AP42 Section:	10.5
Reference:	19
Title:	*Emissions Test Report, Willamette Industries, Springfield, Oregon, Veneer Dryer #1 And Veneer Dryer #2, Test Dates June 1-2, 1998*, prepared for Willamette Industries, by BWR Associates, Inc., Project No. 98-092D, 1998. 2002 supplement

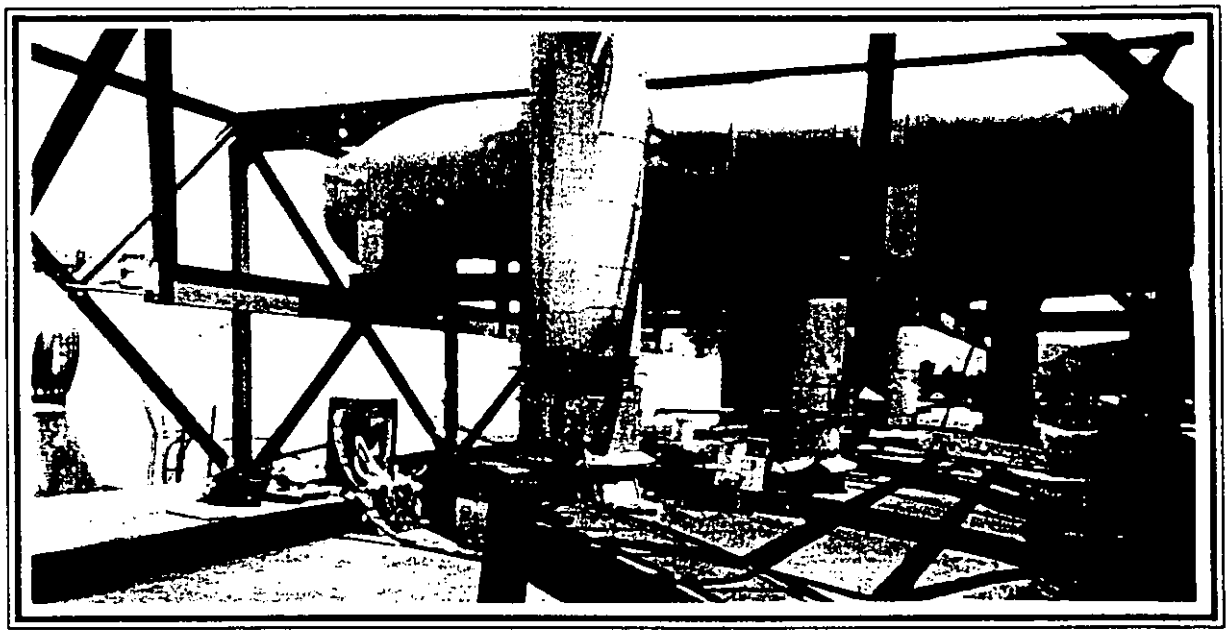
BWR assoc., inc.
environmental consultants

(19)

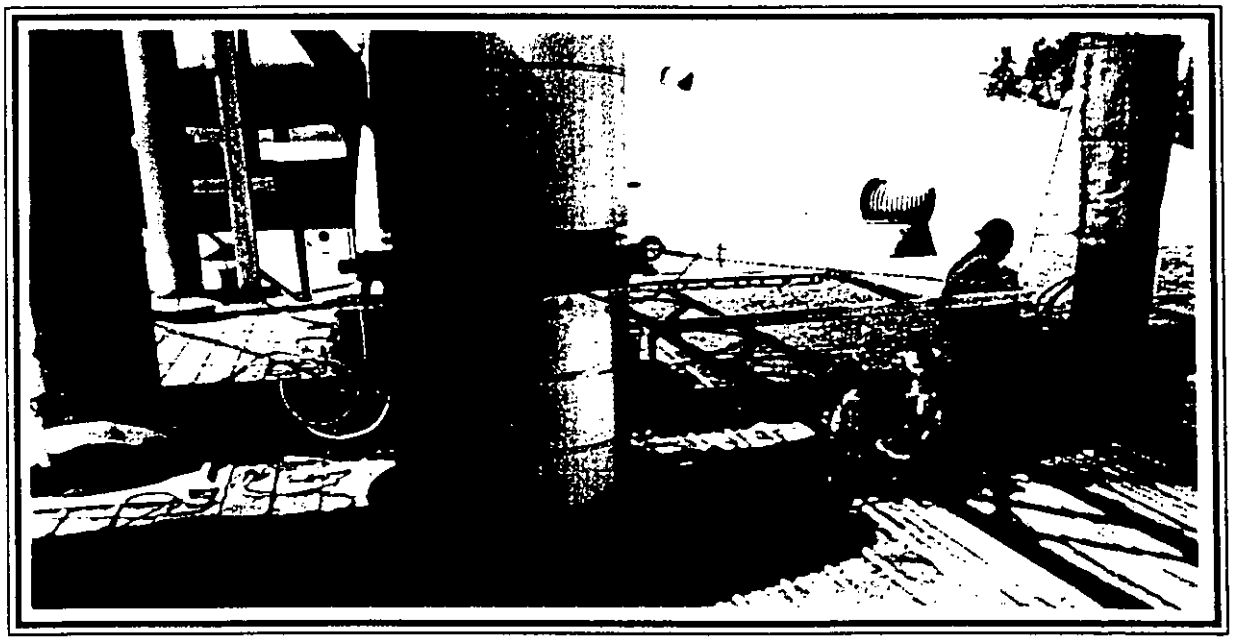
D-V1
D-V2
Report 210

◆ EMISSIONS TEST REPORT ◆

WILLAMETTE INDUSTRIES
Springfield, Oregon



Veneer Dryer #1 - (6/2/98)



Veneer Dryer #2 - (6/1/98)

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- 6.1.1. Sampling Calculations
- 6.1.2. Field Data
- 6.1.3. Laboratory Analysis
- 6.1.4. Sample and Traverse Point Determination Sheet
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7. APPENDIX B: VENEER DRYER #2 - (6/1/98)

7.1. **Sub-Appendix I: Particulate Sampling Analysis**
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- 7.1.4. Sample and Traverse Point Determination Sheet
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- 7.2.2. Field Data
- 7.2.3. Laboratory Analysis
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7.3. **Sub-Appendix III: Instrumental Gaseous Sampling Analysis**
- 7.3.1. Sampling Calculations
- 7.3.2. Field Data
- 7.3.3. Continuous Gas Sampling Schematic
- 7.3.4. Calibration and Quality Assurance Data

8. APPENDIX C: SUPPORTING DATA/DOCUMENTATION

8.1. Production Documentation
8.2. Source Test Plan

1. CERTIFICATION SHEET

****

WILLAMETTE INDUSTRIES
Springfield, Oregon

Project #98-092D

I hereby certify that the sampling and analytical procedures and data presented in this report are authentic and accurate.

by: Jackie Jeurcke
Reviewed by

I hereby certify that the testing details and conclusions reported herein are, to the best of my knowledge, accurate and valid.

by: Mark W Bailey
BWR Associates Inc.

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EMISSIONS TEST REPORT

WILLAMETTE INDUSTRIES
Springfield, Oregon

VENEER DRYERS #1 & #2

2. INTRODUCTION:

2.1. Test Purpose:

The purpose of this testing was to develop emission factors for uncontrolled direct fired natural gas veneer dryers.

2.2. Test Parameters:

All field testing was performed by Mark W. Bailey, Jim Turcke and Jackie Turcke of BWR Associates Inc. as outlined below.

Source	Parameters Measured	Test Location	Test Date
Veneer Dryer #1 • heart (2 runs) • sap (2 runs)	Particulate Matter Formaldehyde Carbon Monoxide Nitrogen Oxides Volatile Organic Compounds Oxygen & Carbon Dioxide	Dryer Exhaust (prior to ESP)	6/2/98
Veneer Dryer #2 • heart (2 runs) • sap (2 runs	Particulate Matter Formaldehyde Carbon Monoxide Nitrogen Oxides Volatile Organic Compounds Oxygen & Carbon Dioxide	Dryer Exhaust (prior to ESP)	6/1/98

2.3. Observers Names:

2.3.1. **Agency Observers**: Notified, not present

2.3.2. **Industry Observers**: Bob Calhoun, Quality Control Supervisor
Willamette Industries

Kathy Sperle, Environmental Engineer
Willamette Industries

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3. SUMMARY OF RESULTS:

3.1. VENEER DRYER #1 - HEART (6/2/98) :

Exhaust Characteristics	Run 1	Run 2	Avg 1-2
Temperature - °F	224	218	221
Moisture - %	8	9	8
Velocity - fpm	2030	2000	2020
Flow Rate - acf/min	14000	13800	13900
- dscf/min	9700	9500	9600
Particulate Emissions	**Run 1**	**Run 2**	**Avg 1-2**
Concentration - gr / dscf	0.060	0.045	0.053
Mass Emission - lbs / hr	5.0	3.7	4.3
Emission Factor - lbs / MSF (3/8")	0.45	0.32	0.38
Isokinetic Sample Rate - %	106	106	106
Gaseous Emissions	**Run 1**	**Run 2**	**Avg 1-2**
Carbon Monoxide (CO) lbs/MSF			
- ppm (dry)	24	26	25
- lbs / hr	1.0	1.1	1.0
- lbs / MMBtu S.D. 0.133	0.20	0.22	0.21
lbs/MSF 0.357	0.089	0.089	0.09
Nitrogen Oxides (NOx) lbs/MSF			
- ppm (dry)	5	5	5
- lbs / hr 0.069	0.3	0.3	0.3
- lbs / MMBtu 0.05	0.07	0.06	0.07
- lbs/Msf 0.12	0.0[illegible]	0.055	
FID Detectable Volatile Organic Compounds (VOC)			
- ppm (wet, as carbon)	187	179	183
- lbs carbon / hr	3.65	3.48	3.57
- lbs carbon / MSF (3/8")	0.33	0.30	0.31
Formaldehyde (HCHO)			
- ppm (dry)	10	12	11
- lbs formaldehyde / hr	0.47	0.53	0.50
- lbs carbon / hr	0.19	0.21	0.20
- lbs carbon / MSF (3/8")	0.02	0.02	0.02
Total VOC's (FID + HCHO)			
- lbs carbon / hr	3.84	3.69	3.77
- lbs carbon / MSF (3/8")	0.34	0.32	0.33
Oxygen Content - % (dry)	19.34	19.34	19.34
Carbon Dioxide Content - % (dry)	0.83	0.82	0.83
Dryer Production	**Run 1**	**Run 2**	**Avg 1-2**
Throughput - Sq Ft / Hr (3/8")	11,173	11,591	11,382

4 run Average lbs/MMBtu
.115 S.D.
0.37

0.078
0.018 S.D.
0.096

THC

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3.2. VENEER DRYER #1 - SAP (6/2/98) :

Exhaust Characteristics	Run 3	Run 4	Avg 3-4
Temperature - °F	232	232	232
Moisture - %	8	8	8
Velocity - fpm	2060	2050	2060
Flow Rate - acf/min	14200	14100	14100
- dscf/min	9700	9600	9600
Particulate Emissions	**Run 3**	**Run 4**	**Avg 3-4**
Concentration - gr / dscf	0.035	0.035	0.035
Mass Emission - lbs / hr	2.9	2.9	2.9
Emission Factor - lbs / MSF (3/8")	0.49	0.36	0.42
Isokinetic Sample Rate - %	98	99	98
Gaseous Emissions	**Run 3**	**Run 4**	**Avg 3-4**
Carbon Monoxide (CO)			
- ppm (dry)	20	21	20
- lbs / hr	0.8	0.9	0.9
- lbs / MMBtu	0.17	0.15	0.16
lbs/mmsf	0.136	0.111	0.128
Nitrogen Oxides (NOx)			
- ppm (dry)	4	4	4
- lbs / hr	0.3	0.3	0.3
- lbs / MMBtu	0.06	0.05	0.06
	0.05	0.037	
FID Detectable Volatile Organic Compounds (VOC)			
- ppm (wet, as carbon)	60	72	66
- lbs carbon / hr	1.18	1.40	1.29
- lbs carbon / MSF (3/8")	0.20	0.17	0.19
Formaldehyde (HCHO)			
- ppm (dry)	12	15	13
- lbs formaldehyde / hr	0.54	0.66	0.60
- lbs carbon / hr	0.21	0.26	0.24
- lbs carbon / MSF (3/8")	0.04	0.03	0.03
Total VOC's (FID + HCHO)			
- lbs carbon / hr	1.39	1.66	1.53
- lbs carbon / MSF (3/8")	0.24	0.21	0.22
Oxygen Content - % (dry)	19.33	19.08	19.21
Carbon Dioxide Content - % (dry)	0.75	0.79	0.77
Dryer Production	**Run 3**	**Run 4**	**Avg 3-4**
Throughput - Sq Ft / Hr (3/8")	5,883	8,073	6,978

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3.3. VENEER DRYER #2 - HEART (6/1/98) :

Exhaust Characteristics	Run 1	Run 2	Avg 1-2
Temperature - °F	240	249	245
Moisture - %	7	6	6
Velocity - fpm	6190	6410	6300
Flow Rate - acf/min	42600	44000	43300
- dscf/min	28900	29700	29300
Particulate Emissions	**Run 1**	**Run 2**	**Avg 1-2**
Concentration - gr / dscf	0.019	0.022	0.020
Mass Emission - lbs / hr	4.6	5.5	5.1
Emission Factor - lbs / MSF (3/8")	0.30	0.41	0.36
Isokinetic Sample Rate - %	100	98	99
Gaseous Emissions	**Run 1**	**Run 2**	**Avg 1-2**
Carbon Monoxide (CO)			
- ppm (dry)	34	33	33
- lbs / hr	4.3	4.2	4.2
- lbs / MMBtu	0.49 0.279	0.36 0.312	0.42 0.29
Nitrogen Oxides (NOx)			
- ppm (dry)	4	5	5
- lbs / hr	0.9	1.0	1.0
- lbs / MMBtu	0.10 0.058	0.09 0.07	0.10
FID Detectable Volatile Organic Compounds (VOC)			
- ppm (wet, as carbon)	92	87	89
- lbs carbon / hr	5.30	5.11	5.20
- lbs carbon / MSF (3/8")	0.34	0.38	0.36
Formaldehyde (HCHO)			
- ppm (dry)	2	2	2
- lbs formaldehyde / hr	0.25	0.34	0.30
- lbs carbon / hr	0.10	0.14	0.12
- lbs carbon / MSF (3/8")	0.01	0.01	0.01
Total VOC's (FID + HCHO)			
- lbs carbon / hr	5.40	5.25	5.32
- lbs carbon / MSF (3/8")	0.35	0.39	0.37
Oxygen Content - % (dry)	19.98	19.71	19.84
Carbon Dioxide Content - % (dry)	0.65	0.64	0.65
Dryer Production	**Run 1**	**Run 2**	**Avg 1-2**
Throughput - Sq Ft / Hr (3/8")	15,370	13,437	14,404

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3.4. VENEER DRYER #2 - SAP (6/1/98) :

Exhaust Characteristics	Run 3	Run 4	Avg 3-4
Temperature - °F	258	247	253
Moisture - %	10	10	10
Velocity - fpm	6240	6200	6220
Flow Rate - acf/min	42900	42600	42700
- dscf/min	27600	27800	27700
Particulate Emissions	**Run 3**	**Run 4**	**Avg 3-4**
Concentration - gr / dscf	0.013	0.016	0.015
Mass Emission - lbs / hr	3.0	3.9	3.4
Emission Factor - lbs / MSF (3/8")	0.43	0.51	0.47
Isokinetic Sample Rate - %	100	100	100
Gaseous Emissions	**Run 3**	**Run 4**	**Avg 3-4**
Carbon Monoxide (CO)			
- ppm (dry)	25	22	24
- lbs / hr	3.0	2.7	2.8
- lbs / MMBtu	0.20 0.42	0.25 0.357	0.23
Nitrogen Oxides (NOx)			
- ppm (dry)	6	5	6
- lbs / hr	1.2	0.9	1.1
- lbs / MMBtu	0.08 0.169	0.09 0.118	0.08
FID Detectable Volatile Organic Compounds (VOC)			
- ppm (wet, as carbon)	56	58	57
- lbs carbon / hr	3.19	3.29	3.24
- lbs carbon / MSF (3/8")	0.45	0.44	0.44
Formaldehyde (HCHO)			
- ppm (dry)	2	2	2
- lbs formaldehyde / hr	0.22	0.19	0.21
- lbs carbon / hr	0.09	0.08	0.08
- lbs carbon / MSF (3/8")	0.01	0.01	0.01
Total VOC's (FID + HCHO)			
- lbs carbon / hr	3.28	3.37	3.33
- lbs carbon / MSF (3/8")	0.46	0.45	0.45
Oxygen Content - % (dry)	19.25	19.73	19.49
Carbon Dioxide Content - % (dry)	0.80	0.71	0.76
Dryer Production	**Run 3**	**Run 4**	**Avg 3-4**
Throughput - Sq Ft / Hr (3/8")	7,063	7,565	7,314

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3.5. Discussion:

Test Locations / Conditions: The exhaust of each veneer dryer was tested individually prior to the wet ESP. Four (4) runs were performed for each veneer dryer. Runs 1 & 2 were conducted while the dryer was processing douglas fir heart, and runs 3 & 4 were conducted with douglas fir sap.

VOC's Representation: All VOC emissions were expressed on a carbon basis. Total VOC's were calculated by the arithmetic sum of FID detectable VOC's (EPA 25A) and Formaldehyde (NCASI Acetylacetone Method).

CO & NOx Emission Factors: Theoretically, CO & NOx emissions are attributed to the combustion process which in this case are the natural gas burners (2 burners per dryer). Therefore, a combustion factor (Fd) was utilized to determine a "lbs/MMBtu" emission factor . As per EPA's 40 CFR Pt. 60, App. A, Method 19, Table 19-1, Fd = 8710 dscf/MMBtu for natural gas. This Fd factor was used in conjunction with an excess air correction to achieve the lbs/MMBtu emission result.

3.6. Quality Assurance Procedures: The QA procedures performed during this project were conducted in accordance with associated EPA methodology. Summaries of the QA evaluations are found in Tables I - IV and detailed in Sections 6.1.6., 6.2.5. & 6.3.4. of Appendix A, and Sections 7.1.6. & 7.2.5. & 7.3.4. of Appendix B.

Table I: Measurement System Performance Evaluation
EPA Methods 2-4, ODEQ 7

System Component	Measure of Performance (6/1/98)	(6/2/98)
Type S Pitot Tube:		
Maximum average difference of Cp sides A, B	0.0072	0.0072
Maximum average deviation from mean		
Side A	0.0089	0.0089
Side B	0.0080	0.0080
Probe Nozzle:		
Maximum difference between measurements	0.003 inches	0.002 inches
Sampling System Thermometers:		
Maximum difference from reference thermometer		
Filter Oven	0.2%	0.2%
Impinger Exit	0.9%	0.9%
Stack	0.1%	0.1%
Dry Gas Meter Inlet	0.2%	0.2%
Dry Gas Meter Outlet	0.5%	0.5%
Orifice Meter Coefficient, $\Delta H_@$		
Maximum difference from average $\Delta H_@$	0.03 "H_2O	0.03 "H_2O
Dry Gas Meter Coefficient (Y)		
Maximum difference from average Y	0.007	0.007
Difference between pre/post Y	1%	1%

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Table II: Measurement System Performance Evaluation
NCASI Formaldehyde Method

System Component	Measure of Performance
Dry Gas Meter Thermometers: Maximum difference from reference thermometer Dry Gas Meter Inlet Dry Gas Meter Outlet	 0.4% 0.3%
Dry Gas Meter Coefficient (Y) Maximum difference from average Y Difference between pre/post Y	 0.004 0%
Spike Recovery - % Low Spike High Spike	 89 100

Table III: Measurement System Performance Evaluation (6/1/98) - Instrumental Gases

Instrument Parameter	Instrument / Test Method				
	CO / EPA 10	NOx / EPA 7E	VOC/EPA 25A	O_2 / EPA 3A	CO_2 / EPA 3A
Span	300 ppm	100 ppm	100 ppm propane	25%	10%
Sensitivity (% of span)	1.0	1.0	<0.1	0.5	0.1
Calibration Gas (% of span)	zero: 0 mid: 34 high: 84	zero: 0 mid: 49 high: 84	zero: 0 low: 30 mid: 51 high: 88	zero: 0 mid: 48 high: 82	zero: 0 mid: 56 high: 85
Analyzer Calibration Error	% of span zero: 0.1 mid: 0.7 high: 0.5	% of span zero: 0.0 mid: 0.8 high: 0.0	% of cal gas low: - 0.7 mid: - 0.2	% of span zero: 0.0 mid: 1.2 high: 0.7	% of span zero: 0.5 mid: 0.1 high: 0.2
Sampling System Bias (% of span) maximum zero: maximum upscale:	 0.5 - 0.8	 1.0 1.0	not applicable	 1.2 1.6	 - 1.6 - 0.8
Drift (% of span) maximum zero maximum upscale	 0.7 - 0.7	 1.0 0.0	 1.2 - 0.9	 0.8 2.0	 - 1.6 - 0.4

Table IV: Measurement System Performance Evaluation (6/2/98) - Instrumental Gases

Instrument Parameter	Instrument / Test Method				
	CO / EPA 10	NOx / EPA 7E	VOC/EPA 25A	O_2 / EPA 3A	CO_2 / EPA 3A
Span	300 ppm	100 ppm	100 ppm propane	25%	10%
Sensitivity (% of span)	1.0	1.0	<0.1	0.5	0.1
Calibration Gas (% of span)	zero: 0 mid: 34 high: 80	zero: 0 mid: 49 high: 84	zero: 0 low: 30 mid: 51 high: 88	zero: 0 mid: 48 high: 82	zero: 0 mid: 56 high: 85
Analyzer Calibration Error	% of span zero: 0.1 mid: 0.7 high: 0.5	% of span zero: 0.0 mid: 0.8 high: 0.0	% of cal gas low: 0.3 mid: - 0.2	% of span zero: 0.0 mid: 1.2 high: 0.7	% of span zero: 0.5 mid: 0.1 high: 0.2
Sampling System Bias (% of span) maximum zero: maximum upscale:	 - 1.5 - 2.4	 3.0 3.0	not applicable	 1.2 - 2.4	 0.5 0.8
Drift (% of span) maximum zero maximum upscale	 - 0.7 - 0.7	 3.0 2.0	 2.7 3.0	 0.4 - 1.6	 0.4 - 1.1

3.7. Data Representation:

Calculations presented in this report utilize a standard temperature of 528R (68°F) and a standard pressure of 29.92 "Hg. Calculations are carried out by computer and the final results listed in Section 3 are manually rounded according to the procedures outlined in "Standard Methods for the Examination of Water and Wastewater", 14th edition, 1975.

3.8. Errors in Stack Sampling:

Table V is taken from a paper entitled "Significance of Errors in Stack Sampling Measurements" by R.T. Shigahara, W.F. Todd, and W.S. Smith. It summarizes the maximum error expressed in percent which may be introduced into the test procedures by equipment or instrument limitations. In practice, BWR Associates has been able to consistently reproduce results from steady state operations within less than 5% variation between sequential tests and at less than 3% variation between simultaneous tests.

TABLE V: ERRORS IN STACK SAMPLING

Measurement	% Max Error
Stack Temperature Ts	1.4
Meter Temperature Tm	1.0
Stack Gage Pressure Ps	0.42
Meter Gage Pressure Pm	0.42
Atmospheric Pressure Patm	0.21
Dry Molecular Weight Md	0.42
Moisture Content Bws (Absolute)	1.1
Differential Pressure Head ΔP	10.0
Orifice Pressure Differential ΔH	5.0
Pitot Tube Coefficient Cp	2.4
Orifice Meter Coefficient Km	1.5
Diameter of Probe Nozzle Dn	0.80

4. SOURCE DESCRIPTION AND OPERATION:

Type of Source: Longitudinal direct fired veneer dryers

	Veneer Dryer #1	Veneer Dryer #2
Manufacturer:	Prentice	Coe
# of Decks:	6	6
# of Sections:	18	18

Air Pollution Control System: (Downstream of sampling locations)

Wet Electrostatic Precipitator (E-Tube)
Manufacturer: Geo Energy
Install Date: 1997

Average Operating Parameters:

Veneer Dryer #1 Testing (6/2/98)

Test	Ft^2/hr (3/8")	Redry (%)	Thickness & Species	Average Dry Time (min)	Average Temperatures (°F)		
					green end	hot end N / S	
1	11,173	3	0.169" 53's douglas fir heart	10.9	na	448 / 411	430
2	11,591	4	0.169" 53's douglas fir heart	10.9	na	454 / 414	434
3	5,883	3	0.169" RW douglas fir sap	20.9	208	464 / 428	446
4	8,073	3	0.169" RW douglas fir sap	19.4	209	464 / 426	445

Veneer Dryer #2 Testing (6/1/98)

Test	Ft^2/hr (3/8")	Redry (%)	Thickness & Species	Average Dry Time (min)	Average Temperatures (°F)	
					green N / S	hot end N / S
1	15,370	5	0.169" 53's douglas fir heart	11.0	469 / 438 454	247 / 247 247
2	13,437	9	0.169" 53's douglas fir heart	11.7	483 / 450 467	258 / 256 257
3	7,063	22	0.169" 53's douglas fir sap	24.2	543 / 505 524	268 / 269 269
4	7,565	26	0.169" 53's douglas fir sap	na	529 / 484 507	265 / 260 263

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5. PROCEDURES:

5.1. **Sampling Port Location**: See Sample and Traverse Point Determination Sheets (Appendices A & B, Sections 6.1.4. & 7.1.4.)

5.2. **Sampling Point Description**: See Sample and Traverse Point Determination Sheet (Appendices A & B, Sections 6.1.4. & 7.1.4.)

5.3. **Sampling Apparatus**: See Sample Train Schematics (Appendix A, Sections 6.1.5. & 6.2.5.) and Continuous Gas Sampling Schematic (Appendix A, Section 6.3.3.)

5.4. **Instruments Utilized**:

Siemens Ultramat 5E NDIR CO Analyzer
Beckman 951A Chemiluminescent NOx Analyzer
Rosemount Analytical 402 FID VOC Analyzer
Beckman 7003D Chemical Cell Oxygen Analyzer
Beckman 870 NDIR CO_2 Analyzer

5.5. **Sampling Methods Utilized:** The following methods were utilized for the pollutants tested:

Particulate	ODEQ 7
Carbon Monoxide	EPA 10
Oxides of Nitrogen	EPA 7E
Volatile Organic Compounds	EPA 25A (FID Detectable)
Formaldehyde	NCASI Acetylacetone Method
Diluent Gases	EPA 3A

6.1. SUB-APPENDIX I: PARTICULATE SAMPLING ANALYSIS

D-vi

6.1.1. Sampling Calculations
- 6.1.1.1. Nomenclature
- 6.1.1.2. Sample Hand Calculation
- 6.1.1.3. Computer Calculations
  - 6.1.1.3.1. Runs 1-2 (heart)
  - 6.1.1.3.2. Runs 3-4 (sap)

6.1.2. Field Data
- 6.1.2.1. Run 1 (heart)
- 6.1.2.2. Run 2 (heart)
- 6.1.2.3. Run 3 (sap)
- 6.1.2.4. Run 4 (sap)

6.1.3. Laboratory Analysis
- 6.1.3.1. Weight Distribution
- 6.1.3.2. Intermediate Weights
- 6.1.3.3. Blank Calculations

6.1.4. Sample and Traverse Point Determination Sheet

6.1.5. Sample Train Schematic

6.1.6. Calibration and Quality Assurance Data
- 6.1.6.1. Pitot Tube #6 Calibration
- 6.1.6.2. Stack Thermometer G Calibration
- 6.1.6.3. Nozzle Z Calibration
- 6.1.6.4. Sample Train LS-2 Thermometers
  - 6.1.6.4.1. Filter Oven
  - 6.1.6.4.2. Impinger Exit
- 6.1.6.5. Control Unit #2 Thermometers
  - 6.1.6.5.1. Meter In
  - 6.1.6.5.2. Meter Out
- 6.1.6.6. Control Unit #2 Calibrations
  - 6.1.6.6.1. Full Range
  - 6.1.6.6.2. Post Test

NOMENCLATURE FOR ODEQ METHODS 1-4, 7

ABBREVIATION	DESCRIPTION
A	Cross sectional area of exhaust - $ft.^2$.
Bws (calc)	Water vapor in the gas stream, proportion by volume. As calculated from condensate catch.
Bws (min)	Water vapor in the gas stream, proportion by volume. Minimum value as determined by either BWS (calc) or BWS (sat).
Bws (sat)	Water vapor in the gas stream, proportion by volume. Calculated by use of carrier equation and assuming saturated conditions.
% CO_2	Percent of carbon dioxide by volume - dry.
Cp	Pitot tube coefficient, dimensionless. Determined by calibration.
Cs	Concentration of particulate matter in exhaust gas, dry basis, corrected to standard conditions - gr/dscf and g/dscm.
Cs'	Concentration of particulate matter in exhaust gas, dry basis, corrected to standard conditions and for excess air - gr/dscf and g/dscm.
C_t	Emission rate of particulate matter in the gas stream - lbs/hr and kg/hr.
dH	Average pressure differential across the orifice meter - inches of H_2O.
Dn	Average nozzle diameter - inches.
dP	Average square root of velocity head - inches H_2O.
dt	Total sampling time - minutes.
e"	Vapor pressure of water at saturated temperature - inches Hg.
%I	Percent of isokinetic sampling.
Md	Dry molecular weight - g/g-mole.

NOMENCLATURE FOR ODEQ METHODS 1-4, 7
Continued

ABBREVIATION	DESCRIPTION
Mn	Total amount of particulate matter collected - mg.
Ms	Molecular weight of exhaust gas, wet basis - g/g-mole.
Na	Average cosine of null angle.
$\%N_2$	Percent of nitrogen by volume, dry basis.
$\%O_2$	Percent oxygen by volume, dry basis.
Pb	Barometric pressure at measurement site - inches Hg.
Ps	Absolute exhaust gas pressure - inches Hg.
Qs	Actual exhaust gas flow rate - acf/min and acm/min.
Qs (std)	Dry volumetric exhaust gas flow rate corrected to standard conditions - dscf/min and dscm/min.
Tmi	Average dry gas meter inlet temperature - °F.
Tmo	Average dry gas meter outlet temperature - °F.
Ts	Average exhaust gas temperature - °F.
Vlc	Total volume of liquid collected in impingers and silica gel-ml.
Vm	Volume of gas sample as measured by dry gas meter - dcf.
Vm (std)	Volume of gas sample measured by the dry gas meter, corrected to standard conditions.
Vp	Average sample point velocity - fps and fpm.
Vs	Average exhaust gas velocity - fps and fpm.
Vw (std)	Volume of water vapor in the gas sample, corrected to standard conditions - scf.
Y	Dry gas meter calibration factor.

SAMPLE CALCULATIONS FOR ODEQ METHODS 1-4, 7

$$Vm(std) = 17.64\ (Vm)\ (Y) \left[\frac{(Pb) + (dH/13.6)}{(((Tm) + (Tmo))/2) + 460} \right]$$

$$Vm(std) = 17.64\ (51.869)(0.99) \left[\frac{(29.00) + (2.067/13.6)}{(((95.4) + (85.9)/2) + 460} \right]$$

Vm(std) = 47.95 dscf

Vw(std) = 0.04707 (Vlc)
Vw(std) = 0.04707 (85.2) = 4.01 scf

$$Bws(calc) = \frac{(Vw(std))}{(Vm(std)) + (Vw(std))} = \frac{(4.01)}{(47.95) + (4.01)}$$

Bws(calc) = 0.077 Vol.

Md = 0.440 (% CO2) + 0.320 (% O2) + 0.280 (% N2)

Md = 0.440 (0.83) + 0.320 (19.34) + 0.280 (79.83)

Md = 28.91 g/g-mole

Ms = (Md) (1-(Bws(calc)) + 18.0 (Bws(calc)

Ms = (28.91) (1-(0.077)) + 18.0 (0.077) = 28.07 g/g-mole

.923 26.683 1.296

$$Vs = 85.49\ (Cp)\ (dP) \sqrt{\frac{(Ts) + 460}{(Ps)\ (Ms)}}$$

$$Vs = 85.49\ (0.794)\ (0.545) \sqrt{\frac{(224.5) + 460}{(29.67)\ (28.07)}}$$

36.99

Vs = 33.9 fps

Qs = 60 (Vs) (A) = 60 (33.9) (6.874)

Qs = 13,980 cfm

$$Qs(std) = (1-(Bws(calc)) (Qs)\left[\frac{528}{(Ts) + 460}\right]\left[\frac{(Ps)}{29.92}\right]$$

$$Qs(std) = (1-(0.077) (13980)\left[\frac{528}{(224.5) + 460}\right]\left[\frac{(29.07)}{29.92}\right]$$

0.923 = 12904

Qs(std) = 9670 dscfm

Cs = 0.01543 (Mn) / (Vm(std)

Cs = 0.01543 (186.97) / (47.95)

Cs = 0.060 gr/dscf

Ct = 0.00857 (Cs) (Qs(std)) = 0.00857 (0.060) (9670)

Ct = 5.0 lbs/hr

$$\%I = \frac{17.32\ ((Ts) + 460)\ (Vm(std))}{(Ps)\ (Vs)\ (Dn)^2\ (dt)\ (1-(Bws(calc))}$$

$$\%I = \frac{17.32\ ((224.5) + 460)\ (47.95)}{(29.07)(33.9)(0.3140)^2\ (60)(1-(0.077))}$$

568473

%I = 105.6

.923

CLIENT: Willamette Industries, Springfield, OR

JOB #: 98-092D

SOURCE: Veneer Dryer #1

RUN #: 1

DATE: 6/2/98

CALCULATION SHEET FOR ODEQ METHODS 1-4, 7
DRYER #1 - HEART

SYMBOL DEFINITIONS - UNITS		RUN 1	RUN 2	AVG
Vm Sample Volume-dcf		51.860	50.900	
Y Gas Meter Factor		0.99	0.99	
Pb Barometric Pressure-"Hg		29.00	29.00	
dH Average Orifice Differential-"H2O		2.067	2.043	
Tmi Average Inlet Meter Temp.-F		95.4	92.5	
Tmo Average Outlet Meter Temp-F		85.9	82.0	
Vm(std) Standard Sample Volume	-dscf	47.95	47.35	
	-dscm	1.36	1.34	
Vlc Net Volume Condensate-ml		85.2	95.8	
Vw(std) Standard Net Volume Condensate-scf		4.01	4.51	
Bws Fraction Of H2O Vapor-vol.		7.7% 0.077	0.087 8.7%	0.082
%CO2 Percent CO2 By Vol. (dry)		0.83	0.82	0.83
%O2 Percent O2 By Vol. (dry)		19.34	19.34	19.34
%N2 Percent Nitrogen By Vol. (dry)		79.83	79.84	
Md Dry Molecular Weight-g/g. mole		28.91	28.91	
Ms Wet Molecular Weight (wet)-g/g. mole		28.06	27.96	
Cp Pitot Tube Coefficient		0.794	0.794	
dP Average SQRT Of Velocity Head-"H2O		0.545	0.539	
Ts Average Exhaust Temp-F		224.5	217.7	221.1
Ps Absolute Exhaust Pressure-"Hg		29.07	29.07	
Vs Average Exhaust Gas Velocity	-fps	34	33	34
	-fpm	2034	2005	2019
A Cross Sectional Area of Exhaust-sq. ft.		6.874	6.874	
Qs Exhaust Gas Flow Rate-acf/min		13980	13779	13879
	-acm/min	396	390	393
Qs(std) Standard Gas Flow Rate	-scf/min	10479	10431	10455
	-dscf/min	9670	9524	9597
	-dscm/min	274	270	272
Mn Weight Of Collected Particulate-mg		187.0	138.9	
Cs Particulate Concentration	-gr/dscf	0.060	0.045	0.053
	-g/dscm	0.138	0.104	0.121
Ct Particulate Emission Rate	-lbs/hr	5.0	3.7	4.3
	-kg/hr	2.3	1.7	2.0
Pr Production Rate	-sq. ft/hr (3/8")	11173	11591	11382
Ef Particulate Emission Factor	-lbs/MSF (3/8")	0.45	0.32	0.38
Dn Average Nozzle Diam.-inches		0.3140	0.3140	
dt Total Sampling Time-min.		60.0	60.0	
%I Percent Of Isokinetic Sampling		106	106	106

PLANT: WILLAMETTE INDUSTRIES SPRINGFIELD, OR
JOB: 98-092D
SOURCE: VENEER DRYER #1 CONDITION: HEART
DATE: 6/2/98

CALCULATION SHEET FOR ODEQ METHODS 1-4, 7
DRYER #1 - SAP

SYMBOL DEFINITIONS - UNITS		RUN 3	RUN 4	AVG
Vm Sample Volume-dcf		47.594	47.480	
Y Gas Meter Factor		0.99	0.99	
Pb Barometric Pressure-"Hg		29.00	29.00	
dH Average Orifice Differential-"H2O		1.790	1.764	
Tmi Average Inlet Meter Temp.-F		86.8	88.8	
Tmo Average Outlet Meter Temp-F		77.7	78.9	
Vm(std) Standard Sample Volume	-dscf	44.65	44.41	
	-dscm	1.26	1.26	
Vlc Net Volume Condensate-ml		82.2	83.5	
Vw(std) Standard Net Volume Condensate-scf		3.87	3.93	
Bws Fraction Of H2O Vapor-vol.		0.080	0.081	0.081
%CO2 Percent CO2 By Vol. (dry)		0.75	0.79	0.77
%O2 Percent O2 By Vol. (dry)		19.33	19.08	19.21
%N2 Percent Nitrogen By Vol. (dry)		79.92	80.12	
Md Dry Molecular Weight-g/g. mole		28.89	28.89	
Ms Wet Molecular Weight (wet)-g/g. mole		28.02	28.00	
Cp Pitot Tube Coefficient		0.795	0.794	
dP Average SQRT Of Velocity Head-"H2O		0.549	0.546	
Ts Average Exhaust Temp-F		231.5	231.8	231.7
Ps Absolute Exhaust Pressure-"Hg		29.07	29.07	
Vs Average Exhaust Gas Velocity	-fps	34	34	34
	-fpm	2061	2051	2056
A Cross Sectional Area of Exhaust-sq. ft.		6.874	6.874	
Qs Exhaust Gas Flow Rate-acf/min		14168	14096	14132
	-acm/min	401	399	400
Qs(std) Standard Gas Flow Rate	-scf/min	10512	10454	10483
	-dscf/min	9674	9604	9639
	-dscm/min	274	272	273
Mn Weight Of Collected Particulate-mg		100.4	100.8	
Cs Particulate Concentration	-gr/dscf	0.035	0.035	0.035
	-g/dscm	0.079	0.080	0.080
Ct Particulate Emission Rate	-lbs/hr	2.9	2.9	2.9
	-kg/hr	1.3	1.3	1.3
Pr Production Rate	-sq. ft/hr (3/8")	5883	8073	6978
Ef Particulate Emission Factor	-lbs/MSF (3/8")	0.49	0.36	0.42
Dn Average Nozzle Diam.-inches		0.3140	0.3140	
dt Total Sampling Time-min..		60.0	60.0	
%I Percent Of Isokinetic Sampling		98	99	98

PLANT: WILLAMETTE INDUSTRIES SPRINGFIELD, OR
JOB: 98-092D
SOURCE: VENEER DRYER #1 CONDITION: SAP
DATE: 6/2/98

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FIELD DATA SHEET

DATE: 6-2-98

JOB #: 98-092D
PLANT: Willamette Ind.
LOCATION: Springfield, OR
SOURCE: Veneer Dryer #1
DUCT DIMENSION(S): Ø=35.5"
RUN #: 1-
START: 745
FINISH: 846
dH FACTOR: 6.8

C.U. #: 2
dHa: 1.65
Y:

THERMOMETER #: G

D.B. 227 W.B. 116

PROBE #: 6
Cp: 0.794

NOZZLE #: Z
DIAMETER: 0.3140

BAROMETRIC PRESSURE: 29.00
STATIC PRESSURE: +1.0
EXHAUST PRESSURE: 29.07
ESTIMATED MOISTURE:

LEAK CHECK
SYSTEM INITIAL: 0.00 cfm @ 10 "Hg
FINAL: 0.00 cfm @ 8 "Hg
PITOT INITIAL: ✓
FINAL: ✓

CONTROL UNIT OPERATOR: JJT

POINT NO.	TIME MIN.	METER VOL. (cu. ft.)	dP "H20	dH "H20	TEMPERATURE (F) METER IN	OUT	STACK	BOX	IMP	VAC "Hg	O2 (%)	CO2 (%)	
Start		558.601	****	***	**	**	***	**	***	***	***	***	***
1	2.5	561.2	0.43	2.91	78	77	228	250	66	2			
2	5	563.8	0.45	3.04	83	77	229	260	65	2			
3	7.5	566.4	0.41	2.77	86	78	227	260	64	2			
4	10	568.7	0.35	2.37	89	79	225	260	64	2			
5	12.5	571.0	0.33	2.25	90	80	228	260	64	1			
6	15	573.1	0.30	2.05	92	81	234	260	64	1			
7	17.5	575.0	0.22	1.50	92	82	232	260	64	1			
8	20	577.0	0.25	1.71	93	83	229	260	64	1			
9	22.5	579.1	0.30	2.05	95	85	228	260	63	1			
10	25	581.1	0.28	1.91	95	85	227	260	64	1			
11	27.5	583.4	0.32	2.19	96	85	227	260	63	1			
12	30	585.671	0.33	2.25	98	87	227	260	64	1			
13	32.5	587.7	0.28	1.91	96	87	223	260	65	1			
14	35	589.8	0.28	1.91	98	88	220	260	65	1			
15	37.5	591.7	0.23	1.60	98	88	220	260	65	1			
16	40	593.6	0.22	1.53	99	89	218	260	66	1			
17	42.5	595.5	0.22	1.53	99	90	220	260	66	1			
18	45	597.4	0.22	1.53	100	91	222	260	65	1			
19	47.5	599.5	0.25	1.75	100	91	223	260	65	1			
20	50	601.3	0.24	1.68	101	91	220	260	66	1			
21	52.5	603.4	0.28	1.96	101	91	220	260	65	1			
22	55	605.6	0.31	2.17	102	92	221	260	64	1			
23	57.5	607.9	0.35	2.45	103	92	220	260	65	1			
24	60	610.461	0.37	2.59	105	93	219	260	66	2			
25													

AVERAGE OF PARAMETERS: √dP: 0.545 2.067 95.4 85.9 224.5
Vm, dcf: 51.860 ✓

IMPINGER CONDENSATE:
IMPINGER #1: 151 ml
IMPINGER #2: 121 ml
IMPINGER #3: 3 ml
TOTAL VOL.: 275 ml ✓
NET VOL. (TOTAL - 200): 75 ml ✓
SILICA GEL: 467.0
GROSS: _____ g.
TARE: 256.8 g.
NET: 10.2 g. ✓
TOTAL CONDENSATE (VIc): 85.2 ml ✓

2904
1604

SAMPLE IDENTIFICATION AND DESCRIPTION
FILTER ID#: _____ FILTER APPEARANCE: Yellow/lt. yellow
IMPINGER CATCH APPEARANCE: lt. yellow
BACK HALF CONTENTS/H20 WASH ID #: WIS 101A/B
BACK HALF ACETONE WASH ID #: WIS 102
FRONT HALF ACETONE WASH ID #: WIS 103
CUTTER NOZZLE ACETONE WASH ID #: _____

WATER #: 497 VOL. 200 ml CHARGE
200 ml BACK
ACETONE #: 775 VOL. 200 ml FRONT
200 ml BACK

SAMPLES RECOVERED BY: JJT/JAT
LAB DATE: 06/03/98 BY: DV

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Revised March, 1991

FIELD DATA SHEET

DATE: 6-2-98

JOB #: 98-092D
PLANT: Willamette Ind.
LOCATION: Springfield, OR
SOURCE: Veneer Dryer #1
DUCT DIMENSION(S): Ø = 35.5"
RUN #: 2-M
START: 1001
FINISH: 1102
dH FACTOR:

C.U. #: 2
dHa: 1.65
Y:
THERMOMETER #: G
D.B. ____ W.B. ____

PROBE #: 6
Cp: 0.794
NOZZLE #: 7
DIAMETER: 0.314

BAROMETRIC PRESSURE: 29.00
STATIC PRESSURE: +1.0
EXHAUST PRESSURE: 29.07
ESTIMATED MOISTURE:

LEAK CHECK
SYSTEM INITIAL: 0.01 cfm @ 5 "Hg
FINAL: 0.00 cfm @ 3 "Hg
PITOT INITIAL: ✓
FINAL: ✓

CONTROL UNIT OPERATOR: JJT

POINT NO.	TIME MIN.	METER VOL. (cu. ft.)	dP "H20	dH "H20	TEMPERATURE (F) METER IN	OUT	STACK	BOX	IMP	VAC "Hg	O2 (%)	CO2 (%)	
Start		610.600	****	***	**	**	***	**	***	***	***	***	***
1	2.5	613.3	0.42	2.94	81	78	220	260	66	2			
2	5	615.8	0.43	2.95	85	78	220	260	66	2			
3	7.5	618.4	0.40	2.74	89	80	220	260	65	2			
4	10	620.8	0.35	2.40	93	82	220	260	65	2			
5	12.5	623.0	0.33	2.26	95	84	220	250	65	2			
6	15	625.1	0.30	2.10	96	85	219	250	65	2			
7	17.5	627.0	0.22	1.54	97	86	218	250	65	1			
8	20	628.9	0.24	1.68	97	87	218	250	66	1			
9	22.5	630.7	0.28	1.96	97	88	218	250	61	1			
10	25	632.9	0.30	2.10	97	87	217	250	55	2			
11	27.5	635.1	0.33	2.11	97	85	217	250	53	2			
12	30	637.228	0.30	2.11	96	84	217	250	52	2			
13	32.5	639.2	0.25	1.76	93	82	217	240	55	1			
14	35	641.2	0.27	1.90	93	82	218	250	54	2			
15	37.5	643.2	0.23	1.62	93	82	218	250	53	1			
16	40	645.0	0.21	1.48	92	81	218	250	54	1			
17	42.5	646.8	0.20	1.39	91	81	218	260	54	1			
18	45	648.6	0.21	1.46	91	80	217	260	55	1			
19	47.5	650.6	0.25	1.74	91	80	217	260	56	1			
20	50	652.5	0.25	1.74	91	80	216	260	56	1			
21	52.5	654.6	0.27	1.88	91	79	216	260	55	1			
22	55	656.8	0.33	2.29	91	79	216	260	56	2			
23	57.5	659.1	0.33	2.29	92	79	216	260	57	2			
24	60	661.500	0.37	2.59	92	79	214	260	57	2			
25													

AVERAGE OF PARAMETERS: √dP: 0.539 2.043 92.5 82.0 217.7
Vm, dcf: 50.900 ✓ ✓ ✓ ✓ ✓ ✓

IMPINGER CONDENSATE:
IMPINGER #1: 175 ml
IMPINGER #2: 112 ml
IMPINGER #3: 0 ml ✓
TOTAL VOL.: 287 ml ✓
NET VOL. (TOTAL - 200): 87 ml
SILICA GEL: GROSS: 256.2 g.
TARE: 247.4 g.
NET: 8.8 g. ✓
TOTAL CONDENSATE (Vlc): 95.8 ml ✓

B: 1605
lt. yellow

SAMPLE IDENTIFICATION AND DESCRIPTION
FILTER ID#: 2905 FILTER APPEARANCE: yellow
IMPINGER CATCH APPEARANCE: lt. yellow
BACK HALF CONTENTS/H20 WASH ID #: WIS 104A/B
BACK HALF ACETONE WASH ID #: WIS 105
FRONT HALF ACETONE WASH ID #: WIS 106
CUTTER NOZZLE ACETONE WASH ID #:

WATER #: 497 VOL. 200 ml CHARGE
200 ml BACK
ACETONE #: 774 VOL. 200 ml FRONT
775 200 ml BACK

SAMPLES RECOVERED BY: JJT
LAB DATE: 06/03/98 BY: JV

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Revised March, 1991

FIELD DATA SHEET

DATE: 6-2-98

JOB #: 98-092D
PLANT: Willamette Ind.
LOCATION: Springfield, OR
SOURCE: Veneer Dryer #1
DUCT DIMENSION(S): Ø=35.5"
RUN #: 3-SAP
START: 1226
FINISH: 1327
dH FACTOR:

C.U. #: 2
dHa: 1.65
Y:
THERMOMETER #: G
D.B. ____ W.B. 121

PROBE #: 6
Cp: 0.795
NOZZLE #: Z
DIAMETER: 0.3140

BAROMETRIC PRESSURE: 29.00
STATIC PRESSURE: +1.0
EXHAUST PRESSURE: 29.07
ESTIMATED MOISTURE:

LEAK CHECK
SYSTEM INITIAL: 0.01 cfm @ 5 "Hg
FINAL: 0.00 cfm @ 3 "Hg
PITOT INITIAL: ✓
FINAL: ✓

CONTROL UNIT OPERATOR: JJT

POINT NO.	TIME MIN.	METER VOL. (cu. ft.)	dP "H2O	dH "H2O	TEMPERATURE (F) METER IN	OUT	STACK	BOX	IMP	VAC "Hg	O2 (%)	CO2 (%)	
Start		661.602	****	***	**	**	***	**	***	***	***	***	***
1	2.5	663.8	0.42	2.46	77	75	227	250	58	2			
2	5	666.3	0.46	2.69	81	75	230	250	59	2			
3	7.5	668.6	0.40	2.34	83	76	230	250	61	2			
4	10	670.7	0.35	2.06	85	77	230	260	62	1			
5	12.5	672.8	0.33	1.94	85	77	231	260	63	1			
6	15	674.6	0.25	1.47	87	77	231	260	62	1			
7	17.5	676.3	0.20	1.18	87	78	230	260	62	1			
8	20	678.0	0.22	1.29	87	78	229	260	61	1			
9	22.5	679.9	0.28	1.65	87	78	228	260	61	1			
10	25	681.9	0.32	1.88	87	78	228	260	60	1			
11	27.5	683.8	0.28	1.65	88	78	231	260	61	1			
12	30	685.823	0.30	1.76	88	78	234	260	60	1			
13	32.5	687.8	0.30	1.76	86	78	230	250	60	1			
14	35	689.8	0.30	1.76	87	77	232	250	60	1			
15	37.5	691.8	0.33	1.94	88	78	232	250	60	1			
16	40	693.8	0.27	1.59	89	78	232	250	58	1			
17	42.5	695.5	0.25	1.47	89	78	232	250	59	1			
18	45	697.3	0.23	1.35	88	77	232	250	60	1			
19	47.5	699.2	0.27	1.59	88	77	233	250	61	1			
20	50	700.9	0.22	1.29	89	78	234	250	63	1			
21	52.5	702.7	0.25	1.46	89	79	235	250	61	1			
22	55	704.8	0.35	2.05	89	79	235	250	61	1			
23	57.5	707.0	0.37	2.16	90	80	235	250	60	1			
24	60	709.196	0.37	2.16	90	80	235	250	61	1			
25													

AVERAGE OF PARAMETERS: √dP: 0.549 1.790 86.8 77.7 231.5
Vm, dcf: 47.594 ✓

IMPINGER CONDENSATE:
IMPINGER #1: 162 ml
IMPINGER #2: 111 ml
IMPINGER #3: 0 ml
TOTAL VOL.: 273 ml
NET VOL. (TOTAL - 200): 73 ml ✓
SILICA GEL: 257.9
GROSS: ____ g.
TARE: 248.7 g. 9.20 ✓
NET: ____ g.
TOTAL CONDENSATE (Vlc): 82.2 ml ✓

B: 1606
lt. yellow

SAMPLE IDENTIFICATION AND DESCRIPTION
FILTER ID#: 2906 FILTER APPEARANCE: yellow
IMPINGER CATCH APPEARANCE: lt. yellow
BACK HALF CONTENTS/H2O WASH ID #: WS107A/B
BACK HALF ACETONE WASH ID #: WS108
FRONT HALF ACETONE WASH ID #: WS109
CUTTER NOZZLE ACETONE WASH ID #: —

WATER #: 492 VOL. 200 ml CHARGE
200 ml BACK
ACETONE #: 774 VOL. 200 ml FRONT
200 ml BACK

SAMPLES RECOVERED BY: JJT / JAT LAB DATE: 06/03/98 BY: DV

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Revised March, 1991

FIELD DATA SHEET

DATE: 6-2-98

JOB #: 98-092D
PLANT: Willamette Ind
LOCATION: Springfield, OR
SOURCE: Veneer Dryer #1
DUCT DIMENSION(S): Ø=35.5"
RUN #: 4-SAP
START: 1433
FINISH: 1534
dH FACTOR:

C.U. #: 2
dHa: 1.65
Y:
THERMOMETER #: G
D.B. ____ W.B. ____

PROBE #: 6
Cp: 0.794
NOZZLE #: Z
DIAMETER: 0.3140

BAROMETRIC PRESSURE: 29.06
STATIC PRESSURE: +1.0
EXHAUST PRESSURE: 29.07
ESTIMATED MOISTURE:

LEAK CHECK
SYSTEM INITIAL: 0.00 cfm @ 5 "Hg
FINAL: 0.00 cfm @ 4 "Hg
PITOT INITIAL: ✓
FINAL: ✓

CONTROL UNIT OPERATOR: JJT

POINT NO.	TIME MIN.	METER VOL. (cu. ft.)	dP "H20	dH "H20	TEMPERATURE (F) METER IN	OUT	STACK	BOX	IMP	VAC "Hg	O2 (%)	CO2 (%)	
Start		709.401	****	***	**	**	***	**	***	***	***	***	***
1	2.5	711.8	0.47	2.75	75	73	227	250	57	2			
2	5	714.4	0.52	3.04	79	73	230	250	55	2			
3	7.5	716.6	0.39	2.28	83	74	236	240	59	1			
4	10	718.7	0.31	1.81	84	75	237	240	60	1			
5	12.5	720.6	0.30	1.76	85	75	236	240	62	1			
6	15	722.3	0.22	1.29	85	76	235	250	62	1			
7	17.5	724.0	0.20	1.16	85	76	234	250	60	1			
8	20	725.7	0.22	1.28	85	76	233	250	60	1			
9	22.5	727.5	0.25	1.45	86	76	234	250	61	1			
10	25	729.3	0.25	1.45	87	77	234	260	61	1			
11	27.5	731.2	0.28	1.63	89	79	233	260	62	1			
12	30	733.190	0.28	1.63	90	80	233	260	63	1			
13	32.5	735.0	0.23	1.34	89	80	226	260	61	1			
14	35	736.7	0.23	1.34	90	80	229	260	60	1			
15	37.5	738.7	0.30	1.75	91	81	231	270	62	1			
16	40	740.6	0.28	1.63	92	81	230	270	64	1			
17	42.5	742.5	0.25	1.45	93	82	230	270	63	1			
18	45	744.3	0.25	1.45	93	82	230	270	63	1			
19	47.5	746.1	0.25	1.45	93	83	232	270	63	1			
20	50	748.0	0.27	1.58	93	83	231	270	63	1			
21	52.5	—	0.37	2.16	95	83	230	270	63	1			
22	55	752.4	0.40	2.33	96	83	231	270	63	1			
23	57.5	754.7	0.37	2.16	96	83	231	270	63	1			
24	60	756.881	0.37	2.16	96	83	230	270	63				
25													

AVERAGE OF PARAMETERS: √dP: 0.546 1.764 88.8 78.9 231.8
Vm, dcf: 47.480 ✓ ✓ ✓ ✓ ✓ ✓

IMPINGER CONDENSATE:
IMPINGER #1: 162 ml
IMPINGER #2: 112 ml
IMPINGER #3: 0 ml
TOTAL VOL.: 274 ml
NET VOL. (TOTAL - 200): 74 ml ✓
SILICA GEL: 267.1
GROSS: ____ g.
TARE: 257.6 g. 9.5 ✓
NET: ____ g.
TOTAL CONDENSATE (VIc): 83.5 ml ✓

B: 1607
lt. yellow

SAMPLE IDENTIFICATION AND DESCRIPTION
FILTER ID#: 2907 FILTER APPEARANCE: yellow
IMPINGER CATCH APPEARANCE: lt. yellow
BACK HALF CONTENTS/H20 WASH ID #: WIS 110978
BACK HALF ACETONE WASH ID #: WIS 111
FRONT HALF ACETONE WASH ID #: WIS 112
CUTTER NOZZLE ACETONE WASH ID #: ~~WIS~~

WATER #: 492 VOL. 200 ml CHARGE
200 ml BACK
ACETONE #: 774 VOL. 200 ml FRONT
200 ml BACK

SAMPLES RECOVERED BY: JJT/JAT
LAB DATE: 06/02/98 BY: JV

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Revised March, 1991

ODEQ METHOD 7 LABORATORY ANALYSIS SHEET

PROJECT#:	98-092D	SAMPLE DATE:	06/02/98
PLANT:	WILLAMETTE INDUSTRIES	REC'D DATE:	06/03/98
LOCATION:	SPRINGFIELD, OR	REPORT DATE:	06/10/98
SOURCE:	VENEER DRYER #1	ANALYST:	DV

TEMP: 65F
HUMIDITY: 45%

	RUN 1	RUN 2	RUN 3	RUN 4
FILTER NUMBER:	2904	2905	2906	2907
FILTER GROSS, g	2.8788	2.8550	2.8730	2.8455
FILTER TARE, g	2.8011	2.8191	2.8433	2.8145
FILTER NET, g	0.0777	0.0359	0.0297	0.0310
FRONT WASH CONTAINER NO:	WIS 103	WIS 106	WIS 109	WIS 112
BEAKER NUMBER:	216	079	244	005
BEAKER GROSS, g	108.6075	105.6394	106.9727	108.0303
BEAKER TARE, g	108.5812	105.6192	106.9520	108.0100
BLANK NET, g	0.0000	0.0000	0.0000	0.0000
FRONT WASH NET, g	0.0263	0.0202	0.0207	0.0203
BACK WASH CONTAINER NO:	WIS 102	WIS 105	WIS 108	WIS 111
BEAKER NUMBER:	226	250	057	086
BEAKER GROSS, g	106.1976	106.3845	96.5172	105.8486
BEAKER TARE, g	106.1610	106.3473	96.4970	105.8302
BLANK NET, g	0.0000	0.0000	0.0000	0.0000
BACK WASH NET, g	0.0366	0.0372	0.0202	0.0184
WATER RESIDUAL BOTTLE NO.:	WIS 101A/B	WIS 104A/B	WIS 107A/B	WIS 110A/B
ORGANIC EXTRACT				
BEAKER NUMBERS:	129	211	128	235
BEAKER GROSS, g	95.6477	105.2780	102.2360	106.7297
BEAKER TARE, g	95.6284	105.2570	102.2205	106.7138
BLANK NET, g	0.0000	0.0000	0.0000	0.0000
ORG. EXT. NET, g	0.0193	0.0210	0.0155	0.0159
INORGANIC EXTRACT RESIDUE				
BEAKER NUMBER:	239	050	046	212
BEAKER GROSS, g	104.7209	97.2410	96.8530	106.8911
BEAKER TARE, g	104.7126	97.2325	96.8446	106.8793
BLANK NET, g	0.0008	0.0008	0.0008	0.0008
INORG.EXT.RES.NET, g	0.0075	0.0077	0.0076	0.0110
BACK FILTER NUMBER:	1604	1605	1606	1607
FILTER GROSS, g	2.5174	2.5206	2.5180	2.5225
FILTER TARE, g	2.4978	2.5037	2.5113	2.5183
FILTER NET, g	0.0196	0.0169	0.0067	0.0042
TOTAL FRONT HALF NET, g	0.1040	0.0561	0.0504	0.0513
, mg	104.0000	56.1000	50.4000	51.3000
TOTAL BACK HALF, NET, g	0.0830	0.0828	0.0500	0.0495
, mg	82.9700	82.7700	49.9700	49.4700
TOTAL FRONT AND BACK, NET, g	0.1870	0.1389	0.1004	0.1008
TOTAL FRONT AND BACK NET, mg	186.9700	138.8700	100.3700	100.7700

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INTERMEDITATE BEAKER/FILTER WEIGHT HISTORY

TEMP	65F	62F		65F									
HUMIDITY	45%	45%		45%									
DATE	06/09/98	06/10/98		06/10/98									
TIME	1400	0815		1630									
BEAKER #	WEIGHT 1	WEIGHT 2	DIFFERENCE WT2-WT1	WEIGHT 3	DIFFERENCE WT3-WT2	WEIGHT 4	DIFFERENCE WT4-WT3	WEIGHT 5	DIFFERENCE WT5-WT4	WEIGHT 6	DIFFERENCE WT6-WT5	WEIGHT 7	DIFFERENCE WT7-WT6
216	108.6097	108.6080	-0.0017	108.6075	* -0.0005								
079	105.6399	105.6394	* -0.0005										
244	108.9759	108.9731	-0.0028	108.9727	* -0.0004								
005	108.0307	108.0303	* -0.0004										
226	106.1976	106.1976											
250	106.3845	106.3846	* 0.0001										
057	96.5172	96.5172											
086	105.8490	105.8486	* -0.0004										
129	95.6477	95.6480	* 0.0003										
211	105.2782	105.2780	* -0.0002										
128	102.2360	102.2360											
235	106.7310	106.7300	-0.0010	106.7297	* -0.0003								
239	104.7209	104.7210	* 0.0001										
050	97.2410	97.2410											
046	96.8546	96.8533	-0.0013	96.8530	* -0.0003								
212	106.8916	106.8911	* -0.0005										
FILTER #	WEIGHT 1	WEIGHT 2	DIFFERENCE WT2-WT1	WEIGHT 3	DIFFERENCE WT3-WT2	WEIGHT 4	DIFFERENCE WT4-WT3	WEIGHT 5	DIFFERENCE WT5-WT4	WEIGHT 6	DIFFERENCE WT6-WT5	WEIGHT 7	DIFFERENCE WT7-WT6
2904	2.8788	2.8788											
2905	2.8551	2.8550	* -0.0001										
2906	2.8730	2.8730											
2907	2.8455	2.8455											
1604	2.5174	2.5174											
1605	2.5206	2.5206											
1606	2.5182	2.5180	* -0.0002										
1607	2.5225	2.5225											

CLIENT WILLAMETTE INDUSTRIES

JOB # 98-092D

SAMPLE DATE 06/02/98

SOURCE VENEER DRYER #1

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BLANK CALCULATION SHEET

PROJECT #: 98-092D
COMPANY: WILLAMETTE INDUSTRIES
LOCATION: SPRINGFIELD, OR
SOURCE: VENEER DRYER #1

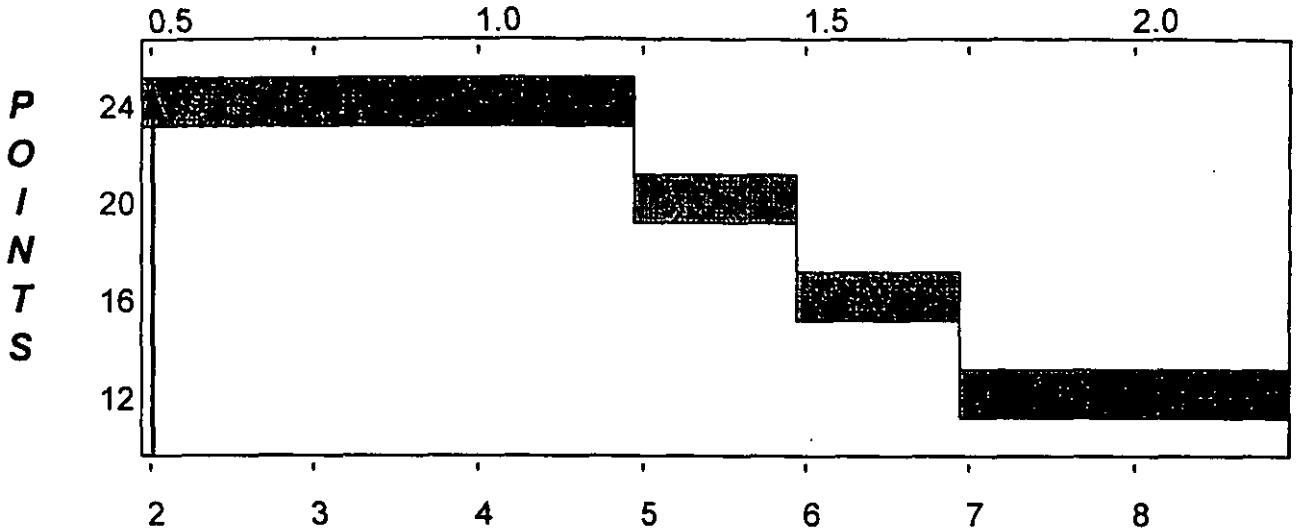
	RUN 1	RUN 2	RUN 3	RUN 4
ACETONE FRONT WASH				
ACETONE BOTTLE #:	775	774	774	774
FIELD VOLUME, ml:	200	200	200	200
BLANK VALUE/100ml, g:	0.0000	0.0000	0.0000	0.0000
LAB VOLUME, ml:	15	15	15	15
ACETONE BLANK NET, g:	0.0000	0.0000	0.0000	0.0000
ACETONE BACK WASH				
ACETONE BOTTLE #:	775	775	774	774
FIELD VOLUME, ml:	200	200	200	200
BLANK VALUE/100ml, g:	0.0000	0.0000	0.0000	0.0000
LAB VOLUME, ml:	15	15	15	15
ACETONE BLANK NET, g:	0.0000	0.0000	0.0000	0.0000
ORGANIC SOLVENT				
SOLVENT BOTTLE #:	45	45	45	45
BLANK VALUE/150ml, g:	0.0000	0.0000	0.0000	0.0000
LAB VOLUME USED, ml:	150	150	150	150
ORGANIC SOLVENT BLANK NET, g:	0.0000	0.0000	0.0000	0.0000
CHARGING SOLUTION BLANK				
SOLUTION BOTTLE #:	497	497	492	492
FIELD VOLUME, ml:	200	200	200	200
BLANK VALUE/100ml, g:	0.0002	0.0002	0.0002	0.0002
LAB VOLUME, ml:	15	15	15	15
SOLUTION BLANK NET, g:	0.0004	0.0004	0.0004	0.0004
WATER BACK WASH				
WATER BOTTLE #:	497	497	492	492
FIELD VOLUME, ml:	200	200	200	200
BLANK VALUE/100ml, g:	0.0002	0.0002	0.0002	0.0002
WATER BLANK NET, g:	0.0004	0.0004	0.0004	0.0004
ALLOWABLE ACETONE BLANK VALUE				
FRONT WASH				
VOLUME USED IN FRONT WASH, ml:	215	215	215	215
DENSITY OF ACETONE USED, g/ml:	0.7857	0.7857	0.7857	0.7857
ALLOWABLE BLANK VALUE, g:	0.0017	0.0017	0.0017	0.0017
BACK WASH				
VOLUME USED IN BACK WASH, ml:	215	215	215	215
DENSITY OF ACETONE USED, g/ml:	0.7857	0.7857	0.7857	0.7857
ALLOWABLE BLANK VALUE g:	0.0017	0.0017	0.0017	0.0017
ALLOWABLE ORGANIC SOLVENT BLANK VALUE				
VOLUME SOLVENT USED , ml:	150	150	150	150
DENSITY OF SOLVENT USED, g/ml:	1.3255	1.3255	1.3255	1.3255
ALLOWABLE BLANK VALUE, g:	0.0026	0.0026	0.0026	0.0026

SAMPLE AND TRAVERSE POINT DETERMINATION SHEET

MINIMUM NUMBER OF TRAVERSE POINTS FOR PARTICULATE TRAVERSES

EPA METHOD 1

Sample Port Location
Duct diameters upstream from flow disturbance (distance A)



Sample Port Location
Duct diameters downstream from flow disturbance (distance B)

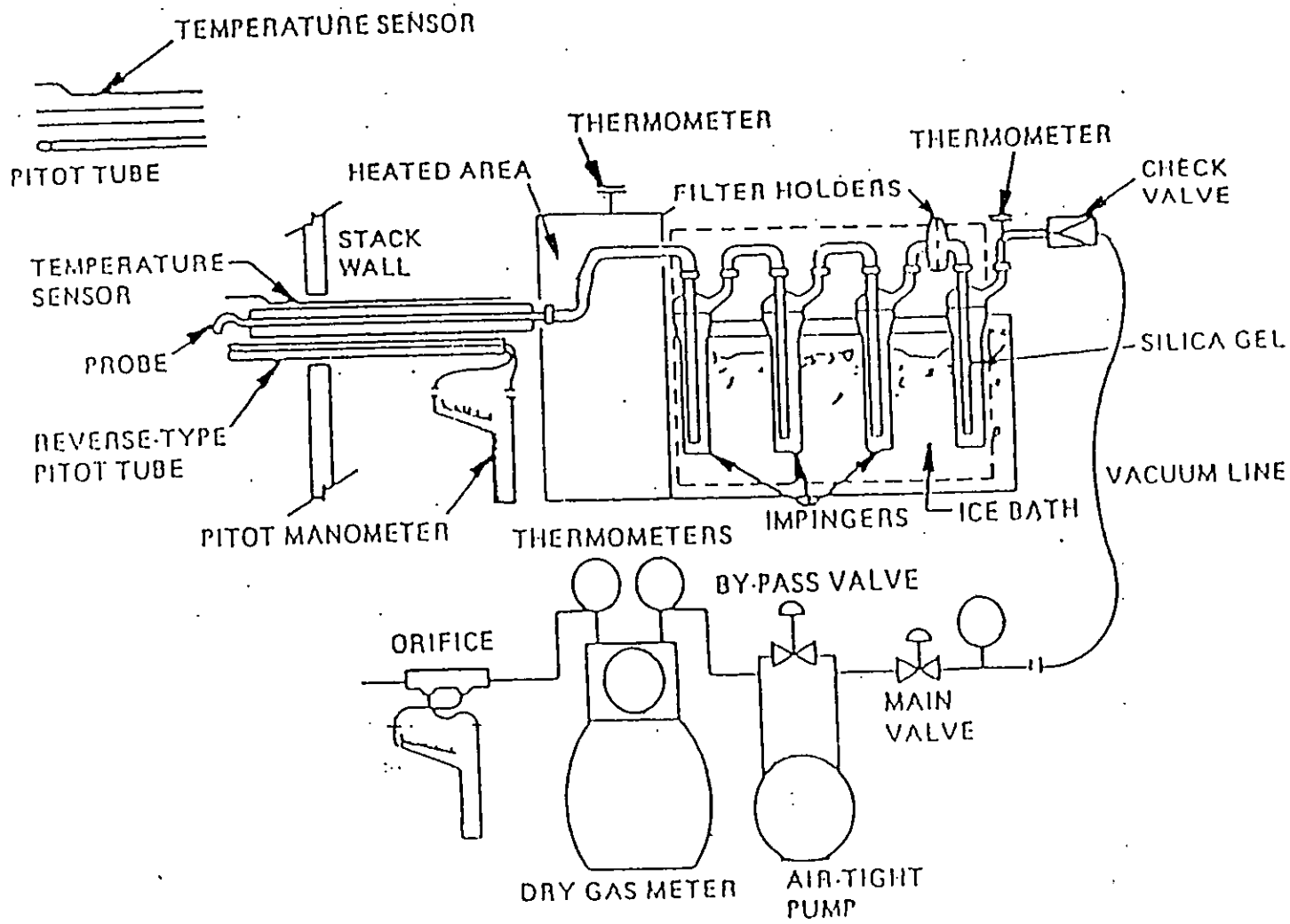
LOCATION OF TRAVERSE POINTS IN CIRCULAR STACKS

Percent of stack diameter from inside wall to traverse point

TRAVERSE POINT #	Number of Traverse Points on a Diameter					POINT LOCATION
	4	6	8	10	12	
1	6.7	4.4	3.2	2.6	**2.1**	**1.0**
2	25.0	14.6	10.5	8.2	**6.7**	**2.4**
3	75.0	29.6	19.4	14.6	**11.8**	**4.2**
4	93.3	70.4	32.3	22.6	**17.7**	**6.3**
5		85.4	67.7	34.2	**25.0**	**8.9**
6		95.6	80.6	65.8	**35.6**	**12.6**
7			89.5	77.4	**64.4**	**22.9**
8			96.8	85.4	**75.0**	**26.6**
9				91.8	**82.3**	**29.2**
10				97.4	**88.2**	**31.3**
11					**93.3**	**33.1**
12					**97.9**	**34.5**

Stack Diameter (inches): 35.5
Distance A: 24" = 0.7 stack diameters
Distance B: 72" = 2.0 stack diameters
Points Required: 24
Job #: 98-092D

Client: Willamette Industries
Location: Springfield, OR
Source: Veneer Dryer #1
Date: June 2, 1998



ODEQ METHOD 7 PARTICULATE SAMPLE APPARATUS

MULTI-VELOCITY "S" TYPE PITOT TUBE CALIBRATION WORKSHEET

PITOT/PROBE ASSEMBLY #	6	DATE	1/7/98
EFFECTIVE LENGTH- in.	58	CALIBRATOR	JJT
FACE-OPENING ALIGNMENT	OK	MANOMETER LEAK CHECK	OK

VELOCITY DETERMINATION DATA

FAN SETTING	I	II	III	IV
EXHAUST GAS TEMPERATURE- F.	46	47	47	47
BAROMETRIC PRESSURE- "Hg	28.83	28.83	28.83	28.83
STATIC PRESSURE- "H2O	1.4	1.1	0.6	-0.5
ABSOLUTE EXHAUST GAS PRESSURE- "Hg	28.93	28.91	28.87	28.79
MOLECULAR WEIGHT OF EXHAUST GAS	28.73	28.73	28.73	28.73
CALIBRATION VELOCITY- fpm	970	1896	3084	4619

CALIBRATION DATA

FAN SETTING	SIDE "A"				SIDE "B"		
	dP(std)	dP(s)	Cp		dP(std)	dP(s)	Cp
	0.060	0.100	0.7669		0.065	0.110	0.7610
I	0.060	0.095	0.7868		0.065	0.105	0.7789
	0.060	0.095	0.7868		0.065	0.105	0.7789
AVG.	0.0600	0.0967	0.7801	AVG.	0.0650	0.1067	0.7730
	0.225	0.350	0.7938		0.225	0.350	0.7938
II	0.230	0.350	0.8025		0.230	0.350	0.8025
	0.230	0.350	0.8025		0.230	0.350	0.8025
AVG.	0.2283	0.3500	0.7996	AVG.	0.2283	0.3500	0.7996
	0.600	0.890	0.8129		0.610	0.900	0.8150
III	0.605	0.890	0.8162		0.610	0.900	0.8150
	0.605	0.890	0.8162		0.605	0.900	0.8117
AVG.	0.6033	0.8900	0.8151	AVG.	0.6083	0.9000	0.8139
	1.350	1.900	0.8345		1.350	1.950	0.8237
IV	1.350	1.900	0.8345		1.350	1.900	0.8345
	1.350	1.900	0.8345		1.350	1.900	0.8345
AVG.	1.3500	1.9000	0.8345	AVG.	1.3500	1.9167	0.8309

MAXIMUM DIFFERENCE BETWEEN Cp AVERAGES OF SIDES "A" & "B" AT ANY GIVEN FAN SETTING:

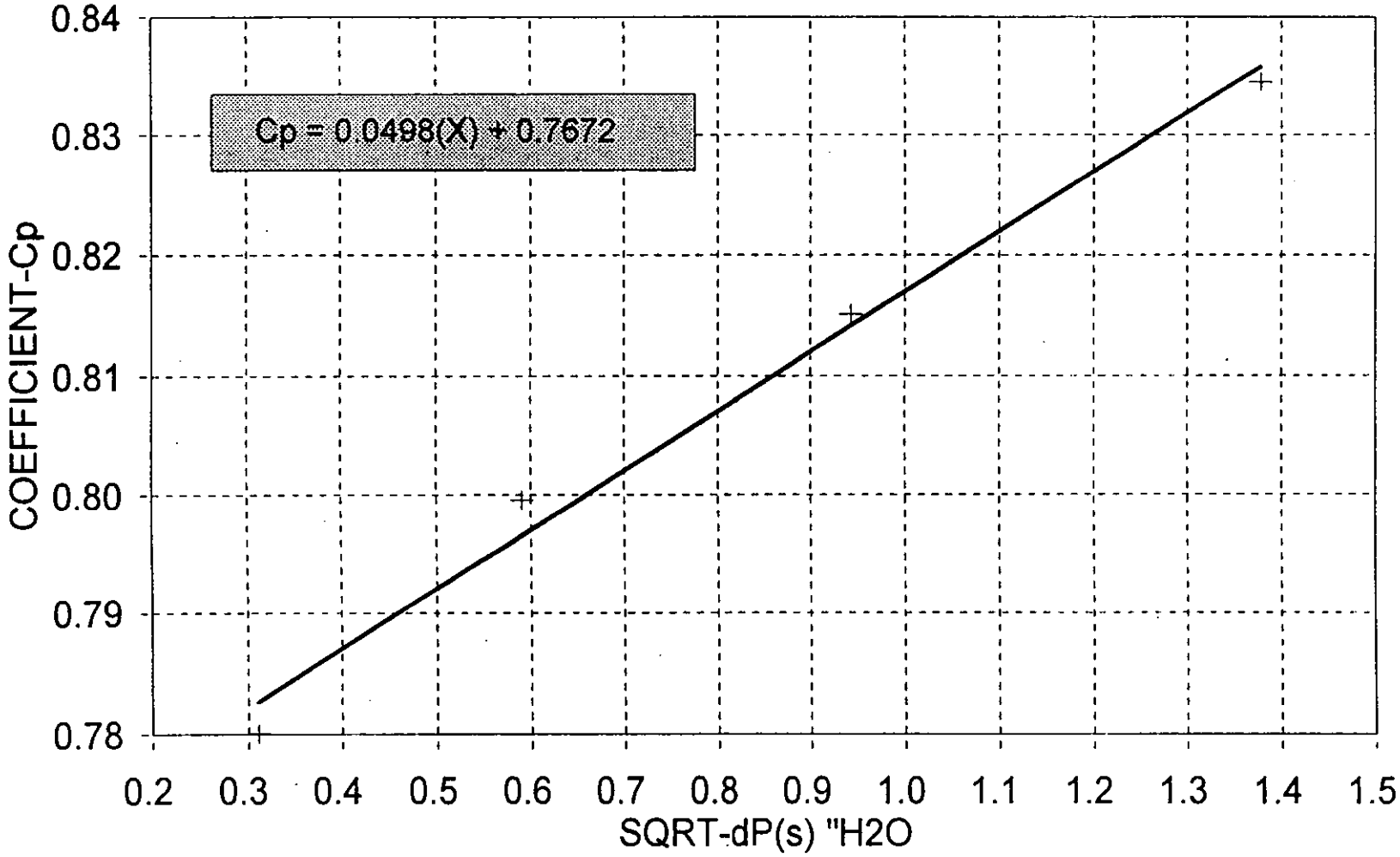
ALLOWABLE= 0.01
DIFFERENCE= 0.0072

MAXIMUM AVERAGE DEVIATION FROM THE MEAN FOR SIDES "A" & "B" AT ANY GIVEN FAN SETTING:

ALLOWABLE= 0.01
SIDE "A" DEVIATION= 0.0089
SIDE "B" DEVIATION= 0.0080

PITOT TUBE #6, SIDE A

1/7/98



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THERMOMETER AND THERMOCOUPLE IDENTIFICATION AND CALIBRATION

IDENTIFICATION

THERMOMETER ID #: G

THERMOCOUPLE ID #: 6

JOB #: 98-092D

DATE: 6-18-98

CALIBRATED BY: BV

CALIBRATION

AVG. EXHAUST TEMPERATURE-F.: 226

RANGE OF CALIBRATION-10% ABS.,F 157 295

READING	REFERENCE THERMOMETER F	TEST THERMOMETER F
I	158	160.1
II	235	235.0
III	290	289.2
AVERAGE-F.	227.7	228.1

PERCENT DIFFERENCE OF ABSOLUTE READINGS:

ALLOWABLE 1.5 %

ACTUAL 0.1 %

EPA SAMPLE NOZZLE
IDENTIFICATION AND CALIBRATION

IDENTIFICATION

NOZZLE ID#:	Z
JOB #:	98-092D
DATE:	6-1-98
CALIBRATED BY:	JJT

CALIBRATION

DIAMETER #	INSIDE DIAMETER (")
I	0.3150
II	0.3130
III	0.3140
AVERAGE	0.3140

DIFFERENCE BETWEEN LARGEST AND SMALLEST MEASUREMENTS

ALLOWABLE 0.004 INCHES

ACTUAL 0.002 INCHES

FULL RANGE THERMOMETER
IDENTIFICATION AND CALIBRATION

IDENTIFICATION

TEMPERATURE MEASURING POINT: FILTER OVEN

THERMOMETER ID #: LS-2 DATE: 12-4-97

RANGE-F.: 50-500 CALIBRATOR: BV

CALIBRATION

READING	REFERENCE THERMOMETER-F	TEST THERMOMETER-F.
I	71	70
II	71	70
III	71	70
AVERAGE-F.	71.0	70.0
I	252	250
II	253	254
III	255	255
AVERAGE-F.	253.3	253.0

HIGHEST PERCENT DIFFERENCE OF AVERAGE ABSOLUTE READINGS:

ALLOWABLE: 1.5 %

ACTUAL: 0.2 %

FULL RANGE THERMOMETER
IDENTIFICATION AND CALIBRATION

IDENTIFICATION

TEMPERATURE MEASURING POINT: IMPINGER

THERMOMETER ID #: LS-2 DATE: 12-4-97

RANGE-F.: T/C CALIBRATOR: BV

CALIBRATION

READING	REFERENCE THERMOMETER-F	TEST THERMOMETER-F.
I	71	72.6
II	71	72.6
III	71	72.5
AVERAGE-F.	71.0	72.6
I	31	35.7
II	31	35.6
III	31	35.7
AVERAGE-F.	31.0	35.7

HIGHEST PERCENT DIFFERENCE OF AVERAGE ABSOLUTE READINGS:

ALLOWABLE: 1.5 %

ACTUAL: 0.9 %

FULL RANGE THERMOMETER
IDENTIFICATION AND CALIBRATION

IDENTIFICATION

TEMPERATURE MEASURING POINT: CU #2 METER INLET

THERMOMETER ID #: CU #2 IN DATE: 4/7/98

RANGE-F.: -40-160 CALIBRATOR: jat

CALIBRATION

READING	REFERENCE THERMOMETER-F	TEST THERMOMETER-F.
I	90	90
II	90	90
III	90	90
AVERAGE-F.	90.0	90.0
I	118	119
II	118	119
III	118	119
AVERAGE-F.	118.0	119.0

HIGHEST PERCENT DIFFERENCE OF AVERAGE ABSOLUTE READINGS:

ALLOWABLE: 1.5 %

ACTUAL: 0.2 %

FULL RANGE THERMOMETER
IDENTIFICATION AND CALIBRATION

IDENTIFICATION

TEMPERATURE MEASURING POINT: CU #2 METER OUTLET

THERMOMETER ID #: CU #2 OUT DATE: 4/7/98

RANGE-F.: -40-160 CALIBRATOR: jat

CALIBRATION

READING	REFERENCE THERMOMETER-F	TEST THERMOMETER-F.
I	90	92
II	90	92
III	90	92
AVERAGE-F.	90.0	92.0
I	117	120
II	117	120
III	117	120
AVERAGE-F.	117.0	120.0

HIGHEST PERCENT DIFFERENCE OF AVERAGE ABSOLUTE READINGS:

ALLOWABLE: 1.5 %

ACTUAL: 0.5 %

FULL RANGE CONTROL UNIT CALIBRATION WORKSHEET

CONTROL UNIT #:	2	DATE:	4/8/98
SERIAL #:	7271	CALIBRATOR:	jat
THERMOMETERS CALIBRATED:	4/7/98	LEAK CHECK:	PASS
BAROMETRIC PR. "Hg:	28.89		

DELTA H "H2O	0.5	1	1.5	2	3	4
BEGINING METER TEMP. F						
-DRY GAS METER :INLET	86	90	91	95	100	105
:OUTLET	81	84	85	86	88	91
-REFERENCE METER	72	72	72	72	73	74
BEGINING VOLUME METER READING						
-DRY GAS METER	44.600	59.900	69.450	79.950	91.200	127.607
-REFERENCE METER	188.140	202.680	211.770	221.800	232.520	267.270
ENDING METER TEMP. F						
-DRY GAS METER :INLET	90	93	96	100	108	116
:OUTLET	84	85	86	87	92	93
-REFERENCE METER	72	72	72	72	73	74
ENDING VOLUME METER READING						
-DRY GAS METER	58.736	69.088	79.272	90.340	126.873	144.953
-REFERENCE METER	201.570	211.420	221.140	231.700	266.580	283.840

CALIBRATION CALCULATIONS

DELTA H "H2O	0.5	1	1.5	2	3	4
DRY GAS METER c.f.	14.136	9.188	9.822	10.390	35.673	17.346
REFERENCE METER c.f.	13.430	8.740	9.370	9.900	34.060	16.570
AVERAGE DRY GAS METER TEMP. F						
-INLET	88.00	91.50	93.50	97.50	104.00	110.50
-OUTLET	82.50	84.50	85.50	86.50	90.00	92.00
-AVERAGE	85.25	88.00	89.50	92.00	97.00	101.25
AVE. REFERENCE METER TEMP. F						
	72.00	72.00	72.00	72.00	73.00	74.00
TIME min.	32.5	15	13	12	34	14
DRY GAS METER FACTOR	0.97	0.98	0.98	0.98	0.99	0.99
ORIFICE DELTA Ha "H2O	1.67	1.67	1.63	1.65	1.67	1.59

AVERAGE DRY GAS METER FACTOR "Y" 0.98

AVERAGE ORIFICE DELTA Ha "H2O 1.65

LARGEST DEVIATION FROM AVERAGE GAS METER FACTOR "Y"
-DIFFERENCE 0.007

LARGEST DEVIATION FROM AVERAGE ORIFICE DELTA Ha "H2O
-DIFFERENCE 0.03

POST-TEST SERIES CONTROL UNIT CALIBRATION WORKSHEET

CLIENT: WILLAMETTE INDUSTRIES
LOCATION: SPRINGFIELD, OR
SOURCE: VENEER DRYER #1

CONTROL UNIT #:	2	DATE:	6/8/98
SERIAL #:	7271	JOB #:	98-092D
dHa "H2O:	1.65	CALIBRATOR:	JJT
BAROMETRIC PR. "Hg:	28.73	MAX. VACUUM "H	2
PRE-TEST FACTOR "Y":	0.98	AVERAGE dH "H2O	1.916

CALIBRATION RUN #	1	2	3
BEGINING METER TEMP. F			
-DRY GAS METER :INLET	86.0	92.0	100.0
:OUTLET	78.0	80.0	86.0
-REFERENCE METER	70.0	70.0	70.0
BEGINING VOLUME METER READING			
-DRY GAS METER	897.101	903.400	919.902
-REFERENCE METER	364.170	370.210	386.000
ENDING METER TEMP. F			
-DRY GAS METER -INLET	92.0	100.0	104.0
-OUTLET	80.0	86.0	89.0
-REFERENCE METER	70.0	70.0	72.0
ENDING VOLUME METER READING			
-DRY GAS METER	903.400	919.902	938.800
-REFERENCE METER	370.210	386.000	404.040

CALIBRATION CALCULATIONS

CALIBRATION RUN #	1	2	3
DRY GAS METER c.f.	6.299	16.502	18.898
REFERENCE METER c.f.	6.040	15.790	18.040
AVERAGE DRY GAS METER TEMP. F			
-INLET	89.00	96.00	102.00
-OUTLET	79.00	83.00	87.50
-AVERAGE	84.00	89.50	94.75
AVERAGE REFERENCE METER TEMP. F	70.00	70.00	71.00
DRY GAS METER FACTOR "Y"	0.98	0.99	0.99

AVERAGE POST-TEST DRY GAS METER FACTOR "Y" 0.99

LARGEST DEVIATION FROM AVERAGE GAS METER FACTOR "Y"
- DIFFERENCE 0.007

DEVIATION FROM PRE-TEST DRY GAS METER FACTOR "Y"
- % DIFFERENCE 1

6.2. SUB-APPENDIX II: FORMALDEHYDE SAMPLING ANALYSIS

6.2.1. Sampling Calculations
- 6.2.1.1. Nomenclature
- 6.2.1.2. Sample Hand Calculation
- 6.2.1.3. Computer Calculations
  - 6.2.1.3.1. Runs 1-2 (heart)
  - 6.2.1.3.2. Runs 3-4 (sap)

6.2.2. Field Data
- 6.2.2.1. Run 1 (heart)
- 6.2.2.2. Run 2 (heart)
- 6.2.2.3. Run 3 (sap)
- 6.2.2.4. Run 4 (sap)

6.2.3. Laboratory Analysis

6.2.4. Sample Train Schematic

6.2.5. Calibration and Quality Assurance Data
- 6.2.5.1. Dry Gas Meter Thermometers
- 6.2.5.2. Dry Gas Meter Calibration

NOMENCLATURE FOR NCASI FORMALDEHYDE (ACETYLACETONE METHOD)

Abbreviation	Description
Cform	Concentration of formaldehyde in exhaust gas, dry basis, corrected to standard conditions - ppm.
dt	Total sampling time - minutes.
Eform	Emission rate of formaldehyde in the gas stream - lbs/hr.
Eform'	Emission rate of formaldehyde in the gas stream converted to carbon - lbs of carbon/hr.
Pb	Barometric pressure at measurement site - inches Hg.
Pstd	Standard absolute pressure, 29.92 "Hg.
Qs	Actual exhaust gas flow rate - acf/min and acm/min.
Qs (std)	Dry volumetric exhaust gas flow rate corrected to standard conditions - dscf/min and dscm/min.
Tm	Average dry gas meter temperature - °F.
Tstd	Standard absolute temperature, 528 R.
Vm	Volume of gas sample as measured by dry gas meter - dcf and dcm
Vm (std)	Volume of gas sample measured by the dry gas meter, corrected to standard conditions - dscf and dscm.
Wform	Total mass of formaldehyde collected in the sample train - ug.
Y	Dry gas meter calibration factor.

SAMPLE CALCULATIONS FOR NCASI FORMALDEHYDE (ACETYLACETONE METHOD)

$$Vm(std) = \frac{(Tstd)\,(Vm)\,(Y)\,(Pb)}{(Pstd)\,(Tm+460)}$$

$$Vm(std) = \frac{(528)\,(2.2778)\,(1.00)\,(29.00)}{(29.92)\,((74.8)+460)}$$

Vm(std) = 2.1797 dscf

Qs(std) = 9670 dscfm (from EPA Methods 1-4)

$$Eform = \frac{(Wform,\ ug)}{(Vm(std),dscf}\left[\frac{Qs(std),\ dscf}{min}\right]\left(\frac{60\ min}{hr}\right)\left(\frac{1\ g}{1 \times 10^{6}\ ug}\right)\left(\frac{1\ lb}{453.6\ g}\right)$$

$$Eform = \frac{(800.2)\,(9670)\,(1.32 \times 10^{-7})}{(2.1797)}$$

Eform = 0.47 lbs formaldehyde/hr

$$Eform' = (Eform)\ \frac{(MW\ of\ Carbon,\ 12.01)}{(MW\ of\ Formaldehyde,\ 30.03)} = 0.19\ \text{lbs carbon/hr}$$

$$Cform = (Eform)/[(30.03)\,(60)\,(2.59 \times 10^{-9})\,(Qs(std))]$$

$$Cform = (0.47)\,/\,[(30.03)\,(60)\,(2.59 \times 10^{-9})\,(9670)]$$

Cform = 10.4 ppm formaldehyde

CLIENT: Willamette Ind., Springfield, OR

JOB # : 98-092 D

SOURCE: Veneer Dryer #1

RUN # : 1

DATE : 6/2/98

CALCULATION SHEET FOR NCASI FORMALDEHYDE METHOD
DRYER #1 - HEART

			RUN 1	RUN 2	AVG
SYMBOL DEFINITIONS - UNITS					
Vm	Sample Volume	-dcf	2.2778	2.2390	
		-dcm	0.0645	0.0634	
Y	Gas Meter Factor		1.00	1.00	
Pb	Barometric Pressure-"Hg		29.00	29.00	
Tm	Average Dry Gas Meter Temp.-F		74.8	68.2	
Vm(std)	Standard Sample Volume	-dscf	2.1797	2.1693	
		-dscm	0.0617	0.0614	
Qs(std)	Standard Gas Flow Rate	-scf/min	10479	10431	10455
		-dscf/min	9670	9524	9597
		-dscm/min	274	270	272
Wform	Weight Of Collected Formaldehyde-ug		800.2	907.2	
Eform	Formaldehyde Emission Rate	-lbs formaldehyde/hr	0.47	0.53	0.50
		-lbs carbon/hr	0.19	0.21	0.20
Cform	Formaldehyde Concentration	-ppm	10.4	11.9	11.1
Pr	Production Rate	-sq ft / hr (3/8" basis)	11173	11591	11382
Ef	Emission Factor	-lbs formaldehyde / MSF (3/8")	0.04	0.05	0.04
		-lbs carbon / MSF (3/8")	0.02	0.02	0.02
dt	Total Sampling Time-min.		60.0	60.0	

PLANT: WILLAMETTE INDUSTRIES SPRINGFIELD, OR
JOB: 98-092D
SOURCE: VENEER DRYER #1
DATE: 6/2/98

90

CALCULATION SHEET FOR NCASI FORMALDEHYDE METHOD
DRYER #1 - SAP

			RUN 3	RUN 4	AVG
SYMBOL DEFINITIONS - UNITS					
Vm	Sample Volume	-dcf	2.3237	2.2637	
		-dcm	0.0658	0.0641	
Y	Gas Meter Factor		1.00	1.00	
Pb	Barometric Pressure-"Hg		29.00	29.00	
Tm	Average Dry Gas Meter Temp.-F		71.1	68.0	
Vm(std)	Standard Sample Volume	-dscf	2.2391	2.1941	
		-dscm	0.0634	0.0621	
Qs(std)	Standard Gas Flow Rate	-scf/min	10512	10454	10483
		-dscf/min	9674	9604	9639
		-dscm/min	274	272	273
Wform	Weight Of Collected Formaldehyde-ug		939.2	1135.0	
Eform	Formaldehyde Emission Rate	-lbs formaldehyde/hr	0.54	0.66	0.60
		-lbs carbon/hr	0.21	0.26	0.24
Cform	Formaldehyde Concentration	-ppm	11.9	14.7	13.3
Pr	Production Rate	-sq ft / hr (3/8" basis)	5883	8073	6978
Ef	Emission Factor	-lbs formaldehyde / MSF (3/8")	0.09	0.08	0.09
		-lbs carbon / MSF (3/8")	0.04	0.03	0.03
dt	Total Sampling Time-min.		60.0	60.0	

PLANT: WILLAMETTE INDUSTRIES SPRINGFIELD, OR
JOB: 98-092D
SOURCE: VENEER DRYER #1
DATE: 6/2/98

NCASI FIELD DATA SHEET

DATE: 6-2-98

JOB#: 98-0920
PLANT: WILL IND
LOCATION: SPFLD OR
SOURCE: V D #1
RUN#: 1
START: 0820
FINISH: 0920

BAROMETRIC PRESSURE: 29.00
THERMOMETER #: G
CRITICAL ORIFICE #: NA

LEAK CHECKS
INITIAL: 0 @ 10
FINAL: 0 @ 10

OPERATOR: MWB

DATA POINT	TIME MIN.	ROTAMETER RATE	ORIFICE PR. INLET	ORIFICE PR. OUTLET	TEMPERATURE (F) ~~BOX~~ mch	TEMPERATURE (F) IMP.	NOTES
START	0	****	****	****	****	****	926.1
1	5	1.1	0	6	73	67	
2	10	1.1	0	6	76	63	
3	15	1.1	0	6	76	62	
4	20	1.1	0	6	74	60	
5	25	1.1	0	6	74	59	
6	30	1.1	0	6	75	59	
7	35	1.1	0	6	73	59	
8	40	1.1	0	6	73	61	
9	45	1.1	0	6	75	62	
10	50	1.1	0	6	75	63	
11	55	1.1	0	6	76	66	
12	60	1.1	0	6	77	67	990.6
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24					74.8		0.0645 m^3

TOTAL _____ AVERAGE _____ AVERAGE _____

RECOVERY VOLUMES

IMPINGER CONTENT VOLUME, ML: 35
WASH VOLUME, ML: _____
TOTAL: 72.0

RECOVERY I.D.

CONDENSATE/WASH: WI V D1 R1
SILICA GEL: A V01 R1
B _____
H2O #: W

92

NCASI FIELD DATA SHEET

DATE: 6-2-98

JOB#: 98-0920

PLANT: WILL LAND

LOCATION: SPFLD, OR

SOURCE: VO #1

RUN#: 2 ♡

START: 1036

FINISH: 1136

BAROMETRIC PRESSURE: 29.00

THERMOMETER #: G

CRITICAL ORIFICE #: NA

LEAK CHECKS

INITIAL: 0 @ 9

FINAL: 0 @ 10

OPERATOR: MMB

DATA POINT	TIME MIN.	ROTAMETER RATE	ORIFICE PR. INLET	ORIFICE PR. OUTLET	TEMPERATURE (F) meter ~~BOX~~	TEMPERATURE (F) IMP.	NOTES
START	0	****	****	****	****	****	991.2
1	5	10.1	0	6	72	70	
2	10	10.1	0	6	69	64	
3	15	10.1	0	6	67	57	
4	20	10.1	0	6	67	54	
5	25	10.1	0	6	68	54	
6	30	10.1	0	6	70	56	
7	35	10.1	0	6	70	54	
8	40	10.1	0	6	69	54	
9	45	10.1	0	6	68	54	
10	50	10.1	0	6	67	54	
11	55	10.1	0	6	65	54	
12	60	10.1	0	6	66	57	1054.6
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24					68.2		0.0634

TOTAL _____ AVERAGE _____ AVERAGE _____

RECOVERY VOLUMES

IMPINGER CONTENT VOLUME, ML: 35

WASH VOLUME, ML: _____

TOTAL: 78.5

RECOVERY I.D.

CONDENSATE/WASH: WJ VO# R2

SILICA GEL: A VO1R2

B _____

H2O #: _____

93

NCASI FIELD DATA SHEET

DATE: [illegible]

JOB#: [illegible]
PLANT: [illegible]
LOCATION: [illegible]
SOURCE: [illegible]
RUN#: 3
START: 1303
FINISH:

BAROMETRIC PRESSURE: [illegible]
THERMOMETER #: [illegible]
CRITICAL ORIFICE #: NA

LEAK CHECKS
INITIAL: 0.009
FINAL: [illegible] 24

OPERATOR: [illegible]

DATA POINT	TIME MIN.	ROTAMETER RATE	ORIFICE PR. INLET	ORIFICE PR. OUTLET	TEMPERATURE (F) ~~BOX~~	TEMPERATURE (F) IMP.	NOTES
START	0	****	****	****	****	****	55.1
1	5	10.1	0	6	70	70	
2	10	10.1	0	6	70	65	
3	15	10.1	0	6	73	66	
4	20	10.1	0	6	74	65	
5	25	10.1	0	6	73	64	
6	30	10.1	0	6	71	64	
7	35	10.1	0	6	71	66	
8	40	10.1	0	6	71	66	
9	45	10.1	0	6	72	67	
10	50	10.1	0	6	71	64	
11	55	10.1	0	6	69	58	
12	60	10.1	0	6	68	54	120.9
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24					71.1		0.0658 m3

TOTAL _____ AVERAGE _____ AVERAGE _____

RECOVERY VOLUMES

IMPINGER CONTENT VOLUME, ML: 35
WASH VOLUME, ML: _____
TOTAL: 70.0

RECOVERY I.D.

CONDENSATE/WASH: WI V01 R3
SILICA GEL: A V01 R3
B _____
H2O #: _____

94

NCASI FIELD DATA SHEET

DATE: 6-2-94

JOB#: 94-6100

PLANT: [illegible]

LOCATION: SPFCO OR

SOURCE: VD #1

RUN#: 4

START: 1509

FINISH: 1609

BAROMETRIC PRESSURE: 29.00

THERMOMETER #: 6

CRITICAL ORIFICE #: N/A

LEAK CHECKS

INITIAL: 0 @ 9

FINAL: 0 @ 10

OPERATOR: MWB

DATA POINT	TIME MIN.	ROTAMETER RATE	ORIFICE PR. INLET	ORIFICE PR. OUTLET	TEMPERATURE (F) ~~BOX~~	TEMPERATURE (F) IMP.	NOTES
START	0	****	****	****	****	****	121.7
1	5	10.1	0	6	67	64	
2	10	10.1	0	6	68	57	
3	15	10.1	0	6	70	56	
4	20	10.1	0	6	71	57	
5	25	10.1	0	6	68	55	
6	30	10.1	0	6	68	56	
7	35	10.1	0	6	67	57	
8	40	10.1	0	6	67	58	
9	45	10.1	0	6	66	58	
10	50	10.1	0	6	67	57	
11	55	10.1	0	6	68	58	
12	60	10.1	0	6	69	59	135.4
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24					68.0		0.0641 m^3

TOTAL ____ AVERAGE ____ AVERAGE ____

RECOVERY VOLUMES

IMPINGER CONTENT VOLUME, ML: 35

WASH VOLUME, ML: ____

TOTAL: 71.5

RECOVERY I.D.

CONDENSATE/WASH: VIVD1 R4

SILICA GEL: A VD1 R4

B ____

H2O #: ____

95

LABORATORY ANALYSIS REPORT

JOB#:	98-092D	SAMPLE DATE:	06/1-2/98
CLIENT:	WILLAMETTE INDUSTRIES	REC'D DATE:	06/05/98
LOCATION:	SPRINGFIELD,OR	REPORT DATE:	06/16/98
SOURCE:	VD#1 & VD#2	ANALYST:	DV

FORMALDEHYDE ANALYSIS

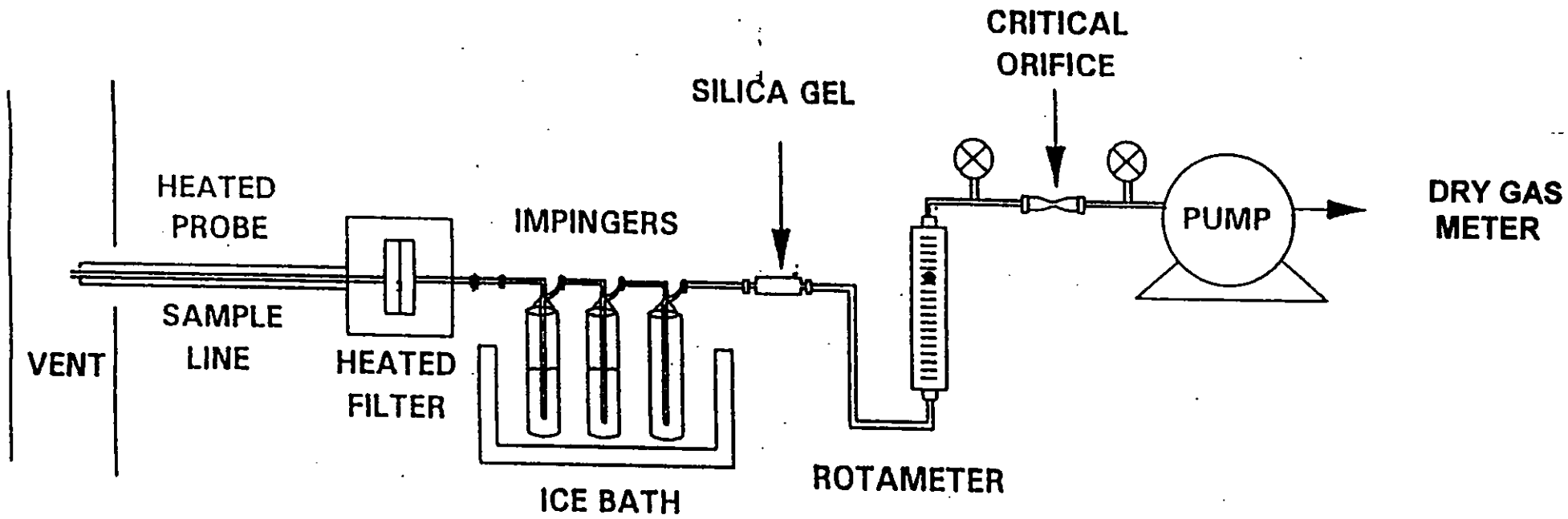
ACETYLACETONE METHOD - NCASI

SAMPLE ID#	ABS.	CONC. ug/2ml	DILUTION FACTOR	FIN.CONC. ug/2ml	TOTAL FIELD VOL.,ml	CONC. ug/sample
VD#1 RUN 1	0.405	5.6	4	22.2	72.0	800.2
VD#1 RUN 2	0.445	6.2	4	24.7	73.5	907.2
VD#1 RUN 3	0.480	6.7	4	26.8	70.0	939.2
VD#1 RUN 4	0.560	7.9	4	31.7	71.5	1135.0
VD#1 BLANK	0.000	0.0	1	0.0	29.5	ND@0.2ug/ml
VD#2 RUN 1	0.300	3.9	1	3.9	67.0	132.2
VD#2 RUN 2	0.415	5.7	1	5.7	62.5	178.5
VD#2 RUN 3	0.280	3.6	1	3.6	69.0	125.5
VD#2 RUN 4	0.240	3.0	1	3.0	70.5	106.6
VD#2 BLANK	0.000	0.0	1	0.0	30.0	ND@0.2ug/ml
SPIKE LOW	0.190	2.3	1	2.3	79.0	89.1
SPIKE HIGH	0.465	6.5	1	6.5	92.5	299.6
QAQC	0.278	3.6	2	7.2	1.0	3.6
SPIKE	0.560	7.9	1	7.9	2.0	7.9

QUALITY ASSURANCE SUMMARY

SAMPLE ID#	THEO. ug/sample	EXP. ug/sample	SAMPLE RECOVERY %	SPIKE RECOVERY %
QAQC	4.0	3.6	90.2	108.2
SPIKE	8.0	7.9	99.2	
SPIKE LOW	100.0	89.1	89.1	
SPIKE HIGH	300.0	299.6	99.9	

FIGURE 1 NCASI FORMALDEHYDE SAMPLING TRAIN



FULL RANGE THERMOMETER
IDENTIFICATION AND CALIBRATION

IDENTIFICATION

TEMPERATURE MEASURING POINT: LOW FLOW CU IN (T/C M 1)

THERMOMETER ID #: B DATE: 5-15-98

RANGE-F.: T/C CALIBRATOR: BV

CALIBRATION

READING	REFERENCE THERMOMETER-F	TEST THERMOMETER-F.
I	72	73.4
II	72	73.5
III	72	73.4
AVERAGE-F.	72.0	73.4
I	116	118.1
II	116	118
III	116	118.1
AVERAGE-F.	116.0	118.1

HIGHEST PERCENT DIFFERENCE OF AVERAGE ABSOLUTE READINGS:

ALLOWABLE: 1.5 %

ACTUAL: 0.4 %

FULL RANGE THERMOMETER
IDENTIFICATION AND CALIBRATION

IDENTIFICATION

TEMPERATURE MEASURING POINT: LOW FLOW CU OUT (T/C M 2)

THERMOMETER ID #: B DATE: 5-15-98

RANGE-F.: T/C CALIBRATOR: BV

CALIBRATION

READING	REFERENCE THERMOMETER-F	TEST THERMOMETER-F.
I	72	73.3
II	72	73.4
III	72	73.4
AVERAGE-F.	72.0	73.4
I	116	117.8
II	116	117.9
III	116	117.8
AVERAGE-F.	116.0	117.8

HIGHEST PERCENT DIFFERENCE OF AVERAGE ABSOLUTE READINGS:

ALLOWABLE: 1.5 %

ACTUAL: 0.3 %

POST-TEST SERIES DRY GAS METER CALIBRATION WORKSHEET

CLIENT: WILLAMETTE INDUSTRIES, DURAFLAKE
LOCATION: SPRINGFIELD, OR
SOURCE: VENEER DRYERS 1 & 2

DRY GAS METER #:	LF	DATE:	6/25/98
BAROMETRIC PR. "Hg:	28.64	JOB #:	98-092D
PRE-TEST FACTOR "Y":	1.00	CALIBRATOR:	JJT/DV

CALIBRATION RUN #	1	2	3
BEGINING METER TEMP. F			
-DRY GAS METER -INLET	72.2	72.3	72.2
-OUTLET	71.6	71.6	71.6
-REFERENCE METER	70.0	70.5	71.0
BEGINING VOLUME METER READING			
-DRY GAS METER	203.0	206.0	208.0
-REFERENCE METER	0.090	0.045	0.015
ENDING METER TEMP. F			
-DRY GAS METER -INLET	72.2	72.3	72.3
-OUTLET	71.6	71.6	71.6
-REFERENCE METER	70.5	71.0	71.0
ENDING VOLUME METER READING			
-DRY GAS METER	203.800	206.800	208.800
-REFERENCE METER	0.890	0.850	0.815

CALIBRATION CALCULATIONS

CALIBRATION RUN #	1	2	3
DRY GAS METER (liters)	0.800	0.800	0.800
REFERENCE METER (liters)	0.800	0.805	0.800
AVERAGE DRY GAS METER TEMP. F			
-INLET	72.2	72.3	72.3
-OUTLET	71.6	71.6	71.6
-AVERAGE	71.9	72.0	71.9
AVERAGE REFERENCE METER TEMP. F	70.3	70.8	71.0
DRY GAS METER FACTOR "Y"	1.00	1.01	1.00

AVERAGE POST-TEST DRY GAS METER FACTOR "Y" 1.00

LARGEST DEVIATION FROM AVERAGE GAS METER FACTOR "Y"
- DIFFERENCE 0.004

DEVIATION FROM PRE-TEST DRY GAS METER FACTOR "Y"
- % DIFFERENCE 0

6.3. SUB-APPENDIX III: INSTRUMENTAL GASEOUS SAMPLING ANALYSIS

6.3.1. Sampling Calculations
- 6.3.1.1. Formulas for Sampling Calculations
- 6.3.1.2. Computer Calculations
  - 6.3.1.2.1. Runs 1-2 (heart)
  - 6.3.1.2.2. Runs 3-4 (sap)

6.3.2. Field Data
- 6.3.2.1. Run 1 (heart)
- 6.3.2.2. Run 2 (heart)
- 6.3.2.3. Run 3 (sap)
- 6.3.2.4. Run 4 (sap)

6.3.3. Continuous Gas Sampling Schematic

6.3.4. Calibration and Quality Assurance Data
- 6.3.4.1. Calibration and Drift Calculations
  - 6.3.4.1.1. CO Instrument
  - 6.3.4.1.2. NOx Instrument
  - 6.3.4.1.3. VOC Instrument
  - 6.3.4.1.4. O_2 Instrument
  - 6.3.4.1.5. CO_2 Instrument
- 6.3.4.2. Calibration Gas Certification
  - 6.3.4.2.1. CC105497
  - 6.3.4.2.2. CC12295
  - 6.3.4.2.3. CC56913
  - 6.3.4.2.4. CC74100
  - 6.3.4.2.5. CC449
- 6.3.4.3. NOx Instrument Converter Efficiency Check
- 6.3.4.4. NOx Instrument Interference Check

GASEOUS SAMPLING CALCULATIONS

VOC MASS EMISSION:

To adjust average measured concentration to ppm carbon, use the following equation:

$$C_c = KC_{meas}$$

Where:

C_c	=	Organic Concentration as Carbon, ppm, wet basis.
C_{meas}	=	Organic Concentration as Measured, ppm, wet basis.
K	=	Carbon Equivalent Correction Factor = 3 for Propane

Mass Emission Rate:

$$\text{lbs/hr} = (\text{ppm})(\text{flow rate})(\text{MW})(60\ \text{min/hr})(2.59 \times 10^{-9})$$

Where:

MW of Carbon	=	12 lb/lb mole.
PPM	=	Parts Per Million, carbon equivalent, wet basis.
Flow Rate	=	Exhaust Flow Rate, Standard Cubic Feet Per Minute
2.59×10^{-9}	=	Molar Volume Constant and Associated Conversions.

CO AND NOx MASS EMISSION:

Mass Emission Rate:

$$\text{lbs/hr} = (\text{ppm})(\text{flow rate})(\text{MW gas})(60\ \text{min/hr})(2.59 \times 10^{-9})$$

Where:

MW gas	=	28 lb/lb mole for CO
	=	46 lb/lb mole for NO_2
PPM	=	Average Concentration of Measured Gas; - CO parts per million, dry basis - NOx parts per million, dry basis, corrected for zero and span
Flow Rate	=	Exhaust Flow Rate, Dry Standard Cubic Feet Per Minute.
2.59×10^{-9}	=	Molar Volume Constant and Associated Conversions.

GASEOUS SAMPLING CALCULATIONS
DRYER #1 - HEART

	RUN 1	RUN 2	AVG
CARBON MONOXIDE (CO)			
Average-ppm	23.6	25.9	24.7
Upscale Gas Concentration	101.4	240.6	
Start Zero	-2	-3	
Start Upscale	100	237	
End Zero	-4	-3	
End Upscale	98	237	
Exhaust Gas Flow Rate-dscfm	9670	9524	
Mass Emissions-lbs/hr	1.0	1.1	1.0
Emission Factor-lbs/MMBtu*	0.20	0.22	0.21
OXIDES OF NITROGEN (NOx)			
Average-ppm	6.3	5.6	
Upscale Gas Concentration	48.8	83.5	
Start Zero	0	0	
Start Upscale	49	83	
End Zero	3	2	
End Upscale	51	84	
Emission Concentration-ppm	4.8	4.7	4.8
Exhaust Gas Flow Rate-dscfm	9670	9524	
Mass Emissions-lbs/hr	0.3	0.3	0.3
Emission Factor-lbs/MMBtu*	0.07	0.06	0.07
VOLATILE ORGANIC COMPOUNDS (VOC's)			
Average-ppm as propane	62.3	59.7	61.0
Average-ppm as carbon	187.0	179.1	183.0
Upscale Gas Concentration	29.6	51.4	
Start Zero	0.0	0.9	
Start Upscale	29.7	51.3	
End Zero	2.7	2.7	
End Upscale	32.7	54.0	
Exhaust Gas Flow Rate-scfm	10479	10431	
Mass Emissions-lbs carbon/hr	3.65	3.48	3.57
-lbs carbon/MSF(3/8")	0.33	0.30	0.31
OXYGEN (O2) - % by volume			
Average-%	19.13	19.13	
Upscale Gas Concentration	20.43	20.43	
Start Zero	0.2	0.2	
Start Upscale	20.4	20.2	
End Zero	0.3	0.2	
End Upscale	20.0	20.2	
Emission Concentration-%	19.34	19.34	19.34
CARBON DIOXIDE (CO2) - % by volume			
Average-%	0.91	0.87	
Upscale Gas Concentration	5.58	8.54	
Start Zero	0.06	0.05	
Start Upscale	5.63	8.53	
End Zero	0.10	0.06	
End Upscale	5.63	8.55	
Emission Concentration-%	0.83	0.82	0.83
Production Rate, sq. ft./hr (3/8" basis)	11173	11591	

* Natural Gas Combustion Factor = 8710 dscf/MMBtu

PLANT: WILLAMETTE INDUSTRIES SPRINGFIELD, OR
JOB: 98-092D
SOURCE: VENEER DRYER #1 CONDITION: HEART
DATE: 6/2/98

GASEOUS SAMPLING CALCULATIONS
DRYER #1 - SAP

	RUN 3	RUN 4	AVG
CARBON MONOXIDE (CO)			
Average-ppm	20.0	21.1	20.5
Upscale Gas Concentration	240.6	101.4	
Start Zero	-2	-2	
Start Upscale	237	99	
End Zero	-2	-2	
End Upscale	235	98	
Exhaust Gas Flow Rate-dscfm	9674	9604	
Mass Emissions-lbs/hr	0.8	0.9	0.9
Emission Factor-lbs/MMBtu*	0.17	0.15	0.16
OXIDES OF NITROGEN (NOx)			
Average-ppm	4.2	5.3	
Upscale Gas Concentration	83.5	48.8	
Start Zero	0	0	
Start Upscale	84	49	
End Zero	0	2	
End Upscale	83	50	
Emission Concentration-ppm	4.2	4.4	4.3
Exhaust Gas Flow Rate-dscfm	9674	9604	
Mass Emissions-lbs/hr	0.3	0.3	0.3
Emission Factor-lbs/MMBtu*	0.06	0.05	0.06
VOLATILE ORGANIC COMPOUNDS (VOC's)			
Average-ppm as propane	20.1	23.9	22.0
Average-ppm as carbon	60.2	71.6	65.9
Upscale Gas Concentration	51.4	29.6	
Start Zero	0.0	-0.3	
Start Upscale	51.3	29.7	
End Zero	2.1	2.1	
End Upscale	49.8	30.6	
Exhaust Gas Flow Rate-scfm	10512	10454	
Mass Emissions-lbs carbon/hr	1.18	1.40	1.29
-lbs carbon/MSF(3/8")	0.20	0.17	0.19
OXYGEN (O2) - % by volume			
Average-%	19.27	18.97	
Upscale Gas Concentration	20.43	20.43	
Start Zero	0.2	0.2	
Start Upscale	20.5	20.2	
End Zero	0.2	0.2	
End Upscale	20.2	20.4	
Emission Concentration-%	19.33	19.08	19.21
CARBON DIOXIDE (CO2) - % by volume			
Average-%	0.80	0.88	
Upscale Gas Concentration	8.54	5.58	
Start Zero	0.07	0.10	
Start Upscale	8.53	5.67	
End Zero	0.05	0.08	
End Upscale	8.52	5.56	
Emission Concentration-%	0.75	0.79	0.77
Production Rate, sq. ft./hr (3/8" basis)	5883	8073	

*** Natural Gas Combustion Factor = 8710 dscf/MMBtu**

PLANT: WILLAMETTE INDUSTRIES SPRINGFIELD, OR
JOB: 98-092D
SOURCE: VENEER DRYER #1 CONDITION: SAP
DATE: 6/2/98

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BWR ASSOCIATES, INC.
GAS DATA SHEET

PLANT: WILLAMETTE INDUSTRIES
LOCATION: SPRINGFIELD, OR
SOURCE: VENEER DRYER #1
CONDITION: HEART

DATE: 6/2/98
JOB: 98-092D
RUN: 1

OPERATOR
jat

		CO(ppm)	NOx(ppm)	O2(%)	CO2(%)	VOC(ppm)
CAL GAS VALUE		101.4	48.8	20.43	5.58	29.6
INITIAL ZERO		-2	0	0.2	0.06	0.0
INITAL UPSCALE		100.2	49	20.4	5.63	29.7
POINT	TIME	CO(ppm)	NOx(ppm)	O2(%)	CO2(%)	VOC(ppm)
1	817	22	3	19.5	0.88	70.2
2	818	29	4	19.4	0.89	71.7
3	819	31	5	19.3	0.91	73.2
4	820	34	5	19.2	0.92	68.4
5	821	30	6	19.3	0.88	64.2
6	822	29	6	19.2	0.89	63.9
7	823	28	6	19.2	0.89	64.8
8	824	34	5	19.2	0.89	66.9
9	825	25	6	19.2	0.90	65.1
10	826	26	6	19.1	0.93	62.7
11	827	25	6	19.2	0.90	58.8
12	828	23	6	19.3	0.85	52.5
13	829	21	6	19.2	0.87	52.8
14	830	21	6	19.2	0.86	46.3
15	831	22	6	19.2	0.86	50.4
16	832	24	6	19.2	0.88	52.8
17	833	26	6	19.2	0.87	46.8
18	834	25	6	19.2	0.87	49.5
19	835	23	6	19.2	0.89	51.0
20	836	22	6	19.2	0.90	50.4
21	837	19	6	19.2	0.93	52.5
22	838	22	6	19.1	0.97	52.5
23	839	22	7	19.1	0.96	53.1
24	840	23	7	19.1	0.96	53.1
25	841	22	7	19.1	0.94	53.4
26	842	22	7	19.1	0.93	54.0
27	843	21	6	19.1	0.94	51.9
28	844	22	6	19.1	0.95	50.1
29	845	22	6	19.1	0.95	54.6
30	846	24	6	19.1	0.96	58.2
31	847	24	6	19.1	0.95	59.1
32	848	23	6	19.1	0.95	59.1
33	849	24	6	19.1	0.95	59.7
34	850	23	6	19.1	0.95	58.8
35	851	23	6	19.1	0.95	66.3
36	852	24	6	19.1	0.95	66.0
37	853	24	6	19.1	0.93	68.1
38	854	25	6	19.1	0.94	71.1
39	855	24	7	19.0	0.95	71.7
40	856	25	7	19.0	0.97	72.3
41	857	25	7	19.0	0.96	73.8
42	858	23	7	19.0	0.94	72.0
43	859	25	7	19.0	0.95	72.3
44	900	25	7	19.0	0.93	71.4
45	901	24	7	19.0	0.89	73.2
46	902	24	7	19.0	0.91	80.4
47	903	25	7	19.0	0.91	93.3
48	904	25	7	19.1	0.89	92.4
49	905	26	7	19.1	0.85	81.9
50	906	24	7	19.1	0.84	73.5
51	907	22	7	19.2	0.82	68.4
52	908	21	7	19.2	0.84	68.3
53	909	22	7	19.2	0.84	58.2
54	910	20	7	19.2	0.86	47.7
55	911	19	7	19.2	0.86	46.5
56	912	17	7	19.1	0.87	46.2
57	913	16	7	19.1	0.92	55.5
58	914	17	7	19.0	0.93	63.0
59	915	19	7	19.0	0.93	63.9
60	916	19	7	19.0	0.91	65.1
61	917	21	7	19.0	0.91	67.2
AVERAGE		23.6	6.3	19.13	0.91	62.3
FINAL ZERO		-4.2	3	0.3	0.1	2.7
FINAL UPSCALE		97.6	51	20.0	5.63	32.7
CORR. FOR Z/S			4.8	19.34	0.83	

BWR ASSOCIATES, INC.
GAS DATA SHEET

PLANT: WILLAMETTE INDUSTRIES
LOCATION: SPRINGFIELD, OR
SOURCE: VENEER DRYER #1
CONDITION: HEART

DATE: 6/2/98
JOB: 98-092D
RUN: 2
OPERATOR: jat

		CO(ppm)	NOx(ppm)	O2(%)	CO2(%)	VOC(ppm)
CAL GAS VALUE		240.6	83.5	20.43	8.54	51.4
INITIAL ZERO		-2.8	0	0.2	0.05	0.9
INITAL UPSCALE		236.8	83	20.2	8.53	51.3
POINT	TIME	CO(ppm)	NOx(ppm)	O2(%)	CO2(%)	VOC(ppm)
1	1037	24	4	19.2	0.85	54.0
2	1038	24	4	19.2	0.86	51.3
3	1039	24	5	19.2	0.88	51.8
4	1040	24	5	19.1	0.92	49.2
5	1041	24	5	19.1	0.93	50.1
6	1042	23	5	19.1	0.93	51.6
7	1043	26	5	19.1	0.92	52.2
8	1044	24	5	19.1	0.90	52.2
9	1045	23	5	19.1	0.91	52.8
10	1046	23	5	19.1	0.89	53.7
11	1047	22	5	19.1	0.88	54.0
12	1048	22	5	19.1	0.86	54.9
13	1049	23	5	19.1	0.86	60.9
14	1050	24	5	19.1	0.86	62.1
15	1051	24	5	19.1	0.86	63.3
16	1052	22	5	19.1	0.88	64.5
17	1053	26	5	19.0	0.92	63.9
18	1054	25	5	19.1	0.91	62.1
19	1055	25	5	19.1	0.91	62.4
20	1056	23	5	19.1	0.90	62.4
21	1057	26	5	19.1	0.89	57.0
22	1058	24	5	19.1	0.91	48.9
23	1059	23	6	19.1	0.91	48.9
24	1100	22	6	19.1	0.90	49.5
25	1101	23	6	19.1	0.90	48.9
26	1102	23	6	19.1	0.88	49.2
27	1103	21	6	19.1	0.87	48.9
28	1104	21	6	19.1	0.85	48.3
29	1105	22	6	19.1	0.84	46.8
30	1106	24	6	19.1	0.87	50.7
31	1107	28	6	19.1	0.90	63.0
32	1108	26	6	19.1	0.92	73.2
33	1109	25	6	19.0	0.94	77.4
34	1110	24	6	19.0	0.95	75.3
35	1111	25	6	19.1	0.93	66.9
36	1112	24	6	19.1	0.90	59.7
37	1113	25	6	19.2	0.86	55.2
38	1114	27	6	19.2	0.86	57.6
39	1115	25	6	19.2	0.85	58.2
40	1116	30	6	19.2	0.85	66.0
41	1117	30	6	19.2	0.85	72.9
42	1118	30	6	19.2	0.86	77.1
43	1119	32	6	19.2	0.80	76.5
44	1120	30	6	19.2	0.85	78.9
45	1121	32	6	19.1	0.88	72.6
46	1122	32	6	19.1	0.88	68.1
47	1123	33	6	19.1	0.88	67.2
48	1124	33	6	19.1	0.86	69.6
49	1125	31	6	19.2	0.84	73.8
50	1126	32	6	19.2	0.82	74.4
51	1127	31	6	19.2	0.82	78.9
52	1128	31	6	19.2	0.84	67.8
53	1129	29	6	19.2	0.86	59.7
54	1130	28	6	19.2	0.86	57.9
55	1131	29	6	19.2	0.88	56.4
56	1132	29	6	19.1	0.84	55.5
57	1133	27	6	19.2	0.82	54.6
58	1134	26	6	19.2	0.82	52.2
59	1135	25	6	19.2	0.82	51.6
60	1136	23	6	19.2	0.81	50.1
61	1137	24	6	19.2	0.81	47.1
AVERAGE		25.9	5.6	19.13	0.87	59.7
FINAL ZERO		-3	2	0.2	0.06	2.7
FINAL UPSCALE		237	84	20.2	8.55	54.0
CORR. FOR Z/S			4.7	19.34	0.82	

BWR ASSOCIATES, INC.
GAS DATA SHEET

PLANT: WILLAMETTE INDUSTRIES
LOCATION: SPRINGFIELD, OR
SOURCE: VENEER DRYER #1
CONDITION: SAP

DATE: 6/2/98
JOB: 98-092D
RUN: 3

OPERATOR
jat

		CO(ppm)	NOx(ppm)	O2(%)	CO2(%)	VOC(ppm)
CAL GAS VALUE		241	83.5	20.43	8.54	51.4
INITIAL ZERO		-2.2	0	0.2	0.07	0.0
INITAL UPSCALE		236.6	84	20.5	8.53	51.3
POINT	TIME	CO(ppm)	NOx(ppm)	O2(%)	CO2(%)	VOC(ppm)
1	1300	20	4	19.3	0.81	18.3
2	1301	20	4	19.3	0.83	19.8
3	1302	18	4	19.3	0.83	19.2
4	1303	18	4	19.3	0.83	21.0
5	1304	19	4	19.3	0.82	21.0
6	1305	18	4	19.3	0.82	20.7
7	1306	18	4	19.3	0.82	20.4
8	1307	19	4	19.3	0.82	21.0
9	1308	18	4	19.3	0.82	21.6
10	1309	18	4	19.3	0.81	20.7
11	1310	19	4	19.3	0.80	19.5
12	1311	18	4	19.3	0.78	18.3
13	1312	16	4	19.3	0.79	17.7
14	1313	16	4	19.3	0.80	17.4
15	1314	16	4	19.3	0.80	17.1
16	1315	21	4	19.3	0.80	18.9
17	1316	20	4	19.3	0.80	19.5
18	1317	18	4	19.3	0.82	19.8
19	1318	21	4	19.3	0.78	19.2
20	1319	20	4	19.3	0.78	19.2
21	1320	21	4	19.3	0.80	19.2
22	1321	20	4	19.3	0.81	18.6
23	1322	19	4	19.3	0.81	18.6
24	1323	17	4	19.4	0.75	19.5
25	1324	17	4	19.4	0.75	19.5
26	1325	19	4	19.4	0.75	19.8
27	1326	17	4	19.4	0.75	19.2
28	1327	17	4	19.4	0.75	20.7
29	1328	19	4	19.3	0.77	21.6
30	1329	19	4	19.3	0.79	21.0
31	1330	18	4	19.3	0.79	21.3
32	1331	18	4	19.3	0.79	22.2
33	1332	20	4	19.3	0.80	23.1
34	1333	20	4	19.3	0.80	24.0
35	1334	19	4	19.4	0.76	23.1
36	1335	19	4	19.4	0.77	22.8
37	1336	19	4	19.3	0.80	21.9
38	1337	20	4	19.3	0.81	21.9
39	1338	19	4	19.3	0.81	21.9
40	1339	20	4	19.3	0.81	21.0
41	1340	21	4	19.2	0.83	21.0
42	1341	22	4	19.2	0.83	20.7
43	1342	22	4	19.2	0.83	20.7
44	1343	22	4	19.2	0.83	20.1
45	1344	21	4	19.2	0.80	19.8
46	1345	22	5	19.2	0.81	20.1
47	1346	22	5	19.2	0.81	20.1
48	1347	23	5	19.2	0.81	19.8
49	1348	22	5	19.2	0.80	19.2
50	1349	22	4	19.2	0.79	18.6
51	1350	22	4	19.2	0.78	18.3
52	1351	23	4	19.2	0.78	18.6
53	1352	22	4	19.2	0.79	18.6
54	1353	23	5	19.2	0.80	18.6
55	1354	23	5	19.2	0.83	19.2
56	1355	23	5	19.1	0.83	19.8
57	1356	23	5	19.1	0.83	19.8
58	1357	23	5	19.1	0.83	19.8
59	1358	22	5	19.1	0.85	19.8
60	1359	24	5	19.1	0.87	20.1
61	1400	23	5	19.1	0.85	19.8
AVERAGE		20.0	4.2	19.27	0.80	20.1
FINAL ZERO		-2.4	0	0.2	0.05	2.1
FINAL UPSCALE		234.6	83	20.2	8.52	49.8
CORR. FOR Z/S			4.2	19.33	0.75	

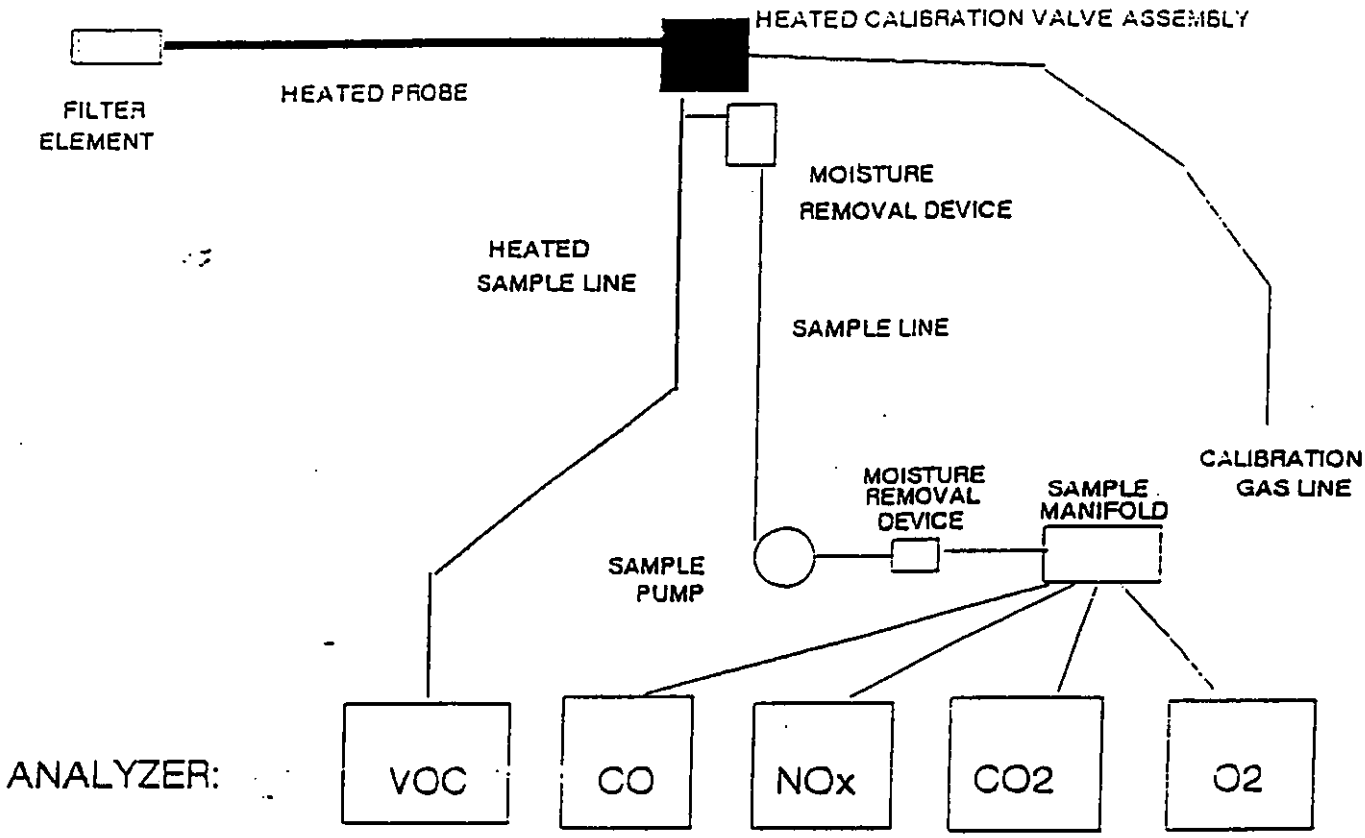
BWR ASSOCIATES, INC.
GAS DATA SHEET

PLANT: WILLAMETTE INDUSTRIES
LOCATION: SPRINGFIELD, OR
SOURCE: VENEER DRYER #1
CONDITION: SAP

DATE: 6/2/98
JOB: 98-092D
RUN: 4
OPERATOR: jat

		CO(ppm)	NOx(ppm)	O2(%)	CO2(%)	VOC(ppm)
CAL GAS VALUE		101.4	48.8	20.43	5.58	29.6
INITIAL ZERO		-2.0	0.0	0.2	0.1	-0.3
INITAL UPSCALE		99.0	49	20.2	5.67	29.7
POINT	TIME	CO(ppm)	NOx(ppm)	O2(%)	CO2(%)	VOC(ppm)
1	1506	22	4	19.2	0.88	22.5
2	1507	22	4	19.2	0.89	21.9
3	1508	22	4	19.2	0.88	21.3
4	1509	21	4	19.2	0.89	19.5
5	1510	21	4	19.2	0.89	22.2
6	1511	20	5	19.1	0.87	21.9
7	1512	20	5	19.1	0.88	22.8
8	1513	20	5	19.1	0.89	23.1
9	1514	20	5	19.1	0.89	23.1
10	1515	20	5	19.1	0.89	23.7
11	1516	20	5	19.1	0.89	24.3
12	1517	20	5	19.1	0.89	22.8
13	1518	21	5	19.1	0.89	22.8
14	1519	19	5	19.1	0.87	22.8
15	1520	22	5	19.1	0.88	22.8
16	1521	21	5	19.1	0.85	22.2
17	1522	20	5	19.1	0.84	21.3
18	1523	19	5	19.1	0.83	21.6
19	1524	21	5	19.0	0.86	22.8
20	1525	20	5	19.0	0.86	22.2
21	1526	21	5	19.0	0.86	23.1
22	1527	22	5	19.0	0.86	23.4
23	1528	20	5	19.1	0.83	24.3
24	1529	20	5	19.1	0.84	23.1
25	1530	20	5	19.1	0.84	23.4
26	1531	20	5	19.1	0.84	24.3
27	1532	20	5	19.1	0.85	23.4
28	1533	21	6	19.0	0.85	22.8
29	1534	20	5	19.0	0.85	22.5
30	1535	19	5	19.0	0.84	21.6
31	1536	21	5	18.9	0.88	23.4
32	1537	22	5	18.9	0.87	22.5
33	1538	21	5	18.9	0.88	23.1
34	1539	22	6	18.9	0.89	23.4
35	1540	22	6	18.9	0.87	24.0
36	1541	22	6	18.9	0.85	24.6
37	1542	22	6	18.9	0.87	24.9
38	1543	22	6	18.9	0.87	25.2
39	1544	22	5	18.9	0.87	24.9
40	1545	22	5	18.9	0.88	24.9
41	1546	22	6	18.9	0.89	25.5
42	1547	22	6	18.9	0.87	24.9
43	1548	22	6	18.9	0.90	25.5
44	1549	21	6	18.9	0.90	25.5
45	1550	21	6	18.9	0.90	25.5
46	1551	22	6	18.9	0.90	25.5
47	1552	22	6	18.9	0.88	26.4
48	1553	22	6	18.9	0.87	25.8
49	1554	20	6	18.9	0.88	27.0
50	1555	22	6	18.8	0.90	26.7
51	1556	21	6	18.8	0.91	26.4
52	1557	22	6	18.8	0.91	26.4
53	1558	22	6	18.8	0.91	26.1
54	1559	22	6	18.8	0.91	24.9
55	1600	23	6	18.7	0.93	25.2
56	1601	23	6	18.7	0.93	24.6
57	1602	22	6	18.7	0.93	24.8
58	1603	21	6	18.8	0.85	24.9
59	1604	21	6	18.8	0.87	24.9
60	1605	21	6	18.9	0.86	24.6
61	1606	20	6	18.9	0.86	25.2
AVERAGE		21.1	5.3	18.97	0.88	23.9
FINAL ZERO		-2.4	2	0.2	0.08	2.1
FINAL UPSCALE		98.0	50	20.4	5.56	30.6
CORR. FOR Z/S			4.4	19.08	0.79	

CONTINUOUS GAS SAMPLING SCHEMATIC



CO INSTRUMENT CALIBRATION BIAS AND DRIFT (AS PER EPA METHOD 10)

INSTRUMENT SPAN (PPM) 300
CLIENT: WILLAMETTE INDUSTRIES
SOURCE: VENEER DRYER #1
LOCATION: SPRINGFIELD, OR
DATE: JUNE 2, 1998

ANALYZER CALIBRATION DATA

	CYLINDER NUMBER	CYLINDER VALUE (ppm)	ANALYZER CALIBRATION RESPONSE (ppm)	ABSOLUTE DIFFERENCE (ppm)	ANALYZER CALIBRATION ERROR (% of span)
Zero Gas	CC105497	0.0	0.4	0.4	0.1
Mid-range gas	CC12295	101.4	103.4	2.0	0.7
High-range gas	CC56913	240.6	242.2	1.6	0.5

SYSTEM CALIBRATION BIAS AND DRIFT DATA

MEASUREMENT SYSTEM RESPONSE TIME (seconds): 25

	ANALYZER CALIBRATION RESPONSE (ppm)	INITIAL VALUES		FINAL VALUES		DRIFT (% of span)
		SYSTEM CALIBRATION RESPONSE (ppm)	SYSTEM CALIBRATION BIAS (% of span)	SYSTEM CALIBRATION RESPONSE (ppm)	SYSTEM CALIBRATION BIAS (% of span)	
RUN 1						
Zero Gas	0.4	-2	-0.8	-4	-1.5	-0.7
Upscale Gas	103.4	100	-1.1	98	-1.8	-0.7
RUN 2						
Zero Gas	0.4	-3	-1.1	-3	-1.1	0.0
Upscale Gas	242.2	237	-1.7	237	-1.7	0.0
RUN 3						
Zero Gas	0.4	-2	-0.8	-2	-0.8	0.0
Upscale Gas	242.2	237	-1.7	235	-2.4	-0.7
RUN 4						
Zero Gas	0.4	-2	-0.8	-2	-0.8	0.0
Upscale Gas	103.4	99	-1.5	98	-1.8	-0.3

NOx INSTRUMENT CALIBRATION BIAS AND DRIFT (AS PER EPA METHOD 7E)

INSTRUMENT SPAN (PPM) 100
CLIENT: WILLAMETTE INDUSTRIES
SOURCE: VENEER DRYER #1
LOCATION: SPRINGFIELD, OR
DATE: JUNE 2, 1998

ANALYZER CALIBRATION DATA

	CYLINDER NUMBER	CYLINDER VALUE (ppm)	ANALYZER CALIBRATION RESPONSE (ppm)	ABSOLUTE DIFFERENCE (ppm)	ANALYZER CALIBRATION ERROR (% of span)
Zero Gas	CC105497	0.0	0.0	0.0	0.0
Mid-range gas	CC12295	48.8	48.0	0.8	0.8
High-range gas	CC56913	83.5	83.5	0.0	0.0

SYSTEM CALIBRATION BIAS AND DRIFT DATA

MEASUREMENT SYSTEM RESPONSE TIME (seconds): 45

	ANALYZER CALIBRATION RESPONSE (ppm)	INITIAL VALUES		FINAL VALUES		DRIFT (% of span)
		SYSTEM CALIBRATION RESPONSE (ppm)	SYSTEM CALIBRATION BIAS (% of span)	SYSTEM CALIBRATION RESPONSE (ppm)	SYSTEM CALIBRATION BIAS (% of span)	
RUN 1						
Zero Gas	0.0	0	0.0	3	3.0	3.0
Upscale Gas	48.0	49	1.0	51	3.0	2.0
RUN 2						
Zero Gas	0.0	0	0.0	2	2.0	2.0
Upscale Gas	83.5	83	-0.5	84	0.5	1.0
RUN 3						
Zero Gas	0.0	0	0.0	0	0.0	0.0
Upscale Gas	83.5	84	0.5	83	-0.5	-1.0
RUN 4						
Zero Gas	0.0	0	0.0	2	2.0	2.0
Upscale Gas	48.0	49	1.0	50	2.0	1.0

VOC INSTRUMENT CALIBRATION AND DRIFT (EPA METHOD 25A)

INSTRUMENT SPAN (ppm): 100
RESPONSE TIME (seconds): 30

CLIENT: WILLAMETTE INDUSTRIES
LOCATION: VENEER DRYER #1
SOURCE: SPRINGFIELD, OR
DATE: JUNE 2, 1998

INITIAL CALIBRATION ERROR TEST

	CYLINDER NUMBER	CALIBRATION GAS (ppm as C3H8)	CALIBRATION GAS (% of span)	INSTRUMENT RESPONSE (ppm as C3H8)	CALIBRATION ERROR (% of cal gas)
Zero Gas	CC105497	0.0	NA	0.0	
Low Level	CC12295	29.62	30	29.7	0.3
Mid Level	CC56913	51.4	51	51.3	-0.2
High Level	CC74100	88.0	88	87.3	

SYSTEM DRIFT DATA

	INITIAL SYSTEM CALIBRATION RESPONSE (ppm as C3H8)	FINAL SYSTEM CALIBRATION RESPONSE (ppm as C3H8)	DRIFT (% of span)
RUN 1			
Zero Gas	0.0	2.7	2.7
Mid Level Gas	29.7	32.7	3.0
RUN 2			
Zero Gas	0.9	2.7	1.8
Mid Level Gas	51.3	54.0	2.7
RUN 3			
Zero Gas	0.0	2.1	2.1
Mid Level Gas	51.3	49.8	-1.5
RUN 4			
Zero Gas	-0.3	2.1	2.4
Mid Level Gas	29.7	30.6	0.9

O2 INSTRUMENT CALIBRATION BIAS AND DRIFT (AS PER EPA METHOD 3A)

INSTRUMENT SPAN (%) 25
CLIENT: WILLAMETTE INDUSTRIES
LOCATION: VENEER DRYER #1
SOURCE: SPRINGFIELD, OR
DATE: JUNE 2, 1998

ANALYZER CALIBRATION DATA

	CYLINDER NUMBER	CYLINDER VALUE (% O2)	ANALYZER CALIBRATION RESPONSE (% O2)	ABSOLUTE DIFFERENCE (% O2)	ANALYZER CALIBRATION ERROR (% of span)
Zero Gas	CC12295	0.00	0.0	0.0	0.0
Mid-range gas	CC449	12.01	12.3	0.3	1.2
High-range gas	CC105497	20.43	20.6	0.2	0.7

SYSTEM CALIBRATION BIAS AND DRIFT DATA

MEASUREMENT SYSTEM RESPONSE TIME (seconds): 45

	ANALYZER CALIBRATION RESPONSE (% O2)	INITIAL VALUES		FINAL VALUES		DRIFT (% of span)
		SYSTEM CALIBRATION RESPONSE (% O2)	SYSTEM CALIBRATION BIAS (% of span)	SYSTEM CALIBRATION RESPONSE (% O2)	SYSTEM CALIBRATION BIAS (% of span)	
RUN 1						
Zero Gas	0.0	0.2	0.8	0.3	1.2	0.4
Upscale Gas	20.6	20.4	-0.8	20.0	-2.4	-1.6
RUN 2						
Zero Gas	0.0	0.2	0.8	0.2	0.8	0.0
Upscale Gas	20.6	20.2	-1.6	20.2	-1.6	0.0
RUN 3						
Zero Gas	0.0	0.2	0.8	0.2	0.8	0.0
Upscale Gas	20.6	20.5	-0.4	20.2	-1.6	-1.2
RUN 4						
Zero Gas	0.0	0.2	0.8	0.2	0.8	0.0
Upscale Gas	20.6	20.2	-1.6	20.4	-0.8	0.8

CO2 INSTRUMENT CALIBRATION BIAS AND DRIFT (AS PER EPA METHOD 3A)

INSTRUMENT SPAN (%)	10
CLIENT:	WILLAMETTE INDUSTRIES
LOCATION:	VENEER DRYER #1
SOURCE:	SPRINGFIELD, OR
DATE:	JUNE 2, 1998

ANALYZER CALIBRATION DATA

	CYLINDER NUMBER	CYLINDER VALUE (% CO2)	ANALYZER CALIBRATION RESPONSE (% CO2)	ABSOLUTE DIFFERENCE (% CO2)	ANALYZER CALIBRATION ERROR (% of span)
Zero Gas	CC105497	0.00	0.05	0.05	0.5
Mid-range gas	CC12295	5.58	5.59	0.01	0.1
High-range gas	CC56913	8.54	8.56	0.02	0.2

SYSTEM CALIBRATION BIAS AND DRIFT DATA

MEASUREMENT SYSTEM RESPONSE TIME (seconds): 45

	ANALYZER CALIBRATION RESPONSE (% CO2)	INITIAL VALUES		FINAL VALUES		DRIFT (% of span)
		SYSTEM CALIBRATION RESPONSE (% CO2)	SYSTEM CALIBRATION BIAS (% of span)	SYSTEM CALIBRATION RESPONSE (% CO2)	SYSTEM CALIBRATION BIAS (% of span)	
RUN 1						
Zero Gas	0.05	0.06	0.1	0.10	0.5	0.4
Upscale Gas	5.59	5.63	0.4	5.63	0.4	0.0
RUN 2						
Zero Gas	0.05	0.05	0.0	0.06	0.1	0.1
Upscale Gas	8.56	8.53	-0.3	8.55	-0.1	0.2
RUN 3						
Zero Gas	0.05	0.07	0.2	0.05	0.0	-0.2
Upscale Gas	8.56	8.53	-0.3	8.52	-0.4	-0.1
RUN 4						
Zero Gas	0.05	0.10	0.5	0.08	0.3	-0.2
Upscale Gas	5.59	5.67	0.8	5.56	-0.3	-1.1

SCOTT-MARRIN, INC.
6531 BOX SPRINGS BLVD. • RIVERSIDE, CA 92507
TELEPHONE (909) 653-6780 • FAX (909) 653-2430

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

BWRAØ1

TO: DATE : 12/11/97

JIM TURCKE
BWR ASSOCIATES INC
92Ø MASON WAY
MEDFORD, OR 975Ø1-

CUSTOMER ORDER NUMBER: 395Ø PAGE 1

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COMPONENT	CONCENTRATION(v/v) +/-EPA UNCERTAINTY	REFERENCE STANDARD	ANALYZER MAKE,MODEL,S/N,DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA
CYLINDER NO.:	CC1Ø5497				
			Varian Model 186Ø		12/1Ø/97
Oxygen	2Ø.43 ±.Ø8 %	GMIS	S/N None	12/1Ø/ØØ	2Ø.41 %
		Cylinder #	Thermal Conductivity		2Ø.44 %
Nitrogen	Balance	CAØ1Ø94	Gas Chromatography		2Ø.45 %
Cylinder Pressure: 2ØØØ psig		@ 23.1Ø %	Last Cal Date: 11/13/97		Mean: 2Ø.43 %

ppm = umole/mole % = mole-%

The above analyses were performed in accordance with Procedure G1 of the EPA Traceability Protocol, Report Number EPA-6ØØ/R93/224, dated September 1993.
This cylinder should not be used if the pressure is less than 15Ø psig.

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 STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS or reanalysis thereof by the company without extra cost.

SCOTT-MARRIN, INC.
6531 BOX SPRINGS BLVD. • RIVERSIDE, CA 92507
TELEPHONE (909) 653-6780 • FAX (909) 653-2430

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

BWRA01

TO: DATE : 05/22/97

JIM TURCKE
BWR ASSOCIATES INC
920 MASON WAY
MEDFORD, OR 97501-1343

CUSTOMER ORDER NUMBER: 8452 PAGE 1

COMPONENT	CONCENTRATION (v/v) +/-EPA UNCERTAINTY	REFERENCE STANDARD	ANALYZER MAKE, MODEL, S/N, DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA	
CYLINDER NO.:	CC12295					
			Carle Insts Model 8000		05/02/97	05/22/97
Carbon monoxide	101.4 ±.1 ppm	GMIS	S/N 8249	05/22/99	101.3 ppm	101.5 ppm
		Cylinder #	Methanation/FID		101.3 ppm	101.4 ppm
		CC40051	Gas Chromatography		101.3 ppm	101.3 ppm
		@ 116.8 ppm	Last Cal Date: 05/01/97	Mean:	101.3 ppm	101.4 ppm
			Monitor Labs Model 8440		04/30/97	05/07/97
Nitric oxide	48.8 ±.1 ppm	GMIS	S/N 683	05/07/99	48.8 ppm	48.6 ppm
		Cylinder #	Continuous		48.8 ppm	48.6 ppm
		CC29042	Chemiluminescence		48.8 ppm	48.8 ppm
		@ 51.3 ppm	Last Cal Date: 04/21/97	Mean:	48.8 ppm	48.7 ppm
			Varian Model 1860		04/28/97	
Propane	29.62 ±.45 ppm	GMIS	S/N None	04/28/99	29.56 ppm	
		Cylinder #	Flame Ionization		29.81 ppm	
		CC121986	Gas Chromatography		29.48 ppm	
		@ 50.6 ppm	Last Cal Date: 04/04/97	Mean:	29.62 ppm	
			Varian Model 1860		04/29/97	
Carbon dioxide	5.58 ± .01 %	GMIS	S/N None	04/29/99	5.57 %	
		Cylinder #	Thermal Conductivity		5.59 %	
Nitrogen, O2-Free Balance		CC86199	Gas Chromatography		5.58 %	
Cylinder Pressure: 2000 psig		@ 7.25 %	Last Cal Date: 03/31/97	Mean:	5.58 %	

ppm = umole/mole % = mole-%

The above analyses were performed in accordance with Procedure G1 of the EPA Traceability Protocol, Report Number EPA-600/R93/224, dated September 1993.

This cylinder should not be used if the pressure is less than 150 psig.

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

116

SCOTT-MARRIN, INC.
6531 BOX SPRINGS BLVD. • RIVERSIDE, CA 92507
TELEPHONE (909) 653-6780 • FAX (909) 653-2430

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

BWRA01

TO: DATE : 06/03/97

JIM TURCKE
BWR ASSOCIATES INC
920 MASON WAY
MEDFORD, OR 97501-1343

CUSTOMER ORDER NUMBER: 7507 PAGE 1

COMPONENT	CONCENTRATION(v/v) +/-EPA UNCERTAINTY	REFERENCE STANDARD	ANALYZER MAKE,MODEL,S/N,DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA	
CYLINDER NO.:	CC56913					
			Carle Insts Model 8000		05/06/97	05/13/97
Carbon monoxide	240.6 $\pm$.8 ppm	GMIS	S/N 8249	05/13/99	241.5 ppm	239.0 ppm
		Cylinder #	Methanation/FID		241.4 ppm	240.2 ppm
		CC7411	Gas Chromatography		241.3 ppm	239.9 ppm
		@ 284.8 ppm	Last Cal Date: 05/01/97	Mean:	241.4 ppm	239.7 ppm
			Monitor Labs Model 8440		05/06/97	05/13/97
Nitric oxide	83.5 $\pm$.2 ppm	GMIS	S/N 136	05/13/99	83.7 ppm	82.5 ppm
		Cylinder #	Continuous		83.8 ppm	83.4 ppm
		CC73111	Chemiluminescence		83.8 ppm	83.6 ppm
		@ 101.3 ppm	Last Cal Date: 05/01/97	Mean:	83.8 ppm	83.2 ppm
			Varian Model 1860		05/16/97	
Propane	51.4 $\pm$.1 ppm	GMIS	S/N None	05/16/99	51.4 ppm	
		Cylinder #	Flame Ionization		51.3 ppm	
		CC51261	Gas Chromatography		51.4 ppm	
		@ 104.0 ppm	Last Cal Date: 05/16/97	Mean:	51.4 ppm	
			Varian Model 1860		05/05/97	
Carbon dioxide	8.54 $\pm$ 0 %	GMIS	S/N None	05/05/99	8.55 %	
		Cylinder #	Thermal Conductivity		8.52 %	
Nitrogen,O2-Free Balance		CC86199	Gas Chromatography		8.54 %	
Cylinder Pressure: 2000 psig		@ 7.25 %	Last Cal Date: 04/09/97	Mean:	8.54 %	

ppm = umole/mole % = mole-%

The above analyses were performed in accordance with Procedure G1 of the EPA Traceability Protocol, Report Number EPA-600/R93/224, dated September 1993.

This cylinder should not be used if the pressure is less than 150 psig.

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

117

SCOTT-MARRIN, INC.
6531 BOX SPRINGS BLVD. • RIVERSIDE, CA 92507
TELEPHONE (909) 653-6780 • FAX (909) 653-2430

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

BWRA01

TO:

DATE : 10/29/97

JIM TURCKE
BWR ASSOCIATES INC
920 MASON WAY
MEDFORD, OR 97501-1343

CUSTOMER ORDER NUMBER: 3922

PAGE 1

COMPONENT	CONCENTRATION (v/v) +/-EPA UNCERTAINTY	REFERENCE STANDARD	ANALYZER MAKE,MODEL,S/N,DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA	
CYLINDER NO.:	CC74100					
			Carle Insts Model 8000		10/22/97	10/29/97
Carbon monoxide	639 ±2 ppm	GMIS	S/N 8249	10/29/99	639 ppm	637 ppm
		Cylinder #	Methanation/FID		639 ppm	639 ppm
		CC7496	Gas Chromatography		640 ppm	639 ppm
		@ 529 ppm	Last Cal Date: 10/03/97	Mean:	639 ppm	638 ppm
			Bovar West Res Model 922		10/21/97	10/29/97
Nitric oxide	119.3 ±.2 ppm	GMIS	S/N VD92284841	10/29/99	118.1 ppm	119.0 ppm
		Cylinder #	Continuous		119.0 ppm	120.0 ppm
		CC117928	UV Photometry		119.2 ppm	120.2 ppm
		@ 101.6 ppm	Last Cal Date: 10/29/97	Mean:	118.8 ppm	119.7 ppm
			Varian Model 1860		10/20/97	
Propane	88.0 ±.3 ppm	GMIS	S/N None	10/20/99	88.0 ppm	
		Cylinder #	Flame Ionization		87.8 ppm	
		CC51261	Gas Chromatography		88.2 ppm	
		@ 104.0 ppm	Last Cal Date: 10/20/97	Mean:	88.0 ppm	
			Varian Model 1860		10/28/97	
Carbon dioxide	15.38 ±.01 %	GMIS	S/N None	10/28/99	15.34 %	
		Cylinder #	Thermal Conductivity		15.38 %	
Nitrogen,O2-Free Balance		CC122859	Gas Chromatography		15.41 %	
Cylinder Pressure: 2000 psig		@ 17.90 %	Last Cal Date: 10/22/97	Mean:	15.38 %	

ppm = umole/mole % = mole-%

The above analyses were performed in accordance with Procedure G1 of the EPA Traceability Protocol, Report Number EPA-600/R93/224, dated September 1993.

This cylinder should not be used if the pressure is less than 150 psig.

Analyst: M.S. Calhoun

Approved: J.T. Marrin

The only liability of this company for any claim, failure to comply with this analysis, shall be replacement or reanalysis thereof by the company without extra cost.

STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

118

SCOTT-MARRIN, INC.
6531 BOX SPRINGS BLVD. • RIVERSIDE, CA 92507
TELEPHONE (909) 653-6780 • FAX (909) 653-2430

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

BWRA01

TO:

JIM TURCKE
BWR ASSOCIATES INC
920 MASON WAY
MEDFORD, OR 97501-1343

DATE : 10/29/97

CUSTOMER ORDER NUMBER: 3922

PAGE 1

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COMPONENT	CONCENTRATION(v/v) +/-EPA UNCERTAINTY	REFERENCE STANDARD	ANALYZER MAKE,MODEL,S/N,DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA
CYLINDER NO.:	CC449				
			Varian Model 1860		10/29/97
Oxygen	12.01 ±.03 %	GMIS	S/N None	10/29/00	12.03 %
		Cylinder #	Thermal Conductivity		11.97 %
Nitrogen	Balance	CC122669	Gas Chromatography		12.02 %
Cylinder Pressure: 2000 psig		@ 10.04 %	Last Cal Date: 10/10/97		Mean: 12.01 %

ppm = umole/mole   % = mole-%

The above analyses were performed in accordance with Procedure G1 of the EPA Traceability Protocol, Report Number EPA-600/R93/224, dated September 1993.

This cylinder should not be used if the pressure is less than 150 psig.

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

NOX INSTRUMENT CONVERTER EFFICIENCY CHECK

Instrument: Beckman model 951A
Serial Number: 101287
Date of Check: 12-16-92
Performed by: DJ

	Initial Peak Value time=0	Final Peak Value time= 30min	delta %	Conversion Efficiency %
Run 1	39.3	38.7	1.5	98.5
Run 2	39.9	39.4	1.3	98.7
Run 3	43.4	43.6	0.5	99.5

Average Conversion Efficiency 98.9 %

Minimum Allowable Conversion Efficiency: 90.0 %

600 South Harbor Boulevard
La Habra, California 90631

NO/NOX INTERFERENCES

Interference:

Interference from various components were tested by Turner and Neti (1973)[6] and also recently by Khong (1991)[3]. Summary of the results are shown on table below:

Interferent	concentration	NOx equivalent (by Khong)
Sulfur dioxide	200 ppm	0.2 ppm
Carbon monoxide	500 ppm	0 ppm
Carbon dioxide	10%	0 ppm
Oxygen	21%	0 ppm
Interferent	**concentration**	**NOx equivalent (by Turner & Neti)**
Ammonia	1000 ppm	< 22 ppm
Oxygen	21%	< 2 ppm
Carbon Dioxide	16%	< 2 ppm
Carbon monoxide	50%	< 2 ppm
Ethylene	1000 ppm	< 2 ppm
Propylene	1000 ppm	< 2 ppm
Butadiene	1000 ppm	< 2 ppm
Acetylene	1000 ppm	< 2 ppm
Hydrogen	1000 ppm	< 2 ppm
Water	15%	negligible
Benzene	3000 ppm	< 2 ppm
N_2O	100%	No response

3) Khong, L., "*Interference Response Test*", a memo to Houben, W. on 7/30/1991.

6) Turner, G. and Neti, M., "*Atmospheric Pressure-Operated NO-O3 Chemiluminescence Analyzer for Auto Exhaust Applications*". ISA 1973.

7.1. SUB-APPENDIX I: PARTICULATE SAMPLING ANALYSIS

7.1.1. Sampling Calculations
- 7.1.1.1. Nomenclature, See 6.1.1.1.
- 7.1.1.2. Sample Hand Calculation, See 6.1.1.2.
- 7.1.1.3. Computer Calculations
  - 7.1.1.3.1. Runs 1-2 (heart)
  - 7.1.1.3.2. Runs 3-4 (sap)

7.1.2. Field Data
- 7.1.2.1. Run 1 (heart)
- 7.1.2.2. Run 2 (heart)
- 7.1.2.3. Run 3 (sap)
- 7.1.2.4. Run 4 (sap)

7.1.3. Laboratory Analysis
- 7.1.3.1. Weight Distribution
- 7.1.3.2. Intermediate Weights
- 7.1.3.3. Blank Calculations

7.1.4. Sample and Traverse Point Determination Sheet

7.1.5. Sample Train Schematic, See 6.1.5.

7.1.6. Calibration and Quality Assurance Data
- 7.1.6.1. Pitot Tube #6 Calibration, See 6.1.6.1.
- 7.1.6.2. Stack Thermometer G Calibration
- 7.1.6.3. Nozzle P Calibration
- 7.1.6.4. Sample Train LS-2 Thermometers, See 6.1.6.4.
  - 7.1.6.4.1. Filter Oven
  - 7.1.6.4.2. Impinger Exit
- 7.1.6.5. Control Unit #2 Thermometers, See 6.1.6.5.
  - 7.1.6.5.1. Meter In
  - 7.1.6.5.2. Meter Out
- 7.1.6.6. Control Unit #2 Calibrations
  - 7.1.6.6.1. Full Range, See 6.1.6.6.1.
  - 7.1.6.6.2. Post Test

CALCULATION SHEET FOR ODEQ METHODS 1-4, 7
DRYER #2 - HEART

SYMBOL DEFINITIONS - UNITS		RUN 1	RUN 2	AVG
Vm Sample Volume-dcf		45.784	47.753	
Y Gas Meter Factor		0.99	0.99	
Pb Barometric Pressure-"Hg		29.00	29.00	
dH Average Orifice Differential-"H2O		1.634	1.765	
Tmi Average Inlet Meter Temp.-F		77.0	97.4	
Tmo Average Outlet Meter Temp-F		65.0	87.8	
Vm(std) Standard Sample Volume	-dscf	43.85	43.96	
	-dscm	1.24	1.24	
Vlc Net Volume Condensate-ml		66.4	63.0	
Vw(std) Standard Net Volume Condensate-scf		3.13	2.97	
Bws Fraction Of H2O Vapor-vol.		6.7 0.067	6.3 0.063	0.065
%CO2 Percent CO2 By Vol. (dry)		0.65	0.64	0.65
%O2 Percent O2 By Vol. (dry)		19.98	19.71	19.84
%N2 Percent Nitrogen By Vol. (dry)		79.37	79.65	
Md Dry Molecular Weight-g/g. mole		28.90	28.89	
Ms Wet Molecular Weight (wet)-g/g. mole		28.18	28.20	
Cp Pitot Tube Coefficient		0.844	0.846	
dP Average SQRT Of Velocity Head-"H2O		1.542	1.583	
Ts Average Exhaust Temp-F		240.1	249.2	244.7
Ps Absolute Exhaust Pressure-"Hg		28.89	28.89	
Vs Average Exhaust Gas Velocity	-fps	103	107	105
	-fpm	6191	6409	6300
A Cross Sectional Area of Exhaust-sq. ft.		6.874	6.874	
Qs Exhaust Gas Flow Rate-acf/min		42553	44054	43303
	-acm/min	1205	1248	1226
Qs(std) Standard Gas Flow Rate	-scf/min	30987	31669	31328
	-dscf/min	28925	29668	29297
	-dscm/min	819	840	830
Mn Weight Of Collected Particulate-mg		53.2	61.7	
Cs Particulate Concentration	-gr/dscf	0.019	0.022	0.020
	-g/dscm	0.043	0.050	0.046
Ct Particulate Emission Rate	-lbs/hr	4.6	5.5	5.1
	-kg/hr	2.1	2.5	2.3
Pr Production Rate	-sq. ft/hr (3/8")	15370	13437	14404
Ef Particulate Emission Factor	-lbs/MSF (3/8")	0.30	0.41	0.36
Dn Average Nozzle Diam.-inches		0.1783	0.1783	
dt Total Sampling Time-min.		60.0	60.0	
%I Percent Of Isokinetic Sampling		100	98	99

PLANT: WILLAMETTE INDUSTRIES SPRINGFIELD, OR
JOB: 98-092D
SOURCE: VENEER DRYER #2 CONDITION: HEART
DATE: 6/1/98

CALCULATION SHEET FOR ODEQ METHODS 1-4, 7
DRYER #2 - SAP

SYMBOL DEFINITIONS - UNITS		RUN 3	RUN 4	AVG
Vm Sample Volume-dcf		46.119	45.813	
Y Gas Meter Factor		0.99	0.99	
Pb Barometric Pressure-"Hg		29.00	29.00	
dH Average Orifice Differential-"H2O		1.589	1.591	
Tmi Average Inlet Meter Temp.-F		106.2	99.1	
Tmo Average Outlet Meter Temp-F		98.6	91.8	
Vm(std) Standard Sample Volume	-dscf	41.70	41.94	
	-dscm	1.18	1.19	
Vlc Net Volume Condensate-ml		93.1	94.6	
Vw(std) Standard Net Volume Condensate-scf		4.38	4.45	
Bws Fraction Of H2O Vapor-vol.		0.095	0.096	0.096
%CO2 Percent CO2 By Vol. (dry)		0.80	0.71	0.76
%O2 Percent O2 By Vol. (dry)		19.25	19.73	19.49
%N2 Percent Nitrogen By Vol. (dry)		79.94	79.56	
Md Dry Molecular Weight-g/g. mole		28.90	28.90	
Ms Wet Molecular Weight (wet)-g/g. mole		27.86	27.86	
Cp Pitot Tube Coefficient		0.843	0.843	
dP Average SQRT Of Velocity Head-"H2O		1.528	1.528	
Ts Average Exhaust Temp-F		258.2	247.0	252.6
Ps Absolute Exhaust Pressure-"Hg		28.89	28.89	
Vs Average Exhaust Gas Velocity	-fps	104	103	104
	-fpm	6243	6195	6219
A Cross Sectional Area of Exhaust-sq. ft.		6.874	6.874	
Qs Exhaust Gas Flow Rate-acf/min		42914	42582	42748
	-acm/min	1215	1206	1211
Qs(std) Standard Gas Flow Rate	-scf/min	30463	30706	30584
	-dscf/min	27566	27759	27662
	-dscm/min	781	786	783
Mn Weight Of Collected Particulate-mg		34.8	44.1	
Cs Particulate Concentration	-gr/dscf	0.013	0.016	0.015
	-g/dscm	0.029	0.037	0.033
Ct Particulate Emission Rate	-lbs/hr	3.0	3.9	3.4
	-kg/hr	1.4	1.8	1.6
Pr Production Rate	-sq. ft/hr (3/8")	7063	7565	7314
Ef Particulate Emission Factor	-lbs/MSF (3/8")	0.43	0.51	0.47
Dn Average Nozzle Diam.-inches		0.1783	0.1783	
dt Total Sampling Time-min.		60.0	60.0	
%I Percent Of Isokinetic Sampling		100	100	100

PLANT: WILLAMETTE INDUSTRIES SPRINGFIELD, OR
JOB: 98-092D
SOURCE: VENEER DRYER #2 CONDITION: SAP
DATE: 6/1/98

FIELD DATA SHEET

DATE: 6-1-98

JOB #: 98-092D
PLANT: WILL SPFLD
LOCATION: SPFLD OR
SOURCE: V.D #2
DUCT DIMENSION(S): Ø = 35.5"
RUN #: 1- Heart
START: 733
FINISH: 834
dH FACTOR:

C.U. #: 2
dHa: 1.65
Y: 0.98

PROBE #: 6
Cp: 0.99 1.7612

NOZZLE #: P
DIAMETER: 0.1783

THERMOMETER #: G

D.B. ____ W.B. 117

BAROMETRIC PRESSURE: 29.00
STATIC PRESSURE: -1.5
EXHAUST PRESSURE: 28.89
ESTIMATED MOISTURE: 8%

LEAK CHECK
SYSTEM INITIAL: 0.01 cfm @ 5 "Hg
FINAL: 0.01 cfm @ 5 "Hg
PITOT INITIAL: ✓
FINAL: ✓

CONTROL UNIT OPERATOR: MWB / JJT

POINT NO.	TIME MIN.	METER VOL. (cu. ft.)	dP "H20	dH "H20	TEMPERATURE (F) METER IN	OUT	STACK	BOX	IMP	VAC "Hg	O2 (%)	CO2 (%)	
Start	0	367.801	****	***	**	**	***	**	***	***	***	***	***
1	2.5	69.7	2.40	1.60	62	56	241	250	60	1			
2	5.0	71.7	2.35	1.55	65	58	242	250	56	1			
3	7.5	73.4	2.30	1.50	66	58	239	250	57	1			
4	10.0	75.1	2.00	1.35	68	59	239	260	55	1			
5	12.5	76.9	2.00	1.35	69	60	238	265	54	1			
6	15.0	78.5	1.90	1.30	70	61	238	270	55	1			
7	17.5	80.5	2.70	1.90	72	62	238	270	54	1			
8	20.0	82.6	3.00	2.04	75	62	237	270	54	1			
9	22.5	84.8	3.0	2.04	77	63	237	270	54	1			
10	25.0	86.9	3.0	2.04	79	64	235	270	55	1			
11	27.5	89.1	2.9	2.00	81	65	235	275	55	1			
12	30.0	91.042	2.7	1.86	81	66	230	270	57	1			
13	32.5	—	2.3	1.59	80	66	239	270	57	1			
14	35.0	94.9	2.35	1.62	81	67	243	270	58	1			
15	37.5	96.7	2.2	1.52	81	68	243	270	58	1			
16	40.0	98.5	2.15	1.48	81	68	244	270	58	1			
17	42.5	400.4	2.1	1.45	81	68	243	270	58	1			
18	45.0	2.2	2.1	1.45	81	67	246	270	57	1			
19	47.5	4.0	2.2	1.52	81	69	248	270	57	1			
20	50.0	6.0	2.3	1.59	82	69	247	270	56	1			
21	52.5	7.9	2.4	1.66	83	70	245	275	57	1			
22	55.0	9.8	2.5	1.72	84	70	243	270	57	1			
23	57.5	10.8	2.35	1.63	84	70	240	270	58	1			
24	60.0	413.585	2.1	1.45	85	71	232	270	58	1			
25													

AVERAGE OF PARAMETERS: √dP: 1.542 1.634 77.0 65.0 240.1
Vm, dcf: 45.784 ✓

IMPINGER CONDENSATE:
IMPINGER #1: 144 ml
IMPINGER #2: 111 ml
IMPINGER #3: 0 ml
TOTAL VOL.: 255 ml ✓
NET VOL. (TOTAL - 200): 55 ml ✓
SILICA GEL: 272.3
GROSS: ____ g.
TARE: 260.9 g. 11.4 ✓
NET: ____ g.
TOTAL CONDENSATE (Vlc): 66.4 ml ✓

B: 1600
white

SAMPLE IDENTIFICATION AND DESCRIPTION
FILTER ID#: 2900 FILTER APPEARANCE: white / wood fibers
IMPINGER CATCH APPEARANCE: Slightly cloudy
BACK HALF CONTENTS/H20 WASH ID #: WIS 201A/B
BACK HALF ACETONE WASH ID #: WIS 202
FRONT HALF ACETONE WASH ID #: WIS 203
CUTTER NOZZLE ACETONE WASH ID #: —

WATER #: 497 VOL. 200 ml CHARGE
200 ml BACK
ACETONE #: 775 VOL. 200 ml FRONT
200 ml BACK

SAMPLES RECOVERED BY: JJT / JAT
LAB DATE: 06/01/98 BY: DV

Revised March, 1991

FIELD DATA SHEET

DATE: 6-1-98

JOB #: 98-092D
PLANT: Willamette Ind.
LOCATION: Springfield, OR
SOURCE: Veneer Dryer #2
DUCT DIMENSION(S): Ø = 35.5"
RUN #: 2-Ø
START: 958
FINISH: 1100
dH FACTOR:

C.U. #: 2
dHa: 1.65
Y:

THERMOMETER #: G

D.B. ____ W.B. ____

PROBE #: 6
Cp:

NOZZLE #: P
DIAMETER: 0.1783

BAROMETRIC PRESSURE: 29.00
STATIC PRESSURE: -1.5
EXHAUST PRESSURE: 28.89
ESTIMATED MOISTURE:

LEAK CHECK
SYSTEM INITIAL: 0.00 cfm @ 5 "Hg
FINAL: 0.00 cfm @ 3 "Hg
PITOT INITIAL: ✓
FINAL: ✓

CONTROL UNIT OPERATOR: JJT

POINT NO.	TIME MIN.	METER VOL. (cu. ft.)	dP "H2O	dH "H2O	TEMPERATURE (F) METER IN	OUT	STACK	BOX	IMP	VAC "Hg	O2 (%)	CO2 (%)	
Start		413.649	****	***	**	**	***	**	***	***	***	***	***
1	2.5	415.6	2.4	1.66	78	76	247	270	66	1			
2	5	417.4	2.3	1.59	80	76	250	270	65	1			
3	7.5	419.2	2.15	1.49	82	76	250	270	65	1			
4	10	421.0	2.0	1.39	83	76	250	270	63	1			
5	12.5	422.8	1.9	1.32	85	77	251	270	61	1			
6	15	424.5	1.9	1.32	86	78	251	270	59	1			
7	17.5	426.5	2.7	1.87	88	79	250	270	60	1			
8	20	428.8	3.2	2.20	91	80	250	270	60	1			
9	22.5	431.0	3.3	2.28	94	82	250	270	61	1			
10	25	433.3	3.3	2.28	96	83	249	270	61	1			
11	27.5	435.5	3.2	2.21	98	84	245	270	62	1			
12	30	437.679	3.0	2.07	100	86	235	270	63	1			
13	32.5	439.7	2.4	1.66	100	90	244	270	65	1			
14	35	441.6	2.5	1.75	101	91	245	270	65	1			
15	37.5	443.5	2.4	1.68	103	92	243	270	64	1			
16	40	445.5	2.3	1.61	105	94	243	270	62	1			
17	42.5	447.3	2.2	1.56	105	95	245	270	62	1			
18	45	449.2	2.1	1.49	106	96	247	270	63	1			
19	47.5	451.2	2.4	1.70	107	97	251	270	63	1			
20	50	453.1	2.5	1.79	108	98	255	270	62	1			
21	52.5	455.3	2.7	1.93	110	99	257	270	63	1			
22	55	457.4	2.8	2.00	110	100	260	270	64	1			
23	57.5	459.4	2.5	1.80	111	101	257	270	64	1			
24	60	461.402	2.4	1.72	111	101	257	270	64	1			
25													

AVERAGE OF PARAMETERS: √dP: 1.583 ✓ 1.765 ✓ 97.4 ✓ 87.8 ✓ 249.2 ✓
Vm, dcf: 47.753 ✓

IMPINGER CONDENSATE:
IMPINGER #1: 142 ml
IMPINGER #2: 111 ml
IMPINGER #3: 1 ml
TOTAL VOL.: 254 ml ✓
NET VOL. (TOTAL - 200): 54 ml ✓

B: 1601
white

SILICA GEL: 251.1
GROSS: ____ g.
TARE: 242.1 g. 9.0 ✓
NET: ____ g.
TOTAL CONDENSATE (VIc): 63.0 ml ✓

P
0.177
0.178
0.180
0.1783

SAMPLE IDENTIFICATION AND DESCRIPTION
FILTER ID#: 2901 FILTER APPEARANCE: White/Wood Flakes
IMPINGER CATCH APPEARANCE: Slightly Cloudy
BACK HALF CONTENTS/H2O WASH ID #: WIS204A/B
BACK HALF ACETONE WASH ID #: WIS205
FRONT HALF ACETONE WASH ID #: WIS206
CUTTER NOZZLE ACETONE WASH ID #: ——

WATER #: 497 VOL. 200 ml CHARGE
200 ml BACK
ACETONE #: 775 VOL. 200 ml FRONT
200 ml BACK

SAMPLES RECOVERED BY: JJT/JAT
LAB DATE: 06/01/98 BY: DV

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Reviewed March, 1991

FIELD DATA SHEET

DATE: 6-1-98

JOB #: 98-092D
PLANT: Willamette Ind.
LOCATION: Springfield, OR
SOURCE: Veneer Dryer #2
DUCT DIMENSION(S): Ø=35.5"
RUN #: 3-Sap
START: 1238
FINISH: 1339
dH FACTOR:

C.U. #: 2
dHa: 1.60
Y:

THERMOMETER #: G

D.B. 250 W.B. 126

PROBE #: 6
Cp:

NOZZLE #: P
DIAMETER: 0.1783

BAROMETRIC PRESSURE: 29.00
STATIC PRESSURE: -1.5
EXHAUST PRESSURE: 28.89
ESTIMATED MOISTURE: 10

LEAK CHECK
SYSTEM INITIAL: 0.01 cfm @ 5 "Hg
FINAL: 0.00 cfm @ 3 "Hg
PITOT INITIAL: ✓
FINAL: ✓

CONTROL UNIT OPERATOR: JJR

POINT NO.	TIME MIN.	METER VOL. (cu. ft.)	dP "H20	dH "H20	TEMPERATURE (F) METER IN	OUT	STACK	BOX	IMP	VAC "Hg	O2 (%)	CO2 (%)	
Start		461.500	****	***	**	**	***	**	***	***	***	***	***
1	2.5	463.4	2.3	1.56	92	91	262	270	65	1			
2	5	465.2	2.3	1.56	93	92	264	270	66	1			
3	7.5	467.1	2.2	1.49	96	92	268	270	67	1			
4	10	468.9	2.0	1.36	98	94	268	270	67	1			
5	12.5	470.7	2.0	1.36	99	94	267	270	68	1			
6	15	472.5	1.8	1.22	101	95	267	270	65	1			
7	17.5	474.4	2.5	1.70	103	96	267	270	64	1			
8	20	476.6	2.9	1.94	105	95	267	270	62	1			
9	22.5	478.6	3.0	2.00	107	98	267	270	62	1			
10	25	480.8	3.1	2.07	109	99	262	270	61	1			
11	27.5	483.0	3.1	2.07	110	100	260	270	62	1			
12	30	485.158	3.1	2.07	111	100	260	270	62	1			
13	32.5	487.0	2.2	1.48	109	100	252	270	63	1			
14	35	488.9	2.2	1.48	108	100	252	270	63	1			
15	37.5	490.7	2.1	1.42	108	100	251	270	64	1			
16	40	492.7	2.0	1.35	108	100	260	270	65	1			
17	42.5	494.3	2.0	1.35	108	100	250	270	66	1			
18	45	496.0	1.9	1.30	109	101	251	270	67	1			
19	47.5	497.9	2.1	1.43	110	102	251	270	65	1			
20	50	499.9	2.5	1.71	111	102	251	270	64	1			
21	52.5	501.9	2.4	1.64	112	103	253	270	65	1			
22	55	503.8	2.3	1.57	114	104	253	270	66	1			
23	57.5	505.7	2.2	1.50	114	104	253	270	66	1			
24	60	507.619	2.2	1.50	114	104	251	270	66	1			
25													

AVERAGE OF PARAMETERS: √dP: 1.528 ✓ 1.589 ✓ 106.2 ✓ 93.6 ✓ 258.2 ✓
Vm, dcf: 46.119

IMPINGER CONDENSATE:
IMPINGER #1: 172 ml
IMPINGER #2: 111 ml
IMPINGER #3: 0 ml
TOTAL VOL.: 283 ml ✓
NET VOL. (TOTAL - 200): 83 ml ✓
SILICA GEL: 259.8
GROSS: g.
TARE: 249.7 g. 10.1 ✓
NET: g.
TOTAL CONDENSATE (Vlc): 93.1 ml ✓

SAMPLE IDENTIFICATION AND DESCRIPTION
FILTER ID#: 2902/1 FILTER APPEARANCE: white-n-woody/wi
IMPINGER CATCH APPEARANCE: clear
BACK HALF CONTENTS/H20 WASH ID #: WIS 207A/B
BACK HALF ACETONE WASH ID #: WIS 208
FRONT HALF ACETONE WASH ID #: WIS 209
CUTTER NOZZLE ACETONE WASH ID #:

B 1502

WATER #: 479 VOL. 200 ml CHARGE
200 ml BACK
ACETONE #: 775 VOL. 200 ml FRONT
200 ml BACK

SAMPLES RECOVERED BY: JJR
LAB DATE: 06/01/98 BY: JN

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Revised March, 1991

FIELD DATA SHEET

DATE: 6-1-98

JOB #: 98-092D
PLANT: Willamette Ind.
LOCATION: Springfield, OR
SOURCE: Veneer Dryer #2
DUCT DIMENSION(S): Ø = 35.5"
RUN #: 4-SAP
START: 1459
FINISH: 1600
dH FACTOR:

C.U. #: 2
dHa: 1.65
Y:

PROBE #: 6
Cp:

NOZZLE #: P
DIAMETER: 0.1783

THERMOMETER #: G

BAROMETRIC PRESSURE: 29.00
STATIC PRESSURE: -1.5
EXHAUST PRESSURE: 28.09
ESTIMATED MOISTURE:

D.B. ____ W.B. ____

LEAK CHECK
SYSTEM INITIAL: 0.01 cfm @ 5 "Hg
FINAL: 0.00 cfm @ 3 "Hg
PITOT INITIAL: ✓
FINAL: ✓

CONTROL UNIT OPERATOR: JJT

POINT NO.	TIME MIN.	METER VOL. (cu. ft.)	dP "H20	dH "H20	TEMPERATURE (F) METER IN	OUT	STACK	BOX	IMP	VAC "Hg	O2 (%)	CO2 (%)	
Start		507.704	****	***	**	**	***	**	***	***	***	***	***
1	2.5	509.6	2.3	1.57	90	90	256	250	61	1			
2	5	511.5	2.2	1.50	91	90	256	260	59	1			
3	7.5	513.3	2.15	1.45	93	90	255	270	60	1			
4	10	515.0	2.0	1.35	94	90	252	270	60	1			
5	12.5	516.8	2.0	1.35	95	90	251	270	61	1			
6	15	518.5	1.8	1.21	96	91	249	270	62	1			
7	17.5	520.5	2.5	1.68	98	91	247	255	63	1			
8	20	522.6	2.9	1.97	99	91	246	260	63	1			
9	22.5	524.8	3.2	2.17	100	92	244	260	62	1			
10	25	527.0	3.0	2.03	102	92	243	260	63	1			
11	27.5	529.1	3.0	2.03	103	93	241	260	63	1			
12	30	531.195	3.0	2.03	104	93	240	260	63	1			
13	32.5	533.0	2.2	1.50	101	93	239	260	64	1			
14	35	535.0	2.2	1.50	100	93	240	260	64	1			
15	37.5	536.8	2.1	1.42	100	92	242	260	65	1			
16	40	538.5	2.1	1.42	101	92	242	260	66	1			
17	42.5	540.3	1.9	1.29	100	92	244	260	67	1			
18	45	542.0	2.0	1.35	100	92	245	260	66	1			
19	47.5	544.0	2.2	1.50	100	92	247	260	65	1			
20	50	545.9	2.3	1.56	101	92	247	260	64	1			
21	52.5	547.8	2.3	1.56	101	92	248	260	65	1			
22	55	549.8	2.5	1.69	102	93	250	260	65	1			
23	57.5	551.6	2.2	1.50	103	93	251	260	66	1			
24	60	553.517	2.3	1.56	104	93	254	260	66	1			
25													

AVERAGE OF PARAMETERS: √dP: 1.528 1.591 99.1 91.8 247.0
Vm, dcf: 45.813 ✓

IMPINGER CONDENSATE:
IMPINGER #1: 176 ml
IMPINGER #2: 111 ml
IMPINGER #3: 0 ml
TOTAL VOL.: 287 ml ✓
NET VOL. (TOTAL - 200): 87 ml ✓
SILICA GEL: GROSS: 256.7 g.
TARE: 249.1 g.
NET: 7.6 g. ✓
TOTAL CONDENSATE (VIc): 94.6 ml ✓

B: 1603
white

SAMPLE IDENTIFICATION AND DESCRIPTION
FILTER ID#: 2903 FILTER APPEARANCE: white/wood flake
IMPINGER CATCH APPEARANCE: clear
BACK HALF CONTENTS/H20 WASH ID #: WIS 110A/B
BACK HALF ACETONE WASH ID #: WIS 111
FRONT HALF ACETONE WASH ID #: WIS 112
CUTTER NOZZLE ACETONE WASH ID #: —

WATER #: 497 VOL. 200 ml CHARGE
200 ml BACK
ACETONE #: 775 VOL. 200 ml FRONT
200 ml BACK

SAMPLES RECOVERED BY: JJT / JAT
LAB DATE: 06/02/98 BY: DV

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Revised March, 1991

ODEQ METHOD 7 LABORATORY ANALYSIS SHEET

PROJECT#:	98-092D	SAMPLE DATE:	06/01/98
PLANT:	WILLAMETTE INDUSTRIES	REC'D DATE:	06/03/98
LOCATION:	SPRINGFIELD, OR	REPORT DATE:	06/10/98
SOURCE:	VENEER DRYER #2	ANALYST:	DV

TEMP: 65F
HUMIDITY: 45%

	RUN 1	RUN 2	RUN 3	RUN 4	BLANK
FILTER NUMBER:	2900	2901	2902	2903	2908
FILTER GROSS, g	2.8102	2.7995	2.8454	2.8305	2.8272
FILTER TARE, g	2.8048	2.7883	2.8400	2.8175	2.8272
FILTER NET, g	0.0054	0.0112	0.0054	0.0130	0.0000
FRONT WASH CONTAINER NO:	WIS 203	WIS 206	WIS 209	WIS 212	
BEAKER NUMBER:	102	247	237	224	
BEAKER GROSS, g	105.3938	109.1975	102.2664	107.5220	
BEAKER TARE, g	105.3815	109.1839	102.2555	107.5077	
BLANK NET, g	0.0000	0.0000	0.0000	0.0000	
FRONT WASH NET, g	0.0123	0.0136	0.0109	0.0143	
BACK WASH CONTAINER NO:	WIS 202	WIS 205	WIS 208	WIS 211	
BEAKER NUMBER:	231	083	089	025	
BEAKER GROSS, g	107.3445	105.9970	104.9107	103.0798	
BEAKER TARE, g	107.3291	105.9806	104.9018	103.0715	
BLANK NET, g	0.0000	0.0000	0.0000	0.0000	
BACK WASH NET, g	0.0154	0.0164	0.0089	0.0083	
WATER RESIDUAL BOTTLE NO.:	WIS 201A/B	WIS 204A/B	WIS 207A/B	WIS 210A/B	
ORGANIC EXTRACT					
BEAKER NUMBERS:	004	257	045	038	
BEAKER GROSS, g	106.0924	104.0896	95.9324	105.1535	
BEAKER TARE, g	106.0806	104.0790	95.9268	105.1483	
BLANK NET, g	0.0000	0.0000	0.0000	0.0000	
ORG. EXT. NET, g	0.0118	0.0106	0.0056	0.0052	
INORGANIC EXTRACT RESIDUE					
BEAKER NUMBER:	073	049	011	202	
BEAKER GROSS, g	98.5935	99.6606	107.1022	108.0887	
BEAKER TARE, g	98.5880	99.6559	107.0982	108.0857	
BLANK NET, g	0.0008	0.0008	0.0008	0.0008	
INORG.EXT.RES.NET, g	0.0047	0.0039	0.0032	0.0022	
BACK FILTER NUMBER:	1600	1601	1602	1603	1608
FILTER GROSS, g	2.5183	2.5156	2.5230	2.5103	2.5019
FILTER TARE, g	2.5147	2.5096	2.5222	2.5092	2.5019
FILTER NET, g	0.0036	0.0060	0.0008	0.0011	0.0000
TOTAL FRONT HALF NET, g	0.0177	0.0248	0.0163	0.0273	
, mg	17.7000	24.8000	16.3000	27.3000	
TOTAL BACK HALF, NET, g	0.0355	0.0369	0.0185	0.0168	
, mg	35.4700	36.8700	18.4700	16.7700	
TOTAL FRONT AND BACK, NET, g	0.0532	0.0617	0.0348	0.0441	
TOTAL FRONT AND BACK NET, mg	53.1700	61.6700	34.7700	44.0700	

INTERMEDITATE BEAKER/FILTER WEIGHT HISTORY

TEMP	65F	63F		65F									
HUMIDITY	45%	45%		45%									
DATE	06/09/98	06/10/98		06/10/98									
TIME	1525	0955		1700									
			DIFFERENCE		DIFFERENCE		DIFFERENCE		DIFFERENCE		DIFFERENCE		DIFFERENCE
BEAKER #	WEIGHT 1	WEIGHT 2	WT2-WT1	WEIGHT 3	WT3-WT2	WEIGHT 4	WT4-WT3	WEIGHT 5	WT5-WT4	WEIGHT 6	WT6-WT5	WEIGHT 7	WT7-WT6
102	105.3940	105.3938	* -0.0002										
247	109.1975	109.1975											
237	102.2664	102.2665	* 0.0001										
224	107.5220	107.5220											
231	107.3445	107.3445											
083	105.9972	105.9970	* -0.0002										
089	104.9130	104.9111	-0.0019	104.9107	* -0.0004								
025	103.0798	103.0799	* 0.0001										
004	106.0924	106.0924											
257	104.0896	104.0899	* 0.0003										
045	95.9324	95.9325	* 0.0001										
038	105.1535	105.1535											
073	98.5935	98.5938	* 0.0003										
049	99.6606	99.6606											
011	107.1022	107.1025	* 0.0003										
202	108.0887	108.0887											
			DIFFERENCE		DIFFERENCE		DIFFERENCE		DIFFERENCE		DIFFERENCE		DIFFERENCE
FILTER #	WEIGHT 1	WEIGHT 2	WT2-WT1	WEIGHT 3	WT3-WT2	WEIGHT 4	WT4-WT3	WEIGHT 5	WT5-WT4	WEIGHT 6	WT6-WT5	WEIGHT 7	WT7-WT6
2900	2.8102	2.8102											
2901	2.8000	2.7995	* -0.0005										
2902	2.8458	2.8454	* -0.0004										
2903	2.8305	2.8305											
2906	2.8272	2.8272											
1600	2.5186	2.5183	* -0.0003										
1601	2.5156	2.5156											
1602	2.5230	2.5230											
1603	2.5103	2.5103											
1606	2.5019	2.5019											

CLIENT WILLAMETTE INDUSTRIES

JOB # 98-092D

SAMPLE DATE 06/01/98

SOURCE VENEER DRYER #2

130

BLANK CALCULATION SHEET

PROJECT #: 98-092D
COMPANY: WILLAMETTE INDUSTRIES
LOCATION: SPRINGFIELD, OR
SOURCE: VENEER DRYER #2

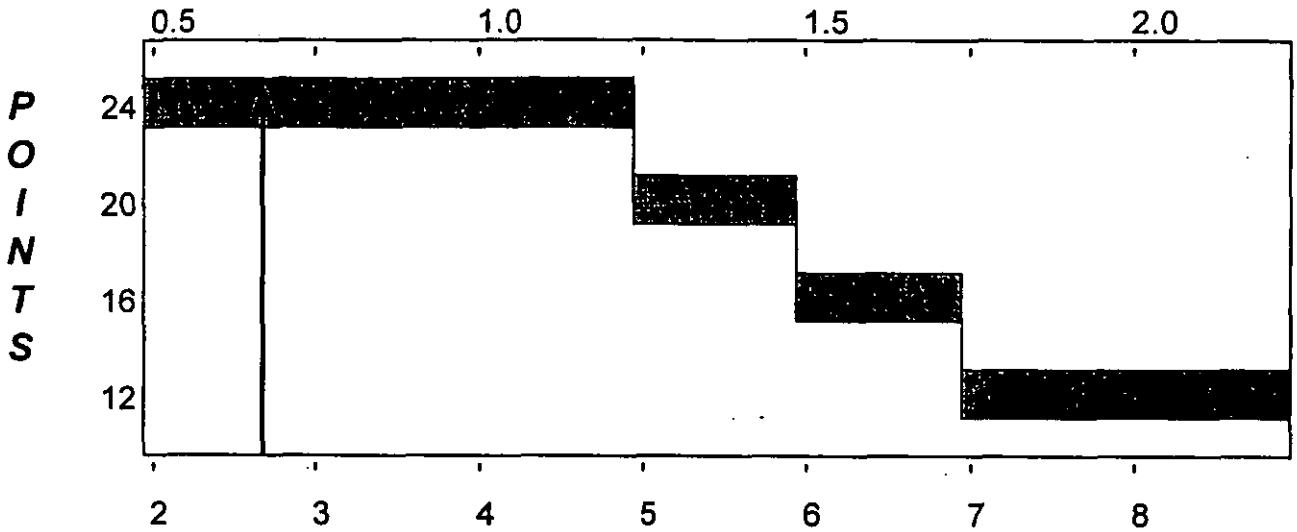
	RUN 1	RUN 2	RUN 3	RUN 4
ACETONE FRONT WASH				
ACETONE BOTTLE #:	775	775	775	775
FIELD VOLUME, ml:	200	200	200	200
BLANK VALUE/100ml, g:	0.0000	0.0000	0.0000	0.0000
LAB VOLUME, ml:	15	15	15	15
ACETONE BLANK NET, g:	0.0000	0.0000	0.0000	0.0000
ACETONE BACK WASH				
ACETONE BOTTLE #:	775	775	775	775
FIELD VOLUME, ml:	200	200	200	200
BLANK VALUE/100ml, g:	0.0000	0.0000	0.0000	0.0000
LAB VOLUME, ml:	15	15	15	15
ACETONE BLANK NET, g:	0.0000	0.0000	0.0000	0.0000
ORGANIC SOLVENT				
SOLVENT BOTTLE #:	45	45	45	45
BLANK VALUE/150ml, g:	0.0000	0.0000	0.0000	0.0000
LAB VOLUME USED, ml:	150	150	150	150
ORGANIC SOLVENT BLANK NET, g:	0.0000	0.0000	0.0000	0.0000
CHARGING SOLUTION BLANK				
SOLUTION BOTTLE #:	497	497	497	497
FIELD VOLUME, ml:	200	200	200	200
BLANK VALUE/100ml, g:	0.0002	0.0002	0.0002	0.0002
LAB VOLUME, ml:	15	15	15	15
SOLUTION BLANK NET, g:	0.0004	0.0004	0.0004	0.0004
WATER BACK WASH				
WATER BOTTLE #:	497	497	497	497
FIELD VOLUME, ml:	200	200	200	200
BLANK VALUE/100ml, g:	0.0002	0.0002	0.0002	0.0002
WATER BLANK NET, g:	0.0004	0.0004	0.0004	0.0004
ALLOWABLE ACETONE BLANK VALUE				
FRONT WASH				
VOLUME USED IN FRONT WASH, ml:	215	215	215	215
DENSITY OF ACETONE USED, g/ml:	0.7857	0.7857	0.7857	0.7857
ALLOWABLE BLANK VALUE, g:	0.0017	0.0017	0.0017	0.0017
BACK WASH				
VOLUME USED IN BACK WASH, ml:	215	215	215	215
DENSITY OF ACETONE USED, g/ml:	0.7857	0.7857	0.7857	0.7857
ALLOWABLE BLANK VALUE g:	0.0017	0.0017	0.0017	0.0017
ALLOWABLE ORGANIC SOLVENT BLANK VALUE				
VOLUME SOLVENT USED , ml:	150	150	150	150
DENSITY OF SOLVENT USED, g/ml:	1.3255	1.3255	1.3255	1.3255
ALLOWABLE BLANK VALUE, g:	0.0026	0.0026	0.0026	0.0026

SAMPLE AND TRAVERSE POINT DETERMINATION SHEET

MINIMUM NUMBER OF TRAVERSE POINTS FOR PARTICULATE TRAVERSES

EPA METHOD 1

Sample Port Location
Duct diameters upstream from flow disturbance (distance A)



Sample Port Location
Duct diameters downstream from flow disturbance (distance B)

LOCATION OF TRAVERSE POINTS IN CIRCULAR STACKS

Percent of stack diameter from inside wall to traverse point

TRAVERSE POINT #	Number of Traverse Points on a Diameter					POINT LOCATION
	4	6	8	10	12	
1	6.7	4.4	3.2	2.6	2.1	1.0
2	25.0	14.6	10.5	8.2	6.7	2.4
3	75.0	29.6	19.4	14.6	11.8	4.2
4	93.3	70.4	32.3	22.6	17.7	6.3
5		85.4	67.7	34.2	25.0	8.9
6		95.6	80.6	65.8	35.6	12.6
7			89.5	77.4	64.4	22.9
8			96.8	85.4	75.0	26.6
9				91.8	82.3	29.2
10				97.4	88.2	31.3
11					93.3	33.1
12					97.9	34.5

Stack Diameter (inches): 35.5
Distance A: 24" = 0.7 stack diameters
Distance B: 96" = 2.7 stack diameters
Points Required: 24
Job #: 98-092D

Client: Willamette Industries
Location: Springfield, OR
Source: Veneer Dryer #2
Date: June 1, 1998

THERMOMETER AND THERMOCOUPLE IDENTIFICATION AND CALIBRATION

IDENTIFICATION

THERMOMETER ID #: G

THERMOCOUPLE ID #: 6

JOB #: 98-092D

DATE: 6-18-98

CALIBRATED BY: BV

CALIBRATION

AVG. EXHAUST TEMPERATURE-F.: 249

RANGE OF CALIBRATION-10% ABS.,F 178 320

READING	REFERENCE THERMOMETER F	TEST THERMOMETER F
I	178	178.1
II	239	238.2
III	317	316.5
AVERAGE-F.	244.7	244.3

PERCENT DIFFERENCE OF ABSOLUTE READINGS:

ALLOWABLE 1.5 %

ACTUAL 0.1 %

EPA SAMPLE NOZZLE
IDENTIFICATION AND CALIBRATION

IDENTIFICATION

NOZZLE ID#:	P
JOB #:	98-092D
DATE:	6-1-98
CALIBRATED BY:	JJT

CALIBRATION

DIAMETER #	INSIDE DIAMETER (")
I	0.1770
II	0.1780
III	0.1800
AVERAGE	0.1783

DIFFERENCE BETWEEN LARGEST AND SMALLEST MEASUREMENTS

ALLOWABLE 0.004 INCHES

ACTUAL 0.003 INCHES

POST-TEST SERIES CONTROL UNIT CALIBRATION WORKSHEET

CLIENT: WILLAMETTE INDUSTRIES
LOCATION: SPRINGFIELD, OR
SOURCE: VENEER DRYER #2

CONTROL UNIT #:	2	DATE:	6/8/98
SERIAL #:	7271	JOB #:	98-092D
dHa "H2O:	1.65	CALIBRATOR:	BV
BAROMETRIC PR. "Hg:	28.73	MAX. VACUUM "H	1
PRE-TEST FACTOR "Y":	0.98	AVERAGE dH "H2O	1.645

CALIBRATION RUN #	1	2	3
BEGINING METER TEMP. F			
-DRY GAS METER :INLET	77.0	90.0	97.0
:OUTLET	76.0	80.0	85.0
-REFERENCE METER	72.0	72.0	72.0
BEGINING VOLUME METER READING			
-DRY GAS METER	940.100	951.100	962.300
-REFERENCE METER	405.300	415.940	426.720
ENDING METER TEMP. F			
-DRY GAS METER -INLET	90.0	97.0	101.0
-OUTLET	80.0	85.0	89.0
-REFERENCE METER	72.0	72.0	74.0
ENDING VOLUME METER READING			
-DRY GAS METER	951.100	962.300	975.900
-REFERENCE METER	415.940	426.720	439.760

CALIBRATION CALCULATIONS

CALIBRATION RUN #	1	2	3
DRY GAS METER c.f.	11.000	11.200	13.600
REFERENCE METER c.f.	10.640	10.780	13.040
AVERAGE DRY GAS METER TEMP. F			
-INLET	83.50	93.50	99.00
-OUTLET	78.00	82.50	87.00
-AVERAGE	80.75	88.00	93.00
AVERAGE REFERENCE METER TEMP. F	72.00	72.00	73.00
DRY GAS METER FACTOR "Y"	0.98	0.99	0.99

AVERAGE POST-TEST DRY GAS METER FACTOR "Y" 0.99

LARGEST DEVIATION FROM AVERAGE GAS METER FACTOR "Y"
- DIFFERENCE 0.007

DEVIATION FROM PRE-TEST DRY GAS METER FACTOR "Y"
- % DIFFERENCE 1

7.2. SUB-APPENDIX II: FORMALDEHYDE SAMPLING ANALYSIS

7.2.1. *Sampling Calculations*
- 7.2.1.1. Nomenclature, See 6.2.1.1.
- 7.2.1.2. Sample Hand Calculation, See 6.2.1.2.
- 7.2.1.3. Computer Calculations
  - 7.2.1.3.1. Runs 1-2 (heart)
  - 7.2.1.3.2. Runs 3-4 (sap)

7.2.2. Field Data
- 7.2.2.1. Run 1 (heart)
- 7.2.2.2. Run 2 (heart)
- 7.2.2.3. Run 3 (sap)
- 7.2.2.4. Run 4 (sap)

7.2.3. Laboratory Analysis, See 6.2.3.

7.2.4. Sample Train Schematic, See 6.2.4.

7.2.5. Calibration and Quality Assurance Data
- 7.2.5.1. Dry Gas Meter Thermometers, See 6.2.5.1.
- 7.2.5.2. Dry Gas Meter Calibration, See 6.2.5.2.

CALCULATION SHEET FOR NCASI FORMALDEHYDE METHOD
DRYER #2 - HEART

			RUN 1	RUN 2	AVG
SYMBOL DEFINITIONS - UNITS					
Vm	Sample Volume	-dcf	2.0341	2.2036	
		-dcm	0.0576	0.0624	
Y	Gas Meter Factor		1.00	1.00	
Pb	Barometric Pressure-"Hg		29.00	29.00	
Tm	Average Dry Gas Meter Temp.-F		64.8	87.9	
Vm(std)	Standard Sample Volume	-dscf	1.9836	2.0583	
		-dscm	0.0562	0.0583	
Qs(std)	Standard Gas Flow Rate	-scf/min	30987	31669	31328
		-dscf/min	28925	29668	29297
		-dscm/min	819	840	830
Wform	Weight Of Collected Formaldehyde-ug		132.2	178.5	
Eform	Formaldehyde Emission Rate	-lbs formaldehyde/hr	0.25	0.34	0.30
		-lbs carbon/hr	0.10	0.14	0.12
Cform	Formaldehyde Concentration	-ppm	1.9	2.5	2.2
Pr	Production Rate	-sq ft / hr (3/8" basis)	15370	13437	14404
Ef	Emission Factor	-lbs formaldehyde / MSF (3/8")	0.02	0.03	0.02
		-lbs carbon / MSF (3/8")	0.01	0.01	0.01
dt	Total Sampling Time-min.		60.0	60.0	

PLANT: WILLAMETTE INDUSTRIES SPRINGFIELD, OR
JOB: 98-092D
SOURCE: VENEER DRYER #2
DATE: 6/1/98

CALCULATION SHEET FOR NCASI FORMALDEHYDE METHOD
DRYER #2 - SAP

			RUN 3	RUN 4	AVG
SYMBOL DEFINITIONS - UNITS					
Vm	Sample Volume	-dcf	2.2213	2.1613	
		-dcm	0.0629	0.0612	
Y	Gas Meter Factor		1.00	1.00	
Pb	Barometric Pressure-"Hg		29.00	29.00	
Tm	Average Dry Gas Meter Temp.-F		98.2	81.3	
Vm(std)	Standard Sample Volume	-dscf	2.0365	2.0433	
		-dscm	0.0577	0.0579	
Qs(std)	Standard Gas Flow Rate	-scf/min	30463	30706	30584
		-dscf/min	27566	27759	27662
		-dscm/min	781	786	783
Wform	Weight Of Collected Formaldehyde-ug		125.5	106.6	
Eform	Formaldehyde Emission Rate	-lbs formaldehyde/hr	0.22	0.19	0.21
		-lbs carbon/hr	0.09	0.08	0.08
Cform	Formaldehyde Concentration	-ppm	1.7	1.5	1.6
Pr	Production Rate	-sq ft / hr (3/8" basis)	7063	7565	7314
Ef	Emission Factor	-lbs formaldehyde / MSF (3/8")	0.03	0.03	0.03
		-lbs carbon / MSF (3/8")	0.01	0.01	0.01
dt	Total Sampling Time-min.		60.0	60.0	

PLANT: WILLAMETTE INDUSTRIES SPRINGFIELD, OR
JOB: 98-092D
SOURCE: VENEER DRYER #2
DATE: 6/1/98

NCASI FIELD DATA SHEET

DATE: 6-1-98

JOB#: 920
PLANT: WILL
LOCATION: SPFLD OR
SOURCE: V D #2
RUN#: 1-0
START: 809
FINISH: 918

BAROMETRIC PRESSURE: 29.00
THERMOMETER #: G
CRITICAL ORIFICE #: NA

LEAK CHECKS
INITIAL: 0 @ 17
FINAL: 0 @ 11

OPERATOR: M-B

DATA POINT	TIME MIN.	ROTAMETER RATE	ORIFICE PR. INLET	ORIFICE PR. OUTLET	TEMPERATURE (F) meter ~~BOX~~	TEMPERATURE (F) IMP.	NOTES
START	0	****	****	****	****	****	674.2
1	5	1.00	0	5	64	67	
2	10	1.0	0	5	63	63	
3	15	1.0	0	5	62	60	
4	20	1.0	0	5	63	60	
5	25	1.0	0	5	64	62	
6	30	1.0	0	5	65	64	
7	35	1.0	0	5	65	65	
8	40	1.0	0	5	65	65	
9	45	1.0	0	5	66	66	
10	50	1.0	0	5	66	66	
11	55	1.0	0	5	67	66	
12	60	1.0	0	5	67	67	731.8
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24					64.8		0.0576 m^3

TOTAL _____ AVERAGE _____ AVERAGE _____

RECOVERY VOLUMES

RECOVERY I.D.

1 cwm
8 min
40 sec

IMPINGER CONTENT VOLUME, ML: 34
WASH VOLUME, ML: _____
TOTAL: 67.0

CONDENSATE/WASH: VD2 R1
SILICA GEL: A VD2 R1
B _____
H2O #: _____

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NCASI FIELD DATA SHEET

DATE: 6-1-98

JOB#: 92-D

PLANT: WILL IND

LOCATION: SPFLD OR

SOURCE: VD2

RUN#: ~~VD2~~ R2 ♡

START: 1033

FINISH: 1133

BAROMETRIC PRESSURE: 29.00

THERMOMETER #: G

CRITICAL ORIFICE #:

LEAK CHECKS

INITIAL: 0.0 18

FINAL: 0.0 7

OPERATOR: MWB

DATA POINT	TIME MIN.	ROTAMETER RATE	ORIFICE PR. INLET	ORIFICE PR. OUTLET	TEMPERATURE (F) meter ~~BOX~~	TEMPERATURE (F) IMP.	NOTES
START	0	****	****	****	****	****	734.2
1	5	1.1	0	6	79	67	
2	10	1.1	0	6	82	66	
3	15	1.1	0	6	83	66	
4	20	1.1	0	6	85	65	
5	25	1.1	0	6	86	66	
6	30	1.1	0	6	88	68	
7	35	1.1	0	6	91	68	
8	40	1.1	0	6	92	68	
9	45	1.1	0	6	91	68	
10	50	1.1	0	6	92	68	
11	55	1.1	0	6	93	67	
12	60	1.1	0	6	93	67	796.6
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24					87.9		0.0624 m3

TOTAL _____ AVERAGE _____ AVERAGE _____

RECOVERY VOLUMES

RECOVERY I.D.

IMPINGER CONTENT VOLUME, ML: 32

WASH VOLUME, ML: _____

TOTAL: 62.5

CONDENSATE/WASH: VD2 R2

SILICA GEL: A VD2 R2

B _____

H2O #: _____

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NCASI FIELD DATA SHEET

DATE: 6-1-98

JOB#: 98-092D
PLANT: WILC SAND.
LOCATION: SPFLD OR
SOURCE: V. DRYER #2
RUN#: 3-D
START: 1314
FINISH: 1414

BAROMETRIC PRESSURE: 29.00
THERMOMETER #: G
CRITICAL ORIFICE #:

LEAK CHECKS
INITIAL: 0 @ 11
FINAL: 0 @ 10

OPERATOR: MWB

DATA POINT	TIME MIN.	ROTAMETER RATE	ORIFICE PR. INLET	ORIFICE PR. OUTLET	TEMPERATURE (F) ~~BOX~~ METER	TEMPERATURE (F) IMP.	NOTES
START	0	****	****	****	****	****	797.1
1	5	1.1	0	6	97	71	
2	10	1.1	0	6	97	69	
3	15	1.1	0	6	97	68	
4	20	1.1	0	6	99	68	
5	25	1.1	0	6	98	67	
6	30	1.1	0	6	98	65	
7	35	1.1	0	6	99	66	
8	40	1.1	0	6	100	67	
9	45	1.1	0	6	99	66	
10	50	1.1	0	6	99	67	
11	55	1.1	0	6	99	68	
12	60	1.1	0	6	96	68	860.0
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24					98.2		0.0629 m^3

TOTAL _____ AVERAGE _____ AVERAGE _____

RECOVERY VOLUMES

IMPINGER CONTENT VOLUME, ML: 34
WASH VOLUME, ML: _____
TOTAL: 69.0

RECOVERY I.D.

CONDENSATE/WASH: VD2 R3
SILICA GEL: A VD2 R3
B _____
H2O #: _____

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NCASI FIELD DATA SHEET

DATE: 6-1-98

JOB#: 98-092D
PLANT: WILL IND
LOCATION: SPFLD
SOURCE: VD HZ
RUN#: 4 D
START: 1538
FINISH: 1638

BAROMETRIC PRESSURE: 29.00
THERMOMETER #: G
CRITICAL ORIFICE #: NA

LEAK CHECKS
INITIAL: 0 @ 20
FINAL: 0 @ 10

OPERATOR: MWB

DATA POINT	TIME MIN.	ROTAMETER RATE	ORIFICE PR. INLET	ORIFICE PR. OUTLET	TEMPERATURE (F) ~~BOX~~ OVEN	TEMPERATURE (F) IMP.	NOTES
START	0	****	****	****	****	****	8643
1	5	10.1	0	6	80	70	
2	10	10.1	0	6	80	64	
3	15	10.1	0	6	81	63	
4	20	10.1	0	6	81	63	
5	25	10.1	0	6	81	62	
6	30	10.1	0	6	81	60	
7	35	10.1	0	6	81	62	
8	40	10.1	0	6	82	60	
9	45	10.1	0	6	81	57	
10	50	10.1	0	6	84	57	
11	55	10.1	0	6	82	58	
12	60	10.1	0	6	82	58	925.5
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24					81.3		0.0612 m^3

TOTAL _____ AVERAGE _____ AVERAGE _____

RECOVERY VOLUMES

IMPINGER CONTENT VOLUME, ML: 34.5
WASH VOLUME, ML: _____
TOTAL: 70.5

RECOVERY I.D.

CONDENSATE/WASH: V02 R4
SILICA GEL: A V02 R4
B _____
H2O #: _____

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7.3. SUB-APPENDIX III: INSTRUMENTAL GASEOUS SAMPLING ANALYSIS

7.3.1. Sampling Calculations
- 7.3.1.1. Formulas for Sampling Calculations, See 6.3.1.1.
- 7.3.1.2. Computer Calculations
  - 7.3.1.2.1. Runs 1-2 (heart)
  - 7.3.1.2.2. Runs 3-4 (sap)

7.3.2. Field Data
- 7.3.2.1. Run 1 (heart)
- 7.3.2.2. Run 2 (heart)
- 7.3.2.3. Run 3 (sap)
- 7.3.2.4. Run 4 (sap)

7.3.3. Continuous Gas Sampling Schematic, See 6.3.3.

7.3.4. Calibration and Quality Assurance Data
- 7.3.4.1. Calibration and Drift Calculations
  - 7.3.4.1.1. CO Instrument
  - 7.3.4.1.2. NOx Instrument
  - 7.3.4.1.3. VOC Instrument
  - 7.3.4.1.4. O_2 Instrument
  - 7.3.4.1.5. CO_2 Instrument
- 7.3.4.2. Calibration Gas Certification, See 6.3.4.2.
  - 7.3.4.2.1. CC105497
  - 7.3.4.2.2. CC12295
  - 7.3.4.2.3. CC56913
  - 7.3.4.2.4. CC74100
  - 7.3.4.2.5. CC449
- 7.3.4.3. NOx Instrument Converter Efficiency Check, See 6.3.4.3.
- 7.3.4.4. NOx Instrument Interference Check, See 6.3.4.4.

GASEOUS SAMPLING CALCULATIONS
DRYER #2 - HEART

	RUN 1	RUN 2	AVG
CARBON MONOXIDE (CO)			
Average-ppm	33.8	32.6	33.2
Upscale Gas Concentration	101.4	101.4	
Start Zero	0	2	
Start Upscale	103	104	
End Zero	2	1	
End Upscale	104	104	
Exhaust Gas Flow Rate-dscfm	28925	29668	
Mass Emissions-lbs/hr	4.3	4.2	4.2
Emission Factor-lbs/MMBtu*	0.49	0.36	0.42
OXIDES OF NITROGEN (NOx)			
Average-ppm	4.3	4.8	
Upscale Gas Concentration	48.8	48.8	
Start Zero	0	0	
Start Upscale	48	49	
End Zero	0	0	
End Upscale	48	49	
Emission Concentration-ppm	4.4	4.8	4.6
Exhaust Gas Flow Rate-dscfm	28925	29668	
Mass Emissions-lbs/hr	0.9	1.0	1.0
Emission Factor-lbs/MMBtu*	0.10	0.09	0.10
VOLATILE ORGANIC COMPOUNDS (VOC's)			
Average-ppm as propane	30.6	28.9	29.7
Average-ppm as carbon	91.7	86.6	89.1
Upscale Gas Concentration	29.6	29.6	
Start Zero	0.0	0.0	
Start Upscale	29.4	29.7	
End Zero	0.0	0.9	
End Upscale	29.7	29.7	
Exhaust Gas Flow Rate-scfm	30987	31669	
Mass Emissions-lbs carbon/hr	5.30	5.11	5.20
-lbs carbon/MSF(3/8")	0.34	0.38	0.36
OXYGEN (O2) - % by volume			
Average-%	20.30	19.83	
Upscale Gas Concentration	20.43	20.4	
Start Zero	0.1	0.3	
Start Upscale	20.5	20.5	
End Zero	0.3	0.3	
End Upscale	21.0	20.6	
Emission Concentration-%	19.98	19.71	19.84
CARBON DIOXIDE (CO2) - % by volume			
Average-%	0.62	0.59	
Upscale Gas Concentration	5.58	5.58	
Start Zero	0.05	-0.01	
Start Upscale	5.59	5.55	
End Zero	-0.11	-0.09	
End Upscale	5.56	5.51	
Emission Concentration-%	0.65	0.64	0.65
Production Rate, sq. ft./hr (3/8" basis)	15370	13437	

*** Natural Gas Combustion Factor = 8710 dscf/MMBtu**

PLANT: WILLAMETTE INDUSTRIES SPRINGFIELD, OR
JOB: 98-092D
SOURCE: VENEER DRYER #2 CONDITION: HEART
DATE: 6/1/98

GASEOUS SAMPLING CALCULATIONS
DRYER #2 - SAP

	RUN 3	RUN 4	AVG
CARBON MONOXIDE (CO)			
Average-ppm	24.7	22.3	23.5
Upscale Gas Concentration	101.4	101.4	
Start Zero	2	2	
Start Upscale	103	104	
End Zero	2	2	
End Upscale	101	103	
Exhaust Gas Flow Rate-dscfm	27566	27759	
Mass Emissions-lbs/hr	3.0	2.7	2.8
Emission Factor-lbs/MMBtu*	0.20	0.25	0.23
OXIDES OF NITROGEN (NOx)			
Average-ppm	6.3	5.1	
Upscale Gas Concentration	48.8	48.8	
Start Zero	0	0	
Start Upscale	49	49	
End Zero	0	1	
End Upscale	49	49	
Emission Concentration-ppm	6.3	4.6	5.5
Exhaust Gas Flow Rate-dscfm	27566	27759	
Mass Emissions-lbs/hr	1.2	0.9	1.1
Emission Factor-lbs/MMBtu*	0.08	0.09	0.08
VOLATILE ORGANIC COMPOUNDS (VOC's)			
Average-ppm as propane	18.7	19.2	18.9
Average-ppm as carbon	56.1	57.5	56.8
Upscale Gas Concentration	29.6	29.6	
Start Zero	0.3	0.0	
Start Upscale	29.7	29.7	
End Zero	0.9	1.2	
End Upscale	30.0	28.8	
Exhaust Gas Flow Rate-scfm	30463	30706	
Mass Emissions-lbs carbon/hr	3.19	3.29	3.24
-lbs carbon/MSF(3/8")	0.45	0.44	0.44
OXYGEN (O2) - % by volume			
Average-%	19.24	20.00	
Upscale Gas Concentration	20.43	20.43	
Start Zero	0.3	0.4	
Start Upscale	20.5	20.5	
End Zero	0.3	0.3	
End Upscale	20.3	20.9	
Emission Concentration-%	19.25	19.73	19.49
CARBON DIOXIDE (CO2) - % by volume			
Average-%	0.84	0.72	
Upscale Gas Concentration	5.58	5.58	
Start Zero	0.05	0.05	
Start Upscale	5.53	5.56	
End Zero	0.06	-0.02	
End Upscale	5.56	5.53	
Emission Concentration-%	0.80	0.71	0.76
Production Rate, sq. ft./hr (3/8" basis)	7063	7565	

* **Natural Gas Combustion Factor = 8710 dscf/MMBtu**

PLANT: WILLAMETTE INDUSTRIES SPRINGFIELD, OR
JOB: 98-092D
SOURCE: VENEER DRYER #2 CONDITION: SAP
DATE: 6/1/98

BWR ASSOCIATES, INC.
GAS DATA SHEET

PLANT: WILLAMETTE INDUSTRIES
LOCATION: SPRINGFIELD, OR
SOURCE: VENEER DRYER #2
CONDITION HEART

DATE: 6/1/98 OPERATOR
JOB: 98-092D jat
RUN: 1

		CO(ppm)	NOx(ppm)	O2(%)	CO2(%)	VOC(ppm)
CAL GAS VALUE		101.4	48.8	20.43	5.58	29.62
INITIAL ZERO		0.4	0	0.1	0.05	0.0
INITAL UPSCALE		103	48	20.5	5.59	29.4
POINT	TIME	CO(ppm)	NOx(ppm)	O2(%)	CO2(%)	VOC(ppm)
1	803	36	4	20.3	0.64	29.1
2	804	36	4	20.3	0.64	29.7
3	805	36	4	20.3	0.64	29.4
4	806	36	4	20.3	0.64	29.1
5	807	34	4	20.3	0.62	27.6
6	808	34	4	20.3	0.63	28.5
7	809	35	4	20.3	0.63	26.4
8	810	33	4	20.3	0.59	25.5
9	811	34	4	20.4	0.58	25.2
10	812	35	4	20.4	0.58	25.5
11	813	34	4	20.4	0.58	27.0
12	814	34	4	20.4	0.58	28.8
13	815	35	4	20.4	0.60	29.4
14	816	35	4	20.4	0.59	29.4
15	817	35	4	20.4	0.60	30.0
16	818	35	4	20.4	0.60	28.8
17	819	35	4	20.4	0.61	28.2
18	820	35	4	20.4	0.61	28.5
19	821	35	4	20.4	0.61	28.2
20	822	34	4	20.4	0.61	28.5
21	823	34	4	20.4	0.61	28.2
22	824	35	4	20.4	0.61	30.0
23	825	33	4	20.4	0.59	30.9
24	826	33	4	20.4	0.60	30.9
25	827	33	4	20.4	0.59	30.3
26	828	34	4	20.4	0.58	30.6
27	829	35	4	20.4	0.58	30.3
28	830 *	32	4	20.4	0.55	35.1
29	840	37	3	20.8	0.42	19.8
30	841	33	3	20.7	0.46	20.7
31	842	32	3	20.4	0.60	26.4
32	843	32	3	20.4	0.62	26.4
33	844	32	4	20.3	0.62	27.6
34	845	32	4	20.3	0.63	29.1
35	846	33	4	20.3	0.63	28.5
36	847	32	4	20.3	0.63	28.8
37	848	32	4	20.3	0.63	29.4
38	849	32	4	20.3	0.63	28.5
39	850	30	5	20.0	0.77	34.8
40	851	30	5	20.2	0.63	31.2
41	852	32	5	20.2	0.65	30.6
42	853	32	5	20.2	0.65	31.2
43	854	32	5	20.2	0.67	31.2
44	855	33	5	20.2	0.66	30.3
45	856	33	5	20.2	0.65	30.3
46	857	32	5	20.2	0.66	29.1
47	858	32	5	20.2	0.66	29.7
48	859	33	5	20.2	0.66	30.9
49	900	34	5	20.2	0.66	31.2
50	901	33	5	20.2	0.67	32.1
51	902	32	5	20.2	0.67	31.5
52	903	33	5	20.2	0.66	32.4
53	904	34	5	20.2	0.66	32.4
54	905	35	5	20.1	0.67	35.4
55	906	35	5	20.2	0.67	37.5
56	907	35	5	20.2	0.67	37.8
57	908	37	5	20.1	0.67	39.9
58	909	36	5	20.1	0.66	34.5
59	910	36	5	20.1	0.66	36.6
60	911	36	5	20.1	0.66	35.7
61	912	36	5	20.1	0.66	63.0
AVERAGE		33.8	4.3	20.30	0.62	30.6
FINAL ZERO		2	0.0	0.3	-0.11	0.0
FINAL UPSCALE		104	48	21.0	5.56	29.7
CORR. FOR Z/S			4.4	19.98	0.65	

* RUN SUSPENDED, CHAIN OFF
OPERATION REGAINED, SAMPLING RESUMED @ 840

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BWR ASSOCIATES, INC.
GAS DATA SHEET

PLANT: WILLAMETTE INDUSTRIES
LOCATION: SPRINGFIELD, OR
SOURCE: VENEER DRYER #2
CONDITION HEART

DATE: 6/1/98 OPERATOR
JOB: 98-092D jat
RUN: 2

		CO(ppm)	NOx(ppm)	O2(%)	CO2(%)	VOC(ppm)
CAL GAS VALUE		101.4	48.8	20.43	5.58	29.62
INITIAL ZERO		2	0.0	0.3	-0.01	0.0
INITAL UPSCALE		104	49	20.5	5.55	29.7
POINT	TIME	CO(ppm)	NOx(ppm)	O2(%)	CO2(%)	VOC(ppm)
1	1028	34	4	19.8	0.57	29.1
2	1029	34	4	19.8	0.56	29.7
3	1030	33	4	19.9	0.56	27.9
4	1031	32	4	19.9	0.57	29.4
5	1032	32	5	19.8	0.61	30.0
6	1033	32	5	19.8	0.61	30.0
7	1034	32	5	19.8	0.62	29.7
8	1035	31	5	19.8	0.60	27.0
9	1036	30	5	19.9	0.59	26.4
10	1037	30	5	19.9	0.59	24.6
11	1038	30	5	19.9	0.59	22.5
12	1039	29	5	19.9	0.59	21.6
13	1040	30	5	19.9	0.59	20.7
14	1041	30	5	19.9	0.59	20.4
15	1042	30	5	19.9	0.59	23.1
16	1043	31	5	19.9	0.59	26.1
17	1044	31	5	19.9	0.60	27.0
18	1045	32	5	19.9	0.60	27.0
19	1046	32	5	19.9	0.60	25.2
20	1047	31	5	19.9	0.60	25.8
21	1048	32	5	19.9	0.60	26.7
22	1049	32	5	19.9	0.60	27.0
23	1050	31	5	19.8	0.59	28.5
24	1051	32	5	19.8	0.59	28.2
25	1052	32	5	19.8	0.59	29.1
26	1053	33	5	19.8	0.60	28.8
27	1054	33	5	19.8	0.61	30.6
28	1055	35	5	19.8	0.62	29.7
29	1056	34	5	19.8	0.62	30.0
30	1057	34	5	19.8	0.61	30.0
31	1058	34	5	19.8	0.62	30.3
32	1059	32	5	19.8	0.62	30.0
33	1100	33	5	19.8	0.62	26.1
34	1101	32	5	19.8	0.61	28.2
35	1102	31	5	19.8	0.61	29.1
36	1103	31	5	19.8	0.61	29.7
37	1104	32	5	19.8	0.60	30.3
38	1105	32	5	19.8	0.60	31.2
39	1106	33	5	19.8	0.60	30.0
40	1107	33	5	19.8	0.59	29.1
41	1108	33	5	19.8	0.59	29.1
42	1109	32	5	19.8	0.60	30.6
43	1110	33	5	19.8	0.59	26.1
44	1111	33	5	19.7	0.58	25.8
45	1112	32	5	19.7	0.60	27.0
46	1113	33	5	19.7	0.59	32.7
47	1114	34	5	19.7	0.59	33.3
48	1115	34	5	19.7	0.60	33.3
49	1116	33	5	19.8	0.57	33.9
50	1117	36	5	19.8	0.55	33.0
51	1118	35	5	19.8	0.55	32.7
52	1119	34	5	19.9	0.56	32.4
53	1120	36	5	19.9	0.57	32.4
54	1121	34	5	19.9	0.56	30.0
55	1122	35	4	19.9	0.56	29.7
56	1123	35	4	19.9	0.56	30.9
57	1124	34	4	19.9	0.57	31.5
58	1125	34	4	19.9	0.57	31.8
59	1126	32	4	19.9	0.57	32.1
60	1127	35	4	19.9	0.56	32.7
61	1128	34	4	19.8	0.58	33.6
AVERAGE		32.6	4.8	19.83	0.59	28.9
FINAL ZERO		1.2	0	0.3	-0.09	0.9
FINAL UPSCALE		103.6	49	20.6	5.51	29.7
CORR. FOR Z/S			4.8	19.71	0.64	

BWR ASSOCIATES, INC.
GAS DATA SHEET

PLANT: WILLAMETTE INDUSTRIES
LOCATION: SPRINGFIELD, OR
SOURCE: VENEER DRYER #2
CONDITION SAP

DATE: 6/1/98 OPERATOR
JOB: 98-092D jat
RUN: 3

		CO(ppm)	NOx(ppm)	O2(%)	CO2(%)	VOC(ppm)
CAL GAS VALUE		101.4	48.8	20.43	5.58	29.6
INITIAL ZERO		1.8	0	0.3	0.05	0.3
INITAL UPSCALE		103.4	49	20.5	5.53	29.7
POINT	TIME	CO(ppm)	NOx(ppm)	O2(%)	CO2(%)	VOC(ppm)
1	1313	27	5	19.2	0.77	17.7
2	1314	28	5	19.3	0.79	18.0
3	1315	28	5	19.3	0.78	18.0
4	1316	27	5	19.3	0.78	18.0
5	1317	27	5	19.3	0.80	16.8
6	1318	28	5	19.3	0.81	16.2
7	1319	24	5	19.3	0.81	15.9
8	1320	24	5	19.4	0.82	15.3
9	1321	24	6	19.3	0.81	14.7
10	1322	22	6	19.3	0.83	14.7
11	1323	22	7	19.2	0.88	14.4
12	1324	21	7	19.2	0.89	14.1
13	1325	21	7	19.2	0.89	13.8
14	1326	22	7	19.2	0.89	13.8
15	1327	22	7	19.2	0.89	13.8
16	1328	23	7	19.2	0.89	13.8
17	1329	22	7	19.2	0.89	13.8
18	1330	22	7	19.2	0.89	13.8
19	1331	21	7	19.2	0.89	13.8
20	1332	22	7	19.2	0.89	13.8
21	1333	21	7	19.2	0.88	14.4
22	1334	21	7	19.2	0.88	14.4
23	1335	21	7	19.2	0.88	14.7
24	1336	21	7	19.2	0.88	14.7
25	1337	21	7	19.2	0.88	14.4
26	1338	21	7	19.2	0.88	15.0
27	1339	20	7	19.2	0.90	15.0
28	1340	22	7	19.2	0.89	15.3
29	1341	22	7	19.2	0.90	15.6
30	1342	22	7	19.2	0.87	17.1
31	1343	24	6	19.2	0.88	17.7
32	1344	23	6	19.2	0.89	18.9
33	1345	24	6	19.2	0.88	20.4
34	1346	25	6	19.2	0.89	20.7
35	1347	25	6	19.1	0.89	22.2
36	1348	25	6	19.2	0.82	22.5
37	1349	24	6	19.2	0.82	23.1
38	1350	26	6	19.2	0.82	23.7
39	1351	27	6	19.2	0.82	23.4
40	1352	28	6	19.2	0.82	23.1
41	1353	29	6	19.3	0.81	22.8
42	1354	29	6	19.3	0.81	22.8
43	1355	28	6	19.3	0.81	22.8
44	1356	27	6	19.3	0.81	22.8
45	1357	27	6	19.3	0.82	22.5
46	1358	26	6	19.3	0.82	22.5
47	1359	27	6	19.3	0.82	21.9
48	1400	27	6	19.3	0.81	27.6
49	1401	27	7	19.3	0.82	24.9
50	1402	27	7	19.3	0.84	23.1
51	1403	27	7	19.3	0.83	22.8
52	1404	27	7	19.3	0.84	21.9
53	1405	26	7	19.3	0.82	21.0
54	1406	27	6	19.3	0.82	21.0
55	1407	26	6	19.3	0.83	21.6
56	1408	26	6	19.3	0.83	21.9
57	1409	27	6	19.3	0.83	21.0
58	1410	26	6	19.2	0.82	21.0
59	1411	27	6	19.2	0.82	21.6
60	1412	27	6	19.2	0.83	21.9
61	1413	27	7	19.2	0.82	21.6
AVERAGE		24.7	6.3	19.24	0.84	18.7
FINAL ZERO		2.0	0.0	0.3	0.06	0.9
FINAL UPSCALE		101.4	49	20.3	5.56	30.0
CORR. FOR Z/S			6.3	19.25	0.80	

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BWR ASSOCIATES, INC.
GAS DATA SHEET

PLANT: WILLAMETTE INDUSTRIES
LOCATION: SPRINGFIELD, OR
SOURCE: VENEER DRYER #2
CONDITION SAP

DATE: 6/1/98 OPERATOR
JOB: 98-092D jat
RUN: 4

		CO(ppm)	NOx(ppm)	O2(%)	CO2(%)	VOC(ppm)
CAL GAS VALUE		101.4	48.8	20.43	5.58	29.6
INITIAL ZERO		1.8	0	0.4	0.05	0.0
INITAL UPSCALE		103.8	49	20.5	5.56	29.7
POINT	TIME	CO(ppm)	NOx(ppm)	O2(%)	CO2(%)	VOC(ppm)
1	1534	25	6	20.0	0.80	20.4
2	1535	25	6	20.0	0.79	21.0
3	1536	25	6	20.0	0.79	21.9
4	1537	25	6	20.0	0.79	22.2
5	1538	26	6	19.9	0.79	23.1
6	1539	26	6	19.9	0.79	22.8
7	1540	26	6	19.9	0.82	22.5
8	1541	26	6	19.7	0.87	21.3
9	1542	26	6	19.7	0.88	21.3
10	1543	26	6	19.7	0.86	21.0
11	1544	25	6	19.7	0.87	21.3
12	1545	26	6	19.7	0.85	20.7
13	1546	24	6	19.8	0.83	20.1
14	1547	25	6	19.8	0.85	19.5
15	1548	25	6	19.8	0.84	19.8
16	1549	25	6	19.8	0.85	18.9
17	1550	25	6	19.8	0.84	18.6
18	1551	25	6	19.8	0.85	18.9
19	1552	24	5	19.7	0.88	18.0
20	1553	27	5	19.7	0.88	18.3
21	1554	24	5	19.7	0.88	18.3
22	1555	24	5	19.7	0.88	18.0
23	1556	24	5	19.7	0.88	18.3
24	1557	24	5	19.7	0.88	18.9
25	1558	24	5	19.7	0.88	18.3
26	1559	25	5	19.7	0.87	18.6
27	1600	24	6	19.7	0.86	18.9
28	1601	26	6	19.7	0.88	19.2
29	1602	26	6	19.7	0.88	19.2
30	1603	25	6	19.7	0.88	18.6
31	1604	25	6	19.7	0.88	18.0
32	1605	26	6	19.7	0.85	18.3
33	1606	25	6	19.7	0.86	18.3
34	1607	25	6	19.7	0.85	18.0
35	1608	26	6	19.7	0.85	17.7
36	1609	26	6	19.7	0.85	17.4
37	1610	26	6	19.7	0.85	18.6
38	1611	27	6	19.7	0.86	18.3
39	1612	25	6	19.7	0.85	18.9
40	1613	26	6	19.7	0.84	19.8
41	1614	26	6	19.7	0.85	19.2
42	1615	27	6	19.7	0.85	20.1
43	1616	25	6	19.7	0.86	20.4
44	1617	28	6	19.7	0.87	21.6
45	1618	27	6	19.6	0.88	20.1
46	1619	27	6	19.7	0.81	23.4
47	1620	23	5	19.7	0.81	28.2
48	1621	11	3	21.0	0.15	19.8
49	1622	7	3	21.2	0.07	17.7
50	1623	4	2	21.3	0.05	16.8
51	1624	4	1	21.3	0.05	16.8
52	1625	4	1	21.3	0.05	16.5
53	1626	4	1	21.3	0.05	15.6
54	1627	4	1	21.3	0.05	12.0
55	1628	4	1	21.3	0.05	11.7
56	1629	5	1	21.4	0.05	25.2
57	1630	32	3	21.0	0.34	20.7
58	1631	25	5	20.1	0.73	15.3
59	1632	23	5	19.9	0.80	15.3
60	1633	21	6	19.8	0.83	15.9
61	1634	22	6	19.8	0.83	16.5
AVERAGE		22.3	5.1	20.00	0.72	19.2
FINAL ZERO		1.8	1	0.3	-0.02	1.2
FINAL UPSCALE		103.0	49	20.9	5.53	28.8
CORR. FOR Z/S			4.6	19.73	0.71	

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CO INSTRUMENT CALIBRATION BIAS AND DRIFT (AS PER EPA METHOD 10)

INSTRUMENT SPAN (PPM) 300
CLIENT: WILLAMETTE INDUSTRIES
SOURCE: VENEER DRYER #2
LOCATION: SPRINGFIELD, OR
DATE: JUNE 1, 1998

ANALYZER CALIBRATION DATA

	CYLINDER NUMBER	CYLINDER VALUE (ppm)	ANALYZER CALIBRATION RESPONSE (ppm)	ABSOLUTE DIFFERENCE (ppm)	ANALYZER CALIBRATION ERROR (% of span)
Zero Gas	CC105497	0.0	0.4	0.4	0.1
Mid-range gas	CC12295	101.4	103.4	2.0	0.7
High-range gas	CC56913	240.6	242.2	1.6	0.5

SYSTEM CALIBRATION BIAS AND DRIFT DATA

MEASUREMENT SYSTEM RESPONSE TIME (seconds): 25

	ANALYZER CALIBRATION RESPONSE (ppm)	INITIAL VALUES		FINAL VALUES		DRIFT (% of span)
		SYSTEM CALIBRATION RESPONSE (ppm)	SYSTEM CALIBRATION BIAS (% of span)	SYSTEM CALIBRATION RESPONSE (ppm)	SYSTEM CALIBRATION BIAS (% of span)	
RUN 1						
Zero Gas	0.4	0	-0.1	2	0.5	0.7
Upscale Gas	103.4	103	-0.1	104	0.2	0.3
RUN 2						
Zero Gas	0.4	2	0.5	1	0.2	-0.3
Upscale Gas	103.4	104	0.2	104	0.2	0.0
RUN 3						
Zero Gas	0.4	2	0.5	2	0.5	0.0
Upscale Gas	103.4	103	-0.1	101	-0.8	-0.7
RUN 4						
Zero Gas	0.4	2	0.5	2	0.5	0.0
Upscale Gas	103.4	104	0.2	103	-0.1	-0.3

NOx INSTRUMENT CALIBRATION BIAS AND DRIFT (AS PER EPA METHOD 7E)

INSTRUMENT SPAN (PPM) 100
CLIENT: WILLAMETTE INDUSTRIES
SOURCE: VENEER DRYER #2
LOCATION: SPRINGFIELD, OR
DATE: JUNE 1, 1998

ANALYZER CALIBRATION DATA

	CYLINDER NUMBER	CYLINDER VALUE (ppm)	ANALYZER CALIBRATION RESPONSE (ppm)	ABSOLUTE DIFFERENCE (ppm)	ANALYZER CALIBRATION ERROR (% of span)
Zero Gas	CC105497	0.0	0.0	0.0	0.0
Mid-range gas	CC12295	48.8	48.0	0.8	0.8
High-range gas	CC56913	83.5	83.5	0.0	0.0

SYSTEM CALIBRATION BIAS AND DRIFT DATA

MEASUREMENT SYSTEM RESPONSE TIME (seconds): 45

	ANALYZER CALIBRATION RESPONSE (ppm)	INITIAL VALUES		FINAL VALUES		DRIFT (% of span)
		SYSTEM CALIBRATION RESPONSE (ppm)	SYSTEM CALIBRATION BIAS (% of span)	SYSTEM CALIBRATION RESPONSE (ppm)	SYSTEM CALIBRATION BIAS (% of span)	
RUN 1						
Zero Gas	0.0	0	0.0	0	0.0	0.0
Upscale Gas	48.0	48	0.0	48	0.0	0.0
RUN 2						
Zero Gas	0.0	0	0.0	0	0.0	0.0
Upscale Gas	48.0	49	1.0	49	1.0	0.0
RUN 3						
Zero Gas	0.0	0	0.0	0	0.0	0.0
Upscale Gas	48.0	49	1.0	49	1.0	0.0
RUN 4						
Zero Gas	0.0	0	0.0	1	1.0	1.0
Upscale Gas	48.0	49	1.0	49	1.0	0.0

VOC INSTRUMENT CALIBRATION AND DRIFT (EPA METHOD 25A)

INSTRUMENT SPAN (ppm): 100
RESPONSE TIME (seconds): 30

CLIENT: WILLAMETTE INDUSTRIES
LOCATION: VENEER DRYER #2
SOURCE: SPRINGFIELD, OR
DATE: JUNE 1, 1998

INITIAL CALIBRATION ERROR TEST

	CYLINDER NUMBER	CALIBRATION GAS (ppm as C3H8)	CALIBRATION GAS (% of span)	INSTRUMENT RESPONSE (ppm as C3H8)	CALIBRATION ERROR (% of cal gas)
Zero Gas	CC105497	0.0	NA	0.0	
Low Level	CC12295	29.62	30	29.4	-0.7
Mid Level	CC56913	51.4	51	51.3	-0.2
High Level	CC74100	88.0	88	88.0	

SYSTEM DRIFT DATA

	INITIAL SYSTEM CALIBRATION RESPONSE (ppm as C3H8)	FINAL SYSTEM CALIBRATION RESPONSE (ppm as C3H8)	DRIFT (% of span)
RUN 1			
Zero Gas	0.0	0.0	0.0
Mid Level Gas	29.4	29.7	0.3
RUN 2			
Zero Gas	0.0	0.9	0.9
Mid Level Gas	29.7	29.7	0.0
RUN 3			
Zero Gas	0.3	0.9	0.6
Mid Level Gas	29.7	30.0	0.3
RUN 4			
Zero Gas	0.0	1.2	1.2
Mid Level Gas	29.7	28.8	-0.9

O2 INSTRUMENT CALIBRATION BIAS AND DRIFT (AS PER EPA METHOD 3A)

INSTRUMENT SPAN (%)	25
CLIENT:	WILLAMETTE INDUSTRIES
LOCATION:	VENEER DRYER #2
SOURCE:	SPRINGFIELD, OR
DATE:	JUNE 1, 1998

ANALYZER CALIBRATION DATA

	CYLINDER NUMBER	CYLINDER VALUE (% O2)	ANALYZER CALIBRATION RESPONSE (% O2)	ABSOLUTE DIFFERENCE (% O2)	ANALYZER CALIBRATION ERROR (% of span)
Zero Gas	CC12295	0.00	0.0	0.0	0.0
Mid-range gas	CC449	12.01	12.3	0.3	1.2
High-range gas	CC105497	20.43	20.6	0.2	0.7

SYSTEM CALIBRATION BIAS AND DRIFT DATA

MEASUREMENT SYSTEM RESPONSE TIME (seconds): 45

	ANALYZER CALIBRATION RESPONSE (% O2)	INITIAL VALUES		FINAL VALUES		DRIFT (% of span)
		SYSTEM CALIBRATION RESPONSE (% O2)	SYSTEM CALIBRATION BIAS (% of span)	SYSTEM CALIBRATION RESPONSE (% O2)	SYSTEM CALIBRATION BIAS (% of span)	
RUN 1						
Zero Gas	0.0	0.1	0.4	0.3	1.2	0.8
Upscale Gas	20.6	20.5	-0.4	21.0	1.6	2.0
RUN 2						
Zero Gas	0.0	0.3	1.2	0.3	1.2	0.0
Upscale Gas	20.6	20.5	-0.4	20.6	0.0	0.4
RUN 3						
Zero Gas	0.0	0.3	1.2	0.3	1.2	0.0
Upscale Gas	20.6	20.5	-0.4	20.3	-1.2	-0.8
RUN 4						
Zero Gas	0.0	0.4	1.6	0.3	1.2	-0.4
Upscale Gas	20.6	20.5	-0.4	20.9	1.2	1.6

CO2 INSTRUMENT CALIBRATION BIAS AND DRIFT (AS PER EPA METHOD 3A)

INSTRUMENT SPAN (%) 10
CLIENT: WILLAMETTE INDUSTRIES
LOCATION: VENEER DRYER #2
SOURCE: SPRINGFIELD, OR
DATE: JUNE 1, 1998

ANALYZER CALIBRATION DATA

	CYLINDER NUMBER	CYLINDER VALUE (% CO2)	ANALYZER CALIBRATION RESPONSE (% CO2)	ABSOLUTE DIFFERENCE (% CO2)	ANALYZER CALIBRATION ERROR (% of span)
Zero Gas	CC105497	0.00	0.05	0.05	0.5
Mid-range gas	CC12295	5.58	5.59	0.01	0.1
High-range gas	CC56913	8.54	8.56	0.02	0.2

SYSTEM CALIBRATION BIAS AND DRIFT DATA

MEASUREMENT SYSTEM RESPONSE TIME (seconds): 45

	ANALYZER CALIBRATION RESPONSE (% CO2)	INITIAL VALUES		FINAL VALUES		DRIFT (% of span)
		SYSTEM CALIBRATION RESPONSE (% CO2)	SYSTEM CALIBRATION BIAS (% of span)	SYSTEM CALIBRATION RESPONSE (% CO2)	SYSTEM CALIBRATION BIAS (% of span)	
RUN 1						
Zero Gas	0.05	0.05	0.0	-0.11	-1.6	-1.6
Upscale Gas	5.59	5.59	0.0	5.56	-0.3	-0.3
RUN 2						
Zero Gas	0.05	-0.01	-0.6	-0.09	-1.4	-0.8
Upscale Gas	5.59	5.55	-0.4	5.51	-0.8	-0.4
RUN 3						
Zero Gas	0.05	0.05	0.0	0.06	0.1	0.1
Upscale Gas	5.59	5.53	-0.6	5.56	-0.3	0.3
RUN 4						
Zero Gas	0.05	0.05	0.0	-0.02	-0.7	-0.7
Upscale Gas	5.59	5.56	-0.3	5.53	-0.6	-0.3

PRODUCTION CERTIFICATION SHEET

Project #: 98-092D

Plant: Willamette Industries

Location: Springfield, OR

I hereby certify that the following exhibits related to the plant/facility operation during the testing procedures are accurate and valid to the best of my knowledge.

Site Representative: Jackie Turcke *
Signature

Name (please print): Jackie Turcke

Title: Env. Technician, Burr Assoc. Inc.

* Production data recorded and calculated by Willamette Ind. personnel

Willamette Industries, Inc.
Springfield Plywood

Date:	6/1/98
Dryer No.	2
Test No.	1
Specie	Fir
Thickness	0.169
Width	53
Moisture	Heart
Drying Time of Test	96 Minutes

Production	**Dry**	**Wet**	**Total**
3/8's ftg	23,305	1,287	24,592
3/8's ftg by hour	14,571	799	15,370

Date:	6/1/98
Dryer No.	2
Test No.	2
Specie	Fir
Thickness	0.169
Width	53
Moisture	Heart
Drying Time of Test	94 Minutes

Production	**Dry**	**Wet**	**Total**
3/8's ftg	19,156	1,895	21,051
3/8's ftg by hour	13,128	309	13,437

Willamette Industries, Inc.
Springfield Plywood

Date:	6/1/98
Dryer No.	2
Test No.	3
Specie	Fir
Thickness	0.169
Width	53
Moisture	Sap
Drying Time of Test	94 Minutes

Production	**Dry**	**Wet**	**Total**
3/8"s ftg	8,631	2,434	11,065
3/8's ftg by hour	5,508	1,554	7,063

Date:	6/1/98
Dryer No.	2
Test No.	4
Specie	Fir
Thickness	0.169
Width	53
Moisture	Sap
Drying Time of Test	99 Minutes

Production	**Dry**	**Wet**	**Total**
3/8's ftg	9,237	3,245	12,482
3/8's ftg by hour	5,598	1,967	7,565

WILLAMETTE INDUSTRIES, INC.
Springfield Division

DRYER TEST RUN

Test No. 1 Date: 6-1-98

Dryer No. 2 Time Started: 7:38 Ended: 9:22

Fuel Cell Bark: n/a Test Run Specie: 1/6 D. Fir ♡ 53's

	Time Monitored	Speed
DRYING SPEED	7:38	10.2 min
	7:58	10.8 ✓
	8:20	11.4 ✓
	8:52	11.4 ✓
	9:08	11.4 ✓

	Time	Gr. End Nor./South	Hot End Nor./South	Chart	Fuel Cell
OPERATING TEMP.	7:39	475-440	255-255	440	n/a
	7:57	470-440	250-250	430	↓
	8:22	475-445	255-255	450	↓
	8:53	450-420	235-230	375	↓
	9:06	475-445	240-245	430	↓

COMMENTS: Down Time: 8:40 To 8:48 (8 minutes)

Chain off of unloader roll.

WILLAMETTE INDUSTRIES, INC.
Springfield Division

DRYER TEST RUN

Test No. 2 **Date:** 6-1-98

Dryer No. 2 **Time Started:** 10:04 **Ended:** 11:38

Fuel Cell Bark: n/a **Test Run Specie:** 1/6 Fir ♡ 53's

	Time Monitored	Speed
DRYING SPEED	10:10	11.6 min
	10:28	11.7 ✓
	10:46	11.7 ✓
	11:05	11.7 ✓
	11:28	11.7 ✓

	Time	Gr. End not-sorted	Hot End not-sorted	Chart	Fuel Cell
OPERATING TEMP.	10:07	485-455	255-255	450°	na
	10:27	470-440	255-255	445	
	10:44	480-445	253-253	445	
	11:06	495-460	263-262	460	
	11:29	485-450	262-257	450	

COMMENTS:

WILLAMETTE INDUSTRIES, INC.
Springfield Division

DRYER TEST RUN

Test No. 3 **Date:** 6-1-98

Dryer No. 2 **Time Started:** 12:45 **Ended:** 2:19

Fuel Cell Bark: n/a **Test Run Specie:** 1/6 D. Fir Sap 53's

	Time Monitored	Speed
DRYING SPEED	12:50	23.4 min
	1:08	23.8 ✓
	1:28	24.6 ✓
	1:54	24.5 ✓
	2:10	24.5 ✓

	Time	Gr. End (Not - South)	Hot End (Not - South)	Chart	Fuel Cell
OPERATING TEMP.	12:47	545-500	275-280	520°	n/a
	1:10	535-490	270-265	500	↓
	1:27	535-505	260-260	495	↓
	1:55	555-520	267-265	510	↓
	2:08	545-510	270-275	510	↓

COMMENTS:

WILLAMETTE INDUSTRIES, INC.
Springfield Division

DRYER TEST RUN

Test No. 4 **Date:** 6-1-98

Dryer No. 2 **Time Started:** 3:03 **Ended:** 4:42

Fuel Cell Bark: n/a **Test Run Specie:** 1/6 D. Fir Sap 53's

	Time Monitored	Speed
DRYING SPEED		

	Time	Gr. End (Spot-South)	Hot End (Spot-South)	Chart	Fuel Cell
OPERATING TEMP.	3:05	500-455	270-265	490°	na
	3:26	506-467	255-255	480	
	3:45	515-505	255-260	495	
	4:05	555-530	270-270	515	
	4:21	570-465	275-250	545	

COMMENTS: Down Time - (5 minutes) Temperature drop in the dryer.

Willamette Industries, Inc.
Springfield Plywood

Date:	6/2/98
Dryer No.	1
Test No.	1
Specie	Fir
Thickness	0.169
Width	53
Moisture	Heart
Drying Time of Test	100 Minutes

Production	Dry	Wet	Total
3/8's ftg	18,063	559	18,622
3/8's ftg by hour	10,838	335	11,173

Date:	6/2/98
Dryer No.	1
Test No.	2
Specie	Fir
Thickness	0.169
Width	53
Moisture	Heart
Drying Time of Test	95 Minutes

Production	Dry	Wet	Total
3/8"s ftg	17,618	734	18,352
3/8's ftg by hour	11,127	464	11,591

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Willamette Industries, Inc.
Springfield Plywood

Date:	6/2/98
Dryer No.	1
Test No.	3
Specie	Fir
Thickness	0.169
Width	Random
Moisture	Sap
Drying Time of Test	93 Minutes

Production	Dry	Wet	Total
3/8's ftg	8,844	274	9,118
3/8's ftg by hour	5,707	176	5,883

Date:	6/2/98
Dryer No.	1
Test No.	4
Specie	Fir
Thickness	0.169
Width	Random
Moisture	Sap
Drying Time of Test	96 Minutes

Production	Dry	Wet	Total
3/8"s ftg	12,529	388	12,917
3/8's ftg by hour	7,831	242	8,073

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WILLAMETTE INDUSTRIES, INC.
Springfield Division

DRYER TEST RUN

Test No. 1 **Date:** 6-2-98

Dryer No. 1 **Time Started:** 7:45 **Ended:** 9:25

Fuel Cell Bark: n/a **Test Run Specie:** 1/6 FIR O.S. ♡ 53's

	Time Monitored	Speed
DRYING SPEED	7:51	11.3 min.
	8:10	10.9 "
	8:27	11.0 "
	8:52	10.8 "
	9:10	10.7 "

	Time	Gr. End	Hot End (not-scaled)	Chart	Fuel Cell
OPERATING TEMP.	7:47		435-405	394°	na
	8:05		445-400	398	
	8:28		450-410	395	
	8:50		455-420	395	
	9:12		455-420	397	

COMMENTS:

WILLAMETTE INDUSTRIES, INC.
Springfield Division

DRYER TEST RUN

Test No. 2 **Date:** 6-2-98

Dryer No. 1 **Time Started:** 10:06 **Ended:** 11:41

Fuel Cell Bark: na **Test Run Specie:** 1/6 FIR 0.5. 87 53%

	Time Monitored	Speed
DRYING SPEED	10:10	10.7 min.
	10:30	10.9 ✓
	10:56	10.9 ✓
	11:13	11.0 ✓
	11:30	10.9 ✓

	Time	Gr. End	Hot End (not - smtl)	Chart	Fuel Cell
OPERATING TEMP.	10:06		465-410	395°	na
	10:31		455-420	395	
	10:58		450-410	397	
	11:14		445-420	395	
	11:31		455-410	397	

COMMENTS:

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WILLAMETTE INDUSTRIES, INC.
Springfield Division

DRYER TEST RUN

Test No. 3 Date: 6-2-98

Dryer No. 1 Time Started: 12:34 Ended: 2:07

Fuel Cell Bark: na Test Run Specie: 1/6 FIR Sap Strip

DRYING SPEED

Time Monitored	Speed
12:41	21. min.
1:00	21. ✓
1:25	21.2 ✓
1:43	20.9 ✓
1:58	20.5 ✓

OPERATING TEMP.

Time	Gr. End	Hot End (Nor.-South)	Chart	Fuel Cell
12:43	205°	460-435	411°	na
1:02	205	465-420	408	↓
1:27	210	465-420	414	↓
1:44	210	465-435	406	↓
1:59	210	465-430	407	↓

COMMENTS:

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WILLAMETTE INDUSTRIES, INC.
Springfield Division

DRYER TEST RUN

Test No. 4 Date: 6-2-98

Dryer No. 1 Time Started: 2:39 Ended: 4:15

Fuel Cell Bark: na Test Run Specie: 1/6 Fir Sap Strips

DRYING SPEED

Time Monitored	Speed
2:46	19.2 min.
3:04	19.4 ✓
3:21	19.5 ✓
3:44	19.5 ✓
4:06	19.5 ✓

OPERATING TEMP.

Time	Gr. End	Hot End 401 - South	Chart	Fuel Cell
2:48	210°	465-420	408°	na
3:06	210	465-435	407°	↓
3:23	210	465-420	410	↓
3:46	210	465-430	408	↓
4:08	205	460-425	410	↓

COMMENTS:

BWR
environmental consultants

May 26, 1998

Jerry Boyum
Lane Regional Air Pollution Authority
225 N. 5th, Suite 501
Springfield, Oregon 97477

REGARDING: EMISSIONS TESTING AT WILLAMETTE INDUSTRIES, INC., SPRINGFIELD PLYWOOD.

Dear Jerry:

This correspondence is to notify the Agency of the pending source test for the above-referenced facility, scheduled for June 1 & 2, 1998. The purpose of the testing is to develop emission factors for direct fired natural gas veneer dryers. Unless changed by the Agency, this notice also serves as the approved source test plan.

1. Sources to be Tested: Two direct fired veneer dryers.

2. Source Description: Two longitudinal veneer dryers (one Prentice and one Coe) direct-fired by hogged wood waste or natural gas.

3. Pollutant(s) to be Monitored:
   - Total Particulate
   - Oxides of Nitrogen
   - Carbon Monoxide
   - Volatile Organic Compounds, including Formaldehyde

4. Methods Approved:

Flow Rate:	EPA Methods 1, 2, 3A, & 4
Particulate:	ODEQ Method 7
Oxides of Nitrogen:	EPA Method 7E
Carbon Monoxide:	EPA Method 10
Volatile Organic Compounds:	
✔FID Detectable	EPA Method 25A
✔Formaldehyde	NCASI Method

5. Number of Sampling Replicates: The number of sampling replicates will vary pending results of in-field data analysis. At this time, the following is scheduled on each dryer:

Flow Rate:	Four one-hour measurements
Particulate:	Four one-hour measurements
Oxides of Nitrogen:	Four one-hour measurements
Carbon Monoxide:	Four one-hour measurements
Volatile Organic Compounds:	Four one-hour measurements

6. Source Testing Personnel: Four BWR Associates, Inc. representatives

7. Source Site Personnel Contact: Kathy Sperle
Telephone: (541) 924-5384

8. Applicable Process/Production Information to be Collected by Willamette Industries and is to include:

DRYER INFORMATION
- Dryer Production, ft^2/hr (3/8")
- Veneer Species & size
- Dryer Speed
- Redry Rate, %
- Dryer Temperatures by Zones

9. Special sampling considerations, including sampling site configurations, equipment limitations, special methods, etc.:

The exhaust of each veneer dryer will be tested individually prior to the wet ESP. Each dryer will be direct fired by natural gas..

10. Other Process Considerations, including intermittent production, special feed or product, etc.: Testing is to be conducted while processing Douglas Fir Veneer, Sap & Heart.

In no case will sampling replicate(s) be accepted if separated by a time duration of twenty-four (24) or more hours, unless prior authorization is granted by the Agency.

If you have any questions, or need additional information, please let me know.

Sincerely,

Jackie Fourche
FOR

Mark W. Bailey
Director of Air Quality Services

cc: Kathy Sperle, Willamette Industries, Incorporated

WILLAMETTE INDUSTRIES, INC.
SPRINGFIELD PLYWOOD

DATE	6/1/98
DRYER NO.	2
TEST NO.	2
SPIECES	FIR
THICKNESS	0.169
WIDTH	53
MOISTURE	HEART
DRYING TIME OF TEST	94 MIN.
DOWN TIME	0 MIN.

	METHOD # 1	METHOD # 2			METHOD # 3		
	INFEED FACTORS	48 X 96 OUTFEED			101.5 X 51 OUTFEED		
	TOTAL	DRY	WET	TOTAL	DRY	WET	TOTAL
3/8'S FTG	21,051	20,884	2,067	22,951	23,462	2,322	25,784
3/8'S FTG BY HOUR	13,437	13,330	1,319	14,649	14,975	1,482	16,457

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WILLAMETTE INDUSTRIES, INC.
SPRINGFIELD PLYWOOD

JUN 0 5 1998

DATE	6/1/98
DRYER NO.	2
TEST NO.	1
SPIECES	FIR
THICKNESS	0.169
WIDTH	53
MOISTURE	HEART
DRYING TIME OF TEST	96 MIN.
DOWN TIME	8 MIN.

Mark,
Use the Footage listed under Method #2.
Thanks,
Kathy

	METHOD # 1	METHOD # 2			METHOD # 3		
	INFEED FACTORS	48 X 96 OUTFEED			101.5 X 51 OUTFEED		
	TOTAL	DRY	WET	TOTAL	DRY	WET	TOTAL
3/8'S FTG	24,592	21,120	1,166	22,286	23,622	6,538	30,160
3/8'S FTG BY HOUR	15,370	13,200	729	13,929	14,763	4,086	18,549

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WILLAMETTE INDUSTRIES, INC.
SPRINGFIELD PLYWOOD

ATE	6/1/98
RYER NO.	2
EST NO.	4
PIECES	FIR
HICKNESS	0.169
IDTH	53
IOISTURE	SAP
RYING TIME OF TEST	99 MIN.
OWN TIME	5 MIN.

	METHOD # 1	METHOD # 2			METHOD # 3		
	INFEED FACTORS	48 X 96 OUTFEED			101.5 X 51 OUTFEED		
	TOTAL	DRY	WET	TOTAL	DRY	WET	TOTAL
/8'S FTG	12,482	11,001	3,780	14,781	12,359	4,247	16,606
/8'S FTG BY HOUR	7,565	6,667	2,291	8,958	7,490	2,574	10,064

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WILLAMETTE INDUSTRIES, INC.
SPRINGFIELD PLYWOOD

DATE	6/1/98
DRYER NO.	2
TEST NO.	3
SPIECES	FIR
THICKNESS	0.169
WIDTH	53
MOISTURE	SAP
DRYING TIME OF TEST	94 MIN.
DOWN TIME	0 MIN.

	METHOD # 1	METHOD # 2			METHOD # 3		
	INFEED FACTORS	48 X 96 OUTFEED			101.5 X 51 OUTFEED		
	TOTAL	DRY	WET	TOTAL	DRY	WET	TOTAL
3/8'S FTG	11,065	9,076	2,576	11,652	10,196	2,895	13,091
3/8'S FTG BY HOUR	7,062	5,793	1,717	7,510	6,508	1,849	8,357

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WILLAMETTE INDUSTRIES, INC.
SPRINGFIELD PLYWOOD

ATE	6/2/98
YER NO.	1
ST NO.	2
IECES	FIR
ICKNESS	0.169
DTH	53
ISTURE	HEART
YING TIME OF TEST	95 MIN.
WN TIME	0 MIN.

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	METHOD # 1			METHOD # 2			METHOD # 3		
	INFEED FACTORS			48 X 96 OUTFEED			101.5 X 51 OUTFEED		
	Dry	Wet	TOTAL	DRY	WET (4%)	TOTAL	DRY	WET	TOTAL
S FTG	17619	734	18,352	20,658	878	21,536	23,208	986	24,194
S FTG BY HOUR	11121	464	11,591	13,047	555	13,602	14,657	623	15,280

WILLAMETTE INDUSTRIES, INC.
SPRINGFIELD PLYWOOD

DATE	6/2/98
DRYER NO.	1
TEST NO.	1
SPIECES	FIR
THICKNESS	0.169
WIDTH	53
MOISTURE	HEART
DRYING TIME OF TEST	100 MIN.
DOWN TIME	0 MIN.

	METHOD # 1			METHOD # 2			METHOD # 3		
	INFEED FACTORS			48 X 96 OUTFEED			101.5 X 51 OUTFEED		
	Dry	Wet	TOTAL	DRY	WET (3%)	TOTAL	DRY	WET	TOTAL
1/8'S FTG	19063	559	18,622	21,734	736	22,470	24,417	827	25,244
1/8'S FTG BY HOUR	10983	335	11,173	13,040	441	13,481	14,650	496	15,146

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WILLAMETTE INDUSTRIES, INC.
SPRINGFIELD PLYWOOD

DATE	6/2/98
DRYER NO.	1
TEST NO.	4
specie ~~SPIECES~~	FIR
THICKNESS	0.169
WIDTH	RW
MOISTURE	SAP
DRYING TIME OF TEST	96 MIN.
DOWN TIME	0 MIN.

	METHOD # 1			METHOD # 2			METHOD # 3		
	INFEED FACTORS			48 X 96 OUTFEED			101.5 X 51 OUTFEED		
	Dry	Wet	TOTAL	DRY	WET 3%	TOTAL	DRY	WET	TOTAL
1/8'S FTG	12529	388	12,917	11,019	396	11,415	12,310	420	12,730
1/8'S FTG BY HOUR	7,831	242	8,073	6,887	248	7,134	7,694	263	7,956

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WILLAMETTE INDUSTRIES, INC.
SPRINGFIELD PLYWOOD

DATE	6/2/98
DRYER NO.	1
TEST NO.	3
SPIECES	FIR
THICKNESS	0.169
WIDTH	RW
MOISTURE	SAP
DRYING TIME OF TEST	93 MIN.
DOWN TIME	0 MIN.

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	METHOD # 1			METHOD # 2			METHOD # 3		
	INFEED FACTORS			48 X 96 OUTFEED			101.5 X 51 OUTFEED		
	Dry	Wet	TOTAL	DRY	WET 3%	TOTAL	DRY	WET	TOTAL
3/8'S FTG	8844	274	9,118	8,916	304	9,220	9,626	727	10,353
3/8'S FTG BY HOUR	5707	176	5,883	5,753	196	5,949	6,211	469	6,680