FINAL REPORT

FCA US LLC

STERLING HEIGHTS, MICHIGAN

STERLING HEIGHTS ASSEMBLY PLANT: EUBOILER1, EUBOILER2, AND EUBOILER3 FINAL REPORT

RWDI #2301817

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SUBMITTED TO

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EXECUTIVE SUMMARY

RWDI USA LLC (RWDI) was retained by FCA US LLC (FCA) to complete the emission sampling program at their Sterling Heights Assembly Plant (SHAP) located at 38111 Van Dyke, Sterling Heights, Michigan. SHAP operates an automobile assembly plant that produces Ram trucks. Under Flexible Group FG-Facility-North three (3) boilers are fired by natural gas in order to provide heat and steam to SHAP.

Executive Table i: Emission Data EUBOILER1

Parameter	Emission Rate	
	lb/hr	lb/MMBTU
PM	0.29	0.0062
PM_{10}	0.23	0.0050
$PM_{2.5}$	0.20	0.0043
NO_X	4.6	0.085

Executive Table ii: Emission Data EUBOILER2

Parameter	Emission Rate	
	lb/hr	lb/MMBTU
PM	0.22	0.0044
PM_{10}	0.19	0.0038
$PM_{2.5}$	0.18	0.0035
NO_X	2.4	0.046

Executive Table iii: Average – Emission Data EUBOILER3

Parameter	Average Emission Rate	
	lb/hr	lb/MMBTU
PM	0.24	0.0051
PM_{10}	0.22	0.0047
$PM_{2.5}$	0.19	0.0041
NO_X	2.6	0.055

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1 INTRODUCTION

RWDI USA LLC (RWDI) was retained by FCA US LLC (FCA) to complete the emission sampling program at their Sterling Heights Assembly Plant (SHAP) located at 38111 Van Dyke, Sterling Heights, Michigan. SHAP operates an automobile assembly plant that produces Ram trucks. Under Flexible Group FG-Facility-Norththree (3) boilers (EUBOILER1, EUBOILER2 and EUBOILER3) are fired by natural gas in order to provide heat and steam to SHAP.

The test program included measurements of Nitrogen Oxides (NO_x) and Particulate (PM, PM_{10} and $PM_{2.5}$) on three (3) Boilers (EU-BOILER1, EU-BOILER2 and EU-BOILER3). The testing was completed to fulfill the requirements from the Michigan Department of Environment, Great Lakes, and Energy (EGLE) under the Renewable Operating Permit (ROP) (Permit Number MI-ROP-B7248-2020a). Under the FG-Facility-North group, Condition V, testing is required to be tested every five (5) years.

RWDI also completed flue gas velocity measurements and moisture content measurements for each NO_x and Particulate Matter (PM_{10} and $PM_{2.5}$) test completed. RWDI utilized the methods outlined by the United States Environmental Protection Agency (U.S. EPA) Methods 1, 2, 3A, 4, 7E, 201A, and 202. For NO_x, three (3) 120-minute tests were completed on EU-BOILER3 and single 120-minute tests were completed on both EU-BOILER1 and EU-BOILER2. For Particulate Matter (PM, PM_{10} and $PM_{2.5}$), three (3) 120-minute test runs were completed on EU-BOILER3 and single 120-minute tests were completed on both EU-BOILER1 and EU-BOILER2. The NO_x and Particulate emission results are provided in pounds per hour (lb/hr) and pounds per million British Thermal Units per hour (lb/MMBTU/hr).

SHAP recorded and determined the total natural gas usage during each test, total steam load and percentage of capacity during each testing for each boiler.

1.1 Location and Date of Testing

The test program was completed January 17th and 18th, 2023 at the FCA Sterling Heights Assembly Plant (SHAP) located at 38111 Van Dyke, Sterling Heights, Michigan.

1.2 Purpose of Testing

Testing was completed to fulfill the requirements from the Michigan Department of Environment, Great Lakes, and Energy (EGLE) under Permit Number MI-ROP-B7248-2020a.

1.3 Description of Source

The sampling locations for EU-BOILER1, EU-BOILER2 and EU-BOILER3, under FG-Facility, are located outside on the roof of the Powerhouse. The rated capacity of each boiler is listed below.

- EU-BOILER1 – 85 MMBtu/hr
- EU-BOILER2 – 118 MMBtu/hr
- EU-BOILER3 – 118 MMBtu/hr

1.4 Applicable Permit

MI-ROP-B7248-2020a.

1.5 Personnel Involved in Testing

Table 1.5: Testing Personnel

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Adekunle Sanni Environmental Specialist	**FCA – Sterling Heights Assembly Plant** 3811 VanDyke Ave Sterling Heights, MI 48312	(586) 208-4483
Brad Bergeron Senior Project Manager	**RWDI USA LLC** 2239 Star Court Rochester Hills, MI 48309	(519) 817-9888
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2 SUMMARY OF RESULTS

2.1 Operating Data

FCA personnel was in contact with RWDI during testing to coordinate start and stop times for each test and to ensure the boilers were operating normally and within. During each test, the following process data was collected:

- Natural Gas Usage (ft^3/hr)
- Steam Load (lb/hr)
- Gross Calorie Value (BTU/scf)

The process data can be found in **Appendix D**.

Table 2.1.1: Summary of Process Data

Source	Test	Natural Gas Usage (scf)	Boiler Operation (MMBTU)	Steam Load (lb/hr)
EUBOIER1	1	43,902	46.05	40,488
EUBOILER2	1	47,805	50.15	40,488
EUBOILER3	1	42,537	44.62	37,612
	2	44,328	46.86	39,851
	3	44,776	46.97	40,299

2.2 Applicable Permit Number

Testing was completed to show compliance with MI-ROP-B7248-2020b.

3 SOURCE DESCRIPTION

3.1 Description of Process and Emission Control Equipment

SHAP operates an automotive assembly plant that produces Ram Trucks. Under Flexible Group FG-FACILITY three (3) boilers are fired by natural gas to provide heat and steam to the SHAP site. EU-BOILER1 has no air pollution control. EU-BOILER2 and EU-BOILER3 are each equipped with low NOx burner technology.

3.2 Process Flow Sheet or Diagram (if applicable)

Process flow diagram is available upon request.

3.3 Type and Quantity of Raw and Finished Materials

EUBOILER1, EUBOILER2, and EUBOILER3 are three (3) natural gas boilers.

3.4 Normal Rated Capacity of Process

- EU-BOILER1 – 85 MMBtu/hr
- EU-BOILER2 – 118 MMBtu/hr
- EU-BOILER3 – 118 MMBtu/hr

3.5 Process Instrumentation Monitored During the Test

There is no instrumentation monitoring the boiler emissions.

4 SAMPLING LOCATIONS

4.1 Process Sampling Locations

Table 4.1.1: Summary of Exhaust Parameters

Source	Diameter	Approximate Duct Diameters from Flow Disturbance	Number of Ports	Points per Traverse	Total Points per Test
EUBOILER1	62"	5.8 downstream and 2.0 upstream	2	6 – PM 6 – NOx and O_2	12 - PM 12 – NOx and O_2
EUBOILER2	62"	5.8 downstream and 2 upstream	2	6 – PM 6 – NOx and O_2	12 – PM 12 – NOx and O_2
EUBOILER3	62"	5.8 downstream and 2 upstream	2	6 - PM 6 – NOx and O_2	12 – PM 12 – NOx and O_2

A 12-point stratification check was conducted during the first test on each source. It was concluded that none of the three (3) boilers were stratified. On the subsequent two (2) tests on EU-BOILER3 the US EPA Method 7E sample was collected from a single point. The stratification checks on EU-BOILER1 and EU-BOILER2 were conducted during the one and only US EPA Method 7E test conducted on each source.

5 SAMPLING AND ANALYTICAL PROCEDURES

5.1 Description of Sampling Train and Field Procedures

The emission test program was completed based on the following test methods codified at Title 40, Part 60, Appendix A of the Code of Federal Regulations (40 CFR 60, Appendix A)

- Method 1 – Sample and Velocity Traverses for Stationary Sources
- Method 2 – Determination of Stack Gas Velocity and Volumetric Flowrate
- Method 3A – Determination of Molecular Weight of Dry Stack Gases (Instrument)
- Method 4 – Determination of Moisture Content in Stack Gases
- Method 7E – Determination of Nitrogen Oxides in Stack Gases
- Method 201A – Determination of PM2.5 and PM10 from Stationary Sources
- Method 202 – Determination of Condensable Particulate Matter from Stationary Sources

5.1.1 Stack Velocity, Temperature, and Volumetric Flow Rate

The exhaust velocities and flow rates were determined following the US EPA Method 2, "Determination of Stack Gas Velocity and Flow Rate (Type S Pitot Tube)". Velocity measurements were taken with a pre-calibrated S-Type pitot tube and incline manometer. Volumetric flow rates were determined following the equal area method as outlined in US EPA Method 2. Temperature measurements were made simultaneously with the velocity measurements and were conducted using a chromel-alumel type "k" thermocouple in conjunction with a digital temperature indicator.

The dry molecular weight of the stack gas was determined following calculations outlined in US EPA Method 3A, "Determination of Molecular Weight of Dry Stack Gas". Stack moisture content were determined through direct condensation and according to US EPA Method 4, "Determination of Moisture Content of Stack Gas". Moisture was collected in the 201A/202 sampling train.

5.1.2 Nitrogen Oxides, Carbon Dioxide, and Oxygen

Nitrogen oxides, carbon dioxide, and oxygen concentrations were determined utilizing RWDI's continuous emissions monitoring (CEM) system.

Prior to testing, a 3-point analyzer calibration error check were conducted using USEPA protocol gases. The calibration error check was performed by introducing zero, mid and high-level calibration gases directly into the analyzer. The calibration error check was performed to confirm that the analyzer response is within ±2% of the certified calibration gas introduced. Prior to each test run, a system-bias test was performed where known concentrations of calibration gases were introduced at the probe tip to measure if the analyzers response were within ±5% of the introduced calibration gas concentrations. At the conclusion of each test run a system-bias check were performed to evaluate the percent drift from pre and post-test system bias checks. The system bias checks were used to confirm that the analyzer did not drift greater than ±3% throughout a test run.

Zero and upscale calibration checks were conducted both before and after each test run in order to quantify measurement system calibration drift and sampling system bias. Upscale is either the mid- or high-range gas, whichever most closely approximates the flue gas level. During these checks, the calibration gases were introduced into the sampling system at the probe outlet so that the calibration gases will be analyzed in the same manner as the flue gas samples.

A gas sample were continuously extracted from the stack and delivered to a series of gas analyzers, which measure the pollutant or diluent concentrations in the gas. The analyzers were calibrated on-site using EPA Protocol No. 1 certified calibration mixtures. The probe tip was equipped with a sintered stainless-steel filter for particulate removal. The end of the probe was connected to a heated Teflon sample line, which were deliver the sample gases from the stack to the CEM system. The heated sample line was designed to maintain the gas temperature above 250°F in order to prevent condensation of stack gas moisture within the line.

Before entering the analyzers, the gas sample was pass directly into a refrigerated condenser, which cools the gas to approximately 35°F to remove the stack gas moisture. After passing through the condenser, the dry gas entered a Teflon-head diaphragm pump and a flow control panel, which delivered the gas in series to the analyzers. Each of these analyzers were measure the respective gas concentrations on a dry volumetric basis.

A stratification check was completed on each boiler exhaust.

5.1.3 Gas Dilution System

Calibration gases were mixed using an Environics 4040 Gas Dilution System. The mass flow controllers are factory calibrated using a primary flow standard traceable to the United States National Institute of Standards and Technology (NIST). Each flow controller utilizes an 11-point calibration table with linear interpolation, to increase accuracy and reduce flow controller nonlinearity.

The calibration is done yearly, and the records are included in the Source Testing Report. A multi-point EPA Method 205 check were executed in the field prior to testing to ensure accurate gas-mixtures. The gas dilution system consisting of calibrated orifices or mass flow controllers and dilutes a high-level calibration gas to within ±2% of predicted values. The gas divider is capable of diluting gases at set increments and will be evaluated for accuracy in the field in accordance with US EPA Method 205 "*Verification of Gas Dilution Systems for Field Instrument Calibrations*". The gas divider dilutions were measured to evaluate that the responses are within ±2% of predicted values. In addition, a certified mid-level calibration gas within ±10% of one of the tested dilution gases were introduced into an analyzer to ensure the response of the gas calibration is within ±2% of gas divider dilution concentration.

5.1.4 PM/PM_{10}/$PM_{2.5}$ and Condensable Particulate Matter

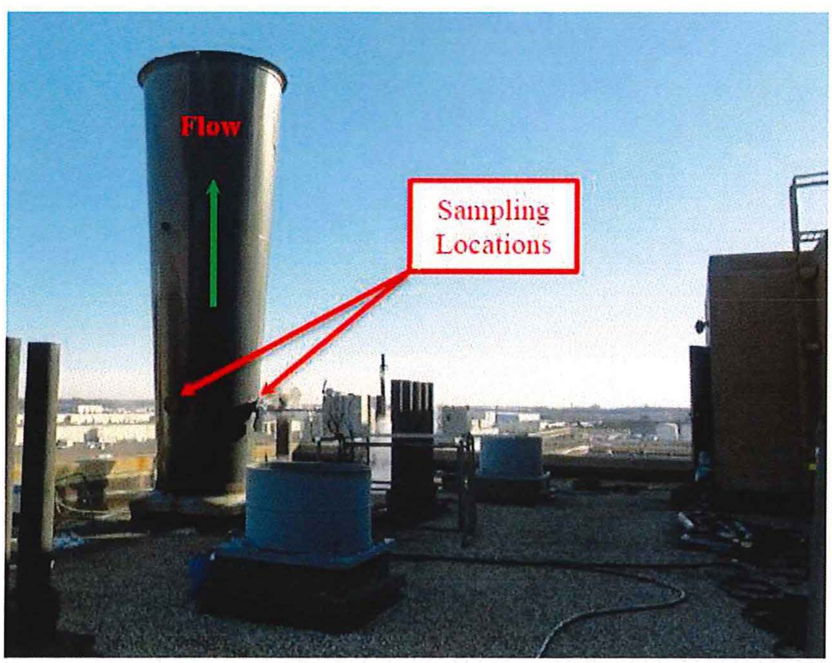
Particulate matter (PM/PM_{10}/$PM_{2.5}$) were sample following procedures outlined in U.S. EPA Method 201a and Method 202 (Condensable Particulate Matter).

5.2 Description of Recovery and Analytical Procedures

The particulate matter samples were all recovered in accordance with US EPA Methods 201A and 202.

5.3 Sampling Port Description

The stacks for all three boilers are located in a row on the roof of the Powerhouse. All three stacks were identical in their construction. A picture of the sampling setup on EU-BOILER1 is below and is representative of the sampling setup on the other two boiler stacks.



6 TEST RESULTS AND DISCUSSION

6.1 Data Analysis

Table 6.1.1: EU-BOILER1 – Emission Data – PM, PM_{10}, $PM_{2.5}$ and NO_X

Parameter	Emission Rate	
	lb/hr	lb/MMBtu
PM	0.29	0.0062
PM_{10}	0.23	0.0050
$PM_{2.5}$	0.20	0.0043
NO_X	4.6	0.085

Table 6.1.2: EU-BOILER2 - Emission Data – PM, PM_{10}, $PM_{2.5}$ and NO_X

Parameter	Emission Rate	
	lb/hr	lb/MMBtu
PM	0.22	0.0044
PM_{10}	0.19	0.0038
$PM_{2.5}$	0.18	0.0035
NO_X	2.4	0.046

Table 6.1.3: EU-Boiler 3 - Emission Data – PM, PM_{10}, $PM_{2.5}$ and NO_X

Parameter	Emission Rate (lb/hr) / lb/MMBTU			
	Run 1	Run 2	Run 3	Average
PM	0.16 lb/hr 0.0037 lb/MMBTU	0.29 lb/hr 0.0062 lb/MMBTU	0.25 lb/hr 0.0054 lb/MMBTU	0.24 lb/hr 0.0051 lb/MMBTU
PM_{10}	0.14 lb/hr 0.0031 lb/MMBTU	0.27 lb/hr 0.0058 lb/MMBTU	0.24 lb/hr 0.0051 lb/MMBTU	0.22 lb/hr 0.0047 lb/MMBTU
$PM_{2.5}$	0.12 lb/hr 0.0027 lb/MMBTU	0.26 lb/hr 0.0055 lb/MMBTU	0.19 lb/hr 0.0041 lb/MMBTU	0.19 lb/hr 0.0041 lb./MMBTU
NO_X	2.5 lb/hr 0.055 lb/MMBTU	2.6 lb/hr 0.054 lb/MMBTU	2.6 lb/hr 0.055 lb/MMBTU	2.6 lb/hr 0.055 lb/MMBTU

6.1 Discussion of Results

Testing was successfully completed during the week of January 16, 2023. The detailed results can be found in **Appendices B and C.**

6.2 Calibration Sheets

Calibration sheets can be found in **Appendix E**.

6.3 Sample Calculations

Sample calculations can be found in **Appendix F**.

6.4 Field Data Sheets

Field data sheets can be found in **Appendix G**.

6.5 Laboratory Data

Laboratory data can be found in **Appendix H**.