FINAL REPORT

FCA US LLC

TRENTON, MICHIGAN

TRENTON ENGINE COMPLEX: TESTING REPORT

RWDI #2201110

March 8, 2023

SUBMITTED TO

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EXECUTIVE SUMMARY

RWDI USA LLC (RWDI) was retained by FCA US LLC (FCA) to complete an air sampling program to evaluate the Carbon Monoxide (CO) and Nitrogen Oxides (NO_x) concentrations and emission rates on two (2) boilers identified as EU-BOILER1 and EU-BOILER5 under FG-BLR1&BLR5 from Renewable Operating Permit MI-ROP-B3350-2022 issued by the State of Michigan Department of Environment, Great Lakes, and Energy (EGLE) to the Trenton Engine Complex (TEC) located at 2300 Van Horn Road, Trenton, Michigan. The testing followed United states Environmental Protection Agency (USEPA) Test Methods 1,2,3,4,3A,7E and 10.

Testing consisted of three (3) 60-minute test runs for nitrogen oxide and carbon monoxide emissions. In addition, Oxygen, Carbon Dioxide, Stack Gas Velocity, and Flow Rate were measured to determine stack gas composition and emission rates. The Intent-To-Test Plan (ITTP) was submitted to EGLE on November 29th, 2022 and a correspondence document was issued by EGLE on January 6th, 2023. The ITTP and EGLE correspondence document can be found in **Appendix A** of this report.

The sampling was conducted on January 18th, 2023 for both EU-BOILER1 and EU-BOILER5. Sampling was witnessed by EGLE representatives. All parameters were tested in accordance with USEPA referenced methodologies. Results of the sampling program are outlined in the table below. Results of individual tests are presented in the Appendices.

Table i: EU-BOILER1 Nitrogen Oxides and Carbon Monoxide Results

Parameter	Run 1		Run 2		Run 3		Average	
	lb/MMBtu	lb/hr	lb/MMBtu	lb/hr	lb/MMBtu	lb/hr	lb/MMBtu	lb/hr
Nitrogen Oxides	0.10	6.8	0.10	6.4	0.10	6.0	0.10	6.4
	0.10 ROP Limit	--	0.10 ROP Limit	--	0.10 ROP Limit	--	0.10 ROP Limit	--
Carbon Monoxide	2.63E-04	0.010	<1.46E-04	<0.006	<1.38E-04	<0.005	<1.82E-04	<0.007
	0.084 ROP Limit	--	0.084 ROP Limit	--	0.084 ROP Limit	--	0.084 ROP Limit	--

Notes: lb/MMBtu – pounds per million British Thermal Units
lb/hr – pounds per hour

Table ii: EU-BOILER5 Nitrogen Oxides and Carbon Monoxide Results

Parameter	Run 1		Run 2		Run 3		Average	
	lb/MMBtu	lb/hr	lb/MMBtu	lb/hr	lb/MMBtu	lb/hr	lb/MMBtu	lb/hr
Nitrogen Oxides	0.11	8.9	0.11	9.2	0.11	10.2	0.11	9.4
	0.28 ROP Limit	--	0.28 ROP Limit	--	0.28 ROP Limit	--	0.28 ROP Limit	--
Carbon Monoxide	0.0119	1.05	0.0109	1.08	0.0076	0.71	0.0101	0.95
	0.084 ROP Limit	--	0.084 ROP Limit	--	0.084 ROP Limit	--	0.084 ROP Limit	--

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1 INTRODUCTION

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The sampling was conducted on January 18th, 2023 for both EU-BOILER1 and EU-BOILER5. Sampling was witnessed by EGLE representatives. All parameters were tested in accordance with USEPA referenced methodologies.

1.1 Location and Dates of Testing

The test program was completed January 18, 2023 at the FCA Trenton Engine Complex located at 2300 Van Horn Road, Trenton, Michigan.

1.2 Purpose of Testing

The testing was conducted to fulfill the requirements of Michigan Department of Environment, Great Lakes, and Energy (EGLE) MI-ROP-B3350-2022, Condition FG-BLR1&BLR5, V.2.

1.3 Personnel Involved in Testing

Table 1: Testing Personnel

Personnel (Title & Email)	Affiliation	Phone Number
Tom Caltrider Corporate Environmental Programs Thomas.Caltrider@stellantis.com	**FCA US, LLC**	(248) 882-7169
Michael Spacil Environmental Specialist Michael.Spacil@stellantis.com	**FCA US, LLC**	(248) 909-7668
Brad Bergeron Senior Project Manager Brad.Bergeron@rwdi.com	**RWDI USA LLC** 2239 Star Court Rochester Hills, MI 48309	(248) 234-3885
David Trahan Senior Field Technician Dave.Trahan@rwdi.com	**RWDI USA LLC** 2239 Star Court Rochester Hills, MI 48309	(586) 292-8119
Andrew Riley Environment Quality Analyst RileyA8@michigan.gov	**EGLE** Warren District Office	(586) 565-7379

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. The process data can be found in **Appendix G**. During each test, the following process data was collected by FCA personnel:

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

Table 2: Summary of Process Data

Source	Test	Natural Gas Usage (ft^3/hr)	Steam Load (lb/hr)	Gross Calorie Value (BTU/scf)
EUBOILER1	1	35,570	37,935	1049
	2	37,190	39,663	1049
	3	36,590	39,023	1049
EUBOILERS5	1	83,970	50,713	1049
	2	94,030	56,788	1049
	3	89,623	54,127	1049

2.2 Applicable Permit Number

Testing was completed to show compliance with MI-ROP-B3350-2022.

3 SOURCE DESCRIPTION

3.1 Description of Process and Emission Control Equipment

TEC operates an engine manufacturing plant that produces six-cylinder engines for Chrysler, Dodge and Jeep vehicles. Under Flexible Group FG-BLR1&BLR5 two (2) boilers are fired by natural gas to provide heat and steam to the TEC site. There are no controls associated with these boilers.

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 and EUBOILER5 are two natural gas boilers.

3.4 Normal Rated Capacity of Process

EUBOILER1 and EUBOILER5 have a rated capacity of 60 MMBTU/hr and 180 MMBTU/hr, respectively.

3.5 Process Instrumentation Monitored During the Test

There is no instrumentation monitoring the boiler emissions.

4 SAMPLING AND ANALYTICAL PROCEDURES

4.1 Description of Sampling Train and Field Procedures

4.1.1 Stack Velocity, Temperature, and Volumetric Flow Rate Determination

The exhaust velocities and flow rates were determined following U.S. EPA Method 2, "Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)". Velocity measurements were taken with a pre-calibrated S-Type pitot tube and incline manometer or digital manometer. Volumetric flow rates were determined following the equal area method as outlined in U.S. 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 calibrated digital temperature indicator.

The dry molecular weight of the stack gas was determined following calculations outlined in U.S. EPA Method 3A, "Gas Analysis for the Determination of Dry Molecular Weight".

Stack moisture content was determined through direct condensation and according to U.S. EPA Method 4, "Determination of Moisture Content of Stack Gases". A schematic Methods 1 to 4 is provided in the **Figure Tab**. A 30-minute moisture test was conducted for every test.

4.1.2 Sampling for Carbon Monoxide (CO), Nitrogen Oxide (NO_x), Oxygen (O_2) and Carbon Dioxide (CO_2)

NO_x, CO_2, O_2, and CO concentrations were determined utilizing RWDI's continuous emissions monitoring (CEM) system. Prior to testing, a 3-point analyzer calibration error check was 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 was within ±5% of the introduced calibration gas concentrations. At the conclusion of each test run a system-bias check was 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 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 were analyzed in the same manner as the flue gas samples.

A gas sample was 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 delivered the sample gases from the stack to the CEM system. The heated sample line was designed to maintain the gas temperature above 250°F to prevent condensation of stack gas moisture within the line.

Before entering the analyzers, the gas sample passed 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 measured the respective gas concentrations on a dry volumetric basis.

4.1.3 USEPA Method 205 – Dilution System

Calibration gas was 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 was 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 was 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 was 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 was introduced into an analyzer to ensure the response of the gas calibration is within ±2% of gas divider dilution concentration.

4.1.4 Nitrogen Oxides Emission Rate Calculation (US EPA Methods 19)

USEPA Method 19, "Determination of Sulfur Dioxide Removal Efficiency and Particulate Matter, Sulfur Dioxide and Nitrogen Oxide Emission Rates," was used to calculate a NO_x emission factor based on Oxygen concentrations and appropriate F-factors. Equation 19-1 from the method was used. Table 19-1 was used to determine the conversion factor for concentration (1.194×10^{-7}) was used for NO_x. Table 19-2 was used for the F-Factor (natural gas 8,710 dscf/10^6 BTU).

$$E = (1.194 \times 10^{-7}) \times C_d \times F_d \times ((20.9/(20.9-\%O_{2d}))$$

Where:

E = Pollutant Emission Rate (lb./10^6 BTU)
C_d = Pollutant Concentration, Dry Basis (ppm)
F_d = Fuel Factor, Dry Basis (dscf/10^6 BTU)
$\%O_{2d}$ = Oxygen Concentration, Dry Basis (%)

4.2 Description of Recovery and Analytical Procedures

There were no samples to recover during this test program. All testing used real time data from the analyzers.

4.3 Sampling Port Description

Stack figures can be found in the **Figures Tab**.

5 TEST RESULTS AND DISCUSSION

5.1 Detailed Results

The following table give a summary of the test results. A more detailed breakdown of each test and be found in **Appendix B**.

Table 3: EU-BOILER1 Nitrogen Oxides and Carbon Monoxide Results

Parameter	Run 1		Run 2		Run 3		Average	
	lb/MMBtu	lb/hr	lb/MMBtu	lb/hr	lb/MMBtu	lb/hr	lb/MMBtu	lb/hr
Nitrogen Oxides	0.10	6.8	0.10	6.4	0.10	6.0	0.10	6.4
	0.10 ROP Limit	--	0.10 ROP Limit	--	0.10 ROP Limit	--	0.10 ROP Limit	--
Carbon Monoxide	2.63E-04	0.010	<1.46E-04	<0.006	<1.38E-04	<0.005	<1.82E-04	<0.007
	0.084 ROP Limit	--	0.084 ROP Limit	--	0.084 ROP Limit	--	0.084 ROP Limit	--

Notes: lb/MMBtu – pounds per million British Thermal Units
lb/hr – pounds per hour

Table 4: EU-BOILER5 Nitrogen Oxides and Carbon Monoxide Results

Parameter	Run 1		Run 2		Run 3		Average	
	lb/MMBtu	lb/hr	lb/MMBtu	lb/hr	lb/MMBtu	lb/hr	lb/MMBtu	lb/hr
Nitrogen Oxides	0.11	8.9	0.11	9.2	0.11	10.2	0.11	9.4
	0.28 ROP Limit	--	0.28 ROP Limit	--	0.28 ROP Limit	--	0.28 ROP Limit	--
Carbon Monoxide	0.0119	1.05	0.0109	1.08	0.0076	0.71	0.0101	0.95
	0.084 ROP Limit	--	0.084 ROP Limit	--	0.084 ROP Limit	--	0.084 ROP Limit	--

Notes: lb/MMBtu – pounds per million British Thermal Units
lb/hr – pounds per hour

5.2 Discussion of Results

EUBOILER1 and EUBOILER5 were within the permitted limits. Detailed CEMS spreadsheets can be found in **Appendix B** and the flowrate spreadsheets can be found in **Appendix C**.

5.3 Variations in Testing Procedures

The testing program followed the test plan provided in **Appendix A**.

5.4 Process Upset Conditions During Testing

There was no process upset conditions during testing.

5.5 Maintenance Performed in Last Three Months

Only routine maintenance has been performed.

5.6 Re-Test

This was not a retest.

5.7 Audit Samples

This test did not require any audit samples.

5.8 Field Data Sheets

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

5.9 Calibration Sheets

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

5.10 Sample Calculations

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

5.11 Laboratory Data

There was no laboratory data from this testing program.

TABLES

Table 5: Summary of Sampling Parameters and Methodology

Source Location	No. of Tests per Stack	Sampling Parameter	Sampling Method
EUBOILER1, EUBOILER5	3	Velocity, Temperature and Flow Rate	U.S. EPA [1] Methods 1-4
	3	Oxygen, Carbon Dioxide	U.S. EPA [1] Method 3A
	3	Nitrogen Oxides	U.S. EPA [1] Method 7E
	3	Carbon Monoxide	U.S. EPA [1] Method 10

Notes:

[1] U.S. EPA - United States Environmental Protection Agency

Table 6: Sampling Time Summary

Source and Test #	Sampling Date	Start Time	End Time
EUBOILER1			
Test #1	18-Jan-23	7:54 AM	8:53 AM
Test #2	18-Jan-23	9:14 AM	10:13 AM
Test #3	18-Jan-23	10:33 AM	11:32 AM
EUBOILER5			
Test #1	18-Jan-23	12:43 PM	1:42 PM
Test #2	18-Jan-23	2:01 PM	3:00 PM
Test #3	18-Jan-23	3:22 PM	4:21 PM

Table 7A: Sampling Summary - Flow Characteristics
EUBOILER1

Stack Gas Parameter		Test No. 1	Test No. 2	Test No. 3	Average
Testing Date		18-Jan-23	18-Jan-23	18-Jan-23	-
Stack Temperature	°F	380	433	410	408
	°C	193	223	210	209
Moisture	%	12.1%	12.9%	14.3%	13.1%
Velocity	ft/s	18.2	18.5	17.0	17.9
	m/s	5.6	5.7	5.2	5.5
Actual Flow Rate	CFM	26,015	26,431	24,188	25,545
Referenced Flow Rate[3]	CFM	14,062	13,324	12,318	13,235
	m^3/s	6.64	6.29	5.81	6.25

Notes:

[1] Referenced flow rate expressed as dry at 101.3 kPa, 68 °F, and Actual Oxygen

Table 7B: Sampling Summary - Flow Characteristics
EUBOILER5

Stack Gas Parameter		Test No. 1	Test No. 2	Test No. 3	Average
Testing Date		18-Jan-23	18-Jan-23	18-Jan-23	-
Stack Temperature	°F	237	240	252	243
	°C	114	116	122	117
Moisture	%	10.5%	13.7%	12.7%	12.3%
Velocity	ft/s	18.3	17.9	19.7	18.6
	m/s	5.6	5.5	6.0	5.7
Actual Flow Rate	CFM	31,103	30,408	33,397	31,636
Referenced Flow Rate[3]	CFM	20,626	19,371	21,162	20,386
	m^3/s	9.74	9.14	9.99	9.62

Notes:

[1] Referenced flow rate expressed as dry at 101.3 kPa, 68 °F, and Actual Oxygen

Table 8: Results Summary

Source	Test No.	NO_x			CO		
		lb/hr	lb/MMBTU	ROP Limit lb/MMBTU	lb/hr	lb/MMBTU	ROP Limit lb/MMBTU
EUBOILER1	1	6.8	0.10	0.10	0.010	2.63E-04	8.40E-02
	2	6.4	0.10	0.10	<0.006	<1.46E-04	8.40E-02
	3	6.0	0.10	0.10	<0.005	<1.38E-04	8.40E-02
	Average	**6.4**	**0.10**	--	**<0.007**	**<1.82E-04**	--
EUBOILER5	1	8.9	0.11	0.28	1.05	0.0119	0.0840
	2	9.2	0.11	0.28	1.08	0.0109	0.0840
	3	10.2	0.11	0.28	0.71	0.0076	0.0840
	Average	**9.4**	**0.11**	--	**0.95**	**0.0101**	--

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TRENTON, MICHIGAN

TRENTON ENGINE COMPLEX: TESTING REPORT

RWDI #2201110

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Table i: EU-BOILER1 Nitrogen Oxides and Carbon Monoxide Results

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	lb/MMBtu	lb/hr	lb/MMBtu	lb/hr	lb/MMBtu	lb/hr	lb/MMBtu	lb/hr
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Notes: lb/MMBtu – pounds per million British Thermal Units
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Table ii: EU-BOILER5 Nitrogen Oxides and Carbon Monoxide Results

Parameter	Run 1		Run 2		Run 3		Average	
	lb/MMBtu	lb/hr	lb/MMBtu	lb/hr	lb/MMBtu	lb/hr	lb/MMBtu	lb/hr
Nitrogen Oxides	0.11	8.9	0.11	9.2	0.11	10.2	0.11	9.4
	0.28 ROP Limit	--	0.28 ROP Limit	--	0.28 ROP Limit	--	0.28 ROP Limit	--
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Andrew Riley Environment Quality Analyst RileyA8@michigan.gov	**EGLE** Warren District Office	(586) 565-7379

2 SUMMARY OF RESULTS

2.1 Operating Data

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- Steam Load (lb/hr)
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	2	37,190	39,663	1049
	3	36,590	39,023	1049
EUBOILERS5	1	83,970	50,713	1049
	2	94,030	56,788	1049
	3	89,623	54,127	1049

2.2 Applicable Permit Number

Testing was completed to show compliance with MI-ROP-B3350-2022.

3 SOURCE DESCRIPTION

3.1 Description of Process and Emission Control Equipment

TEC operates an engine manufacturing plant that produces six-cylinder engines for Chrysler, Dodge and Jeep vehicles. Under Flexible Group FG-BLR1&BLR5 two (2) boilers are fired by natural gas to provide heat and steam to the TEC site. There are no controls associated with these boilers.

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 and EUBOILER5 are two natural gas boilers.

3.4 Normal Rated Capacity of Process

EUBOILER1 and EUBOILER5 have a rated capacity of 60 MMBTU/hr and 180 MMBTU/hr, respectively.

3.5 Process Instrumentation Monitored During the Test

There is no instrumentation monitoring the boiler emissions.

4 SAMPLING AND ANALYTICAL PROCEDURES

4.1 Description of Sampling Train and Field Procedures

4.1.1 Stack Velocity, Temperature, and Volumetric Flow Rate Determination

The exhaust velocities and flow rates were determined following U.S. EPA Method 2, "Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)". Velocity measurements were taken with a pre-calibrated S-Type pitot tube and incline manometer or digital manometer. Volumetric flow rates were determined following the equal area method as outlined in U.S. 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 calibrated digital temperature indicator.

The dry molecular weight of the stack gas was determined following calculations outlined in U.S. EPA Method 3A, "Gas Analysis for the Determination of Dry Molecular Weight".

Stack moisture content was determined through direct condensation and according to U.S. EPA Method 4, "Determination of Moisture Content of Stack Gases". A schematic Methods 1 to 4 is provided in the **Figure Tab**. A 30-minute moisture test was conducted for every test.

4.1.2 Sampling for Carbon Monoxide (CO), Nitrogen Oxide (NO_x), Oxygen (O_2) and Carbon Dioxide (CO_2)

NO_x, CO_2, O_2, and CO concentrations were determined utilizing RWDI's continuous emissions monitoring (CEM) system. Prior to testing, a 3-point analyzer calibration error check was 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 was within ±5% of the introduced calibration gas concentrations. At the conclusion of each test run a system-bias check was 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 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 were analyzed in the same manner as the flue gas samples.

A gas sample was 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 delivered the sample gases from the stack to the CEM system. The heated sample line was designed to maintain the gas temperature above 250°F to prevent condensation of stack gas moisture within the line.

Before entering the analyzers, the gas sample passed 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 measured the respective gas concentrations on a dry volumetric basis.

4.1.3 USEPA Method 205 – Dilution System

Calibration gas was 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 was 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 was 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 was 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 was introduced into an analyzer to ensure the response of the gas calibration is within ±2% of gas divider dilution concentration.

4.1.4 Nitrogen Oxides Emission Rate Calculation (US EPA Methods 19)

USEPA Method 19, "Determination of Sulfur Dioxide Removal Efficiency and Particulate Matter, Sulfur Dioxide and Nitrogen Oxide Emission Rates," was used to calculate a NO_x emission factor based on Oxygen concentrations and appropriate F-factors. Equation 19-1 from the method was used. Table 19-1 was used to determine the conversion factor for concentration (1.194×10^{-7}) was used for NO_x. Table 19-2 was used for the F-Factor (natural gas 8,710 dscf/10^6 BTU).

$$E = (1.194 \times 10^{-7}) \times C_d \times F_d \times ((20.9/(20.9-\%O_{2d}))$$

Where:

E = Pollutant Emission Rate (lb./10^6 BTU)
C_d = Pollutant Concentration, Dry Basis (ppm)
F_d = Fuel Factor, Dry Basis (dscf/10^6 BTU)
$\%O_{2d}$ = Oxygen Concentration, Dry Basis (%)

4.2 Description of Recovery and Analytical Procedures

There were no samples to recover during this test program. All testing used real time data from the analyzers.

4.3 Sampling Port Description

Stack figures can be found in the **Figures Tab**.

5 TEST RESULTS AND DISCUSSION

5.1 Detailed Results

The following table give a summary of the test results. A more detailed breakdown of each test and be found in **Appendix B**.

Table 3: EU-BOILER1 Nitrogen Oxides and Carbon Monoxide Results

Parameter	Run 1		Run 2		Run 3		Average	
	lb/MMBtu	lb/hr	lb/MMBtu	lb/hr	lb/MMBtu	lb/hr	lb/MMBtu	lb/hr
Nitrogen Oxides	0.10	6.8	0.10	6.4	0.10	6.0	0.10	6.4
	0.10 ROP Limit	--	0.10 ROP Limit	--	0.10 ROP Limit	--	0.10 ROP Limit	--
Carbon Monoxide	2.63E-04	0.010	<1.46E-04	<0.006	<1.38E-04	<0.005	<1.82E-04	<0.007
	0.084 ROP Limit	--	0.084 ROP Limit	--	0.084 ROP Limit	--	0.084 ROP Limit	--

Notes: lb/MMBtu – pounds per million British Thermal Units
lb/hr – pounds per hour

Table 4: EU-BOILER5 Nitrogen Oxides and Carbon Monoxide Results

Parameter	Run 1		Run 2		Run 3		Average	
	lb/MMBtu	lb/hr	lb/MMBtu	lb/hr	lb/MMBtu	lb/hr	lb/MMBtu	lb/hr
Nitrogen Oxides	0.11	8.9	0.11	9.2	0.11	10.2	0.11	9.4
	0.28 ROP Limit	--	0.28 ROP Limit	--	0.28 ROP Limit	--	0.28 ROP Limit	--
Carbon Monoxide	0.0119	1.05	0.0109	1.08	0.0076	0.71	0.0101	0.95
	0.084 ROP Limit	--	0.084 ROP Limit	--	0.084 ROP Limit	--	0.084 ROP Limit	--

Notes: lb/MMBtu – pounds per million British Thermal Units
lb/hr – pounds per hour

5.2 Discussion of Results

EUBOILER1 and EUBOILER5 were within the permitted limits. Detailed CEMS spreadsheets can be found in **Appendix B** and the flowrate spreadsheets can be found in **Appendix C**.

5.3 Variations in Testing Procedures

The testing program followed the test plan provided in **Appendix A**.

5.4 Process Upset Conditions During Testing

There was no process upset conditions during testing.

5.5 Maintenance Performed in Last Three Months

Only routine maintenance has been performed.

5.6 Re-Test

This was not a retest.

5.7 Audit Samples

This test did not require any audit samples.

5.8 Field Data Sheets

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

5.9 Calibration Sheets

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

5.10 Sample Calculations

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

5.11 Laboratory Data

There was no laboratory data from this testing program.

TABLES

Table 5: Summary of Sampling Parameters and Methodology

Source Location	No. of Tests per Stack	Sampling Parameter	Sampling Method
EUBOILER1, EUBOILER5	3	Velocity, Temperature and Flow Rate	U.S. EPA [1] Methods 1-4
	3	Oxygen, Carbon Dioxide	U.S. EPA [1] Method 3A
	3	Nitrogen Oxides	U.S. EPA [1] Method 7E
	3	Carbon Monoxide	U.S. EPA [1] Method 10

Notes:

[1] U.S. EPA - United States Environmental Protection Agency

Table 6: Sampling Time Summary

Source and Test #	Sampling Date	Start Time	End Time
EUBOILER1			
Test #1	18-Jan-23	7:54 AM	8:53 AM
Test #2	18-Jan-23	9:14 AM	10:13 AM
Test #3	18-Jan-23	10:33 AM	11:32 AM
EUBOILER5			
Test #1	18-Jan-23	12:43 PM	1:42 PM
Test #2	18-Jan-23	2:01 PM	3:00 PM
Test #3	18-Jan-23	3:22 PM	4:21 PM

Table 7A: Sampling Summary - Flow Characteristics
EUBOILER1

Stack Gas Parameter		Test No. 1	Test No. 2	Test No. 3	Average
	Testing Date	18-Jan-23	18-Jan-23	18-Jan-23	-
Stack Temperature	°F	380	433	410	408
	°C	193	223	210	209
Moisture	%	12.1%	12.9%	14.3%	13.1%
Velocity	ft/s	18.2	18.5	17.0	17.9
	m/s	5.6	5.7	5.2	5.5
Actual Flow Rate	CFM	26,015	26,431	24,188	25,545
Referenced Flow Rate[3]	CFM	14,062	13,324	12,318	13,235
	m^3/s	6.64	6.29	5.81	6.25

Notes:

[1] Referenced flow rate expressed as dry at 101.3 kPa, 68 °F, and Actual Oxygen

Table 7B: Sampling Summary - Flow Characteristics
EUBOILER5

Stack Gas Parameter		Test No. 1	Test No. 2	Test No. 3	Average
	Testing Date	18-Jan-23	18-Jan-23	18-Jan-23	-
Stack Temperature	°F	237	240	252	243
	°C	114	116	122	117
Moisture	%	10.5%	13.7%	12.7%	12.3%
Velocity	ft/s	18.3	17.9	19.7	18.6
	m/s	5.6	5.5	6.0	5.7
Actual Flow Rate	CFM	31,103	30,408	33,397	31,636
Referenced Flow Rate[3]	CFM	20,626	19,371	21,162	20,386
	m^3/s	9.74	9.14	9.99	9.62

Notes:

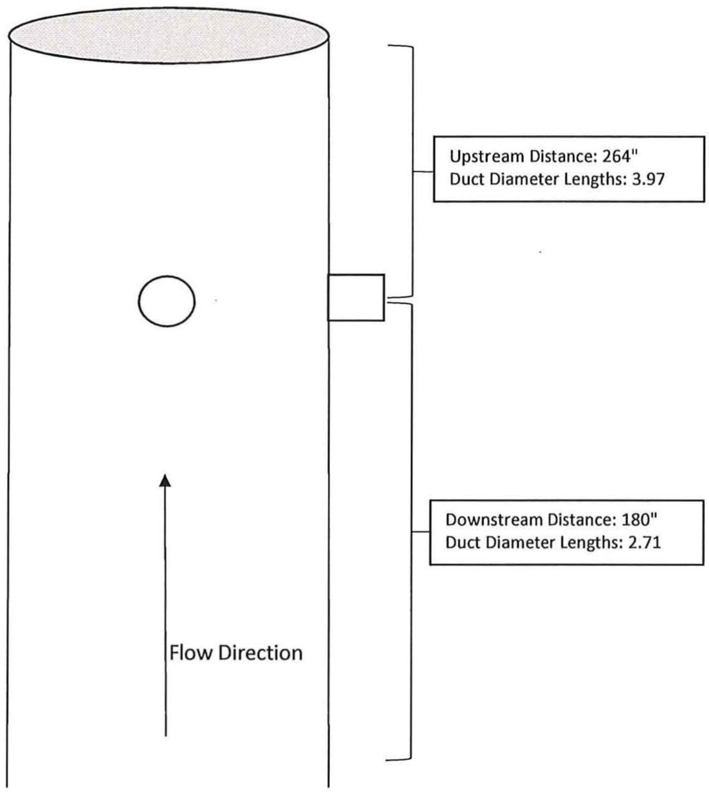
[1] Referenced flow rate expressed as dry at 101.3 kPa, 68 °F, and Actual Oxygen

Table 8: Results Summary

Source	Test No.	NO_x			CO		
		lb/hr	lb/MMBTU	ROP Limit lb/MMBTU	lb/hr	lb/MMBTU	ROP Limit lb/MMBTU
EUBOILER1	1	6.8	0.10	0.10	0.010	2.63E-04	8.40E-02
	2	6.4	0.10	0.10	<0.006	<1.46E-04	8.40E-02
	3	6.0	0.10	0.10	<0.005	<1.38E-04	8.40E-02
	Average	**6.4**	**0.10**	--	**<0.007**	**<1.82E-04**	--
EUBOILER5	1	8.9	0.11	0.28	1.05	0.0119	0.0840
	2	9.2	0.11	0.28	1.08	0.0109	0.0840
	3	10.2	0.11	0.28	0.71	0.0076	0.0840
	Average	**9.4**	**0.11**	--	**0.95**	**0.0101**	--

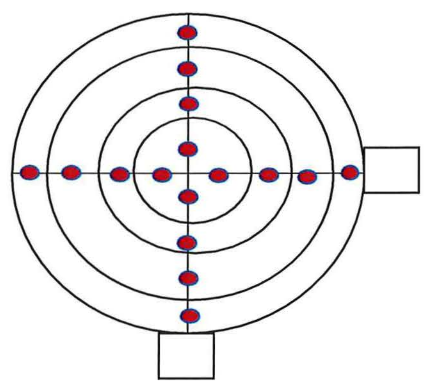
FIGURES

Figure No. 1: Schematic of Traverse Points - EUBOILER1



Diameter: 66

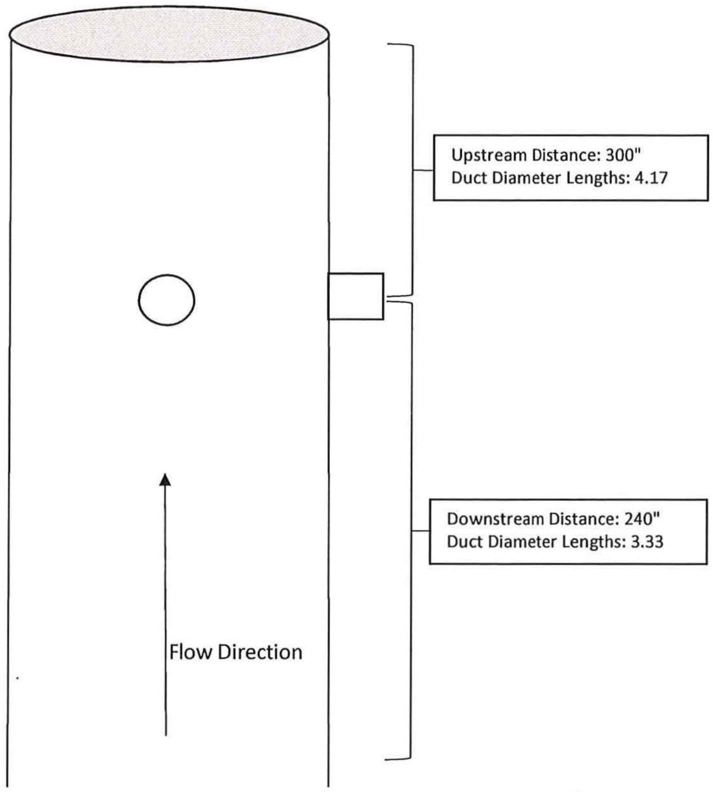
Sampling Points (in.)	
1	2.11
2	6.93
3	12.80
4	21.32
5	44.68
6	53.20
7	59.07
8	63.89



Not to Scale

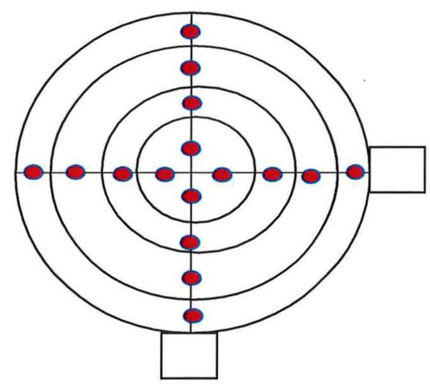
EUBOILER1	Date:	**RWDI USA LLC**
FCA US, LLC	January 18, 2023	2239 Star Court
Trenton Engine Plant		Rochester Hills, MI 48309
Trenton, Michigan		

Figure No. 2: Schematic of Traverse Points EUBOILER5



Diameter: 72

Sampling Points (in.)	
1	2.30
2	7.56
3	13.97
4	23.26
5	48.74
6	58.03
7	64.44
8	69.70



Not to Scale

EUBOILER5
FCA US, LLC
Trenton Engine Plant
Trenton, Michigan

Date:
January 18, 2023

RWDI USA LLC
2239 Star Court
Rochester Hills, MI 48309