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Initial Filterable Particulate Continuous Emission Monitoring System Correlation Test Report

We Energies
Presque Isle Power Plant
TOXECON Outlet Duct
Marquette, Michigan
June 4 through 8, 2017

Report Submittal Date:
July 20, 2017

Project No. M172202I

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Elmhurst, Illinois 60126
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1.0 EXECUTIVE SUMMARY

MOSTARDI PLATT conducted a filterable particulate matter continuous emission monitoring system (PM CEMS) correlation curve test program in accordance with EPA Performance Specification 11 (PS-11) for We Energies at the Presque Isle Power Plant on the TOXECON Outlet Duct in Marquette, Michigan on June 4 through 8, 2017. This report summarizes the results of the test program and test methods used.

The test location, test dates, test method, and test parameter are summarized below.

TEST INFORMATION			
Test Location	**Test Dates**	**Test Method**	**Test Parameter**
TOXECON Outlet Duct	June 4 through 8, 2017	Method 17	Filterable Particulate Matter (FPM)

The purpose of this test program was to provide FPM emissions at three different emission levels in order to develop a new correlation between PM CEMS output and reference methods measurements, according to 40CFR60, Appendix B, Performance Specification 11. Emission rates are expressed in terms of milligrams per actual cubic meter (mg/acm) at stack conditions. This program consisted of 21 tests performed at the outlet duct test location.

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**	**Operating Condition**	**Run Number**	**Emission Rates, mg/acm at stack conditions**
TOXECON Outlet Duct	6/4/17	Baseline	1	5.145
		Baseline	2	4.545
		Baseline	3	4.537
		Baseline	4	7.593
	6/5/17	Baseline	5	4.870
		Mid Grain Loading	6	1.445
		Mid Grain Loading	7	5.925
		Mid Grain Loading	8	8.559
		Mid Grain Loading	9	4.417
		Mid Grain Loading	10	4.737
	6/6/17	Baseline	11	3.249
		Mid Grain Loading	12	8.726
		Mid Grain Loading	13	8.356
		Mid Grain Loading	14	11.206
		High Grain Loading	15	17.085
		High Grain Loading	16	17.482
	6/8/17	High Grain Loading	17	14.440
		High Grain Loading	18	15.884
		High Grain Loading	19	13.454

TEST RESULTS				
Test Location	**Test Date**	**Operating Condition**	**Run Number**	**Emission Rates, mg/acm at stack conditions**
TOXECON Outlet Duct	6/8/17	High Grain Loading	20	10.269
		High Grain Loading	21	9.862

Operating data as provided by We Energies is found in Appendix A.

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

TEST PERSONNEL INFORMATION		
Location	**Address**	**Contact**
Test Coordinator	We Energies 333 West Everett Street Milwaukee, Wisconsin 53203	Ms. Brenda Bergemann (414) 221-2459 (phone) brenda.bergemann@we-energies.com
Test Facility	We Energies Presque Isle Power Plant Marquette, Michigan	
Testing Company Representative	Mostardi Platt 888 Industrial Drive Elmhurst, Illinois 60126	Mr. Rich Sollars Project Manager (630) 993-2100 (phone) rsollars@mp-mail.com

The test crew consisted of Messrs. B. Schuler, E. Charatz, J. Biggins, J. Nestor, M. Lipinski, S. Cronin, and R. Sollars of Mostardi Platt.

2.0 TEST METHODOLOGY

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

The following methodologies were used during the test program:

Method 1 Sample and Velocity Traverse Determination

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

TEST POINT INFORMATION				
Location	**Upstream Diameters**	**Downstream Diameters**	**Test Parameter**	**Number of Sampling Points**
TOXECON Outlet Duct	>0.5	>2.0	FPM	30

Method 2 Volumetric Flow Rate Determination

Gas velocity was measured following Method 2, for purposes of calculating the gas volumetric flow rate. An S-type pitot tube, incline manometer, 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 Carbon Dioxide (CO_2) and Oxygen (O_2) Determination

The flue gas carbon dioxide (CO_2) and oxygen (O_2) content was determined in accordance with Method 3A. ECOM analyzers were used to determine flue gas CO_2 and O_2. All of the equipment used was calibrated in accordance with the specifications of the Method. Calibration data are presented in Appendix H and copies of the gas cylinder certifications are found in Appendix I.

Method 17 Particulate Determination

The TOXECON outlet duct gas particulate concentrations and emission rates were determined in accordance with Method 17, using a dry, pre-weighed in stack glass fiber filter and gelman set up. An Environmental Supply Company sampling train was used to sample flue gas at an isokinetic rate, as specified in the Method. Particulate matter in the nozzle was recovered using an acetone rinse. The nozzle wash and filter catch were analyzed by Mostardi Platt in accordance with the Method. Laboratory 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.

3.0 TEST RESULT SUMMARIES

Client: We Energies
Facility: Presque Isle Power Plant
Test Location: Toxecon Outlet Duct
Test Method: 17

Test Condition	Baseline	Baseline	Baseline	Baseline	Baseline
Date	6/4/17	6/4/17	6/4/17	6/4/17	6/5/17
Start Time	7:04	8:40	10:15	12:35	6:10
End Time	8:18	9:54	11:30	13:52	7:22
	Run 1	Run 2	Run 3	Run 4	Run 5
Stack Conditions					
Average Gas Temperature, °F	318.8	322.7	322.1	320.8	315.8
Flue Gas Moisture, percent by volume	11.3%	11.4%	11.1%	9.4%	11.7%
Average Flue Pressure, in. Hg	29.20	29.20	29.20	29.65	29.42
Gas Sample Volume, dscf	60.341	62.047	64.050	62.492	61.486
Average Gas Velocity, ft/sec	37.084	38.344	39.343	38.000	36.873
Gas Volumetric Flow Rate, acfm	749,858	775,327	795,541	768,378	745,600
Gas Volumetric Flow Rate, dscfm	439,963	452,087	466,077	466,524	440,732
Gas Volumetric Flow Rate, scfm	496,078	510,393	524,102	514,836	498,936
Average $\%CO_2$ by volume, dry basis	13.6	13.9	13.8	13.7	14.0
Average $\%O_2$ by volume, dry basis	5.7	5.4	5.5	5.6	5.4
Isokinetic Variance	102.1	102.2	102.3	99.7	103.9
Fd Factor, dscf/mmBtu	9,820.0	9,820.0	9,820.0	9,820.0	9,820.0
Particulate Matter (Method 17)					
grams collected	0.01498	0.01369	0.01405	0.02213	0.01435
mg/dscm	8.767	7.792	7.747	12.506	8.242
mg/wscm	7.776	6.903	6.887	11.330	7.278
mg/acm at stack conditions	5.145	4.545	4.537	7.593	4.870
grains/acf	0.0022	0.0020	0.0020	0.0033	0.0021
grains/dscf	0.0038	0.0034	0.0034	0.0055	0.0036
lb/hr	14.446	13.192	13.522	21.850	13.604
lb/mmBtu (Standard Fd Factor)	0.0074	0.0064	0.0064	0.0105	0.0068

Client:	**We Energies**
Facility:	**Presque Isle Power Plant**
Test Location:	**Toxecon Outlet Duct**
Test Method:	**17**

Test Condition	Mid Grain Loading	Mid Grain Loading	Mid Grain Loading	Mid Grain Loading	Mid Grain Loading
Date	**6/5/17**	**6/5/17**	**6/5/17**	**6/5/17**	**6/5/17**
Start Time	**8:15**	**9:40**	**11:10**	**12:40**	**14:15**
End Time	**9:25**	**10:52**	**12:21**	**13:50**	**15:25**
	Run 6	**Run 7**	**Run 8**	**Run 9**	**Run 10**
Stack Conditions					
Average Gas Temperature, °F	325.0	328.1	336.9	336.8	335.5
Flue Gas Moisture, percent by volume	11.8%	11.3%	12.4%	11.0%	11.7%
Average Flue Pressure, in. Hg	29.42	29.42	29.42	29.42	29.42
Gas Sample Volume, dscf	42.057	42.006	41.399	41.725	42.665
Average Gas Velocity, ft/sec	37.677	38.412	37.745	37.834	38.607
Gas Volumetric Flow Rate, acfm	761,840	776,700	763,231	765,019	780,652
Gas Volumetric Flow Rate, dscfm	444,429	453,880	435,565	443,524	449,884
Gas Volumetric Flow Rate, scfm	503,807	511,592	497,211	498,396	509,433
Average %CO_2 by volume, dry basis	14.1	14.0	13.8	14.1	14.2
Average %O_2 by volume, dry basis	5.4	5.5	5.9	5.6	5.5
Isokinetic Variance	104.1	101.8	104.6	103.5	104.4
Fd Factor, dscf/mmBtu	9,820.0	9,820.0	9,820.0	9,820.0	9,820.0
Particulate Matter (Method 17)					
grams collected	0.00295	0.01206	0.01758	0.00900	0.00993
mg/dscm	2.477	10.139	14.996	7.617	8.219
mg/wscm	2.185	8.993	13.137	6.779	7.258
mg/acm at stack conditions	1.445	5.925	8.559	4.417	4.737
grains/acf	0.0006	0.0026	0.0037	0.0019	0.0021
grains/dscf	0.0011	0.0044	0.0066	0.0033	0.0036
lb/hr	4.123	17.235	24.462	12.653	13.848
lb/mmBtu (Standard Fd Factor)	0.0020	0.0084	0.0128	0.0064	0.0068

Client:	**We Energies**
Facility:	**Presque Isle Power Plant**
Test Location:	**Toxecon Outlet Duct**
Test Method:	**17**

Source Condition	Baseline	Mid Grain Loading	Mid Grain Loading	Mid Grain Loading	High Grain Loading	High Grain Loading
Date	6/6/17	6/6/17	6/6/17	6/6/17	6/6/17	6/6/17
Start Time	6:00	8:15	9:45	11:10	13:40	15:08
End Time	7:12	9:25	10:55	12:20	14:56	16:18
	Run 11	Run 12	Run 13	Run 14	Run 15	Run 16
Stack Conditions						
Average Gas Temperature, °F	324.2	324.9	330.2	323.9	321.2	324.5
Flue Gas Moisture, percent by volume	11.0%	11.4%	10.9%	12.3%	11.3%	11.0%
Average Flue Pressure, in. Hg	29.40	29.40	29.40	29.40	29.40	29.40
Gas Sample Volume, dscf	41.981	41.835	41.016	39.858	42.665	41.757
Average Gas Velocity, ft/sec	38.019	37.538	37.468	36.366	39.136	36.196
Gas Volumetric Flow Rate, acfm	768,774	759,046	757,627	735,346	791,348	731,900
Gas Volumetric Flow Rate, dscfm	452,671	444,643	443,204	426,669	465,966	430,843
Gas Volumetric Flow Rate, scfm	508,587	501,661	497,406	486,617	525,482	484,007
Average $\%CO_2$ by volume, dry basis	13.9	14.1	14.0	14.0	14.0	14.1
Average $\%O_2$ by volume, dry basis	5.4	5.4	5.6	5.6	5.5	5.5
Isokinetic Variance	102.1	103.5	101.8	102.8	100.8	106.7
Fd Factor, dscf/mmBtu	9,820.0	9,820.0	9,820.0	9,820.0	9,820.0	9,820.0
Particulate Matter (Method 17)						
grams collected	0.00656	0.01765	0.01659	0.02179	0.03504	0.03512
mg/dscm	5.518	14.899	14.284	19.306	29.003	29.701
mg/wscm	4.911	13.201	12.727	16.931	25.726	26.434
mg/acm at stack conditions	3.249	8.726	8.356	11.206	17.085	17.482
grains/acf	0.0014	0.0038	0.0037	0.0049	0.0075	0.0076
grains/dscf	0.0024	0.0065	0.0062	0.0084	0.0127	0.0130
lb/hr	9.355	24.810	23.709	30.850	50.613	47.925
lb/mmBtu (Standard Fd Factor)	0.0046	0.0123	0.0120	0.0162	0.0241	0.0247

Client:	**We Energies**
Facility:	**Presque Isle Power Plant**
Test Location:	**Toxecon Outlet Duct**
Test Method:	**17**

Source Condition	**High Grain Loading**	**High Grain Loading**	**High Grain Loading**	**High Grain Loading**	**High Grain Loading**
Date	**6/8/17**	**6/8/17**	**6/8/17**	**6/8/17**	**6/8/17**
Start Time	**6:43**	**8:05**	**10:18**	**11:42**	**13:05**
End Time	**7:53**	**10:37**	**11:28**	**12:52**	**14:15**
	Run 17	**Run 18**	**Run 19**	**Run 20**	**Run 21**
Stack Conditions					
Average Gas Temperature, °F	326.4	325.7	337.8	324.0	322.0
Flue Gas Moisture, percent by volume	11.7%	11.2%	10.6%	10.4%	11.6%
Average Flue Pressure, in. Hg	29.40	29.40	29.40	29.65	29.40
Gas Sample Volume, dscf	42.114	40.818	42.013	42.546	41.205
Average Gas Velocity, ft/sec	38.325	37.481	37.933	37.240	37.410
Gas Volumetric Flow Rate, acfm	774,954	757,875	767,020	753,022	756,452
Gas Volumetric Flow Rate, dscfm	451,687	444,668	446,160	450,426	443,856
Gas Volumetric Flow Rate, scfm	511,347	500,545	498,880	502,634	501,947
Average $\%CO_2$ by volume, dry basis	14.2	14.3	14.2	14.2	14.2
Average $\%O_2$ by volume, dry basis	5.4	5.4	5.6	5.6	5.5
Isokinetic Variance	102.6	101.0	103.6	103.9	102.2
Fd Factor, dscf/mmBtu	9,820.0	9,820.0	9,820.0	9,820.0	9,820.0
Particulate Matter (Method 17)					
grams collected	0.02956	0.03131	0.02753	0.02069	0.01962
mg/dscm	24.788	27.089	23.141	17.173	16.815
mg/wscm	21.887	24.055	20.688	15.387	14.865
mg/acm at stack conditions	14.440	15.884	13.454	10.269	9.862
grains/acf	0.0063	0.0069	0.0059	0.0045	0.0043
grains/dscf	0.0108	0.0118	0.0101	0.0075	0.0073
lb/hr	41.931	45.112	38.666	28.970	27.952
lb/mmBtu (Standard Fd Factor)	0.0205	0.0224	0.0194	0.0144	0.0140