FINAL REPORT

DEARBORN INDUSTRIAL GENERATION

DEARBORN, MICHIGAN

2023 RELATIVE ACCURACY TESTING AUDIT (RATA) SOURCE TESTING REPORT PART 60: EUBOILERS 1, 2, & 3 AND EUCTG TURBINES 1, 2, & 3

RWDI #2400110

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SUBMITTED TO

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EXECUTIVE SUMMARY

RWDI USA LLC (RWDI) was retained by Dearborn Industrial Generation (DIG) to complete the Relative Accuracy Testing Audit (RATA) emission sampling program at their facility located at 2400 Miller Road, Dearborn, Michigan. The test program was conducted to fulfill the requirements of the Michigan Department of Environment, Great Lakes and Energy (EGLE) Renewable Operating Permit (ROP) # MI-ROP-N6631-2012a to demonstrate compliance with 40 CFR 60, Appendices A, B & F. The testing program included EUBOILER1, 2 & 3 (noted as Boiler 1100 (EUBOILER1) Boiler 2100 (EUBOILER2) and Boiler 3100 (EUBOILER3) and EUCTG TURBINE 1, 2 & 3 (noted as Turbine 1100 (EUCTG TURBINE1), Turbine 2100 (EUCTG TURBINE2) and Turbine 3100 (EUCTG TURBINE3).

The following parameters were measured/calculated in the source testing program:

Boiler 1100, Boiler 2100 and Boiler 3100 in accordance with Performance Specification 2 (PS-2) and 16 (PS-16):

- Oxides of Nitrogen (NOx) (ppmvd and lb/MMBTU)
- Sulfur Dioxide (SO_2) (ppmvd and lb/MMBTU)
- Carbon Monoxide (CO) (ppmvd and lb/MMBTU)
- Oxygen (O_2) (% dry)

Turbine 1100, Turbine 2100 and Turbine 3100 in accordance with Performance Specification 2 (PS-2) and 16 (PS-16):

- Oxides of Nitrogen (NOx) (ppmvd, ppmvd at 15% O_2 and lb/MMBTU)
- Carbon Monoxide (CO) (ppmvd and lb/MMBTU)
- Oxygen (O_2) (% dry)

As per Section 9.4 of Performance Specification 16, the annual RATA was completed under normal operating conditions.

Executive Table i: Results Summary – Boiler 1100, 2100 & 3100

Parameter	Boiler 1100 Relative Accuracy (RA)	Boiler 2100 Relative Accuracy (RA)	Boiler 3100 Relative Accuracy (RA)	Limit
Oxygen Concentration	1.3% 0.01%	3.6% 0.06%	3.3% 0.15%	20% 1.0% [Absolute Difference]
Nitrogen Oxide Concentration	6.8% 0.06 ppm	5.7% 0.37 ppm	6.7% 0.23 ppm	20% 2.0 ppm
Nitrogen Oxide Emission Rate	6.1%	5.6%	7.3%	20%
Sulfur Dioxide Concentration	10.6%	3.7%	7.6%	20%
Sulfur Dioxide Emission Rate	11.2%	4.3%	6.4%	20%
Carbon Monoxide Concentration	0.77 ppm	0.49 ppm	0.22 ppm	5.0 ppm
Carbon Monoxide Emission Rate	0.0008 lb/MMBTU	0.0008 lb/MMBTU	0.000005 lb/MMBTU	0.015 lb/MMBTU
Total Number of Runs	12	12	12	--
Number of Runs Used in RA	9	9	9	Minimum of 9
BF Gas Flow (kscf/hr)	3,636.2	3,663.1	3,244.3	--
Nat. Gas Flow (kscf/hr)	30.59	32.64	32.90	--

Executive Table ii: Results Summary - Turbine 1100, 2100 & 3100

Parameter	Turbine 1100 Relative Accuracy (RA)	Turbine 2100 Relative Accuracy (RA)	Turbine 3100 Relative Accuracy (RA)	Limit
Oxygen Concentration	2.3% 0.03%	1.6% 0.19%	3.4% 0.32%	20% 1.0% [Absolute Difference]
Nitrogen Oxide Concentration	2.1% 0.19 ppm	1.4% 0.07 ppm	4.9% 0.40 ppm	20% 2.0 ppm
Nitrogen Oxide Concentration (corrected to 15% O_2)	3.5% 0.004 ppm	3.7% 0.24 ppm	1.4% 0.03 ppm	20% 2.0 ppm
Nitrogen Oxide Emission Rate	4.1%	3.0%	1.3	20%
Carbon Monoxide Concentration	0.55 ppm	0.25 ppm	1.08 ppm	5.0 ppm
Carbon Monoxide Concentration (corrected to 15% O_2)	0.45 ppm	0.17 ppm	0.77 ppm	5.0 ppm
Carbon Monoxide Emission Rate	0.0010 lb/MMBTU	0.0007 lb/MMBTU	0.0020 lb/MMBTU	0.015 lb/MMBTU
Total Number of Runs	10	10	10	--
Number of Runs Used in RA	9	9	9	Minimum of 9
Power Generated (MW)	181.3	193.0	186.7	--

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1 INTRODUCTION

RWDI USA LLC (RWDI) was retained by Dearborn Industrial Generation (DIG) to complete the Relative Accuracy Testing Audit (RATA) emission sampling program at their facility located at 2400 Miller Road, Dearborn, Michigan. The test program was conducted to fulfill the requirements of the Michigan Department of Environment, Great Lakes and Energy (EGLE) Renewable Operating Permit (ROP) # MI-ROP-N6631-2012a and Permit to Install (PTI) 163-17 and 8-17 to demonstrate compliance with 40 CFR 60, Appendices A, B & F. The testing program included EUBOILER1, 2 & 3 (noted as Boiler 1100 (EUBOILER1) Boiler 2100 (EUBOILER 2) and Boiler 3100 (EUBOILER3) and EUCTG TURBINE 1, 2 & 3 (noted as Turbine 1100 (EUCTG TURBINE1), Turbine 2100 (EUCTG TURBINE2) and Turbine 3100 (EUCTG TURBINE3).

The following parameters were measured/calculated in the source testing program:

Boiler 1100, Boiler 2100 and Boiler 3100 in accordance with Performance Specification 2 (PS-2) and 16 (PS-16):

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- Carbon Monoxide (CO) (ppmvd and lb/MMBTU)
- Oxygen (O_2) (% dry)

Turbine 1100, Turbine 2100 and Turbine 3100 in accordance with Performance Specification 2 (PS-2) and 16 (PS-16):

- Oxides of Nitrogen (NOx) (ppmvd, ppmvd at 15% O_2 and lb/MMBTU)
- Carbon Monoxide (CO) (ppmvd and lb/MMBTU)
- Oxygen (O_2) (% dry)

As per Section 9.4 of Performance Specification 16, the annual RATA was completed under normal operating conditions.

1.1 Location and Dates of Testing

The test program was completed December 5th-7th, 2023 at Dearborn Industrial Generation in Dearborn, MI.

1.2 Purpose of Testing

The testing was conducted to fulfill the requirements of Michigan Department of Environment, Great Lakes and Energy (EGLE) Renewable Operating Permit (ROP) # MI-ROP-N6631-2012a and Permit to Install (PTI) 163-17 and 8-17.

1.3 Personnel Involved in Testing

Table 1.3.1: Testing Personnel

Personnel (Title & Email)	Affiliation	Phone Number
Kathryn Cunningham Corporate Environmental Kathryn.Cunningham@cmsenergy.com	**CMS Energy**	(517) 375-3043
Ken Mroczkowski Sr. Environmental Compliance Coordinator Kenneth.Mroczkowski@cmsenergy.com		734-691-0795
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Hunter Griggs Field Technician Hunter.Griggs@rwdi.com		(810) 441-8351

2 SOURCE DESCRIPTION

Dearborn Industrial Generation (DIG) located at 2400 Miller Road in Dearborn, Michigan, operates three (3) natural gas fired or a mixture of Blast Furnace Gas (BFG) and natural gas (NG). The BFG to NG ratio is approximately 90% BFG and 10% NG. In addition, DIG operates two (2) combined-cycle turbines and one (1) simple-cycle turbine. The turbines are fired only with natural gas.

Each boiler is rated at an output capacity of 500,000 pounds per hour of superheated steam at a minimum pressure of 1,230 psig and a temperature of 960°F. The input capacity of the boilers while firing NG and BFG is 746 MMBTU/hr and 763 MMBTU/hr under natural gas only firing. The steam from the boilers is sent to the steam turbine for electrician generation and/or utilized as process steam. NOx from the boilers are controlled by low-NOx combustors.

The simple-cycle turbine is rated at an output capacity of 181 Megawatts (MW) and 1,638 Million British Thermal Units (MMBTU) heat input. The combined-cycle turbines are rated at an output capacity of 179 MW and 1,626 MMBTU heat input. The turbines consist of a compressor, combustion turbine, and generator. Energy is generated at the combustion turbine by drawing in ambient air by means if burning fuel and expanding the hot combustion gases in a three-stage turbine. The hot exhaust gases from the combined-cycle combustion turbines are directed to a multi-pressure heat recovery steam generator (HRSG) to produce steam. NOx is controlled by low NOx combustors.The CO and SO_2 are controlled by equipment combustion efficiencies and low-sulfur fuel.

2.1 Boilers 1100, 2100 and 3100

The sampling locations for Boilers 1100, 2100 and 3100 is through individual stacks.

Table 2.1.1: Summary of Sampling Program – Boilers 1100, 2100 and 3100

	Boiler 1100	Boiler 2100	Boiler 3100
Emission Unit Description [Including Process Equipment & Control Device(s)]	Each boiler is nominally rated at an output of 500,000 pounds of hour of superheated steam at a minimum pressure of 1350 psig at a temperature of 960°F. Heat input rating of each unit when firing on natural gas and blast furnace gas is 746 MMBTU/hr. and 763 MMBTU/hr. with natural gas only. Steam from boilers is delivered to stream turbine for electrical generation or process steam. All boilers are equipped with low-NOx combustors.		
Parameter Tested	O_2, NO_x, SO_2, and CO		
Stack Dimensions	126"	126"	126"
Traverse Points	3	3	3
Testing Monitoring Methods	Refer to Section 3.0		

The sampling ports for the RATA testing are located outside the building within the exhaust duct. During the RATA, DIG personnel operated each of the boilers to ensure they are operating at normal operating loads and that each boiler was utilizing at least 90% BFG on a volume basis.

For each 21-minute test, three (3) points were traversed as per Performance Specification 2 Section 8.1.3.2 to be located on the line at 0.4m 1.2m and 2.0m from the stack wall (16", 47" and 79" from stack wall) as noted in the Source Testing Plan.

2.2 Turbines 1100, 2100 and 3100

The sampling locations for Turbines 1100, 2100 and 3100 is through individual stacks.

Table 2.2.1: Summary of Sampling Program – Turbines 1100, 2100 and 3100

	Turbine 1100	Turbine 2100	Turbine 3100
Emission Unit Description [Including Process Equipment & Control Device(s)]	Simple-cycle turbine fired by natural gas, nominally rated at an output capacity of 181 Megawatts (MW) and 1,638 MMTU/hr. heat input. Low-NOx combustors installed to minimize NOx emissions. CO and SO2 are minimized by the efficient combustion and low-sulfur fuel (natural gas)	Each Turbine is a combined-cycle turbine fired by natural gas. Each have a nominally rated at an output capacity of 179 Megawatts (MW) and 1,626 MMTU/hr. heat input. Low-NOx combustors installed to minimize NOx emissions. CO and SO2 are minimized by the efficient combustion and low-sulfur fuel (natural gas)	
Parameter Tested	O_2, NO_x, and CO		
Stack Dimensions	19' x 22'	210"	210"
Traverse Points	3	3	3
Testing Monitoring Methods	Refer to Section 4.0		
Testing Schedule	Refer to Section 1.2		

The sampling ports for the RATA testing are located outside the building within the exhaust duct. During the RATA, DIG personnel operated each of the turbine to ensure they are operating within at least 90% of maximum load. For each 21-minute test, three (3) points were traversed as per Performance Specification 2 Section 8.1.3.2 to be located on the line at 0.4m 1.2m and 2.0m from the stack wall (16", 47" and 79" from stack wall) as noted in the Source Testing Plan.

2.3 Operating Data

Dearborn Industrial Generation personnel collected the process data and verified the unit was operating correctly and production was at acceptable capacity. The process data can be found in **Appendix A**.

2.4 Applicable Permit Number

MI-ROP-N6631-2012a and PTI 163-17 and 8-17.

2.5 Description of Process and Emission Control Equipment

All boilers and turbines are equipped with low-NO_x combustors to minimize NO_x emissions. CO and SO_2 are minimized in the turbines by using efficient combustion and low sulfur fuel (natural gas).

2.6 Process Flow Sheet or Diagram (if applicable)

Process flow diagram is available upon request.

2.7 Type and Quantity of Raw and Finished Materials

This a power generation facility.

2.8 Normal Rated Capacity of Process

Each boiler is nominally rated at an output of 500,000 pounds of hour of superheated steam at a minimum pressure of 1350 psig at a temperature of 960°F. Heat input rating of each unit when firing on natural gas and blast furnace gas is 746 MMBTU/hr. and 763 MMBTU/hr. with natural gas only.

Turbine 1100 is a simple-cycle turbine fired by natural gas, nominally rated at an output capacity of 181 Megawatts (MW) and 1,638 MMTU/hr. heat input

Turbines 2100 and 3100 are combined-cycle turbines fired by natural gas. Each are nominally rated at an output capacity of 179 Megawatts (MW) and 1,626 MMTU/hr heat input.

2.9 Process Instrumentation Monitored During the Test

Plant personnel recorded the following process data:

Boilers 1100, 2100, and 3100

- Steam load rate (lb./hr.)
- Natural gas usage
- Site Specific F-Factor
- PEMs data

The DIG site monitors heat input to the boilers per ROP requirements. DIG also monitors steam load (klb/hr); however, does not have steam load by the minute increment within the data acquisition and handling system. Steam load is calculated on an hourly basis for EPA EDR reporting. While steam load is provided in the process data within this report, it should not be considered valid minute data. Blast Furnace Gas (BFG) and Natural Gas flow rate process data is provided for the stack test run times for the Boiler Units. Hourly steam load can be provided upon request.

Turbines 1100, 2100, and 3100

- Natural gas usage
- MW generation
- PEMs data

2.10 Predictive Emission Monitors Specifications

Boilers 1100, 2100 and 3100 and Turbine 1100, 2100 and 3100 are equipped with the CMC Solutions SmartCEMS®-75 PEMS. The SmartCEMS®-75 PEMS are PLC-based system which calculates pollutant emissions from sensors inputs using high-order polynomial equations. The process sensor inputs are read by the PLC via signals from the facility distributive control system (DCS). Sensor data is validated, and predicted gas concentrations for each sensor are calculated using relationships that are defined by calculating a weighted average of the individual predictions. The PEMS hardware is comprised of four (4) basic components: the PLC, a touch panel PC, a data historian, and report server.

The CMC Solutions SmartCEMS®-75 PEMS records data continuously and generates reports in compliance with 40 CFR Part 60 regulations. These reports can be operated on any workstation on the local area network and provide the operators information on compliance status of the boilers and turbines in real-time.

The CMC Solutions SmartCEMS®-75 PEMS at Dearborn Industrial have the following Serial Numbers:

Unit	Model	Serial Number
Boiler 1100	CMC Solutions SmartCEMS®-75	DIG.BL1100.256738
Boiler 2100	CMC Solutions SmartCEMS®-75	DIG.BL2100.256738
Boiler 3100	CMC Solutions SmartCEMS®-75	DIG.BL3100.256738
Turbine 1100	CMC Solutions SmartCEMS®-75	DIG.GT1100.97341
Turbine 2100	CMC Solutions SmartCEMS®-75	DIG.GT2100.52081
Turbine 3100	CMC Solutions SmartCEMS®-75	DIG.GT3100.52081

2.11 Reference Method Analyzers

The following outlines the Reference Method analyzers used on-site during the RATA testing.

Table 2.11.1: Reference Method (RM) CEMS Analyzers

Pollutant	Specifications		
	Manufacturer	Serial Number	Range
Sulfur Dioxide	Teledyne API T100	1592	0-150 ppm
Nitrogen Oxide	Teledyne T200H	942	0-5,000 ppm
Nitrogen Oxide	Teledyne T200H	851	0-5,000 ppm
Oxygen	Teledyne T200H	851	0-100%
Oxygen	Servomex 4900 Multigas	200116	0-100%
Carbon Monoxide	Teledyne T300M	921	0-5 ppm 0-5,000 ppm
Carbon Monoxide	Teledyne T300M	842	0-5 ppm 0-5,000 ppm

3 SAMPLING AND ANALYTICAL PROCEDURES

3.1 Description of Sampling Train and Field Procedures

3.1.1 Summary of Specific Methodologies for Boiler 1100, 2100 and 3100

3.1.1.1 Relative Accuracy Testing Audit (RATA) O_2, NO_x, SO_2 and CO

To satisfy the NO_x, SO_2 and CO PEMs data accuracy requirement, the relative accuracy result for a minimum of nine performance test runs must meet the criteria outlined in section 13.1 of the USEPA Performance Specification16. A 21-minute period is used for each test run. To satisfy the O_2 PEMs data accuracy requirement, the relative accuracy result for a minimum of nine performance test runs must be less than or equal to 1.0% absolute O_2. As per Performance Specification 2 Section 8.1.3.2 each sampling point is to be located on a line at 0.4m 1.2m and 2.0m from the stack wall (16", 47" and 79" from stack wall). Each point was 7 minutes in duration for each RATA run.

Prior to the RATA, a NO_2-to-NO conversion efficiency check was performed. It must meet the criteria of ≥ 90%. Also prior to the RATA, an interference response test was performed on the analyzers used for this test program.

RWDI operated the reference method heated line at between 250 and 340°F to avoid any condensation. The RATA data for NOx, SO_2 and CO was calculated for measurements reported in ppmvd and lb/MMBTU. O_2 was measured as %-dry.

Method Listing:

The following test methods are referenced for the test program. These methods can be found in 40 CFR, Part 60, Appendix A and B.

Method 3A: Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources.

Method 7E: Determination of Nitrogen Oxides Emissions from Stationary Sources.

Method 6C: Determination of Sulfur Dioxide from Stationary Sources

Method 10: Determination of Carbon Monoxide from Stationary Sources

Method 19: Determination of Sulfur Dioxide Removal Efficiency and Particulate Matter, Sulfur Dioxide and Nitrogen Oxide Emission Rates.

Performance Specification 2: Specifications and Test Procedures for SO_2 and NOx Continuous Emissions Monitoring Systems in Stationary Sources

Performance Specification 16: Specifications and Test Procedures for Predictive Emission Monitoring Systems in Stationary Sources.

EPA Method 3A, 7E, 6C and 10 (O_2, NO_x, SO_2 and CO):

A three-point (zero, mid-, and high-range) analyzer calibration error check is conducted on each reference analyzer before initiating the relative accuracy testing. This check is conducted (after final calibration adjustments are made) by injecting the calibration gases directly into each gas analyzer and recording the responses.

Zero and upscale calibration checks are 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 are introduced into the sampling system at the probe outlet so that the calibration gases are analyzed in the same manner as the flue gas samples.

A gas sample is 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 are calibrated on-site using EPA Protocol No. 1 certified calibration mixtures. The probe tip is equipped with a sintered stainless-steel filter for particulate removal. The end of the probe is connected to a heated Teflon sample line, which delivers the sample gases from the stack to the CEM system. The heated sample line is 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 passes 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 enters a Teflon-head diaphragm pump and a flow control panel, which delivers the gas in series to the O_2, NO_x, SO_2 and CO analyzers. Each of these analyzers measures the respective gas concentrations on a dry volumetric basis.

NOx,SO_2 and CO 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 SO_2 and CO 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} for NO_x), 1.660×10^{-7} for SO_2 and 7.256×10^{-8} for CO). A site specific F-Factor was provided for the Boilers based on mixture of natural gas and blast furnace gas (BFG).

$E = (1.194\times10^{-7}) \times C_d \times F_d \times ((20.9/(20.9-\%O_{2d}))$ for NO_x
$E = (1.660\times10^{-7}) \times C_d \times F_d \times ((20.9/(20.9-\%O_{2d}))$ for SO_2
$E = (7.256\times10^{-8}) \times C_d \times F_d \times ((20.9/(20.9-\%O_{2d}))$ for CO

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 (%)

3.1.2 Summary of Specific Methodologies for Turbine 1100, 2100 and 3100

3.1.2.1 Relative Accuracy Testing Audit (RATA) O_2, NO_x, and CO

To satisfy the NO_x and CO PEMs data accuracy requirement, the relative accuracy result for a minimum of nine performance test runs must meet the criteria outlined in section 13.1 of the USEPA Performance Specification 16. A 21-minute period was used for each test run. To satisfy the O_2 PEMs data accuracy requirement, the relative accuracy result for a minimum of nine performance test runs must be less than or equal to 1.0% absolute O_2. As per Performance Specification 2 Section 8.1.3.2 each sampling point is to be located on a line at 0.4m 1.2m and 2.0m from the stack wall (16", 47" and 79" from stack wall). Each point was 7 minutes in duration for each RATA run.

Prior to the RATA, a NO_2-to-NO conversion efficiency check was performed. It must meet the criteria of ≥ 90%. Also prior to the RATA, an interference response test was performed on the analyzers used for this test program.

RWDI operated our heated line at between 250 and 340°F to avoid any condensation. The RATA data for NO_x and CO was calculated for measurements reported in ppmvd and lb/MMBTU. NOx and CO concentration were also provided corrected to 15% oxygen. O_2 was measured as %-dry.

Method Listing:

The following test methods are referenced for the test program. These methods can be found in 40 CFR, Part 60, Appendix A and B.

Method 3A: Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources.

Method 7E: Determination of Nitrogen Oxides Emissions from Stationary Sources.

Method 10: Determination of Carbon Monoxide from Stationary Sources

Method 19: Determination of Sulfur Dioxide Removal Efficiency and Particulate Matter, Sulfur Dioxide and Nitrogen Oxide Emission Rates.

Performance Specification 2: Specifications and Test Procedures for SO_2 and NOx Continuous Emissions Monitoring Systems in Stationary Sources

Performance Specification 16: Specifications and Test Procedures for Predictive Emission Monitoring Systems in Stationary Sources.

EPA Method 3A, 7E, and 10 (O_2, NO_x, and CO):

A three-point (zero, mid-, and high-range) analyzer calibration error check is conducted on each reference analyzer before initiating the relative accuracy testing. This check is conducted (after final calibration adjustments are made) by injecting the calibration gases directly into each gas analyzer and recording the responses.

Zero and upscale calibration checks are 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 are introduced into the sampling system at the probe outlet so that the calibration gases are analyzed in the same manner as the flue gas samples.

A gas sample is 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 are calibrated on-site using EPA Protocol No. 1 certified calibration mixtures. The probe tip is equipped with a sintered stainless-steel filter for particulate removal. The end of the probe is connected to a heated Teflon sample line, which delivers the sample gases from the stack to the CEM system. The heated sample line is 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 passes 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 enters a Teflon-head diaphragm pump and a flow control panel, which delivers the gas in series to the O_2, NO_x, and CO analyzers. Each of these analyzers measures the respective gas concentrations on a dry volumetric basis.

NOx and CO 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 and CO 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} for NO_x and 7.256×10^{-8} for CO). Table 19-2 was used for the F-Factor (natural gas 8,710 dscf/10^6 BTU).

$E = (1.194 \times 10^{-7}) \times C_d \times F_d \times ((20.9/(20.9-\%O_{2d}))$ for NO_x
$E = (7.256 \times 10^{-8}) \times C_d \times F_d \times ((20.9/(20.9-\%O_{2d}))$ for CO

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 (%)

3.2 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.

3.3 Sampling Port Description

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

4 PERFORMANCE LIMITS

The applicable emission limits are outlined below.

Table 4.1: Part 60 RA Requirements – Boilers 1100, 2100 & 3100

Parameter	Regulatory Reference	Allowable Limit
Oxygen **% volume, dry**	Part 60	≤ 20% of RM or ≤ 1.0% O_2
Nitrogen Oxides **ppmvd** **lb/MMBTU**	Part 60	≤ 20% of RM or ≤ 10% of AS ≤ 20% of RM or ≤ 10% of AS
Sulfur Dioxide **ppmvd** **lb./MMBTU**	Part 60	≤ 20% of RM or ≤ 10% of AS ≤ 20% of RM or ≤ 10% of AS
Carbon Monoxide **ppmvd** **lb./MMBTU**	Part 60	± 5 ppm ± 0.015

Table 4.2: Part 60 RA Requirements – Turbines 1100, 2100 & 3100

Parameter	Regulatory Reference	Allowable Limit
Oxygen **% volume, dry**	Part 60	≤ 20% of RM or ≤ 1.0% O_2
Nitrogen Oxides **ppmvd** **lb./MMBTU** **ppmvd @ 15% O_2**	Part 60	≤ 20% of RM or ≤ 10% of AS ≤ 20% of RM or ≤ 10% of AS ≤ 20% of RM or ≤ 10% of AS
Carbon Monoxide **ppmvd** **lb./MMBTU** **ppmvd @ 15% O_2**	Part 60	± 5 ppm ± 0.015 ± 5 ppm

5 TEST RESULTS AND DISCUSSION

5.1 Detailed Results

Table 5.1.1: Results Summary - EUBoilers 1, 2, and 3 (Boilers 1100, 2100 & 3100)

Parameter	Boiler 1100 Relative Accuracy (RA)	Boiler 2100 Relative Accuracy (RA)	Boiler 3100 Relative Accuracy (RA)	Limit
Oxygen Concentration	1.3% 0.01%	3.6% 0.06%	3.3% 0.15%	20% 1.0% [Absolute Difference]
Nitrogen Oxide Concentration	6.8% 0.06 ppm	5.7% 0.37 ppm	6.7% 0.23 ppm	20% 2.0 ppm
Nitrogen Oxide Emission Rate	6.1%	5.6%	7.2%	20%
Sulfur Dioxide Concentration	10.6%	3.7%	7.6%	20%
Sulfur Dioxide Emission Rate	11.2%	4.3%	6.4%	20%
Carbon Monoxide Concentration	0.77 ppm	0.49 ppm	0.22 ppm	5.0 ppm
Carbon Monoxide Emission Rate	0.0008 lb/MMBTU	0.0008 lb/MMBTU	0.000005 lb/MMBTU	0.015 lb/MMBTU
Total Number of Runs	12	12	12	--
Number of Runs Used in RA	9	9	9	Minimum of 9
BF Gas Flow (kscf/hr)	3,636.2	3,663.1	3,244.3	--
Nat. Gas Flow (kscf/hr)	30.59	32.64	32.90	--

Table 5.1.2: Results Summary - EUCTG Turbines 1, 2, and 3 (Turbines 1100, 2100, & 3100)

Parameter	Turbine 1100 Relative Accuracy (RA)	Turbine 2100 Relative Accuracy (RA)	Turbine 3100 Relative Accuracy (RA)	Limit
Oxygen Concentration	2.3% 0.03%	1.6% 0.19%	3.4% 0.32%	20% 1.0% [Absolute Difference]
Nitrogen Oxide Concentration	2.1% 0.19 ppm	1.4% 0.07 ppm	4.9% 0.40 ppm	20% 2.0 ppm
Nitrogen Oxide Concentration (corrected to 15% O_2)	3.5% 0.004 ppm	3.7% 0.24 ppm	1.4% 0.03 ppm	20% 2.0 ppm
Nitrogen Oxide Emission Rate	4.1%	3.0%	1.3	20%
Carbon Monoxide Concentration	0.55 ppm	0.25 ppm	1.08 ppm	5.0 ppm
Carbon Monoxide Concentration (corrected to 15% O_2)	0.45 ppm	0.17 ppm	0.77 ppm	5.0 ppm
Carbon Monoxide Emission Rate	0.0010 lb/MMBTU	0.0007 lb/MMBTU	0.0020 lb/MMBTU	0.015 lb/MMBTU
Total Number of Runs	10	10	10	--
Number of Runs Used in RA	9	9	9	Minimum of 9
Power Generated (MW)	181.3	193.0	186.7	--

5.2 Discussion of Results

Based on the results of the RATA, all analytes were determined to be within acceptable Relative Accuracy (RA) tolerances as per USEPA Performance Specification 2 and 6.

The CEMS spreadsheets can be found in **Appendix B**.

5.3 Variations in Testing Procedures

No variations.

5.4 Process Upset Conditions During Testing

There were normal process breaks during production.

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 C**.

5.9 Calibration Records

Calibration records can be found in **Appendix D**.

5.10 Sample Calculations

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

5.11 Laboratory Data

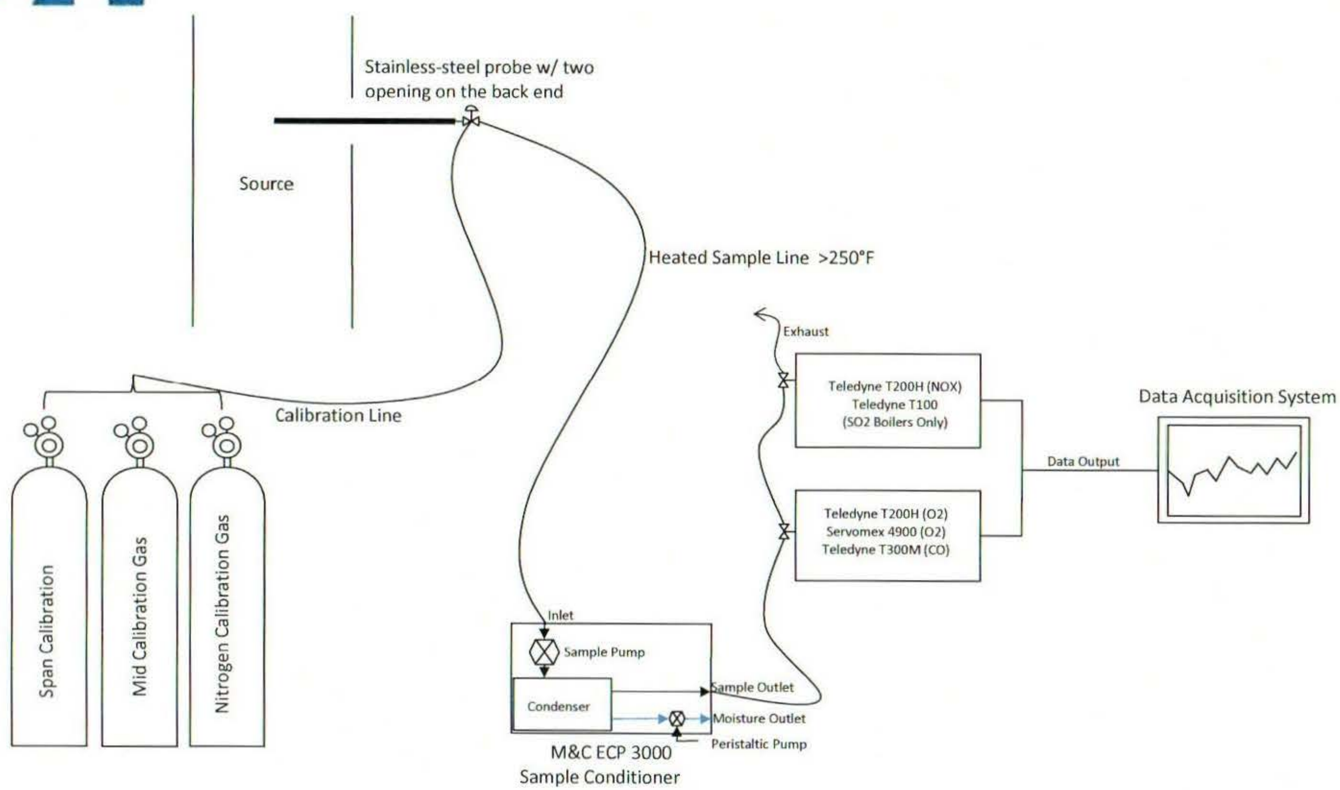
There was no laboratory data from this testing program.

5.12 Source Testing Plan

Source testing plan and EGLE correspondence can be found in **Appendix F**.

TABLES

Figure No. 1: USEPA Method 3A,6C,7E,10 Schematic



USEPA Method 3A,6C,7E,10

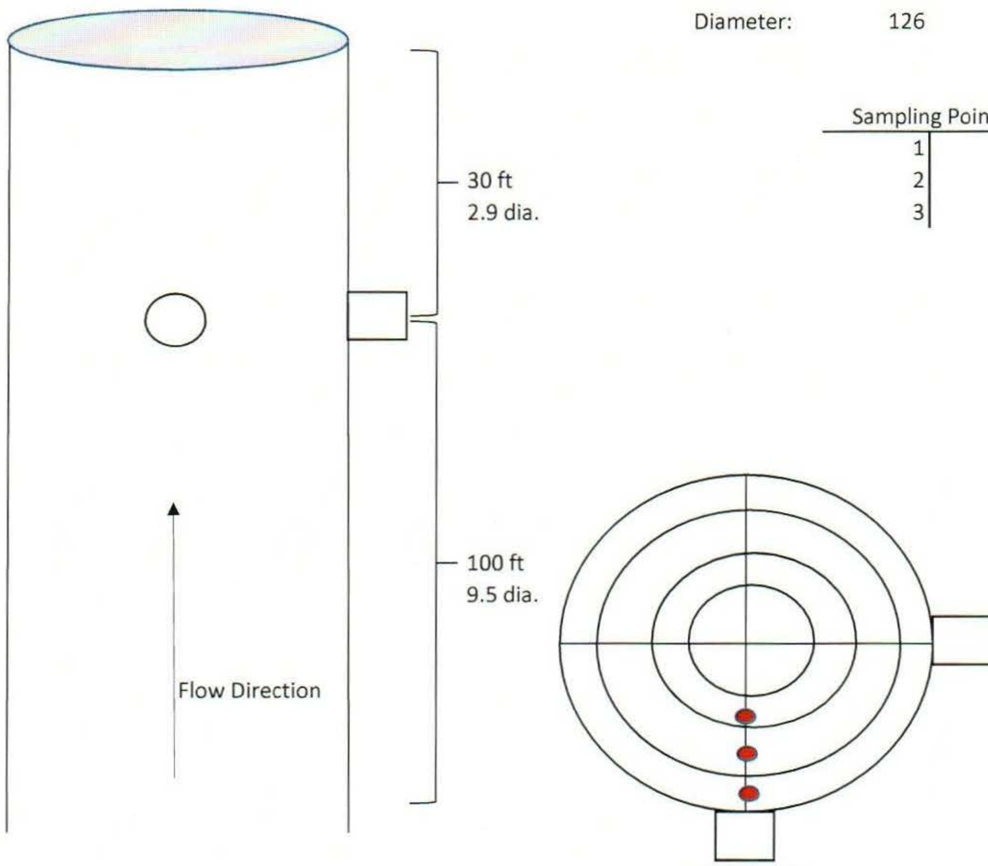
Dearborn Industrial Generation

Dearborn, MI

Project# 2400110

Date: December 5 to 7, 2023

Figure No. 2 Schematic of Traverse Locations Boilers 1100, 2100 and 3100

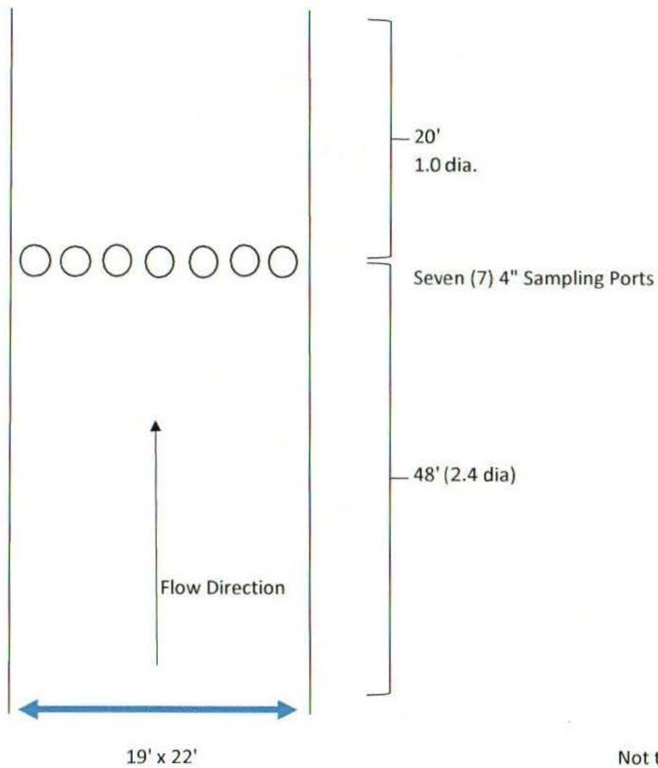


Diameter: 126

Sampling Points (in.)	
1	16.0
2	47.0
3	79.0

Diameter: 19' x 22' (228" x 264")
Effective Diameter: 245 inches

Figure No. 3: Schematic of Traverse Locations for Turbine 1100



Point	Distance from inside Wall						
	Port 1	Port 2	Port 3	Port 4	Port 5	Port 6	Port 7
1	X	X	X	16"	X	X	X
2	X	X	X	47"	X	X	X
3	X	X	X	79"	X	X	X

Not to scale

Turbine 1100
Dearborn Industrial Generation

Dearborn, MI

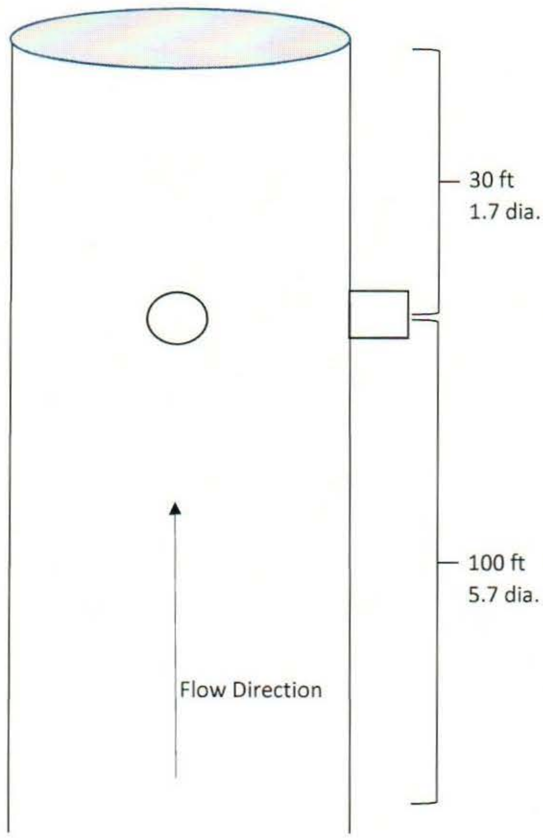
Date:
Dec. 7th, 2023

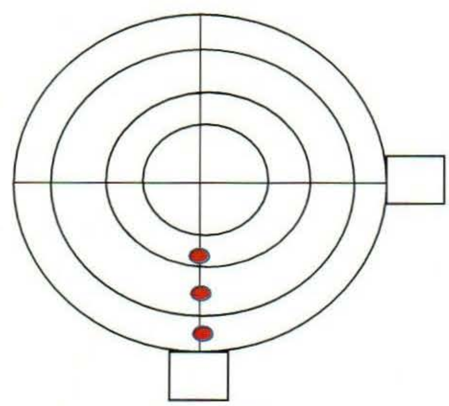
RWDI USA LLC
2239 Star Court
Rochester Hills, MI 48309

Figure No. 4 Schematic of Traverse Locations Turbines 2100 and 3100

Diameter: 210

Sampling Points (in.)	
1	16.0
2	47.0
3	79.0





Not to scale

Turbines 2100 & 3100
Dearborn Industrial Generation

Dearborn, Michigan

Date:
December 5th to 6th, 2023

RWDI USA LLC
2239 Star Court
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