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Emerson, LA facility
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DEECO™
P.O. Box 4159
Cary, NC 27519
1-800-733-3261 Fax (919) 250-1835

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FORMALDEHYDE, TOTAL HYDROCARBONS, AND METHANE EMISSIONS FROM FOUR PROCESS STACKS

WILLAMETTE INDUSTRIES, INC.
EMERSON, ~~ARKANSAS~~ LA LA.

AUTHOR: William Buynitzky

TEST DATES: April 23-24, 1998

FIELD TEAM: W. Buynitzky, M. Milborne, D. Goshaw, A. Bass, and W. Millnor

PREPARED FOR: Willamette Industries, Inc.

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1.0 INTRODUCTION

DEECO, Inc. (DEECO) was contracted to conduct emissions testing at Willamette Industries, Inc. (Willamette) facility located in Emerson Arkansas. Emissions testing was conducted during the period of April 23 and 24, 1998 to gather emissions data for the veneer dryer stacks. There are three drying zones and one cooling zone.

All four of the sources were tested for the same components. Each location was tested for Total Hydrocarbons, Methane, Carbon Dioxide, Oxygen, and formaldehyde. The Veneer Dryer Heating Vents are referred to as No. 1, No. 2, and No. 3 starting at the feed end and ending before the cooling zone.

In conjunction with the manual sampling, the gas stream temperature, flow rate, and moisture were determined employing EPA Methods 2, and 4, respectively. The gas stream dry molecular weight was based upon results of method 3A analysis. The NCASI Chilled Impinger method was used to measure formaldehyde. Three one-hour test runs were conducted for each compound of interest at each of the sampling locations.

Organic and inorganic gases were monitored with EPA instrumental methods. Volatile organic compounds (VOCs) were monitored using EPA Method 25A.

Mr. Kim Carter and Ms. Nita Woods were the Willamette contacts on-site. The DEECO field sampling team consisted of: A. Bass, W. Buynitzky, D. Goshaw, M. Milbourne, and W. Millinor.

The remainder of this document summarizes the results, procedures, and quality control measures followed for this program. Section 2 contains tabulated air emission results for each parameter of interest. Section 3 summarizes the air emission sampling and analytical procedures performed by DEECO, with a brief description and/or reference to the applicable methodologies. Section 4 discusses the basic quality control elements in place for this program to assure the collection of representative, accurate air emission data.

The appendices provided in this document contain all of the necessary information to verify the reported results. Included as Appendices are: Field Data Sheets, Analytical Data Sheets, Equipment Calibration Data Sheets, Emission Summary Sheets, and Test Participants.

2.0 SUMMARY OF RESULTS

The emission test results are presented below by the process stack and condition tested. Condition 1 was tested on April 23, 1998 and Condition 2 was tested on April 24, 1998.

2.1 Dryer Vent #1

The first section of the dryer is natural gas fired. The products of combustion, and the removed water and organics from the veneer exit from a single process vent stack. Table 2.1 summarizes the No. 1 dryer stack condition 1 emission results for formaldehyde, THC, and methane, and Table 2.5 summarizes the same parameters for condition 2.

2.1.1 Dryer Vent #1, Condition 1

The flowrate from the No. 1 stack averaged 2830 actual cubic feet per minute (acfm) and 715 dry standard cubic feet per minute (dscfm), at an average stack temperature of 429.6 °F. The NCASI result averages for formaldehyde are: 151.4 milligrams per cubic meter (mg/M^3) and 0.501 lb/hr. The EPA Method 25A emission results averaged 5277 parts per million by volume (ppmv) and 14.1 lb/hr non-methane total hydrocarbons when reported in an as carbon basis.

2.1.2 Dryer Vent #1, Condition 2

The flowrate from the No. 1 stack averaged 3060 acfm and 714 dscfm, at an average stack temperature of 434.7 °F. The NCASI result averages for formaldehyde are: 115.6 milligram per cubic meter (mg/M^3) and 0.389 lb/hr. The EPA Method 25A emission results averaged 3277 ppmv and 10.5 lb/hr non-methane total hydrocarbons when reported on an as carbon basis.

2.2 Dryer Vent #2

The second section of the dryer uses steam as the heat source to remove moisture from the veneer to be dried. The removed water and organics from the veneer exit from a single process vent stack. Table 2.2 summarizes the No. 2 dryer stack condition 1 emission results for formaldehyde, THC, and methane, while Table 2.6 presents the results from condition 2.

2.2.1 Dryer Vent #2, Condition 1

The flowrate from the No. 2 stack averaged 4360 acfm and 937 dscfm, at an average stack temperature of 330.1 °F. The NCASI result averages for formaldehyde are: 57.9 milligram per cubic meter (mg/M^3) and 0.256 lb/hr. The EPA Method 25A emission results averaged 2049 ppmv and 5.5 lb/hr non-methane total hydrocarbons when reported in an as carbon basis.

2.2.2 Dryer Vent #2, Condition 2

The flowrate from the No. 2 stack averaged 4390 actual cubic feet per minute (acfm) and 1090 dscfm, at an average stack temperature of 332.6 °F. The NCASI result averages for formaldehyde are: 54.5 milligram per cubic meter (mg/M^3) and 0.278 lb/hr. The EPA Method 25A emission results averaged 2103 parts per million by volume (ppmv) and 11.1 lb/hr non-methane total hydrocarbons when reported in an as carbon basis.

2.3 Dryer Vent #3

The third section of the dryer uses steam as the heat source to remove moisture from the veneer to be dried. The removed water and organics from the veneer exit from a single process vent stack. Table 2.3 summarizes the No. 3 dryer stack condition 1 emission results for formaldehyde, THC, and methane, and Table 2.7 presents the results from condition 2.

2.3.1 Dryer Vent #3, Condition 1.

The flowrate from the No. 3 stack averaged 2546 acfm and 858 dscfm, at an average stack temperature of 322.8 °F . The NCASI result averages for formaldehyde are: 12.2 mg/M^3 and 0.05 lb/hr. The EPA Method 25A emission results averaged 1379 parts per million by volume (ppmv) and 4.3 lb/hr non-methane total hydrocarbons when reported on an as carbon basis.

2.3.2 Dryer Vent #3, Condition 2.

The flowrate from the No. 3 stack averaged 2530 acfm and 1070 dscfm, at an average stack temperature of 321.8 °F. The NCASI result averages for formaldehyde are: 9.9 milligram per cubic meter (mg/M^3) and 0.05 lb/hr. The EPA Method 25A emission results averaged 1692 parts per million by volume (ppmv) and 5.3 lb/hr non-methane total hydrocarbons when reported in an as carbon basis.

2.4 Cooling Zone Vent

The second section of the dryer uses steam as the heat source to remove moisture from the veneer to be dried. The removed water and organics from the veneer exit from a single process vent stack. Table 2.4 summarizes the No. 3 dryer stack emission results for condition 1, and Table 2.8 summarizes the results for condition 2.

2.4.1 Cooling Zone, Condition 1

The flowrate from the No. 3 stack averaged 16380 acfm and 14600 dscfm, at an average stack temperature of 97.6 °F. The NCASI result averages for formaldehyde are: <0.07 mg/M^3 and <0.005 lb/hr. For this condition, all formaldehyde samples were below the detection limit of the analysis performed. The reported detection limits have been used to calculate potential emission rates. The EPA Method 25A emission results averaged 18 ppmv and 0.3 lb/hr non-methane total hydrocarbons when reported on an as carbon basis.

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2.4.2 Cooling Zone, Condition 2

The flowrate from the No. 3 stack averaged 19950 acfm and 16730 dscfm, at an average stack temperature of 113.2 °F. The NCASI result averages for formaldehyde are: <0.04 mg/M^3 and <0.003 lb/hr. For this condition, all formaldehyde samples were below the detection limit of the analysis performed. The reported detection limits have been used to calculate potential emission rates. The EPA Method 25A emission results averaged 17.0 ppmv and 0.3 lb/hr non-methane total hydrocarbons when reported in an as carbon basis.

2.5 Veneer Dryer Operations

The veneer dryer operating conditions were monitored and recorded by facility staff. Testing was conducted under two operating conditions. As shown in Table 2.9, Condition 1 veneer dried in footage at 3/8" was an hourly average of 23,619 with an average moisture content of 10.35%. As shown in Table 2.10, Condition 2 veneer dried in footage at 3/8" was an hourly average of 20,900 with an average moisture content of 6.95%. The process data sheets and charts are presented in Appendix E.

TABLE 2.1. SUMMARY OF VENEER DRYER VENT NO. 1 EXHAUST EMISSION RESULTS, CONDITION 1 - APRIL 23, 1998 AT WILLAMETTE INDUSTRIES, EMERSON DIVISION

	Units	Run #1	Run #2	Run #3	Average
Parameter	Time	1041-1140	1415-1514	1615-1714	NA
Flow Rate	acfm	2440	2980	3070	2830
	dscfm	555	693	899	715
Moisture	%	61.8	60.8	50.7	57.8
Oxygen	%	3.4	3.2	3.2	3.3
Carbon Dioxide	%	8.5	8.7	8.7	8.6
Total Hydrocarbons	ppm (as Propane)	1534	2021	1752	1769
	ppm (as Carbon)	4602	6063	5256	5277
	lb/hr (as Carbon)	12.5	20.0	17.9	16.8
Methane	ppm (as Carbon)	1078	115	307	500
	lb/hr (as Carbon)	5.5	0.7	2.0	2.8
Total Non-Methane Hydrocarbons	lb/hr (as Carbon)	6.9	19.3	15.9	14.1
Formaldehyde	lb/hr	0.429	0.458	0.616	0.501
	lb/board ft	$1.77e^{-5}$	$1.99e^{-5}$	$2.60e^{-5}$	$2.12e^{-5}$
Production	footage/hr	24216	22968	23671	23619

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TABLE 2.2. SUMMARY OF VENEER DRYER VENT NO. 2 EXHAUST EMISSION RESULTS, CONDITION 1 - APRIL 23, 1998 AT WILLAMETTE INDUSTRIES, EMERSON DIVISION

	Units	Run #1	Run #2	Run #3	Average
Parameter	Time	1041-1140	1415-1514	1615-1714	NA
Flow Rate	acfm	4280	4350	4450	4360
	dscfm	872	937	1003	937
Moisture	%	69.5	67.8	66.2	67.8
Oxygen	%	13.8	14.0	13.5	13.8
Carbon Dioxide	%	3.2	2.8	3.7	3.2
Total Hydrocarbons	ppm (as Propane)	794	558	697	682
	ppm (as Carbon)	2382	1674	2091	2049
	lb/hr (as Carbon)	12.7	9.1	11.6	11.2
Methane	ppm (as Carbon)	1427	184	231	614
	lb/hr (as Carbon)	13.0	1.7	2.2	5.6
Total Non-Methane Hydrocarbons	lb/hr (as Carbon)	0.0	7.4	9.4	5.5
Formaldehyde	lb/hr	0.184	0.251	0.333	0.256
	lb/board ft	0.0000076	$10.93e^{-6}$	$14.07e^{-6}$	$10.87e^{-6}$
Production	footage/hr	24216	22968	23671	23619

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TABLE 2.3. SUMMARY OF VENEER DRYER VENT NO. 3 EXHAUST EMISSION RESULTS, CONDITION 1 - APRIL 23, 1998 AT WILLAMETTE INDUSTRIES, EMERSON DIVISION

	Units	Run #1	Run #2	Run #3	Average
Parameter	Time	1041-1140	1415-1514	1615-1714	NA
Flow Rate	acfm	2560	2550	2530	2550
	dscfm	865	849	860	858
Moisture	%	49.9	50.6	49.6	50.0
Oxygen	%	20.1	20.2	20.0	20.1
Carbon Dioxide	%	0.5	0.5	0.5	0.5
Total Hydrocarbons	ppm (as Propane)	504	414	461	460
	ppm (as Carbon)	1512	1242	1383	1379
	lb/hr (as Carbon)	4.9	4.0	4.4	4.4
Methane	ppm (as Carbon)	0.0	0.0	44.7	14.9
	lb/hr (as Carbon)	0.0	0.0	0.2	0.1
Total Non-Methane Hydrocarbons	lb/hr (as Carbon)	4.9	4.0	4.2	4.3
Formaldehyde	lb/hr	0.030	0.042	0.074	0.049
	lb/board ft	$1.24e^{-6}$	$1.83e^{-6}$	$3.13e^{-6}$	$2.07e^{-6}$
Production	footage/hr	24216	22968	23671	23619

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TABLE 2.4. SUMMARY OF VENEER DRYER COOLING VENT EMISSION RESULTS, CONDITION 1 - APRIL 23, 1998 AT WILLAMETTE INDUSTRIES, EMERSON DIVISION

	Units	Run #1	Run #2	Run #3	Average
Parameter	Time	1041-1140	1415-1514	1615-1714	NA
Flow Rate	acfm	16200	16050	16890	16380
	dscfm	14430	14250	15120	14600
Moisture	%	8.2	15.0	16.9	13.4
Oxygen	%	20.9	20.9	20.9	20.9
Carbon Dioxide	%	0.0	0.0	0.0	0.0
Total Hydrocarbons	ppm (as Propane)	0.4	8	9	6
	ppm (as Carbon)	1.2	24	27	18
	lb/hr (as Carbon)	0.0	0.7	0.8	0.6
Methane	ppm (as Carbon)	14.7	14.2	0.0	9.6
	lb/hr (as Carbon)	0.5	0.5	0.0	0.3
Total Non-Methane Hydrocarbons	lb/hr (as Carbon)	0.0	0.2	0.8	0.3
Formaldehyde[1]	lb/hr	<0.003	<0.006	<0.006	<0.005
	lb/board ft	$<1.2e^{-7}$	$<2.6e^{-7}$	$<2.5e^{-7}$	$<2.1e^{-7}$
Production	footage/hr	24216	22968	23671	23619

[1] - All formaldehyde samples collected on the cooler were below detection limits. Emissions are based upon reported detection limits.

TABLE 2.5. SUMMARY OF VENEER DRYER VENT NO. 1 EXHAUST EMISSION RESULTS, CONDITION 2 - APRIL 24, 1998 AT WILLAMETTE INDUSTRIES, EMERSON DIVISION

	Units	Run #1	Run #2	Run #3	Average
Parameter	Time	0916-1016	1050-1150	1351-1451	NA
Flow Rate	acfm	3230	3050	2910	3060
	dscfm	770	689	684	714
Moisture	%	59.2	61.4	60.9	60.6
Oxygen	%	10.4	9.5	7.8	9.2
Carbon Dioxide	%	5.8	6.0	6.8	6.2
Total Hydrocarbons	ppm (as Propane)	945	1251	1081	1092
	ppm (as Carbon)	2835	3753	3243	3277
	lb/hr (as Carbon)	10.0	12.5	10.6	11.0
Methane	ppm (as Carbon)	78.1	68.3	81.5	76.0
	lb/hr (as Carbon)	0.5	0.4	0.5	0.5
Total Non-Methane Hydrocarbons	lb/hr (as Carbon)	9.5	12.1	10.1	10.5
Formaldehyde	lb/hr	0.536	0.191	0.441	0.389
	lb/board ft	$25.3e^{-6}$	$9.19e^{-6}$	$21.3e^{-6}$	$18.6e^{-6}$
Production	footage/hr	21189	20777	20733	20900

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TABLE 2.6. SUMMARY OF VENEER DRYER VENT NO. 2 EXHAUST EMISSION RESULTS, CONDITION 2 - APRIL 24, 1998 AT WILLAMETTE INDUSTRIES, EMERSON DIVISION

	Units	Run #1	Run #2	Run #3	Average
Parameter	Time	0916-1016	1050-1150	1351-1451	NA
Flow Rate	acfm	4420	4390	4360	4390
	dscfm	1100	1080	1100	1090
Moisture	%	62.5	63.3	62.0	62.6
Oxygen	%	13.8	14.0	13.5	13.8
Carbon Dioxide	%	3.2	2.8	3.7	3.2
Total Hydrocarbons	ppm (as Propane)	710	708	686	701
	ppm (as Carbon)	2130	2124	2058	2103
	lb/hr (as Carbon)	11.7	11.6	11.2	11.5
Methane	ppm (as Carbon)	51.7	37.8	31.2	40.2
	lb/hr (as Carbon)	0.5	0.4	0.3	0.4
Total Non-Methane Hydrocarbons	lb/hr (as Carbon)	11.2	11.3	10.9	11.1
Formaldehyde	lb/hr	0.302	0.247	0.287	0.278
	lb/board ft	$1.43e^{-5}$	$1.19e^{-5}$	$1.38e^{-5}$	$1.33e^{-5}$
Production	footage/hr	21189	20777	20733	20900

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TABLE 2.7. SUMMARY OF VENEER DRYER VENT NO. 3 EXHAUST EMISSION RESULTS, CONDITION 2 - APRIL 24, 1998 AT WILLAMETTE INDUSTRIES, EMERSON DIVISION

	Units	Run #1	Run #2	Run #3	Average
Parameter	Time	0916-1016	1050-1150	1351-1451	NA
Flow Rate	acfm	2460	2670	2450	2530
	dscfm	1070	1150	1010	1070
Moisture	%	36.1	36.6	38.8	37.1
Oxygen	%	20.1	20.2	20.0	20.1
Carbon Dioxide	%	0.5	0.5	0.5	0.5
Total Hydrocarbons	ppm (as Propane)	580	565	547	564
	ppm (as Carbon)	1740	1695	1641	1692
	lb/hr (as Carbon)	5.4	5.7	5.0	5.4
Methane	ppm (as Carbon)	0.0	17.6	16.1	11.2
	lb/hr (as Carbon)	0.0	0.1	0.1	0.1
Total Non-Methane Hydrocarbons	lb/hr (as Carbon)	5.4	5.6	5.0	5.3
Formaldehyde	lb/hr	0.032	0.040	0.075	0.049
	lb/board ft	$1.51e^{-6}$	$1.93e^{-6}$	$3.62e^{-6}$	$2.35e^{-7}$
Production	footage/hr	21189	20777	20733	20900

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TABLE 2.8. SUMMARY OF VENEER DRYER COOLING VENT EMISSION RESULTS, CONDITION 2 - APRIL 24, 1998 AT WILLAMETTE INDUSTRIES, EMERSON DIVISION

	Units	Run #1	Run #2	Run #3	Average
Parameter	Time	0916-1016	1050-1150	1351-1451	NA
Flow Rate	acfm	19920	20020	19920	19950
	dscfm	16870	16690	16620	16730
Moisture	%	8.0	9.4	9.5[2]	9.0
Oxygen	%	20.9	20.9	20.9	20.9
Carbon Dioxide	%	0.0	0.0	0.0	0.0
Total Hydrocarbons	ppm (as Propane)	4.5	3.2	9.3	5.7
	ppm (as Carbon)	13.5	9.6	27.9	17.0
	lb/hr (as Carbon)	0.5	0.3	1.0	0.6
Methane	ppm (as Carbon)	18.5	0.0	5.4	8.0
	lb/hr (as Carbon)	0.8	0.0	0.2	0.3
Total Non-Methane Hydrocarbons	lb/hr (as Carbon)	0.0	0.3	0.8	0.3
Formaldehyde[1]	lb/hr	<0.004	<0.003	<0.003	<0.003
	lb/board ft	$<1.9e^{-7}$	$<1.4e^{-7}$	$<1.4e^{-7}$	$<1.6e^{-7}$
Production	footage/hr	21189	20777	20733	20900

[1] - All formaldehyde samples collected on the cooler were below detection limits. Emissions are based upon reported detection limits.

[2] - Based upon moisture as saturation. Measured moisture was 10.0%, which is greater than moisture at saturation, so the lesser value was used.

TABLE 2.9. VENEER DRYER #1 CONDITION 1 - APRIL 23, 1998[1] - AT WILLAMETTE INDUSTRIES, EMMERSON DIVISION

Test Run Number	Test Time Minutes	Dried Veneer Footage (3/8") Test	Dried Veneer Footage (3/8") Hourly	Avg. Measured Moisture Content %
1	66	26,638	24,216	11.25
2	62	23,734	22,968	10.22
3	62	24,460	23,671	9.59
Average Hourly Production Data			**23,619**	**10.35**

TABLE 2.10. VENEER DRYER #1 CONDITION 2 - APRIL 24, 1998[2] - AT WILLAMETTE INDUSTRIES, EMMERSON DIVISION

Test Run Number	Test Time Minutes	Dried Veneer Footage (3/8") Test	Dried Veneer Footage (3/8") Hourly	Avg. Measured Moisture Content %
1	61	21,542	21,189	8.07
2	60	20,777	20,777	6.80
3	62	21,424	20,733	5.99
Average Hourly Production Data			**20,900**	**6.95**

[1] Day one dryer production data represents veneer moisture content ranges for typical plywood manufacturing. See Attachment 1-1 in Appendix E.

[2] Day two dryer production data represents veneer moisture content ranges for manufacturing Laminated Veneer Lumber (LVL). See Attachment 1-2 in Appendix E

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3.0 SAMPLING AND ANALYTICAL PROCEDURES

All sampling and analytical procedures followed those recommended by the U.S. Environmental Protection Agency (EPA) Title 40, Part 60, Appendix A or Part 266, Appendix IX of the Code of Federal Regulations. The following specific methods were used:

EPA Method 1 for determination of sampling and traverse points;
EPA Method 2 for flue gas velocity and volummetric flow rate;
EPA Method 4 for flue gas moisture content;
EPA Method 10 for determination of CO concentrations;
EPA Method 25A for determination of THC concentrations;
NCASI Chilled Impinger Method for determination of formaldehyde concentrations.

3.1 Sampling Point Location, Flue Gas Velocity, and Volummetric Flow Rate Determination - EPA Methods 1 and 2

For all isokinetic sampling and velocity determination EPA Methods 1 and 2 were followed. Gas temperatures were measured using calibrated Type K thermocouples and digital readout devices. Gas stream velocity traverses were conducted in conjunction with each isokinetic sampling run using Type S pitot tubes. Gas stream velocity traverses were conducted immediately prior to each non-isokinetic sampling run (at the Hot Vents) using Type S pitot tubes.

3.1.1 Description of Veneer Dryer Vents Nos. 1, 2, and 3

The Veneer Dryer Vents are circular with an inside diameters of 22.5, 22, and 22 inches for dryer vents number 1, number 2, and number 3 respectively. The nearest disturbances were approximately 8 feet (about 4 duct diameters) upstream of the EPA Method 5 sample ports and 30 inches (about 1.2 duct diameters) downstream of the sample ports. Twenty-four traverse points were used, with twelve traverse points being measured in each of the two perpendicular sampling ports. This location met the minimum specifications for selection of a measurement site as outlined in EPA Method 1.

3.1.2 Description of Veneer Dryer Cooling Vent

The Cooling Vents are circular with an inside diameters 48.5 inches. The nearest disturbances was approximately 8 feet (2 duct diameters) upstream of the EPA Method 5 sample ports and 33 inches (greater than half a duct diameter) downstream of the sample ports. Twenty-four traverse points were used, with twelve traverse points being measured in each of the two perpendicular sampling ports. This location met the minimum specifications for selection of a measurement site as outlined in EPA Method 1.

There are three cooler vents on the veneer dryer. The first stack had visible emissions and was therefore selected as the cooler stack to be tested. The second stack had corroded and was not sufficient for testing. The last stack had no visible emissions, but was not tested. Due

to the location of stacks one and two, and the location of the sampling ports, only one of the ports could be traversed. This one port did traverse through the area of greatest expected concentration.

Gas samples for formaldehyde were collected and analyzed following the procedures described in the NCASI Chilled Impinger method for formaldehyde. Three midget impingers of the Greenburg-Smith design, each containing approximately 15 mL of DI water, were used to collect formaldehyde. The last impinger contained silica gel.

Initial and final leak check rates, recovery data, and train operation parameters for each test run can be found on the field data sheets in Appendix A.

The formaldehyde samples were quantitatively recovered from the impinger trains. The contents of the first three impingers were transferred to a labeled glass container with a Teflon-lined lid. The impingers and connecting glassware was rinsed three times with deionized water, and this rinse was combined with the aqueous sample.

The formaldehyde samples were analyzed by Enthalpy Analytical. The laboratory worksheets are reproduced in Appendix B.

3.2 Continuous Measurement THC

Flue gas from the stacks at each location was continuously extracted through a heated probe and passed through a Teflon mat filter housed in a heated compartment. The filtered gas sample was conveyed through a heated Teflon sample line to the monitoring trailer using a heated head sampling pump. Inside the trailer, a portion of the sample was directed to the THC analyzer through a heated sample line.

Carbon monoxide in the flue gas was measured continuously using the procedures outlined in EPA Method 10. A gas sample was transferred continuously to a Horiba ENDA 100 NDIR analyzer. Output from the analyzer was directed to a data acquisition system which recorded one-minute averages and plotted out the trace on a strip chart recorder.

Total hydrocarbons in the flue gas were measured continuously using the procedures outlined in EPA Method 25A. A heated gas sample was provided to a JUM Model VE-7 THC instrumental analyzer. Output from the analyzer was directed to a data acquisition system which recorded the one-minute averages and plotted the trace on a strip chart recorder.

The monitors were calibrated by sending calibration gases to the sample probe. With this method the calibration gases were passed through all the same sampling components as the flue gas sample. The monitoring system also had provisions for direct calibration of the monitors where required by the appropriate method.

4.0 QA/QC PROCEDURES

The objective of a quality assurance/quality control (QA/QC) program is to assure that the precision and accuracy of all environmental data generated by DEECO for clients are commensurate with data quality objectives (DQO's). DQO's are based on a common understanding of the intended end use(s) of the data, the measurement process, and the availability of resources. Once DQO's are established, formally or informally, QC protocol can be defined for the measurements. Although the data for this program was for Title V data reporting, the testing followed compliance testing procedures whenever possible.

All of the equipment used was calibrated according to the procedures outlined in the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, EPA-600/4-77-027b.

4.1 EPA Manual Method Sampling Equipment Calibrations

For manual sampling, the procedures and equipment used to measure stack gas velocity and temperature measurements and to determine the sample gas volume were subjected to pretest and posttest calibrations and/or inspections as required by the appropriate EPA methods.

4.1.1 Barometer

Barometric pressure values were obtained from a Casio barometer, calibrated against a mercury-in-glass barometer, and corrected for elevation to sample port level (0.01 inches Hg per 10 ft. elevation).

4.1.2 Pitot Tubes

Each pitot tube used in sampling met the design specifications for Type-S pitot tubes in EPA Method 2. Therefore, a maximum value baseline coefficient (C_p) of 0.84 was assigned to each pitot tube. Calibration prior to initial use for pitot face-opening alignment included measuring the external tubing diameter (dimension D_t), the base-to-opening plane distance (dimensions P_a and P_b), and the face opening misalignment angles, with all terms as described in Figures 2-2 and 2-3 of EPA Method 2. Pitot tubes were visually inspected for structural integrity at the completion of each test. Inspection sheets for pitot tubes are included in Appendix C.

4.1.3 Calibration Meter and Metering System

The secondary reference meter equipment arrangement for calibration is shown in Figure 5.7 of EPA Method 5. The following prescribed procedures were followed. A wet test meter with a 1 ft^3/rev capacity and $\pm$ 1 percent accuracy is used as the primary calibrant. The dry gas meter's pump is run for a minimum of 5 minutes at a flow rate of 0.35 cfm to condition the interior surface of the wet test meter. Leak checks are performed and if satisfactory, triplicate runs at no less than five different flow rates are done. A calibration curve is prepared and the meter is recalibrated after 200 hours of operation or annually, whichever comes first.

The calibration set-up for the dry gas metering system using the secondary reference meter in lieu of the wet test meter is given in Figure 5.5 of EPA Method 5. A leak check of the metering system before calibration was performed as shown in Figure 5.4 of EPA Method 5. The metering systems's pump was operated for 5 minutes at an orifice manometer setting of 0.5 inches H_20 to heat up the pump and system to stabilize the meter inlet and outlet temperatures. Values for the orifice setting (delta H), wet test meter volume (V_w), corresponding dry test meter volume (V_d), dry test meter inlet and outlet gas temperatures (t_{di} and t_{do}), and time were recorded for the initial calibration. Then, the ratio of the wet test meter to the dry test meter (gamma) and the orifice pressure differential that equates to 0.75 cfm at standard conditions (delta H@) were calculated.

A posttest calibration was made on the dry gas meter used during the test to check its accuracy against the pretest calibration. This posttest calibration check was made using the average orifice setting obtained during each test run, and by setting the vacuum at the maximum value obtained during each test run. These test runs were made against DEECO's secondary reference dry gas meter which was calibrated against a wet test meter.

The calibration data sheets for the dry gas meters are included in Appendix C.

4.1.4 Thermocouples and Digital Indicators

Thermocouples were calibrated by comparing them against an ASTM-3F mercury-in-glass thermometer in ice water, at ambient temperature, and in boiling water. Each thermocouple was calibrated against temperature ranges to which it is typically exposed during test conditions, and they agreed within 1.5 percent (expressed in °R) of the reference thermometer throughout the entire calibration range. Also, thermocouples were checked at ambient temperature at the test site to verify calibration.

Digital indicators were checked by feeding a series of millivolt signal strengths to the input and comparing the indicator reading with the reading the signal should have generated. Acceptable calibration error did not exceed 0.5 percent when temperatures are expressed in °R.

The calibration data sheets for the thermocouples and digital indicators employed for this test program are included in Appendix C.

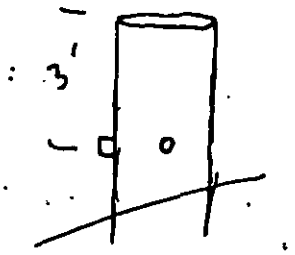
4.1.5 Pretest and Posttest Leak Checks of Sampling Trains

Each Method 5-type sampling train was subjected to pretest and posttest leak checks. For all sampling runs, the posttest leak checks were acceptable.

DEECO

EPA METHOD 1
TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT Willamette
CITY Emerson STATE AR
SAMPLING LOCATION Dryer 2
INSIDE OF FAR WALL TO OUTSIDE OF NIPPLE, (DISTANCE A) 28.5"
INSIDE OF NEAR WALL TO OUTSIDE OF NIPPLE, (DISTANCE B) 6"
NEAREST UPSTREAM DISTURBANCE 3'
DISTURBANCE top
NEAREST DOWNSTREAM DISTURBANCE ~8'
DISTURBANCE inlet
SAMPLER ATB DATE 4/22



SCHEMATIC OF SAMPLING LOCATION

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8-INCH)	DISTANCE B	TRAVERSE DISTANCE FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
1	0.021	22½"	½"	6"	6½"
2	0.067		1½"		7½"
3	0.118		2⅝"		8⅝"
4	0.177		4"		10"
5	0.250		5⅝"		11⅝"
6	0.356		8"		14"
7	0.644		14½"		20½"
8	0.750		16⅞"		22⅞"
9	0.823		18½"		24½"
10	0.882		19⅞"		25⅞"
11	0.933		21"		27"
12	0.979		22"		28"

DEECO

EPA METHOD 1
TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT Willamette
CITY Foreson STATE AR
SAMPLING LOCATION dryer 2
INSIDE OF FAR WALL TO OUTSIDE OF NIPPLE, (DISTANCE A) 27"
INSIDE OF NEAR WALL TO OUTSIDE OF NIPPLE, (DISTANCE B) 5"
NEAREST UPSTREAM DISTURBANCE 40"
DISTURBANCE top
NEAREST DOWNSTREAM DISTURBANCE 544"
DISTURBANCE inlet
SAMPLER ATB DATE 4/22

SCHEMATIC OF SAMPLING LOCATION

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8-INCH)	DISTANCE B	TRAVERSE DISTANCE FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
1	0.021	22"	½"	5"	5½"
2	0.067		1½"		6½"
3	0.118		2⅝"		7⅝"
4	0.177		3⅞"		8⅞"
5	0.250		5½"		10½"
6	0.356		7⅞"		12⅞"
7	0.644		14⅛"		19⅛"
8	0.750		16½"		21½"
9	0.823		18⅛"		23⅛"
10	0.882		19⅜"		24⅜"
11	0.933		20½"		25½"
12	0.979		21½"		26½"

DEECO

EPA METHOD 1
TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT Williamette
CITY Emerson STATE AR
SAMPLING LOCATION Dryer 3
INSIDE OF FAR WALL TO OUTSIDE OF NIPPLE, (DISTANCE A) 27 1/4"
INSIDE OF NEAR WALL TO OUTSIDE OF NIPPLE, (DISTANCE B) 5"
NEAREST UPSTREAM DISTURBANCE 40"
DISTURBANCE
NEAREST DOWNSTREAM DISTURBANCE >44"
DISTURBANCE inlet
SAMPLER ATB DATE 4/22

SCHEMATIC OF SAMPLING LOCATION

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8-INCH)	DISTANCE B	TRAVERSE DISTANCE FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
1	0.021	22"	1/2"	5"	5 1/2"
2	0.067		1 1/2"		6 1/2"
3	0.118		2 5/8"		7 5/8"
4	0.177		3 7/8"		8 7/8"
5	0.250		5 1/2"		10 1/2"
6	0.356		7 7/8"		12 7/8"
7	0.644		14 1/8"		19 1/8"
8	0.750		16 1/2"		21 1/2"
9	0.823		18 1/8"		23 1/8"
10	0.882		19 3/8"		24 3/8"
11	0.933		20 1/2"		25 1/2"
12	0.979		21 1/2"		26 1/2"

DEECO

EPA METHOD 1
TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT Willamette
CITY Emerson STATE AR
SAMPLING LOCATION Cooling #
INSIDE OF FAR WALL TO OUTSIDE OF NIPPLE, (DISTANCE A) 48.5"
INSIDE OF NEAR WALL TO OUTSIDE OF NIPPLE, (DISTANCE B) 3½"
NEAREST UPSTREAM DISTURBANCE 33"
DISTURBANCE top
NEAREST DOWNSTREAM DISTURBANCE 8'
DISTURBANCE bottom
SAMPLER ATB DATE 4/22

SCHEMATIC OF SAMPLING LOCATION

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8-INCH)	DISTANCE B	TRAVERSE DISTANCE FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
1	0.021	45"	1"	3½"	4½"
2	0.067		3"		6½"
3	0.118		5¼"		8¾"
4	0.177		8"		11½"
5	0.258		11¼"		14¾"
6	0.356		16"		19½"
7	0.644		29"		32½"
8	0.750		33¾"		37¼"
9	0.823		37"		40½"
10	0.882		39¾"		43¼"
11	0.933		42"		45½"
12	0.979		44"		47½"

VELOCITY TRAVERSE DATA

SAMPLING LOCATION: Dryer #1

Plant	Wilhamette	Pitot Type	S	Bar Press (in HG)	29.92
City	Emerson, AR	Pitot No.	4K	Post Leak Check	Passed
Operator	MHy BM	Pitot Cp	0.84	Stack Diameter (in)	22.5
Date	4/23/98	Thermocouple	4K	CO2/O2 Analysis By	SA

MEASUREMENT DEVICE

- Micromanometer ☐
- 10" Manometer ☐
- Magnehelic ☒
- Other ☐ Explain:

TRAVERSE SCHEMATIC

Run No.		1		2		3	
Time							
Ts(DB) deg F		NA		NA		NA	
Ts(WB) deg F		NA		NA		NA	
Pg(in H2O)		-0.06		-0.06		-0.06	
Ps(in HG)		29.92		29.92		29.92	
CO2 %							
O2 %							
port	point	Delta P	Ts	Delta P	Ts	Delta P	Ts
A	1	0.030	~~252~~ 430	0.05	427	0.05	428
	2	0.032	~~224~~ 430	0.05	428	0.05	429
	3	0.035	~~235~~ 431	0.05	430	0.055	430
	4	0.040	~~265~~ 431	0.045	430	0.055	431
	5	0.035	~~246~~ 431	0.05	431	0.055	432
	6	0.037	~~271~~ 431	0.05	433	0.05	433
	7	0.031	~~362~~ 430	0.05	432	0.05	434
	8	0.030	431	0.04	433	0.055	434
	9	0.031	429	0.04	433	0.05	434
	10	0.029	427	0.045	432	0.05	434
	11	0.022	422	0.04	432	0.05	434
	12	0.018	418	0.03	431	0.05	433
B	1	0.019	429	0.05	428	0.05	426
	2	0.032	430	0.05	429	0.055	427
	3	0.039	430	0.055	430	0.06	428
	4	0.038	430	0.06	430	0.06	428
	5	0.038	431	0.06	431	0.06	429
	6	0.039	431	0.06	431	0.06	429
	7	0.038	431	0.06	431	0.06	429
	8	0.037	430	0.055	430	0.05	429
	9	0.035	429	0.05	430	0.05	429
	10	0.031	425	0.04	430	0.05	429
	11	0.030	422	0.04	430	0.05	429
	12	0.024	415	0.03	429	0.05	429
Average		sqrt		sqrt		sqrt	
Moist (%)							
Moist (Bws)							
Md(lb/lbmole)							
Ms(lb/lbmole)							
Vs (f/s)							
Qa (acfm)							
Qs (dscfm)							

Ps = Pbar + Pg/13.6

Moist(%) = 100(Bws)

Md = 0.44(%CO2) + 0.32(%O2) + 0.28(%N2 + %CO)

Ms = Md(1-Bws) + 18Bws

Vs = 85.49Cp(sqrt[(Delta P)avg]) x sqrt[(Ts+460)/MsPs)]

Qa = 60VsAs

Qs = Qa[528/(Ts+460)](Ps/29.92) x (1 - Bws)

VELOCITY TRAVERSE DATA

SAMPLING LOCATION

Dryer #2

Plant	Willamette	Pitot Type	S	Bar Press (in HG)	29.92
City	Emerson AR	Pitot No.	4K	Post Leak Check	✓
Operator	MM & BM	Pitot Cp	0.84	Stack Diameter (in)	22
Date	4/23/98	Thermocouple	4K	CO2/O2 Analysis By	Bag/24

MEASUREMENT DEVICE

- Micromanometer ☐
- 10" Manometer ☐
- Magnehelic ☒
- Other ☐

Explain:

TRAVERSE SCHEMATIC

Ps = Pbar + Pg/13.6

Moist(%) = 100(Bws)

Md = 0.44(%CO2) + 0.32(%O2) + 0.28(%N2 + %CO)

Ms = Md(1-Bws) + 18Bws

Vs = 85.49Cp(sqrt[(Delta P)avg]) x sqrt[(Ts+460)/MsPs)]

Qa = 60VsAs

Qs = Qa[528/(Ts+460)](Ps/29.92) x (1 - Bws)

Run No.		1		2		3	
Time							
Ts(DB) deg F		NA		NA		NA	
Ts(WB) deg F		NA		NA		NA	
Pg(in H2O)		-0.06		-0.06		-0.06	
Ps(in HG)		29.92		29.92		29.92	
CO2 %							
O2 %							
port	point	Delta P	Ts	Delta P	Ts	Delta P	Ts
A	1	0.085	323	0.085	325	0.085	329
	2	0.09	324	0.10	328	0.10	328
	3	0.11	330	0.11	331	0.115	327
	4	0.12	330	0.12	331	0.115	331
	5	0.12	330	0.12	330	0.125	331
	6	0.12	330	0.13	331	0.125	332
	7	0.12	330	0.13	331	0.125	331
	8	0.11	330	0.12	331	0.125	331
	9	0.10	330	0.12	331	0.125	332
	10	0.09	330	0.11	330	0.12	332
	11	0.06	329	0.10	330	0.115	331
	12	0.04	326	0.08	328	0.12	331
B	1	0.09	324	0.09	329	0.09	330
	2	0.11	326	0.10	330	0.10	330
	3	0.11	329	0.11	330	0.12	331
	4	0.11	327	0.12	331	0.13	331
	5	0.12	330	0.13	331	0.13	331
	6	0.12	332	0.13	331	0.125	332
	7	0.115	331	0.11	332	0.12	333
	8	0.125	331	0.12	333	0.12	333
	9	0.12	331	0.11	332	0.115	333
	10	0.13	330	0.11	330	0.11	333
	11	0.12	330	0.10	330	0.105	333
	12	0.10	330	0.08	330	0.11	333
Average		sqrt		sqrt		sqrt	
Moist (%)		NA		NA		NA	
Moist (Bws)							
Md(lb/lbmole)							
Ms(lb/lbmole)							
Vs (ft/s)							
Qa (acfm)							
Qs (dscfm)							

VELOCITY TRAVERSE DATA

SAMPLING LOCATION

Dryer #3

Plant	Willamette	Pitot Type	S	Bar Press (in HG)	29.92
City	Emerson, AR	Pitot No.	4K	Post Leak Check	Passed
Operator	MM + BM	Pitot Cp	0.84	Stack Diameter (in)	22
Date	4/23/98	Thermocouple	4K	CO2/O2 Analysis By	Bag / 3A

MEASUREMENT DEVICE

- Micromanometer ☐
- 10" Manometer ☐
- Magnehelic ☒
- Other ☐

Explain:

TRAVERSE SCHEMATIC

Ps = Pbar + Pg/13.6

Moist(%) = 100(Bws)

Md = 0.44(%CO2) + 0.32(%O2) + 0.28(%N2 + %CO)

Ms = Md(1-Bws) + 18Bws

Vs = 85.49Cp(sqrt[(Delta P)avg]) x sqrt[(Ts+460)/MsPs)]

Qa = 60VsAs

Qs = Qa[528/(Ts+460)](Ps/29.92) x (1 - Bws)

Run No.		1		2		3	
Time							
Ts(DB) deg F		NA		NA		NA	
Ts(WB) deg F		NA		NA		NA	
Pg(in H2O)		-0.04		-0.04		-0.04	
Ps(in HG)		29.92		29.92		29.92	
CO2 %							
O2 %							
port	point	Delta P	Ts	Delta P	Ts	Delta P	Ts
A	1	0.058	318	0.04	319	0.04	320
	2	0.055	320	0.04	320	0.04	321
	3	0.06	321	0.045	322	0.05	323
	4	0.06	322	0.05	323	0.05	323
	5	0.055	322	0.05	323	0.045	324
	6	0.05	323	0.045	324	0.04	324
	7	0.045	323	0.04	325	0.045	325
	8	0.04	324	0.045	325	0.045	325
	9	0.04	324	0.05	326	0.045	326
	10	0.04	324	0.05	326	0.05	326
	11	0.035	323	0.05	325	0.05	326
	12	0.03	322	0.04	323	0.05	326
B	1	0.04	317	0.04	319	0.03	322
	2	0.045	318	0.04	320	0.04	322
	3	0.05	320	0.05	322	0.05	323
	4	0.05	321	0.05	322	0.055	323
	5	0.06	321	0.06	323	0.055	324
	6	0.04	323	0.05	324	0.055	324
	7	0.04	323	0.05	324	0.05	325
	8	0.045	324	0.045	325	0.045	325
	9	0.05	323	0.04	324	0.04	325
	10	0.04	322	0.04	324	0.04	324
	11	0.04	322	0.04	323	0.035	322
	12	0.03	319	0.03	321	0.03	321
Average		sqrt		sqrt		sqrt	
Moist (%)		NA		NA		NA	
Moist (Bws)							
Md(lb/lbmole)							
Ms(lb/lbmole)							
Vs (ft/s)							
Qa (acfm)							
Qs (dscfm)							

VELOCITY TRAVERSE DATA

SAMPLING LOCATION

Cooler

Plant	Willamette	Pitot Type	S	Bar Press (in HG)	29.92
City	Gresham, OR	Pitot No.	4K	Post Leak Check	Passed
Operator	MM + BM + AB	Pitot Cp	0.84	Stack Diameter (in)	45
Date	4/23/98	Thermocouple	4K	CO2/O2 Analysis By	Bag/3A

MEASUREMENT DEVICE

- Micromanometer ☐
- 10" Manometer ☐
- Magnehelic ☒
- Other ☐

Explain:

TRAVERSE SCHEMATIC

Run No.		1		2		3	
Time							
Ts(DB) deg F							
Ts(WB) deg F							
Pg(in H2O)		-0.05		-0.06		-0.085	
Ps(in HG)							
CO2 %							
O2 %							
port	point	Delta P	Ts	Delta P	Ts	Delta P	Ts
A	1	0.15	100	0.17	100	0.20	99
	2	0.22	98	0.23	97	0.22	100
	3	0.21	97	0.20	97	0.24	102
	4	0.24	98	0.25	98	0.32	103
	5	0.27	98	0.29	98	0.35	102
	6	0.29	97	0.30	99	0.38	102
	7	0.24	97	0.23	97	0.28	101
	8	0.20	97	0.20	97	0.28	100
	9	0.18	97	0.18	98	0.25	98
	10	0.14	97	0.13	98	0.17	100
	11	0.13	98	0.14	98	0.15	101
	12	0.12	97	0.13	97	0.13	100
B	1	0.09	97	0.08	99	0.07	101
	2	0.10	97	0.09	99	0.08	101
	3	0.07	98	0.09	99	0.09	101
	4	0.08	100	0.09	100	0.14	101
	5	0.12	99	0.13	100	0.17	101
	6	0.19	98	0.20	100	0.21	101
	7	0.30	100	0.22	100	0.24	101
	8	0.27	97	0.27	100	0.25	101
	9	0.23	97	0.20	100	0.18	100
	10	0.20	98	0.15	99	0.16	99
	11	0.17	98	0.16	99	0.14	98
	12	0.12	97	0.13	99	0.10	97
Average		sqrt		sqrt		sqrt	
Moist (%)							
Moist (Bws)							
Md(lb/lbmole)							
Ms(lb/lbmole)							
Vs (ft/s)							
Qa (acfm)							
Qs (dscfm)							

Ps = Pbar + Pg/13.6

Moist(%) = 100(Bws)

Md = 0.44(%CO2) + 0.32(%O2) + 0.28(%N2 + %CO)

Ms = Md(1-Bws) + 18Bws

Vs = 85.49Cp(sqrt[(Delta P)avg]) x sqrt[(Ts+460)/MsPs)]

Qa = 60VsAs

Qs = Qa[528/(Ts+460)](Ps/29.92) x (1 - Bws)

DEECO

FORMALDEHYDE TESTING FIELD DATA SHEET

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
W. Monroe, Ennis, AR	4/23/98	Dryer 2	Formaldehyde	1 Condition 1

OPERATOR	AMBIENT PRESS (In. Hg)	STATIC PRESS (in. ~~Hg~~ H2O)	AMBIENT TEMP (deg. F)	FILTER TYPE	STACK ID (In.)	PITOT Cp	PROBE LENGTH AND LINER TYPE	PURGE TIME (MIN)	PURGE RATE (lpm)
Bill Millner	29.92	-0.06	70	NA	22.5	NA	1' Stainless	—	—

ASSUMED MOISTURE (%)	DGM BOX No.		DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	ORSAT NO.	LEAK CHECK (INITIAL)	LEAK CHECK (FINAL)	O2 CONTENT %	CO2 CONTENT %	
NA	Vost 4		1.001	NA	NA	CEM	NA	0.01 @ 4"	—	—	

TRAV. POINT NO.	ELAPSED TEST TIME (MIN)	CLOCK TIME (24 HR)	DGM READING Vm (liters)	SAMPLE VOLUME METERED (Vm)	SAMPLE FLOW SETTING (lpm)	PERCENT DEVIATION a %	STACK TEMP (deg. F)	PROBE TEMP (deg. F)	FILTER OVEN TEMP (deg. F)	DGM IN/OUT TEMP (deg. F)	SAMPLE TRAIN VAC (In. Hg)
Single pt.	0		0.00		1	NA	Method 2	NA	NA	85	0
	5		4.62							85	2
	10		10.6							85	2
	15		15.61							85	2
	20		20.42							85	2
	25		25.31							85	2
	30		30.17							87	2
	35		35.13							92	2
	40		39.99							91	2
	45		44.64							90	2
	50		49.32							72	2
	55		53.91							89	2
	60		58.86							89	2
										90	2
	TOTAL TIME		TOTAL VOLUME (l)	AVE	AVE (lpm)		AVE. TEMP			AVE. TEMP	MIN. VACUUM
	60		58.86		1.0		NA				

PERCENT DEVIATION = $\frac{Vm - Vm\ avg}{Vm\ avg} \times 100\%$

~~34.5~~ 43.2 including 1st glass bend

512.0 Final

DEECO

FORMALDEHYDE TESTING FIELD DATA SHEET

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Willamette Emerson AR	4/23/98	Dryer 1	Formaldehyde	3 Condition 1

OPERATOR	AMBIENT PRESS (in. Hg)	STATIC PRESS (in. Hg) H_2O	AMBIENT TEMP (deg. F)	FILTER TYPE	STACK ID (in.)	PITOT Cp	PROBE LENGTH AND LINER TYPE	PURGE TIME (MIN)	PURGE RATE (lpm)
Bill Gillow	29.92	-0.06	60	NA	22.5	NA	1' Stainless	—	—

ASSUMED MOISTURE (%)	DGM BOX No.		DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	ORSAT NO.	LEAK CHECK (INITIAL)	LEAK CHECK (FINAL)	O2 CONTENT %	CO2 CONTENT %	
NA	Vost 4		1.001	NA	NA	CEM	NA	0.01 @ 5"	—	—	

TRAV. POINT NO.	ELAPSED TEST TIME (MIN)	CLOCK TIME (24 HR)	DGM READING Vm (liters)	SAMPLE VOLUME METERED (Vm)	SAMPLE FLOW SETTING (lpm)	PERCENT DEVIATION a %	STACK TEMP (deg. F)	PROBE TEMP (deg. F)	FILTER OVEN TEMP (deg. F)	DGM IN/OUT TEMP (deg. F)	SAMPLE TRAIN VAC (in. Hg)
Single	0	4:15	0.000	NA	1	NA	Method 2	NA	NA		
Point	5		4.19							101	2
	10		6.62							99	2
	15		9.30							93	2
	20		12.31							91	2
	25		15.05							94	2
	30		17.80							100	2
	35		20.21							102	2
	40		24.20							101	2
	45		27.51							100	2
	50		34.26							97	2
	55		39.71							99	2
	60		45.81							102	3
	TOTAL TIME		TOTAL VOLUME (l)	AVE	AVE (lpm)		AVE. TEMP.			AVE. TEMP.	MIN VACUUM
	60		45.81	—	1						

$$\text{PERCENT DEVIATION} = \frac{Vm - Vm\ avg}{Vm\ avg} \times 100\%$$

443.2
476.6

23

DEEQ

FORMALDEHYDE TESTING FIELD DATA SHEET

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Willamette Emerson AR	4/23/98	Dryer 2	Formaldehyde	1 Condition 1

OPERATOR	AMBIENT PRESS (In. Hg)	STATIC PRESS (In. Hg/H2O)	AMBIENT TEMP (deg. F)	FILTER TYPE	STACK ID (In.)	PITOT Cp	PROBE LENGTH AND LINER TYPE	PURGE TIME (MIN)	PURGE RATE (lpm)
Bill Miller	29.92	-0.06	70	NA	22	NA	1'	—	—

ASSUMED MOISTURE (%)	DGM BOX No.		DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	ORSAT NO.	LEAK CHECK (INITIAL)	LEAK CHECK (FINAL)	O2 CONTENT %	CO2 CONTENT %	
NA	VOST 6		1.001	NA	NA	D2R1	NA	0.01 @ 5"	NA	NA	

TRAV. POINT NO.	ELAPSED TEST TIME (MIN)	CLOCK TIME (24-HR)	DGM READING Vm (liters)	SAMPLE VOLUME METERED (Vm)	SAMPLE FLOW SETTING (lpm)	PERCENT DEVIATION a %	STACK TEMP (deg. F)	PROBE TEMP (deg. F)	FILTER OVEN TEMP (deg. F)	DGM IN/OUT TEMP (deg. F)	SAMPLE TRAIN VAC (In. Hg)
mp/point	0		0	NA	1	NA	See Method 2	N/A	N/A	96	1
	5		6.35							96	1
	10		12.04							97	1
	15		17.53							98	1
	20		~~[illegible]~~ 23.17							98	1
	25		29.22							98	1
	30		33.34							98	1
	35		37.76							98	1
	40		42.92							98	1
	45		47.67							98	1
	50		53.46							98	1
	55		59.19							98	1
	60		64.97							98	1
	TOTAL TIME		TOTAL VOLUME (l)	AVE	AVE (lpm)		AVE TEMP			AVE TEMP	MIN VACUUM
	60		64.97		1			464.8			

PERCENT DEVIATION = $\frac{Vm - Vm\ avg}{Vm\ avg} \times 100\%$

~~[illegible]~~ including 1st glass bend

570.2 Final

DEECO

FORMALDEHYDE TESTING FIELD DATA SHEET

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Silbrette, Emerson, AR	4/23/98	Dryer 2	Formaldehyde	2 Condition 1

OPERATOR	AMBIENT PRESS (In. Hg)	STATIC PRESS (In. Hg)	AMBIENT TEMP (deg. F)	FILTER TYPE	STACK ID (In.)	PITOT Cp	PROBE LENGTH AND LINER TYPE	PURGE TIME (MIN)	PURGE RATE (lpm)
Bill Millinor	29.92	-0.06	75	NA	22	NA	1' stainless	—	—

ASSUMED MOISTURE (%)	DGM BOX No.		DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	ORSAT NO.	LEAK CHECK (INITIAL)	LEAK CHECK (FINAL)	O2 CONTENT %	CO2 CONTENT %	
NA	VOST 6		1.001	NA	NA	D2R2	NA	0.016 5"	NA	NA	

TRAV. POINT NO.	ELAPSED TEST TIME (MIN)	CLOCK TIME (24-HR)	DGM READING Vm (liters)	SAMPLE VOLUME METERED (Vm)	SAMPLE FLOW SETTING (lpm)	PERCENT DEVIATION a %	STACK TEMP (deg. F)	PROBE TEMP (deg. F)	FILTER OVEN TEMP (deg. F)	DGM IN/OUT TEMP (deg. F)	SAMPLE TRAIN VAC (In. Hg)
	0	0	0	NA	1.0	NA	see Method 2	NA	NA	106	1.5
	5		6.76							104	1.5
	10		12.61							105	1.5
	15		18.55							105	1.5
	20		24.41							106	2
	25		32.06							106	2.5
	30		40.41							107	2.5
	35		49.07							107	2.5
	40		57.92							106	2.5
	45		64.10							99	.5
	50		70.15							99	.5
	55		71.63							—	.5
	60		79.81							—	
	TOTAL TIME		TOTAL VOLUME (l)	AVE	AVE (lpm)		AVE. TEMP.			AVE. TEMP.	MIN. VACUUM
	60		79.81	—	1.0		—			105.0	0.5

after this

PERCENT DEVIATION = $\frac{Vm - Vm\ avg}{Vm\ avg} \times 100\%$

353.5

During test, had to change #3 Imp. it had a hole in bottom, sucked water in to sil gel

DEECO

FORMALDEHYDE TESTING FIELD DATA SHEET

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Willamette Emerson AR	4/23/98	Dryer 2	Formaldehyde	3 Conditional

OPERATOR	AMBIENT PRESS (in. Hg)	STATIC PRESS (in. Hg)	AMBIENT TEMP (deg. F)	FILTER TYPE	STACK ID (in.)	PITOT Cp	PROBE LENGTH AND LINER TYPE	PURGE TIME (MIN)	PURGE RATE (lpm)
Bill Millner	29.92	-0.06	80	NA	22	NA	1' Stainless	—	—

ASSUMED MOISTURE (%)	DGM BOX No.		DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	ORSAT NO.	LEAK CHECK (INITIAL)	LEAK CHECK (FINAL)	O2 CONTENT %	CO2 CONTENT %	
NA	Vo-16		1.001	NA	NA		NA	0.01 @ 5"	NA	NA	

TRAV. POINT NO.	ELAPSED TEST TIME (MIN)	CLOCK TIME (24-HR)	DGM READING Vm (liters)	SAMPLE VOLUME METERED (Vm)	SAMPLE FLOW SETTING (lpm)	PERCENT DEVIATION a %	STACK TEMP (deg. F)	PROBE TEMP (deg. F)	FILTER OVEN TEMP (deg. F)	DGM IN/OUT TEMP (deg. F)	SAMPLE TRAIN VAC (in. Hg)
Single	0	4:15	0		1.0	NA	See Method 2	NA	NA		
point	5	4.81 →								104	1
	10	7.73 →								104	1
	15	14.31 →								104	1
	20	18.32 →								103	1
	25		22.81							103	1
	30		26.38							104	1
	35		29.81							105	1
	40		33.62							105	1
	45		40.21							105	1
	50		45.03							105	1
	55		49.77							106	1
	60		55.62							106	1
	TOTAL TIME		TOTAL VOLUME (l)	AVE	AVE (lpm)		AVE. TEMP.			AVE. TEMP.	MIN VACUUM
	60		55.62	—	1.0		—			104.2	1

PERCENT DEVIATION = $\frac{Vm - Vm\ avg}{Vm\ avg} \times 100\%$

~~538~~ 0

538.5
462.0

358.4

401.4 Final

DEECO

FORMALDEHYDE TESTING FIELD DATA SHEET

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Willamette	4/29/98	Dryer #3	Formaldehyde	One Condition

OPERATOR	AMBIENT PRESS (In. Hg)	STATIC PRESS (in. Hg)	AMBIENT TEMP (deg. F)	FILTER TYPE	STACK ID (In.)	PITOT Cp	PROBE LENGTH AND LINER TYPE	PURGE TIME (MIN)	PURGE RATE (lpm)
MM	29.92	-0.04	70	N/A	22	N/A	1' Stainless	—	—

ASSUMED MOISTURE (%)	DGM BOX No.		DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	ORSAT NO.	LEAK CHECK (INITIAL)	LEAK CHECK (FINAL)	O2 CONTENT %	CO2 CONTENT %	
N/A	Vost 1		1.025	N/A	N/A	CEM;	0.00505"	0.010 @6"	CEM	CEM	

TRAV. POINT NO.	ELAPSED TEST TIME (MIN)	CLOCK TIME (24 HR)	DGM READING Vm (liters)	SAMPLE VOLUME METERED (Vm)	SAMPLE FLOW SETTING (lpm)	PERCENT DEVIATION a %	STACK TEMP (deg. F)	PROBE TEMP (deg. F)	FILTER OVEN TEMP (deg. F)	DGM IN/OUT TEMP (deg. F)	SAMPLE TRAIN VAC (In. Hg)
Single Pt.	0		0.88	NA	1.0	NA	See Method 2	—	—	85	1
	5		4.92		1.0			—	—	85	1
	10		9.57		1.0			—	—	86	1
	15		14.38		1.0			—	—	86	1
	20		19.35		1.0			—	—	87	1
	25		24.39		1.0			—	—	87	1
	30		29.44		1.0			—	—	88	1
	35		34.35		1.0			—	—	88	1
	40		39.37		1.0			—	—	88	1
	45		44.24		1.0			—	—	88	1
	50		49.06		1.0			—	—	89	1
	55		54.17		1.0			—	—	90	1
	60		58.99		1.0						
	TOTAL TIME		TOTAL VOLUME (l)	AVE	AVE (lpm)		AVE. TEMP			AVE. TEMP	MIN VACUUM
	60		58.11	—	1.0		—			86.7	

$$\text{PERCENT DEVIATION} = \frac{Vm - Vm\ avg}{Vm\ avg} \times 100\%$$

DEECO

360.9

FORMALDEHYDE TESTING FIELD DATA SHEET

404.2 Final

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Willamette	4/23/98	Dryer #3	Formaldehyde	Two Condition 1

OPERATOR	AMBIENT PRESS (In. Hg)	STATIC PRESS (In. Hg)	AMBIENT TEMP (deg. F)	FILTER TYPE	STACK ID (In.)	PITOT Cp	PROBE LENGTH AND LINER TYPE	PURGE TIME (MIN)	PURGE RATE (lpm)
MM	29.92	-0.04	80	N/A	22"	N/A	1' Stainless	—	—

ASSUMED MOISTURE (%)	DGM BOX No.		DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	ORSAT NO.	LEAK CHECK (INITIAL)	LEAK CHECK (FINAL)	O2 CONTENT %	CO2 CONTENT %	
N/A	Vost # 1		1.029	N/A	N/A	CEM's	0.005@5"	0.0020	20.9	0.0	

TRAV. POINT NO.	ELAPSED TEST TIME (MIN)	CLOCK TIME (24 HR)	DGM READING Vm (liters)	SAMPLE VOLUME METERED (Vm)	SAMPLE FLOW SETTING (lpm)	PERCENT DEVIATION a %	STACK TEMP (deg. F)	PROBE TEMP (deg. F)	FILTER OVEN TEMP (deg. F)	DGM IN/OUT TEMP (deg. F)	SAMPLE TRAIN VAC (In. Hg)
Single Pt.	0		59.21	NA	1.0		See Method 2	—	—	89	1
	5		63.83		1.0			—	—	90	1
	10		68.78		1.0			—	—	90	1
	15		73.57		1.0			—	—	91	1
	20		78.38		1.0			—	—	92	1
	25		83.19		1.0			—	—	92	1
	30		88.03		1.0			—	—	93	1
	35		92.66		1.0			—	—	94	1
	40		97.34		1.0			—	—	94	1
	45		102.02		1.0			—	—	94	1
	50		107.01		1.0			—	—	94	1
	55		111.83		1.0			—	—	94	1
	60		116.83		1.0						
	TOTAL TIME		TOTAL VOLUME (l)	AVE	AVE (lpm)		AVE. TEMP.			AVE. TEMP.	MIN VACUUM
	60		57.62	—	1.0		—			92.1	1

$$\text{PERCENT DEVIATION} = \frac{Vm - Vm\ avg}{Vm\ avg} \times 100\%$$

410.3 Final
368 Initial

DEECO

FORMALDEHYDE TESTING FIELD DATA SHEET

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Willamette	4/23/98	Dryer #3	Formaldehyde	Three Conditional

OPERATOR	AMBIENT PRESS (In. Hg)	STATIC PRESS (in. Hg)	AMBIENT TEMP (deg. F)	FILTER TYPE	STACK ID (In.)	PITOT Cp	PROBE LENGTH AND LINER TYPE	PURGE TIME (MIN)	PURGE RATE (lpm)
MM	29.92	-0.04	80	N/A	22	N/A	1' Stainless	—	—

ASSUMED MOISTURE (%)	DGM BOX No.		DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	ORSAT NO.	LEAK CHECK (INITIAL)	LEAK CHECK (FINAL)	O2 CONTENT %	CO2 CONTENT %	
N/A	Vost #1		1.029	N/A	N/A	CEMS	0.005@7"	0.00	20.9	0.0	

TRAV. POINT NO.	ELAPSED TEST TIME (MIN)	CLOCK TIME (24 HR)	DGM READING Vm (liters)	SAMPLE VOLUME METERED (Vm)	SAMPLE FLOW SETTING (lpm)	PERCENT DEVIATION a %	STACK TEMP (deg. F)	PROBE TEMP (deg. F)	FILTER OVEN TEMP (deg. F)	DGM IN/OUT TEMP (deg. F)	SAMPLE TRAIN VAC (In. Hg)
Single Pt.	0	04:15	17.88	N/A	1.0	N/A	See Method 2			95	1
	5		22.75		1.0					94	1
	10		27.61		1.0					93	1
	15		32.37		1.0					92	1
	20		37.31		1.0					92	1
	25		42.32		1.0					93	1
	30		47.34		1.0					93	1
	35		51.98		1.0					93	1
	40		56.88		1.0					93	1
	45		61.60		1.0					93	1
	50		66.45		1.0					93	1
	55		71.28		1.0					93	1
	60		76.43		1.0					93	1
	TOTAL TIME		TOTAL VOLUME (l)	AVE	AVE (lpm)		AVE TEMP			AVE TEMP	MIN VACUUM
	60		54.55	—	1.0		—			93.1	1

$$\text{PERCENT DEVIATION} = \frac{Vm - Vm\ avg}{Vm\ avg} \times 100\%$$

351.1
354.5 Final

DEECO

FORMALDEHYDE TESTING FIELD DATA SHEET

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Willamette	4/23/98	Cooler (#4)	Formaldehyde	One Condition

OPERATOR	AMBIENT PRESS (In. Hg)	STATIC PRESS (In. Hg)	AMBIENT TEMP (deg. F)	FILTER TYPE	STACK ID (In.)	PITOT Cp	PROBE LENGTH AND LINER TYPE	PURGE TIME (MIN)	PURGE RATE (lpm)
[illegible]	29.92	~~-.06~~ -0.05"		N/A	45	N/A	1' Stainless	—	—

ASSUMED MOISTURE (%)	DGM BOX No.		DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	ORSAT NO.	LEAK CHECK (INITIAL)	LEAK CHECK (FINAL)	O2 CONTENT %	CO2 CONTENT %	
N/A	Vost #3		1.064	N/A	N/A	CEM's	0.005@5"	0.009 @12"	20.9	0.0	

TRAV. POINT NO.	ELAPSED TEST TIME (MIN)	CLOCK TIME (24-HR)	DGM READING Vm (liters)	SAMPLE VOLUME METERED (Vm)	SAMPLE FLOW SETTING (lpm)	PERCENT DEVIATION Δ %	STACK TEMP (deg. F)	PROBE TEMP (deg. F)	FILTER OVEN TEMP (deg. F)	DGM IN/OUT TEMP (deg. F)	SAMPLE TRAIN VAC (In. Hg)
Single Pt	0		0.00	NA	1.0 ~~1.0~~	NA	See Method 2			96	9
	5		3.70							95	9
	10		7.42							95	9
	15		12.15							95	9
	20		16.55							96	9
	25		21.46							96	9
	30		25.84							96	9
	35		30.32							96	9
	40		33.13							96	9
	45		37.92							96	9
	50		42.16							96	9
	55		46.38							96	9
	60		50.28								
	TOTAL TIME		TOTAL VOLUME (l)	AVE.	AVE. (lpm)		AVE. TEMP.			AVE. TEMP.	MIN VACUUM
	60		50.28	—	1.0					95.8	9

$$\text{PERCENT DEVIATION} = \frac{Vm - Vm\ avg}{Vm\ avg} \times 100\%$$

DEECO

356.8
360.8 final

FORMALDEHYDE TESTING FIELD DATA SHEET

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Willamette	4/23/98	Cooler (#4)	Formaldehyde	Two (Condition 1)

OPERATOR	AMBIENT PRESS (In. Hg)	STATIC PRESS (in. ~~Hg~~ H2O)	AMBIENT TEMP (deg. F)	FILTER TYPE	STACK ID (in.)	PITOT Cp	PROBE LENGTH AND LINER TYPE	PURGE TIME (MIN)	PURGE RATE (lpm)
MM	29.92	-0.06		N/A	45	N/A	1' Stainless	—	—

ASSUMED MOISTURE (%)	DGM BOX No.		DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	ORSAT NO.	LEAK CHECK (INITIAL)	LEAK CHECK (FINAL)	O2 CONTENT %	CO2 CONTENT %	
NA	Vost #3		1.064	N/A	N/A	CEM's	0.008@10"	0.001@15"	20.9	0.0	

TRAV. POINT NO.	ELAPSED TEST TIME (MIN)	CLOCK TIME (24-HR)	DGM READING Vm (liters)	SAMPLE VOLUME METERED (Vm)	SAMPLE FLOW SETTING (lpm)	PERCENT DEVIATION a %	STACK TEMP (deg. F)	PROBE TEMP (deg. F)	FILTER OVEN TEMP (deg. F)	DGM IN/OUT TEMP (deg. F)	SAMPLE TRAIN VAC (in. Hg)	
Single Pt	0		50.43	NA	1	NA	See Method 2	N/A	N/A	88	8	Rotameter 95
	5		52.25					N/A	N/A	88	8	
	10		53.75					N/A	N/A	90	8	
	15		55.78					N/A	N/A	92	8	
	20		57.57					N/A	N/A	92	8	
	25		60.03					N/A	N/A	94	8	
	30		62.02					N/A	N/A	94	8	
	35		65.48					N/A	N/A	96	8	@ 35 min 102
	40		68.51					N/A	N/A	96	8	
	45		71.54					N/A	N/A	96	8	
	50		74.83					N/A	N/A	96	8	
	55		77.14					N/A	N/A	96	8	
	60		80.137									
	TOTAL TIME		TOTAL VOLUME (l)	AVE	AVE (lpm)		AVE. TEMP.			AVE. TEMP.	MIN. VACUUM	
	60		29.74	—	1.0					92.2	8	

$$\text{PERCENT DEVIATION} = \frac{Vm - Vm\ avg}{Vm\ avg} \times 100\%$$

18

355.3
357.1

DEECO

FORMALDEHYDE TESTING FIELD DATA SHEET

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Williams Hc	4/23/98	Cooler (#4)	Formaldehyde	Three Condition

OPERATOR	AMBIENT PRESS (In. Hg)	STATIC PRESS (in. ~~Hg~~ H2O)	AMBIENT TEMP (deg. F)	FILTER TYPE	STACK ID (In.)	PITOT Cp	PROBE LENGTH AND LINER TYPE	PURGE TIME (MIN)	PURGE RATE (lpm)
MM	29.92	-0.05	80	N/A	45	N/A	1' Stainless	—	—

ASSUMED MOISTURE (%)	DGM BOX No.		DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	ORSAT NO.	LEAK CHECK (INITIAL)	LEAK CHECK (FINAL)	O2 CONTENT %	CO2 CONTENT %	
NA	Vost #3		1.064	N/A	N/A	CEM's	0.002@15"	0.004@17"	20.9	0.0	

TRAV. POINT NO.	ELAPSED TEST TIME (MIN)	CLOCK TIME (24 HR)	DGM READING Vm (liters)	SAMPLE VOLUME METERED (Vm)	SAMPLE FLOW SETTING (lpm)	PERCENT DEVIATION a %	STACK TEMP (deg. F)	PROBE TEMP (deg. F)	FILTER OVEN TEMP (deg. F)	DGM IN/OUT TEMP (deg. F)	SAMPLE TRAIN VAC (In. Hg)	
Single Pt	0	09:15	80.18		1 lpm	NA	See Method 2			95	8	Rotate 93
	5		82.21							95	8	
	10		83.52							95	8	
	15		85.51							95	8	
	20		88.81							96	8	
	25		91.74							96	8	98
	30		93.73							96	8	
	35		95.98							96	8	
	40		96.75							96	8	
	45		100.02							96	8	
	50		102.44							96	8	
	55		105.21							96	8	
	60		107.35									
	TOTAL TIME		TOTAL VOLUME (l)	AVE	AVE (lpm)		AVE TEMP			AVE TEMP	MIN VACUUM	
	60		27.17		1.0		—			96.7	8	

$$\text{PERCENT DEVIATION} = \frac{Vm - Vm\ avg}{Vm\ avg} \times 100\%$$

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CEM Calibration Sheet

DEECO

Client: Willamette City: Emerson AK
Source: Veneer #3, #4 stack Date: 4-23-98
CEM Operator: DSS

Condition 1

	Calibration Error			Run: ONE					Run: TWO					Run: THREE				
				Pretest Time: 9:50		Post-test Time: ~~11:50~~ 12:20			Pretest Time: 12:20 ~~11:50~~		Post-test Time: 15:35			Pretest Time: 15:35		Post-test Time: 17:25		
	Cylinder Value	Analyzer Calibration Response	Difference (% of Span) (<2%)	System Calibration Response	System Cal Bias (% of Span) (<3%)	System Calibration Response	System Cal Bias (% of Span) (<3%)	System Cal Drift (% of Span) (<3%)	System Calibration Response	System Cal Bias (% of Span) (<3%)	System Calibration Response	System Cal Bias (% of Span) (<3%)	System Cal Drift (% of Span) (<3%)	System Calibration Response	System Cal Bias (% of Span) (<3%)	System Calibration Response	System Cal Bias (% of Span) (<3%)	System Cal Drift (% of Span) (<3%)
O2 Zero																		
O2 Mid																		
O2 High																		
CO2 Zero																		
CO2 Mid																		
CO2 High																		
SO2 LO Zero	0	—	—	-0.2	-0.0	19.3	0.2	0.2	19.3	0.2	19.0	0.2	0.0	19.0	0.2	15.5	+0.2	-0.0
SO2 LO Low	3100	—	—	3097	-0.0													
SO2 LO Mid	5090	—	—	4810	-2.3	4930	-1.1	1.2	4930	-1.1	4890	-1.7	-0.6	4870	-1.7	4715		
SO2 LO High	8510	—	—	8505	-0.1													
NOx Zero																		
NOx Low*																		
NOx Mid																		
NOx High																		
SO2 Zero																		
SO2 Mid																		
SO2 High																		
THC Response Time: 0:50				System Calibration Response	System Cal Bias (% of Span) (<3%)	System Calibration Response	System Cal Bias (% of Span) (<3%)	System Cal Drift (% of Span) (<3%)	System Calibration Response	System Cal Bias (% of Span) (<3%)	System Calibration Response	System Cal Bias (% of Span) (<3%)	System Cal Drift (% of Span) (<3%)	System Calibration Response	System Cal Bias (% of Span) (<3%)	System Calibration Response	System Cal Bias (% of Span) (<3%)	System Cal Drift (% of Span) (<3%)
THC Zero	0			-0.1	-0.0	-5.0	-0.05	-0.0	-5.0	-0.05	-11.3	-0.1	-0.5	-11.3	-0.1	-5.2	-0.5	+0.5
THC Low	3100			3099	-0.0													
THC Mid	5040			4990	-0.5	4942	-1.0	-0.5	4942	-1.0	4890	-1.5	-0.5	4890	-1.5	4880	-1.6	-0.0
THC High	8510			8519	0.1													

* NO_x low calibration gas is used only for turbine testing.

CEM Calibration Sheet

DEECO

Client: Willamette City: Emerson AK

Source: Veneer - #1, #2 stack Date: 4-23-98

CEM Operator: DGS

Condition 1

	Calibration Error			Run: ONE					Run: TW 1					Run: THREE				
				Pretest Time: 10:15		Post-test Time: 12:15			Pretest Time: 12:15		Post-test Time: 15:20			Pretest Time: 15:20		Post-test Time		
	Cylinder Value	Analyzer Calibration Response	Difference (% of Span) (<2%)	System Calibration Response	System Cal Bias (% of Span) (<3%)	System Calibration Response	System Cal Bias (% of Span) (<3%)	System Cal Drift (% of Span) (<3%)	System Calibration Response	System Cal Bias (% of Span) (<3%)	System Calibration Response	System Cal Bias (% of Span) (<3%)	System Cal Drift (% of Span) (<3%)	System Calibration Response	System Cal Bias (% of Span) (<3%)	System Calibration Response	System Cal Bias (% of Span) (<3%)	System Cal Drift (% of Span) (<3%)
O2 Zero	0	0.0	0.0	0.3	1.2	0.3	1.2	0.0	0.3	1.2	0.0	0.0	-1.2	0.0	0.0	0.1	0.4	0.4
O2 Mid	11.9	12.0	0.9	11.9	0.0	11.6	-1.2	-1.2	11.6	-1.2	11.5	1.6	-0.4	11.5	1.0	11.9	6.0	1.0
O2 High	22.1	22.1	0.0															
CO2 Zero	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	-1.0	-1.0	0.2	-1.0	0.0	0.0	-0.5
CO2 Mid	10.1	10.1	0.0	9.9	1.0	9.9	1.0	0.0	9.9	1.0	9.9	1.0	0.0	9.9	1.0	9.9	1.0	0.0
CO2 High	17.8	17.8	0.0															
THC Zero	0	—	—	-0.1	0.0	6.7	-.07	+.07	*1.7	+.02	2.1	0.0	0.0	*2.1	0.0	4.1	0.0	0.0
THC Low	3100	—	—	2745	-3.6				3083	-0.2				3033				
THC Mid	5040	—	—	4960	-0.8	4715	-3.2	-2.5	5000	-0.4	4400	-6.4	-6.0	5005	~~4950~~	4733	-3.0	-2.7
THC High	8510	—	—	8530	+0.2				8520	+0.1				8525	+0.1			
NOx Zero																		
NOx Low																		
NOx Mid																		
NOx High																		
SO2 Zero																		
SO2 Mid																		
SO2 High																		
THC Response Time	0:46			System Calibration Response	System Cal Bias (% of Out) (<3%)	System Calibration Response	System Cal Bias (% of Out) (<3%)	System Cal Drift (% of Span) (<3%)	System Calibration Response	System Cal Bias (% of Out) (<3%)	System Calibration Response	System Cal Bias (% of Out) (<3%)	System Cal Drift (% of Span) (<3%)	System Calibration Response	System Cal Bias (% of Out) (<3%)	System Calibration Response	System Cal Bias (% of Out) (<3%)	System Cal Drift (% of Span) (<3%)
THC Zero	0			-0.1	0.0	13.0	0.1	0.1	*7.2	0.1	37.1	+0.4	+0.3	*37.1	0.4	1.8	0.0	-0.4
THC Low	3100			2830	-2.7				2920	-0.18				3031				
THC Mid	5040			5085	+0.45	5000	-0.4	-0.9	~~8500~~	0.9	5480	+4.4	+2.5	4981	~~[illegible]~~.8	4970	0.7	0.1
THC High	8510			8515	+0.05				8500	0.1				8516	+0.1			

* NO_x low calibration gas is used only for turbine testing.

5230

+ full cal @ 12:40

full cal @ 16:10

DEECO

FORMALDEHYDE SAMPLE RECOVERY SHEET

Plant Willamette, Emerson Ar
Sample Location #1 Dryer
Sample Recovery Person JNB
Sample Date 4-23-98
Recovery Date 4-23-98
Run ID Dryer 1 - Condition 1

Weight (g)	Run 1	Run 2	Run 3
Final wt. (g)	512.0	421.3	476.6
Initial wt. (g)	443.2	356.8	443.2
Increased wt. (g)	68.8	64.5	33.4

RECOVERED SAMPLE

Formaldehyde

Run 1
Impinger Container No. ~~labeled~~ cond 1 #1 Run 1
Sample Volume (mL) 136 Level Marked ✓
Contains: ~~DNPH~~ Impinger Contents ✓
Water Rinse ✓ $MeCl_2$ Rinse NA

Run 2
Impinger Container No. cond 1 #1 Run 2
Sample Volume (mL) 86 Level Marked ✓
Contains: ~~DNPH~~ Impinger Contents ✓
Water Rinse ✓ $MeCl_2$ Rinse NA

Run 3
Impinger Container No. cond 1 #1 Run 3
Sample Volume (mL) 132 Level Marked ✓
Contains: ~~DNPH~~ Impinger Contents ✓
Water Rinse ✓ $MeCl_2$ Rinse NA

Blank
Impinger Container No. NA
Contains: DNPH Impinger Contents NA
Water Rinse NA $MeCl_2$ Rinse NA

SAMPLE INTEGRITY AND COMMENTS

Sample stored and locked? yes
Remarks:

Date of laboratory custody
Laboratory person taking custody
Remarks:

DEECO

FORMALDEHYDE SAMPLE RECOVERY SHEET

Plant Willamette, Emerson Ar Sample Date 4-23-98
Sample Location #2 Dryer Recovery Date 4-23-98
Sample Recovery Person [illegible] Run ID Cond 1 #2

Weight (g)	Run 1	Run 2	Run 3
Final wt. (g)	570.2	Refer to Data sheet	538.5
Initial wt. (g)	464.8		462.0
Increased wt. (g)	105.4	NA	76.5

RECOVERED SAMPLE

Formaldehyde

Run 1
Impinger Container No. Cond 1 #2 Run 1
Sample Volume (mL) ~~128~~ 166 WDB Level Marked ✓
Contains: ~~DNPH~~ Impinger Contents ✓
Water Rinse ✓ $MeCl_2$ Rinse NA

Run 2
Impinger Container No. Cond 1 #2 Run 2
Sample Volume (mL) ~~128~~ 124 WDB Level Marked ✓
Contains: ~~DNPH~~ Impinger Contents ✓
Water Rinse ✓ $MeCl_2$ Rinse NA

Run 3
Impinger Container No. Cond 1 #2 Run 3
Sample Volume (mL) ~~184~~ WDB 186 Level Marked ✓
Contains: ~~DNPH~~ Impinger Contents ✓
Water Rinse ✓ $MeCl_2$ Rinse NA

Blank
Impinger Container No. NA
Contains: DNPH Impinger Contents NA
Water Rinse NA $MeCl_2$ Rinse NA

SAMPLE INTEGRITY AND COMMENTS

Sample stored and locked? yes
Remarks:

Date of laboratory custody
Laboratory person taking custody
Remarks:

DEECO

FORMALDEHYDE SAMPLE RECOVERY SHEET

Plant Willamette, Emerson Ar Sample Date 4-23-98
Sample Location #3 Dryer Recovery Date 4-23-98
Sample Recovery Person ~~AJB~~ Run ID Cond 1 #3

Weight (g)	Run 1	Run 2	Run 3
Final wt. (g)	401.4	404.2	410.3
Initial wt. (g)	358.4	360.9	368
Increased wt. (g)	43.0	43.3	42.3

RECOVERED SAMPLE

Formaldehyde

Run 1
Impinger Container No. Cond 1 #3 Run 1
Sample Volume (mL) ~~166~~ WMB 84 Level Marked ✓
Contains: ~~DNPH~~ Impinger Contents ✓
Water Rinse ✓ $MeCl_2$ Rinse NA

Run 2
Impinger Container No. Cond 1 #3 Run 2
Sample Volume (mL) ~~128~~ WMB 136 Level Marked ✓
Contains: ~~DNPH~~ Impinger Contents ✓
Water Rinse ✓ $MeCl_2$ Rinse NA

Run 3
Impinger Container No. Cond 1 #3 Run 3
Sample Volume (mL) ~~186~~ WMB 92 Level Marked ✓
Contains: ~~DNPH~~ Impinger Contents ✓
Water Rinse ✓ $MeCl_2$ Rinse NA

Blank
Impinger Container No. NA
Contains: DNPH Impinger Contents NA
Water Rinse NA $MeCl_2$ Rinse NA

SAMPLE INTEGRITY AND COMMENTS

Sample stored and locked? yes
Remarks:

Date of laboratory custody
Laboratory person taking custody
Remarks:

DEECO

FORMALDEHYDE SAMPLE RECOVERY SHEET

Plant Willamette, Emerson Ar Sample Date 4-23-98
Sample Location #4 Cooler Recovery Date 4-23-98
Sample Recovery Person [illegible] Run ID Cond 1 #4

Weight (g)	Run 1	Run 2	Run 3
Final wt. (g)	354.5	360.8	355.3
Initial wt. (g)	351.1	356.8	351.1
Increased wt. (g)	3.4	4.0	4.2

RECOVERED SAMPLE

Formaldehyde

Run 1
Impinger Container No. Cond 1 #4 Run1
Sample Volume (mL) _____ Level Marked ✓
Contains: ~~DNPH~~ Impinger Contents ✓
Water Rinse ✓ $MeCl_2$ Rinse NA

Run 2
Impinger Container No. Cond 1 #4 Run2
Sample Volume (mL) _____ Level Marked ✓
Contains: ~~DNPH~~ Impinger Contents ✓
Water Rinse ✓ $MeCl_2$ Rinse NA

Run 3
Impinger Container No. Cond 1 #4 Run3
Sample Volume (mL) _____ Level Marked ✓
Contains: ~~DNPH~~ Impinger Contents ✓
Water Rinse ✓ $MeCl_2$ Rinse NA

Blank
Impinger Container No. NA
Contains: DNPH Impinger Contents NA
Water Rinse NA $MeCl_2$ Rinse NA

SAMPLE INTEGRITY AND COMMENTS

Sample stored and locked? yes
Remarks: _____

Date of laboratory custody _____
Laboratory person taking custody _____
Remarks: _____

Condition #1	Days	O_2	CO_2
Run #1		—	—
#1			
#2		13.8	3.2
#3		20.1	0.5
#4		20.9	0.0
Run #2			
#1		—	—
#2		14.2	2.8
#3		20.2	0.5
#4		20.9	0.0
Run #3			
#1		—	—
#2		13.5	3.7
#3		20.0	0.5
✓ #4		20.9	0.0
→ X Run #4			
X #2		14.5	3.2
#3		18.3	1.5
→ X #4		20.9	0.0
X Run #5			
→ #2		14.0	3.7
X #3		18.5	1.3
✓ #4		20.7	0.2
Run #6			
✓ #2		14.2	3.4
X #3		19.9	0.4
✓ #4			

VELOCITY TRAVERSE DATA

SAMPLING LOCATION: Dryer #1

Plant	Willamette	Pitot Type	S	Bar Press (in HG)	29.91
City	Lonsdale AR	Pitot No.	4K	Post Leak Check	✓
Operator	MM + BM	Pitot Cp	0.84	Stack Diameter (in)	22.5
Date	4/24/98	Thermocouple	4K	CO2/O2 Analysis By	Bag/3A

MEASUREMENT DEVICE

- Micromanometer ☐
- 10" Manometer ☐
- Magnehelic ☒
- Other ☐ Explain:

TRAVERSE SCHEMATIC

Run No.		4		~~5~~		~~6~~	
Time							
Ts(DB) deg F		NA		NA		NA	
Ts(WB) deg F		NA		NA		NA	
Pg(in H2O)		-0.04		-0.04		-0.04	
Ps(in HG)		29.91		29.91		29.91	
CO2 %							
O2 %							
port	point	Delta P	Ts	Delta P	Ts	Delta P	Ts
A	1	0.045	445	0.05	440	0.05	419
	2	0.045	445	0.05	440	0.06	419
	3	0.05	446	0.055	442	0.055	419
	4	0.05	446	0.06	442	0.06	418
	5	0.05	447	0.06	442	0.06	418
	6	0.05	448	0.055	443	0.06	418
	7	0.05	449	0.05	442	0.05	418
	8	0.05	450	0.05	442	0.045	419
	9	0.045	450	0.045	442	0.04	418
	10	0.045	450	0.04	442	0.04	418
	11	0.04	449	0.04	441	0.04	418
	12	0.035	448	0.04	440	0.04	417
B	1	0.045	442	0.045	441	0.04	419
	2	0.045	442	0.045	441	0.045	418
	3	0.05	442	0.05	442	0.05	419
	4	0.05	442	0.05	442	0.05	419
	5	0.05	442	0.055	441	0.055	419
	6	0.05	442	0.055	441	0.05	420
	7	0.05	442	0.05	441	0.05	419
	8	0.05	442	0.05	441	0.05	418
	9	0.05	442	0.05	441	0.05	418
	10	0.05	441	0.05	440	0.05	418
	11	0.04	441	0.04	440	0.04	417
	12	0.035	440	0.04	438	0.04	417
Average		sqrt		sqrt		sqrt	
Moist (%)		NA		NA		NA	
Moist (Bws)							
Md(lb/lbmole)							
Ms(lb/lbmole)							
Vs (ft/s)							
Qa (acfm)							
Qs (dscfm)							

$Ps = Pbar + Pg/13.6$

$Moist(\%) = 100(Bws)$

$Md = 0.44(\%CO2) + 0.32(\%O2) + 0.28(\%N2 + \%CO)$

$Ms = Md(1-Bws) + 18Bws$

$Vs = 85.49Cp(sqrt[(Delta\ P)avg]) \times sqrt[(Ts+460)/MsPs)]$

$Qa = 60VsAs$

$Qs = Qa[528/(Ts+460)](Ps/29.92) \times (1 - Bws)$

VELOCITY TRAVERSE DATA

SAMPLING LOCATION: Dryer #7

Plant	Willamette	Pitot Type	S	Bar Press (in HG)	29.91
City	Emerson, AR	Pitot No.	4K	Post Leak Check	✓
Operator	MM + BM	Pitot Cp	0.84	Stack Diameter (in)	22
Date	4/24/98	Thermocouple	4K	CO2/O2 Analysis By	Bag/3h

MEASUREMENT DEVICE

- Micromanometer ☐
- 10" Manometer ☐
- Magnehelic ☒
- Other ☐

Explain:

TRAVERSE SCHEMATIC

Run No.		4		5		6	
Time							
Ts(DB) deg F		NA		NA		NA	
Ts(WB) deg F		NA		NA		NA	
Pg(in H2O)		0.0		0.0		0.0	
Ps(in HG)		29.91		29.91		29.91	
CO2 %							
O2 %							
port	point	Delta P	Ts	Delta P	Ts	Delta P	Ts
A	1	0.09	332	0.09	332	0.09	333
	2	0.11	332	0.11	332	0.10	334
	3	0.11	333	0.11	333	0.11	334
	4	0.11	333	0.11	333	0.11	334
	5	0.12	333	0.12	333	0.12	334
	6	0.115	332	0.115	332	0.115	334
	7	0.12	332	0.12	332	0.12	333
	8	0.13	332	0.12	332	0.125	333
	9	0.13	332	0.13	333	0.13	333
	10	0.125	332	0.125	332	0.12	333
	11	0.12	332	0.12	332	0.12	333
	12	0.12	331	0.12	332	0.12	332
B	1	0.075	331	0.08	331	0.08	333
	2	0.10	331	0.10	332	0.10	334
	3	0.11	331	0.11	332	0.11	334
	4	0.12	331	0.12	332	0.12	334
	5	0.125	332	0.125	332	0.12	334
	6	0.125	333	0.13	332	0.125	334
	7	0.12	333	0.12	333	0.12	334
	8	0.11	333	0.11	333	0.11	334
	9	0.10	333	0.10	333	0.10	333
	10	0.115	333	0.115	333	0.115	333
	11	0.12	332	0.12	332	0.12	333
	12	0.11	332	0.11	332	0.11	333
Average		sqrt		sqrt		sqrt	
Moist (%)		NA		NA		NA	
Moist (Bws)							
Md(lb/lbmole)							
Ms(lb/lbmole)							
Vs (f/s)							
Qa (acfm)							
Qs (dscfm)							

$Ps = Pbar + Pg/13.6$

$Moist(\%) = 100(Bws)$

$Md = 0.44(\%CO2) + 0.32(\%O2) + 0.28(\%N2 + \%CO)$

$Ms = Md(1-Bws) + 18Bws$

$Vs = 85.49Cp(sqrt[(Delta\ P)avg]) \times sqrt[(Ts+460)/MsPs)]$

$Qa = 60VsAs$

$Qs = Qa[528/(Ts+460)](Ps/29.92) \times (1 - Bws)$

VELOCITY TRAVERSE DATA

SAMPLING LOCATION: Dryer #3

Plant	Williamette	Pitot Type	S	Bar Press (in HG)	29.91
City	Emerson AR	Pitot No.	4K	Post Leak Check	✓
Operator	MMT BM	Pitot Cp	0.84	Stack Diameter (in)	22
Date	4/24/98	Thermocouple	4K	CO2/O2 Analysis By	Bag/3L

MEASUREMENT DEVICE

- Micromanometer ☐
- 10" Manometer ☐
- Magnehelic ☒
- Other ☐

Explain:

TRAVERSE SCHEMATIC

Ps = Pbar + Pg/13.6

Moist(%) = 100(Bws)

Md = 0.44(%CO2) + 0.32(%O2) + 0.28(%N2 + %CO)

Ms = Md(1-Bws) + 18Bws

Vs = 85.49Cp(sqrt[(Delta P)avg]) x sqrt[(Ts+460)/MsPs)]

Qa = 60VsAs

Qs = Qa[528/(Ts+460)](Ps/29.92) x (1 - Bws)

Run No.		4		5		6	
Time							
Ts(DB) deg F		NA		NA		NA	
Ts(WB) deg F		NA		NA		NA	
Pg(in H2O)		-0.03		-0.03		-0.03	
Ps(in HG)		29.91		29.91		29.91	
CO2 %							
O2 %							
port	point	Delta P	Ts	Delta P	Ts	Delta P	Ts
A	1	0.03	313	0.03	312	0.03	329
	2	0.04	314	0.04	313	0.04	328
	3	0.045	314	0.045	314	0.045	328
	4	0.045	315	0.045	315	0.045	328
	5	0.045	315	0.045	315	0.045	329
	6	0.05	316	0.05	316	0.05	330
	7	0.05	316	0.05	316	0.05	330
	8	0.05	317	0.05	318	0.05	330
	9	0.05	318	0.05	318	0.045	330
	10	0.05	318	0.05	319	0.05	330
	11	0.05	319	0.05	320	0.05	330
	12	0.05	319	0.05	318	0.045	327
B	1	0.03	318	0.02	322	0.03	329
	2	0.04	319	0.04	323	0.035	328
	3	0.05	319	0.05	323	0.05	329
	4	0.05	319	0.05	323	0.05	329
	5	0.055	319	0.055	324	0.05	329
	6	0.05	320	0.05	322	0.05	329
	7	0.045	320	0.045	321	0.045	329
	8	0.045	320	0.045	321	0.045	328
	9	0.045	320	0.045	321	0.04	328
	10	0.04	320	0.04	321	0.04	327
	11	0.04	320	0.04	321	0.04	327
	12	0.035	319	0.035	320	0.03	326
Average		sqrt		sqrt		sqrt	
Moist (%)		NA		NA		NA	
Moist (Bws)							
Md(lb/lbmole)							
Ms(lb/lbmole)							
Vs (ft/s)							
Qa (acfm)							
Qs (dscfm)							

VELOCITY TRAVERSE DATA

SAMPLING LOCATION: Cooler (#4)

Plant	Willamette	Pitot Type	S	Bar Press (in HG)	29.91
City	Eugene, OR	Pitot No.	4K	Post Leak Check	✓
Operator	MM+BM	Pitot Cp	0.84	Stack Diameter (in)	45
Date	4/24/98	Thermocouple	4K	CO2/O2 Analysis By	Bag/3A

MEASUREMENT DEVICE

- Micromanometer ☐
- 10" Manometer ☐
- Magnehelic ☒
- Other ☐ Explain:

TRAVERSE SCHEMATIC

Run No.		4		5		6	
Time							
Ts(DB) deg F		NA		NA		NA	
Ts(WB) deg F		NA		NA		NA	
Pg(in H2O)		-0.05		-0.05		-0.05	
Ps(in HG)		29.91		29.91		29.91	
CO2 %		0		0		0	
O2 %		20.9		20.9		20.9	
port	point	Delta P	Ts	Delta P	Ts	Delta P	Ts
A	1	0.13	112	0.13	112	0.13	112
	2	0.19	113	0.20	113	0.20	113
	3	0.21	114	0.21	114	0.25	114
	4	0.25	114	0.24	114	0.23	115
	5	0.23	115	0.23	115	0.22	115
	6	0.23	115	0.23	115	0.22	115
	7	0.27	114	0.28	114	0.26	114
	8	0.28	114	0.30	114	0.31	113
	9	0.33	113	0.33	113	0.34	111
	10	0.34	112	0.34	112	0.33	112
	11	0.34	112	0.33	112	0.30	111
	12	0.32	111	0.31	111	0.31	111
B	1	Port	not	accessable		NA	
	2						
	3						
	4						
	5						
	6						
	7						
	8						
	9						
	10						
	11						
	12						
Average		sqrt		sqrt		sqrt	
Moist (%)		NA		NA		NA	
Moist (Bws)							
Md(lb/lbmole)							
Ms(lb/lbmole)							
Vs (f/s)							
Qa (acfm)							
Qs (dscfm)							

Ps = Pbar + Pg/13.6

Moist(%) = 100(Bws)

Md = 0.44(%CO2) + 0.32(%O2) + 0.28(%N2 + %CO)

Ms = Md(1-Bws) + 18Bws

Vs = 85.49Cp(sqrt[(Delta P)avg]) x sqrt[(Ts+460)/MsPs)]

Qa = 60VsAs

Qs = Qa[528/(Ts+460)](Ps/29.92) x (1 - Bws)

DEECO

FORMALDEHYDE TESTING FIELD DATA SHEET

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Willamette Emerson, AR	4/24/98	Dryer 1	Formaldehyde	run 2 condition 2 #5

OPERATOR	AMBIENT PRESS (In. Hg)	STATIC PRESS (in. ~~Hg~~ H_2O)	AMBIENT TEMP (deg. F)	FILTER TYPE	STACK ID (In.)	PITOT Cp	PROBE LENGTH AND LINER TYPE	PURGE TIME (MIN)	PURGE RATE (lpm)
Bill Millinor	29.91	-0.04	70	NA	22.5	NA	1' stainless	—	—

ASSUMED MOISTURE (%)	DGM BOX No.		DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	ORSAT NO.	LEAK CHECK (INITIAL)	LEAK CHECK (FINAL)	O2 CONTENT %	CO2 CONTENT %	
	VOST 4		1.001	NA	NA	CEM	NA	0.0004	See CEMs	See CEMs	

TRAV. POINT NO.	ELAPSED TEST TIME (MIN)	CLOCK TIME (24 HR)	DGM READING Vm (liters)	SAMPLE VOLUME METERED (Vm)	SAMPLE FLOW SETTING (lpm)	PERCENT DEVIATION a %	STACK TEMP (deg. F)	PROBE TEMP (deg. F)	FILTER OVEN TEMP (deg. F)	DGM IN/OUT TEMP (deg. F)	SAMPLE TRAIN VAC (In. Hg)
begin point	0		0	NA	1	NA	See M2	NA	NA	89	2
	5		5.17	↓	↓	↓	↓	↓	↓	90	2
	10		9.98							87	2
	15		14.87							87	2
	20		19.98							87	2
	25		24.95							87	2
	30		29.84							87	2
	35		34.98							88	2
	40		39.87							88	2
	45		44.97							88	2
	50		49.87							88	2
	55		54.52							88	2.5
	60		59.74							86	2.5
	TOTAL TIME		TOTAL VOLUME (l)	AVE	AVE (lpm)		AVE TEMP			AVE TEMP	MIN VACUUM
	60		59.74	—	1.0		—			87.7	2

486.2 including 1st glass stem

PERCENT DEVIATION = $\frac{Vm - Vm\ avg}{Vm\ avg} \times 100\%$

94

DEECO

FORMALDEHYDE TESTING FIELD DATA SHEET

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Willamette Emerson AR	4/24/98	Dryer 1	Formaldehyde	Run 1 Condition 2 #5

OPERATOR	AMBIENT PRESS (In. Hg)	STATIC PRESS (in. ~~Hg~~ H_2O)	AMBIENT TEMP (deg. F)	FILTER TYPE	STACK ID (In.)	PITOT Cp	PROBE LENGTH AND LINER TYPE	PURGE TIME (MIN)	PURGE RATE (lpm)
Bill Millinor	29.91	-0.04	75	NA	22.5	NA	1' Stainless	—	—

ASSUMED MOISTURE (%)	DGM BOX No.		DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	ORSAT NO.	LEAK CHECK (INITIAL)	LEAK CHECK (FINAL)	O2 CONTENT %	CO2 CONTENT %	
NA	Vost 4		1.001	NA	NA	Cem	—	0.0165"	—	—	

TRAV. POINT NO.	ELAPSED TEST TIME (MIN)	CLOCK TIME (24-HR)	DGM READING Vm (liters)	SAMPLE VOLUME METERED (Vm)	SAMPLE FLOW SETTING (lpm)	PERCENT DEVIATION a %	STACK TEMP (deg. F)	PROBE TEMP (deg. F)	FILTER OVEN TEMP (deg. F)	DGM IN/OUT TEMP (deg. F)	SAMPLE TRAIN VAC (in. Hg)
Single	0	9:15	0	NA	1	NA	See A2	NA	NA	80	2
point	5		5.04							81	2
	10		9.81							83	2
	15		14.49							84	2
	20		19.27							83	2
	25		24.04							85	2
	30		28.91							81	2
	35		33.81							83	2
	40		38.72							86	2.5
	45		43.44							84	2.5
	50		48.37							87	2.5
	55		53.28							88	2.5
	60		57.98							87	2.5
	TOTAL TIME		TOTAL VOLUME (l)	AVE	AVE (lpm)		AVE. TEMP.			AVE. TEMP.	MIN VACUUM
	60		57.98	—	1.0		—			84.0	2

PERCENT DEVIATION → $\frac{Vm - Vm\ avg}{Vm\ avg} \times 100\%$

352.4

95

DEECO

FORMALDEHYDE TESTING FIELD DATA SHEET

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Willamette, Emerson AR	4/24/98	Dryer 1	Formaldehyde	run 3 condition 2 #6

OPERATOR	AMBIENT PRESS (In. Hg)	STATIC PRESS (in. H2O)	AMBIENT TEMP (deg. F)	FILTER TYPE	STACK ID (In.)	PITOT Cp	PROBE LENGTH AND LINER TYPE	PURGE TIME (MIN)	PURGE RATE (lpm)
Bill Millner	29.91	-0.04	80	NA	22.5	NA	1' stainless	—	—

ASSUMED MOISTURE (%)	DGM BOX No.		DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	ORSAT NO.	LEAK CHECK (INITIAL)	LEAK CHECK (FINAL)	O2 CONTENT %	CO2 CONTENT %	
NA	VOST 4		1.001	NA	NA	CEM	NA	0.015"	—	—	

TRAV. POINT NO.	ELAPSED TEST TIME (MIN)	CLOCK TIME (24 HR)	DGM READING Vm (liters)	SAMPLE VOLUME METERED (Vm)	SAMPLE FLOW SETTING (lpm)	PERCENT DEVIATION a %	STACK TEMP (deg. F)	PROBE TEMP (deg. F)	FILTER OVEN TEMP (deg. F)	DGM IN/OUT TEMP (deg. F)	SAMPLE TRAIN VAC (In. Hg)
Single	0		0	NA	2	NA	See N2	NA	NA	99	2
point	5		5.16							101	2
	10		10.14							99	2
	15		15.23							96	2
	20		20.55							95	2
	25		25.74							94	2
	30		30.93							95	2
	35		35.94							94	2
	40		40.98							95	2
	45		46.17							97	2
	50		51.42							97	2
	55		56.71							97	2
	60		61.75							100	2
	TOTAL TIME		TOTAL VOLUME (l)	AVE	AVE (lpm)		AVE. TEMP.			AVE. TEMP.	MIN VACUUM
	60		61.75	—	1		—			96.1	2

$$\text{PERCENT DEVIATION} = \frac{Vm - Vm\ avg}{Vm\ avg} \times 100\%$$

447.7 with 1st glass stem

96

FORMALDEHYDE TESTING FIELD DATA SHEET

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Willamette, Emerson AR	4/24/98	Dryer 2	Formaldehyde	Run 2 Condition 2 #4

OPERATOR	AMBIENT PRESS (in. Hg)	STATIC PRESS (in. Hg)	AMBIENT TEMP (deg. F)	FILTER TYPE	STACK ID (in.)	PITOT Cp	PROBE LENGTH AND LINER TYPE	PURGE TIME (MIN)	PURGE RATE (lpm)
Bill Gilliver	29.91	0	70	NA	22	NA	1' stainless	—	—

ASSUMED MOISTURE (%)	DGM BOX No.		DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	ORSAT NO.	LEAK CHECK (INITIAL)	LEAK CHECK (FINAL)	O2 CONTENT %	CO2 CONTENT %	
NA	VOST 6			NA	NA	CEM	NA	0.01 5"	—	—	

TRAV. POINT NO.	ELAPSED TEST TIME (MIN)	CLOCK TIME (24-HR)	DGM READING Vm (liters)	SAMPLE VOLUME METERED (Vm)	SAMPLE FLOW SETTING (lpm)	PERCENT DEVIATION a %	STACK TEMP (deg. F)	PROBE TEMP (deg. F)	FILTER OVEN TEMP (deg. F)	DGM IN/OUT TEMP (deg. F)	SAMPLE TRAIN VAC (in. Hg)
Single point	0	9:15	0	NA	1	NA	See method 2	NA	NA	90	1
	5		6.48							90	1
	10		12.02							91	1
	15		17.60							92	1
	20		23.34							92	1
	25		29.01							92	1
	30		34.59							92	1
	35		40.21							93	1
	40		45.78							94	1
	45		51.31							94	1
	50		56.83							94	1
	55		62.56							94	1
	60	10:15	68.25							95	1
	TOTAL TIME		TOTAL VOLUME (l)	AVE	AVE (lpm)		AVE. TEMP.			AVE. TEMP.	MIN VACUUM
	60		68.25	—	1.0		—			92.5	1

449.3 with 1st glass stem

$$\text{PERCENT DEVIATION} = \frac{Vm - Vm\ avg}{Vm\ avg} \times 100\%$$

97

DEECO

FORMALDEHYDE TESTING FIELD DATA SHEET

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Willamette, Emerson AR	4/24/98	Dryer 2	Formaldehyde	run 2 condition 2 #25

OPERATOR	AMBIENT PRESS (in. Hg)	STATIC PRESS (in. Hg)	AMBIENT TEMP (deg. F)	FILTER TYPE	STACK ID (in.)	PITOT Cp	PROBE LENGTH AND LINER TYPE	PURGE TIME (MIN)	PURGE RATE (lpm)
Bill Millner	29.91	0	75	NA	22	NA	1' Stainless	—	—

ASSUMED MOISTURE (%)	DGM BOX No.		DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	ORSAT NO.	LEAK CHECK (INITIAL)	LEAK CHECK (FINAL)	O2 CONTENT %	CO2 CONTENT %	
NA	VOST 6			NA	NA	CEM	NA	0.0@ 5"	—	—	

TRAV. POINT NO.	ELAPSED TEST TIME (MIN)	CLOCK TIME (24 HR)	DGM READING Vm (liters)	SAMPLE VOLUME METERED (Vm)	SAMPLE FLOW SETTING (lpm)	PERCENT DEVIATION a %	STACK TEMP (deg. F)	PROBE TEMP (deg. F)	FILTER OVEN TEMP (deg. F)	DGM IN/OUT TEMP (deg. F)	SAMPLE TRAIN VAC (in. Hg)
Single point	0		0	NA	1	NA	See N2	NA	NA	97	1
	5		6.21							98	1
	10		11.73							97	1
	15		17.34							97	1
	20		23.02							97	1
	25		28.57							97	1
	30		34.40							97	1
	35		39.91							97	1
	40		45.64							97	1
	45		50.08							97	1
	50		56.81							98	1
	55		62.35							98	1
	60		67.99							98	1
	TOTAL TIME		TOTAL VOLUME (l)	AVE	AVE (lpm)		AVE. TEMP			AVE. TEMP	MIN VACUUM
	60		67.99	—	1.0		—			97.3	1

$$\text{PERCENT DEVIATION} = \frac{Vm - Vm\ avg}{Vm\ avg} \times 100\%$$

446.7

86

DEECO

FORMALDEHYDE TESTING FIELD DATA SHEET

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Willamette, Emerson AR	4/24/98	Dryer 2	Formaldehyde	run 3 condition 2 #6

OPERATOR	AMBIENT PRESS (In. Hg)	STATIC PRESS (In. Hg)	AMBIENT TEMP (deg. F)	FILTER TYPE	STACK ID (In.)	PITOT Cp	PROBE LENGTH AND LINER (TYPE)	PURGE TIME (MIN)	PURGE RATE (lpm)
Bill Millner	29.91	0	60	NA	22	NA	1' stan less	—	—

ASSUMED MOISTURE (%)	DGM BOX No.		DGM CAL. FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	ORSAT NO.	LEAK CHECK (INITIAL)	LEAK CHECK (FINAL)	O2 CONTENT %	CO2 CONTENT %	
	Vost 6			NA	NA	CEM	NA	0.03@6"	—	—	

TRAV. POINT NO.	ELAPSED TEST TIME (MIN)	CLOCK TIME (24 HR)	DGM READING Vm (liters)	SAMPLE VOLUME METERED (Vm)	SAMPLE FLOW SETTING (lpm)	PERCENT DEVIATION a %	STACK TEMP (deg. F)	PROBE TEMP (deg. F)	FILTER OVEN TEMP (deg. F)	DGM IN/OUT TEMP (deg. F)	SAMPLE TRAIN VAC (In. Hg)
Single point	0		0	NA	1	NA	See A2	NA	NA	102	1
	5		5.54							102	1
	10		11.41							102	1
	15		17.28							102	1
	20		22.99							101	1
	25		28.59							102	1
	30		34.17							102	1.5
	35		39.87							102	1.5
	40		45.51							102	1.5
	45		51.12							103	1.5
	50		56.67							102	1.5
	55		62.17							101	1.5
	60		67.73							102	1.5
	TOTAL TIME		TOTAL VOLUME (l)	AVE	AVE (lpm)		AVE. TEMP.			AVE. TEMP.	MIN VACUUM
	60		67.73	—	—		—			101.9	1

$$\text{PERCENT DEVIATION} = \frac{Vm - Vm\ avg}{Vm\ avg} \times 100\%$$

351.2

354.0

DEECO

FORMALDEHYDE TESTING FIELD DATA SHEET

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Willamette Emerson, AR	4/24/98	Dryer #3	Formaldehyde	4 Condition 2

OPERATOR	AMBIENT PRESS (in. Hg)	STATIC PRESS (in. ~~Hg~~ H_2O)	AMBIENT TEMP (deg. F)	FILTER TYPE	STACK ID (in.)	PITOT Cp	PROBE LENGTH AND LINER TYPE	PURGE TIME (MIN)	PURGE RATE (lpm)
MM	29.91	-0.03	70	N/A	22	N/A	1' Stainless	—	—

ASSUMED MOISTURE (%)	DGM BOX No.		DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	ORSAT NO.	LEAK CHECK (INITIAL)	LEAK CHECK (FINAL)	O2 CONTENT %	CO2 CONTENT %	
NA	Vest 1		1.029	N/A	N/A	CEM's	0.005 @ 7"	0.005 @ 7"	—	—	

TRAV. POINT NO.	ELAPSED TEST TIME (MIN)	CLOCK TIME (24-HR)	DGM READING Vm (liters)	SAMPLE VOLUME METERED (Vm)	SAMPLE FLOW SETTING (lpm)	PERCENT DEVIATION a %	STACK TEMP (deg. F)	PROBE TEMP (deg. F)	FILTER OVEN TEMP (deg. F)	DGM IN/OUT TEMP (deg. F)	SAMPLE TRAIN VAC (in. Hg)
Sgl Pt.	0		45.37	NA	1.0	NA	See M2			70	1
	5		49.60		1.0					71	1
	10		54.42		1.0					71	1
	15		59.49		1.0					71	1
	20		64.36		1.0					72	1
	25		69.39		1.0					72	1
	30		74.33		1.0					72	1
	35		79.18		1.0					73	1
	40		84.19		1.0					73	1
	45		89.21		1.0					73	1
	50		94.31		1.0					73	1
	55		99.30		1.0					74	1
	60		104.41		1.0						
	TOTAL TIME		TOTAL VOLUME (l)	AVE	AVE (lpm)		AVE. TEMP.			AVE. TEMP.	MIN VACUUM
	60		59.04	—	1.0		—			72.1	

$$\text{PERCENT DEVIATION} = \frac{Vm - Vm\ avg}{Vm\ avg} \times 100\%$$

355.0

DEECO

FORMALDEHYDE TESTING FIELD DATA SHEET

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Williamette Emerson, AR	4/24/98	Dryer #3	Formaldehyde	#Five Condition 2

OPERATOR	AMBIENT PRESS (In. Hg)	STATIC PRESS (in. ~~Hg~~ H2O)	AMBIENT TEMP (deg. F)	FILTER TYPE	STACK ID (In.)	PITOT Cp	PROBE LENGTH AND LINER TYPE	PURGE TIME (MIN)	PURGE RATE (lpm)
MM	29.91	-0.03	75	N/A	22	N/A	1' Stainless	—	—

ASSUMED MOISTURE (%)	DGM BOX No.		DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	ORSAT NO.	LEAK CHECK (INITIAL)	LEAK CHECK (FINAL)	O2 CONTENT %	CO2 CONTENT %	
NA	Vol #1		1.029	N/A	N/A	CEMS	0.003@5"	0.003@5"	—	—	

TRAV. POINT NO.	ELAPSED TEST TIME (MIN)	CLOCK TIME (24-HR)	DGM READING Vm (liters)	SAMPLE VOLUME METERED (Vm)	SAMPLE FLOW SETTING (lpm)	PERCENT DEVIATION a %	STACK TEMP (deg. F)	PROBE TEMP (deg. F)	FILTER OVEN TEMP (deg. F)	DGM IN/OUT TEMP (deg. F)	SAMPLE TRAIN VAC (In. Hg)
Single Pt	0	10:50	4.48	NA	1.0	NA	See M2			77	1
	5		9.20		1.0					78	1
	10		14.04		1.0					78	1
	15		19.20		1.0					78	1
	20		24.20		1.0					78	1
	25		29.07		1.0					78	1
	30		34.17		1.0					78	1
	35		39.02		1.0					79	1
	40		44.26		1.0					79	1
	45		49.31		1.0					79	1
	50		54.32		1.0					80	1
	55		59.46		1.0					80	1
	60		64.59		1.0						
	TOTAL TIME		TOTAL VOLUME (l)	AVE	AVE (lpm)		AVE. TEMP.			AVE. TEMP.	MIN VACUUM
	60		60.11	—	1.0		—			79.5	1

$$\text{PERCENT DEVIATION} = \frac{Vm - Vm\ avg}{Vm\ avg} \times 100\%$$

101

354.6

DEECO

FORMALDEHYDE TESTING FIELD DATA SHEET

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Williamette Emerson, AR	4/24/98	Dryer #3	Formaldehyde	Six Cond. Run 2

OPERATOR	AMBIENT PRESS (in. Hg)	STATIC PRESS (in. ~~Hg~~ H_2O)	AMBIENT TEMP (deg. F)	FILTER TYPE	STACK ID (in.)	PITOT Cp	PROBE LENGTH AND LINER TYPE	PURGE TIME (MIN)	PURGE RATE (lpm)
MM	29.91	-0.03	80	N/A	22	N/A	1' Stainless	—	—

ASSUMED MOISTURE (%)	DGM BOX No.		DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	ORSAT NO.	LEAK CHECK (INITIAL)	LEAK CHECK (FINAL)	O2 CONTENT %	CO2 CONTENT %	
NA	Box #1		1.029	N/A	N/A	CEM's	0.002@5"	0.002@5"	—	—	

TRAV. POINT NO.	ELAPSED TEST TIME (MIN)	CLOCK TIME (24-HR)	DGM READING Vm (liters)	SAMPLE VOLUME METERED (Vm)	SAMPLE FLOW SETTING (lpm)	PERCENT DEVIATION a %	STACK TEMP (deg. F)	PROBE TEMP (deg. F)	FILTER OVEN TEMP (deg. F)	DGM IN/OUT TEMP (deg. F)	SAMPLE TRAIN VAC (in. Hg)
Single Pt	0	13:50	69.94	NA	1.0	NA	See M2			85	1
	5		74.52		1.0					85	1
	10		79.39		1.0					86	1
	15		84.41		1.0					85	1
	20		89.44		1.0					85	1
	25		94.40		1.0					85	1
	30		99.60		1.0					85	1
	35		104.54		1.0					85	1
	40		109.61		1.0					85	1
	45		114.52		1.0					85	1
	50		119.31		1.0					86	1
	55		124.50		1.0					86	1
	60		—	—	—					—	
	TOTAL TIME		TOTAL VOLUME (l)	AVE	AVE (lpm)		AVE TEMP			AVE TEMP	MIN VACUUM
			54.56	—	1.0		—			85.3	1

$$\text{PERCENT DEVIATION} = \frac{Vm - Vm\ avg}{Vm\ avg} \times 100\%$$

102

356.3

DEECO

FORMALDEHYDE TESTING FIELD DATA SHEET

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Williamette Emerson, AR	4/24/98	Cooler	Formaldehyde	4 Condition 2

OPERATOR	AMBIENT PRESS (In. Hg)	STATIC PRESS (In. ~~Hg~~ H_2O)	AMBIENT TEMP (deg. F)	FILTER TYPE	STACK ID (In.)	PITOT Cp	PROBE LENGTH AND LINER TYPE	PURGE TIME (MIN)	PURGE RATE (lpm)
MM	29.91	-0.05	70	N/A	45	N/A	1' Stainless	—	—

ASSUMED MOISTURE (%)	DGM BOX No.		DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	ORSAT NO.	LEAK CHECK (INITIAL)	LEAK CHECK (FINAL)	O2 CONTENT %	CO2 CONTENT %	
N/A	Vat #3		1.064	N/A	N/A	CEM	0.004 @ 20"	0.004 @ 20"	—	—	

TRAV. POINT NO.	ELAPSED TEST TIME (MIN)	CLOCK TIME (24-HR)	DGM READING Vm (liters)	SAMPLE VOLUME METERED (Vm)	SAMPLE FLOW SETTING (lpm)	PERCENT DEVIATION a %	STACK TEMP (deg. F)	PROBE TEMP (deg. F)	FILTER OVEN TEMP (deg. F)	DGM IN/OUT TEMP (deg. F)	SAMPLE TRAIN VAC (In. Hg)	Rotameter
Single Pt	0		Crit. Orifice	NA	1.1	NA	See A2			82	18	66
	5				1.1					82	18	66
	10				1.1					82	18	66
	15				1.1					82	18	67
	20				1.1					82	18	67
	25				1.1					82	18	67
	30				1.1					82	18	69
	35				1.1					82	18	69
	40				1.1					82	18	70
	45				1.1					82	18	70
	50				1.1					83	18	70
	55				1.1					83	18	70
	60				1.1							
	TOTAL TIME		TOTAL VOLUME (l)	AVE	AVE (lpm)		AVE TEMP			AVE TEMP	MIN VACUUM	
	60		66.0	—	1.1		—			—	18	

$$\text{PERCENT DEVIATION} = \frac{Vm - Vm\ avg}{Vm\ avg} \times 100\%$$

meter broke

Orifice 1.1 lpm

123

354.8

DEECO

FORMALDEHYDE TESTING FIELD DATA SHEET

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Willamette Emerson, AR	4/24/98	Cooler (#4)	Formaldehyde	Five Condition 2

OPERATOR	AMBIENT PRESS (in. Hg)	STATIC PRESS (in. Hg) H_2O	AMBIENT TEMP (deg. F)	FILTER TYPE	STACK ID (in.)	PITOT Cp	PROBE LENGTH AND LINER TYPE	PURGE TIME (MIN)	PURGE RATE (lpm)
MM	29.91	-0.05	75	N/A	45	N/A	1' Stainless	—	—

ASSUMED MOISTURE (%)	DGM BOX No.		DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	ORSAT NO.	LEAK CHECK (INITIAL)	LEAK CHECK (FINAL)	O2 CONTENT %	CO2 CONTENT %	
NA	Vol #3		1	N/A	N/A	CEM's	0.008@20"	0.006@20"	—	—	

TRAV. POINT NO.	ELAPSED TEST TIME (MIN)	CLOCK TIME (24-HR)	DGM READING Vm (liters)	SAMPLE VOLUME METERED (Vm)	SAMPLE FLOW SETTING (lpm)	PERCENT DEVIATION %	STACK TEMP (deg. F)	PROBE TEMP (deg. F)	FILTER OVEN TEMP (deg. F)	DGM IN/OUT TEMP (deg. F)	SAMPLE TRAIN VAC (in. Hg)	Rotameter
Single Pt	0		Coil Coalface	NA	1.1	—	See M2			89	18	70
	5				1.1	0				89	18	70
	10				1.1					89	18	70
	15				1.1					89	18	70
	20				1.1					89	18	70
	25				1.1					89	18	70
	30				1.1					89	18	70
	35				1.1					89	18	71
	40				1.1					89	18	71
	45				1.1					89	18	71
	50				1.1					90	18	73
	55				1.1					92	18	73
	60				1.1							
	TOTAL TIME		TOTAL VOLUME (l)	AVE	AVE (lpm)		AVE. TEMP.			AVE. TEMP.	MIN VACUUM	
	60		66.0		1.1		—			89.3	18	

$$\text{PERCENT DEVIATION} = \frac{Vm - Vm\ avg}{Vm\ avg} \times 100\%$$

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DEECO

351.5

FORMALDEHYDE TESTING FIELD DATA SHEET

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Willamette, Ericson, AK	4/24/98	Center	Formaldehyde	Six Condition 2

OPERATOR	AMBIENT PRESS (In. Hg)	STATIC PRESS (In. ~~Hg~~ H_2O)	AMBIENT TEMP (deg. F)	FILTER TYPE	STACK ID (In.)	PITOT Cp	PROBE LENGTH AND LINER TYPE	PURGE TIME (MIN)	PURGE RATE (lpm)
MM	29.91	-0.05	80	N/A	45	N/A	1' Stainless	—	—

ASSUMED MOISTURE (%)	DGM BOX No.		DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	ORSAT NO.	LEAK CHECK (INITIAL)	LEAK CHECK (FINAL)	O2 CONTENT %	CO2 CONTENT %	
	Box #3		1	N/A	N/A	CEM	0.011 @ 20"	0.009 @ 24"	20.9	0.0	

TRAV. POINT NO.	ELAPSED TEST TIME (MIN)	CLOCK TIME (24-HR)	DGM READING Vm (liters)	SAMPLE VOLUME METERED (Vm)	SAMPLE FLOW SETTING (lpm)	PERCENT DEVIATION %	STACK TEMP (deg. F)	PROBE TEMP (deg. F)	FILTER OVEN TEMP (deg. F)	DGM IN/OUT TEMP (deg. F)	SAMPLE TRAIN VAC. (In. Hg)	
Single Pt	0	1330	Crit. Orifice	NA	1.1	0	See N2			94	18	71
	5				1.1					94	18	71
	10				1.1					94	18	71
	15				1.1					94	18	71
	20				1.1					94	18	71
	25				1.1					94	18	71
	30				1.1					94	18	71
	35				1.1					94	18	71
	40				1.1					94	18	72
	45				1.1					94	18	72
	50				1.1					95	18	72
	55				1.1					95	18	72
	60				1.1							
	TOTAL TIME		TOTAL VOLUME (l)	AVE	AVE (lpm)		AVE. TEMP.			AVE. TEMP.	MIN. VACUUM	
	60		66.0	—	1.1		—			94.1	18	

$$\text{PERCENT DEVIATION} = \frac{Vm - Vm\ avg}{Vm\ avg} \times 100\%$$

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CEM Calibration Sheet

DEECO

Client: Williamette City: Emerson AK
Source: Veneer #3 #4 Dryer Date: 4-24-98
CEM Operator: DJS

	Calibration Error			Run: FOUR					Run: FIVE					Run: SIX				
				Pre-test Time: 8:40		Post-test Time: 10:25			Pre-test Time: 10:25		Post-test Time: 12:00			Pre-test Time: 12:00		Post-test Time: 15:20		
	Cylinder Value	Analyzer Calibration Response	Difference (% of Span) (<2%)	System Calibration Response	System Cal Bias (% of Span) (<5%)	System Calibration Response	System Cal Bias (% of Span) (<5%)	System Cal Drift (% of Span) (<5%)	System Calibration Response	System Cal Bias (% of Span) (<5%)	System Calibration Response	System Cal Bias (% of Span) (<5%)	System Cal Drift (% of Span) (<5%)	System Calibration Response	System Cal Bias (% of Span) (<5%)	System Calibration Response	System Cal Bias (% of Span) (<5%)	System Cal Drift (% of Span) (<5%)
O2 Zero																		
O2 Mid																		
O2 High																		
CO2 Zero																		
CO2 Mid																		
CO2 High																		
CO Zero																		
SO2 Low	0	—	—	0.8	0.0	-9.9	0.1	-0.1	-9.9	0.1	50.3	0.5	0.6	50.3	0.5	200	-2.0	-1.5
SO2 Mid	3100	—	—	3072	-0.3													
SO2 High	5040	—	—	5200	+01.6	5200	1.6	0.0	5200	1.6	4919	-1.2	-2.8	4919	-1.2	4700	-3.4	-2.2
	8510	—	—	8500	-0.1													
NOx Low*																		
NOx Mid																		
NOx High																		
SO2 Zero																		
SO2 Mid																		
SO2 High																		
THC Response Time				System Calibration Response	System Cal Bias (% of Out) (<5%)	System Calibration Response	System Cal Bias (% of Out) (<5%)	System Cal Drift (% of Span) (<5%)	System Calibration Response	System Cal Bias (% of Out) (<5%)	System Calibration Response	System Cal Bias (% of Out) (<5%)	System Cal Drift (% of Span) (<5%)	System Calibration Response	System Cal Bias (% of Out) (<5%)	System Calibration Response	System Cal Bias (% of Out) (<5%)	System Cal Drift (% of Span) (<5%)
THC Zero	0			0.6	0.0	-2.1	-0.0	-0.0	-2.1	-0.0	-1.1	0.0	0.0	-1.1	0.0	3.7	0.0	0.0
THC Low	3100			3110	+0.1													
THC Mid	5040			5053	+0.1	4996	-0.4	-0.6	4996	-0.4	4985	-0.5	-0.1	4985	-0.5	5008	0.3	+0.2
THC High	8510			8515	+0.05													

* - NO_x low calibration gas is used only for turbine testing.

CEM Calibration Sheet

Client: Willamette City: Emerson AK
Source: Tower Date: 4-24-98
CEM Operator: DSG

	Calibration Error			Run: FOUR					Run: FIVE					Run: SIX				
				Pretest Time: 8:50		Post-test Time: 10:30			Pretest Time: 10:30		Post-test Time: 12:00			Pretest Time: 12:00		Post-test Time: 15:30		
	Cylinder Value	Analyzer Calibration Response	Difference (% of Span) (<2%)	System Calibration Response	System Cal Bias (% of Span) (<3%)	System Calibration Response	System Cal Bias (% of Span) (<3%)	System Cal Drift (% of Span) (<3%)	System Calibration Response	System Cal Bias (% of Span) (<3%)	System Calibration Response	System Cal Bias (% of Span) (<3%)	System Cal Drift (% of Span) (<3%)	System Calibration Response	System Cal Bias (% of Span) (<3%)	System Calibration Response	System Cal Bias (% of Span) (<3%)	System Cal Drift (% of Span) (<3%)
O2 Zero	0	0.0	0.0	0.5	12.0	0.2	0.8	-1.2	0.2	0.8	0.5	12.0	+1.2	0.5	2.0	0.4	1.6	-0.4
O2 Mid	11.9	12.1	0.8	12.2	+0.8	12.2	0.8	0.0	12.2	0.8	12.2	0.8	0.0	12.2	0.8	11.9	0.0	0.8
O2 High	22.1	22.1	0.0															
CO2 Zero	0	0.0	0.0	0.0	0.0	0.1	0.5	0.5	0.1	0.5	0.1	0.5	0.0	0.1	0.5	0.1	0.5	0.0
CO2 Mid	10.1	10.2	0.5	10.0	-0.5	10.0	-0.5	0.0	10.0	-0.5	10.2	+0.5	1.0	10.2	0.5	9.8	-1.0	2.0
CO2 High	17.8	17.8	0.0															
THS Zero	0	—	—	9.0	+0.1	17.0	0.2	0.1	17	0.2	14.7	0.1	0.0	14.7	0.1	13.4	0.1	0.0
THS Low	3100	—	—	3034	-0.7	2794	-3.06	-2.4	2794	-3.1	2880	-2.2	+1.1	2880	-2.2	2885	-2.2	0.0
THS Mid	5040	—	—	5017	-0.2													
THS High	8510	—	—	8491	-0.2													
NOx Zero																		
NOx Low*																		
NOx Mid																		
NOx High																		
SO2 Zero																		
SO2 Mid																		
SO2 High																		
THC Response Time				System Calibration Response	System Cal Bias (% of Out) (<3%)	System Calibration Response	System Cal Bias (% of Out) (<3%)	System Cal Drift (% of Span) (<3%)	System Calibration Response	System Cal Bias (% of Out) (<3%)	System Calibration Response	System Cal Bias (% of Out) (<3%)	System Cal Drift (% of Span) (<3%)	System Calibration Response	System Cal Bias (% of Out) (<3%)	System Calibration Response	System Cal Bias (% of Out) (<3%)	System Cal Drift (% of Span) (<3%)
THC Zero	0			4.1	0.0	28.0	+0.3	+0.2	28	+0.3	21.3	0.2	-0.0	21.3	0.2	12.0	0.1	-0.1
THC Low	3100			2900	-2.0	3040	-0.6	1.4	3040	-0.6	3230	1.3	1.9	3230	1.3	3000	1.0	-2.3
THC Mid	5040			5400	+3.6													
THC High	8510			8500	0.1													

* - NO_x low calibration gas is used only for turbine testing.

DECO

FORMALDEHYDE SAMPLE RECOVERY SHEET

Plant Willamette, Emerson Jr Sample Date 4-24-'98
Sample Location Dryer 1 Recovery Date 4-24-98
Sample Recovery Person AJB Run ID cond 2 #1

Weight (g)	Run 4	Run 5	Run 6
Final wt. (g)	415.0	553.5	516.1
Initial wt. (g)	352.4	486.2	447.7
Increased wt. (g)	62.6	67.3	68.4

RECOVERED SAMPLE

Formaldehyde

Run 4
Impinger Container No. cond 2 #1 - Run 1
Sample Volume (mL) 128 Level Marked ✓
Contains: ~~DNPH~~ Impinger Contents ✓
Water Rinse ✓ $MeCl_2$ Rinse NA

Run 5
Impinger Container No. cond 2 #1 Run 2
Sample Volume (mL) 128 Level Marked ✓
Contains: ~~DNPH~~ Impinger Contents ✓
Water Rinse ✓ $MeCl_2$ Rinse NA

Run 6
Impinger Container No. cond 2 #1 run 3
Sample Volume (mL) 184 Level Marked ✓
Contains: ~~DNPH~~ Impinger Contents ✓
Water Rinse ✓ $MeCl_2$ Rinse NA

Blank
Impinger Container No. NA
Contains: DNPH Impinger Contents NA
Water Rinse NA $MeCl_2$ Rinse NA

SAMPLE INTEGRITY AND COMMENTS

Sample stored and locked? yes
Remarks:

Date of laboratory custody
Laboratory person taking custody
Remarks:

DEECO

FORMALDEHYDE SAMPLE RECOVERY SHEET

Plant Willamette Emerson Ar Sample Date 4-24-98
Sample Location #2 Dryer Recovery Date 4-24-98
Sample Recovery Person ~~ATB~~ Run ID Cond 2 #2

Weight (g)	Run 4	Run 5	Run 6
Final wt. (g)	531.0	530.0	429.1
Initial wt. (g)	449.3	446.7	351.2
Increased wt. (g)	81.7	83.3	77.9

RECOVERED SAMPLE

Formaldehyde

Run 4
Impinger Container No. Cond 2 #2 Run 1
Sample Volume (mL) 166 Level Marked ✓
Contains: ~~DNPH~~ Impinger Contents ✓
Water Rinse ✓ $MeCl_2$ Rinse NA

Run 5
Impinger Container No. Cond 2 #2 Run 2
Sample Volume (mL) 168 Level Marked ✓
Contains: ~~DNPH~~ Impinger Contents ✓
Water Rinse ✓ $MeCl_2$ Rinse NA

Run 6
Impinger Container No. Cond 2 #2 Run 3
Sample Volume (mL) 154 Level Marked ✓
Contains: ~~DNPH~~ Impinger Contents ✓
Water Rinse ✓ $MeCl_2$ Rinse NA

Blank
Impinger Container No. NA
Contains: DNPH Impinger Contents NA
Water Rinse NA $MeCl_2$ Rinse NA

SAMPLE INTEGRITY AND COMMENTS

Sample stored and locked? yes
Remarks:

Date of laboratory custody
Laboratory person taking custody
Remarks:

DEECO

FORMALDEHYDE SAMPLE RECOVERY SHEET

Plant Willamette Emerson Ar Sample Date 4-24-98
Sample Location #4 Cooler Recovery Date 4-24-98
Sample Recovery Person ATB Run ID Cond 2 #4

Weight (g)	Run 4	Run ~~6~~ 5 w/b	Run ~~5~~ 6 w/b
Final wt. (g)	357.8	356.4	353.0
Initial wt. (g)	356.3	354.8	351.5
Increased wt. (g)	1.5	1.6	1.5

RECOVERED SAMPLE

Formaldehyde

Run 4
Impinger Container No. cond 2 #4 Run 1
Sample Volume (mL) 62 Level Marked ✓
Contains: ~~DNPH~~ Impinger Contents ✓
Water Rinse ✓ $MeCl_2$ Rinse NA

Run 5
Impinger Container No. cond 2 #4 Run 2
Sample Volume (mL) 46 Level Marked ✓
Contains: ~~DNPH~~ Impinger Contents ✓
Water Rinse ✓ $MeCl_2$ Rinse NA

Run 6
Impinger Container No. cond 2 #4 Run 3
Sample Volume (mL) 50 Level Marked ✓
Contains: ~~DNPH~~ Impinger Contents ✓
Water Rinse ✓ $MeCl_2$ Rinse NA

Blank
Impinger Container No. Water Blank
Contains: DNPH Impinger Contents NA
Water Rinse ✓ $MeCl_2$ Rinse NA

SAMPLE INTEGRITY AND COMMENTS

Sample stored and locked? yes
Remarks:

Date of laboratory custody
Laboratory person taking custody
Remarks:

APPENDIX A

FIELD DATA SHEETS

APPENDIX B

ANALYTICAL DATA SHEETS

DEECO, Inc.

3404 Lake Woodard Drive
Raleigh, NC 27604

Willamette

(98-1559)

Analytical Report

(0598-10)

NCASI Method

Formaldehyde

Enthalpy Analytical, Inc.
3211 Bramer Drive
Raleigh, NC 27604
919/850-4392

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Summary of Results

Company:	DEECO/Willamette	Client #:	98-1559
Analyst:	DMB	Enthalpy #:	0598-10
Parameters:	Formaldehyde (NCASI)	PO #:	98-00189
# Samples:	25	Report Date:	05/27/98

Sample ID	Compound/Catch Weight (ug)
	Formaldehyde
COND 1 #1 RUN 1	9,404
COND 1 #1 RUN 2	7,844
COND 1 #1 RUN 3	6,365
COND 2 #1 RUN 1	8,588
COND 2 #2 RUN 2	3,353
COND 2 #1 RUN 2	8,100
COND 1 #2 RUN 1	2,782
COND 1 #2 RUN 2	4,288
COND 1 #2 RUN 3	3,702
COND 2 #2 RUN 1	3,826
COND 2 #2 RUN 2	3,167
COND 2 #2 RUN 3	3,549
COND 1 #3 RUN 1	428
COND 1 #3 RUN 2	602
COND 1 #3 RUN 3	1,060
COND 2 #3 RUN 1	381
COND 2 #3 RUN 2	447
COND 2 #3 RUN 3	862
COND 1 #4 RUN 1	< 2.29
COND 1 #4 RUN 2	< 2.68
COND 1 #4 RUN 3	< 2.21
COND 2 #4 RUN 1	< 2.45
COND 2 #4 RUN 2	< 1.90
COND 2 #4 RUN 3	< 1.97

Reviewed by:

QA: Bruce G. Hawks — Date: 5/27/98

Analyst: David M. Bockowitz — Date: 5/28/98

Results

MDL:	0.015	Absorbance
LOQ:	0.020	Absorbance

Curve Range: (0.40 - 7.86 ppm)

Company:	DEECO/Willamette	Client #:	98-1559
Analyst:	DMB	Enthalpy #:	0598-10
Parameters:	Formaldehyde	PO #:	98-00189
# Samples:	25	Report Date:	05/27/98

Sample Identification	Time (min.) Run	Time (min.) Analysis	Calibration Curve	Absorbance #1	Absorbance #2	% Difference of Mean	Average Absorbance	Sample Volume	Dilution Factor	Catch (ug)
COND 1 #1 RUN 1	NA	NA	0598-10	0.330	0.340	1.49	0.335	138	26	9,404
COND 1 #1 RUN 2	NA	NA	0598-10	0.440	0.450	1.12	0.445	86	26	7,844
COND 1 #1 RUN 3	NA	NA	0598-10	0.240	0.240	0.00	0.240	132	26	6,365
COND 2 #1 RUN 1	NA	NA	0598-10	0.330	0.330	0.00	0.330	128	26	8,588
COND 2 #1 RUN 2	NA	NA	0598-10	0.130	0.140	3.70	0.135	128	26	3,353
COND 2 #1 RUN 3	NA	NA	0598-10	0.220	0.220	0.00	0.220	184	26	8,100
COND 1 #2 RUN 1	NA	NA	0598-10	0.090	0.090	0.00	0.090	166	26	2,782
COND 1 #2 RUN 2	NA	NA	0598-10	0.170	0.180	2.86	0.175	124	26	4,288
COND 1 #2 RUN 3	NA	NA	0598-10	0.100	0.110	4.76	0.105	186	26	3,702
COND 2 #2 RUN 1	NA	NA	0598-10	0.120	0.120	0.00	0.120	166	26	3,826
COND 2 #2 RUN 2	NA	NA	0598-10	0.100	0.100	0.00	0.100	168	26	3,167
COND 2 #2 RUN 3	NA	NA	0598-10	0.120	0.120	0.00	0.120	154	26	3,549

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ENTHALPY analytical, inc.

I:\0598\0598-10\0598-10F.WK1 3:49 PM 05/27

MDL:	0.015	Absorbance
LOQ:	0.020	Absorbance

Curve Range: (0.40 - 7.86 ppm)

Company:	DEECO/Willamette	Client #:	98-1559
Analyst:	DMB	Enthalpy #:	0598-10
Parameters:	Formaldehyde	PO #:	98-00189
# Samples:	25	Report Date:	05/27/98

Sample Identification	Time (min.) Run	Time (min.) Analysis	Calibration Curve	Absorbance #1	Absorbance #2	% Difference of Mean	Average Absorbance	Sample Volume	Dilution Factor	Catch (ug)
COND 1 #3 RUN 1	NA	NA	0598-10	0.065	0.070	3.70	0.068	84	11	428
COND 1 #3 RUN 2	NA	NA	0598-10	0.060	0.060	0.00	0.060	136	11	602
COND 1 #3 RUN 3	NA	NA	0598-10	0.140	0.140	0.00	0.140	92	11	1,060
COND 2 #3 RUN 1	NA	NA	0598-10	0.060	0.060	0.00	0.060	86	11	381
COND 2 #3 RUN 2	NA	NA	0598-10	0.080	0.080	0.00	0.080	72	11	447
COND 2 #3 RUN 3	NA	NA	0598-10	0.145	0.145	0.00	0.145	72	11	862
COND 1 #4 RUN 1	NA	NA	0598-10	< 0.015	< 0.015	0.00	< 0.015	58	1	< 2.29
COND 1 #4 RUN 2	NA	NA	0598-10	< 0.015	< 0.015	0.00	< 0.015	68	1	< 2.68
COND 1 #4 RUN 3	NA	NA	0598-10	< 0.015	< 0.015	0.00	< 0.015	56	1	< 2.21
COND 2 #4 RUN 1	NA	NA	0598-10	< 0.015	< 0.015	0.00	< 0.015	62	1	< 2.45
COND 2 #4 RUN 2	NA	NA	0598-10	< 0.015	< 0.015	0.00	< 0.015	48	1	< 1.90
COND 2 #4 RUN 3	NA	NA	0598-10	< 0.015	< 0.015	0.00	< 0.015	50	1	< 1.97
HPLC Water Blank	NA	NA	0598-10	< 0.015	< 0.015	0.00	< 0.015	412	1	< 16.3

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ENTHALPY analytical, inc.

MDL:	0.015	Absorbance
LOQ:	0.020	Absorbance

Curve Range: (0.40 - 7.86 ppm)

Company:	DEECO/Willamette	Client #:	98-1559
Analyst:	DMB	Enthalpy #:	0598-10
Parameters:	Formaldehyde	PO #:	98-00189
# Samples:	25	Report Date:	05/27/98

Sample Identification	Time (min.) Run	Time (min.) Analysis	Calibration Curve	Absorbance #1	Absorbance #2	% Difference of Mean	Average Absorbance	Sample Volume	Dilution Factor	Catch (ug)
COND 1 #3 RUN 3 Duplicate	NA	NA	0598-10	0.150	0.140	3.45	0.145	92	11	1,101

%Dev 3.78

										Concentration (ug/mL)
COND 2 #2 RUN 3	NA	NA	0598-10	0.120	0.120	0.00	0.120	1	1	0.886
COND 2 #2 RUN 3 Spike	NA	NA	0598-10	0.190	0.190	0.00	0.190	1	1	1.45

Spike Amt: 0.602

Recovery: 93.8%

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ENTHALPY analytical, inc.

Narrative Summary

Enthalpy Analytical Narrative Summary

Company:	DEECO/Willamette
Client #:	98-1559
PO #:	98-00189

Enthalpy #:	0598-10
Analyst:	DMB
Parameters:	Formaldehyde

Custody

Samples were received on 05/04/98 by Jeanette Beasly of Enthalpy Analytical, Inc. after being relinquished by DEECO, Inc. Samples were received at room temperature. Prior to and during analysis they were kept under lock with access only to authorized personnel of Enthalpy Analytical, Inc.

Analysis

The samples were analyzed for formaldehyde according to the procedures outlined in the NCASI sampling and analytical method.

Samples were analyzed using a Spectronics Spectrophotometer set at 412 nm reading in units of absorbance. All samples were analyzed twice and the average of these readings were used to calculate the concentration.

All reagents and standards were made fresh prior to analysis. The acetylacetone reagent was made by quantitatively transferring 15.4 grams of ammonium acetate into to a 100 mL volumetric flask, then adding 50 mL of DI water. To this solution, 0.20 mL of acetylacetone and 0.3 mL of glacial acetic acid was added, mixed thoroughly, then diluted to the mark (100 mL). Formaldehyde standards were made by diluting a certified 37% standard with DI water.

For sample analysis, 2.00 mL of the sample is added to the cuvette; then, 2.0 mL of the acetylacetone reagent is added, sealed with Parafilm and mixed with a Vortex mixer ~ 60 seconds. This solution is heated at 60°c for 10 minutes, then cooled to room temperature prior to analysis. The standards are prepared by adding a know concentration of formaldehyde to the 2.0 mL of acetylacetone reagent. This solution is then diluted to a volume of 4.0 mL, and analyzed in the same manner as the samples.

Labeling OK

Reproducibility All standards were within 10% of their tag value.

Quality of Data OK

Reporting Notes MDL -- Minimum Detection Limit.

LOQ -- Limit of Quantification

Sample Custody

DEECO, Inc

3404 Lake Woodard Dr.
Raleigh, NC 27604
919-250-0285

Date:	4/ /98
Lab:	Enthalpy
Train:	NCASI

Plant Name: WILLAMETTE, Inc

Plant Location: Ruston, LA

Project Name: 1559

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time	Comments
[illegible]	5/4/98	[illegible]	5/4/98 0810 PM	not cold
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time	Comments
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time	Comments
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time	Comments

Field Sample No.	Date	Composite or Grab	Analysis Required	Sampling Train	Sample Description	Special Notes	Lab
Cond 1-#2-Run 3	4/ /98	Composite	NCASI for Formaldehyde	NCASI Chilled Im	Water		Enthalpy
Cond 2-#2-Run 1	4/ /98	Composite	NCASI for Formaldehyde	NCASI Chilled Im	Water		Enthalpy
Cond 2-#2-Run 2	4/ /98	Composite	NCASI for Formaldehyde	NCASI Chilled Im	Water		Enthalpy
Cond 2-#2-Run 3	4/ /98	Composite	NCASI for Formaldehyde	NCASI Chilled Im	Water		Enthalpy
Cond 1-#3-Run 1	4/ /98	Composite	NCASI for Formaldehyde	NCASI Chilled Im	Water		Enthalpy
Cond 1-#3-Run 2	4/ /98	Composite	NCASI for Formaldehyde	NCASI Chilled Im	Water		Enthalpy
Cond 1-#3-Run 3	4/ /98	Composite	NCASI for Formaldehyde	NCASI Chilled Im	Water		Enthalpy
Cond 2-#3-Run 1	4/ /98	Composite	NCASI for Formaldehyde	NCASI Chilled Im	Water		Enthalpy

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DEECO, Inc

3404 Lake Woodard Dr.
Raleigh, NC 27604
919-250-0285

Date:	4/ /98
Lab:	Enthalpy
Train:	NCASI

Plant Name: WILLAMETTE, Inc

Plant Location: Ruston, LA

Project Name: 1559

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time	Comments
[illegible]	5/4/98	[illegible]	5/4/98 6:20 pm	Not cold

Field Sample No.	Date	Composite or Grab	Analysis Required	Sampling Train	Sample Description	Special Notes	Lab
Cond 1-#1-Run 1	4/ /98	Composite	NCASI for Formaldehyde	NCASI Chilled Im	Water		Enthalpy
Cond 1-#1-Run 2	4/ /98	Composite	NCASI for Formaldehyde	NCASI Chilled Im	Water		Enthalpy
Cond 1-#1-Run 3	4/ /98	Composite	NCASI for Formaldehyde	NCASI Chilled Im	Water		Enthalpy
Cond 2-#1-Run 1	4/ /98	Composite	NCASI for Formaldehyde	NCASI Chilled Im	Water		Enthalpy
Cond 2-#1-Run 2	4/ /98	Composite	NCASI for Formaldehyde	NCASI Chilled Im	Water		Enthalpy
Cond 2-#1-Run 3	4/ /98	Composite	NCASI for Formaldehyde	NCASI Chilled Im	Water		Enthalpy
Cond 1-#2-Run 1	4/ /98	Composite	NCASI for Formaldehyde	NCASI Chilled Im	Water		Enthalpy
Cond 1-#2-Run 2	4/ /98	Composite	NCASI for Formaldehyde	NCASI Chilled Im	Water		Enthalpy

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DEECO, Inc

3404 Lake Woodard Dr.
Raleigh, NC 27604
919-250-0285

Date:	4/ /98
Lab:	Enthalpy
Train:	NCASI

Plant Name: WILLAMETTE, Inc

Plant Location: Ruston, LA

Project Name: 1559

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time	Comments
[illegible]	5/4/98	Jannetta Beeks	5/4/98 [illegible]	not cold
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time	Comments
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time	Comments
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time	Comments

Field Sample No.	Date	Composite or Grab	Analysis Required	Sampling Train	Sample Description	Special Notes	Lab
Cond 2-#3-Run 2	4/ /98	Composite	NCASI for Formaldehyde	NCASI Chilled Im	Water		Enthalpy
Cond 2-#3-Run 3	4/ /98	Composite	NCASI for Formaldehyde	NCASI Chilled Im	Water		Enthalpy
Cond 1-#4-Run 1	4/ /98	Composite	NCASI for Formaldehyde	NCASI Chilled Im	Water		Enthalpy
Cond 1-#4-Run 2	4/ /98	Composite	NCASI for Formaldehyde	NCASI Chilled Im	Water		Enthalpy
Cond 1-#4-Run 3	4/ /98	Composite	NCASI for Formaldehyde	NCASI Chilled Im	Water		Enthalpy
Cond 2-#4-Run 1	4/ /98	Composite	NCASI for Formaldehyde	NCASI Chilled Im	Water		Enthalpy
Cond 2-#4-Run 2	4/ /98	Composite	NCASI for Formaldehyde	NCASI Chilled Im	Water		Enthalpy
Cond 2-#4-Run 3	4/ /98	Composite	NCASI for Formaldehyde	NCASI Chilled Im	Water		Enthalpy

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DEECO, Inc

3404 Lake Woodard Dr.
Raleigh, NC 27604
919-250-0285

Date:	4/ /98
Lab:	Enthalpy
Train:	NCASI

Plant Name: Williamette

Plant Location: Ruston, LA

Project Name:

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time	Comments
Daniel W. Duhm	5/4/98	Jeanette Bailey	5/4/98 6:20pm	not cold
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time	Comments
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time	Comments
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time	Comments

Field Sample No.	Date	Composite or Grab	Analysis Required	Sampling Train	Sample Description	Special Notes	Lab
Water — BLK		Comp	NCASI	NCASI	Water		Enthalpy
Water							
Water							
Water							
Water							
Water							
Water							
Water							

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SAMPLE ANALYSIS SHEET

PROJECT NUMBER: 98-1559 DATE: 5/4/98
PROJECT NAME: Willamette Inc
PROJECT MANAGER: Bill B

SAMPLE INFORMATION:

ANALYSIS TYPE: NCASI for formaldehyde

SAMPLE DESCRIPTION: 2 conditions on four stacks
3 runs each

NUMBER OF SAMPLES FOR ANALYSIS: 24 + BLK

TURNAROUND TIME; GIVE DATE SAMPLE RESULTS NEEDED: Normal

LAB REQUESTED: Enthalpy
(SPECIFY IN-HOUSE LAB OR OTHERWISE)

LAB CONTACT PERSON AND PHONE NUMBER:

BUDGETED COST FOR SAMPLE ANALYSIS: 50 per analysis

PURCHASE ORDER NUMBER: 98-00187

RESULTS REPORTED TO: Bill B and Richard D

CHAIN OF CUSTODY ATTACHED (YES) NO

SAMPLE CONTAINERS LABELED (YES) NO

SAMPLE LEVELS MARKED (YES) NO

OTHER INFORMATION:

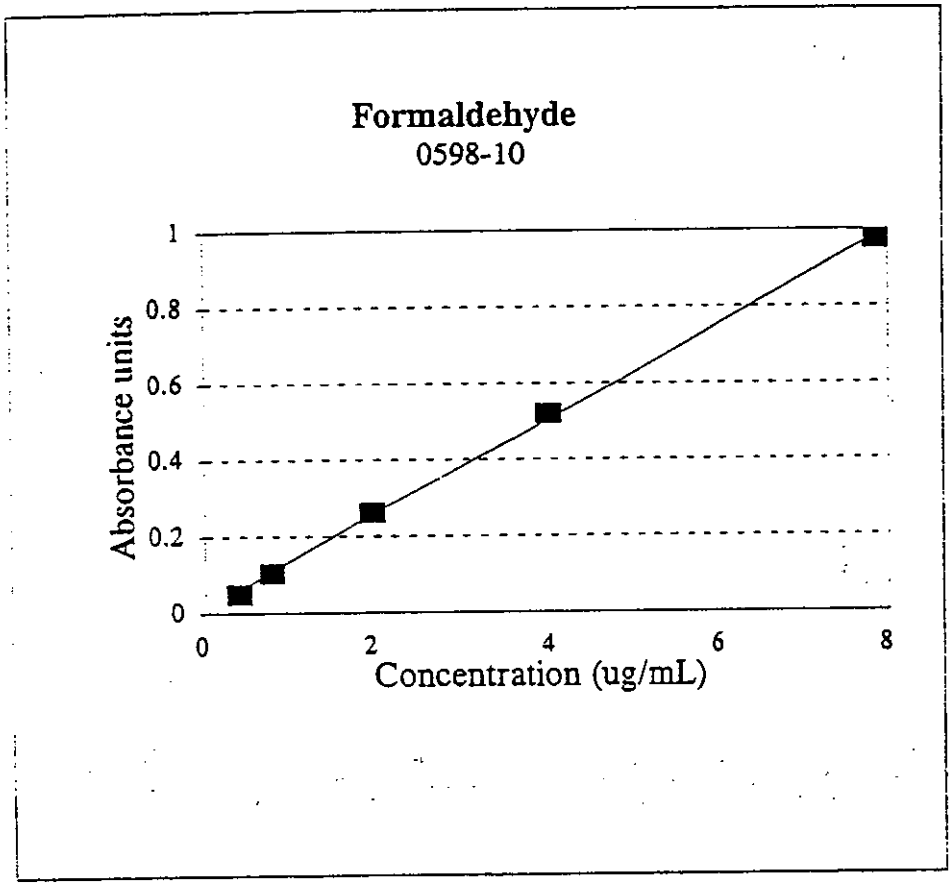
SIGNATURE OF P MGR. W.H.M DATE:

SIGNATURE OF DIRECTOR DATE:
(MUST BE SIGNED)-BILLD./CHUCK/SCOTT/BARBARA
IF AMOUNT IS OVER $5000.00

DATE RECEIVED BY DONNA/BRIAN INITIALED: 1128

Curve/QA Point(s)

Std. Concentration ug/mL	Absorbance #1	Dev. from Mean	Absorbance #2	Dev. from Mean	Absorbance Avg.	Predicted Conc. ppm
0.400	0.05	0.00	0.05	0.00	0.050	0.322
0.800	0.10	-4.76	0.11	4.76	0.105	0.765
1.99	0.260	-0.95	0.265	0.95	0.263	2.04
3.97	0.520	0.00	0.520	0.00	0.520	4.11
7.86	0.975	0.00	0.975	0.00	0.975	7.78



SLOPE = 0.12396613

Intercept = 0.01010576

R^2 = 0.9990

APPENDIX C

EQUIPMENT CALIBRATION DATA SHEETS

VOST CALIBRATION

Wet Test Number:	14AJ2	Date:	04/19/98
Meter Box Number:	VOST #1	Barometric:	29.65
Previous Y(cal check):	1.03	Operator:	M MILBOURNE
# of Flow Rates:	1	Initials:	

	Run 1	Run 2	Run 3	Run 1	Run 2	Run 3	Run 1	Run 2	Run 3
DRY GAS METER									
Vol, Initial (L)	61.56	69.32	75.74	0.00	0.00	0.00	0.00	0.00	0.00
Vol, Final (L)	69.32	75.74	102.44	0.00	0.00	0.00	0.00	0.00	0.00
Temp, Initial (F)	70.0	71.0	72.0	0.0	0.0	0.0	0.0	0.0	0.0
Temp, Final (F)	71.0	72.0	72.0	0.0	0.0	0.0	0.0	0.0	0.0
Press, Initial ("H20)	1.9	1.9	1.9	0.0	0.0	0.0	0.0	0.0	0.0
Press, Final ("H20)	1.9	1.9	1.9	0.0	0.0	0.0	0.0	0.0	0.0
WET TEST METER									
Vol, Initial (L)	55.07	63.53	70.49	0.00	0.00	0.00	0.00	0.00	0.00
Vol, Final (L)	63.53	70.49	99.35	0.00	0.00	0.00	0.00	0.00	0.00
Temp, Initial (F)	71.5	71.5	71.5	0.0	0.0	0.0	0.0	0.0	0.0
Temp, Final (F)	71.5	71.5	71.0	0.0	0.0	0.0	0.0	0.0	0.0
Press, Initial ("H20)	0.3	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0
Press, Final ("H20)	0.3	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0
Test Time (min)	8.50	7.00	29.00						
Flow Rate (lpm)	1.00								
Q, DGM (lpm,std)	0.905	0.907	0.910	N/A	N/A	N/A	N/A	N/A	N/A
Q, WTM (lpm,std)	0.981	0.980	0.981	N/A	N/A	N/A	N/A	N/A	N/A
Y	1.084	1.080	1.078	N/A	N/A	N/A	N/A	N/A	0.000
% Difference from Ave	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Average Y		1.081			N/A			N/A	
% change from prior Y		-5.0							

VOST CALIBRATION

Wet Test Number:	14AJ2	Date:	********
Meter Box Number:	VOST #6	Barometric:	29.83
Previous Y(cal check):	1.03	Operator:	Arthur Dougherty
# of Flow Rates:	1	Initials:	

	Run 1	Run 2	Run 3	Run 1	Run 2	Run 3	Run 1	Run 2	Run 3
DRY GAS METER									
Vol, Initial (L)	0.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vol, Final (L)	4.00	7.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Temp, Initial (F)	79.0	80.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temp, Final (F)	80.0	81.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Press, Initial ("H20)	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Press, Final ("H20)	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WET TEST METER									
Vol, Initial (L)	0.00	4.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vol, Final (L)	4.35	8.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Temp, Initial (F)	82.0	82.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temp, Final (F)	82.0	82.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Press, Initial ("H20)	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Press, Final ("H20)	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Test Time (min)	4.05	3.25							
Flow Rate (lpm)	1.00								
Q, DGM (lpm,std)	0.966	1.048		N/A	N/A	N/A	N/A	N/A	N/A
Q, WTM (lpm,std)	1.043	1.120		N/A	N/A	N/A	N/A	N/A	N/A
Y	1.080	1.069		N/A	N/A	N/A	N/A	N/A	0.000
% Difference from Ave	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Average Y		1.074			N/A			N/A	
% change from prior Y		-4.2							

VOST CALIBRATION

Wet Test Number:	14AJ2	Date:	********
Meter Box Number:	VOST #4	Barometric:	29.83
Previous Y(cal check):	1.00	Operator:	Arthur Dougherty
# of Flow Rates:	1	Initials:	

	Run 1	Run 2	Run 3	Run 1	Run 2	Run 3	Run 1	Run 2	Run 3
DRY GAS METER									
Vol, Initial (L)	0.00	3.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vol, Final (L)	3.09	6.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Temp, Initial (F)	86.0	87.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temp, Final (F)	87.0	88.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Press, Initial ("H20)	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Press, Final ("H20)	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WET TEST METER									
Vol, Initial (L)	0.00	3.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vol, Final (L)	3.25	6.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Temp, Initial (F)	81.5	81.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temp, Final (F)	81.5	81.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Press, Initial ("H20)	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Press, Final ("H20)	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Test Time (min)	3.07	3.12							
Flow Rate (lpm)	1.00								
Q, DGM (lpm,std)	0.972	0.985		N/A	N/A	N/A	N/A	N/A	N/A
Q, WTM (lpm,std)	1.029	0.988		N/A	N/A	N/A	N/A	N/A	N/A
Y	1.059	1.003		N/A	N/A	N/A	N/A	N/A	0.000
% Difference from Ave	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Average Y		1.031			N/A			N/A	
% change from prior Y		-2.8							

APPENDIX D

EMISSION SUMMARY SHEETS

Willamette Industries
Veneer Dryer Stack 1, Condition 1
Emerson, Arkansas
98-1559

filename:

SYMBOL	SAMPLING PARAMETERS	RUN NO. ==> / DATE ==> / RUN TIME ==>	RUN 1 4/23/98 1041-1140	RUN 2 4/23/98 1415-1514	RUN 3 4/23/98 1615-1714	AVERAGE
	MEASURED DATA AT STACK	UNITS				
(Y)	Dry Gas Meter Calibration Factor	--	1.001	1.001	1.001	
(Vi)	Initial Meter Volume	liters	0.000	0.000	0.000	
(Vf)	Final Meter Volume	liters	58.860	58.490	45.810	
(Lp)	Leak Check Correction	lpm	0	0	0	
(Vm)	Total Meter Volume	liters	58.860	58.490	45.810	54.387
(t)	Sampling Time	min.	60	60	60	60
(Vwc)	Volume of Water Collected	mL	68.8	64.5	33.4	55.6
(Vwsg)	Silica Gel Weight Increase	g	0.0	0.0	0.0	0.0
(Vlc)	Total Water Collected	mL	68.8	64.5	33.4	55.6
(Pbar)	Barometric Pressure	in. Hg	29.92	29.92	29.92	29.92
(Pg)	Stack Static Pressure	in. H2O	0	0.0	0.0	
(H)	Avg. Orifice Pressure Drop H	in. H2O	0.00	0.00	0.00	
(Ts)	Avg. Stack Gas Temperature	F	428.1	430.5	430.3	429.6
(Tm)	Avg. Dry Gas Meter Temperature	F	88.1	97.7	98.3	
(Ds)	Diameter of Stack	inches	22.500	22.500	22.500	
(W)	Width of Stack	inches	0.000	0.000	0.000	
(L)	Length of Stack	inches	0.000	0.000	0.000	
(Cp)	Pitot Tube Coefficient	--	0.84	0.84	0.84	
(p)	Avg. Square Root Velocity Head p	(in. H2O)	0.178	0.218	0.230	
(%O2)	Stack Gas Oxygen	%	3.4	3.2	3.2	3.3
(%CO2)	Stack Gas Carbon Dioxide	%	8.5	8.7	8.7	8.6
(%N2)	Stack Gas Nitrogen	%	88.1	88.1	88.1	88.1
	CALCULATED STACK GAS DATA					
(Ps)	Stack Gas Pressure	in. Hg	29.92	29.92	29.92	29.92
(%Bws)	Stack Gas Moisture	%	61.8	60.8	50.7	57.8
(%B'w)	Moisture at Saturation	%	100.0	100.0	100.0	
(Vmstd)	Standard Dry Gas Meter Volume	dscf	56.738	55.409	43.354	51.834
(Md)	Dry Gas Molecular Weight	lb/lb-mole	29.50	29.52	29.52	29.51
(Ms)	Wet Gas Molecular Weight	lb/lb-mole	22.39	22.51	23.68	22.86
(vs)	Stack Gas Velocity	ft/s	14.73	18.00	18.54	17.1
(A)	Stack Area	ft2	2.76	2.76	2.76	
(Qsd)	Volumetric Gas Flow Rate	dscfm	555	693	899	715
(Qs)	Volumetric Gas Flow Rate	acfm	2,441	2,982	3,071	2,831
	Formaldehyde EMISSIONS					
(HCic)	Formaldehyde sample concentration	ug/mL	9404	7844	6365	7871.00
(HCib)	Formaldehyde Blank Sample Concentration	ug/mL	0	0	0	0.00
(HCicb)	Formaldehyde corrected concentration	ug/mL	9404	7844	6365	7871.00
(V HCI)	Volume Formaldehyde Sample	mL	1	1	1	1.00
(Mn)	Mass Formaldehyde Sample	mg	9.404	7.844	6.365	7.871
(Cs)	Formaldehyde Concentration	mg/M3	165.74	141.57	146.82	151.38
(Cs@7%O2)	Formaldehyde Concentration at 7%O2	mg/M3 at 7%O2	131.65	111.17	115.30	119.37
(E)	Formaldehyde Emission Rate	lb/hr	0.429	0.458	0.616	0.501

132.81 113.44 117.65

	HYDROCARBON EMISSION RATES		4602.3	6662.1	5256.6	
WET	Total Hydrocarbon concentration (as Propane)	ppmv	1534.1	2020.7	1752.2	1769.0
	Total Hydrocarbon concentration (as Propane)	lb/scf	1.75E-04	2.31E-04	2.00E-04	2.02E-04
	Total Hydrocarbon emission rate (as Propane)	lb/hr	15.25	24.48	21.87	20.53
	Total Hydrocarbon emission rate (as Carbon)	lb/hr	12.48	20.03	17.89	16.80
	METHANE EMISSION RATES					
	Total Methane concentration	ppmvd	1077.5	115.1	306.5	499.7000
	Total Methane concentration (as Carbon)	lb/scf	0.0000	0.0000	0.0000	0.0000
	Total Methane emission rate (as Carbon)	lb/hr	5.54	0.72	1.98	2.75
	NON-METHANE HYDROCARBONS					
	Non-Methane emission rate (as Carbon)	lb/hr	6.94	19.31	15.91	14.05

Willamette Industries
Veneer Dryer Stack 2, Condition 1
Emerson, Arkansas
98-1559

filename:

SYMBOL	SAMPLING PARAMETERS	RUN NO.==> / DATE==> / RUN TIME==	RUN 1 4/23/98 1041-1140	RUN 2 4/23/98 1415-1514	RUN 3 4/23/98 1615-1714	AVERAGE
	MEASURED DATA AT STACK	UNITS				
(Y)	Dry Gas Meter Calibration Factor	-	1.001	1.001	1.001	
(Vi)	Initial Meter Volume	liters	0.000	0.000	0.000	
(Vf)	Final Meter Volume	liters	64.970	79.810	55.620	
(Lp)	Leak Check Correction	lpm	0	0	0	
(Vm)	Total Meter Volume	liters	64.970	79.810	55.620	66.800
(t)	Sampling Time	min.	60	60	60	60
(Vwc)	Volume of Water Collected	mL	105.4	118.0	76.5	100.0
(Vwsg)	Silica Gel Weight Increase	g	0.0	0.0	0.0	0.0
(Vlc)	Total Water Collected	mL	105.4	118.0	76.5	100.0
(Pbar)	Barometric Pressure	in. Hg	29.92	29.92	29.92	29.92
(Pg)	Stack Static Pressure	in. H2O	0	0.0	0.0	
(H)	Avg. Orifice Pressure Drop H	in. H2O	0.00	0.00	0.00	
(Ts)	Avg. Stack Gas Temperature	F	328.9	330.3	331.2	330.1
(Tm)	Avg. Dry Gas Meter Temperature	F	97.6	104.5	104.5	
(Ds)	Diameter of Stack	inches	22.500	22.500	22.500	
(W)	Width of Stack	inches	0.000	0.000	0.000	
(L)	Length of Stack	inches	0.000	0.000	0.000	
(Cp)	Pitot Tube Coefficient	-	0.84	0.84	0.84	
(p)	Avg. Square Root Velocity Head p	(in. H2O)	0.324	0.331	0.339	
(%O2)	Stack Gas Oxygen	%	13.8	14.0	13.5	13.8
(%CO2)	Stack Gas Carbon Dioxide	%	3.2	2.8	3.7	3.2
(%N2)	Stack Gas Nitrogen	%	83.0	83.2	82.8	83.0
	CALCULATED STACK GAS DATA					
(Ps)	Stack Gas Pressure	in. Hg	29.92	29.92	29.92	29.92
(%Bws)	Stack Gas Moisture	%	69.5	67.8	66.2	67.8
(%B'w)	Moisture at Saturation	%	100.0	100.0	100.0	
(Vmstd)	Standard Dry Gas Meter Volume	dscf	61.556	74.688	52.855	62.766
(Md)	Dry Gas Molecular Weight	lb/lb-mole	29.06	29.01	28.23	29.07
(Ms)	Wet Gas Molecular Weight	lb/lb-mole	21.37	21.54	21.76	21.56
(vs)	Stack Gas Velocity	ft/s	25.81	26.28	26.86	26.3
(A)	Stack Area	ft2	2.76	2.76	2.76	
(Qsd)	Volumetric Gas Flow Rate	dscfm	872	937	1,003	937
(Qs)	Volumetric Gas Flow Rate	acfm	4,276	4,354	4,449	4,360
	Formaldehyde EMISSIONS					
(HCic)	Formaldehyde sample concentration	ug/mL	2782	4288	3702	3590.67
(HCib)	Formaldehyde Blank Sample Concentration	ug/mL	0	0	0	0.00
(HCicb)	Formaldehyde corrected concentration	ug/mL	2782	4288	3702	3590.67
(V HCi)	Volume Formaldehyde Sample	mL	1	1	1	1.00
(Mn)	Mass Formaldehyde Sample	mg	2.782 36.21	4.288 46.00	3.702 56.99	3.591
(Cs)	Formaldehyde Concentration	ppm m	45.19	57.41	71.12	57.91
(Cs@7%O2)	Formaldehyde Concentration at 7%O2	mg/M3 at 7%O2	88.48	115.66	133.59	112.57
(E)	Formaldehyde Emission Rate	lb/hr	0.184	0.251	0.333	0.256

HYDROCARBON EMISSION RATES x3=ppmC		2382.3	1673.4	2090.4	
Total Hydrocarbon concentration (as Propane)	ppmv	794.1	557.8	696.8	682.9
Total Hydrocarbon concentration (as Propane)	lb/scf	9.07E-05	6.37E-05	7.96E-05	7.80E-05
Total Hydrocarbon emission rate (as Propane)	lb/hr	15.57	11.12	14.18	13.62
Total Hydrocarbon emission rate (as Carbon)	lb/hr	12.74	9.10	11.60	11.15
METHANE EMISSION RATES					
Total Methane concentration	ppmvd	1427.7	184.3	231.2	614.4000
Total Methane concentration (as Carbon)	lb/scf	0.0000	0.0000	0.0000	0.0000
Total Methane emission rate (as Carbon)	lb/hr	13.00	1.71	2.19	5.63
NON-METHANE HYDROCARBONS					
Non-Methane emission rate (as Carbon)	lb/hr	-0.26	7.39	9.41	5.51

Willamette Industries
Veneer Dryer Stack 3, Condition 1
Emerson, Arkansas
98-1559

filename:

SYMBOL	SAMPLING PARAMETERS	RUN NO.==> / DATE==> / RUN TIME==	RUN 1 4/23/98 1041-1140	RUN 2 4/23/98 1415-1514	RUN 3 4/23/98 1615-1714	AVERAGE
	MEASURED DATA AT STACK	UNITS				
(Y)	Dry Gas Meter Calibration Factor	-	1.025	1.025	1.025	
(Vi)	Initial Meter Volume	liters	0.880	59.210	17.880	
(Vf)	Final Meter Volume	liters	58.990	116.830	76.430	
(Lp)	Leak Check Correction	lpm	0	0	0	
(Vm)	Total Meter Volume	liters	58.110	57.620	58.550	58.093
(t)	Sampling Time	min.	60	60	60	60
(Vwc)	Volume of Water Collected	mL	43.0	43.3	42.3	42.9
(Vwsg)	Silica Gel Weight Increase	g	0.0	0.0	0.0	0.0
(Vlc)	Total Water Collected	mL	43.0	43.3	42.3	42.9
(Pbar)	Barometric Pressure	in. Hg	29.92	29.92	29.92	29.92
(Pg)	Stack Static Pressure	in. H2O	0	0.0	0.0	
(H)	Avg. Orifice Pressure Drop H	in. H2O	0.00	0.00	0.00	
(Ts)	Avg. Stack Gas Temperature	F	321.6	323.0	323.7	322.8
(Tm)	Avg. Dry Gas Meter Temperature	F	87.3	92.3	93.1	
(Ds)	Diameter of Stack	inches	22.000	22.000	22.000	
(W)	Width of Stack	inches	0.000	0.000	0.000	
(L)	Length of Stack	inches	0.000	0.000	0.000	
(Cp)	Pitot Tube Coefficient	-	0.84	0.84	0.84	
(p)	Avg. Square Root Velocity Head p	(in. H2O)	0.213	0.212	0.211	
(%O2)	Stack Gas Oxygen	%	20.1	20.2	20.0	20.1
(%CO2)	Stack Gas Carbon Dioxide	%	0.5	0.5	0.5	0.5
(%N2)	Stack Gas Nitrogen	%	79.4	79.3	79.5	79.4
	CALCULATED STACK GAS DATA					
(Ps)	Stack Gas Pressure	in. Hg	29.92	29.92	29.92	29.92
(%Bws)	Stack Gas Moisture	%	49.9	50.6	49.6	50.0
(%B'w)	Moisture at Saturation	%	100.0	100.0	100.0	
(Vmstd)	Standard Dry Gas Meter Volume	dscl	57.445	56.444	57.269	57.053
(Md)	Dry Gas Molecular Weight	lb/lb-mole	28.88	28.89	28.88	28.88
(Ms)	Wet Gas Molecular Weight	lb/lb-mole	23.45	23.38	23.48	23.44
(vs)	Stack Gas Velocity	ft/s	16.14	16.08	16.00	16.1
(A)	Stack Area	ft2	2.64	2.64	2.64	
(Qsd)	Volumetric Gas Flow Rate	dscfm	865	849	860	858
(Qs)	Volumetric Gas Flow Rate	acfm	2,557	2,547	2,534	2,546
	Formaldehyde EMISSIONS					
(HClc)	Formaldehyde sample concentration	ug/mL	428	602	1060	696.67
(HClb)	Formaldehyde Blank Sample Concentration	ug/mL	0	0	0	0.00
(HClcb)	Formaldehyde corrected concentration	ug/mL	428	602	1060	696.67
(V HCl)	Volume Formaldehyde Sample	mL	1	1	1	1.00
(Min)	Mass Formaldehyde Sample	mg	0.428	0.602	1.060	0.697
(Cs)	Formaldehyde Concentration	ppm (m)	7.45 (5.97)	10.67 (8.55)	18.51 (14.83)	12.21
(Cs@7%O2)	Formaldehyde Concentration at 7%O2	mg/M3 at 7%O2	129.46	211.78	285.86	209.03
(E)	Formaldehyde Emission Rate	lb	0.030	0.042	0.074	0.049

HYDROCARBON EMISSION RATES					
		1512	1240.5	1383	
Total Hydrocarbon concentration (as Propane)	ppmv	504	413.5	461	459.5
Total Hydrocarbon concentration (as Propane)	lb/scf	5.76E-05	4.72E-05	5.26E-05	5.25E-05
Total Hydrocarbon emission rate (as Propane)	lb/hr	5.96	4.87	5.39	5.41
Total Hydrocarbon emission rate (as Carbon)	lb/hr	4.88	3.98	4.41	4.42

METHANE EMISSION RATES					
Total Methane concentration	ppmvd	0	0	44.7	14.9000
Total Methane concentration (as Carbon)	lb/scf	0.0000	0.0000	0.0000	0.0000
Total Methane emission rate (as Carbon)	lb/hr	0.00	0.00	0.24	0.08

NON-METHANE HYDROCARBONS					
Non-Methane emission rate (as Carbon)	lb/hr	4.88	3.98	4.17	4.34

Willamette Industries
Veneer Dryer Cooler Stack, Condition 1
Emerson, Arkansas
98-1559

filename:

SYMBOL	SAMPLING PARAMETERS	UNITS	RUN 1 4/23/98 1041-1140	RUN 2 4/23/98 1415-1514	RUN 3 4/23/98 1615-1714	AVERAGE
	RUN NO.==>					
	DATE==>					
	RUN TIME==					
	MEASURED DATA AT STACK					
(Y)	Dry Gas Meter Calibration Factor	-	1.064	1.064	1.064	
(Vi)	Initial Meter Volume	liters	0.000	50.430	80.180	
(Vf)	Final Meter Volume	liters	50.280	80.170	107.350	
(Lp)	Leak Check Correction	lpm	0	0	0	
(Vm)	Total Meter Volume	liters	50.280	29.740	27.170	35.730
(t)	Sampling Time	min.	60	60	60	60
(Vwc)	Volume of Water Collected	mL	3.4	4.0	4.2	3.9
(Vwg)	Silica Gel Weight Increase	g	0.0	0.0	0.0	0.0
(Vlc)	Total Water Collected	mL	3.4	4.0	4.2	3.9
(Pbar)	Barometric Pressure	in. Hg	29.92	29.92	29.92	29.92
(Pg)	Stack Static Pressure	in. H2O	0	0.0	0.0	
(H)	Avg. Orifice Pressure Drop H	in. H2O	0.00	0.00	0.00	
(Ts)	Avg. Stack Gas Temperature	F	97.8	98.7	96.3	97.6
(Tm)	Avg. Dry Gas Meter Temperature	F	95.8	93.2	95.7	
(Ds)	Diameter of Stack	inches	45.000	45.000	45.000	
(W)	Width of Stack	inches	0.000	0.000	0.000	
(L)	Length of Stack	inches	0.000	0.000	0.000	
(Cp)	Pitot Tube Coefficient	-	0.84	0.84	0.84	
(p)	Avg. Square Root Velocity Head p	(in. H2O)	0.419	0.414	0.437	
(%O2)	Stack Gas Oxygen	%	20.9	20.9	20.9	20.9
(%CO2)	Stack Gas Carbon Dioxide	%	0.0	0.0	0.0	0.0
(%N2)	Stack Gas Nitrogen	%	79.1	79.1	79.1	79.1
	CALCULATED STACK GAS DATA					
(Ps)	Stack Gas Pressure	in. Hg	29.92	29.92	29.92	29.92
(%Bws)	Stack Gas Moisture	%	8.2	15.0	16.9	13.4
(%B'w)	Moisture at Saturation	%	5.9	6.1	5.7	
(Vmstd)	Standard Dry Gas Meter Volume	dscf	50.806	30.192	27.459	36.152
(Md)	Dry Gas Molecular Weight	lb/lb-mole	28.84	28.84	28.84	28.84
(Ms)	Wet Gas Molecular Weight	lb/lb-mole	28.20	28.18	28.22	28.20
(vs)	Stack Gas Velocity	ft/s	24.45	24.23	25.49	24.7
(A)	Stack Area	ft2	11.04	11.04	11.04	
(Qsd)	Volumetric Gas Flow Rate	dscfm	14,430	14,250	15,117	14,599
(Qs)	Volumetric Gas Flow Rate	acfm	16,199	16,054	16,892	16,382
	Formaldehyde EMISSIONS					
(HCic)	Formaldehyde sample concentration	ug/mL	2.29	2.68	2.21	2.39
(HCib)	Formaldehyde Blank Sample Concentration	ug/mL	0	0	0	0.00
(HCicb)	Formaldehyde corrected concentration	ug/mL	2.29	2.68	2.21	2.39
(V HCI)	Volume Formaldehyde Sample	mL	1	1	1	1.00
(Mn)	Mass Formaldehyde Sample	mg	0.002	0.003	0.002	0.002
(Cs)	Formaldehyde Concentration	mg/m3	0.05	0.09	0.08	0.07
(Cs@7%O2)	Formaldehyde Concentration at 7%O2	mg/M3 at 7%O2	ERR	ERR	ERR	ERR
(E)	Formaldehyde Emission Rate	lb	0.003	0.006	0.006	0.005

ppm 0.040 0.072 0.064

DET. LIM. = 1/2

HYDROCARBON EMISSION RATES					
	x3 = ppmC	1.2	24	27	
Total Hydrocarbon concentration (as Propane)	ppmv	0.4	8	9	5.8
Total Hydrocarbon concentration (as Propane)	lb/scf	4.57E-08	9.14E-07	1.03E-06	6.62E-07
Total Hydrocarbon emission rate (as Propane)	lb/hr	0.04	0.83	0.99	0.62
Total Hydrocarbon emission rate (as Carbon)	lb/hr	0.03	0.68	0.81	0.51

WET

METHANE EMISSION RATES					
Total Methane concentration	ppmvd	14.7	14.2	0	9.6333
Total Methane concentration (as Carbon)	lb/scf	0.0000	0.0000	0.0000	0.0000
Total Methane emission rate (as Carbon)	lb/hr	0.51	0.49	0.00	0.33

NON-METHANE HYDROCARBONS					
Non-Methane emission rate (as Carbon)	lb/hr	-0.48	0.19	0.81	0.17

Willamette Industries
Veneer Dryer Stack 1, Condition 2
Emerson, Arkansas
98-1559

Filename:

SYMBOL	SAMPLING PARAMETERS	RUN NO.==> / DATE==> / RUN TIME==	RUN 1 4/24/98 0916-1016	RUN 2 4/24/98 1050-1150	RUN 3 4/24/98 1351-1451	AVERAGE
	MEASURED DATA AT STACK	UNITS				
(Y)	Dry Gas Meter Calibration Factor	–	1.001	1.001	1.001	
(Vi)	Initial Meter Volume	liters	0.000	0.000	0.000	
(Vf)	Final Meter Volume	liters	58.860	58.490	45.810	
(Lp)	Leak Check Correction	lpm	0	0	0	
(Vm)	Total Meter Volume	liters	59.740	57.980	61.750	59.823
(t)	Sampling Time	min.	60	60	60	60
(Vwc)	Volume of Water Collected	mL	62.6	67.3	68.4	66.1
(Vwsg)	Silica Gel Weight Increase	g	0.0	0.0	0.0	0.0
(Vlc)	Total Water Collected	mL	62.6	67.3	68.4	66.1
(Pbar)	Barometric Pressure	in. Hg	29.92	29.92	29.92	29.92
(Pg)	Stack Static Pressure	in. H2O	-0.04	-0.04	-0.04	
(H)	Avg. Orifice Pressure Drop H	in. H2O	0.00	0.00	0.00	
(Ts)	Avg. Stack Gas Temperature	F	444.7	441.1	418.3	434.7
(Tm)	Avg. Dry Gas Meter Temperature	F	67.7	84.0	96.8	
(Ds)	Diameter of Stack	inches	22.500	22.500	22.500	
(W)	Width of Stack	inches	0.000	0.000	0.000	
(L)	Length of Stack	inches	0.000	0.000	0.000	
(Cp)	Pitot Tube Coefficient	–	0.84	0.84	0.84	
(p)	Avg. Square Root Velocity Head p	(in. H2O)	0.235	0.221	0.214	
(%O2)	Stack Gas Oxygen	%	10.4	9.5	7.8	9.2
(%CO2)	Stack Gas Carbon Dioxide	%	5.8	6.0	6.8	6.2
(%N2)	Stack Gas Nitrogen	%	83.8	84.5	85.4	84.6
	CALCULATED STACK GAS DATA					
(Ps)	Stack Gas Pressure	in. Hg	29.92	29.92	29.92	29.92
(%Bws)	Stack Gas Moisture	%	59.2	61.4	60.9	60.5
(%B'w)	Moisture at Saturation	%	100.0	100.0	100.0	
(Vmstd)	Standard Dry Gas Meter Volume	dscf	57.627	56.303	58.581	57.503
(Md)	Dry Gas Molecular Weight	lb/lb-mole	29.34	29.34	29.40	29.36
(Ms)	Wet Gas Molecular Weight	lb/lb-mole	22.63	22.37	22.46	22.49
(vs)	Stack Gas Velocity	ft/s	19.49	18.40	17.56	18.5
(A)	Stack Area	ft2	2.76	2.76	2.76	
(Qsd)	Volumetric Gas Flow Rate	dscf/m	770	689	684	714
(Qa)	Volumetric Gas Flow Rate	acf/m	3,229	3,049	2,909	3,062
	Formaldehyde EMISSIONS					
(HCc)	Formaldehyde sample concentration	ug/mL	8588	3353	8100	6680.33
(HCb)	Formaldehyde Blank Sample Concentration	ug/mL	0	0	0	0.00
(HCcb)	Formaldehyde corrected concentration	ug/mL	8588	3353	8100	6680.33
(V HCf)	Volume Formaldehyde Sample	mL	1	1	1	1.00
(Ma)	Mass Formaldehyde Sample	mg	8.588	3.353	8.100	6.680
(Cs)	Formaldehyde Concentration	ppm	149.03	59.55	138.27	115.62
(Cs@7%O2)	Formaldehyde Concentration at 7%O2	mg/M3 at 7%O2	197.29	72.61	146.72	138.87
(E)	Formaldehyde Emission Rate	lb	0.536	0.191	0.441	0.389

119.42 47.72 110.80

HYDROCARBON EMISSION RATES					
Total Hydrocarbon concentration (as Propane)	ppmv	945	1251	1080.5	1092.2
Total Hydrocarbon concentration (as Propane)	lb/scf	1.08E-04	1.43E-04	1.23E-04	1.25E-04
Total Hydrocarbon emission rate (as Propane)	lb/hr	12.20	15.31	12.95	13.49
Total Hydrocarbon emission rate (as Carbon)	lb/hr	9.98	12.53	10.59	11.03

x3 = ppm C 2835 3753 3241.5

WET

METHANE EMISSION RATES					
Total Methane concentration	ppmvd	78.1	68.3	81.5	75.9667
Total Methane concentration (as Carbon)	lb/scf	2.43E-06	2.13E-06	2.54E-06	0.0000
Total Methane emission rate (as Carbon)	lb/hr	0.53	0.44	0.50	0.49

NON-METHANE HYDROCARBONS					
Non-Methane emission rate (as Carbon)	lb/hr	9.45	12.09	10.09	10.54

VOC
HCHO
Methane
CO2

Willamette Industries
Veneer Dryer Stack 2, Condition 2
Emerson, Arkansas
98-1559

Filename:

SYMBOL	SAMPLING PARAMETERS	RUN NO.==> / DATE==> / RUN TIME==	RUN 4 4/24/98 0916-1016	RUN 5 4/24/98 1050-1150	RUN 6 4/24/98 1351-1451	AVERAGE
	MEASURED DATA AT STACK	UNITS				
(Y)	Dry Gas Meter Calibration Factor	-	1.001	1.001	1.001	
(Vi)	Initial Meter Volume	liters	0.000	0.000	0.000	
(Vf)	Final Meter Volume	liters	68.250	67.990	67.730	
(Lp)	Leak Check Correction	lpm	0	0	0	
(Vm)	Total Meter Volume	liters	68.250	67.990	67.730	67.990
(t)	Sampling Time	min.	60	60	60	60
(Vwc)	Volume of Water Collected	mL	81.7	83.3	77.9	81.0
(Vwsg)	Silica Gel Weight Increase	g	0.0	0.0	0.0	0.0
(Vlc)	Total Water Collected	mL	81.7	83.3	77.9	81.0
(Pbar)	Barometric Pressure	in. Hg	29.92	29.92	29.92	29.92
(Pg)	Stack Static Pressure	in. H2O	0	0.0	0.0	
(H)	Avg. Orifice Pressure Drop H	in. H2O	0.00	0.00	0.00	
(Ts)	Avg. Stack Gas Temperature	F	332.1	332.3	333.5	332.6
(Tm)	Avg. Dry Gas Meter Temperature	F	92.5	97.3	101.8	
(Ds)	Diameter of Stack	inches	22.500	22.500	22.500	
(W)	Width of Stack	inches	0.000	0.000	0.000	
(L)	Length of Stack	inches	0.000	0.000	0.000	
(Cp)	Pitot Tube Coefficient	-	0.84	0.84	0.84	
(p)	Avg. Square Root Velocity Head p	(in. H2O)	0.339	0.337	0.336	
(%O2)	Stack Gas Oxygen	%	13.8	14.0	13.5	13.8
(%CO2)	Stack Gas Carbon Dioxide	%	3.2	2.8	3.7	3.2
(%N2)	Stack Gas Nitrogen	%	83.0	83.2	82.8	83.0
	CALCULATED STACK GAS DATA					
(Ps)	Stack Gas Pressure	in. Hg	29.92	29.92	29.92	29.92
(%Bws)	Stack Gas Moisture	%	62.5	63.3	62.0	62.6
(%B'w)	Moisture at Saturation	%	100.0	100.0	100.0	
(Vmstd)	Standard Dry Gas Meter Volume	dscf	65.258	64.453	63.668	64.466
(Md)	Dry Gas Molecular Weight	lb/lb-mole	29.06	29.01	29.13	29.07
(Ms)	Wet Gas Molecular Weight	lb/lb-mole	22.15	22.04	22.23	22.14
(vs)	Stack Gas Velocity	ft/s	26.65	26.51	26.32	26.5
(A)	Stack Area	ft2	2.76	2.76	2.76	
(Qsd)	Volumetric Gas Flow Rate	dscfm	1,103	1,075	1,103	1,094
(Qa)	Volumetric Gas Flow Rate	acfm	4,416	4,392	4,360	4,389
	Formaldehyde EMISSIONS					
(HClc)	Formaldehyde sample concentration	ug/mL	3826	3167	3549	3514.00
(HClb)	Formaldehyde Blank Sample Concentration	ug/mL	0	0	0	0.00
(HClcb)	Formaldehyde corrected concentration	ug/mL	3826	3167	3549	3514.00
(V HCl)	Volume Formaldehyde Sample	mL	1	1	1	1.00
(Mn)	Mass Formaldehyde Sample	mg	3.826	3.167	3.549	3.514
(Cs)	Formaldehyde Concentration	m	58.63	49.14	55.72	54.50
(Cs@7%O2)	Formaldehyde Concentration at 7%O2	mg/M3 at 7%O2	114.78	98.99	104.67	106.15
(E)	Formaldehyde Emission Rate	lb	0.302	0.247	0.287	0.278

46.98 39.38 44.65

HYDROCARBON EMISSION RATES					
		2129.1	2124	2058.6	
Total Hydrocarbon concentration (as Propane)	ppmv	709.7	708	686.2	701.3
Total Hydrocarbon concentration (as Propane)	lb/scf	8.10E-05	8.09E-05	7.84E-05	8.01E-05
Total Hydrocarbon emission rate (as Propane)	lb/hr	14.31	14.20	13.64	14.05
Total Hydrocarbon emission rate (as Carbon)	lb/hr	11.71	11.62	11.16	11.50

METHANE EMISSION RATES					
Total Methane concentration	ppmvd	51.7	37.8	31.2	40.2333
Total Methane concentration (as Carbon)	lb/scf	0.0000	0.0000	0.0000	0.0000
Total Methane emission rate (as Carbon)	lb/hr	0.49	0.35	0.29	0.38

NON-METHANE HYDROCARBONS					
Non-Methane emission rate (as Carbon)	lb/hr	11.22	11.26	10.87	11.12

Willamette Industries
Veneer Dryer Stack 3, Condition 2
Emerson, Arkansas
98-1559

filename:

SYMBOL	SAMPLING PARAMETERS	RUN NO.==> / DATE==> / RUN TIME==	RUN 4 4/24/98 0916-1016	RUN 5 4/24/98 1050-1150	RUN 6 4/24/98 1351-1451	AVERAGE
	MEASURED DATA AT STACK	UNITS				
(Y)	Dry Gas Meter Calibration Factor	--	1.025	1.025	1.025	
(Vi)	Initial Meter Volume	liters	45.370	4.480	69.940	
(Vf)	Final Meter Volume	liters	104.410	64.590	124.500	
(Lp)	Leak Check Correction	lpm	0	0	0	
(Vm)	Total Meter Volume	liters	59.040	60.110	54.560	57.903
(t)	Sampling Time	min.	60	60	60	60
(Vwc)	Volume of Water Collected	mL	25.4	26.1	25.7	25.7
(Vwsg)	Silica Gel Weight Increase	g	0.0	0.0	0.0	0.0
(Vlc)	Total Water Collected	mL	25.4	26.1	25.7	25.7
(Pbar)	Barometric Pressure	in. Hg	29.92	29.92	29.92	29.92
(Pg)	Stack Static Pressure	in. H2O	-0.03	-0.03	-0.03	
(?H)	Avg. Orifice Pressure Drop ?H	in. H2O	0.00	0.00	0.00	
(Ts)	Avg. Stack Gas Temperature	?F	317.8	319.0	328.6	321.8
(Tm)	Avg. Dry Gas Meter Temperature	?F	72.1	78.5	85.3	
(Ds)	Diameter of Stack	inches	22.000	22.000	22.000	
(W)	Width of Stack	inches	0.000	0.000	0.000	
(L)	Length of Stack	inches	0.000	0.000	0.000	
(Cp)	Pitot Tube Coefficient	--	0.84	0.84	0.84	
(?p)?	Avg. Square Root Velocity Head ?p	(in. H2O)?	0.212	0.229	0.209	
(%O2)	Stack Gas Oxygen	%	20.1	20.2	20.0	20.1
(%CO2)	Stack Gas Carbon Dioxide	%	0.5	0.5	0.5	0.5
(%N2)	Stack Gas Nitrogen	%	79.4	79.3	79.5	79.4
	CALCULATED STACK GAS DATA					
(Ps)	Stack Gas Pressure	in. Hg	29.92	29.92	29.92	29.92
(%Bws)	Stack Gas Moisture	%	36.1	34.6	38.8	37.1
(%B'w)	Moisture at Saturation	%	100.0	100.0	100.0	
(Vmstd)	Standard Dry Gas Meter Volume	dscf	60.028	60.383	54.129	58.180
(Md)	Dry Gas Molecular Weight	lb/lb-mole	28.88	28.89	28.88	28.88
(Ms)	Wet Gas Molecular Weight	lb/lb-mole	24.96	24.91	24.66	24.84
(vs)	Stack Gas Velocity	ft/s	15.50	16.84	15.48	15.9
(A)	Stack Area	ft2	2.64	2.64	2.64	
(Qsd)	Volumetric Gas Flow Rate	dscfm	1,066	1,147	1,005	1,073
(Qs)	Volumetric Gas Flow Rate	scfm	2,456	2,667	2,452	2,525
	Formaldehyde EMISSIONS					
(HCic)	Formaldehyde sample concentration	ug/mL	381	447	862	563.33
(HCib)	Formaldehyde Blank Sample Concentration	ug/mL	0	0	0	0.00
(HCicb)	Formaldehyde corrected concentration	ug/mL	381	447	862	563.33
(V HCi)	Volume Formaldehyde Sample	mL	1	1	1	1.00
(Mn)	Mass Formaldehyde Sample	mg	0.381	0.447	0.862	0.563
(Cs)	Formaldehyde Concentration	ppm	6.35	7.40	15.92	9.89
(Cs@7%O2)	Formaldehyde Concentration at 7%O2	mg/M3 at 7%O2	110.28	147.00	245.95	167.74
(E)	Formaldehyde Emission Rate	lb	0.032	0.040	0.075	0.049

5.09 5.93 12.76

HYDROCARBON EMISSION RATES					
vs = ppm C		1738.8	1944.4	1802.2	
Total Hydrocarbon concentration (as Propane)	ppmv	579.6	564.8	547.4	563.9
Total Hydrocarbon concentration (as Propane)	lb/scf	6.62E-05	6.45E-05	6.25E-05	6.44E-05
Total Hydrocarbon emission rate (as Propane)	lb/hr	6.62	6.99	6.16	6.59
Total Hydrocarbon emission rate (as Carbon)	lb/hr	5.42	5.72	5.04	5.39

wet.

METHANE EMISSION RATES					
Total Methane concentration	ppmvd	0	17.6	16.1	11.2333
Total Methane concentration (as Carbon)	lb/scf	0.0000	0.0000	0.0000	0.0000
Total Methane emission rate (as Carbon)	lb/hr	0.00	0.10	0.08	0.06

NON-METHANE HYDROCARBONS					
Non-Methane emission rate (as Carbon)	lb/hr	5.42	5.62	4.95	5.33

Willamette Industries
Veneer Dryer Cooler Stack, Condition 2
Emerson, Arkansas
98-1559

filename:

SYMBOL	SAMPLING PARAMETERS	RUN NO.==> / DATE==> / RUN TIME==	RUN 4 4/24/98 0916-1016	RUN 5 4/24/98 1050-1150	RUN 6 4/24/98 1351-1451	AVERAGE
SYMBOL	MEASURED DATA AT STACK	UNITS				
(Y)	Dry Gas Meter Calibration Factor	-	1.064	1.064	1.064	
(Vi)	Initial Meter Volume	liters	0.000	0.000	0.000	
(Vf)	Final Meter Volume	liters	50.000	50.000	50.000	
(Lp)	Leak Check Correction	lpm	0	0	0	
(Vm)	Total Meter Volume	liters	50.000	50.000	50.000	50.000
(t)	Sampling Time	min.	60	60	60	60
(Vwc)	Volume of Water Collected	mL	3.4	4.0	4.2	3.9
(Vwsg)	Silica Gel Weight Increase	g	0.0	0.0	0.0	0.0
(Vlc)	Total Water Collected	mL	3.4	4.0	4.2	3.9
(Pbar)	Barometric Pressure	in. Hg	29.92	29.92	29.92	29.92
(Pg)	Stack Static Pressure	in. H2O	-0.05	-0.05	-0.05	
(H)	Avg. Orifice Pressure Drop H	in. H2O	0.00	0.00	0.00	
(Ts)	Avg. Stack Gas Temperature	F	113.3	113.3	113.0	113.2
(Tm)	Avg. Dry Gas Meter Temperature	F	82.2	89.3	94.2	
(Ds)	Diameter of Stack	inches	45.000	45.000	45.000	
(W)	Width of Stack	inches	0.000	0.000	0.000	
(L)	Length of Stack	inches	0.000	0.000	0.000	
(Cp)	Pitot Tube Coefficient	-	0.84	0.84	0.84	
(p)	Avg. Square Root Velocity Head p	(in. H2O)	0.506	0.507	0.505	
(%O2)	Stack Gas Oxygen	%	20.9	20.9	20.9	20.9
(%CO2)	Stack Gas Carbon Dioxide	%	0.0	0.0	0.0	0.0
(%N2)	Stack Gas Nitrogen	%	79.1	79.1	79.1	79.1
	CALCULATED STACK GAS DATA					
(Ps)	Stack Gas Pressure	in. Hg	29.92	29.92	29.92	29.92
(%Bws)	Stack Gas Moisture	%	8.0	9.4	10.0	9.1
(%B'w)	Moisture at Saturation	%	9.5	9.5	9.5	
(Vmstd)	Standard Dry Gas Meter Volume	dscf	51.789	51.107	50.661	51.186
(Md)	Dry Gas Molecular Weight	lb/lb-mole	28.84	28.84	28.84	28.84
(Ms)	Wet Gas Molecular Weight	lb/lb-mole	27.96	27.81	27.81	27.86
(vs)	Stack Gas Velocity	ft/s	30.06	30.20	30.07	30.1
(A)	Stack Area	ft2	11.04	11.04	11.04	
(Qsd)	Volumetric Gas Flow Rate	dscfm	16,871	16,692	16,621	16,728
(Qa)	Volumetric Gas Flow Rate	acfm	19,923	20,016	19,924	19,954
	Formaldehyde EMISSIONS					
(HCic)	Formaldehyde sample concentration	ug/mL	2.45	1.9	1.97	2.11
(HCib)	Formaldehyde Blank Sample Concentration	ug/mL	0	0	0	0.00
(HCicb)	Formaldehyde corrected concentration	ug/mL	2.45	1.9	1.97	2.11
(V HCI)	Volume Formaldehyde Sample	mL	1	1	1	1.00
(Mn)	Mass Formaldehyde Sample	mg	0.002	0.002	0.002	0.002
(Cs)	Formaldehyde Concentration	ppm	0.040 / 0.05	0.032 / 0.04	0.032 / 0.04	0.04 — DET LIM
(Cs@7%O2)	Formaldehyde Concentration at 7%O2	mg/M3 at 7%O2	ERR	ERR	ERR	ERR
(E)	Formaldehyde Emission Rate	lb	0.004	0.003	0.003	0.003
			0.040/2	0.032/2	0.032/2	USE 1/2
	HYDROCARBON EMISSION RATES	x3 =ppmC	13.5	9.6	27.9	
	Total Hydrocarbon concentration (as Propane)	ppmv	4.5	3.2	9.3	5.7
WET	Total Hydrocarbon concentration (as Propane)	lb/scf	5.14E-07	3.65E-07	1.06E-06	6.47E-07
	Total Hydrocarbon emission rate (as Propane)	lb/hr	0.57	0.40	1.17	0.71
	Total Hydrocarbon emission rate (as Carbon)	lb/hr	0.46	0.33	0.96	0.58
	METHANE EMISSION RATES					
	Total Methane concentration	ppmvd	18.5	0	5.4	7.9667
	Total Methane concentration (as Carbon)	lb/scf	0.0000	0.0000	0.0000	0.0000
	Total Methane emission rate (as Carbon)	lb/hr	0.79	0.00	0.23	0.34
	Methane heat input emission rate	lb/MMBt	0.0000	0.0000	0.0000	0.0000
	NON-METHANE HYDROCARBONS					
	Non-Methane emission rate (as Carbon)	lb/hr	-0.33	0.33	0.73	0.24

APPENDIX E

PROCESS OPERATING DATA

Attachment 1-1

Day 1 (4-23-98), Tests 1-3

4/23/98 Run #1

Bin	Description	Average Moisture %	Piece Count From Run	Piece Count x Moist. Cont.
Bin #1	DX	5	103	515
Bin #2	HMX	10	138	1380
Bin #3	REDRY	15	280	4200
Bin #4	WET D	15	302	4530
Bin #5	WET C	15	108	1620
Bin #6	D	10	198	1980
Bin #7	NMD	5	198	990
Bin #8	C	10	131	1310
Bin #9	NMC	5	171	855
Bin #10	B	13	131	1637.5
Bin #11	NMA	5	98	490
Bin #12	SN	20	160	3200
		Total Pcs	2,018	22,708

13.9%

Average Moisture Content for Run #1 =
(Sum(Piece Count x Moisture Content))/Total Pieces = 11.25%

4/23/98 Run #2

Bin	Description	Average Moisture %	Piece Count From Run	Piece Count x Moist. Cont.
Bin #1	DX	5	82	410
Bin #2	HMX	10	164	1640
Bin #3	REDRY	15	170	2550
Bin #4	WET D	15	191	2865
Bin #5	WET C	15	81	1215
Bin #6	D	10	216	2160
Bin #7	NMD	5	187	935
Bin #8	C	10	119	1190
Bin #9	NMC	5	190	950
Bin #10	B	13	178	2225
Bin #11	NMA	5	144	720
Bin #12	SN	20	76	1520
		Total Pcs	1,798	18,380

9.4%

Average Moisture Content for Run #2 =
(Sum(Piece Count x Moisture Content))/Total Pieces = 10.22%

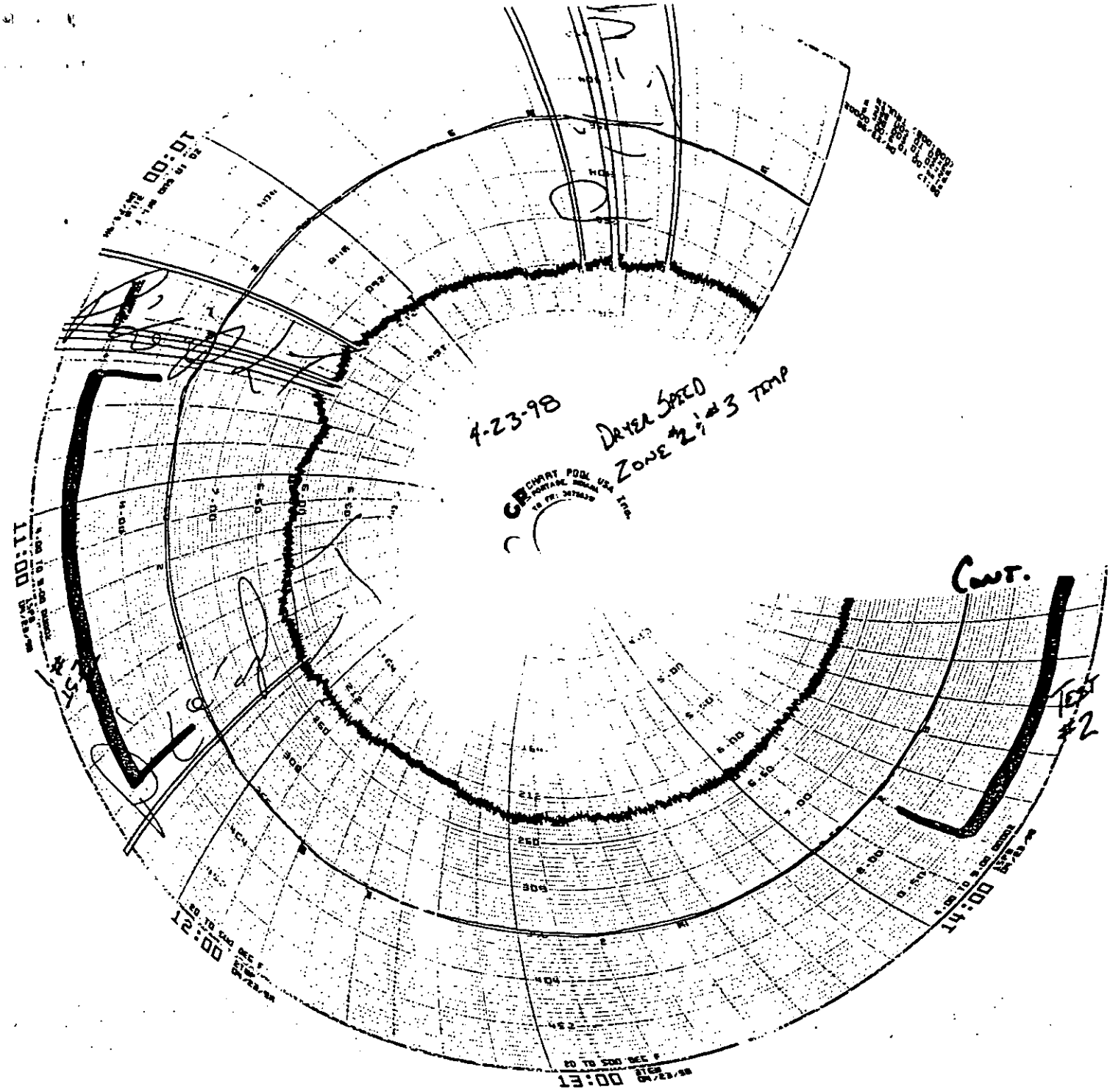
4/23/98 Run #3

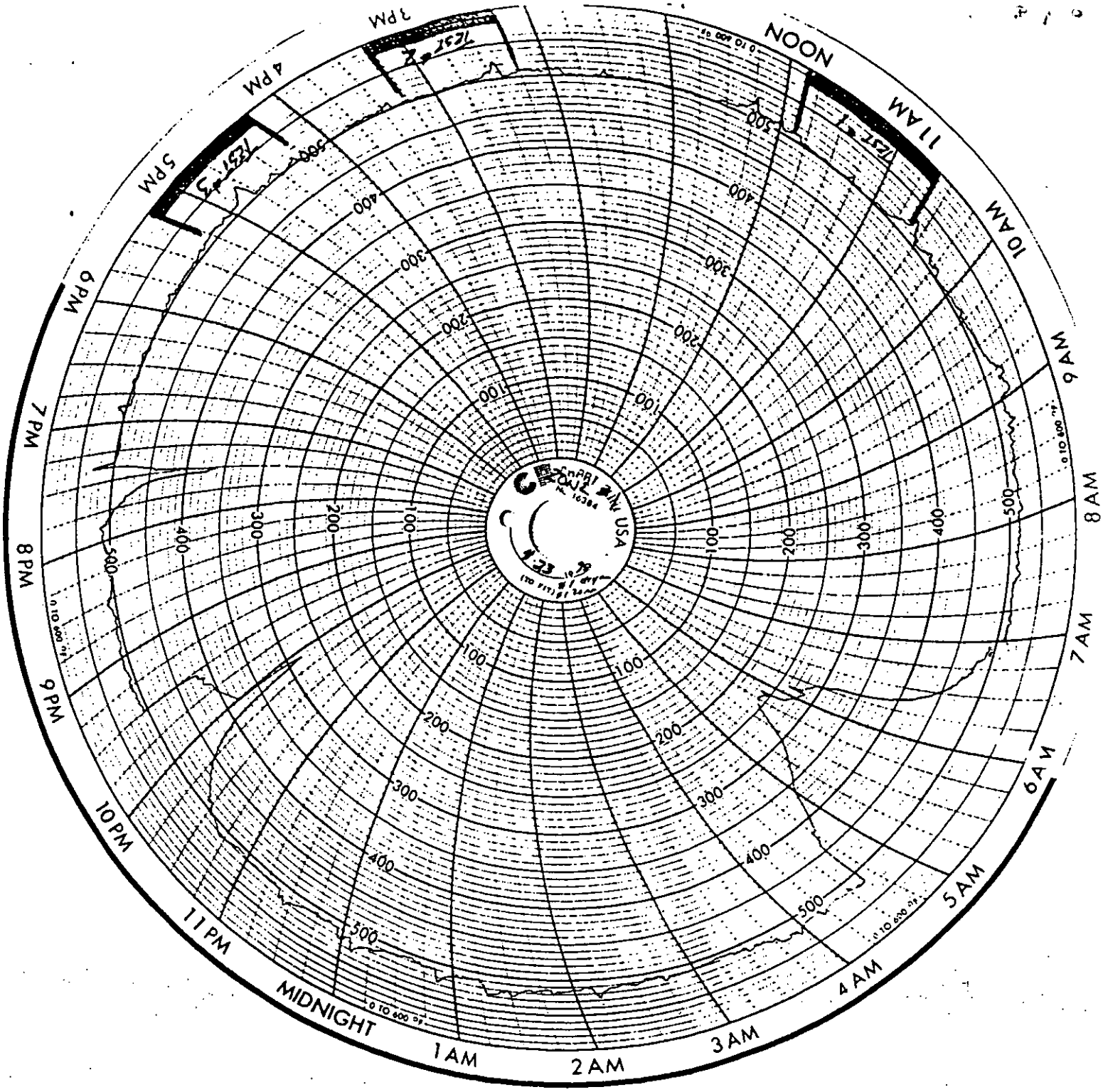
Bin	Description	Average Moisture %	Piece Count From Run	Piece Count x Moist. Cont.
Bin #1	DX	5	85	425
Bin #2	HMX	10	76	760
Bin #3	REDRY	15	88	1320
Bin #4	WET D	15	226	3390
Bin #5	WET C	15	90	1350
Bin #6	D	10	216	2160
Bin #7	NMD	5	301	1505
Bin #8	C	10	144	1440
Bin #9	NMC	5	185	925
Bin #10	B	13	151	1887.5
Bin #11	NMA	5	214	1070
Bin #12	SN	20	77	1540
		Total Pcs	1,853	17,773

4.7%

Average Moisture Content for Run #3 =
(Sum(Piece Count x Moisture Content))/Total Pieces = 9.59%

148


4-23-98
DRYER SPEED
ZONE #2 & 3 TEMP
CHART POOL USA Inc.
CWT.
TEST #2
10:00
11:00
12:00
13:00
14:00


MIDNIGHT
1 AM
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4 AM
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6 AM
7 AM
8 AM
9 AM
10 AM
11 AM
NOON
1 PM
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5 PM
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8 PM
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10 PM
11 PM
100
200
300
400
500
USA

Chart Pool USA Inc.
18:00
19:00
20:00
21:00
22:00
15:00
17:00

Attachment 1-2

Day 2 (4-24 , Tests 1-3

4/24/98 Run #1

Bin	Description	Average Moisture %	Piece Count From Run	Piece Count x Moist. Cont.
Bin #1	DX	5	138	690
Bin #2	HMX	10	114	1140
Bin #3	REDRY	15	70	1050
Bin #4	WET D	15	118	1770
Bin #5	WET C	15	56	840
Bin #6	D	10	112	1120
Bin #7	NMD	5	192	960
Bin #8	C	10	105	1050
Bin #9	NMC	5	372	1860
Bin #10	B	13	74	925
Bin #11	NMA	5	257	1285
Bin #12	SN	20	24	480
		Total Pcs	1,632	13,170

Average Moisture Content for Run #1 =
(Sum(Piece Count x Moisture Content))/Total Pieces = 8.07%

4/24/98 Run #2

Bin	Description	Average Moisture %	Piece Count From Run	Piece Count x Moist. Cont.
Bin #1	DX	5	254	1270
Bin #2	HMX	10	118	1180
Bin #3	REDRY	15	30	450
Bin #4	WET D	15	66	990
Bin #5	WET C	15	36	540
Bin #6	D	10	84	840
Bin #7	NMD	5	351	1755
Bin #8	C	10	57	570
Bin #9	NMC	5	404	2020
Bin #10	B	13	24	300
Bin #11	NMA	5	147	735
Bin #12	SN	20	3	60
		Total Pcs	1,574	10,710

Average Moisture Content for Run #2 =
(Sum(Piece Count x Moisture Content))/Total Pieces = 6.80%

4/24/98 Run #3

Bin	Description	Average Moisture %	Piece Count From Run	Piece Count x Moist. Cont.
Bin #1	DX	5	151	755
Bin #2	HMX	10	38	380
Bin #3	REDRY	15	10	150
Bin #4	WET D	15	33	495
Bin #5	WET C	15	19	285
Bin #6	D	10	60	600
Bin #7	NMD	5	363	1815
Bin #8	C	10	56	560
Bin #9	NMC	5	562	2810
Bin #10	B	13	16	200
Bin #11	NMA	5	309	1545
Bin #12	SN	20	6	120
		Total Pcs	1,623	9,715

Average Moisture Content for Run #3 =
(Sum(Piece Count x Moisture Content))/Total Pieces = 5.99%

152

4-24-98
Drum Speed
Cons #2 #3
TEMP
TEST #2
TEST #
CHART POOL USA Inc.
14:00
00:ET
12:00
11:00
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09:00
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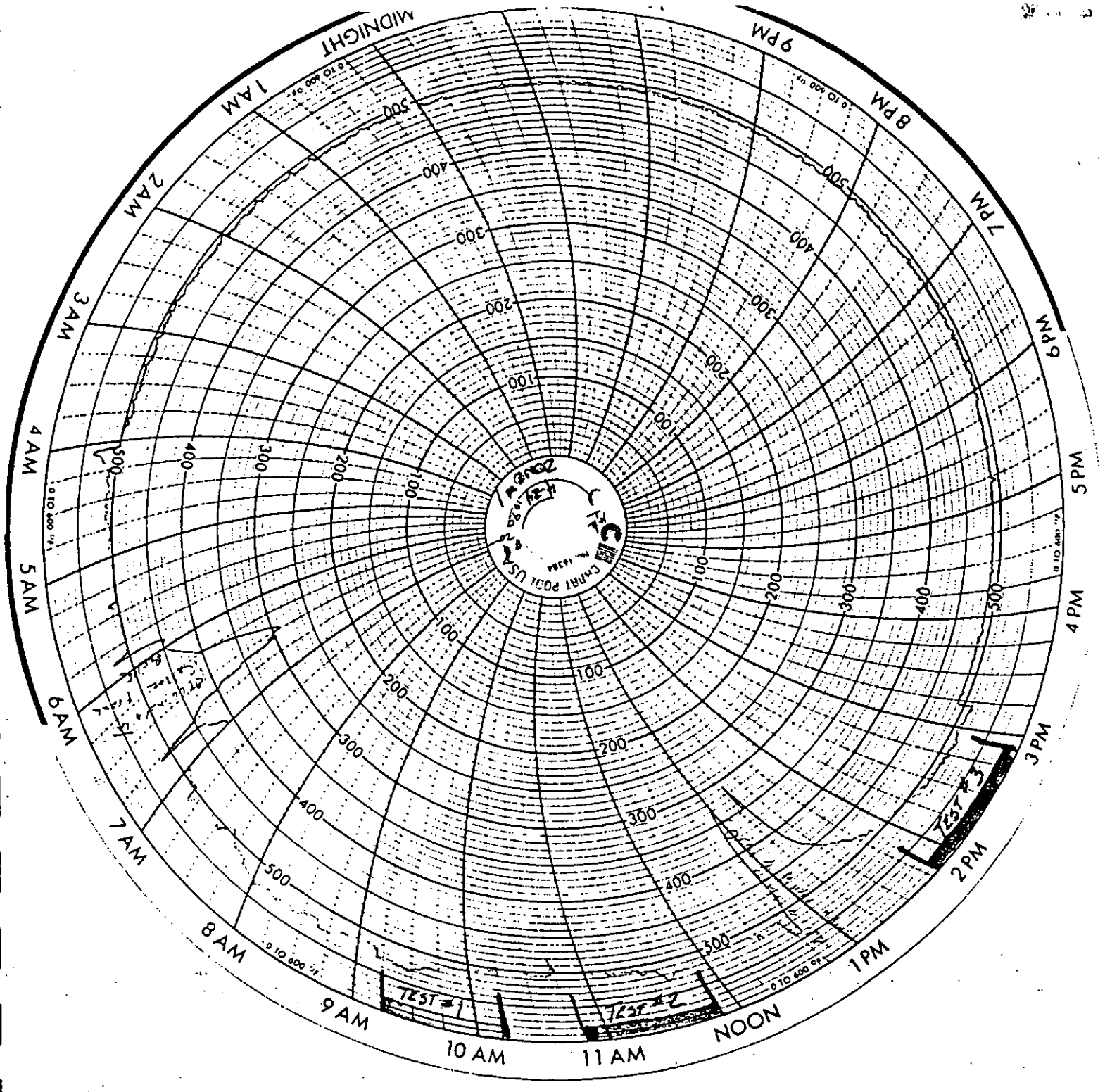
07:00


MIDNIGHT
1 AM
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4 AM
5 AM
6 AM
7 AM
8 AM
9 AM
10 AM
11 AM
NOON
1 PM
2 PM
3 PM
4 PM
5 PM
6 PM
7 PM
8 PM
9 PM
0 TO 400 FT
100
200
300
400
500
TEST #1
TEST #2
TEST #3

APPENDIX F

TEST PARTICIPANTS

Test Participants

W. Buynitzky	DEECO Team Leader
A. Bass	Site Leader
D. Goshaw	CEM operator
M. Milbourne	Field Tech
W. Millinor	Field Tech
Kim Carter	Willamette Contact
Nita Woods	Willamette Contact