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TEST REPORT

for

PS-11 CERTIFICATION TEST

PARTICULATE MATTER CONTINUOUS EMISSIONS MONITORING SYSTEM (PM CEMS)

EUBOILER#3

River Rouge Power Plant
River Rouge, Michigan

August 14-16, 2019

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EXECUTIVE SUMMARY %

A PS-11 Flow Certification on the on a new Particulate Matter Continuous Emissions Monitoring System (PM CEMS). The PS-11 was performed on the EUBOILER#3 exhaust stack located at the River Rouge Power Plant, in River Rouge, Michigan. A new flow monitor was installed because a lightning strike to the Unit 3 stack damaged the original PM CEMS that had been in place on the stack.

Testing is required by 40 CFR Part 63 Subpart UUUUU and Michigan Department of Environment, Great Lakes, and Energy (EGLE) Renewable Operating Permit No. MI-ROP-B2810-2012b. Testing was conducted between August 14-16, 2019 in accordance with Procedure 2 of 40 CFR Part 60, Appendix F. Testing was conducted by Montrose Air Quality Services.

Results are as follows:

UNIT	MODEL	CONFIDENCE CORRELATION	CONFIDENCE INTERVAL	TOLERANCE INTERVAL
3	Linear	0.990	7.34 %	23.6 %
Allowable		***≥0.85***	***≤10%***	***≤25%***

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1.0 INTRODUCTION

A PS-11 Flow Certification on the on a new Particulate Matter Continuous Emissions Monitoring System (PM CEMS). The PS-11 was performed on the EUBOILER#3 exhaust stack located at the River Rouge Power Plant, in River Rouge, Michigan. A new flow monitor was installed because a lightning strike to the Unit 3 stack damaged the original PM CEMS that had been in place on the stack.

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Due to the emergency nature of the situation (lightning strike causing PM CMES failure), a Test Protocol was not submitted in advance of the testing. However, Department of Environment, Great Lakes & Energy (EGLE), Technical Process Unit was informed of the situation and the plan prior to testing. EGLE staff was not present during testing. Coordination with the facility was performed by Ms. Tanecia Wilson, Associate Engineer.

2.0 SOURCE DESCRIPTION

The River Rouge Power Plant (RRPP), located at 1 Belanger Park Dr. River Rouge, Michigan, employs the use of one coal-fired boiler. EUBOILER#3 is a Foster-Wheeler Boiler, nominally rated at 278 GMW. Particulate emissions from EUBOILER#3 are controlled via a Wheelabrator-Fry electrostatic precipitator (ESP). The air pollution control equipment has a designed collection efficiency of 99.9%.

The boiler is equipped with a Dry Sorbent Injection (DSI) and Activated Carbon Injection (ACI) air quality control system. The DSI system is used to control acid gases from the unit. Trona is received at the plant where inline mills further refine the Trona. The ACI system is used to control Mercury emissions.

The coal blend for EUBOILER#3 was 100% low-sulfur western (LSW). Testing was performed on EUBOILER#3 while operating at normal load conditions, per Subpart
River Rouge Power Plant utilizes Sick AG Maihak SP100 dust measuring systems. The analyzers utilize a measuring technique based off scattered light principal. The SP100 model is specific for low to medium dust collections. The following unit was tested:

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Unit	Analyzer	Manufacturer/ Model	Analyzer Range	Serial Number
EUBOILER#3	PM	Sick/ Maihak SP100	200 mg/acm	17378772

3.0 SAMPLING AND ANALYTICAL PROCEDURES

DTE Energy obtained emissions measurements in accordance with procedures specified in the USEPA *Standards of Performance for New Stationary Sources*. The sampling and analytical methods used in the testing program are indicated in the table below

Sampling Method	Parameter	Analysis
USEPA Methods 1-2	Exhaust Gas Flow Rates	Field data analysis and reduction
USEPA Method 3A	O_2 & CO_2	Instrumental Analyzer Method
USEPA Method 4	Moisture Content	Field data analysis and reduction
USEPA Method 5 – MATS Modified	Particulate Matter (Non-Sulfuric Acid)	Gravimetric Analysis

3.1 STACK GAS VELOCITY AND FLOWRATES (USEPA Methods 1-2)

3.1.1 *Sampling Method*

Stack gas velocity traverses were conducted in accordance with the procedures outlined in USEPA Method 1, "Sample and Velocity Traverses for Stationary Sources," and Method 2, "Determination of Stack Gas Velocity and Volumetric Flowrate." Four (4) sampling ports were utilized on each unit's exhaust stack, sampling at six (6) points per port for a total of twenty-four (24) points. Velocity traverses were conducted simultaneously with the particulate sampling. See Figure 1 for a diagram of the traverse/sampling points used.

Cyclonic flow checks were performed on each stack during the initial flow monitor certification RATAs. Testing at the sampling location demonstrated that no cyclonic flow was present at either location. No changes to the stacks have occurred since

the cyclonic flow checks were performed. Additionally, verifications of null angle at 0° were observed while performing static pressure checks.

3.1.2 *Method 2 Sampling Equipment*

The EPA Method 2 sampling equipment consisted of a 0-10" incline manometer, S-type Pitot tube (C_p = 0.84) and a Type-K calibrated thermocouple.

3.2 OXYGEN & CARBON DIOXIDE (USEPA Method 3A)

3.2.1 *Sampling Method*

Oxygen (O_2) and carbon dioxide (CO_2) emissions were evaluated using USEPA Method 3A, "Gas Analysis for Carbon Dioxide, Oxygen, Excess Air, and Dry Molecular Weight (Instrumental Analyzer Method)". The analyzers utilize paramagnetic sensors.

3.2.2 *O_2/CO_2 Sampling Train*

The EPA Method 3A sampling system (Figure 2) consisted of the following:

(1) PTFE sampling line (collecting gas sample from the dry gas meter exhaust)
(2) 10 liter Tedlar bag
(3) Servomex 1400 O_2/CO_2 gas analyzer
(4) Appropriate USEPA Protocol 1 calibration gases

3.2.3 *Sampling Train Calibration*

The O_2 and CO_2 analyzers were calibrated per procedures outlined in USEPA Methods 3A. Zero, span, and mid-range calibration gases were introduced directly into the analyzer to verify the instruments linearity, prior to sampling, and again at the completion of each test run.

3.3 MOISTURE DETERMINATION (USEPA Method 4)

3.3.1 *Sampling Method*

Determination of the moisture content of the exhaust gas was performed using USEPA Method 4, "Determination of Moisture Content in Stack Gases". The moisture was collected in glass impingers as a component of the Method 5 (Modified) sampling train, and the percentage of water was then derived from calculations outlined in USEPA Method 4.

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3.4 PARTICULATE MATTER (USEPA Method 5 – MATS Modified)

3.4.1 *Filterable Particulate Sampling Method*

USEPA Method 5 – MATS Modified, "Determination of Particulate Emissions from Stationary Sources" was used to measure the filterable (front-half) particulate emissions (see Figure 3 for a schematic of the sampling train). Fifteen (15), 60-minute test runs were conducted.

The Method 5 – MATS Modified modular isokinetic stack sampling system consisted of the following:

(1) PTFE coated stainless-steel button-hook nozzle
(2) Heated glass-lined probe
(3) Heated 3" glass filter holder with a quartz filter (Maintained at a temperature of 320 ± 25 °F)
(4) Set of impingers for the collection of condensate for moisture determination
(5) Length of sample line
(6) Environmental Supply® control case equipped with a pump, dry gas meter, and calibrated orifice.

The quartz filters used in the sampling were initially baked for 3 hours at 320 °F, desiccated for 24 hours and weighed to a constant weight as described in Method 5 - MATS Modified to obtain the initial tare weight.

After completion of the final leak test for each test run, the filter was recovered, and the probe, nozzle and the front half of the filter holder assembly were brushed and rinsed with acetone. The acetone rinses were collected in a pre-cleaned sample container. The container was labeled with the test number, test location, test date, and the level of liquid marked on the outside of the container. Immediately after recovery, the sample containers were placed in a cooler for storage.

At the laboratory, the acetone rinses were transferred to clean pre-weighed beakers, and evaporated to dryness at ambient temperature and pressure. The beakers and filters were desiccated for 24 hours and weighed to a constant weight (within 0.5 mg). The data sheets containing the initial and final weights on the filters and beakers can be found in Appendix C.

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Collected field blanks consisted of a blank filter and acetone solution blank. The acetone blank was collected from the rinse bottle used in sample recovery. The blank filter and acetone were collected and analyzed following the same procedures used to recover and analyze the field samples. Field data sheets for the Method 5 - MATS Modified sampling can be found in Appendix B.

3.4.2 *Quality Control and Assurance*

All sampling and analytical equipment was calibrated per the guidelines referenced in EPA Method 5 – MATS Modified. All calibration data for Methods 1-5 is in Appendix D.

3.4.3 *Data Reduction*

The filterable PM emissions data collected during the testing were calculated and reported as mg/acm.

4.0 OPERATING PARAMETERS

The test program included the collection of PM CEMs emission data and Load during each PM emissions test. Data collected during the testing is presented in Appendix E.

5.0 DISCUSSION OF RESULTS

Table 1 presents the Reference Method particulate emission testing results (RM PM), raw particulate matter continuous emissions monitoring system (PM CEMS) results, unit load, and PM range designation for each test. A total of 18 test runs were conducted during the test. Two of the tests were eliminated due to poor correlation. The remaining 16 tests were used to determine the best model for the PM CEMS Unit. The Linear Model was determined to be best.

Table 2 presents a graph which shows the correlation curve from the PS-11 testing.

6.0 CERTIFICATION STATEMENT

"I certify that I believe the information provided in this document is true, accurate, and complete. Results of testing are based on the good faith application of sound professional judgment, using techniques, factors, or standards approved by the Local, State, or Federal Governing body, or generally accepted in the trade."

_____

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RESULTS TABLES

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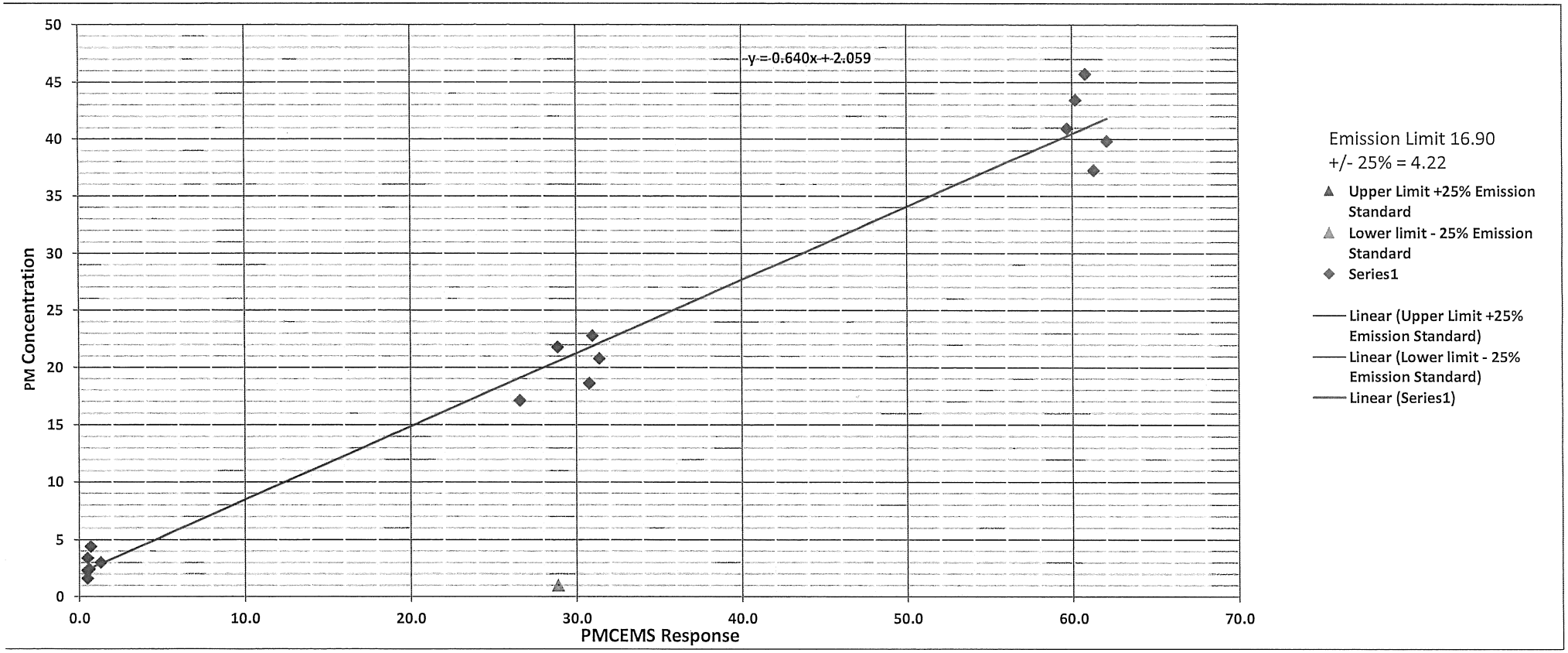
TABLE NO. 1
PS-11 TEST RESULTS
PARTICULATE MATTER CONTINUOUS EMISSIONS MONITORING SYSTEM
River Rouge Power Plant - EUBOILER#3 Stack
August 14-16, 2019

Test ID	Date (2019)	Test Time DAHS (24 hour)	Unit Load (GMW)	PM CEMS (mg/acm)[1]	PM RM (mg/acm)[1]	PM Load Range
PM-1	14-Aug	6:26- 7:38	189	12.9	25.1	Mid
PM-2	14-Aug	8:20-9:30	213	29.0	21.8	Mid
PM-3	14-Aug	11:06-13-11	217	26.6	17.1	Mid
PM-4	14-Aug	13:43-14:53	267	30.7	18.6	Mid
PM-5	14-Aug	15:18-16:31	268	34.0	22.8	Mid
PM-6	14-Aug	17:00-18:10	267	31.4	20.8	Mid
PM-7	15-Aug	8:13-9:28	215	55.9	39.8	High
PM-8	15-Aug	9:52-11:07	215	59.9	26.9	High
PM-9	15-Aug	11:37-12:48	215	59.7	40.9	High
PM-10	15-Aug	15:15-14:23	215	60.9	45.7	High
PM-11	15-Aug	14:50-15:55	215	60.2	43.4	High
PM-12	15-Aug	16:30-17:38	216	1.3	3.0	Low
PM-13	15-Aug	18:10-19:20	216	0.7	4.5	Low
PM-14	16-Aug	7:05-8:13	214	61.3	37.2	High
PM-15	16-Aug	8:43-9:53	215	0.6	2.4	Low
PM-16	16-Aug	10:26-11:35	216	0.5	1.6	Low
PM-17	16-Aug	12:05-13:14	216	0.5	2.3	Low
PM-18	16-Aug	13:38-14:48	216	0.5	3.4	Low

[1] milligrams per actual cubic meter

= Data Not Included in the RCA correlation graph

TABLE NO. 2
PS-11 SUMMARY GRAPH
River Rouge Power Plant - EUBOILER#3
August 14-16, 2019



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FIGURES

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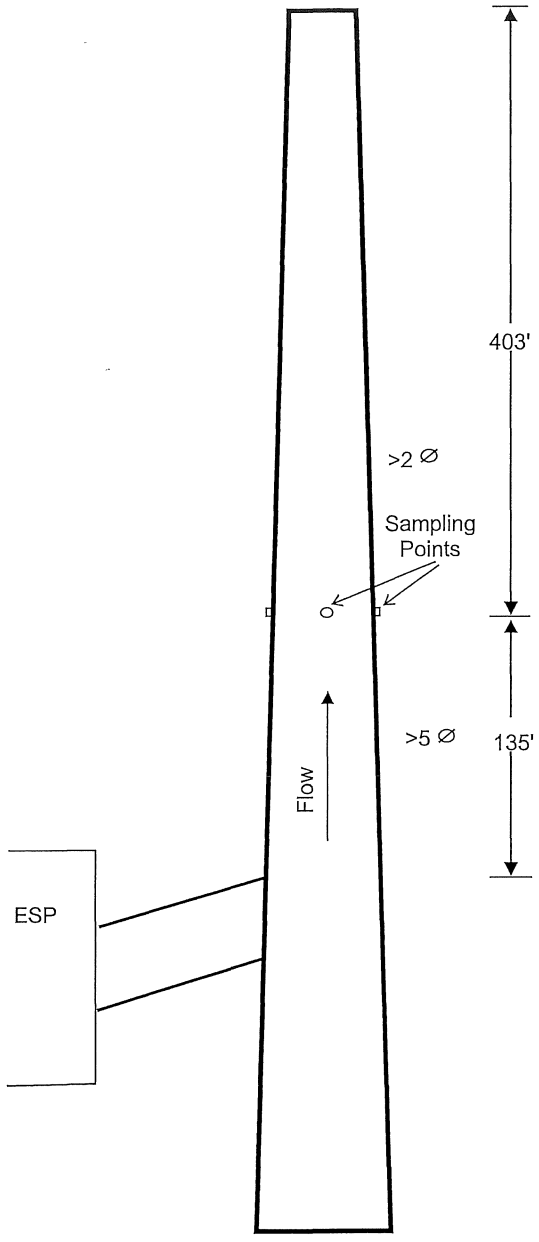
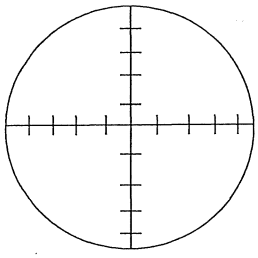
Figure 1 - Sampling Location
River Rouge Power Plant - EUBOILER#3



Stack Diameter 282"



Velocity Measurement Points

Points	Distance From Inner Wall
1	5.92
2	18.89
3	33.28
4	49.91
5	70.50
6	100.39

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Figure 2 - EPA Method 3A
River Rouge Power Plant - EUBOILER#3

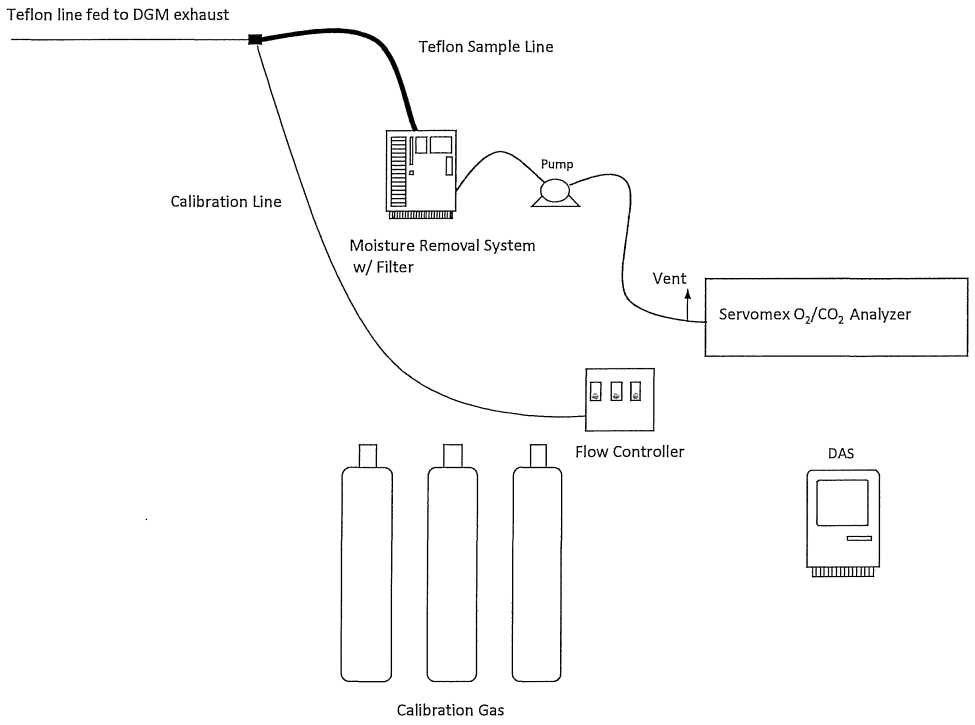

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Figure 3 - EPA Method 5B
River Rouge Power Plant - EUBOILER#3