicable test protocols in accordance with the quality assurance guidelines outlined in document EPA-600/4-77-027b "Quality Assurance Handbook for Air Pollution Measurement Systems, Volume 3". Mr. Prevo completed the EPA Air Pollution Training Institute (APTI) Course #SI:414 "Quality Assurance for Source Emission Measurements" in March of 1993.

CEM analyzers were calibrated externally before and after every test run by introducing EPA Protocol One calibration gas standards to the front of the sample probe (in front of the filter) while maintaining a constant sample rate and recording each analyzer's response on a data acquisition system, strip chart recorder and field data sheet.

CEM analyzer output voltages were in alignment with and corresponded to the data acquisition system (DAS) and the strip chart recorder settings.

Calibration data sheets for the type K stack thermocouple and dry gas meter are contained in Appendix E.

All calculations in this report have been made according to the applicable equations as shown in the EPA 40CFR60 Appendix A, and have been checked manually by Tracy Prevo and independently by Mr. Mark Anderson, P. E..

A manual calculation verifying each step of the emission rate calculation for (#2 fuel oil) oxides of nitrogen test run number two is contained in Appendix F.

SOURCE OPERATIONS:

Plant personnel reported that the boilers were operating normally throughout the source tests conducted on March 20th and 21st, 1996. Unit Operating Condition parameters were recorded by Valid Results, Inc. at intervals throughout the source test. A summary of the unit operating conditions recorded is contained in Appendix D.

APPENDIX A:

Calculations

Method 5 Isokinetic Sample Rate
Method 2 Volumetric Flow Rate
Method 4 H_2O Concentration
R.M. Bias Calibration Corrections
Gaseous Pollutant Emission Rates

VALID RESULTS, INC.: EPA Method 5 Test Run Isokinetic Calculation Table

Client:	Longview Fibre Co.	Standard Temperature:	528	degrees Rankine
Operator:	M. Regan	Standard Pressure:	29.92	inches mercury
Plant Location:	Seattle, WA	Pitot Coefficient (Cp):	0.84	dimensionless
Source:	Boiler	Meter Coefficient (Yd):	1.0003	dimensionless
Control Equip:	LO NOx Burner	Stack Diameter:	23.75	inches
Permit Limit:	0.02 grains/dscf @7% Oxygen	Stack Outlet Area (As):	3.076	square feet

Test Run #1

Test Date: 3/21/1996

#2 Fuel Oil Fired

Calculated Parameters:

Name:	Symbol:	Value:	Units:	Equation:
Isokinetic Sampling Rate	Isokinetics	101.37	%	100*Ts*Vm(std)*Pstd/(60*Tstd*Vs*Time*An*Ps*(1-Bws))
Standard Meter Volume	Vm(std)	50.586	dry standard cubic feet	Vm*Y*Pm*Tstd/(Pstd*Tm)
Stack Gas Velocity	Vs	10.67	feet per second	85.49*Cp*<SQRT(Delta P)>*SQRT(Ts/(Ps*Ms))
Wet Molecular Weight	Ms	28.88	gram/gram-mole	Md*(1-Bws) + 18.0*Bws
Dry Molecular Weight	Md	30.17	gram/gram-mole	0.44*(%CO2) + 0.32*(%O2) + 0.28*(%N2 + %CO)
Stack Gas Moisture	Bws	0.1064	%/100	Vwc(std)/(Vwc(std) + Vm(std))
Standard Water Volume	Vwc(std)	6.022	dry standard cubic feet	0.04707*(Imp ml) + 0.04715*(Silica ml)
Nozzle Area	An	0.002158	square feet	(3.14*(Dn/2)*(Dn/2))/144

Measured Parameters:

Name:	Symbol:	Value:	Units:	Equation:
Standard Temperature	Tstd	528	degrees Rankine	
Standard Pressure	Pstd	29.92	inches mercury	
Barometric Pressure	Pbar	30.45	inches mercury	
Stack Static Pressure	Pstatic	-0.03	inches water	
Pitot Tube Coefficient	Cp	0.84	dimensionless	
Nozzle Diameter	Dn	0.629	inches	
Meter Coefficient	Y	1.0003	dimensionless	
Meter Volume	Vm	49.602	cubic feet	
Sample Time	Time	60	minutes	
Avg. SQRT Pitot Pressure	<SQRT(Delta P)>	0.156	inches water	
Avg. Orifice Pressure	<Delta H>	2.36	inches water	
Avg. Stack Temperature	<Tstk>	337.6	degrees Fahrenheit	
Avg. Meter Temperature	<Tm>	70.0	degrees Fahrenheit	
Stack Temperature	Ts	797.6	degrees Rankine	<Tstk> + 460
Stack Pressure	Ps	30.45	inches mercury	Pbar + (Pstatic/13.6)
Meter Temperature	Tm	530.0	degrees Rankine	<Tm> + 460
Meter Pressure	Pm	30.62	inches mercury	Pbar + (<Delta H>/13.6)
Oxygen	%O2	3.81	%	
Carbon Dioxide	%CO2	12.62	%	
Nitrogen/Carbon Monoxide	%N2 + %CO	83.57	%	
Impinger Water	Imp ml	108.9	milliliters	
Silica Water	Silica ml	19	milliliters	

VALID RESULTS, INC.: EPA Method 5 Test Run Isokinetic Calculation Table

Client:	Longview Fibre Co.	Standard Temperature:	528	degrees Rankine
Operator:	M. Regan	Standard Pressure:	29.92	inches mercury
Plant Location:	Seattle, WA	Pitot Coefficient (Cp):	0.84	dimensionless
Source:	Boiler	Meter Coefficient (Yd):	1.0003	dimensionless
Control Equip:	LO NOx Burner	Stack Diameter:	23.75	inches
Permit Limit:	0.02 grains/dscf @7% Oxygen	Stack Outlet Area (As):	3.076	square feet

Test Run #2

Test Date: 3/21/1996

#2 Fuel Oil Fired

Calculated Parameters:

Name:	Symbol:	Value:	Units:	Equation:
Isokinetic Sampling Rate	Isokinetics	95.08	%	100*Ts*Vm(std)*Pstd/(60*Tstd*Vs*Time*An*Ps*(1-Bws))
Standard Meter Volume	Vm(std)	58.619	dry standard cubic feet	Vm*Y*Pm*Tstd/(Pstd*Tm)
Stack Gas Velocity	Vs	12.70	feet per second	85.49*Cp*<SQRT(Delta P)>*SQRT(Ts/(Ps*Ms))
Wet Molecular Weight	Ms	29.15	gram/gram-mole	Md*(1-Bws) + 18.0*Bws
Dry Molecular Weight	Md	30.20	gram/gram-mole	0.44*(%CO2) + 0.32*(%O2) + 0.28*(%N2 + %CO)
Stack Gas Moisture	Bws	0.0862	%/100	Vwc(std)/(Vwc(std) + Vm(std))
Standard Water Volume	Vwc(std)	5.5311	dry standard cubic feet	0.04707*(Imp ml) + 0.04715*(Silica ml)
Nozzle Area	An	0.002158	square feet	(3.14*(Dn/2)*(Dn/2))/144

Measured Parameters:

Name:	Symbol:	Value:	Units:	Equation:
Standard Temperature	Tstd	528	degrees Rankine	
Standard Pressure	Pstd	29.92	inches mercury	
Barometric Pressure	Pbar	30.4	inches mercury	
Stack Static Pressure	Pstatic	-0.04	inches water	
Pitot Tube Coefficient	Cp	0.84	dimensionless	
Nozzle Diameter	Dn	0.629	inches	
Meter Coefficient	Y	1.0003	dimensionless	
Meter Volume	Vm	57.788	cubic feet	
Sample Time	Time	60	minutes	
Avg. SQRT Pitot Pressure	<SQRT(Delta P)>	0.188	inches water	
Avg. Orifice Pressure	<Delta H>	3.26	inches water	
Avg. Stack Temperature	<Tstk>	324.5	degrees Fahrenheit	
Avg. Meter Temperature	<Tm>	73.2	degrees Fahrenheit	
Stack Temperature	Ts	784.5	degrees Rankine	<Tstk> + 460
Stack Pressure	Ps	30.40	inches mercury	Pbar + (Pstatic/13.6)
Meter Temperature	Tm	533.2	degrees Rankine	<Tm> + 460
Meter Pressure	Pm	30.64	inches mercury	Pbar + (<Delta H>/13.6)
Oxygen	%O2	3.5	%	
Carbon Dioxide	%CO2	12.9	%	
Nitrogen/Carbon Monoxide	%N2 + %CO	83.6	%	
Impinger Water	Imp ml	113.1	milliliters	
Silica Water	Silica ml	4.4	milliliters	

VALID RESULTS, INC.: EPA Method 5 Test Run Isokinetic Calculation Table

Client:	Longview Fibre Co.	Standard Temperature:	528	degrees Rankine
Operator:	M. Regan	Standard Pressure:	29.92	inches mercury
Plant Location:	Seattle, WA	Pitot Coefficient (Cp):	0.84	dimensionless
Source:	Boiler	Meter Coefficient (Yd):	1.0003	dimensionless
Control Equip:	LO NOx Burner	Stack Diameter:	23.75	inches
Permit Limit:	0.02 grains/dscf @7% Oxygen	Stack Outlet Area (As):	3.076	square feet

Test Run #3

Test Date: 3/21/1996

#2 Fuel Oil Fired

Calculated Parameters:

Name:	Symbol:	Value:	Units:	Equation:
Isokinetic Sampling Rate	Isokinetics	94.47	%	100*Ts*Vm(std)*Pstd/(60*Tstd*Vs*Time*An*Ps*(1-Bws))
Standard Meter Volume	Vm(std)	77.509	dry standard cubic feet	Vm*Y*Pm*Tstd/(Pstd*Tm)
Stack Gas Velocity	Vs	17.27	feet per second	85.49*Cp*<SQRT(Delta P)>*SQRT(Ts/(Ps*Ms))
Wet Molecular Weight	Ms	29.25	gram/gram-mole	Md*(1-Bws) + 18.0*Bws
Dry Molecular Weight	Md	30.19	gram/gram-mole	0.44*(%CO2) + 0.32*(%O2) + 0.28*(%N2 + %CO)
Stack Gas Moisture	Bws	0.0771	%/100	Vwc(std)/(Vwc(std) + Vm(std))
Standard Water Volume	Vwc(std)	6.4736	dry standard cubic feet	0.04707*(Imp ml) + 0.04715*(Silica ml)
Nozzle Area	An	0.002158	square feet	(3.14*(Dn/2)*(Dn/2))/144

Measured Parameters:

Name:	Symbol:	Value:	Units:	Equation:
Standard Temperature	Tstd	528	degrees Rankine	
Standard Pressure	Pstd	29.92	inches mercury	
Barometric Pressure	Pbar	30.45	inches mercury	
Stack Static Pressure	Pstatic	-0.03	inches water	
Pitot Tube Coefficient	Cp	0.84	dimensionless	
Nozzle Diameter	Dn	0.629	inches	
Meter Coefficient	Y	1.0003	dimensionless	
Meter Volume	Vm	76.068	cubic feet	
Sample Time	Time	60	minutes	
Avg. SQRT Pitot Pressure	<SQRT(Delta P)>	0.252	inches water	
Avg. Orifice Pressure	<Delta H>	5.73	inches water	
Avg. Stack Temperature	<Tstk>	351.0	degrees Fahrenheit	
Avg. Meter Temperature	<Tm>	74.8	degrees Fahrenheit	
Stack Temperature	Ts	811.0	degrees Rankine	<Tstk> + 460
Stack Pressure	Ps	30.45	inches mercury	Pbar + (Pstatic/13.6)
Meter Temperature	Tm	534.8	degrees Rankine	<Tm> + 460
Meter Pressure	Pm	30.87	inches mercury	Pbar + (<Delta H>/13.6)
Oxygen	%O2	3.63	%	
Carbon Dioxide	%CO2	12.8	%	
Nitrogen/Carbon Monoxide	%N2 + %CO	83.57	%	
Impinger Water	Imp ml	118.8	milliliters	
Silica Water	Silica ml	18.7	milliliters	

VALID RESULTS, INC.: EPA Method 2: Volumetric Flow Rate Determination

Client:	Longview Fibre	Barometric Pressure (P_{bar}):	30.25	Pitot Tube Coeff. (C_p):	0.84
Date:	3/20/96	Standard Temperature (T_{std}):	68	% Oxygen (%O_2):	7.13
Operator:	T. P., M. R.	Standard Pressure (P_{std}):	29.92	% Carbon Dioxide (%CO_2):	7.96
Plant Location:	Seattle, WA	Stack Static Pressure (P_{static}):	-0.02	Moisture Content (%H_2O):	13.07
Source:	Boiler #1 (Natural Gas)	Fuel Type:	Natural Gas	Stack Diameter (D_e\D_s):	23.75
Run #: 1	Time : 14:27	Load:	variable	Stack Area (A_s):	3.076

Port ID#	Point #	% Stack Inside Diam.	Port Depth (inches)	Probe Marks	Cyclonic Zero Angle	Pitot Tube (Delta P)	Stack Temp. (T_s) Deg F	SQRT (Delta P)
S	12	97.9	4	27.3	<6	0.020	**256**	**0.1414**
	11	93.3	4	26.2	<5	0.020	**260**	**0.1414**
	10	88.2	4	24.9	<3	0.020	**266**	**0.1414**
	9	82.3	4	23.5	<3	0.020	**267**	**0.1414**
	8	75.0	4	21.8	<2	0.020	**279**	**0.1414**
	7	64.4	4	19.3	0	0.020	**281**	**0.1414**
	6	35.6	4	12.5	0	0.020	**284**	**0.1414**
	5	25.0	4	9.9	0	0.020	**283**	**0.1414**
	4	17.7	4	8.2	0	0.020	**283**	**0.1414**
	3	11.8	4	6.8	0	0.024	**279**	**0.1549**
	2	6.7	4	5.6	0	0.025	**269**	**0.1581**
	1	2.1	4	4.5	0	0.020	**260**	**0.1414**
W	12	Probe Marks Repeated			<6	0.020	**258**	**0.1414**
	11				<5	0.025	**261**	**0.1581**
	10				<3	0.020	**268**	**0.1414**
	9				<3	0.020	**269**	**0.1414**
	8				<2	0.025	**274**	**0.1581**
	7				0	0.020	**278**	**0.1414**
	6				0	0.020	**283**	**0.1414**
	5				0	0.020	**284**	**0.1414**
	4				0	0.025	**283**	**0.1581**
	3				0	0.020	**278**	**0.1414**
	2				0	0.025	**271**	**0.1581**
	1				0	0.020	**263**	**0.1414**
<Average>							**<272.4>**	**<0.145>**

Molecular Weight Wet (MW_s) = ((0.44(%CO_2) + 0.32(%O_2) + 0.28(%CO + %N_2))*(100-%H_2O) + 0.18(%H_2O))

MW_s = **28.05** Lb/Lb-Mole

Stack Gas Velocity (V_s) = (85.49*C_p*(SQRT(Delta P))*(SQRT((T_s + 460)/((P_{bar} + P_{static}/13.6)*MW_s)))

V_s = **9.67** Feet per Second

Corrected Stack Gas Volumetric Flow Rate (Q_s) = (60*((100-%H_2O)/100)*V_s*A_s*((T_{std} + 460)/(T_s + 460))*(P_s/P_{std}))

$Q_{s(corr)}$ = **1,131** Standard Dry Cubic Feet per Minute

Actual Cubic Feet per Second = 60*V_s*A_s

$Q_{s(actual)}$ = **1,785** Actual Cubic Feet per Minute

VALID RESULTS, INC.: EPA Method 2: Volumetric Flow Rate Determination

Client:	Longview Fibre	Barometric Pressure (P_{bar}):	30.25	Pitot Tube Coeff. (C_p):	0.84
Date:	3/20/96	Standard Temperature (T_{std}):	68	% Oxygen (%O_2):	4.41
Operator:	T. P., M. R.	Standard Pressure (P_{std}):	29.92	% Carbon Dioxide (%CO_2):	9.49
Plant Location:	Seattle, WA	Stack Static Pressure (P_{static}):	-0.04	Moisture Content (%H_2O):	14.85
Source:	Boiler #1 (Natural Gas)	Fuel Type:	Natural Gas	Stack Diameter ($D_e \backslash D_s$):	23.75
Run #: 2	Time : 16:13	Load:	variable	Stack Area (A_s):	3.076

Port ID#	Point #	% Stack Inside Diam.	Port Depth. (inches)	Probe Marks	Cyclonic Zero Angle	Pitot Tube (Delta P)	Stack Temp. (T_s) Deg F	SQRT (Delta P)
W	12	97.9	4	27.25	<6	0.040	**254**	**0.2000**
	11	93.3	4	26.16	<5	0.050	**253**	**0.2236**
	10	88.2	4	24.95	<3	0.040	**257**	**0.2000**
	9	82.3	4	23.55	<3	0.040	**259**	**0.2000**
	8	75.0	4	21.81	<2	0.050	**260**	**0.2236**
	7	64.4	4	19.30	0	0.040	**256**	**0.2000**
	6	35.6	4	12.46	0	0.040	**257**	**0.2000**
	5	25.0	4	9.94	0	0.030	**255**	**0.1732**
	4	17.7	4	8.20	0	0.030	**256**	**0.1732**
	3	11.8	4	6.80	0	0.030	**258**	**0.1732**
	2	6.7	4	5.59	0	0.030	**250**	**0.1732**
	1	2.1	4	4.50	0	0.020	**248**	**0.1414**
S	12				<6	0.050	**288**	**0.2236**
	11				<5	0.060	**288**	**0.2449**
	10				<3	0.060	**290**	**0.2449**
	9		Probe Marks Repeated		<3	0.060	**290**	**0.2449**
	8				<2	0.060	**290**	**0.2449**
	7				0	0.060	**293**	**0.2449**
	6				0	0.050	**295**	**0.2236**
	5				0	0.040	**297**	**0.2000**
	4				0	0.030	**296**	**0.1732**
	3				0	0.030	**294**	**0.1732**
	2				0	0.030	**274**	**0.1732**
	1				0	0.020	**263**	**0.1414**
<Average>							**<271.7>**	**<0.201>**

Molecular Weight Wet (MW_s) = ((0.44(%CO_2) + 0.32(%O_2) + 0.28(%CO + %N_2))*(100-%H_2O) + 0.18(%H_2O))

MW_s = **27.96** Lb/Lb-Mole

Stack Gas Velocity (V_s) = (85.49*C_p*(SQRT(Delta P))*(SQRT((T_s + 460)/((P_{bar} + P_{static}/13.6)*MW_s)))

V_s = **13.43** Feet per Second

Corrected Stack Gas Volumetric Flow Rate (Q_s) = (60*((100-%H_2O)/100)*V_s*A_s*((T_{std} + 460)/(T_s + 460))*(P_s/P_{std}))

$Q_{s(corr)}$ = **1,540** Standard Dry Cubic Feet per Minute

Actual Cubic Feet per Second = 60*V_s*A_s

$Q_{s(actual)}$ = **2,479** Actual Cubic Feet per Minute

VALID RESULTS, INC.: EPA Method 2: Volumetric Flow Rate Determination

Client:	Longview Fibre	Barometric Pressure (P_{bar}):	30.25	Pitot Tube Coeff. (C_p):	0.84
Date:	3/20/96	Standard Temperature (T_{std}):	68	% Oxygen (%O_2):	4.74
Operator:	T. P., M. R.	Standard Pressure (P_{std}):	29.92	% Carbon Dioxide (%CO_2):	9.26
Plant Location:	Seattle, WA	Stack Static Pressure (P_{static}):	-0.06	Moisture Content (%H_2O):	15.05
Source:	Boiler #1 (Natural Gas)	Fuel Type:	Natural Gas	Stack Diameter (D_e\D_s):	23.75
Run #: 3	Time : 18:06	Load:	variable	Stack Area (A_s):	3.076

Port ID#	Point #	% Stack Inside Diam.	Port Depth (inches)	Probe Marks	Cyclonic Zero Angle	Pitot Tube (Delta P)	Stack Temp. (T_s) Deg F	SQRT (Delta P)
W	12	97.9	4	27.25	<6	0.060	**288**	**0.2449**
	11	93.3	4	26.16	<5	0.060	**285**	**0.2449**
	10	88.2	4	24.95	<3	0.060	**286**	**0.2449**
	9	82.3	4	23.55	<3	0.060	**291**	**0.2449**
	8	75.0	4	21.81	<2	0.060	**294**	**0.2449**
	7	64.4	4	19.30	0	0.060	**294**	**0.2449**
	6	35.6	4	12.46	0	0.060	**296**	**0.2449**
	5	25.0	4	9.94	0	0.050	**300**	**0.2236**
	4	17.7	4	8.20	0	0.050	**302**	**0.2236**
	3	11.8	4	6.80	0	0.040	**302**	**0.2000**
	2	6.7	4	5.59	0	0.030	**294**	**0.1732**
	1	2.1	4	4.50	0	0.030	**270**	**0.1732**
S	12	Probe Marks Repeated			<6	0.050	**287**	**0.2236**
	11				<5	0.050	**287**	**0.2236**
	10				<3	0.060	**286**	**0.2449**
	9				<3	0.060	**290**	**0.2449**
	8				<2	0.050	**299**	**0.2236**
	7				0	0.060	**298**	**0.2449**
	6				0	0.060	**298**	**0.2449**
	5				0	0.050	**296**	**0.2236**
	4				0	0.040	**298**	**0.2000**
	3				0	0.050	**291**	**0.2236**
	2				0	0.040	**278**	**0.2000**
	1				0	0.040	**267**	**0.2000**
<Average>							**<290.7>**	**<0.225>**

Molecular Weight Wet (MW_s) = ((0.44(%CO_2) + 0.32(%O_2) + 0.28(%CO + %N_2))*(100-%H_2O) + 0.18(%H_2O))

MW_s = **27.91** Lb/Lb-Mole

Stack Gas Velocity (V_s) = (85.49*C_p*(SQRT(Delta P))*(SQRT((T_s + 460)/((P_{bar} + P_{static}/13.6)*MW_s)))

V_s = **15.24** Feet per Second

Corrected Stack Gas Volumetric Flow Rate (Q_s) = (60*((100-%H_2O)/100)*V_s*A_s*((T_{std} + 460)/(T_s + 460))*(P_s/P_{std}))

$Q_{s(corr)}$ = **1,699** Standard Dry Cubic Feet per Minute

Actual Cubic Feet per Second = 60*V_s*A_s

$Q_{s(actual)}$ = **2,813** Actual Cubic Feet per Minute

VALID RESULTS , EPA Method 2: Volumetric Flow Rate Determination

Client:	Longview Fibre	Barometric Pressure (P_{bar}):	30.45	Pitot Tube Coeff. (C_p):	0.84
Date:	3/21/96	Standard Temperature (T_{std}):	68	% Oxygen (%O_2):	3.81
Operator:	T. P., M. R.	Standard Pressure (P_{std}):	29.92	% Carbon Dioxide (%CO_2):	12.62
Plant Location:	Seattle, WA	Stack Static Pressure (P_{static}):	-0.03	Moisture Content (%H_2O):	10.64
Source:	Boiler #1 (#2 Fuel Oil)	Fuel Type:	Natural Gas	Stack Diameter ($D_e \backslash D_s$):	23.75
Run #: 1	Time : 14:27	Load:	variable	Stack Area (A_s):	3.076

Port ID#	Point #	% Stack Inside Diam.	Port Depth (inches)	Probe Marks	Cyclonic Zero Angle	Pitot Tube (Delta P)	Stack Temp. (T_s) Deg F	SQRT (Delta P)
S	12	97.9	4	27.3	<5	0.035	**331**	**0.1871**
	11	93.3	4	26.2	<5	0.035	**351**	**0.1871**
	10	88.2	4	24.9	<5	0.035	**351**	**0.1871**
	9	82.3	4	23.5	<5	0.035	**350**	**0.1871**
	8	75.0	4	21.8	<5	0.035	**349**	**0.1871**
	7	64.4	4	19.3	<5	0.040	**349**	**0.2000**
	6	35.6	4	12.5	<5	0.040	**350**	**0.2000**
	5	25.0	4	9.9	<5	0.045	**350**	**0.2121**
	4	17.7	4	8.2	<5	0.035	**345**	**0.1871**
	3	11.8	4	6.8	<5	0.010	**330**	**0.1000**
	2	6.7	4	5.6	<5	0.010	**300**	**0.1000**
	1	2.1	4	4.5	<5	0.010	**283**	**0.1000**
W	12	Probe Marks Repeated			<5	0.020	**315**	**0.1414**
	11				<5	0.015	**333**	**0.1225**
	10				<5	0.010	**334**	**0.1000**
	9				<5	0.010	**334**	**0.1000**
	8				<5	0.010	**336**	**0.1000**
	7				<5	0.010	**351**	**0.1000**
	6				<5	0.035	**352**	**0.1871**
	5				<5	0.040	**351**	**0.2000**
	4				<5	0.040	**344**	**0.2000**
	3				<5	0.020	**344**	**0.1414**
	2				<5	0.020	**335**	**0.1414**
	1				<5	0.035	**335**	**0.1871**
<Average>							**<337.6>**	**<0.156>**

Molecular Weight Wet (MW_s) = ((0.44(%CO_2) + 0.32(%O_2) + 0.28(%CO + %N_2))*(100-%H_2O) + 0.18(%H_2O))

MW_s = **28.88** Lb/Lb-Mole

Stack Gas Velocity (V_s) = (85.49*C_p*(SQRT(Delta P))*(SQRT((T_s + 460)/((P_{bar} + P_{static}/13.6)*MW_s)))

V_s = **10.67** Feet per Second

Corrected Stack Gas Volumetric Flow Rate (Q_s) = (60*((100-%H_2O)/100)*V_s*A_s*((T_{std} + 460)/(T_s + 460))*(P_s/P_{std}))

$Q_{s(corr)}$ = **1,185** Standard Dry Cubic Feet per Minute

Actual Cubic Feet per Second = 60*V_s*A_s

$Q_{s(actual)}$ = **1,969** Actual Cubic Feet per Minute

VALID RESULTS , EPA Method 2: Volumetric Flow Rate Determination

Client:	Longview Fibre	Barometric Pressure (P_{bar}):	30.40	Pitot Tube Coeff. (C_p):	0.84
Date:	3/21/96	Standard Temperature (T_{std}):	68	% Oxygen (%O_2):	3.50
Operator:	T. P., M. R.	Standard Pressure (P_{std}):	29.92	% Carbon Dioxide (%CO_2):	12.90
Plant Location:	Seattle, WA	Stack Static Pressure (P_{static}):	-0.04	Moisture Content (%H_2O):	8.62
Source:	Boiler #1 (#2 Fuel Oil)	Fuel Type:	Diesel #2	Stack Diameter (D_e\D_s):	23.75
Run #: 2	Time : 16:30	Load:	variable	Stack Area (A_s):	3.076

Port ID#	Point #	% Stack Inside Diam.	Port Depth (inches)	Probe Marks	Cyclonic Zero Angle	Pitot Tube (Delta P)	Stack Temp. (T_s) Deg F	SQRT (Delta P)
S	12	97.9	4	27.3	<5	0.035	**300**	**0.1871**
	11	93.3	4	26.2	<5	0.030	**330**	**0.1732**
	10	88.2	4	24.9	<5	0.030	**332**	**0.1732**
	9	82.3	4	23.5	<5	0.030	**340**	**0.1732**
	8	75.0	4	21.8	<5	0.035	**344**	**0.1871**
	7	64.4	4	19.3	<5	0.035	**347**	**0.1871**
	6	35.6	4	12.5	<5	0.040	**347**	**0.2000**
	5	25.0	4	9.9	<5	0.035	**341**	**0.1871**
	4	17.7	4	8.2	<5	0.025	**322**	**0.1581**
	3	11.8	4	6.8	<5	0.030	**273**	**0.1732**
	2	6.7	4	5.6	<5	0.020	**282**	**0.1414**
	1	2.1	4	4.5	<5	0.035	**280**	**0.1871**
W	12	Probe Marks Repeated			<5	0.045	**310**	**0.2121**
	11				<5	0.040	**326**	**0.2000**
	10				<5	0.040	**345**	**0.2000**
	9				<5	0.040	**345**	**0.2000**
	8				<5	0.040	**369**	**0.2000**
	7				<5	0.040	**372**	**0.2000**
	6				<5	0.040	**365**	**0.2000**
	5				<5	0.040	**347**	**0.2000**
	4				<5	0.035	**347**	**0.1871**
	3				<5	0.035	**286**	**0.1871**
	2				<5	0.035	**275**	**0.1871**
	1				<5	0.040	**264**	**0.2000**
<Average>							**<324.5>**	**<0.188>**

Molecular Weight Wet (MW_s) = ((0.44(%CO_2) + 0.32(%O_2) + 0.28(%CO + %N_2))*(100-%H_2O) + 0.18(%H_2O))

MW_s = **29.15** Lb/Lb-Mole

Stack Gas Velocity (V_s) = (85.49*C_p*(SQRT(Delta P))*(SQRT((T_s + 460)/((P_{bar} + P_{static}/13.6)*MW_s)))

V_s = **12.70** Feet per Second

Corrected Stack Gas Volumetric Flow Rate (Q_s) = (60*((100-%H_2O)/100)*V_s*A_s*((T_{std} + 460)/(T_s + 460))*(P_s/P_{std}))

$Q_{s(corr)}$ = **1,465** Standard Dry Cubic Feet per Minute

Actual Cubic Feet per Second = 60*V_s*A_s

$Q_{s(actual)}$ = **2,344** Actual Cubic Feet per Minute

VALID RESULTS , EPA Method 2: Volumetric Flow Rate Determination

Client:	Longview Fibre	Barometric Pressure (P_{bar}):	30.45	Pitot Tube Coeff. (C_p):	0.84
Date:	3/21/96	Standard Temperature (T_{std}):	68	% Oxygen (%O_2):	3.63
Operator:	T. P., M. R.	Standard Pressure (P_{std}):	29.92	% Carbon Dioxide (%CO_2):	12.80
Plant Location:	Seattle, WA	Stack Static Pressure (P_{static}):	-0.03	Moisture Content (%H_2O):	7.71
Source:	Boiler #1 (#2 Fuel Oil)	Fuel Type:	Natural Gas	Stack Diameter (D_e\D_s):	23.75
Run #: 3	Time : 19:30	Load:	variable	Stack Area (A_s):	3.076

Port ID#	Point #	% Stack Inside Diam.	Port Depth (inches)	Probe Marks	Cyclonic Zero Angle	Pitot Tube (Delta P)	Stack Temp. (T_s) Deg F	SQRT (Delta P)
S	12	97.9	4	27.3	<5	0.070	**345**	**0.2646**
	11	93.3	4	26.2	<5	0.060	**358**	**0.2449**
	10	88.2	4	24.9	<5	0.060	**358**	**0.2449**
	9	82.3	4	23.5	<5	0.060	**360**	**0.2449**
	8	75.0	4	21.8	<5	0.060	**360**	**0.2449**
	7	64.4	4	19.3	<5	0.065	**359**	**0.2550**
	6	35.6	4	12.5	<5	0.065	**358**	**0.2550**
	5	25.0	4	9.9	<5	0.080	**358**	**0.2828**
	4	17.7	4	8.2	<5	0.080	**356**	**0.2828**
	3	11.8	4	6.8	<5	0.060	**333**	**0.2449**
	2	6.7	4	5.6	<5	0.060	**332**	**0.2449**
	1	2.1	4	4.5	<5	0.060	**318**	**0.2449**
W	12	Probe Marks Repeated			<5	0.070	**339**	**0.2646**
	11				<5	0.070	**360**	**0.2646**
	10				<5	0.060	**363**	**0.2449**
	9				<5	0.070	**362**	**0.2646**
	8				<5	0.070	**364**	**0.2646**
	7				<5	0.070	**363**	**0.2646**
	6				<5	0.060	**363**	**0.2449**
	5				<5	0.060	**363**	**0.2449**
	4				<5	0.060	**362**	**0.2449**
	3				<5	0.060	**341**	**0.2449**
	2				<5	0.050	**338**	**0.2236**
	1				<5	0.050	**311**	**0.2236**
<Average>							**<351.0>**	**<0.252>**

Molecular Weight Wet (MW_s) = ((0.44(%CO_2) + 0.32(%O_2) + 0.28(%CO + %N_2))*(100-%H_2O) + 0.18(%H_2O))

MW_s = **29.25** Lb/Lb-Mole

Stack Gas Velocity (V_s) = (85.49*C_p*(SQRT(Delta P))*(SQRT((T_s + 460)/((P_{bar} + P_{static}/13.6)*MW_s)))

V_s = **17.27** Feet per Second

Corrected Stack Gas Volumetric Flow Rate (Q_s) = (60*((100-%H_2O)/100)*V_s*A_s*((T_{std} + 460)/(T_s + 460))*(P_s/P_{std}))

$Q_{s(corr)}$ = **1,949** Standard Dry Cubic Feet per Minute

Actual Cubic Feet per Second = 60*V_s*A_s

$Q_{s(actual)}$ = **3,187** Actual Cubic Feet per Minute

STACK GAS MOISTURE DETERMINATION

Longview Fibre
Seattle, WA
Boiler #1 (Natural Gas)

Date: 3/20/96 Load: variable
Time: 13:37-14:37 Test Run: 1

1. Uncorrected Meter Volume (V_m)	29.356 cubic feet
2. Meter Factor (Y_d)	1.0003
3. Barometric Pressure (Pb)	30.25 " Hg
4. Meter Pressure (^H)	0.8 " H_2O
5. Meter Temperature (T_m)	43.0 F°
6. Std. Temperature (T_{std})	68.0 F°
7. Impinger H_20 Gain (V_w)	93.0 ml
8. Silica Gel Wt. Gain (V_w)	6.7 gm
9. Moisture Vapor ($V_{w\,std}$)	4.693 cubic feet
Std. Meter Volume ($V_{m\,std}$)	**31.225 cubic feet**
Percent of H_2O in Stack (% H_2O)	**13.07 %**

WHERE,

Hg = Mercury
F = Degrees Fahrenheit
ml = milliliters
gm = grams
% = Percent

CALCULATIONS,

Moisture Vapor = ((0.04707* ml H_2O) + (0.04715* mg Silica))

Std. Meter Vol. = $V_m \times Y_d \times (T_{std} + 460) \times (P_b + {}^\wedge H / 13.6) / ((T_m + 460) \times 29.92)$

Stack Moisture = Moisture Vapor / Moisture Vapor + Std. Meter Vol.

STACK GAS MOISTURE DETERMINATION

Longview Fibre
Seattle, WA
Boiler #1 (Natural Gas)

Date: 3/20/96 | Load: variable
Time: 15:48-16:48 | Test Run: 2

1. Uncorrected Meter Volume (V_m)	30.284 cubic feet
2. Meter Factor (Y_d)	1.0003
3. Barometric Pressure (Pb)	30.25 " Hg
4. Meter Pressure (^H)	0.8 " H_2O
5. Meter Temperature (T_m)	42.7 F°
6. Std. Temperature (T_{std})	68.0 F°
7. Impinger H_20 Gain (V_w)	114.4 ml
8. Silica Gel Wt. Gain (V_w)	5.0 gm
9. Moisture Vapor ($V_{w\,std}$)	5.621 cubic feet
Std. Meter Volume ($V_{m\,std}$)	**32.231 cubic feet**
Percent of H_2O in Stack (% H_2O)	**14.85 %**

WHERE,

Hg = Mercury
F = Degrees Fahrenheit
ml = milliliters
gm = grams
% = Percent

CALCULATIONS,

Moisture Vapor = ((0.04707* ml H_2O) + (0.04715* mg Silica))

Std. Meter Vol. = V_m x Y_d x (T_{std} + 460) x (P_b + ^H/13.6)/(T_m + 460) x 29.92)

Stack Moisture = Moisture Vapor / Moisture Vapor + Std. Meter Vol.

STACK GAS MOISTURE DETERMINATION

Longview Fibre
Seattle, WA
Boiler #1 (Natural Gas)

Date: 3/20/96 Load: variable
Time: 17:43-18:43 Test Run: 3

1. Uncorrected Meter Volume (V_m)	29.531 cubic feet
2. Meter Factor (Y_d)	1.0003
3. Barometric Pressure (Pb)	30.25 " Hg
4. Meter Pressure (^H)	0.8 " H_2O
5. Meter Temperature (T_m)	43.7 F°
6. Std. Temperature (T_{std})	68.0 F°
7. Impinger H_20 Gain (V_w)	113.1 ml
8. Silica Gel Wt. Gain (V_w)	5.0 gm
9. Moisture Vapor ($V_{w\,std}$)	5.559 cubic feet
Std. Meter Volume ($V_{m\,std}$)	**31.367 cubic feet**
Percent of H_2O in Stack (% H_2O)	**15.05 %**

WHERE,

Hg = Mercury
F = Degrees Fahrenheit
ml = milliliters
gm = grams
% = Percent

CALCULATIONS,

Moisture Vapor = ((0.04707* ml H_2O) + (0.04715* mg Silica))

Std. Meter Vol. = V_m x Y_d x (T_{std} + 460) x (P_b + ^H / 13.6) / ((T_m + 460) x 29.92)

Stack Moisture = Moisture Vapor / Moisture Vapor + Std. Meter Vol.

STACK GAS MOISTURE DETERMINATION

Longview Fibre
Seattle, WA
Boiler #1 (#2 Fuel Oil)

Date: 3/21/96 | Load: variable
Time: 13:38-15:02 | Test Run: 1

1. Uncorrected Meter Volume (V_m)	49.602 cubic feet
2. Meter Factor (Y_d)	1.0003
3. Barometric Pressure (Pb)	30.45 " Hg
4. Meter Pressure (^H)	2.36 " H_2O
5. Meter Temperature (T_m)	70.0 F°
6. Std. Temperature (T_{std})	68.0 F°
7. Impinger H_20 Gain (V_w)	108.9 ml
8. Silica Gel Wt. Gain (V_w)	19.0 gm
9. Moisture Vapor ($V_{w\,std}$)	6.022 cubic feet
Std. Meter Volume ($V_{m\,std}$)	**50.592 cubic feet**
Percent of H_2O in Stack (% H_2O)	**10.64 %**

WHERE,

Hg = Mercury
F = Degrees Fahrenheit
ml = milliliters
gm = grams
% = Percent

CALCULATIONS,

Moisture Vapor = ((0.04707* ml H_2O) + (0.04715* mg Silica))

Std. Meter Vol. = $V_m \times Y_d \times (T_{std} + 460) \times (P_b + {}^\wedge H / 13.6) / ((T_m + 460) \times 29.92)$

Stack Moisture = Moisture Vapor / Moisture Vapor + Std. Meter Vol.

STACK GAS MOISTURE DETERMINATION

Longview Fibre
Seattle, WA
Boiler #1 (#2 Fuel Oil)

Date: 3/21/96 | Load: variable
Time: 15:54-17:42 | Test Run: 2

1. Uncorrected Meter Volume (V_m)	57.788 cubic feet
2. Meter Factor (Y_d)	1.0003
3. Barometric Pressure (Pb)	30.40 " Hg
4. Meter Pressure (^H)	3.26 " H_2O
5. Meter Temperature (T_m)	73.2 F°
6. Std. Temperature (T_{std})	68.0 F°
7. Impinger H_20 Gain (V_w)	113.1 ml
8. Silica Gel Wt. Gain (V_w)	4.4 gm
9. Moisture Vapor ($V_{w\,std}$)	5.531 cubic feet
Std. Meter Volume ($V_{m\,std}$)	**58.619 cubic feet**
Percent of H_2O in Stack (% H_2O)	**8.62 %**

WHERE,

Hg = Mercury
F = Degrees Fahrenheit
ml = milliliters
gm = grams
% = Percent

CALCULATIONS,

Moisture Vapor = ((0.04707* ml H_2O) + (0.04715* mg Silica))

Std. Meter Vol. = $V_m \times Y_d \times (T_{std} + 460) \times (P_b + {}^\wedge H / 13.6) / ((T_m + 460) \times 29.92)$

Stack Moisture = Moisture Vapor / Moisture Vapor + Std. Meter Vol.

STACK GAS MOISTURE DETERMINATION

Longview Fibre
Seattle, WA
Boiler #1 (#2 Fuel Oil)

Date: 3/21/96 | Load: variable
Time: 18:50-20:04 | Test Run: 3

1. Uncorrected Meter Volume (V_m)	76.068 cubic feet
2. Meter Factor (Y_d)	1.0003
3. Barometric Pressure (Pb)	30.45 " Hg
4. Meter Pressure (^H)	5.73 " H_2O
5. Meter Temperature (T_m)	74.8 F°
6. Std. Temperature (T_{std})	68.0 F°
7. Impinger H_20 Gain (V_w)	118.8 ml
8. Silica Gel Wt. Gain (V_w)	18.7 gm
9. Moisture Vapor ($V_{w\,std}$)	6.474 cubic feet
Std. Meter Volume ($V_{m\,std}$)	**77.512 cubic feet**
Percent of H_2O in Stack (% H_2O)	**7.71 %**

WHERE,

Hg = Mercury
F = Degrees Fahrenheit
ml = milliliters
gm = grams
% = Percent

CALCULATIONS,

Moisture Vapor = ((0.04707* ml H_2O) + (0.04715* mg Silica))

Std. Meter Vol. = V_m x Y_d x (T_{std} + 460) x (P_b + ^H/13.6)/((T_m + 460) x 29.92)

Stack Moisture = Moisture Vapor / Moisture Vapor + Std. Meter Vol.

VALID RESULTS, INC.: M3A O_2 Raw Field Data Averages and Bias Calibration Corrections

Client:	Longview Fibre
Date:	3/20/96
Operator:	T. P., M. R.
Plant Location:	Seattle, WA
Source:	Boiler #1 (Natural Gas)

Percent Oxygen Concentration

Actual Calibration Value 5.00 Run 1

Zero	0.00		
Calibration	5.00		

Run 1

Time: 13:37-14:37

Avg. Meas	<7.13>	7.13	Bias Corrected Average
Zero	0.00	<0.00>	Average Zero Bias
Calibration	5.00	<5.00>	Average Cal. Bias

Run 2

Time: 15:48-16:48

Avg. Meas	<4.41>	4.41	Bias Corrected Average
Zero	0.00	<0.00>	Average Zero Bias
Calibration	5.00	<5.00>	Average Cal. Bias

Run 3

Time: 17:43-18:43

Avg. Meas	<4.74>	4.74	Bias Corrected Average
Zero	0.00	<0.00>	Average Zero Bias
Calibration	5.00	<5.00>	Average Cal. Bias

Bias Corrected Average of Test Runs 1, 2, & 3. **<5.43>**

VALID RESULTS, INC.: M3A CO_2 Raw Field Data Averages and Bias Calibration Corrections

Client: Longview Fibre
Date: 3/20/96
Operator: T. P., M. R.
Plant Location: Seattle, WA
Source: Boiler #1 (Natural Gas)

Percent Carbon Dioxide Concentration

Actual Calibration Value		6.00	Run 1
Zero	0.00		
Calibration	6.18		

Run 1

Time: 13:37-14:37

Avg. Meas	<8.21>	7.96	Bias Corrected Average
Zero	0.00	<0.00>	Average Zero Bias
Calibration	6.20	<6.19>	Average Cal. Bias

Run 2

Time: 15:48-16:48

Avg. Meas	<9.87>	9.49	Bias Corrected Average
Zero	0.00	<0.00>	Average Zero Bias
Calibration	6.28	<6.24>	Average Cal. Bias

Run 3

Time: 17:43-18:43

Avg. Meas	<9.63>	9.26	Bias Corrected Average
Zero	0.00	<0.00>	Average Zero Bias
Calibration	6.20	<6.24>	Average Cal. Bias

Bias Corrected Average of Test Runs 1, 2, & 3. **<8.90>**

VALID RESULTS, INC.: M6C SO2 Raw Field Data Averages and Bias Calibration Corrections

Client:	Longview Fibre
Date:	3/20/96
Operator:	T. P., M. R.
Plant Location:	Seattle, WA
Source:	Boiler #1 (Natural Gas)

Parts per Million Sulfur Dioxide Concentration

Actual Calibration Value		25.7	
Zero	0.0		
Calibration	24.9		

Run 1

Time: 13:37-14:37

Avg. Meas	-<0.12>	0.09	Bias Corrected Average
Zero	-0.4	-<0.20>	Average Zero Bias
Calibration	20.6	<22.75>	Average Cal. Bias
Zero Adjust	0.0		
Calibration Adjust	23.8		

Run 2

Time: 15:48-16:48

Avg. Meas	<0.49>	0.81	Bias Corrected Average
Zero	-0.5	-<0.25>	Average Zero Bias
Calibration	22.8	<23.30>	Average Cal. Bias

Run 3

Time: 17:43-18:43

Avg. Meas	-<0.11>	0.48	Bias Corrected Average
Zero	-0.6	-<0.55>	Average Zero Bias
Calibration	23.6	<23.20>	Average Cal. Bias

Bias Corrected Average of Test Runs 1, 2, & 3. **<0.46>**

VALID RESULTS, INC.: M7E NO_x Raw Field Data Averages and Bias Calibration Corrections

Client:	Longview Fibre
Date:	3/20/96
Operator:	T. P., M. R.
Plant Location:	Seattle, WA
Source:	Boiler #1 (Natural Gas)

Parts per Million Oxides of Nitrogen Concentration

Actual Calibration Value		13.0	
Zero	0.09		
Calibration	12.9		

Run 1

Time: 13:37-14:37

Avg. Meas	<19.99>	20.68	Bias Corrected Average
Zero	0.09	<0.09>	Average Zero Bias
Calibration	12.3	<12.60>	Average Cal. Bias

Run 2

Time: 15:48-16:48

Avg. Meas	<19.48>	20.09	Bias Corrected Average
Zero	0.08	<0.09>	Average Zero Bias
Calibration	12.98	<12.64>	Average Cal. Bias

Run 3

Time: 17:43-18:43

Avg. Meas	<19.54>	19.91	Bias Corrected Average
Zero	0.06	<0.07>	Average Zero Bias
Calibration	12.58	<12.78>	Average Cal. Bias

Bias Corrected Average of Test Runs 1, 2, & 3. **<20.23>**

VALID RESULTS, INC.: M10 CO Raw Field Data Averages and Bias Calibration Corrections

Client:	Longview Fibre
Date:	3/20/96
Operator:	T. P., M. R.
Plant Location:	Seattle, WA
Source:	Boiler #1 (Natural Gas)

Parts per Million Carbon Monoxide Concentration

Actual Calibration Value		4.78	Run 1
Zero	0.0		
Calibration	5.4		

Run 1

Time: 13:37-14:37

Avg. Meas	<8.73>	7.66	Bias Corrected Average
Zero	0.0	<0.00>	Average Zero Bias
Calibration	5.5	<5.45>	Average Cal. Bias

Run 2

Time: 15:48-16:48

Avg. Meas	<8.22>	7.25	Bias Corrected Average
Zero	0.2	<0.10>	Average Zero Bias
Calibration	5.4	<5.45>	Average Cal. Bias

Run 3

Time: 17:43-18:43

Avg. Meas	<4.28>	3.73	Bias Corrected Average
Zero	0.4	<0.30>	Average Zero Bias
Calibration	5.4	<5.40>	Average Cal. Bias

Bias Corrected Average of Test Runs 1, 2, & 3. **<6.21>**

VALID RESULTS, INC.: M25A TOC Raw Field Data Averages and Bias Calibration Corrections

Client:	Longview Fibre
Date:	3/20/96
Operator:	T. P., M. R.
Plant Location:	Seattle, WA
Source:	Boiler #1 (Natural Gas)

Parts per Million Total Organic Carbon Concentration (Bias Corrected Average * 3)

Actual Calibration Value		3.3	Run 1
Zero	0.0		
Calibration	3.6		
Run 1			
Time: 13:37-14:37			
Avg. Meas	<1.32>	1.09	Bias Corrected Average
Zero	0.4	<0.20>	Average Zero Bias
Calibration	3.6	<3.60>	Average Cal. Bias
Zero Adjust	0.0		
Calibration Adjust	3.6		
Run 2			
Time: 15:48-16:48			
Avg. Meas	<1.03>	0.93	Bias Corrected Average
Zero	0.2	<0.10>	Average Zero Bias
Calibration	3.2	<3.40>	Average Cal. Bias
Zero Adjust	0		
Calibration Adjust	3.2		
Run 3			
Time: 17:43-18:43			
Avg. Meas	<1.13>	1.17	Bias Corrected Average (initial)
		0.27	*Bias Corrected Average (final)*
Zero	0.8	*<0.40>*	*Average Zero Bias*
Calibration	4.9	*<4.05>*	*Average Cal. Bias*

Corrected Average of Test Runs 1, 2, & 3 (initial). **<1.06>**

VALID RESULTS, INC.: M3A O_2 Raw Field Data Averages and Bias Calibration Corrections

Client:	Longview Fibre
Date:	3/21/96
Operator:	T. P., M. R.
Plant Location:	Seattle, WA
Source:	Boiler #1 (#2 Fuel Oil)

Percent Oxygen Concentration

Actual Calibration Value		11.9	Run 1
Zero	0.00		
Calibration	11.90		

Run 1

Time: 13:38-14:38

Avg. Meas	<3.79>	3.81	Bias Corrected Average
Zero	0.00	<0.00>	Average Zero Bias
Calibration	11.80	<11.85>	Average Cal. Bias

Run 2

Time: 17:05-18:05

Avg. Meas	<3.47>	3.50	Bias Corrected Average
Zero	0.00	<0.00>	Average Zero Bias
Calibration	11.80	<11.80>	Average Cal. Bias

Run 3

Time: 18:50-19:50

Avg. Meas	<3.58>	3.63	Bias Corrected Average
Zero	0.00	<0.00>	Average Zero Bias
Calibration	11.70	<11.75>	Average Cal. Bias

Bias Corrected Average of Test Runs 1, 2, & 3. **<3.65>**

VALID RESULTS, INC.: M3A CO_2 Raw Field Data Averages and Bias Calibration Corrections

Client:	Longview Fibre
Date:	3/21/96
Operator:	T. P., M. R.
Plant Location:	Seattle, WA
Source:	Boiler #1 (#2 Fuel Oil)

Percent Carbon Dioxide Concentration

Actual Calibration Value 6.00

Zero	0.00		
Calibration	6.00		

Run 1

Time: 13:38-14:38

Avg. Meas	<12.57>	12.62	Bias Corrected Average
Zero	0.02	<0.01>	Average Zero Bias
Calibration	5.96	<5.98>	Average Cal. Bias

Run 2

Time: 17:05-18:05

Avg. Meas	<12.83>	12.90	Bias Corrected Average
Zero	0.02	<0.02>	Average Zero Bias
Calibration	6.00	<5.98>	Average Cal. Bias

Run 3

Time: 18:50-19:50

Avg. Meas	<12.75>	12.80	Bias Corrected Average
Zero	0.00	<0.01>	Average Zero Bias
Calibration	5.96	<5.98>	Average Cal. Bias

Bias Corrected Average of Test Runs 1, 2, & 3. **<12.77>**

VALID RESULTS, INC.: M6C SO2 Raw Field Data Averages and Bias Calibration Corrections

Client:	Longview Fibre
Date:	3/21/96
Operator:	T. P., M. R.
Plant Location:	Seattle, WA
Source:	Boiler #1 (#2 Fuel Oil)

Parts per Million Sulfur Dioxide Concentration

Actual Calibration Value		187.0	
Zero	0.0		
Calibration	186.8		

Run 1

Time: 13:38-14:38

Avg. Meas	<152.3>	153.25	Bias Corrected Average
Zero	0.4	<0.20>	Average Zero Bias
Calibration	184.8	<185.80>	Average Cal. Bias

Run 2

Time: 17:05-18:05

Avg. Meas	<156.4>	157.53	Bias Corrected Average
Zero	1.8	<1.10>	Average Zero Bias
Calibration	186.1	<185.45>	Average Cal. Bias

Run 3

Time: 18:50-19:50

Avg. Meas	<156.5>	158.16	Bias Corrected Average
Zero	1.4	<1.60>	Average Zero Bias
Calibration	183.4	<184.75>	Average Cal. Bias

Bias Corrected Average of Test Runs 1, 2, & 3. **<156.31>**

VALID RESULTS, INC.: M7E NO_x Raw Field Data Averages and Bias Calibration Corrections

Client:	Longview Fibre
Date:	3/21/96
Operator:	T. P., M. R.
Plant Location:	Seattle, WA
Source:	Boiler #1 (#2 Fuel Oil)

Parts per Million Oxides of Nitrogen Concentration

Actual Calibration Value		45.0	
Zero	0.1		
Calibration	44.2		

Run 1

Time: 13:38-14:38

Avg. Meas	<39.5>	40.53	Bias Corrected Average
Zero	0.07	<0.09>	Average Zero Bias
Calibration	43.5	<43.85>	Average Cal. Bias
Zero Adjust	0.07		
Calibration Adjust	44.4		

Run 2

Time: 17:05-18:05

Avg. Meas	<33.5>	33.74	Bias Corrected Average
Zero	0.06	<0.07>	Average Zero Bias
Calibration	44.9	<44.65>	Average Cal. Bias

Run 3

Time: 18:50-19:50

Avg. Meas	<44.0>	43.80	Bias Corrected Average
Zero	0.05	<0.06>	Average Zero Bias
Calibration	45.5	<45.20>	Average Cal. Bias

Bias Corrected Average of Test Runs 1, 2, & 3. **<39.36>**

VALID RESULTS, INC.: M10 CO Raw Field Data Averages and Bias Calibration Corrections

Client:	Longview Fibre
Date:	3/21/96
Operator:	T. P., M. R.
Plant Location:	Seattle, WA
Source:	Boiler #1 (#2 Fuel Oil)

Parts per Million Carbon Monoxide Concentration

Actual Calibration Value 4.78

Zero	0.4		
Calibration	5.4		

Run 1

Time: 13:38-14:38

Avg. Meas	<0.24>	-0.21	Bias Corrected Average
Zero	0.5	<0.45>	Average Zero Bias
Calibration	5.2	<5.30>	Average Cal. Bias

Run 2

Time: 17:05-18:05

Avg. Meas	<0.25>	-0.40	Bias Corrected Average
Zero	0.8	<0.65>	Average Zero Bias
Calibration	5.6	<5.40>	Average Cal. Bias

Run 3

Time: 18:50-19:50

Avg. Meas	<0.30>	-0.44	Bias Corrected Average
Zero	0.7	<0.75>	Average Zero Bias
Calibration	5.7	<5.65>	Average Cal. Bias

Average of Test Runs 1, 2, & 3 (< Det. Limit). **<0.10>**

VALID RESULTS, INC.: M25A TOC Raw Field Data Averages and Bias Calibration Corrections

Client:	Longview Fibre
Date:	3/21/96
Operator:	T. P., M. R.
Plant Location:	Seattle, WA
Source:	Boiler #1 (#2 Fuel Oil)

Parts per Million Total Organic Carbon Concentration (Bias Corrected Average * 3)

Actual Calibration Value 3.3

Zero	0		
Calibration	3.4		

Run 1

Time: 13:38-14:38

Avg. Meas	<0.34>	0.24	Bias Corrected Average
Zero	0.2	<0.10>	Average Zero Bias
Calibration	3.3	<3.35>	Average Cal. Bias

Run 2

Time: 17:05-18:05

Avg. Meas	<0.48>	0.29	Bias Corrected Average
Zero	0.2	<0.20>	Average Zero Bias
Calibration	3.4	<3.35>	Average Cal. Bias

Run 3

Time: 18:50-19:50

Avg. Meas	<0.20>	0.37	Bias Corrected Average
Zero	-0.5	-<0.15>	Average Zero Bias
Calibration	2.6	<3.00>	Average Cal. Bias

Bias Corrected Average of Test Runs 1, 2, & 3. **<0.30>**

VALID RESULTS, INC.: EPA Method 6C: Sulfur Dioxide (SO2) Emission Rate Calculation Sheet

Client: Longview Fibre
Date: 3/20/96
Operator: T. P., M. R.
Plant Location: Seattle, WA
Source: Boiler #1 (Natural Gas)
Standard Pressure (P_{std}): 29.92
Standard Temperature (T_{std}): 68

Test Run Number	Barometric Pressure (P_{bar}) "Hg	Stack Gas Volumetric Flow Rate (dscf/m)	SO2 Concentration (ppm)	O_2 Concentration (%)	SO2 Concentration (ppm) @ 3% O_2	SO2 Concentration (mg/dscm)	SO2 Concentration (lb/dscf)	SO2 Emission Rate (lb/hour)	SO2 Emission Rate (tons/year)	SO2 Emission Rate (lbs/MMBtu)
1	30.25	1,131	0.09	7.13	0.12	0.12	7.47E-09	0.00051	0.00223	0.00010
2	30.25	1,540	0.81	4.41	0.88	1.08	6.73E-08	0.00622	0.02724	0.00074
3	30.25	1,699	0.48	4.74	0.53	0.64	3.99E-09	0.00407	0.01783	0.00045
<Average>	<30.25>	<1,457>	<0.46>	<5.43>	<0.51>	<0.61>	<3.82E-08>	<0.00360>	<0.01577>	<0.00043>

Stack Gas Volumetric Flow Rate (dscf/m) = calculated on Volumetric Flow Rate Calculation Sheet — *dry standard cubic feet per minute*

SO2 Concentration (ppm) = bias calibration corrected value — *parts per million*

*SO2 Concentration (ppm @ 3% O_2) = (ppm) * ((20.9 - 3.0)/(20.9 - stack O_2)* — *parts per million at three percent oxygen*

SO2 Concentration (mg/dscm) = ((ppm)(64.07 g/g-mole)*(41,500)/(1,000,000))*
by 40CFR60, Subpart A, Section 60.45, Paragraph F(2) — *milligrams per dry standard cubic meter*

SO2 Concentration (lb/dscf) = ((mg/dscm)(0.01543 grains/mg)/((7,000 grains/lb)*(35.32 cubic feet/cubic meter)))* — *pounds per dry standard cubic foot*

SO2 Emission Rate (lb/hr) = ((lb/dscf)(dscf/m)*60 min/hr))* — *pounds per hour*

SO2 Emission Rate (tons/yr) = ((lb/hr)(24 hr/day)*(365 day/yr)/(2,000 lb/ton))* — *tons per year*

SO2 Emission Rate (lbs/MMBtu) = ((lb/dscf)(8,710)*(20.9)/(20.9 - Stack Oxygen)* — *pounds per million Btu*

VALID RESULTS, INC.: EPA Method 7E: Oxides of Nitrogen (NO_x) Emission Rate Calculation Sheet

Client: Longview Fibre
Date: 3/20/96
Operator: T. P., M. R.
Plant Location: Seattle, WA
Source: Boiler #1 (Natural Gas)
Standard Pressure (P_{std}): 29.92
Standard Temperature (T_{std}): 68

Test Run Number	Barometric Pressure (P_{bar}) "Hg	Stack Gas Volumetric Flow Rate (dscf/m)	NO_x Concentration (ppm)	O_2 Concentration (%)	NO_x Concentration (ppm) @ 3% O_2	NO_x Concentration (mg/dscm)	NO_x Concentration (lb/dscf)	NO_x Emission Rate (lb/hour)	NO_x Emission Rate (tons/year)	NOx Emission Rate (lbs/MMBtu)
1	30.25	1,131	20.7	7.13	26.9	39.5	2.46E-06	0.167	0.731	0.03252
2	30.25	1,540	20.1	4.41	21.8	38.4	2.39E-06	0.221	0.968	0.02638
3	30.25	1,699	19.9	4.74	22.0	38.0	2.37E-06	0.242	1.060	0.02670
<Average>	<30.25>	<1,457>	<20.2>	<5.43>	<23.6>	<38.6>	<2.41E-06>	<0.210>	<0.920>	<0.02853>

Stack Gas Volumetric Flow Rate (dscf/m) = calculated on Volumetric Flow Rate Calculation Sheet — *dry standard cubic feet per minute*

NO_x Concentration (ppm) = bias calibration corrected value — *parts per million*

*NO_x Concentration (ppm @ 3% O_2) = (ppm) * ((20.9 - 3.0)/(20.9 - stack O_2))* — *parts per million at three percent oxygen*

NO_x Concentration (mg/dscm) = ((ppm)(46.01 g/g-mole)*(41,500)/(1,000,000))*
by 40CFR60, Subpart A, Section 60.45, Paragraph F(2) — *milligrams per dry standard cubic meter*

NO_x Concentration (lb/dscf) = ((mg/dscm)(0.01543 grains/mg)/((7000 grains/lb)*(35.32 cubic feet/cubic meter)))* — *pounds per dry standard cubic foot*

NO_x Emission Rate (lb/hr) = ((lb/dscf)(dscf/m)*60 min/hr))* — *pounds per hour*

NO_x Emission Rate (tons/yr) = ((lb/hr)(24 hr/day)*(365 day/yr)/(2000 lb/ton))* — *tons per year*

NOx Emission Rate (lbs/MMBtu) = ((lb/dscf)(8,710)*(20.9)/(20.9 - Stack Oxygen))* — *pounds per million Btu*

VALID RESULTS, INC.: EPA Method 10: Carbon Monoxide (CO) Emission Rate Calculation Sheet

Client: Longview Fibre
Date: 3/20/96
Operator: T. P., M. R.
Plant Location: Seattle, WA
Source: Boiler #1 (Natural Gas)
Standard Pressure (Pstd): 29.92
Standard Temperature (Tstd): 68

Test Run Number	Barometric Pressure (P_{bar}) "Hg	Stack Gas Volumetric Flow Rate (dscf/m)	CO Concentration (ppm)	O_2 Concentration (%)	CO Concentration (ppm) @ 3% O_2	CO Concentration (mg/dscm)	CO Concentration (lb/dscf)	CO Emission Rate (lb/hour)	CO Emission Rate (tons/year)	CO Emission Rate (lbs/MMBtu)
1	30.25	1,131	7.66	7.13	9.96	8.90	5.54E-07	0.038	0.166	0.00732
2	30.25	1,540	7.25	4.41	7.87	8.43	5.25E-07	0.049	0.215	0.00580
3	30.25	1,699	3.73	4.74	4.13	4.34	2.70E-07	0.028	0.123	0.00304
<Average>	<30.25>	<1,457>	<6.21>	<5.43>	<7.32>	<7.22>	<4.50E-07>	<0.038>	<0.168>	<0.00539>

Stack Gas Volumetric Flow Rate (dscf/m) = calculated on Volumetric Flow Rate Calculation Sheet — *dry standard cubic feet per minute*

CO Concentration (ppm) = bias calibration corrected value — *parts per million*

*CO Concentration (ppm @ 3% O_2) = (ppm) * ((20.9 - 3.0)/(20.9 - stack O_2)* — *parts per million at three percent oxygen*

CO Concentration (mg/dscm) = ((ppm)(28.01 g/g-mole)*(41,500)/(1,000,000))*
by 40CFR60, Subpart A, Section 60.45, Paragraph F(2) — *milligrams per dry standard cubic meter*

CO Concentration (lb/dscf) = ((mg/dscm)(0.01543 grains/mg)/((7000 grains/lb)*(35.32 cubic feet/cubic meter)))* — *pounds per dry standard cubic foot*

CO Emission Rate (lb/hr) = ((lb/dscf)(dscf/m)*60 min/hr))* — *pounds per hour*

CO Emission Rate (tons/yr) = ((lb/hr)(24 hr/day)*(365 day/yr)/(2000 lb/ton))* — *tons per year*

CO Emission Rate (lbs/MMBtu) = ((lb/dscf)(8,710)*(20.9)/(20.9 - Stack Oxygen)* — *pounds per million Btu*

VALID RESULTS, INC.: EPA Method 25A: Total Organic Carbon (TOC) Emission Rate Calculation Sheet

Client: Longview Fibre
Date: 3/20/96
Operator: T. P., M. R.
Plant Location: Seattle, WA
Source: Boiler #1 (Natural Gas)
Standard Pressure (P_{std}): 29.92
Standard Temperature (T_{std}): 68

Test Run Number	Barometric Pressure (P_{bar}) "Hg	Stack Gas Volumetric Flow Rate (dscf/m)	TOC Concentration (ppm) Propane	O_2 Concentration (%)	TOC Concentration (ppm) @ 3% O_2	TOC Concentration (mg/dscm)	TOC Concentration (lb/dscf)	TOC Emission Rate (lb/hour)	TOC Emission Rate (tons/year)	TOC Emission Rate (lbs/MMBtu)
1	30.25	1,131	3.3	7.13	4.3	6.0	3.74E-07	0.025	0.110	0.00494
2	30.25	1,540	2.8	4.41	3.0	5.1	3.18E-07	0.029	0.127	0.00351
3	30.25	1,699	3.5	4.74	3.9	6.4	3.99E-07	0.041	0.180	0.00449
<Average>	<30.25>	<1,457>	<3.2>	<5.43>	<3.7>	<5.8>	<3.64E-07>	<0.032>	<0.139>	<0.00431>

Stack Gas Volumetric Flow Rate (dscf/m) = calculated on Volumetric Flow Rate Calculation Sheet — *dry standard cubic feet per minute*

*TOC Concentration (ppm) = bias calibration corrected value * 3 (reported as propane)* — *parts per million*

*TOC Concentration (ppm @ 3% O_2) = (ppm) * ((20.9 - 3.0)/(20.9 - stack O_2)* — *parts per million at three percent oxygen*

TOC Concentration (mg/dscm) = ((ppm)(44.00 g/g-mole)*(41,500)/(1,000,000))*
by 40CFR60, Subpart A, Section 60.45, Paragraph F(2) — *milligrams per dry standard cubic meter*

TOC Concentration (lb/dscf) = ((mg/dscm)(0.01543 grains/mg)/((7,000 grains/lb)*(35.32 cubic feet/cubic meter)))* — *pounds per dry standard cubic foot*

TOC Emission Rate (lb/hr) = ((lb/dscf)(dscf/m)*60 min/hr))* — *pounds per hour*

TOC Emission Rate (tons/yr) = ((lb/hr)(24 hr/day)*(365 day/yr)/(2,000 lb/ton))* — *tons per year*

TOC Emission Rate (lbs/MMBtu) = ((lb/dscf)(8,710)*(20.9)/(20.9 - Stack Oxygen)* — *pounds per million Btu*

VALID RESULTS, INC.: EPA Method 6C: Sulfur Dioxide (SO2) Emission Rate Calculation Sheet

Client: Longview Fibre
Date: 3/21/96
Operator: T. P., M. R.
Plant Location: Seattle, WA
Source: Boiler #1 (#2 Fuel Oil)
Standard Pressure (P_{std}): 29.92
Standard Temperature (T_{std}): 68

Test Run Number	Barometric Pressure (P_{bar}) "Hg	Stack Gas Volumetric Flow Rate (dscf/m)	SO2 Concentration (ppm)	O_2 Concentration (%)	SO2 Concentration (ppm) @ 3% O_2	SO2 Concentration (mg/dscm)	SO2 Concentration (lb/dscf)	SO2 Emission Rate (lb/hour)	SO2 Emission Rate (tons/year)	SO2 Emission Rate (lbs/MMBtu)
1	30.45	1,185	153.25	3.81	160.51	203.71	1.27E-05	0.903	3.955	0.1427
2	30.40	1,465	157.53	3.50	162.06	209.40	1.30E-05	1.143	5.006	0.1435
3	30.45	1,949	158.16	3.63	163.93	210.23	1.31E-05	1.532	6.710	0.1457
<Average>	<30.43>	<1,533>	<156.31>	<3.65>	<162.17>	<207.78>	<1.29E-05>	<1.193>	<5.224>	<0.1440>

Stack Gas Volumetric Flow Rate (dscf/m) = calculated on Volumetric Flow Rate Calculation Sheet — *dry standard cubic feet per minute*

SO2 Concentration (ppm) = bias calibration corrected value — *parts per million*

*SO2 Concentration (ppm @ 3% O_2) = (ppm) * ((20.9 - 3.0)/(20.9 - stack O_2)* — *parts per million at three percent oxygen*

SO2 Concentration (mg/dscm) = ((ppm)(64.07 g/g-mole)*(41,500)/(1,000,000))*
by 40CFR60, Subpart A, Section 60.45, Paragraph F(2) — *milligrams per dry standard cubic meter*

SO2 Concentration (lb/dscf) = ((mg/dscm)(0.01543 grains/mg)/((7,000 grains/lb)*(35.32 cubic feet/cubic meter)))* — *pounds per dry standard cubic foot*

SO2 Emission Rate (lb/hr) = ((lb/dscf)(dscf/m)*60 min/hr))* — *pounds per hour*

SO2 Emission Rate (tons/yr) = ((lb/hr)(24 hr/day)*(365 day/yr)/(2,000 lb/ton))* — *tons per year*

SO2 Emission Rate (lbs/MMBtu) = ((lb/dscf)(9,190)*(20.9)/(20.9 - Stack Oxygen)* — *pounds per million Btu*

VALID RESULTS, INC.: EPA Method 7E: Oxides of Nitrogen (NO_x) Emission Rate Calculation Sheet

Client: Longview Fibre
Date: 3/21/96
Operator: T. P., M. R.
Plant Location: Seattle, WA
Source: Boiler #1 (#2 Fuel Oil)
Standard Pressure (P_{std}): 29.92
Standard Temperature (T_{std}): 68

Test Run Number	Barometric Pressure (P_{bar}) "Hg	Stack Gas Volumetric Flow Rate (dscf/m)	NO_x Concentration (ppm)	O_2 Concentration (%)	NO_x Concentration (ppm) @ 3% O_2	NO_x Concentration (mg/dscm)	NO_x Concentration (lb/dscf)	NO_x Emission Rate (lb/hour)	NO_x Emission Rate (tons/year)	NOx Emission Rate (lbs/MMBtu)
1	30.45	1,185	40.5	3.81	42.4	77.3	4.81E-06	0.342	1.498	0.05406
2	30.40	1,465	33.7	3.50	34.7	64.3	4.01E-06	0.352	1.542	0.04426
3	30.45	1,949	43.8	3.63	45.4	83.6	5.21E-06	0.609	2.667	0.05794
<Average>	<30.43>	<1,533>	<39.3>	<3.65>	<40.8>	<75.1>	<4.68E-06>	<0.434>	<1.902>	<0.05209>

Stack Gas Volumetric Flow Rate (dscf/m) = calculated on Volumetric Flow Rate Calculation Sheet — *dry standard cubic feet per minute*

NO_x Concentration (ppm) = bias calibration corrected value — *parts per million*

*NO_x Concentration (ppm @ 3% O_2) = (ppm) * ((20.9 - 3.0)/(20.9 - stack O_2)* — *parts per million at three percent oxygen*

NO_x Concentration (mg/dscm) = ((ppm)(46.01 g/g-mole)*(41,500)/(1,000,000))*
by 40CFR60, Subpart A, Section 60.45, Paragraph F(2) — *milligrams per dry standard cubic meter*

NO_x Concentration (lb/dscf) = ((mg/dscm)(0.01543 grains/mg)/((7,000 grains/lb)*(35.32 cubic feet/cubic meter)))* — *pounds per dry standard cubic foot*

NO_x Emission Rate (lb/hr) = ((lb/dscf)(dscf/m)*60 min/hr))* — *pounds per hour*

NO_x Emission Rate (tons/yr) = ((lb/hr)(24 hr/day)*(365 day/yr)/(2,000 lb/ton))* — *tons per year*

NOx Emission Rate (lbs/MMBtu) = ((lb/dscf)(9,190)*(20.9)/(20.9 - Stack Oxygen)* — *pounds per million Btu*

VALID RESULTS, INC.: EPA Method 10: Carbon Monoxide (CO) Emission Rate Calculation Sheet

Client: Longview Fibre
Date: 3/21/96
Operator: T. P., M. R.
Plant Location: Seattle, WA
Source: Boiler #1 (#2 Fuel Oil)
Standard Pressure (Pstd): 29.92
Standard Temperature (Tstd): 68

Test Run Number	Barometric Pressure (P_{bar}) "Hg	Stack Gas Volumetric Flow Rate (dscf/m)	CO Concentration (ppm)*	O_2 Concentration (%)	CO Concentration (ppm) @ 3% O_2	CO Concentration (mg/dscm)	CO Concentration (lb/dscf)	CO Emission Rate (lb/hour)	CO Emission Rate (tons/year)	CO Emission Rate (lbs/MMBtu)
1	30.45	1,185	0.10	3.81	0.10	0.12	7.47E-09	0.001	0.004	0.00008
2	30.40	1,465	0.10	3.50	0.10	0.12	7.47E-09	0.001	0.004	0.00008
3	30.45	1,949	0.10	3.63	0.10	0.12	7.47E-09	0.001	0.004	0.00008
<Average>	<30.43>	<1,533>	<0.10>	<3.65>	<0.10>	<0.12>	<7.47E-09>	<0.001>	<0.004>	<0.00008>

** Reported CO concentration is analyzer detection limit (0.1 ppm).*

Stack Gas Volumetric Flow Rate (dscf/m) = calculated on Volumetric Flow Rate Calculation Sheet — *dry standard cubic feet per minute*

CO Concentration (ppm) = bias calibration corrected value — *parts per million*

*CO Concentration (ppm @ 3% O_2) = (ppm) * ((20.9 - 3.0)/(20.9 - stack O_2)* — *parts per million at three percent oxygen*

CO Concentration (mg/dscm) = ((ppm)(28.01 g/g-mole)*(41,500)/(1,000,000))*
by 40CFR60, Subpart A, Section 60.45, Paragraph F(2) — *milligrams per dry standard cubic meter*

CO Concentration (lb/dscf) = ((mg/dscm)(0.01543 grains/mg)/((7,000 grains/lb)*(35.32 cubic feet/cubic meter)))* — *pounds per dry standard cubic foot*

CO Emission Rate (lb/hr) = ((lb/dscf)(dscf/m)*60 min/hr))* — *pounds per hour*

CO Emission Rate (tons/yr) = ((lb/hr)(24 hr/day)*(365 day/yr)/(2,000 lb/ton))* — *tons per year*

CO Emission Rate (lbs/MMBtu) = ((lb/dscf)(9,190)*(20.9)/(20.9 - Stack Oxygen)* — *pounds per million Btu*

VALID RESULTS, INC.: EPA Method 25A: Total Organic Carbon (TOC) Emission Rate Calculation Sheet

Client: Longview Fibre
Date: 3/21/96
Operator: T. P., M. R.
Plant Location: Seattle, WA
Source: Boiler #1 (#2 Fuel Oil)
Standard Pressure (P_{std}): 29.92
Standard Temperature (T_{std}): 68

Test Run Number	Barometric Pressure (P_{bar}) "Hg	Stack Gas Volumetric Flow Rate (dscf/m)	TOC Concentration (ppm) Propane	O_2 Concentration (%)	TOC Concentration (ppm) @ 3% O_2	TOC Concentration (mg/dscm)	TOC Concentration (lb/dscf)	TOC Emission Rate (lb/hour)	TOC Emission Rate (tons/year)	TOC Emission Rate (lbs/MMBtu)
1	30.45	1,185	0.7	3.81	0.7	1.3	8.10E-08	0.006	0.026	0.00091
2	30.40	1,465	0.9	3.50	0.9	1.6	9.97E-08	0.009	0.039	0.00110
3	30.45	1,949	1.1	3.63	1.1	2.0	1.25E-07	0.015	0.066	0.00139
<Average>	<30.43>	<1,533>	<0.9>	<3.65>	<0.9>	<1.6>	<1.02E-07>	<0.010>	<0.044>	<0.00113>

Stack Gas Volumetric Flow Rate (dscf/m) = calculated on Volumetric Flow Rate Calculation Sheet — *dry standard cubic feet per minute*

*TOC Concentration (ppm) = bias calibration corrected value*3 (reported as propane)* — *parts per million*

*TOC Concentration (ppm @ 3% O_2) = (ppm) * ((20.9 - 3.0)/(20.9 - stack O_2)* — *parts per million at three percent oxygen*

TOC Concentration (mg/dscm) = ((ppm)(44.00 g/g-mole)*(41,500)/(1,000,000))*
by 40CFR60, Subpart A, Section 60.45, Paragraph F(2) — *milligrams per dry standard cubic meter*

TOC Concentration (lb/dscf) = ((mg/dscm)(0.01543 grains/mg)/((7,000 grains/lb)*(35.32 cubic feet/cubic meter)))* — *pounds per dry standard cubic foot*

TOC Emission Rate (lb/hr) = ((lb/dscf)(dscf/m)*60 min/hr))* — *pounds per hour*

TOC Emission Rate (tons/yr) = ((lb/hr)(24 hr/day)*(365 day/yr)/(2,000 lb/ton))* — *tons per year*

TOC Emission Rate (lbs/MMBtu) = ((lb/dscf)(9,190)*(20.9)/(20.9 - Stack Oxygen)* — *pounds per million Btu*

APPENDIX B:

Field Data

Method 1 Sample Point Location

Method 2 Volumetric Flow Rate

Method 4 Stack Gas Moisture

Method 5 Particulate Matter

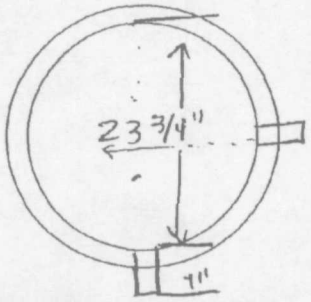
CEM Bias Calibrations

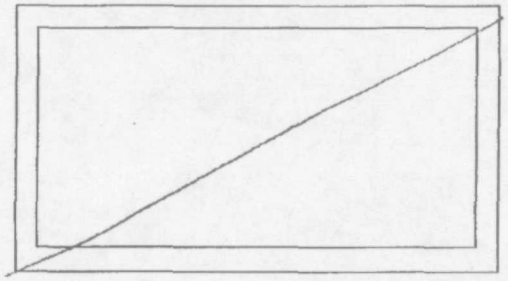
CEM Strip Chart Recordings

Visible Emission Observation Forms

VALID RESULTS , EPA Method 1 & 2: Sample Point Location and Volumetric Flow Rate Determination 27 3/4 - 4'

Client: Imperial Tobacco		Stack Diameter (De or Ds):	23.75
Date: 3/20/96		Upstream (A):	60"
Operator: TP, MR		Downstream (B):	72"
Plant Location: Seattle, WA		Minimum # Points:	12
Source: Clayton Brooks - Boiler		Pitot Tube ID#:	72A ~~6A~~
Fuel Type: Natl Gas		Pitot Tube Coeff. (Cp):	0.84
Load Rating: Variable		Pitot Cal Date:	
Barometric Pressure (Pbar):		Stack Temp TC ID#:	72A
Standard Temperature (Tstd): ~~68~~		TC Cal Date:	
Standard Pressure (Pstd): 29.92		% Oxygen (%O2):	7%
Stack Static Pressure (Pstatic):		% Carbon Dioxide (%CO2):	8%
Time: 1100		Moisture Content (%H2O):	16





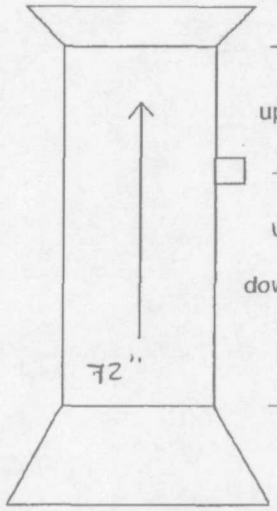
Equivalent Diameter = Stack Diameter (Ds) or 2*Length*Width/(Length + Width)

Stack Area (As) = (1/4*PIE*(Ds)*(Ds)) or ((De)*(De))

Stack Pressure (Ps) = Pbar + (Pstatic/13.6)

Run #: (Pre-Test) Equipment Checklist: Pitot Tube Leak Check:

Port ID#	Point #	% Stack ID	Port Depth	Probe Marks	Cyclonic Zero Angle	Pitot Tube Delta P	Stack Temp. Ts Deg F	SQRT (Delta P)
	12		4"	4.4	6	0.02	262	
	11			5.5	5	0.03		
	10			6.8	3	0.02		
	9			8.2	3	0.02	270	
	8			9.9	2	0.03		
	7			12.5	1	0.02	278	
	6			19.3		0.02		
	5			21.8		0.02	282	
	4			23.5		0.03		
	3			24.9		0.03		
	2			26.2		0.02	270	
	1			27.3		0.02	258	
				CFM				
				M2'M5				
Averages								



A = 60"
upstream
60"

4" to roof
B = 72"
downstream
2" down from roof to band

Post-Test: Pitot Tube Leak Check:

Molecular Weight Wet (MWs) = ((0.44(%CO2) + 0.32(%O2) + 0.28(%CO + %N2))*(1-%H2O) + 18(%H2O))

Stack Gas Velocity (Vs) = (85.49*Cp*(SQRT(Delta P))*(Ts + 460)/(Ps*MWs))

Stack Gas Volumetric Flowrate = (60*(1-%H2O)*Vs*As*((Tstd + 460)/((Ts + 460))*(Ps/Pstd))

Run 1

VALID RESULTS, INC., EPA Method 2: Volumetric Flow Rate Determination

Client: Longview Fibre		Barometric Pressure (Pbar):	30.25	Pitot Tube Coeff. (Cp):	0.84
Date: 3/20/96		Standard Temperature (Tstd):	68	% Oxygen (%O2):	7
Operator: TP, MR		Standard Pressure (Pstd):	29.92	% Carbon Dioxide (%CO2):	8
Plant Location: Seattle, WA		Stack Static Pressure (Pstatic):	-0.02	Moisture Content (%H2O):	16
Source: Cleaver Brooks - Boiler		Fuel Type:	Natural Gas	Stack Diameter (De\Ds):	23.75
Run #: 1	Time: 1424		Load Rating: N/A	Stack Area (As):	

Port ID#	Point #	% Stack Inside Diam.	Port Depth	Probe Marks	Cyclonic Zero Angle	Pitot Tube (Delta P)	Stack Temp. (Ts) Deg F	SQRT (Delta P)
S	12	97.9	4"	27.3	<6	0.02	256	
	11	93.3		26.2	<5	0.02	260	
	10	88.2		24.9	<3	0.02	266	
	9	82.3		23.5	<3	0.02	267	
	8	75.0		21.8	<2	0.02	279	
	7	64.4		19.3	4	0.02	281	
	6	35.6		12.5		0.02	284	
	5	25.0		9.9		0.02	283	
	4	17.7		8.2		0.02	283	
	3	11.8		6.8		0.024	274	
	2	6.7		5.5		0.025	269	
	1	2.1		4.4	↓	0.02	260	
W	12	"	4"	"	↓ "	0.02	258	
	11	"		"	↓ "	0.025	261	
	10	↓		↓	↓	0.02	268	
	9					0.02	269	
	8					0.025	274	
	7					0.02	278	
	6					0.02	283	
	5					0.02	284	
	4					0.025	283	
	3					0.02	278	
	2					0.025	271	
	1	↓		↓	↓	0.02	263	
<Average>								

Molecular Weight Wet (MWs) = ((0.44(%CO2) + 0.32(%O2) + 0.28(%CO + %N2))*(100-%H2O) + 0.18(%H2O))

MWs = _____ Lb/Lb-Mole

Stack Gas Velocity (Vs) = (85.49*Cp*(SQRT(Delta P))*(SQRT((Ts + 460)/((Pbar + Pstatic/13.6)*MWs)))

Vs = _____ Feet per Second

Corrected Stack Gas Volumetric Flow Rate (Qs) = (60*((100-%H2O)/100)*Vs*As*((Tstd + 460)/(Ts + 460))*(Ps/Pstd))

Qs(corr) = _____ Standard Dry Cubic Feet per Minute

Actual Cubic Feet per Second = 60*Vs*As

Qs(actual) = _____ Actual Cubic Feet per Minute

VALID RESULTS, INC.: EPA Method 2: Volumetric Flow Rate Determination

Client: Longview Fibre	Barometric Pressure (Pbar): 30.25	Pitot Tube Coeff. (Cp): 0.84 55
Date: 3/20/96	Standard Temperature (Tstd): 68	% Oxygen (%O2): 7
Operator: TR, MR	Standard Pressure (Pstd): 29.92	% Carbon Dioxide (%CO2): 8
Plant Location: Seattle, WA	Stack Static Pressure (Pstatic): -0.04	Moisture Content (%H2O): 16
Source: Cleaver-Brooks	Fuel Type: Natural Gas	Stack Area (As):

Run #: 2 Time: 1613 Load Rating: Pre-Test: Pitot Tube Leak Check ✓

Port ID#	Point #	% Stack ID	Port Depth	Probe Marks	Cyclonic Zero Angle	Pitot Tube Delta P	Stack Temp. Ts Deg F	SQRT (Delta P)
W	12					0.04	254	
	11					0.05	253	
	10					0.04	257	
	9					0.04	259	
	8					0.05	260	
	7					0.04	256	
	6					0.04	257	
	5					0.03	255	
	4					0.03	256	
	3					0.03	258	
	2					0.03	250	
	1					0.02	248	
S	12					0.05	288	
	11					0.06	288	
	10					0.06	290	
	9					0.06	290	
	8					0.06	290	
	7					0.06	293	
	6					0.05	295	
	5					0.04	297	
	4					0.03	296	
	3					0.03	294	
	2					0.03	274	
	1					0.02	263	
Averages								

See Run #1

Post-Test: Pitot Tube Leak Check:

Molecular Weight Wet (MWs) = ((0.44(%CO2) + 0.32(%O2) + 0.28(%CO + %N2))*(100-%H2O) + 0.18(%H2O))

MWs = _____ Lb/Lb-Mole

Stack Gas Velocity (Vs) = (85.49*Cp*(SQRT(Delta P))*(SQRT(Ts + 460)/((Pbar + Pstatic/13.6)*MWs))

Vs = _____ Feet per Second

Stack Gas Volumetric Flow Rate (Qs) = (60*(100-%H2O)*Vs*As*((Tstd + 460)/((Ts + 460))*(Ps/Pstd))

Qs = _____ Standard Dry Cubic Feet per Minute

VALID RESULTS, INC.: EPA Method 2: Volumetric Flow Rate Determination

Client: Longview Fibre	Barometric Pressure (Pbar): 30.25	Pitot Tube Coeff. (Cp): 0.84 56
Date: 3/20/96	Standard Temperature (Tstd): 68	% Oxygen (%O2): 4.7
Operator: TPMR	Standard Pressure (Pstd): 29.92	% Carbon Dioxide (%CO2): 9.6
Plant Location: Seattle WA	Stack Static Pressure (Pstatic): -0.06	Moisture Content (%H2O): 16
Source: Cleaver Brooks Boiler	Fuel Type: Natural Gas	Stack Area (As):

Run #: 3 Time: 1806 Load Rating: Pre-Test: Pitot Tube Leak Check

Port ID#	Point #	% Stack ID	Port Depth	Probe Marks	Cyclonic Zero Angle	Pitot Tube Delta P	Stack Temp. Ts Deg F	SQRT (Delta P)
W	12					0.06	288	
	11					0.06	285	
	10					0.06	286	
	9					0.06	291	
	8					0.06	294	
	7					0.06	294	
	6					0.06	296	
	5		See Run #1			0.05	300	
	4					0.05	302	
	3					0.04	302	
	2					0.03	294	
	1					0.03	270	
	12					0.05	297	
	11					0.05	297	
	10					0.06	256	
	9					0.06	290	
	8					0.05	299	
	7					0.06	288	
	6					0.06	298	
	5					0.05	296	
	4					0.04	298	
	3					0.05	291	
	2					0.04	278	
	1					0.04	267	
Averages								

Post-Test: Pitot Tube Leak Check:

Molecular Weight Wet (MWs) = ((0.44(%CO2) + 0.32(%O2) + 0.28(%CO + %N2))*(100-%H2O) + 0.18(%H2O))

MWs = _____ Lb/Lb-Mole

Stack Gas Velocity (Vs) = (85.49*Cp*(SQRT(Delta P))*(SQRT(Ts + 460)/((Pbar + Pstatic/13.6)*MWs))

Vs = _____ Feet per Second

Stack Gas Volumetric Flow Rate (Qs) = (60*(100-%H2O)*Vs*As*((Tstd + 460)/((Ts + 460))*(Ps/Pstd))

Qs = _____ Standard Dry Cubic Feet per Minute

FIELD DATA SHEET

METHOD # 4 RUN 1

CLIENT: Longview Fibre LOCATION: Seattle, WA FUEL: Nat Gas

DATE: 3/20/96 LOAD: ~~Nat Gas~~ VAR OPER: MR METER #: Nat #1 METER Yd: 1.0003

RUN (#)	POINT	TIME	GAS METER ft³	METER TEMP, (°F) INLET	METER TEMP, (°F) OUTLET	STACK TEMP (°F)	METER RATE (cfm)	IMP TEMP (°F)	PUMP VAC ("Hg)	Barometric Press.	
	START	13:37	742.724	42	41		0.5	42	1	30.25	
		13:42	745.105	42	42		0.5	34	1		
		13:47	747.695	43	41		0.5	33	1	Corrected Volume	Moisture %
	~~END~~	1352	750.062	44	41		0.5	34	1		
	~~AVG.~~	1357	752.431	45	41						

1

SAMPLE PURGE

Int. Time

_____ @ _____

Final

_____ @ _____

	FINAL	INITIAL	NET
IMPINGER #1	681.4	601.9	79.5
IMPINGER #2	590.1	578.3	11.8
IMPINGER #3	485.1	483.4	1.7
IMPINGER #4			
SILICA GEL WT	802.8	796.1	6.7

INITIAL LEAK CHECK: 0.005 cfm @ 15 "Hg

FINAL LEAK CHECK: 0.004 cfm @ 12 "Hg

Total Wgt/Vol H2O Collected

RUN (#)	POINT	TIME	GAS METER ft³	METER TEMP, (°F) INLET	METER TEMP, (°F) OUTLET	STACK TEMP (°F)	METER RATE (cfm)	IMP TEMP (°F)	PUMP VAC ("Hg)	Barometric Press.	
	~~START~~	1402	754.972	44	42		0.5	33	1		
		1407	757.445	46	41		0.5	33	1		
		1412	759.872	46	41		0.5	33	1	Corrected Volume	Moisture %
	~~END~~	1417	762.324	46	41		0.5	33	1		
	~~AVG.~~	1422	765.755	46	41			33			

2

SAMPLE PURGE

Int. Time

_____ @ _____

Final

_____ @ _____

	FINAL	INITIAL	NET
IMPINGER #1			
IMPINGER #2			
IMPINGER #3			
IMPINGER #4			
SILICA GEL WT			

INITIAL LEAK CHECK: _____ cfm @ _____ "Hg

FINAL LEAK CHECK: _____ cfm @ _____ "Hg

Total Wgt/Vol H2O Collected

RUN (#)	POINT	TIME	GAS METER ft³	METER TEMP, (°F) INLET	METER TEMP, (°F) OUTLET	STACK TEMP (°F)	METER RATE (cfm)	IMP TEMP (°F)	PUMP VAC ("Hg)	Barometric Press.	
	START	1427									
		1432	769.672	47	41		0.5	33	1		
		1437	772.080	47	41		0.5	32	1	Corrected Volume	Moisture %
	END										
	AVG.			<43.0>							

3

SAMPLE PURGE

Int. Time

_____ @ _____

Final

_____ @ _____

	FINAL	INITIAL	NET
IMPINGER #1			
IMPINGER #2			
IMPINGER #3			
IMPINGER #4			
SILICA GEL WT			

INITIAL LEAK CHECK: _____ cfm @ _____ "Hg

FINAL LEAK CHECK: _____ cfm @ _____ "Hg

Total Wgt/Vol H2O Collected

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FIELD DATA SHEET

Run 2

METHOD # 4

CLIENT: Longview Fibre LOCATION: Seattle, WA FUEL: Natural Gas

DATE: 3/20/95 LOAD: [illegible] OPER: MR METER #: Nutech METER Yd: 1.0003

RUN (#)	POINT	TIME	GAS METER ft³	METER TEMP, (°F) INLET	METER TEMP, (°F) OUTLET	STACK TEMP (°F)	METER RATE (cfm)	IMP TEMP (°F)	PUMP VAC ("Hg)	Barometric Press.	
1	START	1548	772.571	45	41		0.5	34	1	30.25	
		1553	775.110	45	42		0.5	33	1		
		1558	777.695	44	39		0.5	34	1	Corrected Volume	Moisture %
	END	1603	780.263	46	39		0.5	34	1		
	AVG.	1608									

SAMPLE PURGE

Int. Time

_____ @ _____

Final

_____ @ _____

	FINAL	INITIAL	NET
IMPINGER #1	786.0	681.4	104.6
IMPINGER #2	599.1	590.1	9.0
IMPINGER #3	485.9	485.1	0.8
IMPINGER #4			
SILICA GEL WT	807.8	802.8	5.0

INITIAL LEAK CHECK: 0.002 cfm @ 14 "Hg

FINAL LEAK CHECK: 0.004 cfm @ 15 "Hg

Total Wgt/Vol H2O Collected

RUN (#)	POINT	TIME	GAS METER ft³	METER TEMP, (°F) INLET	METER TEMP, (°F) OUTLET	STACK TEMP (°F)	METER RATE (cfm)	IMP TEMP (°F)	PUMP VAC ("Hg)	Barometric Press.	
2	START	1613	285.380	46	35		0.5	33	1		
		1618	287.910	45	39		0.5	34	1		
		1623	290.402	46	39		0.5	35	1	Corrected Volume	Moisture %
	END	1628	292.913	47	41		0.5	35	1		
	AVG.	1633	295.440	46	41		0.5	35	1		

SAMPLE PURGE

Int. Time

_____ @ _____

Final

_____ @ _____

	FINAL	INITIAL	NET
IMPINGER #1			
IMPINGER #2			
IMPINGER #3			
IMPINGER #4			
SILICA GEL WT			

INITIAL LEAK CHECK: _____ cfm @ _____ "Hg

FINAL LEAK CHECK: _____ cfm @ _____ "Hg

Total Wgt/Vol H2O Collected

RUN (#)	POINT	TIME	GAS METER ft³	METER TEMP, (°F) INLET	METER TEMP, (°F) OUTLET	STACK TEMP (°F)	METER RATE (cfm)	IMP TEMP (°F)	PUMP VAC ("Hg)	Barometric Press.	
3	START	1638	797.632	46	41		0.5	34	1		
		1643	800.412	47	40		0.5	35	1		
		1648	802.955							Corrected Volume	Moisture %
	END										
	AVG.			42.7							

SAMPLE PURGE

Int. Time

_____ @ _____

Final

_____ @ _____

	FINAL	INITIAL	NET
IMPINGER #1			
IMPINGER #2			
IMPINGER #3			
IMPINGER #4			
SILICA GEL WT			

INITIAL LEAK CHECK: _____ cfm @ _____ "Hg

FINAL LEAK CHECK: _____ cfm @ _____ "Hg

Total Wgt/Vol H2O Collected

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FIELD DATA SHEET

Run 3

METHOD # 4

CLIENT: Longview Fibre LOCATION: Seattle, WA FUEL: Nat Gas

DATE: 3/20/96 LOAD: VAR OPER: MR METER #: Nat #1 METER Yd: 1.0003

RUN (#)	POINT	TIME	GAS METER ft³	METER TEMP, (°F) INLET	METER TEMP, (°F) OUTLET	STACK TEMP (°F)	METER RATE (cfm)	IMP TEMP (°F)	PUMP VAC ("Hg)	Barometric Press.	
	START	1743	803.501	42	44		0.5	35	1	30.25	
		1748	806.035	42	43		0.5	34	1		
		1753	808.562	42	43		0.5	35	1	Corrected Volume	Moisture %
	END	1758	811.053	42	43		0.5	35	1		
	AVG.	1803	813.532	43	40		0.5	35	1		

1	SAMPLE PURGE			FINAL	INITIAL	NET	INITIAL LEAK CHECK
	Int.	Time	IMPINGER #1	748.4	644.4	104.0	0.002 cfm @ 14 "Hg
	_____ @ _____		IMPINGER #2	606.9	599.1	7.8	FINAL LEAK CHECK
	Final		IMPINGER #3	487.2	485.9	1.3	0.002 cfm @ 15 "Hg
	_____ @ _____		IMPINGER #4				Total Wgt/Vol H2O Collected
			SILICA GEL WT	812.8	807.8	5.0	

RUN (#)	POINT	TIME	GAS METER ft³	METER TEMP, (°F) INLET	METER TEMP, (°F) OUTLET	STACK TEMP (°F)	METER RATE (cfm)	IMP TEMP (°F)	PUMP VAC ("Hg)	Barometric Press.	
	START	1808	816.008								
		1813	818.477	46	42		0.5	34	1		
		1818	820.913	45	42		0.5	35	1	Corrected Volume	Moisture %
	END	1823	823.345	44	44		0.5	35	1		
	AVG.	1828	825.747	48	44		0.5	33	1		

2	SAMPLE PURGE			FINAL	INITIAL	NET	INITIAL LEAK CHECK
	Int.	Time	IMPINGER #1				_____ cfm @ _____ "Hg
	_____ @ _____		IMPINGER #2				FINAL LEAK CHECK
	Final		IMPINGER #3				_____ cfm @ _____ "Hg
	_____ @ _____		IMPINGER #4				Total Wgt/Vol H2O Collected
			SILICA GEL WT				

RUN (#)	POINT	TIME	GAS METER ft³	METER TEMP, (°F) INLET	METER TEMP, (°F) OUTLET	STACK TEMP (°F)	METER RATE (cfm)	IMP TEMP (°F)	PUMP VAC ("Hg)	Barometric Press.	
	START	1833	828.147	47	42		0.5	33	1		
		1838	830.621	48	42		0.5	34	1		
		1843	833.032	47	42		0.5	34	1	Corrected Volume	Moisture %
	END										
	AVG.			<43.7							

3	SAMPLE PURGE			FINAL	INITIAL	NET	INITIAL LEAK CHECK
	Int.	Time	IMPINGER #1				_____ cfm @ _____ "Hg
	_____ @ _____		IMPINGER #2				FINAL LEAK CHECK
	Final		IMPINGER #3				_____ cfm @ _____ "Hg
	_____ @ _____		IMPINGER #4				Total Wgt/Vol H2O Collected
			SILICA GEL WT				

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VALID RESULTS , EPA Method 5: Particulate Air Emissions Test

Client:	Longview Fibre
Date:	3/21/96
Operator:	M. Rogan
Plant Location:	Seattle
Source:	20m BTU/hr Boiler
Fuel Type:	Diesel #2
Load Rating:	variable
Barometric Pressure (Pbar):	30.45
Stack Equiv. Diameter (De):	23.75
Stack Moisture (%H2O):	10
Run #:	2

Equipment	Material	ID#	Cal Date	Value
Nozzle	Quartz	56-1	3/21/96	Dn = 0.629
Pitot Tube:	SS	72A		Cp = 0.84
Stack TC:	SS	72A		Yd = 1.0003
Meter:		Nut #1		Delta H@= 1.9578
Filter:	glass	VR132GF		

Impinger Weight Gain			Net	Charge
#	Vfinal	Vinitial	Gain	Solution
1	688.6	584.5	105.1	HPLC DI
2	599.7	597.2	2.5	HPLC DI
3	493.9	492.6	1.3	
4	796.3	783.6	12.7	Silica Gel
	770.4	764.1	6.3	

Probe Liner: 316 SS ___, Pyrex Glass ___, Quartz Glass ✓,

Total Moisture Gain = 108.9±19.0

Standard Temperature (Tstd): 68

Standard Pressure (Pstd): 29.92

Stack Static Pressure (Pstatic): -0.03

~~ORSAT O2~~ CEM 3.8

~~ORSAT CO2~~ CEM 12.6

Pre-Test: Equipment Checklist: ✓ VREPAM1,2 ✓ Sample Train Leak Check: Pre-Test 0.002 @ 15 "Hg, Post-Test 0.002 @ 15 "Hg

Port ID# Point #	Time:	Meter Value:	Pitot Tube Delta P	Stack Temp. Degrees F	Meter Temp. Tmin	Meter Temp. Tmout	Delta H	SQRT (Delta P)	CFM	Filter Temp	Probe Temp	Imping Temp	Pump Vacuum
	1338												
S17		833.339	0.035	331	71	70	2.74			232	235	52	18
11		835.552	0.035	351	71	70	3.66			232	235	53	18
10		837.821	0.035	351	70	70				230	237		17
9		840.145	0.035	350	69	70	3.11			235	238	54	17
8		842.581	0.035	349	70	69	3.10			232	236		18
7		844.837	0.040	349	70	71	3.55			231	234	54	18
6		847.315	0.040	350	70	71	3.55			232	236		17
5		849.732	0.045	350	70	71	4.00			232	230	57	16
4		851.873	0.035	345	67	67	3.11			233	231	57	18
3		854.205	0.010	330	68	67	0.920			232	230		18
2		856.323	0.010	350	68	67	0.930			231	231	58	17
1		858.742	0.010	283	69	68	1.01						18
		860.203											
			Switched Imp #4 Leak ✓ at 15" Hg at				0.004, Dev #4		0.001	at 15 Hg			
W 12		860.488	0.020	315	69	71	1.89			247	245	52	5
11		862.542	0.015	358	71	69	1.39			282	242	41	5
10		863.904	0.010	334	72	68	0.926			251	242	41	4
9		865.792	0.010	334	72	69	0.927			250	241	41	3
8		867.151	0.010	336	73	69	0.925			248	240	41	3
7		868.503	0.010	351	73	69	0.918			250	246	39	3
6		869.831	0.035	352	74	69	3.18			243	246	39	8
5		871.923	0.040	351	73	69	3.62			240	248	39	9
4		874.352	0.040	344	74	69	3.62						9
3		876.932	0.020	344	74	69	1.89			240	243		5
2		879.182	0.020	335	74	64	3.25			240	243		5
1		881.184	0.035	335	76	65	3.10						
	1502	883.226											
Averages													

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VALID RESULTS , EPA Method 5: Particulate Air Emissions Test

Client: Longview Fibre	Equipment	Material	ID#	Cal Date	Value	Impinger Weight Gain			Net	Charge
Date: 3/21/96	Nozzle				Dn = 0.629	#	Vfinal	Vinitial	Gain	Solution
Operator: M. Rogers	Pitot Tube:				Cp = 0.84	1	686.9	578.7	108.2	HPLC DI
Plant Location: Seattle	Stack TC:	See #	1		Yd = 1.0003	2	608.4	603.1	5.3	HPLC DI
Source: 20 mm BTU/ Boiler	Meter:				Delta H@= 1.9376	3	575.5	575.9	0.4	
Fuel Type: Dsl #2	Filter:	Glass	133			4	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	Silica Gel
Load Rating: Variable	Probe Liner: 316 SS ___, Pyrex Glass ___, Quartz Glass X						801.6	797.2		
Barometric Pressure (Pbar): 30.40							Total Moisture Gain = ____			
Stack Equiv. Diameter (De): 23.75	Standard Temperature (Tstd): 68									
Stack Moisture (%H2O): 16	Standard Pressure (Pstd): 29.92					~~ORSAT~~ O2	3.5 CEM			
Run #: 2	Stack Static Pressure (Pstatic): -0.04					~~ORSAT~~ CO2	12.8 CEM			

Pre-Test: Equipment Checklist: _____ VREPAM1,2 _____ Sample Train Leak Check: Pre-Test 0.001 @ 15 "Hg, Post-Test 0.002 @ 15 "Hg

Port ID# Point #	Time:	Meter Value:	Pitot Tube Delta P	Stack Temp. Degrees F	Meter Temp. Tmin	Meter Temp. Tmout	Delta H	SQRT (Delta P)	CFM	Filter Temp	Probe Temp	Imping Temp	Pump Vacuum
	1554												
W12		885.854	0.035	300	75	76	3.42			257	260	58	16
11		886.112	0.030	330	74	74	2.81			260	257	55	4
10		888.385	0.030	332	74	73	2.80			258	259	55	4
9		890.313	0.030	340	75	74	3.32			260	257	55	15
8		892.774	0.035	344	75	74	3.22			260	260	55	14
7		895.132	0.035	347	77	74	3.22			259	258	55	14
6		897.175	0.040	347	77	73	3.67			255	258	55	15
5		899.932	0.035	341	77	72	3.23			252	259	55	14
4		902.431	0.025	322	73	74	3.76			257	260	58	
3		904.592	0.030	273	77	74	3.69			260	259	55	
2		906.771	0.070	282	75	77	4.00			257	260	58	
1		909.083	0.035	280	74	77	3.23			260	255	58	
		911.550											
S 12		911.550	0.045	300	72	71	4.30			264	258	58	15
11		913.962	0.040	326	71	72	3.75			264	258	57	16
10		916.482	0.040	345	71	72	3.66			260	258	58	16
9		918.051	0.040	345	71	72	3.64			258	260	58	11
10		921.552	0.040	369	71	72	3.56			256	260	59	17
7		924.903	0.040	372	70	71	3.54			254	260	58	17
6		926.584	0.040	365	74	70	3.57			254	259	58	18
5		929.293	0.040	347	73	70	3.65			255	259	58	18
4		931.604	0.035	347	75	71	3.27			255	260	58	18
3		934.127	0.035	286	75	70	3.46			258	260	59	17
2		936.612	0.035	275	74	70	3.52			257	260	59	17
1		939.155	0.040	264	71	70	4.08			256	258	59	17
	1742	941.642											
Averages													

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VALID RESULTS , EPA Method 5: Particulate Air Emissions Test

Client: Longview Fibre	Equipment	Material	ID#	Cal Date	Value
Date: 5/21/96	Nozzle				Dn = 0.629
Operator: MRegan	Pitot Tube:		#1		Cp = 0.84
Plant Location: Sec H6	Stack TC:	See			Yd = 1.003
Source: Boiler	Meter:				Delta H@ = 1.9378
Fuel Type: Diesel #2	Filter:	62603	134		
Load Rating: Variable	Probe Liner: 316 SS ___, Pyrex Glass ___, Quartz Glass ___,				
Barometric Pressure (Pbar): 30.45					
Stack Equiv. Diameter (De): 23.75	Standard Temperature (Tstd): 68				
Stack Moisture (%H2O): 16	Standard Pressure (Pstd): 29.92				
Run #: 3	Stack Static Pressure (Pstatic): -0.03				

Impinger #	Weight Gain Vfinal	Vinitial	Net Gain	Charge Solution
1	796.6	682.4		
2	677.3	673.2		
3	498.4	497.9		
4	802.3	~~[illegible]~~ 783.6		

Total Moisture Gain = _____

~~OBSAT~~ O2 3.6 CEM

~~OBSAT~~ CO2 12.8 CEM

Pre-Test: Equipment Checklist: _____ VREPAM1,2 _____ Sample Train Leak Check: Pre-Test 0.004 @ 15 "Hg, Post-Test 0.004 @ 15 "Hg

Port ID# Point #	Time:	Meter Value:	Pitot Tube Delta P	Stack Temp. Degrees F	Meter Temp. Tmin	Meter Temp. Tmout	Delta H	SQRT (Delta P)	CFM	Filter Temp	Probe Temp	Imping Temp	Pump Vacuum
	1850												
C 12		942.551	0.070	345	71	72	6.41			263	263	59	15
11		945.016	0.000	358	74	72	5.42			263	265	58	15
10		948.802	0.000	358	74	72	5.42			266	257	60	13
9		951.923	0.000	360	74	71	5.40			264	266	60	12
8		954.987	0.060	360	75	71	5.40			264	267	62	12
7		958.015	0.065	359	77	70	5.88			261	264	61	12
6		961.208	0.065	358	79	72	5.88			263	267	61	12
5		964.427	0.080	358	79	72	7.11			261	264	61	15
4		967.654	0.080	356	80	72	7.11			261	267	61	15
3		970.954	0.060	333	80	74	5.64			263	261	62	13
2		974.321	0.060	332	81	74	5.64			263	263	61	12
1		977.493	0.060	318	81	74	5.74			264	262	61	12
		980.625											
W 12		980.625	0.070	338 9	71	75	6.48			267	265	60	12
11		983.854	0.070	360	77	72	6.32			264	262	60	12
10		987.110	0.060	363	77	75	5.41			262	264	61	12
9		990.444	0.070	362	76	73	6.32			263	262	61	12
8		993.782	0.070	364	74	76	6.32			261	262	61	12
7		997.071	0.070	363	73	77	6.32			262	267	60	12
6		000.310	0.060	363	74	79	5.41			261	266	60	12
7		003.512	0.060	363	76	79	5.41			267	267	61	12
		006.827	0.060	362	71	79	5.41			266	266	60	11
		009.842	0.060	341	71	74	5.41			260	267	60	14
		012.847	0.050	338	75	77	4.83			267	266	61	14
		015.870	0.050	341	78	77	4.83			269	267	60	
	2004	018.619											
Averages													

VALID RESULTS, INC.: EPA Method 5: Particulate Air Emissions Test Data

Client:	Longview Fibre	Equipment	Material	ID#	Cal Date		Value	Impinger Weight Gain			Net	Charge
Date:	3/21/96	Nozzle	Quartz	5/8-1	3/21/96	Dn =	0.629	#	Vfinal	Vinitial	Gain	Solution
Operator:	M. Regan	Pitot Tube:	316 SS	72A	3/1/96	Cp =	0.84	1	689.6	584.5	105.1	HPLC H2O
Plant Location:	Seattle, WA	Stack TC:	316 SS	72A	3/1/96	Yd =	1.0003	2	599.7	597.2	2.5	HPLC H2O
Source:	Boiler	Meter:		Nutech #1	2/17/96	Delta H@=	1.9378	3	493.9	492.6	1.3	empty
Fuel Type:	Diesel #2	Filter:	Glass Fiber	VR132				4	796.3	777.3	19.0	Silica Gel
Load Rating:	variable	Probe Liner: Quartz Glass										
Barometric Pressure (Pbar):	30.45	Standard Temperature (Tstd):		68	Stack Oxygen (%O2):		3.81	Impinger Water Weight Gain =			108.9	
Stack Diameter (De):	23.75	Standard Pressure (Pstd):		29.92	Stack Carbon Dioxide (%CO2):		12.62	Silica Gel Weight Gain =			19	
Test Run #:	1	Stack Static Pressure (Pstatic):		-0.03	Stack Moisture (%H2O):		16					

Port ID & Point #	Time:	Meter Value:	Pitot Tube Delta P	Stack Temp. Degrees F	Meter Temp. Tm - in	Meter Temp. Tm - out	Delta H	SQRT (Delta P)	CFM
S12	0.0	833.339	0.035	331	71	70	3.19	0.187	1.23
S11	2.5	835.552	0.035	351	71	70	3.11	0.187	1.20
S10	5.0	837.821	0.035	351	70	70	3.11	0.187	1.20
S9	7.5	840.145	0.035	350	69	70	3.11	0.187	1.20
S8	10.0	842.581	0.035	349	70	69	3.11	0.187	1.20
S7	12.5	844.837	0.040	349	70	71	3.56	0.200	1.38
S6	15.0	847.315	0.040	350	70	71	3.56	0.200	1.38
S5	17.5	849.732	0.045	350	70	71	4.00	0.212	1.55
S4	20.0	851.873	0.035	345	67	67	3.11	0.187	1.20
S3	22.5	854.205	0.010	330	68	67	0.91	0.100	0.35
S2	25.0	856.323	0.010	300	68	67	0.94	0.100	0.36
S1	27.5	858.742	0.010	283	69	68	0.97	0.100	0.38
	30.0	**860.203**							
W12		**860.488**	0.020	315	69	71	1.86	0.141	0.72
W11	32.5	862.542	0.015	333	71	69	1.36	0.122	0.53
W10	35.0	863.904	0.010	334	72	68	0.91	0.100	0.35
W9	37.5	865.792	0.010	334	72	69	0.91	0.100	0.35
W8	40.0	867.151	0.010	336	73	69	0.91	0.100	0.35
W7	42.5	868.503	0.010	351	73	69	0.89	0.100	0.34
W6	45.0	869.831	0.035	352	74	69	3.11	0.187	1.20
W5	47.5	871.923	0.040	351	73	69	3.56	0.200	1.38
W4	50.0	874.352	0.040	344	74	69	3.59	0.200	1.39
W3	52.5	876.932	0.020	344	74	69	1.80	0.141	0.70
W2	55.0	879.182	0.020	335	77	64	1.81	0.141	0.70
W1	57.5	881.184	0.035	335	76	64	3.17	0.187	1.23
	60.0	883.226							
Averages	60.0	49.602		<337.6>	<70.0>		<2.36>	<0.156>	<0.91>

VALID RESULTS, INC.: EPA Method 5: Particulate Air Emissions Test Data

Client:	Longview Fibre	Equipment	Material	ID#	Cal Date		Value	Impinger Weight Gain			Net	Charge
Date:	3/21/96	Nozzle	Quartz	5/8-1	3/21/96	Dn =	0.629	#	Vfinal	Vinitial	Gain	Solution
Operator:	M. Regan	Pitot Tube:	316 SS	72A	3/1/96	Cp =	0.84	1	686.9	578.7	108.2	HPLC H2O
Plant Location:	Seattle, WA	Stack TC:	316 SS	72A	3/1/96	Yd =	1.0003	2	608.4	603.1	5.3	HPLC H2O
Source:	Boiler	Meter:		Nutech #1	2/17/96	Delta H@=	1.9378	3	575.5	575.9	-0.4	empty
Fuel Type:	Diesel #2	Filter:	Glass Fiber	VR133				4	801.6	797.2	4.4	Silica Gel
Load Rating:	variable	Probe Liner: Quartz Glass										
Barometric Pressure (Pbar):	30.40	Standard Temperature (Tstd):		68	Stack Oxygen (%O2):		3.5	Impinger Weight Gain =			113.1	
Stack Equiv. Diameter (De):	23.75	Standard Pressure (Pstd):		29.92	Stack Carbon Dioxide (%CO2):		12.9	Silica Gel Weight Gain =			4.4	
Test Run #:	2	Stack Static Pressure (Pstatic):		-0.04	Stack Moisture (%H2O):		16					

Port ID & Point #	Time:	Meter Value:	Pitot Tube Delta P	Stack Temp. Degrees F	Meter Temp. Tm - in	Meter Temp. Tm - out	Delta H	SQRT (Delta P)	CFM
W12	0.0	883.854	0.035	300	75	76	3.35	0.187	1.30
W11	2.5	886.112	0.030	330	74	74	2.75	0.173	1.06
W10	5.0	888.385	0.030	332	74	73	2.74	0.173	1.06
W9	7.5	890.513	0.030	340	75	74	2.72	0.173	1.05
W8	10.0	892.774	0.035	344	75	74	3.16	0.187	1.22
W7	12.5	895.132	0.035	347	77	74	3.15	0.187	1.22
W6	15.0	897.475	0.040	347	77	73	3.60	0.200	1.39
W5	17.5	899.932	0.035	341	77	72	3.17	0.187	1.23
W4	20.0	902.431	0.025	322	73	74	2.31	0.158	0.89
W3	22.5	904.592	0.030	273	77	74	2.97	0.173	1.15
W2	25.0	906.711	0.020	282	75	77	1.96	0.141	0.76
W1	27.5	909.083	0.035	280	74	77	3.44	0.187	1.33
S12	30.0	911.55	0.045	310	72	71	4.22	0.212	1.63
S11	32.5	913.962	0.040	326	71	72	3.67	0.200	1.42
S10	35.0	916.482	0.040	345	71	72	3.58	0.200	1.39
S9	37.5	919.051	0.040	345	71	72	3.58	0.200	1.39
S8	40.0	921.552	0.040	369	71	72	3.48	0.200	1.35
S7	42.5	924.063	0.040	372	70	71	3.46	0.200	1.34
S6	45.0	926.584	0.040	365	74	70	3.50	0.200	1.35
S5	47.5	929.293	0.040	347	73	70	3.58	0.200	1.39
S4	50.0	931.604	0.035	347	75	71	3.14	0.187	1.22
S3	52.5	934.127	0.035	286	75	70	3.39	0.187	1.31
S2	55.0	936.612	0.035	275	74	70	3.44	0.187	1.33
S1	57.5	939.155	0.040	264	71	70	3.98	0.200	1.54
	60.0	941.642							
Averages	60.0	57.788		<324.5>	<73.2>		<3.26>	<0.187>	<1.26>

VALID RESULTS, INC.: EPA Method 5: Particulate Air Emissions Test Data

Client:	Longview Fibre	Equipment	Material	ID #	Cal Date		Value	Impinger Weight Gain			Net	Charge
Date:	3/21/96	Nozzle	Quartz	5/8-1	3/21/96	Dn =	0.629	#	Vfinal	Vinitial	Gain	Solution
Operator:	M. Regan	Pitot Tube:	316 SS	72A	3/1/96	Cp =	0.84	1	796.6	682.4	114.2	HPLC H2O
Plant Location:	Seattle, WA	Stack TC:	316 SS	72A	3/1/96	Yd =	1.0003	2	677.3	673.2	4.1	HPLC H2O
Source:	Boiler	Meter:		Nutech #1	2/17/96	Delta H@=	1.9378	3	498.4	497.9	0.5	empty
Fuel Type:	Diesel #2	Filter:	Glass Fiber	VR134				4	802.3	783.6	18.7	Silica Gel
Load Rating:	variable	Probe Liner:	Quartz Glass									

Barometric Pressure (Pbar):	30.45	Standard Temperature (Tstd):	68	Stack Oxygen (%O2):	3.63
Stack Equiv. Diameter (De):	23.75	Standard Pressure (Pstd):	29.92	Stack Carbon Dioxide (%CO2):	12.8
Test Run #:	3	Stack Static Pressure (Pstatic):	-0.03	Stack Moisture (%H2O):	16

Total Impinger Water Weight Gain =	118.8
Total Silica Gel Weight Gain =	18.7

Port ID & Point #	Time:	Meter Value:	Pitot Tube Delta P	Stack Temp. Degrees F	Meter Temp. Tm - in	Meter Temp. Tm - out	Delta H	SQRT (Delta P)	CFM
S12	0.0	942.551	0.070	345	71	72	6.30	0.265	2.44
S11	2.5	945.616	0.060	358	74	72	5.33	0.245	2.06
S10	5.0	948.802	0.060	358	74	72	5.33	0.245	2.06
S9	7.5	951.923	0.060	360	74	71	5.31	0.245	2.06
S8	10.0	954.987	0.060	360	75	71	5.32	0.245	2.06
S7	12.5	958.015	0.065	359	77	70	5.78	0.255	2.24
S6	15.0	961.208	0.065	358	79	72	5.80	0.255	2.24
S5	17.5	964.427	0.080	358	79	72	7.14	0.283	2.76
S4	20.0	967.054	0.080	356	80	72	7.17	0.283	2.78
S3	22.5	970.954	0.060	333	80	74	5.54	0.245	2.14
S2	25.0	974.321	0.060	332	81	74	5.55	0.245	2.15
S1	27.5	977.483	0.060	318	81	74	5.65	0.245	2.19
W12	30.0	980.625	0.070	339	71	75	6.37	0.265	2.47
W11	32.5	983.884	0.070	360	77	72	6.22	0.265	2.41
W10	35.0	987.110	0.060	363	77	75	5.33	0.245	2.06
W9	37.5	990.444	0.070	362	76	73	6.21	0.265	2.40
W8	40.0	993.782	0.070	364	74	76	6.20	0.265	2.40
W7	42.5	997.071	0.070	363	73	77	6.21	0.265	2.40
W6	45.0	1000.310	0.060	363	74	79	5.33	0.245	2.06
W5	47.5	1003.512	0.060	363	70	79	5.32	0.245	2.06
W4	50.0	1006.827	0.060	362	71	79	5.33	0.245	2.06
W3	52.5	1009.842	0.060	341	71	74	5.44	0.245	2.11
W2	55.0	1012.847	0.050	338	75	77	4.58	0.224	1.77
W1	57.5	1015.870	0.050	311	78	77	4.75	0.224	1.84
	60.0	1018.619							
Averages	60.0	76.068		<351.0>	<74.8>		<5.73>	<0.252>	<2.22>

GASEOUS DATA SHEET

Date: 3/20/96
Client: Longview Fibre
Facility: Seattle WA

Fuel: Natural Gas
Load: VARIABLE
Unit: Cravens Brooks Boiler

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Analyzer Span:		0-25%	0-25%	0-25 ppm	0-50 ppm	0-50 ppm	0-10 ppm
CALIBRATION GASES		5.0	6.00	5.4 ~~4.78~~	13.0		3.3
		11.9	11.8	15.8	24.0	25.7	4.79
		21.9	22.3	~~25~~ 23.7	45.0	44.3	9.67

		INITIAL CAL	TIME	O_2	CO_2	CO	NO_x	SO_2	THC	
	INST	Zero								
		Low Span								
		Mid Span								
		High Span								
	SYST	Zero		0.00	0.00	0.0	0.~~16~~ 0.09	0.0	~~0.2~~	0.0
		Low Span		5.00	6.18	5.4	12.9			3.6
		Mid Span		12.2	12.2	15.4	24.3	24.4		4.9
		High Span		22.4	22.5	24.2	45.03	44.3	~~9.7~~	9.7
START - END TIME 1337-1437 RUN # 1	GAS SAMPLE	1								
		2								
		3								
		4								
		5								
		6								
		7		0.36	0.21	9.04	1.89	0.26	0.26	
		8								
		Average		7.13	8.21	8.73	19.99	-0.12	1.32	
	SYST	Zero		0.00	0.00	0.0	0.09	~~-0.2~~ -0.4	0.4	
		Low Span		5.00	6.20	5.5	12.30	20.6	3.6	
		Mid Span		12.20					4.8	
		High Span			24.2	24.2			4.9	
	RE-SPAN	Zero						~~-0.2~~ 0.0 adj	0.0 no adj	
		Mid Span						23.8 no adj		
		High Span								
START - END TIME 1548-1648 RUN # 2	GAS SAMPLE	1						-		
		2								
		3								
		4								
		5								
		6								
		7		1.05	0.61	12.05	1.40	0.66	0.42	
		8								
		Average		4.41	9.87	8.22	19.48	0.49	1.03	
	SYST	Zero		0.00	0.00	0.2	0.~~09~~	~~-0.5~~ ~~-0.23~~	0.2	
		Low Span		5.00	6.28	5.4	12.98	-0.5	3.2	
		Mid Span		12.25			23.7	22.8	4.4	
		High Span			21.6	24.2			4.1	
	RE-SPAN	Zero							0.0 adj	3.2
		Mid Span								4.8
		High Span							9.7 adj	
START - END TIME 1743-1843 RUN # 3	GAS SAMPLE	1								
		2								
		3								
		4								
		5								
		6								
		7		1.32	0.77	4.77	1.15	0.17	0.36	
		8								
		Average		4.74	9.63	4.28	19.54	-0.11	1.13	
	SYST	Zero		0.00	0.0	0.4	0.06	-0.4	1.0	0.8
		Low Span		5.00	6.20	5.4	12.58	-0.6	4.9	
		Mid Span		12.25				23.6	5.7	
		High Span			24.06	24.4			4.5	

		FINAL CAL	TIME	O_2	CO_2	CO	NO_x	SO_2	THC
	INST	Zero							
		Low Span							
		Mid Span							
		High Span							

LFC000430

GASEOUS DATA SHEET

Date: 3/21/96
Client: Longview Fibre
Facility: Seattle WA

Fuel: Diesel #2
Load: VARIABLE
Unit: Cleaver Brooks Boiler

Analyzer Span:		0-25%	0-25%	0-25ppm	0-100ppm	0-200ppm	0-10ppm
CALIBRATION GASES		~~5.0~~ 4.86	6.00	~~5.4~~ 4.78	24.6		3.3
		11.9	11.8	15.8	45.0	114	4.79
		21.9	22.3	~~25.0~~ 23.7	83.6	187	9.67

	INITIAL CAL	TIME	O_2	CO_2	CO	NO_x	SO_2	THC
INST	Zero							
	Low Span							
	Mid Span							
	High Span							
SYST	Zero		0.00	0.00	~~0.4~~ 0.4	0.1	0.0	0.0
	Low Span		4.85	6.00	5.4			3.4
	Mid Span		11.9	11.8	15.4	44.2	114	4.9
	High Span		21.75	22.2	24.8	83.2	186.8	9.7

START - END TIME 13:38-14:38 RUN # 1

GAS SAMPLE	1						
	2						
	3						
	4						
	5						
	6						
	7	0.08	0.06	0.04	0.55	1.04	0.10
	8						
	Average	(3.79)	(12.57)	(+0.24)	(39.5)	(152.3)	(0.34)
SYST Zero		0.00	0.02	0.5	0.07	0.4	0.2
SYST Low Span			5.96	~~5.2~~ 5.7			3.3
SYST Mid Span		11.80		15.5	43.5	184.8	4.7
SYST High Span							~~4.6~~ 1.0
RE-SPAN Zero							
RE-SPAN Mid Span					14.4 adj		
RE-SPAN High Span							9.7

START - END TIME 1559- 17:45-1805 RUN # 2

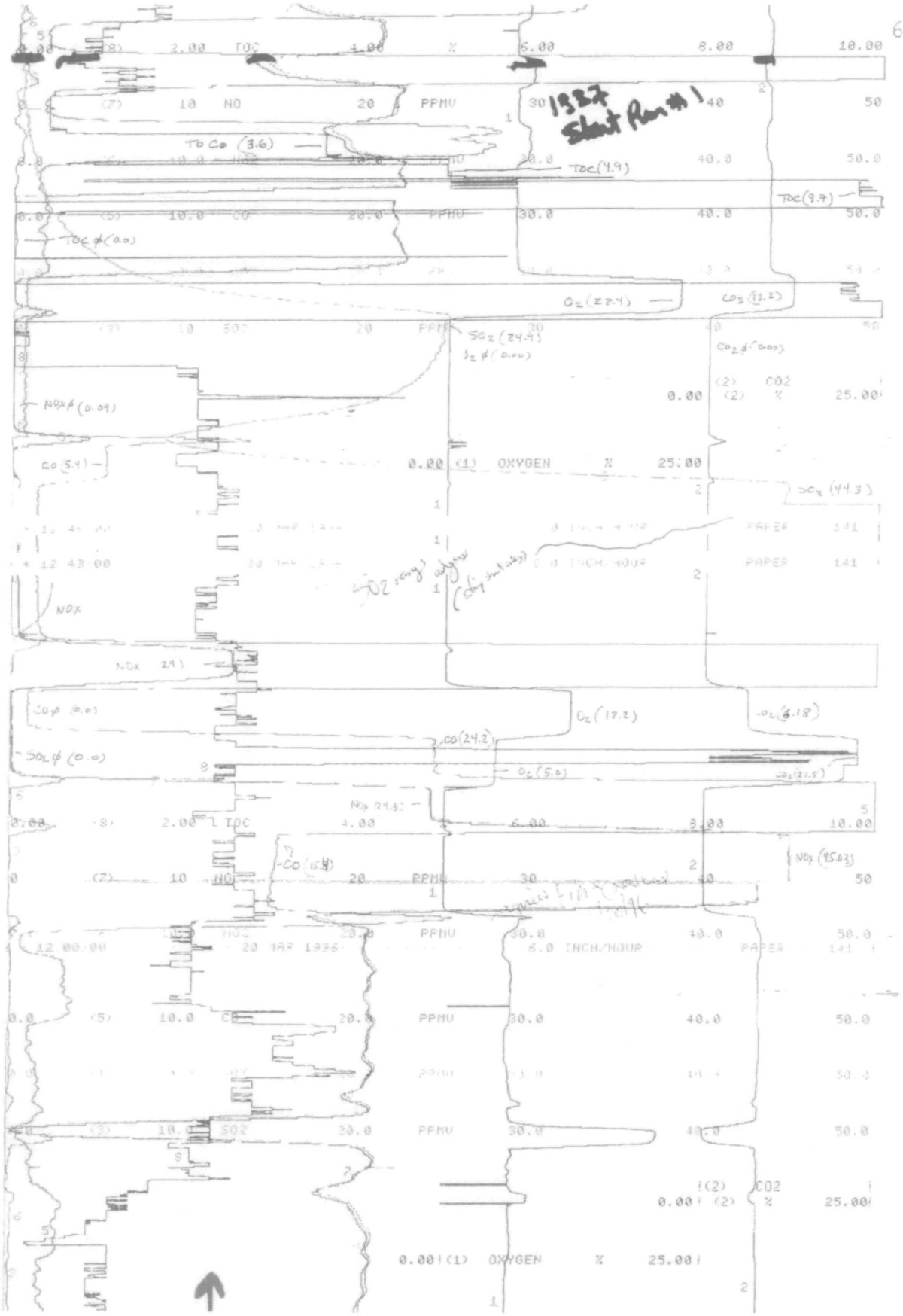
broken off restart at

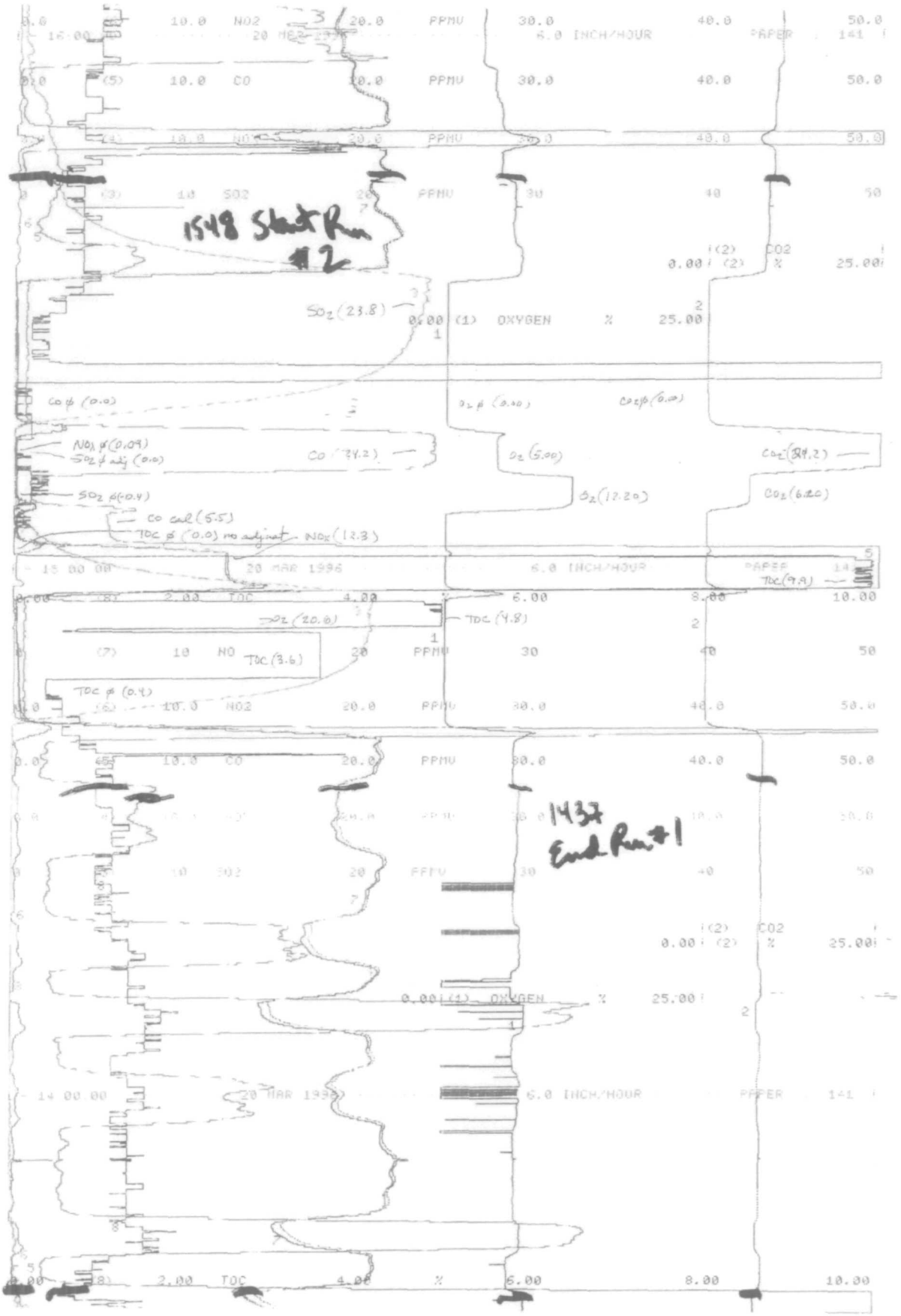
GAS SAMPLE	1						
	2						
	3						
	4						
	5						
	6						
	7	0.25	0.18	0.19	12.64	2.11	0.15
	8						
	Average	(3.47)	(12.83)	(0.25)	(33.5)	(156.4)	(0.48)
SYST Zero		0.00	0.02	0.8	0.06	1.8	0.2
SYST Low Span			6.00	5.6			3.4
SYST Mid Span		11.80		16.0	44.9	186.1	4.8
SYST High Span							9.7
RE-SPAN Zero							
RE-SPAN Mid Span							
RE-SPAN High Span							

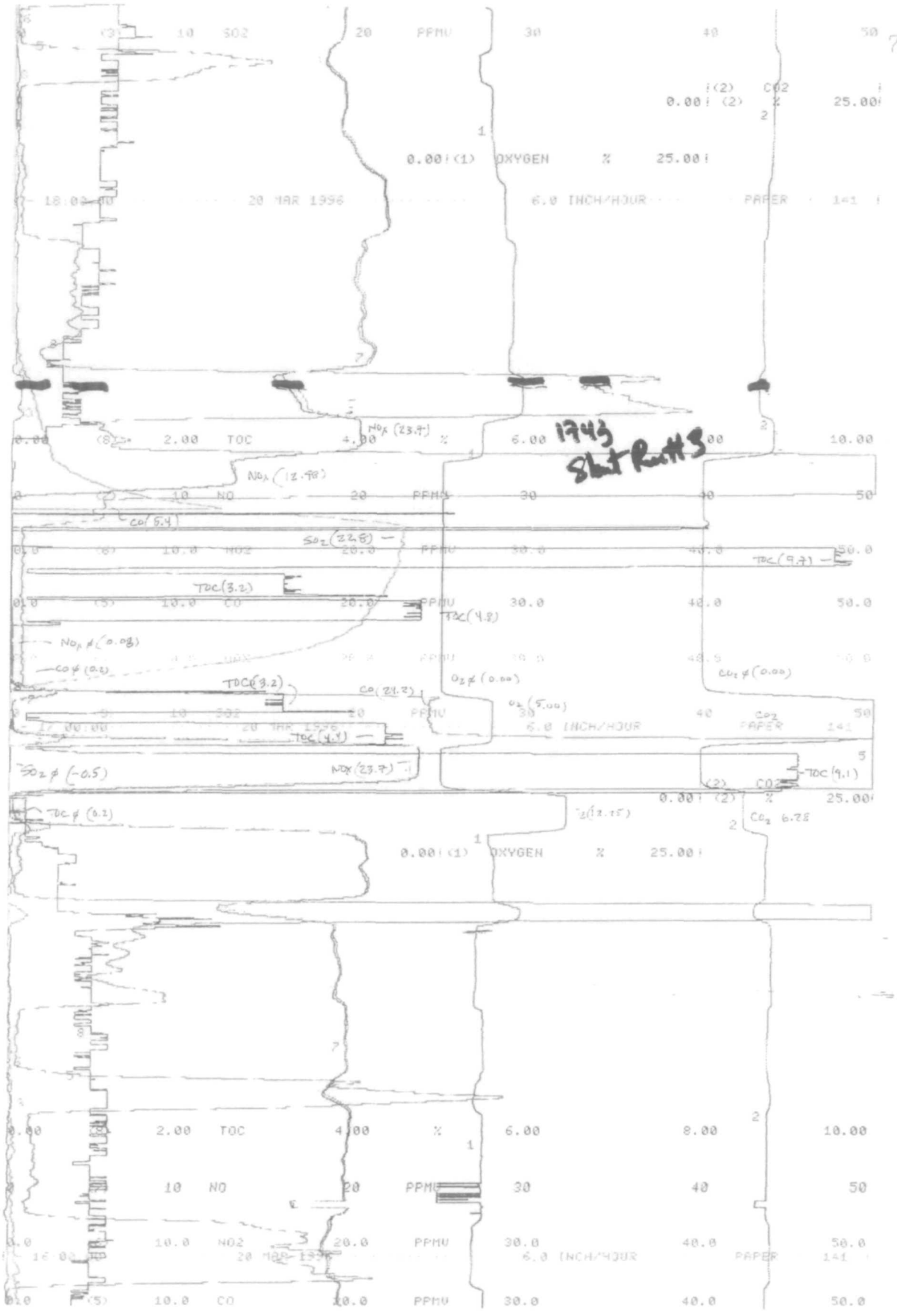
START - END TIME 18:50-1958 RUN # 3

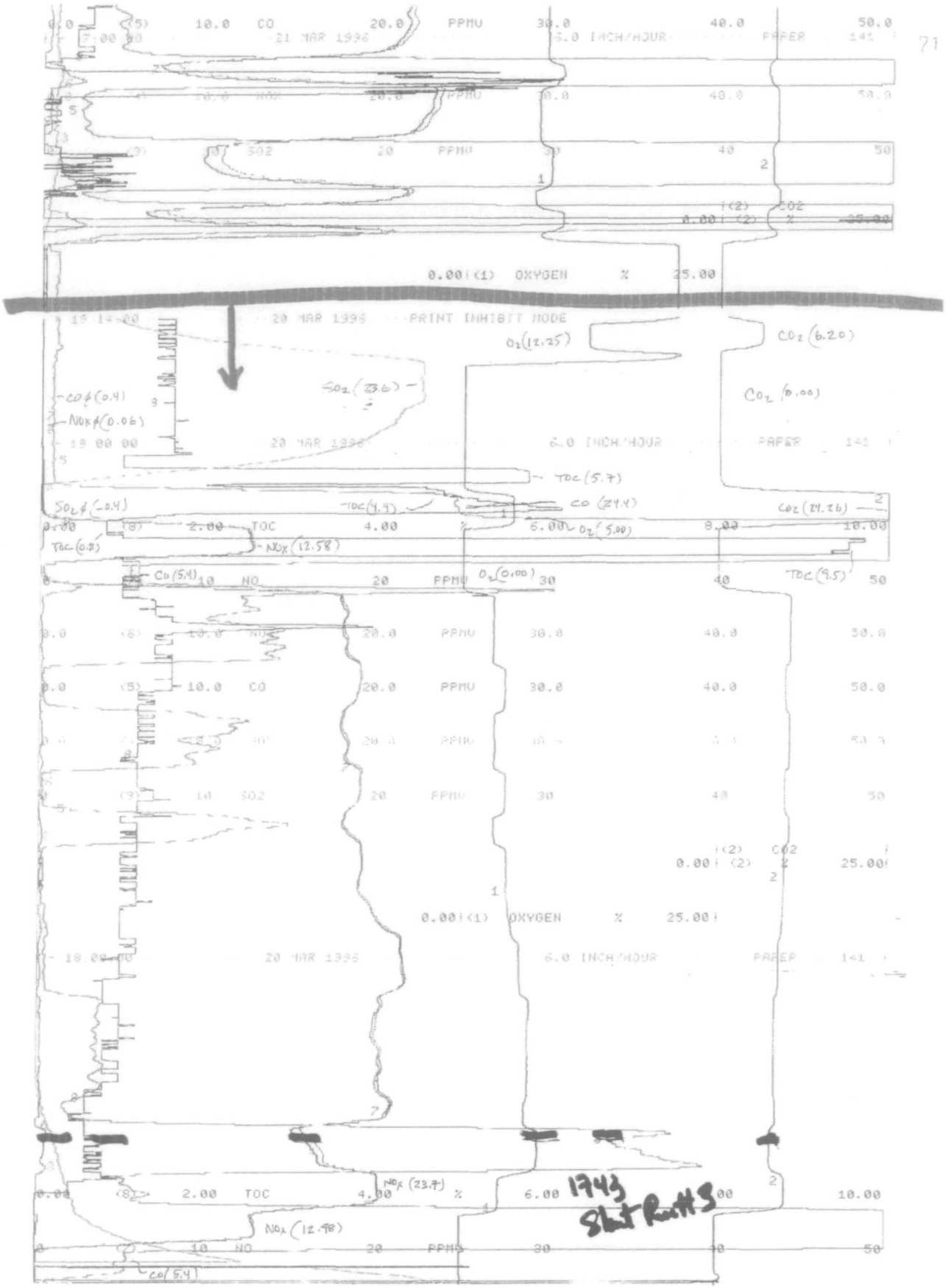
GAS SAMPLE	1						
	2						
	3						
	4						0.2 tail lost / Prior
	5			0.09			-0.4e end
	6						
	7	0.22	0.17	0.30	9.61	2.96	0.15
	8						
	Average	(3.58)	(12.75)	(156.5)	(43.98)	(156.5)	(0.20)
SYST Zero		0.00	0.02	0.7	0.05	1.4	-0.3
SYST Low Span			5.96	5.7			2.6
SYST Mid Span		11.70	16.	16.3	45.5	183.4	3.8
SYST High Span							8.5

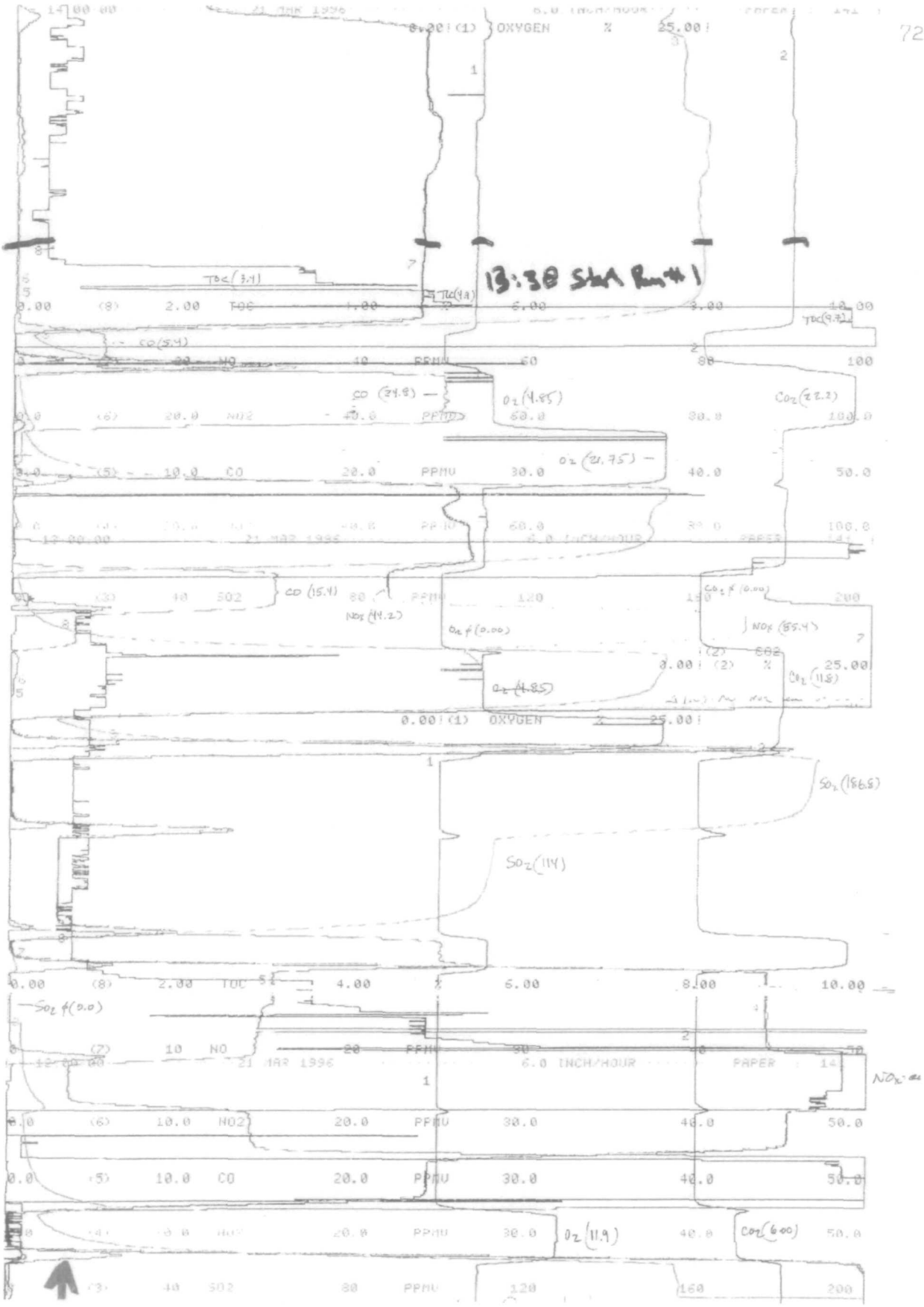
	FINAL CAL	TIME	O_2	CO_2	CO	NO_x	SO_2	THC
INST	Zero							
	Low Span							
	Mid Span							
	High Span							

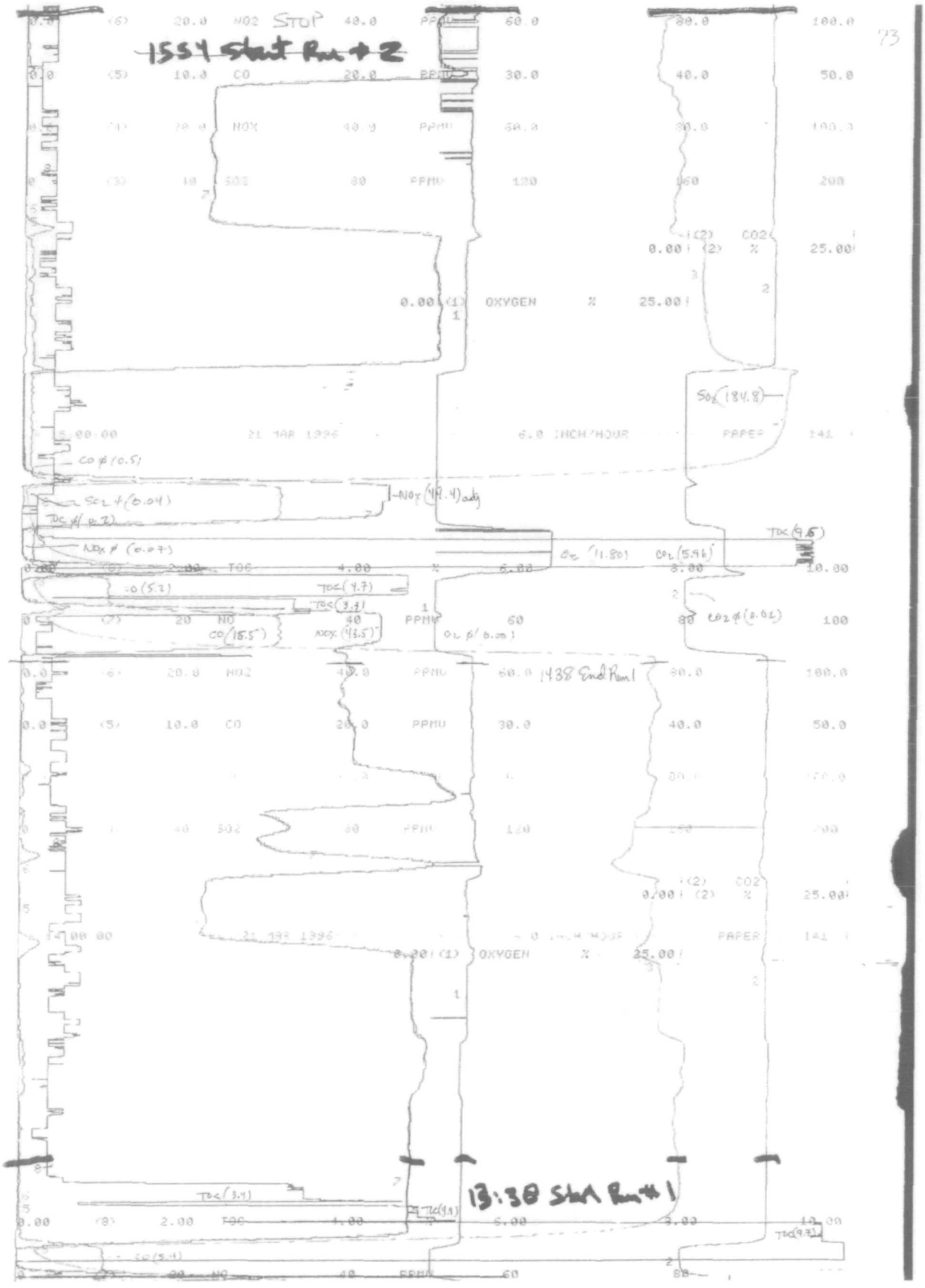

1327
Start Run #1
TOC
NO
PPMV
TOC Co (3.6)
TOC(4.9)
TOC(9.7)
TOC ϕ(0.0)
O2(22.4)
CO2(12.2)
SO2(24.9)
SO2 ϕ(0.00)
CO2 ϕ(0.00)
NOXϕ(0.09)
CO2
OXYGEN
CO(5.4)
SO2(44.3)
PAPER
NOX
NOX 29)
COϕ (0.0)
O2(17.2)
O2(6.18)
CO(24.2)
SO2ϕ (0.0)
O2(5.0)
NOx 24.32
CO(15.4)
NOx (15.02)
20 MAR 1996
6.0 INCH/HOUR
SO2
OXYGEN

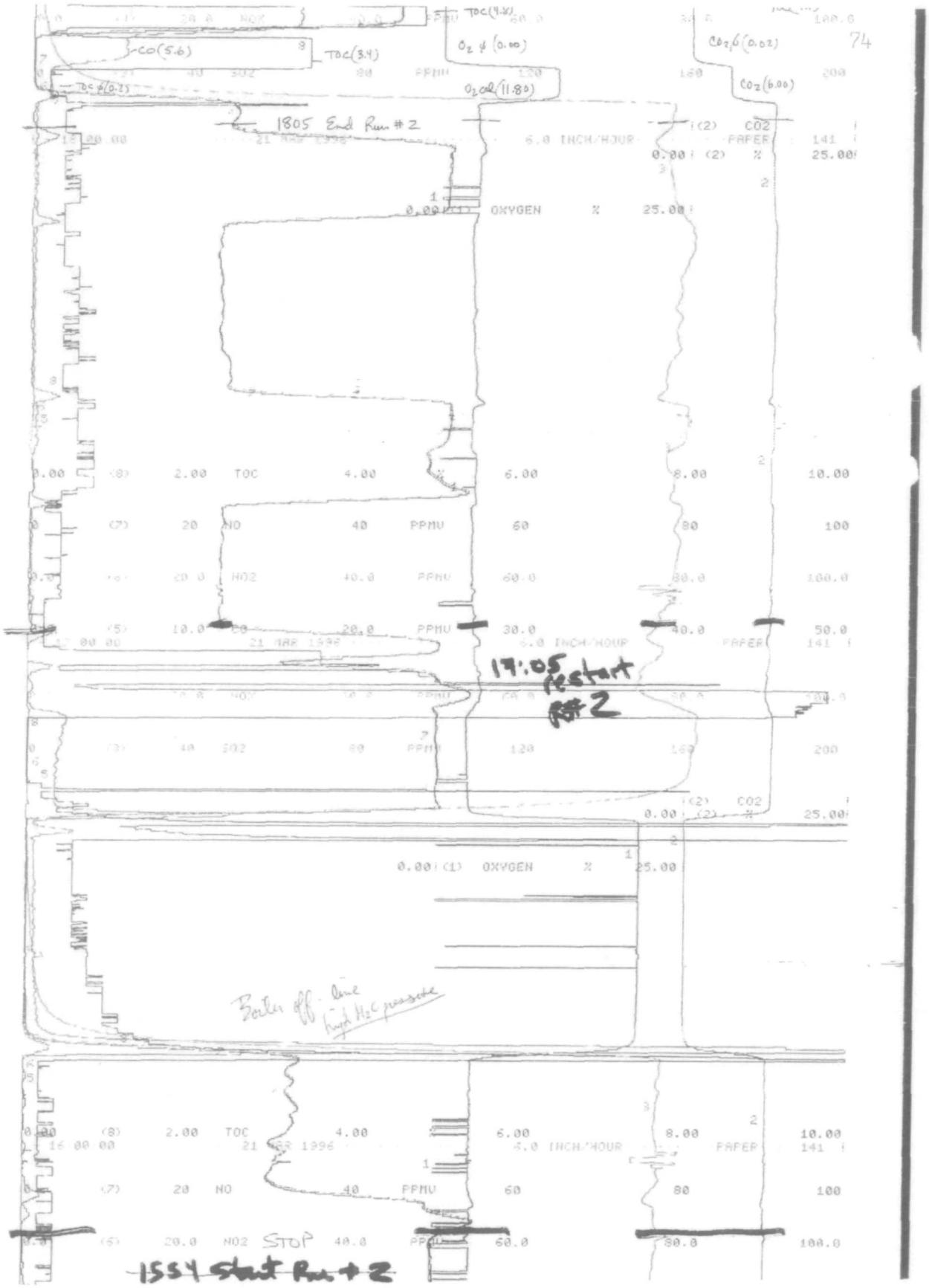

NO2
PPMV
6.0 INCH/HOUR
PAPER
CO
SO2
1548 Start Run #2
CO2
OXYGEN
SO2 (23.8)
CO φ (0.0)
O2 φ (0.00)
CO2 φ (0.0)
NOx φ (0.09)
SO2 φ adj (0.0)
CO (34.2)
O2 (5.00)
CO2 (8.2)
SO2 φ (-0.4)
O2 (12.20)
CO2 (6.20)
CO cal (5.5)
TOC φ (0.0) no adjust
NOx (12.3)
20 MAR 1996
TOC (9.9)
TOC
O2 (20.6)
TOC (4.8)
NO
TOC (3.6)
TOC φ (0.4)
1437 End Run #1

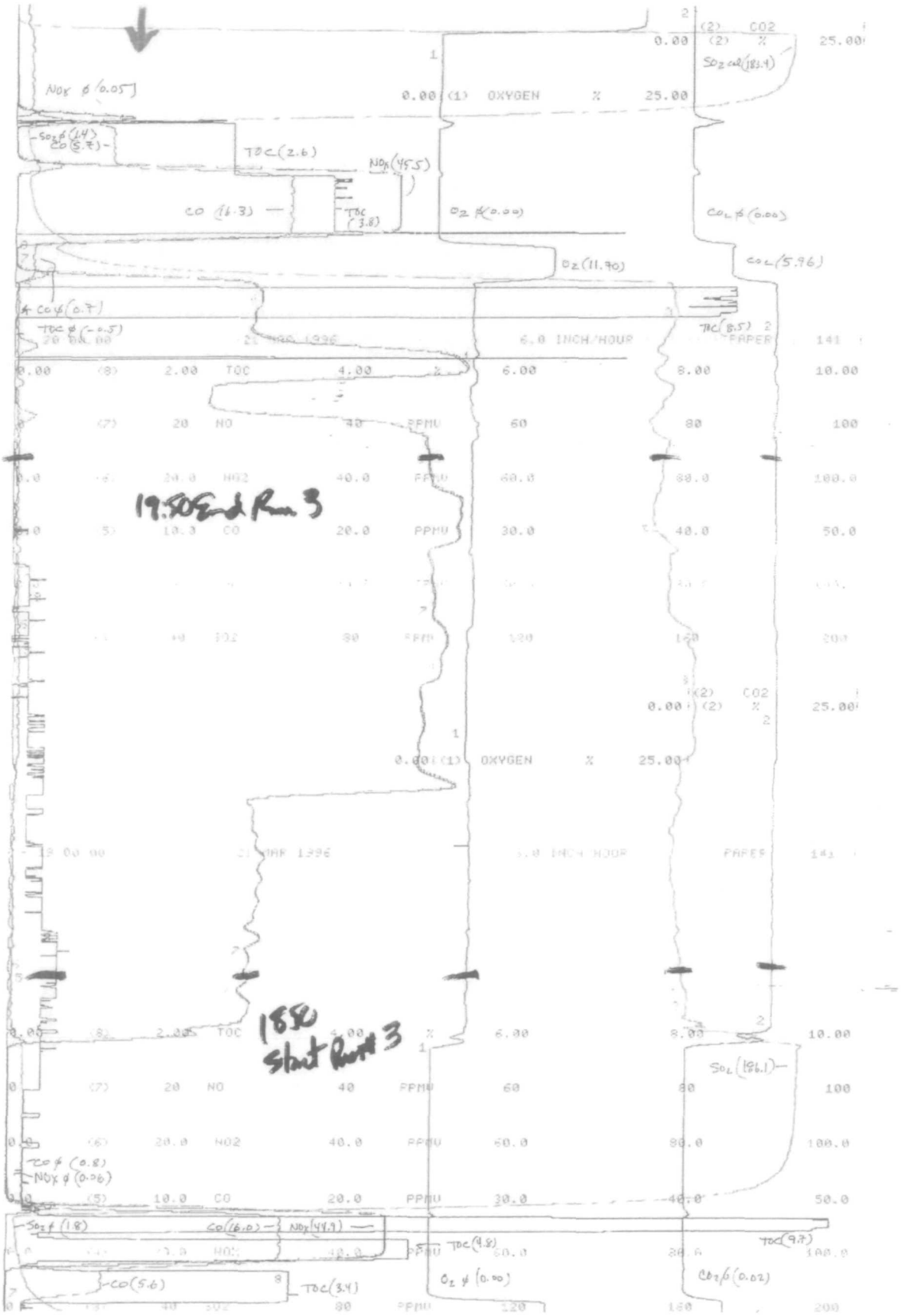

70
SO2
PPMV
CO2
OXYGEN
20 MAR 1996
6.0 INCH/HOUR
PAPER
TOC
NOx
NO
NO2
CO
1743
Shut Run #3
CO(8.4)
SO2(22.8)
TOC(9.7)
TOC(3.2)
TOC(4.8)
NOx ø(0.08)
CO ø(0.2)
O2 ø(0.00)
CO2 ø(0.00)
CO(21.2)
O2(5.00)
TOC(9.1)
SO2 ø(-0.5)
NOx(23.7)
TOC ø(0.2)
O2(12.15)
CO2 6.28


21 MAR 1996
6.0 INCH/HOUR
PAPER
PPMV
CO
SO2
CO2
0.00 (1) OXYGEN % 25.00
20 MAR 1996
PRINT INHIBIT MODE
O2(12.25)
CO2(6.20)
SO2(23.6)
CO2(0.00)
CO(0.4)
NOx(0.06)
TOC(5.7)
SO2(-0.4)
TOC(4.9)
CO(24.4)
CO2(24.26)
TOC(0.8)
NOx(12.58)
CO(5.4)
O2(0.00)
TOC(9.5)
TOC
NO
NOx(23.7)
1743
Start Run #3
NOx(12.98)
CO(5.4)


21 MAR 1996
6.0 INCH/HOUR
PAPER
0.00 (1) OXYGEN % 25.00
13:38 Start Run #1
TOC (3.1)
TOC (9.1)
TOC (9.7)
CO (5.4)
CO (24.8)
O2 (4.85)
CO2 (22.2)
O2 (21.75)
CO (15.4)
NOx (49.2)
O2 f (0.00)
CO2 f (0.00)
NOx (85.4)
CO2 (11.8)
SO2 (186.8)
SO2 (114)
SO2 f (0.0)
NOx
O2 (11.9)
CO2 (6.00)


73
1554 Start Run #2
STOP
NO2
CO
NOX
SO2
OXYGEN
CO2
21 MAR 1996
6.0 INCH/HOUR
PAPER
TOC
NO
1438 End Run 1
13:38 Start Run #1


74
CO(5.6)
TOC(3.4)
TOC(9.8)
O2 ϕ (0.00)
CO2,6(0.02)
O2 cal(11.80)
CO2(6.00)
1805 End Run #2
6.0 INCH/HOUR
PAPER
CO2
OXYGEN
TOC
NO
PPMV
NO2
CO
SO2
17:05 restart Run 2
Boiler off-line high H2O pressure
STOP
1554 start Run #2


0.00 (2) CO2 % 25.00
SO2 ø2(183.4)
NOx ø (0.05)
0.00 (1) OXYGEN % 25.00
SO2 ø (1.4)
CO (5.7)
TOC(2.6)
NOx(45.5)
CO (16.3)
TOC (3.8)
O2 ø(0.00)
CO2 ø (0.00)
O2(11.90)
CO2(5.96)
CO ø(0.7)
TOC ø (-0.5)
TOC(8.5)
6.0 INCH/HOUR
PAPER
0.00 (8) 2.00 TOC 4.00 % 6.00 8.00 10.00
(7) 20 NO 40 PPMV 60 80 100
(6) 20.0 NO2 40.0 PPMV 60.0 80.0 100.0
19:50 End Run 3
(5) 10.0 CO 20.0 PPMV 30.0 40.0 50.0
(4) 40 SO2 80 PPMV 120 160 200
0.00 (2) CO2 % 25.00
0.00 (1) OXYGEN % 25.00
6.0 INCH/HOUR
PAPER
1850 Start Run #3
SO2(186.1)
CO ø (0.8)
NOx ø (0.06)
SO2 ø (1.8)
CO(6.0)
NOx(44.9)
TOC(4.8)
TOC(9.7)
CO(5.6)
TOC(3.4)
O2 ø (0.00)
CO2 ø (0.02)

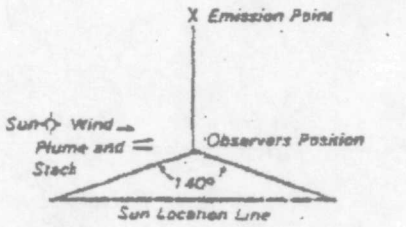
Visible Emission Observation Form

SOURCE NAME	Longview Fibre Company
ADDRESS	5901 E Marginal Way S
CITY	Seattle
STATE	WA
ZIP	98134
PHONE	(206) 762-7170
SOURCE ID NUMBER	PSAPCA 6264/15019
PROCESS EQUIPMENT	Cleaver Brooks Boiler
OPERATING MODE	variable load
CONTROL EQUIPMENT	fuel gas recirculation to NOX
OPERATING MODE	operating
DESCRIBE EMISSION POINT START	Heat trace
STOP	Heat Trace
HEIGHT ABOVE GROUND LEVEL START	~35'
STOP	~35'
HEIGHT RELATIVE TO OBSERVER START	~5'
STOP	~5'
DISTANCE FROM OBSERVER START	30'
STOP	30'
DIRECTION FROM OBSERVER START	W
STOP	W
DESCRIBE EMISSIONS START	None - Heat
STOP	None Heat
EMISSION COLOR START	Clear
STOP	Clear
PLUME TYPE: CONTINUOUS ☐ FUGITIVE ☐ INTERMITTENT ☐	
WATER DROPLETS PRESENT: NO ☒ YES ☐	
IF WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☐	
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED START	Stack top
STOP	Stack top
DESCRIBE BACKGROUND START	white overcast
STOP	white overcast
BACKGROUND COLOR START	"
STOP	"
SKY CONDITIONS START	Overcast
STOP	Overcast
WIND SPEED START	~5mph
STOP	~10mph
WIND DIRECTION START	NW
STOP	W
AMBIENT TEMP. START	~57°
STOP	~60°
WET BULB TEMP.	
RH percent	

OBSERVATION DATE	START TIME	STOP TIME
3/21/96	13:45	14:45

MIN \ SEC	0	15	30	45	MIN \ SEC	0	15	30	45
1	0	0	0	0	31	0	0	0	0
2	0	0	0	0	32	0	0	0	0
3	5	0	0	0	33	0	0	0	0
4	0	0	0	0	34	0	0	0	0
5	0	0	0	0	35	0	0	0	0
6	0	0	0	0	36	0	0	0	0
7	0	0	0	0	37	0	0	0	0
8	0	5	0	0	38	0	0	0	0
9	0	0	0	0	39	0	0	0	0
10	0	0	0	0	40	0	0	0	0
11	0	0	0	0	41	0	0	0	0
12	0	0	0	0	42	0	0	0	0
13	0	0	0	0	43	0	0	0	0
14	0	0	0	0	44	0	0	0	0
15	0	0	0	0	45	0	0	0	0
16	0	0	0	0	46	0	0	5	0
17	0	0	0	0	47	0	0	0	0
18	0	0	5	0	48	0	0	0	0
19	0	0	0	0	49	0	0	0	0
20	0	0	0	0	50	0	0	0	0
21	0	0	0	0	51	0	0	0	0
22	0	0	0	0	52	0	0	0	0
23	0	0	0	0	53	0	0	0	0
24	0	0	0	0	54	0	0	0	0
25	0	0	0	0	55	0	0	0	0
26	0	0	0	0	56	0	0	0	0
27	0	0	0	0	57	0	0	0	0
28	0	0	0	0	58	0	0	0	0
29	0	0	0	0	59	0	0	0	0
30	0	0	0	0	60	0	0	0	0

Source Layout Sketch — Draw North Arrow



AVERAGE OPACITY FOR HIGHEST PERIOD	1 hour
NUMBER OF READINGS ABOVE	0 % WERE 0
RANGE OF OPACITY READINGS MINIMUM	0
MAXIMUM	0
OBSERVER'S NAME (PRINT)	Tracy Prevo
OBSERVER'S SIGNATURE	Tracy L. Prevo
DATE	3/21/96
ORGANIZATION	Valid Facility, Inc.
CERTIFIED BY	WA DEQ
DATE	3/95
VERIFIED BY	
DATE	
COMMENTS	negligible opacity, only emission occurred during load change.
I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS SIGNATURE	
TITLE	
DATE	

APPENDIX C:

Analytical Data

Method 5 Weight Gain Summary
Method 5 Analysis

VALID RESULTS, INC.: EPA Method 5 Sample Weight Gain Summary Data Sheet

Client:	Longview Fibre Co.
Test Date:	3/21/96
Plant Location:	Seattle, WA
Source:	Boiler
Recovery Date:	3/21/96
Analysis Dates:	3/22/96 - 4/4/96

Total and Front Half Particulate Sample Weight Gain Summary

	Run 1		Run 2		Run 3		Run 4	
Total Particulate	33.3	mg	21.8	mg	19.4	mg	-1.3	mg
Front Half Particulate	10.8	mg	6.9	mg	8.9	mg	-0.8	mg

Particulate Sample Weight Gain Summary

	Run 1		Run 2		Run 3		Run 4	
Front Half Acetone	3.5	mg	1.3	mg	4.0	mg	0.2	mg
Front Half Filter	8.1	mg	6.4	mg	5.7	mg	0.6	mg
Back Half Organic	17.5	mg	11.4	mg	8.1	mg	0.1	mg*
Back Half Water	0.5	mg	1.4	mg	0.8	mg	0.1	mg*
Back Half Acetone	5.0	mg	2.6	mg	2.1	mg	0.3	mg
Total Blank Correction	-1.3	mg	-1.3	mg	-1.3	mg	1.3	mg

* maximum allowable blank correction (detection limit)

VALID RESULTS, INC.: Gravimetric Sample Analysis - Aluminum Weighing Tins

Client	Sampling Date	Sample ID	Media ID	Weight Date Initial	Initial Weights	Weight Date Final	Final Weights	Net Weight Gain (Final - Initial)	Total Volume
Longview Fibre Co	3/21/96	R1FH	T167	9/11/96	2.7079	3/22/96		<0.0035>	125
				9/13/96	2.7076	3/25/96	2.7114		
				12/14/96	2.7078	3/31/96	2.7114		
				12/18/96	2.7079	4/1/96	2.7114		
						4/2/96	2.7112		
						4/3/96	2.7112		
<Averages>					<2.7078>		<2.7113>		
Longview Fibre Co	3/21/96	R2FH	T168	9/11/96	2.7039	3/22/96		<0.0013>	125
				9/13/96	2.7036	3/25/96	2.7053		
				12/14/96	2.7038	3/31/96	2.7050		
				12/18/96	2.7039	4/1/96	2.7050		
						4/2/96	2.7050		
						4/3/96			
<Averages>					<2.7038>		<2.7051>		
Longview Fibre Co	3/21/96	R3FH	T169	9/11/96	2.7373	3/22/96		<0.0040>	125
				9/13/96	2.7371	3/25/96	2.7416		
				12/14/96	2.7374	3/31/96	2.7413		
				12/18/96	2.7374	4/1/96	2.7412		
						4/2/96	2.7412		
<Averages>					<2.7373>		<2.7413>		
Longview Fibre Co	3/21/96	R4FH	T162	9/11/96	2.7078	3/22/96	2.7078	<0.0002>	125
				9/13/96	2.7075	3/25/96	2.7081		
				12/14/96	2.7076	3/31/96	2.7077		
				12/18/96	2.7076	4/2/96	2.7078		
						4/3/96	2.7078		
<Averages>					<2.7076>		<2.7078>		

VALID RESULTS, INC.: Gravimetric Sample Analysis - 102 mm Glass Fiber Filters

Client	Sampling Date	Sample ID	Media ID	Weight Date Initial	Initial Weights	Weight Date Final	Final Weights	Net Weight Gain (Final - Initial)	Total Volume
Longview Fibre Co	3/21/96	R1F	VR132GF	6/4/95	0.5831	3/25/96	0.5910	<0.0081>	
				6/5/95	0.5828	3/31/96	0.5911		
						4/1/96	0.5911		
				2/15/96	0.5832	4/2/96	0.5912		
<Averages>					<0.5830>		<0.5911>		
Longview Fibre Co	3/21/96	R2F	VR133GF	6/4/95	0.5830	3/25/96	0.5893	<0.0064>	
				6/5/95	0.5827	3/31/96	0.5892		
						4/1/96	0.5892		
				2/15/96	0.5831	4/2/96	0.5894		
<Averages>					<0.5829>		<0.5893>		
Longview Fibre Co	3/21/96	R3F	VR134GF	6/4/95	0.5861	3/25/96	0.5918	<0.0057>	
				6/5/95	0.5859	3/31/96	0.5918		
						4/1/96	0.5918		
				2/15/96	0.5863	4/2/96	0.5918		
<Averages>					<0.5861>		<0.5918>		
Longview Fibre Co	3/21/96	R4F	VR135GF	6/4/95	0.5840	3/25/96	0.5844	<0.0006>	
				6/5/95	0.5836	3/31/96	0.5845		
						4/1/96	0.5844		
				2/15/96	0.5840	4/2/96	0.5846		
<Averages>					<0.5839>		<0.5845>		

VALID RESULTS, INC.: Gravimetric Sample Analysis - 150 ml Glass Beakers

Client	Sampling Date	Sample ID	Media ID	Weight Date Initial	Initial Weights	Weight Date Final	Final Weights	Net Weight Gain (Final - Initial)	Total Volume
Longview Fibre Co	3/21/96	R1BH - Organic	B56	9/1/95	68.3246			<0.0175>	75
				9/7/95	68.3243				
				9/8/95	68.3246	4/2/96	68.3419		
				9/9/95		4/3/96	68.3420		
						4/4/96	68.3422		
<Averages>					<68.3245>		<68.3420>		
Longview Fibre Co	3/21/96	R2BH - Organic	B57	9/1/95	68.4916			<0.0114>	75
				9/7/95	68.4914				
				9/8/95	68.4913	4/2/96	68.5028		
						4/3/96	68.5029		
						4/4/96	68.5027		
<Averages>					<68.4914>		<68.5028>		
Longview Fibre Co	3/21/96	R3BH - Organic	B58	9/1/95	64.4339			<0.0081>	75
				9/7/95	64.4341				
				9/8/95	64.4341	4/2/96	64.4423		
						4/3/96	64.4419		
						4/4/96	64.4421		
<Averages>					<64.4340>		<64.4421>		
Longview Fibre Co	3/21/96	R4BH - Organic	B59	9/1/95	64.5546	3/31/96	64.5554	<0.0007>	75
				9/7/95	64.5546				
				9/8/95	64.5549	4/2/96	64.5555		
						4/3/96	64.5553		
<Averages>					<64.5547>		<64.5554>		

VALID RESULTS, INC.: Gravimetric Sample Analysis - 150 ml Glass Beakers

Client	Sampling Date	Sample ID	Media ID	Weight Date Initial	Initial Weights	Weight Date Final	Final Weights	Net Weight Gain (Final - Initial)	Total Volume
Longview Fibre Co	3/21/96	R1BH - H2O	B52	12/26/95	68.0126	3/31/96		<0.0005>	125
				12/27/95	68.0127	4/1/96	68.0131		
				12/29/95	68.0130	4/2/96	68.0133		
				9/9/95		4/3/96	68.0136		
<Averages>					<68.0128>		<68.0133>		
Longview Fibre Co	3/21/96	R2BH - H2O	B53	12/26/95	67.7910	3/31/96		<0.0014>	125
				12/27/95	67.7909	4/1/96	67.7920		
				12/29/95	67.7909	4/2/96	67.7925		
						4/3/96	67.7924		
<Averages>					<67.7909>		<67.7923>		
Longview Fibre Co	3/21/96	R3BH - H2O	B54	12/26/95	68.8712	3/31/96		<0.0008>	125
				12/27/95	68.8715	4/1/96	68.8722		
				12/29/95	68.8715	4/2/96	68.8720		
						4/3/96	68.8725		
<Averages>					<68.8714>		<68.8722>		
Longview Fibre Co	3/21/96	R4BH - H2O	B55	12/26/95	68.4268	3/31/96		<0.0004>	125
				12/27/95	68.4270	4/1/96	68.4273		
				12/29/95	68.4267	4/2/96	68.4272		
						4/3/96	68.4270		
<Averages>					<68.4268>		<68.4272>		

VALID RESULTS, INC.: Gravimetric Sample Analysis - Aluminum Weighing Tins

Client	Sampling Date	Sample ID	Media ID	Weight Date Initial	Initial Weights	Weight Date Final	Final Weights	Net Weight Gain (Final - Initial)	Total Volume
Longview Fibre Co	3/21/96	R1BH Ace	T170	9/11/96	2.6864	3/25/96	2.6915	<0.0050>	125
				9/13/96	2.6862	3/31/96	2.6913		
				12/14/96	2.6863	4/1/96	2.6913		
				12/18/96	2.6862	4/2/96	2.6911		
<Averages>					<2.6863>		<2.6913>		
Longview Fibre Co	3/21/96	R2BH Ace	T171	9/11/96	2.7279	3/25/96	2.7288	<0.0026>	125
				9/13/96	2.7278	3/31/96	2.7309		
				12/14/96	2.7277	4/1/96	2.7310		
				12/18/96	2.7277	4/2/96	2.7308		
<Averages>					<2.7278>		<2.7304>		
Longview Fibre Co	3/21/96	R3BH Ace	T172	9/11/96	2.7815	3/25/96	2.7835	<0.0021>	125
				9/13/96	2.7813	3/31/96	2.7835		
				12/14/96	2.7813	4/1/96	2.7834		
				12/18/96	2.7815				
<Averages>					<2.7814>		<2.7835>		
Longview Fibre Co	3/21/96	R4BH Ace	T162	9/11/96	2.7078	3/25/96	2.7078	<0.0003>	125
				9/13/96	2.7075	3/31/96	2.7081		
				12/14/96	2.7076	4/1/96	2.7077		
				12/18/96	2.7076	4/2/96	2.7078		
						4/3/96	2.7078		
<Averages>					<2.7076>		<2.7079>		

APPENDIX D:

Unit Operations

Unit Operations Conditions Report

Unit Operating Conditions Report (Natural Gas Use)

Facility: Longview Fibre Company
Location: Seattle, WA
Source: Cleaver-Brooks Boiler
Test Date: 3/20/96

American Meter Co. (Singer) # 74s 550488
WA Natural Gas Company # 356702 (60°F Base)

Test Run #1	Natural Gas use from 7,285,300 ft^3 to 7,286,900 ft^3				In 43Min 25sec 04_{100th}sec	
	Time	Steam Load	Steam Pressure	Gas Line Pressure		
	13:40	14%	172 psi	1.46 psi	4.98 v	Nozzle Tested @179.5 gal/hr 80% max on #2 16,068,000 Btu/hr
	14:00	18%	173 psi	1.40 psi	4.98 v	
	14:20	17%	173 psi	1.41 psi	4.98v	
	14:40	17%	173 psi	1.42 psi	4.98v	
Test Run #2	Natural Gas use from 7,289,400 ft^3 to 7,292,400 ft^3				In 45min 19sec 94_{100th}sec	
	15:50	29%	172 psi	1.36 psi	4.98v	
	16:00	40%	172 psi	1.33 psi	4.69v	
	16:30	33%	173 psi	1.47 psi	4.98v	
Test Run #3	Natural Gas use from 7,296,600 ft^3 to 7,299,800 ft^3				In 47min 39sec 86_{100th}sec	
	17:50	15%	172 psi	1.53 psi	4.98v	
	18:00	22%	172 psi	1.39 psi	4.98v	
	18:20	37%	173 psi	1.45 psi	4.98v	
	18:30	40%	171 psi	1.36 psi	4.98v	

Unit Operating Conditions Report (#2 Fuel Oil Use)

Facility: Longview Fibre Company
Location: Seattle, WA
Source: Cleaver-Brooks Boiler
Test Date: 3/21/96

#2 Fuel Oil use (historical)
~ 42 gallons per hour

	Time	Steam Load	Steam Pressure	Gas Line Pressure		
Test Run	13:40	31%	173 psi	0.01 psi	4.98 v	Nozzle Tested @179.5 gal/hr 80% max on #2 16,068,000 Btu/hr
#1	13:50	34%	173 psi	0.01 psi	4.98 v	
	14:20	14%	174 psi	0.01 psi	4.98v	
Test Run	17:10	10%	173 psi	1.30 psi	3.71v	
#2	17:40	10%	174 psi	1.30 psi	4.69v	
	17:55	33%	172 psi	1.30 psi	4.98v	
Test Run	18:55	13%	176 psi	1.30 psi	4.24v	
#3	19:10	42%	173 psi	1.30 psi	4.98v	
	19:30	33%	173 psi	1.30 psi	4.98v	

APPENDIX E:

Calibrations

Calibration Gas Certifications
Method 5 - Dry Gas Meter
Nozzle
S-Type Pitot Tube
Type K Thermocouple

SO-CAL Airgas

BYRNE SPECIALTY GASES
601 SOUTH ANDOVER STREET • SEATTLE WASHINGTON USA 98108
206.621.8300

ANALYTICAL REPORT - PRODUCT CERTIFICATION

TO:
Byrne Specialty Gas

Date: 04 December 1995

P.O.: SP-5276-61338

+/- 1 Percent Analytical,
EPA Traceability Protocol For Assay And Certification
of Gaseous Calibration Standards Procedure G-1.

CYLINDER NO.	CONSTITUENTS CONCENTRATION:	NOMINAL	ACTUAL
CC17732	Carbon Dioxide	12.0 %	11.8 %
	Oxygen	22.0 %	21.9 %
	Nitrogen	Balance	Balance

Certification Period (months) : 36
Expiration Date : 04 Dec 1998
Cylinder Pressure: 2000 psia
DO NOT USE BELOW 150 PSIG

Claude J. Vahle

Claude J. Vahle
ANALYST

SO-CAL Airgas

BYRNE SPECIALTY GASES
SEATTLE WASHINGTON USA
206.621.8400

ANALYTICAL REPORT - PRODUCT CERTIFICATION

TO:
Byrne Specialty Gas

Date: 04 December 1995

P.O.: SP-5276-61338

+/- 1 Percent Analytical,
EPA Traceability Protocol For Assay And Certification
of Gaseous Calibration Standards Procedure G-1.

CYLINDER NO.	CONSTITUENTS CONCENTRATION:	NOMINAL	ACTUAL
CC104438	Carbon Dioxide	6.00 %	6.00 %
	Oxygen	12.0 %	11.9 %
	Nitrogen	Balance	Balance

Certification Period (months) : 36
Expiration Date : 04 Dec 1998
Cylinder Pressure: 2000 psia
DO NOT USE BELOW 150 PSIG

Claude J. Vance
ANALYST

SO-CAL Airgas

BYRNE SPECIALTY GASES
601 SOUTH ANDOVER STREET • SEATTLE, WASHINGTON USA 98108
206.621.8400

ANALYTICAL REPORT - PRODUCT CERTIFICATION

TO:
Byrne Specialty Gas

Date: 04 December 1995

P.O.: SP-5276-61338

+/- 1 Percent Analytical,
EPA Traceability Protocol For Assay And Certification
of Gaseous Calibration Standards Procedure G-1.

CYLINDER NO.	CONSTITUENTS CONCENTRATION:	NOMINAL	ACTUAL
CC17732	Carbon Dioxide	12.0 %	11.8 %
	Oxygen	22.0 %	21.9 %
	Nitrogen	Balance	Balance

Certification Period (months) : 36
Expiration Date : 04 Dec 1998
Cylinder Pressure: 2000 psia
DO NOT USE BELOW 150 PSIG

Claude J. Vahle
Claude J. Vahle
ANALYST

NEW ADDRESS
BYRNE SPECIALTY GASES, INC
601 S. ANDOVER ST.
SEATTLE, WA 98108
(206) 621-8400 FAX (206) 621-1192

SO-CAL Airgas

ANALYTICAL REPORT - PRODUCT CERTIFICATION

TO:
Byrne Specialty Gases

Date: 20 June 1995

P.O.: SP-4275-53612

+/- 1 Percent Analytical,
EPA Traceability Protocol For Assay And Certification
of Gaseous Calibration Standards Procedure G-1.

CYLINDER NO.	CONSTITUENTS CONCENTRATION:	NOMINAL	ACTUAL
CC46581	Carbon Monoxide	25 PPM	23.7 PPM
	Carbon Dioxide	22.5 %	22.3 %
	Oxygen	5.00 %	4.86 %
	Nitrogen	Balance	Balance

Certification Period (months) : 36
Expiration Date : 19 June 1998
Cylinder Pressure: 2000 psia
DO NOT USE BELOW 150 PSIG

Claude J. Vaille
ANALYST

SO-CAL Airgas

BYRNE SPECIALTY GASES
601 SOUTH ANDOVER STREET • SEATTLE WASHINGTON USA 98108
206.621.8400

ANALYTICAL REPORT - PRODUCT CERTIFICATION

TO:
Byrne Specialty Gas Co.

Date: 20 December 1995

P.O.: SP-5276-61338

+/- 1 Percent Analytical,
EPA Traceability Protocol For Assay And Certification
of Gaseous Calibration Standards Procedure G-1.

CYLINDER NO.	CONSTITUENTS CONCENTRATION:	NOMINAL	ACTUAL
CC48235	Nitric Oxide	10-15 PPM	10.7 PPM
	NOX		13.0 PPM
	Carbon Monoxide	200-250 PPM	230 PPM
	Nitrogen	Balance	Balance

Certification Period (months) : 24
Expiration Date : 15 Dec 1997
Cylinder Pressure: 2000 psia
DO NOT USE BELOW 150 PSIG

Claude J. Vahle
ANALYST

SO-CAL Airgas

BYRNE SPECIALTY GASES
601 SOUTH ANDOVER STREET • SEATTLE WASHINGTON USA 98108
206.621.8400

ANALYTICAL REPORT - PRODUCT CERTIFICATION

TO:
Byrne Specialty Gas Co.

Date: 20 December 1995

P.O.: SP-5276-61338

+/- 1 Percent Analytical,
EPA Traceability Protocol For Assay And Certification
of Gaseous Calibration Standards Procedure G-1.

CYLINDER NO.	CONSTITUENTS CONCENTRATION:	NOMINAL	ACTUAL
CC49597	Nitric Oxide	20-25 PPM	22.7 PPM
	NOX		24.0 PPM
	Carbon Monoxide	100-150 PPM	141 PPM
	Nitrogen	Balance	Balance

Certification Period (months) : 24
Expiration Date : 15 Dec 1997
Cylinder Pressure: 2000 psia
DO NOT USE BELOW 150 PSIG

Claude J. Vahle
ANALYST

SO-CAL Airgas

BYRNE SPECIALTY GASES
401 SOUTH ANDOVER STREET · SEATTLE WASHINGTON USA 98108
206.621.8400

ANALYTICAL REPORT - PRODUCT CERTIFICATION

TO:
Byrne Specialty Gas Co.

Date: 14 Feburary 1996

P.O.: SP-5449-64189

+/- 1 Percent Analytical,
EPA Traceability Protocol For Assay And Certification
of Gaseous Calibration Standards Procedure G-1.

CYLINDER NO.	CONSTITUENTS CONCENTRATION:	NOMINAL	ACTUAL
CC50074	Carbon Monoxide	12.5 PPM	15.8 PPM
	Nitric Oxide	45 PPM	44.4 PPM
	NOX		45.0 PPM
	Nitrogen	Balance	Balance

Certification Period (months) : 24
Expiration Date : 13 Feb 1998
Cylinder Pressure: 1900 psia
DO NOT USE BELOW 150 PSIG

Claude J. Vahle
ANALYST

P.D.-042 9/93

SO-CAL Airgas

BYRNE SPECIALTY GASES
206.621.8400

ANALYTICAL REPORT - PRODUCT CERTIFICATION

TO:
Byrne Specialty Gas Co.

Date: 04 January 1996

P.O.: SP-5276-61338

+/- 1 Percent Analytical,
EPA Traceability Protocol For Assay And Certification
of Gaseous Calibration Standards Procedure G-1.

CYLINDER NO.	CONSTITUENTS CONCENTRATION:	NOMINAL	ACTUAL
CC50022	Nitric Oxide	85-95 PPM	83.6 PPM
	NOX		84.0 PPM
	Carbon Monoxide	4.5-5.5 PPM	4.78 PPM
	Nitrogen	Balance	Balance

Certification Period (months) : 24
Expiration Date : 02 Jan 1998
Cylinder Pressure: 1900 psia
DO NOT USE BELOW 150 PSIG

Claude J. Vahle
ANALYST

SO-CAL Airgas

BYRNE SPECIALTY GASES

pure and mixed gases · gas handling equipment · cryogenics

BYRNE
Byrne Specialty Gases, Inc.
118 S. Mead Street
Seattle, Washington 98108 (206) 764-4633

ANALYTICAL REPORT - PRODUCT CERTIFICATION

TO:
Byrne

Date: 11 July 1994

P.O.:SP-2917-43511

2 percent analytical
Certified Standards

CYLINDER NO.	CONSTITUENTS CONCENTRATION:	NOMINAL	ACTUAL
CC44416	Sulfur Dioxide	25 PPM	25.7 PPM
	Nitrogen	Balacne	Balance

Claude J. Vahle
Claude J. Vahle ANALYST

SO-CAL Airgas

BYRNE SPECIALTY GASES
401 SOUTH ANDOVER STREET • SEATTLE WASHINGTON USA 98108
206.621.8400

ANALYTICAL REPORT - PRODUCT CERTIFICATION

TO:
Byrne Specialty Gas Co.

Date: 14 December 1995

P.O.: SP-5276-61338

+/- 1 Percent Analytical,
EPA Traceability Protocol For Assay And Certification
of Gaseous Calibration Standards Procedure G-1.

CYLINDER NO.	CONSTITUENTS CONCENTRATION:	NOMINAL	ACTUAL
CC18409	Sulfur Dioxide	40-50 PPM	44.3 PPM
	Nitrogen	Balance	Balance

Certification Period (months) : 24
Expiration Date : 13 Dec 1997
Cylinder Pressure: 2000 psia
DO NOT USE BELOW 150 PSIG

Claude J. Vanle
ANALYST

P D -042 9/93

SO-CAL Airgas

BYRNE SPECIALTY GASES

pure and mixed gases · gas handling equipment · cryogenics

BYRNE
Byrne Specialty Gases, Inc.
118 S. Mead Street
Seattle, Washington 98108 (206) 764-4633

ANALYTICAL REPORT - PRODUCT CERTIFICATION

TO:
Byrne Specialty Gas

Date: 25 August 1994

P.O.: SP-2971-43524

2 percent analytical
Certified Standards

CYLINDER NO.	CONSTITUENTS CONCENTRATION:	NOMINAL	ACTUAL
CC18085	Sulfur Dioxide	110 PPM	114 PPM
	Nitrogen	Balance	Balance

Claude J. Vahle ANALYST

SO-CAL Airgas

BYRNE SPECIALTY GASES
pure and mixed gases - gas handling equipment - cryogenics
BYRNE
Byrne Specialty Gases, Inc.
118 S. Mead Street
Seattle, Washington 98108 (206) 764-4633

ANALYTICAL REPORT - PRODUCT CERTIFICATION

TO:
Byrne Specialty Gas Co.

Date: 06 September 1994

P.O.: SP-2971-43524

2 percent analytical
Certified Standard

CYLINDER NO.	CONSTITUENTS CONCENTRATION:	NOMINAL	ACTUAL
CC96574	Sulfur Dioxide	180 PPM	187 PPM
	Nitrogen	Balance	Balance

Claude J. Vahle ANALYST

SO-CAL Airgas

SPECIALTY GAS DIVISION
11711 S. Alameda Street
Los Angeles, CA 90059
(213) 564-5711

ANALYTICAL REPORT - PRODUCT CERTIFICATION

TO:
Byrne Specialty Gas Co.

Date: 12 May 1995

P.O.: SP-4147-51604

+/- 1 Percent Analytical,
EPA Traceability Protocol For Assay And Certification
of Gaseous Calibration Standards Procedure G-1.

CYLINDER NO.	CONSTITUENTS CONCENTRATION:	NOMINAL	ACTUAL
CC45548	Propane	3 PPM	3.3 PPM
	Air	Balance	Balance

Certification Period (months) : 36
Expiration Date : 10 May 1998
Cylinder Pressure: 2000 psia
DO NOT USE BELOW 150 PSIG

Claude J. Vahle
ANALYST

P.D.-042 9/93

SCOTT-MARRIN, INC.
6531 BOX SPRINGS BLVD. • RIVERSIDE, CA 92507
TELEPHONE (714) 653-6780 • FAX (714) 653-2430

101

REPORT OF ANALYSIS
NIST TRACEABLE GAS MIXTURES

ENVT01
TO: RALPH MOLTZAU
ENVIRONMENTAL TECHNOLOGIES
2298 ALAHAO PLACE
BAY Q
HONOLULU, HI 96819-

DATE: 04/01/93

CUSTOMER ORDER NUMBER: ET90480

PAGE 1

CYLINDER NUMBER	COMPONENT	CONCENTRATION(v/v)	NIST TRACEABLE REFERENCE STANDARD
CC40174	Propane	4.79 ± 0.05 ppm	VOLUMETRIC
	Ultrapure Air	Balance	

ppm = umole/mole % = mole-%

The above analysis is traceable to the National Institute of Standards and Technology by intercomparison with the reference standard listed above.
Where indicated, volumetric and gravimetric reference standards are traceable thru use of our analytical balance. NIST Report No. MMAP 232.09/202691.

Analyst: M.S. Calhoun

Approved: J.T. Marrin

The only liability of this company for gas which fails to comply with this analysis shall be replacement or reanalysis thereof by the company without extra cost.

STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

SO-CAL Airgas

BYRNE SPECIALTY GASES
pure and mixed gases • gas handling equipment • cryogenics

BYRNE
Byrne Specialty Gases, Inc.
118 S. Mead Street
Seattle, Washington 98108 (206) 764-4633

ANALYTICAL REPORT - PRODUCT CERTIFICATION

TO:
Byrne Specialty Gas Co.

Date: 28 April 1995

P.O.: SP-4147-51604

+/- 1 Percent Analytical,
EPA Traceability Protocol For Assay And Certification
of Gaseous Calibration Standards Procedure G-1.

CYLINDER NO.	CONSTITUENTS CONCENTRATION:	NOMINAL	ACTUAL
CC122183	Propane	8.5 PPM	9.67 PPM
	Air	Balance	Balance

Certification Period (months) : 36
Expiration Date : 28 April 1998
Cylinder Pressure: 2000 psia
DO NOT USE BELOW 150 PSIG

Claude J. Vable
ANALYST

P.D.-042 9/93

GRASEBY

CONTROL UNIT CALIBRATION
(English Units)

Date 3-16-95

Metering System Identification: 80855
DGM# 2713308

Barometric pressure, P_b = 29.30 in. Hg

Model Number 2010

Orifice, manometer setting ΔH in. H_2O	Spirometer (wet meter) gas volume V_w ft^3	Dry gas meter volume V_m ft^3	Temperatures: Spirometer (wet meter) t_w °F	Dry Gas Meter: Inlet t_i °F	Dry Gas Meter: Outlet t_o °F	Dry Gas Meter: Average t_m °F	Time Θ min
1.0	5	5.049	74	81	77	79	9.13
2.0	5	5.017	74	83	77	80	6.51
4.0	5	5.031	72	85	77	81	4.62

Calculations

ΔH in. H_2O	Y $\frac{V_w P_b (t_m + 460)}{V_m \left[P_b + \frac{\Delta H}{13.6}\right](t_w + 460)}$	$\Delta H@$ $\frac{0.0317\ \Delta H}{P_b(t_o + 460)} \left[\frac{(t_w + 460)\ \Theta}{V_w}\right]^2$
1.0	.997	1.916
2.0	1.003	1.947
4.0	1.001	1.950
Average	1.000	1.938

Y = Ratio of reading of wet test meter to dry test meter; tolerance for individual values ±0.02 from average.

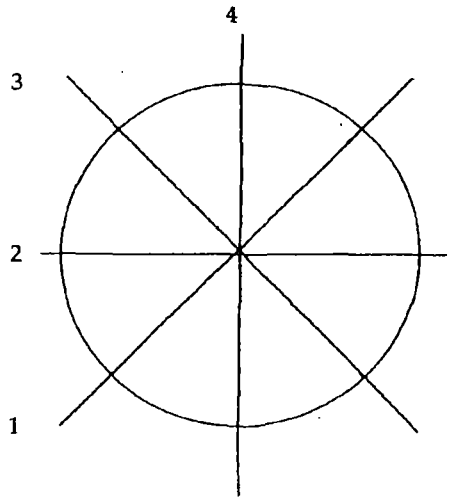
$\Delta H@$ = Orifice pressure differential that equates to 0.75 cfm of air @ 68 °F and 29.92 inches of mercury, in. H_2O; tolerance for individual values ±0.20 from average.

Calibrated by: MAC

GRASEBY ANDERSEN
500 TECHNOLOGY CT., SMYRNA, GA 30082-5211, USA
TEL: 404 319 9999 FAX: 404 319 0336

VALID RESULTS: Nozzle Calibration Data Form

Date: 3/21/96
Operator: T. Pierce
Nozzle Type: Quarty
Nozzle ID: 5/8-1
Ambient Temperature: ~62°

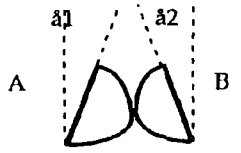


Measured Nozzle Diameters:

D1 =	0.628
D2 =	0.630
D3 =	0.629
D4 =	0.629
Average	< 0.629 >

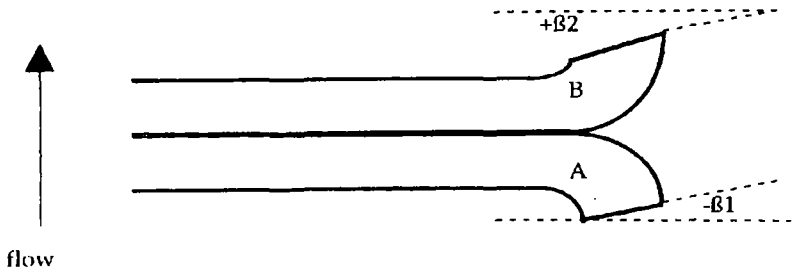
VALID RESULTS: Pitot Tube Calibration Data Sheet

Date: 3/1/96
Operator: T. Pelto
Pitot Tube ID: 72A



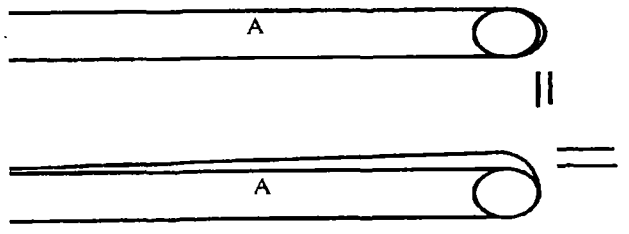
å1 = 1° < 10°

å2 = 0° < 10°



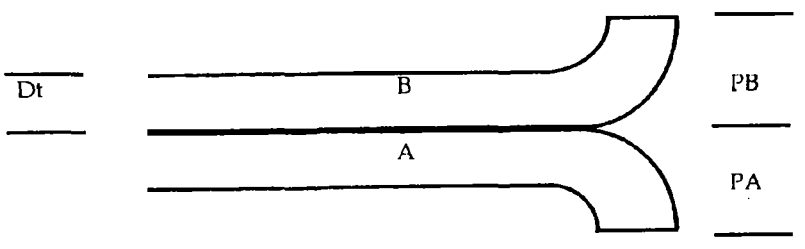
ß2 = 6° < 5°

ß1 = 2° < 5°



Z = 0" <= 1/8"

W = 0" <= 1/32"



Dt = 0.389" 1.05*Dt <= P <= 1.50*Dt

PB = 0.485"

✓ PA =PB

PA = 0.485"

VALID RESULTS: Type-K Thermocouple Calibration

Date: 3/1/96
Operator: T. Pero
Reference Thermometer: Mercury
Barometric Pressure: 29.24"
Ambient Temperature: ~50°

Thermocouple #	Identification	Reference Point	Thermocouple Reading	Reference Thermometer Reading	% Difference
72-A	Stack	Ice Water	32	32	∅
		Boiling Water	212	213	0.47
		Boiling Oil	321	322	0.31

APPENDIX F:

Quality Assurance

SI:414 Certificate of Completion
Flow Rate Calculation
Emission Rate Calculation

EPA

United States
Environmental Protection Agency

Air Pollution Training Institute

Tracy Allen Prevo

has successfully completed

COURSE # SI:414
QUALITY ASSURANCE FOR SOURCE EMISSION MEASUREMENTS

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LFC000472

VALID RESULTS, INC,: EPA Method 2,3,4: Manual Stack Gas Volumetric Flow Rate Calculation Sheet

Client: Longview Fibre Company, Inc.
Test Date: 3/21/96
Operator: T. Prevo
Plant Location: Seattle, WA
Source: Cleaver-Brooks Boiler Outlet Stack

Test Run Number 2 (#2 Fuel Oil) (@ 17:30 hours):

Dry Gas Molecular Weight (Md) *gram/gram-mole*

M_d 30.26 **gm/gm-mole** = 0.44*(12.90 %CO_2)+0.32*(3.50 %O_2)+0.28(100-((12.90 %CO_2)+(3.50 %O_2)))

Corrected Water Collected Volume (Vwc(std)) *dry standard cubic feet*:

$V_{wc(std)}$ 5.324 **dscf** = 0.04707*((113.1 V_{final})-(∅ $V_{initial}$))

Corrected Silica Gel Collected Volume ($V_{wsg(std)}$) *dry standard cubic feet*:

$V_{wsg(std)}$ 0.679 **dscf** = 0.04715*((14.4 W_{final})-(∅ $W_{initial}$))

Corrected Meter Volume ($V_{m(std)}$) *dry standard cubic feet*:

$V_{m(std)}$ 58.619 **dscf** = (57.788 cubic feet)*(1.0003 Y)*((68 T_{std} + 460)/(73.2 T_m + 460))*((30.40 P_{bar} + (3.26 dH/13.6)/(29.92 P_{std})

Stack Gas Moisture Content (B_{ws}) *decimal*

B_{ws} 0.0929 **decimal** = ((5.324 $V_{wc(std)}$)+(0.679 $V_{wsg(std)}$))/((5.324 $V_{wc(std)}$)+(0.679 $V_{wsg(std)}$)+(58.619 $V_{m(std)}$))

Wet Gas Molecular Weight (M_s) *gram/gram-mole*

M_s 29.07 **gm/gm-mole** = (30.26 M_d)*(1- 0.0929 B_{ws}) + (18.0* 0.0929 B_{ws})

Stack Gas Velocity (Vs) *feet per second*

V_s 12.65 **feet/second** = 85.49*(0.84 C_p)*(0.187 SQRT(DeltaP))*SQRT((324.5 T_s+460)/((30.4 P_{bar}+(-0.04 P_{static}/13.6))*(29.07 M_s)

Stack Gas Volumetric Flow Rate (Q_s) *dry standard cubic feet per minute*

Q_s 1,450 **dscfm** = 60*(1-0.0929 B_{ws})*(12.65 V_s)*(3.076 A_s)*((68 T_{std}+460)/(324.5 T_s+460))*(((30.40 P_{bar})+((-0.04 P_{static})/13.6))/(29.92 P_{std}))

Stack Area (A_s) *square feet*

A_s 9.076 **square feet** = (1/4)*(3.1416)*(23.75 Stack Diameter)*(23.75 Stack Diameter) /144 *square inches per square feet*

VALID RESULTS, EPA Method 7E: Manual Oxides of Nitrogen Calibration Bias Correction Calculation Sheet

Client: Longview Fibre Company, Inc.
Test Date: 3/21/96
Operator: T. Prevo
Plant Location: Seattle, WA
Source: Cleaver-Brooks Boiler Outlet Stack

Test Run Number 2 (#2 Fuel Oil):

Effluent Gas Concentration: *Bias Calibration Correction*

C_{gas} 33.74 ppm = ((33.43 C_{avg})*(45 C_{ma})/(44.65 C_m - 0.07 C_0))

Average Measured Gas Concentration: *Chart Divisions to Parts per Million Concentration Units*

C_{avg} 33.43 ppm = (33.5 Average ppm - 0.07 C_o)

Average of Initial and Final Zero Calibration Bias

C_o 0.07 ppm = ((0.07 Initial Zero Bias *ppm* + 0.06 Final Zero Bias *ppm*)/2)

Average of Initial and Final Upscale Calibration Bias

C_m 44.65 ppm = ((44.4 Initial Calibration Bias *ppm* + 44.9 Final Calibration Bias *ppm*)/2)

Actual Upscale Calibration Gas Concentration

C_{ma} 45.0 ppm

Oxides of Nitrogen Concentration (C_{NOx}) *milligrams per dry standard cubic meter*

C_{NOx} 64.3 mg/dscm = ((33.7 ppm)*((46.01 g/g-mole)*(41,500)/(1,000,000 ng/mg)))

Oxides of Nitrogen Concentration (C_{NOx}) *pounds per dry standard cubic foot*

C_{NOx} 4.01×10^{-6} lb/dscf = ((64.3 mg/dscm)*(0.01543 grains/mg))/((7000 grains/lb)*(35.32 cubic feet per cubic meter))

Oxides of Nitrogen Emission Rate (ER_{NOx}) *pounds per hour*

ER_{NOx} 0.350 lb/hr = ((4.01 x 10^{-6} lb/dscf)*(1,450 dscf/m)*(60 min/hr))

Oxides of Nitrogen Emission Rate (ER_{NOx}) *pounds per MMBtu*

ER_{NOx} 0.04426 lb/MMBtu = ((4.01 x 10^{-6} lbs/dscf)*(9,190 dscf/MMBtu)*20.9/(20.9 - 3.50 % $O_{2(stack)}$))