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Industrial Boiler Maximum Achievable Control Technology Test Report

Verso Corporation
Quinnesec Mill
Waste Fuel (Hog) Boiler Outlet Duct
Quinnesec, Michigan
May 31, 2017

Report Submittal Date
June 27, 2017

Project No. M172101C

888 Industrial Drive
Elmhurst, Illinois 60126
630-993-2100

1.0 EXECUTIVE SUMMARY

MOSTARDI PLATT conducted an Industrial Boiler Maximum Achievable Control Technology (IB MACT) test program for Verso Corporation at the Quinnesec Mill on Waste Fuel (Hog) Boiler Outlet Duct on May 31, 2017. This report summarizes the results of the test program and test methods used.

Test location, test date, and test parameters are summarized below.

TEST INFORMATION		
Test Location	**Test Date**	**Test Parameters**
Waste Fuel (Hog) Boiler Outlet Duct	May 31, 2017	Filterable Particulate Matter (FPM), Hydrogen Chloride (HCl), Mercury (Hg), and Carbon Monoxide (CO)

The purpose of the test program was to evaluate the FPM, HCl, and Hg emissions against the IB MACT standards under the stoker/sloped grate wet biomass fuel category. Selected results of the test program are summarized below. A complete summary of emission test results follows the narrative portion of this report.

TEST RESULTS				
Test Location	**Test Date**	**Test Parameter**	**Emission Limit**	**Emission Rate**
Waste Fuel (Hog) Boiler Outlet Duct	5/31/17	FPM	0.037 lb/mmBtu	0.0040 lb/mmBtu (Fd-Factor)
		HCl	0.022 lb/mmBtu	0.0032 lb/mmBtu (Fd-Factor)
		Hg	0.0000057 lb/mmBtu	0.00000089 lb/mmBtu (Fd-Factor)
		CO	1500 ppmvd @ 3 % O_2	528.5 ppmvd @ 3 % O_2

Calculated Fd-Factors supplied by Verso Corporation was used to calculate the emissions on a lb/mmBtu basis. Plant operating data as provided by Verso Corporation is included in Appendix A.

The Stationary Source Audit Sample Program audit sample was obtained from ERA and submitted for analysis to Maxxam Analytical. The results of the audit sample was compared to the assigned value by ERA and found to be acceptable. The audit sample result and evaluation are appended to this report.

The identifications of individuals associated with the test program are summarized below.

TEST PERSONNEL INFORMATION		
Location	**Address**	**Contact**
Test Facility	Verso Corporation U.S. Highway 2 Quinnesec, Michigan 49876	Ms. Paula LaFleur Environmental Engineer (906) 779-3494 (phone) paula.lafleur@versopaper.com
Testing Company Representative	Mostardi Platt 888 Industrial Drive Elmhurst, Illinois 60126	Mr. Tim Mei Project Manager (630) 993-2100 (phone) tmei@mp-mail.com

The test crew consisted of Messrs. A. McKillip, B. Garcia, C. Eldridge, and T. Mei of Mostardi Platt. Mr. David Patterson of the Michigan Department of Environmental Quality (DEQ) observed the test program.

2.0 TEST METHODOLOGY

Emissions testing were conducted following the methods specified in 40 CFR, Part 60, Appendix A. Schematics of the test section diagram and sampling trains used are found in Appendix B and C, respectively. Calculation nomenclature and sample calculations are found in Appendix D. Sample analysis data are found in Appendix E. Copies of reference method data and field data sheets for each test run are included in Appendix F and G, respectively.

The following methodologies were used during the test program:

Method 1 Traverse Point Determination

Test measurement points were selected in accordance with Method 1. The characteristics of the measurement location are summarized below.

TEST POINT INFORMATION						
Location	**Stack Diameter (Feet)**	**Stack Area (Square Feet)**	**Upstream Diameters**	**Downstream Diameters**	**Test Parameter**	**Number of Sampling Points**
Waste Fuel (Hog) Boiler Outlet Duct	10.18	81.393	>0.5	>2.0	FPM, HCl	24
					CO	12 (Stratification)

Gaseous Stratification Test

A 12 point stratification test was performed during Run 1. The results were less than 10% difference and consequently three test points were used for Runs 2 and 3.

Method 2 Volumetric Flowrate Determination

Gas velocity was measured following Method 2, for purposes of calculating stack gas volumetric flow rate. An S-type pitot tube, differential pressure gauge, thermocouple and temperature readout were used to determine gas velocity at each sample point. All of the equipment used was calibrated in accordance with the specifications of the Method. Calibration data are presented in Appendix H.

Method 3A Oxygen (O_2)/Carbon Dioxide (CO_2) Determination

Stack gas molecular weight was determined in accordance with Method 3A, 40 CFR, Part 60, Appendix A. A Servomex analyzer was used to determine stack gas oxygen and carbon dioxide content and, by difference, nitrogen content. All of the equipment used was calibrated in accordance with the specifications of the Method. Calibration data are presented in Appendix H and gas cylinder certifications are presented in Appendix I.

Method 5 Filterable Particulate Matter (FPM) Determination

Stack gas FPM concentrations and emission rates were determined in accordance with USEPA Method 5, 40CFR60, Appendix A with filter and probe temperatures between 248 and 273 degrees Fahrenheit. An Environmental Supply Company, Inc. sampling train was used to

sample stack gas at an isokinetic rate, as specified in the Method utilizing Pallflex TX40HI45 filters. Particulate matter in the sample probe was recovered using an acetone rinse. The probe wash and filter catch were analyzed by Mostardi Platt in accordance with the Method in the Elmhurst, Illinois laboratory. Sample analysis data are found in Appendix E. All of the equipment used was calibrated in accordance with the specifications of the Method. Calibration data are presented in Appendix H.

Method 10 Carbon Monoxide (CO) Determination

Stack gas carbon monoxide concentrations and emission rates were determined in accordance with Method 10. A Thermo Scientific carbon monoxide analyzer was used to determine carbon monoxide concentrations, in the manner specified in the Method.

Stack gas was delivered to the analyzer via a Teflon® sampling line, heated to a minimum temperature of 250°F. Excess moisture in the stack gas was removed using a refrigerated condenser. The entire system was calibrated in accordance with the Method, using certified calibration gases introduced at the probe, before and after each test run.

A list of calibration gases used and the results of all calibration and other required quality assurance checks can be found in Appendix G. Copies of calibration gas certifications can be found in Appendix H.

Method 26A Hydrogen Chloride (HCl) Determination

Stack gas hydrogen chloride concentrations and emission rates were determined in accordance with Method 26A, 40CFR60, Appendix A in conjunction with the USEPA Method 5 sampling. An Environmental Supply Company sampling train was used to sample stack gas, in the manner specified in the Method utilizing Pallflex TX40HI45 filters. Analyses of the samples collected were conducted by Maxxam Analytics, Inc. of Mississauga, Ontario. Sample analysis data are found in Appendix F. All of the equipment used was calibrated in accordance with the specifications of the Method. Calibration data are presented in Appendix I.

Mercury Determination by Method 30B (Sorbent Trap Method)

Paired trains were utilized sampling three test points per test run.

Per Method 30B sampling, each sample was collected on the paired in-situ sorbent traps. A tube of silica was used to capture remaining moisture prior to the sample reaching the gas metering system.

The sample train used for this test program was designed by APEX, Inc. and meets all requirements for Method 30B sampling. Samples were analyzed onsite utilizing an Ohio Lumex, Inc. analyzer for total gaseous mercury. Mercury quality assurance and control data are found in Appendix J. All of the equipment used was calibrated in accordance with the specifications of the Method. Calibration data are presented in Appendix H.

3.0 TEST RESULTS SUMMARIES

Client: Verso Corporation
Facility: Quinnesec Mill
Test Location: Waste Fuel (HOG) Boiler Outlet Duct
Test Method: 5/26A

Source Condition	**Normal**	**Normal**	**Normal**	
Date	**5/31/17**	**5/31/17**	**5/31/17**	
Start Time	**8:18**	**11:08**	**13:45**	
End Time	**10:22**	**13:12**	**15:49**	
	Run 1	**Run 2**	**Run 3**	**Average**
Stack Conditions				
Average Gas Temperature, °F	205.8	213.5	213.1	210.8
Flue Gas Moisture, percent by volume	21.4%	22.0%	21.5%	21.6%
Average Flue Pressure, in. Hg	28.43	28.43	28.43	28.43
Gas Sample Volume, dscf	91.740	92.140	92.125	92.002
Average Gas Velocity, ft/sec	51.370	51.217	51.336	51.308
Gas Volumetric Flow Rate, acfm	215,753	215,109	215,610	215,491
Gas Volumetric Flow Rate, dscfm	127,800	125,082	126,222	126,368
Gas Volumetric Flow Rate, scfm	162,588	160,268	160,720	161,192
Average %CO_2 by volume, dry basis	13.8	13.7	13.9	13.8
Average %O_2 by volume, dry basis	6.5	6.6	6.4	6.5
Isokinetic Variance	101.6	104.2	103.3	103.0
Calculated Fuel Factor Fd, dscf/mmBtu	9,616.0	9,615.0	9,616.0	9,615.7
Filterable Particulate Matter (Method 5)				
grams collected	0.01549	0.01023	0.01003	0.01192
mg/dscm	5.963	3.921	3.845	4.5762
grains/acf	0.0015	0.0010	0.0010	0.0012
grains/dscf	0.0026	0.0017	0.0017	0.0020
lb/hr	2.854	1.837	1.818	2.170
lb/mmBtu (Calculated Fd Factor)	0.0052	0.0034	0.0033	0.0040

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Isokinetic Variance	101.6	104.2	103.3	103.0
Calculated Fuel Factor Fd, dscf/mmBtu	9,616.0	9,615.0	9,616.0	9,615.7
Hydrogen Chloride (HCl) Emissions				
ug of sample collected	11,000	11,000	6,700	9,567
ppm	2.79	2.78	1.69	2.42
mg/dscm	4.23	4.22	2.57	3.67
lb/hr	2.027	1.975	1.214	1.739
lb/mmBtu (Calculated Fd Factor)	0.0037	0.0037	0.0022	0.0032

Verso Corporation Quinnesec Mill Waste Fuel (HOG) Boiler Outlet Duct Gaseous Summary												
Test No.	Date	Start Time	End Time	CO ppmvd	CO_2 % (dry)	O_2 % (dry)	Moisture, BWS	Flowrate, DSCFM	CO lb/hr	Fd-Factors (dscf/mmBtu)	Fd-Factor based CO lb/MMBtu	CO ppmvd @ 3% O_2
1	05/31/17	09:00	10:09	299.8	13.9	6.4	0.214	127,800	167.04	9,616.0	0.302	370.1
2	05/31/17	11:50	12:49	393.0	13.8	6.5	0.220	125,082	214.31	9,615.0	0.398	488.5
3	05/31/17	14:30	15:29	580.7	13.8	6.6	0.215	126,222	319.55	9,616.0	0.593	726.9
Average				424.5	13.8	6.5	0.216	126,368	233.63	9,615.7	0.431	528.5

Method 30B (Sorbent Trap) Mercury Test Results Summary
Verso Paper Corporation
Quinnesec, MI
Waste Fuel (HOG) Boiler Duct

Test No.	Date	Start Time	End Time	V_m (standard L)	ng detected	ug/dscm	ug/wscm	lb/hr	lb/mmBtu (Fd Factor)	lb/mmBtu (Heat Input)
1A	5/31/2017	9:00	10:00	89.991	84.7	0.941	0.740	0.0005	0.00000081	0.00000090
1B				89.515	84.7	0.946	0.744	0.0005	0.00000082	0.00000090
Average					84.7	0.944	0.742	0.0005	0.00000082	0.00000090
2A	5/31/2017	11:50	12:50	88.558	103.2	1.165	0.909	0.0005	0.00000102	0.00000103
2B				88.347	101.2	1.145	0.893	0.0005	0.00000100	0.00000101
Average					102.2	1.155	0.901	0.0005	0.00000101	0.00000102
3A	5/31/2017	14:30	15:30	88.000	86.1	0.978	0.768	0.0005	0.00000086	0.00000089
3B				87.450	83.8	0.958	0.752	0.0005	0.00000084	0.00000087
Average					85.0	0.968	0.760	0.0005	0.00000085	0.00000088

Emmisions Limit 0.0000057 lb/mmBtu (Heat Input)	ng detected	ug/dscm	ug/wscm	lb/hr	lb/Tbtu (Fd Factor)	lb/Tbtu (Heat Input)
Average of Runs 1-3	90.6	1.022	0.801	0.0005	0.00000089	0.00000093

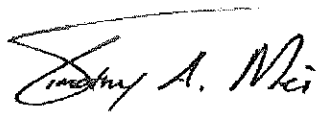
4.0 CERTIFICATION

MOSTARDI PLATT is pleased to have been of service to Verso Corporation. If you have any questions regarding this test report, please do not hesitate to contact us at 630-993-2100.

CERTIFICATION

As project manager, I hereby certify that this test report represents a true and accurate summary of emissions test results and the methodologies employed to obtain those results, and the test program was performed in accordance with the methods specified in this test report.

MOSTARDI PLATT



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