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AIR QUALITY DIVISION

**RESULTS OF THE FEBRUARY 20-21, 2019
BOILER COMPLIANCE TESTS ON THE
NO. 1 AND NO. 2 BOILERS AT THE POTLATCH
DELTIC FACILITY IN GWINN, MICHIGAN**
Permit No. MI-ROP-N5940-2013A


Submitted to:

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DVH

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ABBREVIATIONS

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

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

1 INTRODUCTION

On February 20-21, 2019, Interpoll Laboratories personnel conducted emission compliance testing on Boilers No. 1 and No. 2 at the PotlatchDeltic facility located in Gwinn, Michigan. On-site testing was performed by Chris Warneke and Colin Kelly. Coordination between testing activities and plant operation was provided by Tom Mosher of PotlatchDeltic. The test was witnessed by Tom Gasoli, a representative of the Michigan DEQ.

Both Boilers were manufactured by Hurst Boiler and Welding Company and have a rated heat input of 28.7 MM Btu/hour. Particulate emissions are controlled by a Primary and Secondary Multiclone with Flyash injection.

Particulate evaluations were performed in accordance with EPA Methods 1 - 5, CFR Title 40, Part 60, Appendix A (revised July 1, 2018). Previous data collected at this test site was used to select the appropriate nozzle diameter required for isokinetic sample withdrawal. An Interpoll Labs sampling train, which meets or exceeds specifications in the above-cited reference, was used to extract particulate samples by means of a heated glass-lined probe.

Benzo (a) Pyrene sampling was conducted using an EPA Modified Method 5 (MM5) sampling train with purified XAD-2 resin in accordance with EPA Method 0010. A spike (2-component mixture of isotopically-labeled surrogates) was added to the top of the XAD-2 resin cartridge at the time the cartridges were packed. The pre-sample spikes provide an overall evaluation of the accuracy of sampling, recovery and analysis. A field-biased blank was collected by loading the entire sampling train, leak checking it and then recovering the sample in a manner identical to that used for the field samples. The contents of the Adsorbent Module, Container No. 1, Container No. 2, and Container No. 3 samples were extracted and combined to give a single extract for each flue gas sampling.

Carbon monoxide, oxygen and carbon dioxide concentrations were determined in accordance with Methods 3A, and 10. A slip stream of sample gas was withdrawn from the exhaust gas stream using test ports (provided by the plant) on the stack using a heat-traced probe and filter assembly. After passing through the filter, the gas passed through two condenser-type moisture removal systems operating in series.

The particulate-free dry gas was then transported to the analyzers with the excess exhausted to the atmosphere through a calibrated orifice which was used to ensure that the flow from the stack exceeds the requirements of the analyzers. A heat-traced Teflon line was used to transport the sample gas from the filter holder outlet to the analyzer inlet. The analog response of each analyzer was recorded with a computer data logger and backed up with a strip chart recorder. The O₂, CO₂, and CO analyzers were calibrated with EPA Protocol I gases. The instruments were calibrated before and after each run as per EPA Method 3A and 10.

The important results of the test are summarized in Section 2. Detailed results are presented in Section 3. Field data and all other supporting information are presented in the appendices.

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2 SUMMARY AND DISCUSSION

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The air emission results are summarized in the following tables. An overview of all results is presented in the table below:

1(a) Emission Unit Tested	1(b) Limitation Basis	1(c) Pollutant and Emission Limit	1(d) Test Result
Boiler No. 1	R336.1205	Carbon Monoxide 0.50 lb/MMBtu 14.35 Lbs/Hr.	0.26 lb/MMBtu 7.29 Lbs/Hr
	R336.1225	Benzo (a) Pyrene 9.7 ug/dscm 0.0006 Lbs/Hr.	< 0.009 ug/dscm < 0.000006 Lbs/Hr.
	R336.1331	Particulate 0.20 lb/MMBtu 5.7 Lbs/Hr.	0.15 lb/MMBtu 4.15 Lbs/Hr.
Boiler No. 2	R336.1205	Carbon Monoxide 0.50 lb/MMBtu 14.35 Lbs/Hr.	0.11 lb/MMBtu 2.73 Lbs/Hr
	R336.1225	Benzo (a) Pyrene 9.7 ug/dscm 0.0006 Lbs/Hr.	< 0.009 ug/dscm < 0.000006 Lbs/Hr.
	R336.1331	Particulate 0.20 lb/MMBtu 5.7 Lbs/Hr.	0.14 lb/MMBtu 3.48 Lbs/Hr.

No difficulties were encountered in the field by Interpoll Labs or in the laboratory analysis of the samples, which were conducted by Interpoll Labs. On the basis of these facts and a complete review of the data and results, it is our opinion that the results reported herein are accurate and closely reflect the actual values, which existed at the time the test was performed.

Test 2 Summary of the February 20, 2019, Carbon Monoxide Emission Test on the No. 2 Boiler Stack at the Potlatch Deltic Facility located in Gwinn, MI.

Item		Run 1	Run 2	Run 3	Average
Date of test		02-20-19	02-20-19	02-20-19	
Time runs were done	(Hrs)	0905 / 1005	1140 / 1240	1400 / 1500	
Volumetric Flow					
Actual	(ACFM)	10,054	9,309	9,861	9,741
Standard	(DSCFM)	4,964	4,626	4,781	4,791
Gas Temperature	(°F)	345	344	346	345
Moisture Content	(%v/v)	22.07	21.76	23.38	22.40
Gas Composition	(%v/v, dry)				
Carbon Dioxide		15.95	16.32	16.77	16.34
Oxygen		4.10	3.94	3.54	3.86
Nitrogen		79.95	79.74	79.69	79.80
Results					
CO					
Concentration - ppm, wet	(ppm, w)	103.463	102.474	97.745	101.23
Concentration - ppm, dry	(ppm, d)	132.763	130.967	127.571	130.43
Emission Rate	(LB/MMBTU)	0.111	0.108	0.103	0.11
Emission Rate	(LB/HR)	2.87	2.64	2.66	2.73

Table 1 Summary of the February 20, 2019 Benzo (a) Pyrene Emission Compliance Test on the No. 2 Boiler Stack at the PotlatchDeltic facility in Gwinn, Michigan.

Item		Run 1	Run 2	Run 3	Average
Date of test		02/20/19	02/20/19	02/20/19	
Time runs were done	(Hrs)	0905 / 1009	1140 / 1244	1400 / 1502	
Volumetric Flow					
Actual	(ACFM)	9905	9358	9507	9590
Standard	(DSCFM)	4896	4618	4642	4719
Gas Temperature	(°F)	345	343	347	345
Moisture Content	(%v/v)	21.98	22.38	22.74	22.37
Gas Composition (%v/v, dry)					
Carbon Dioxide		15.95	16.32	16.77	16.34
Oxygen		4.10	3.94	3.54	3.86
Nitrogen		79.95	79.74	79.69	79.80
Isokinetic Variation	(%)	97.7	101.1	100.5	99.77
Benzo A Pyrene Analytical Results					
Total micrograms	<	0.340	< 0.340	< 0.340	< 0.340
(ug/dscm)	<	0.009	< 0.009	< 0.009	< 0.009
(lbs/hr)	<	0.000006	< 0.000006	< 0.000006	< 0.0000059

Test 3 Summary of the February 20, 2019, Particulate Emission Compliance Test on the No. 2 Boiler Stack at the PotlatchDeltic Facility in Gwinn, Michigan.

Item		Run 1	Run 2	Run 3	Average
Date of test		02-20-19	02-20-19	02-20-19	
Time (Start/Finish)	(Hrs)	0905 / 1006	1140 / 1244	1400 / 1502	
Volumetric Flow					
Actual	(ACFM)	10,054	9,309	9,861	9,741
Standard	(SCFM)	6,370	5,913	6,240	6,174
Dry Standard	(DSCFM)	4,964	4,626	4,781	4,791
Gas Temperature	(°F)	345	344	346	345
Moisture Content	(%v/v)	22.07	21.76	23.38	22.40
Gas Composition	(%v/v, dry)				
Carbon Dioxide		15.95	16.32	16.77	16.34
Oxygen		4.10	3.94	3.54	3.86
Nitrogen		79.95	79.74	79.69	79.80
Sample Volume	(dscf)	40.52	36.73	38.55	38.60
Isokinetic Variation	(%)	103.0	100.2	101.7	101.6
Particulate Results-EPA Method 5					
<i>Dry Catch Only</i>					
Sample Mass (Nozzle, PW, Filter)	(g)	0.2361	0.1727	0.2277	
Concentration - Actual	(GR/ACF)	0.04438	0.03605	0.04418	0.04153
Concentration - Actual	(MG/ACM)	101.557	82.484	101.097	95.04593
Concentration - Standard	(GR/DSCF)	0.08990	0.07255	0.09114	0.08453
Emission Rate	(LB/HR)	3.825	2.876	3.734	3.478
Emission Factor	(LB/MMBTU)	0.148	0.118	0.145	0.137

Test 4 Summary of the February 21, 2019 Benzo (a) Pyrene Emission Compliance Test on the No. 1 Boiler Stack at the PotlatchDeltic Facility in Gwinn, Michigan.

Item	Run 1	Run 2	Run 3	Average
Date of test	02/21/19	02/21/19	02/21/19	
Time runs were done (Hrs)	0820 / 0922	1025 / 1132	1245 / 1347	
Volumetric Flow				
Actual (ACFM)	10455	10527	10606	10529
Standard (DSCFM)	5222	5053	5190	5155
Gas Temperature (°F)	344	345	345	344
Moisture Content (%v/v)	20.28	23.23	21.79	21.77
Gas Composition (%v/v, dry)				
Carbon Dioxide	16.28	15.88	15.62	15.93
Oxygen	3.82	3.91	4.26	4.00
Nitrogen	79.90	80.20	80.12	80.07
Isokinetic Variation (%)	96.1	100.9	98.6	98.53
Benzo A Pyrene Analytical Results				
Total Micrograms <	0.340	< 0.340	< 0.340	< 0.340
(ug/dscm) <	0.009	< 0.009	< 0.009	< 0.009
(lbs/hr) <	0.0000061	< 0.0000058	< 0.0000059	< 0.0000059

Test 5 Summary of the February 21, 2019, Carbon Monoxide Emission Test on the Wood Boiler No. 1 at the PotlatchDeltic Facility located in Gwinn, MI.

Item		Run 1	Run 2	Run 3	Average	
Date of test		02-21-19	02-21-19	02-21-19		
Time runs were done	(Hrs)	0820 / 0920	1025 / 1125	1245 / 1345		
Volumetric Flow						
Actual	(ACFM)	10,766	10,971	10,582	10,773	
Standard	(DSCFM)	5,219	5,286	5,197	5,234	
Gas Temperature	(°F)	343	346	345	344	
Moisture Content	(%v/v)	22.70	22.90	21.54	22.38	
Gas Composition	(%v/v, dry)					
Carbon Dioxide		16.28	15.88	15.62	15.93	
Oxygen		3.82	3.91	4.26	4.00	
Nitrogen		79.90	80.20	80.12	80.07	
Results						
CO						
Concentration - ppm, wet	(ppm, w)	317.385	278.949	145.054	247.13	
Concentration - ppm, dry	(ppm, d)	410.565	361.814	184.868	319.08	
Emission Rate	(LB/MMBTU)	0.337	0.299	0.156	0.26	
∞	Emission Rate	(LB/HR)	9.34	8.34	4.19	7.29

Test 6 Summary of the February 21, 2019, Particulate Emission Compliance Test on the No. 1 Boiler Stack at the PotlatchDeltic Facility in Gwinn, Michigan.

Item		Run 1	Run 2	Run 3	Average
Date of test		02-21-19	02-21-19	02-21-19	
Time (Start/Finish)	(Hrs)	0820 / 0922	1025 / 1132	1245 / 1347	
Volumetric Flow					
Actual	(ACFM)	10,766	10,971	10,582	10,773
Standard	(SCFM)	6,751	6,856	6,623	6,743
Dry Standard	(DSCFM)	5,219	5,286	5,197	5,234
Gas Temperature	(°F)	343	346	345	344
Moisture Content	(%v/v)	22.70	22.90	21.54	22.38
Gas Composition	(%v/v, dry)				
Carbon Dioxide		16.28	15.88	15.62	15.93
Oxygen		3.82	3.91	4.26	4.00
Nitrogen		79.90	80.20	80.12	80.07
Sample Volume	(dscf)	42.59	39.84	40.57	41.00
Isokinetic Variation	(%)	103.0	95.1	98.5	98.9
Particulate Results-EPA Method 5					
<i>Dry Catch Only</i>					
Sample Mass (Nozzle, PW, Filter)	(g)	0.2433	0.2321	0.2614	
Concentration - Actual	(GR/ACF)	0.04272	0.04330	0.04881	0.04494
Concentration - Actual	(MG/ACM)	97.749	99.086	111.694	102.84311
Concentration - Standard	(GR/DSCF)	0.08814	0.08990	0.09941	0.09248
Emission Rate	(LB/HR)	3.942	4.072	4.427	4.147
Emission Factor	(LB/MMBTU)	0.142	0.146	0.165	0.151

RESULTS

The results of all field and laboratory evaluations are presented in this section. Gas composition is presented first followed by the computer printout of the particulate results. Preliminary measurements including test port locations are given in the appendices.

The results have been calculated on a personal computer using Microsoft Excel spreadsheets specifically for source testing calculations. EPA-published equations have been used as the basis of the calculation techniques in these programs. The emission rates have been calculated using the product of the concentration times flow method.