FINAL REPORT

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KALAMAZOO, MICHIGAN

COMPLIANCE TESTING REPORT: EU-02-PEAKGEN, EU-ENGINE9, EU-ENGINE10 EMISSIONS REPORT

RWDI #2401188

April 4, 2024

SUBMITTED TO

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EXECUTIVE SUMMARY

RWDI USA LLC (RWDI) has been retained by NTH Consultants, Ltd. (NTH) to complete the emission sampling program at the Western Michigan University (WMU) Robert M. Beam Power Plant located at 1903 West Michigan Avenue, Kalamazoo, Michigan 49008. The Robert M. Beam Power Plant operates a natural gas-fired peaking and black start generator (EU-02-PEAKGEN) and two (2) natural gas RICE engines, EU-ENGINE9 and EU-ENGINE10. Testing on EU-02-PEAKGEN consisted of a carbon monoxide (CO) reduction efficiency test as required under 40 CFR Part 63 Subpart ZZZZ MACT standards. Testing on EU-ENGINE9 and EU-ENGINE10 consisted of oxides of nitrogen (NO_x), CO, formaldehyde (CH_2O), and non-methane/ethane hydrocarbons (VOC) as propane, and flowrate. The testing was required by Michigan Department of Environment, Great Lakes, and Energy (EGLE) Renewable Operating Permit (ROP) No. MI-ROP-K2131-2021a.

Compliance testing took place on February 19th-20th, 2024.

Executive Table i: Results Summary – EU-02-PEAKGEN

Source	Analyte	Sub-Source	Units	Average	Limit
EU-02-PEAKGEN	O2	Inlet	%	9.39	-
		Outlet	%	10.11	-
	CO	Inlet	$ppmv_d$ @ 15% O_2	205.77	-
		Outlet	$ppmv_d$ @ 15% O_2	5.04	47
		System	Reduction Efficiency %	97.6%	93%

Executive Table ii: Results Summary – EU-ENGINE9

Source	Analyte	Units	Average	Limit
EU-ENGINE9	NO_x	$ppmv_d$ @ 15% O_2	63.30	82
		g/hp-hr[1]	0.78	1.0
	CO	$ppmv_d$ @ 15% O_2	16.56	270
		g/hp-hr[1]	0.12	2.0
	VOC[2]	$ppmv_d$ @ 15% O_2	2.61	60
		g/hp-hr[1]	0.03	0.7
	CH_2O	lb/hr	0.59	6.4

[1]Based on electric output which is conservative as it does not account for generator efficiency.

[2]VOC results exclude formaldehyde per NSPS.

Executive Table iii: Results Summary – EU-ENGINE10

Source	Analyte	Units	Average	Limit
EU-ENGINE10	NO_x	$ppmv_d$ @ 15% O_2	77.34	82
		g/hp-hr[1]	0.90	1.0
	CO	$ppmv_d$ @ 15% O_2	35.49	270
		g/hp-hr[1]	0.25	2.0
	VOC[2]	$ppmv_d$ @ 15% O_2	3.33	60
		g/hp-hr[1]	0.04	0.7
	CH_2O	lb/hr	0.84	6.4

[1]Based on electric output which is conservative as it does not account for generator efficiency.

[2]VOC results exclude formaldehyde per NSPS.

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1 INTRODUCTION

RWDI USA LLC (RWDI) has been retained by NTH Consultants, Ltd. (NTH) to complete the emission sampling program at the Western Michigan University (WMU) Robert M. Beam Power Plant located at 1903 West Michigan Avenue, Kalamazoo, Michigan 49008. The Robert M. Beam Power Plant operates a natural gas-fired peaking and black start generator (EU-02-PEAKGEN) and two (2) natural gas RICE engines, EU-ENGINE9 and EU-ENGINE10. Testing on EU-02-PEAKGEN consisted of a carbon monoxide (CO) reduction efficiency test as required under 40 CFR Part 63 Subpart ZZZZ MACT standards. Testing on EU-ENGINE9 and EU-ENGINE10 consisted of oxides of nitrogen (NO_x), CO, formaldehyde (CH_2O), and non-methane/ethane hydrocarbons (VOC) as propane, and flowrate. The testing was required by Michigan Department of Environment, Great Lakes, and Energy (EGLE) Renewable Operating Permit (ROP) No. MI-ROP-K2131-2021a.

Compliance testing took place on February 19th-20th, 2024.

1.1 Location and Date of Testing

The testing program was completed on February 19th-20th, 2024 at the WMU Robert M. Beam Power Plant located at 1903 West Michigan Avenue, Kalamazoo, Michigan 49008.

1.2 Purpose of the Testing

The purpose of testing was to show compliance with EGLE MI-ROP-K2131-2021a for EU-ENGINE9 and EU-ENGINE 10 and 40 CFR Part 63 Subpart ZZZZ MACT standards for EU-02-PEAKGEN.

1.3 Description of the Source

The Robert M. Beam Power Plant operates a natural gas-fired peaking and black start generator (EU-02-PEAKGEN). The unit is a Caterpillar Mode 3516 four stroke lean burn generator rated for a maximum load of 771 kW. An oxidation catalyst is installed to control CO emissions.

The plant also operates two natural gas-fired reciprocating internal combustion engines (RICE) manufactured by Caterpillar. Each RICE is rated at 3,448 brake horsepower (HP) (2.5 megawatts (MW) electric output) with a maximum heat input of 22 MMBtu/hr. EU-ENGINE9 and EU-ENGINE10 use lean-burn technology and are each equipped with oxidation catalysts for control of CO and VOC emissions.

1.4 Personnel Involved in Testing

Table 1.4.1: List of Testing Personnel

George Jarvis, P.E. Power Plant Director George.Jarvis@wmich.edu	**Western Michigan University** **Robert M. Beam Power Plant** 1903 West Michigan Avenue Kalamazoo, Michigan 49008	(269) 387-8548
Mark Weiss **Director of EHS** Mark.Weiss@wmich.edu		(269) 387-5588
Chloe Palajac, P.E. Senior Staff Engineer CPalajac@nthconsultants.com	**NTH Consultants, Ltd** 3300 Eagle Run Drive NE Suite 202 Grand Rapids, Michigan 49525	(313) 600-1191
Trevor Drost Air Quality Division, TPU DrostT@michigan.gov	**State of Michigan** Department of Environment, Great Lakes, and Energy	(517) 245-5781
Mason Sakshaug Supervisor, Source Mason.Sakshaug@rwdi.com	**RWDI USA LLC** 2239 Star Court Rochester Hills, MI 48309	(989) 323-0355
Cade Smith Field Technician Cade.Smith@rwdi.com		(248) 841-8442

2 SUMMARY OF RESULTS

2.1 Operating Data

Operational data collected during the testing included the following (found in **Appendix A**):

- Power generated (EUENGINES 9/10 and EU-02-PEAKGEN)
- Natural gas usage (EUENGINES 9/10 and EU-02-PEAKGEN)
- Inlet catalyst temperature (EU-02-PEAKGEN)
- Pressure drop across the catalyst (EU-02-PEAKGEN)

2.2 Applicable Permit Number

The purpose of testing was to show compliance with Michigan Department of Environment, Great Lakes, and Energy MI-ROP-K2131-2021a and 40 CFR Part 63 Subpart ZZZZ MACT standards.

3 SOURCE DESCRIPTION

3.1 Description of Process and Emission Control Equipment

Refer to Section 1.3 for a description of the process and control equipment.

3.2 Process Flow Sheet or Diagram

A process schematic can be provided upon request.

3.3 Type and Quantity of Raw and Finished Materials

EU-02-PEAKGEN, EU-ENGINE9, and EU-ENGINE10 burn natural gas to produce energy.

3.4 Normal Rated Capacity of Process

EU-02-PEAKGEN is rated for a maximum load of 771 kW. EU-ENGINE9 and EU-ENGINE10 are rated for 3,448 brake horsepower (2.5 megawatts electric output).

3.5 Process Instrumentation Monitored During the Testing

There are no CEMS or PEMS installed on the processes.

4 POLLUTANTS TO BE MEASURED

Testing consisted of emissions for nitrogen oxides (NO_x), carbon monoxide (CO), non-methane/ethane organic compounds (VOC), and formaldehyde (CH_20) on units EU-ENGINE9 and EU-ENGINE10. Testing consisted of a carbon monoxide (CO) reduction efficiency on unit EU-02-PEAKGEN.

5 SAMPLING AND ANALYSIS PROCEDURES

The following section provides brief descriptions of the proposed sampling methods and discusses any proposed modifications to the reference test methods.

5.1 Stack Velocity, Temperature, and Volumetric Flow Rate Determination

The exhaust velocities and flow rates from EU-ENGINE9 and EU-ENGINE10 were determined following the USEPA Method 2, "Determination of Stack Gas Velocity and Flow Rate (Type S Pitot Tube)" from the outlet. 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. Flowrates were taken pre and post-test and the average result was used in the emissions calculation.

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" for O_2. USEPA Method 320 was used for CO_2 content for EU-ENGINE9 and EU-ENGINE10.

Stack moisture content was determined in accordance with USEPA Method 320 for EU-ENGINE9 and EU-ENGINE10.

5.2 NO_x, CO, VOC and CH_2O by USEPA Method 320

Emissions testing was performed at the outlet of EU-ENGINE9 and EU-ENGINE10. Pollutant concentrations were determined utilizing RWDI's continuous emissions monitoring system (CEM) which consists of the FTIR and oxygen analyzer (measuring on wet basis).

Stack gas concentrations for NO_x, CO, H_2O, CH_2O, CO_2 and O_2 was measured using EPA Reference Methods 320 and 3A.

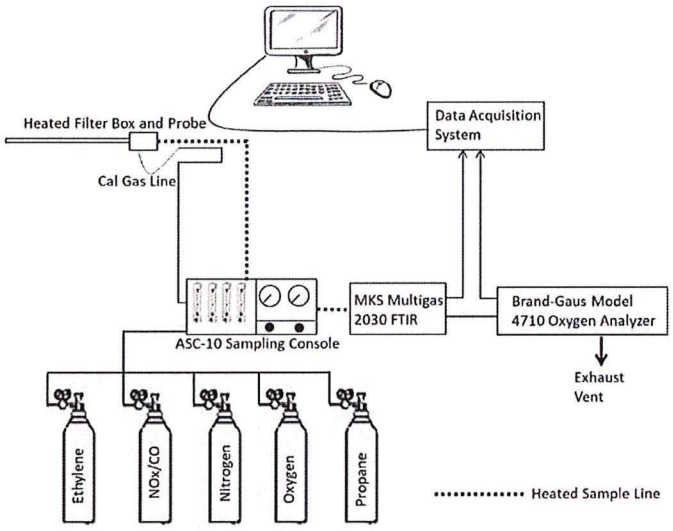
Oxygen measurements were taken continuously following USEPA Method 3A on the outlet (using a wet oxygen analyzer or equivalent).

Regular performance checks on the CEMS were carried out by zero and span calibration checks on the oxygen analyzer and necessary QA procedures on the FTIR using USEPA Protocol calibration gases. These checks will verify the ongoing precision of the FTIR with time by introducing pollutant-free (zero) air followed by a known CTS gas into the FTIR. Spikes for each pollutant were done before and after each test. The response of the monitor to pollutant-free air and the corresponding sensitivity to the calibrations gases were reviewed frequently as an ongoing indication of analyzer performance.

Monitoring was conducted by drawing a sample stream of flue gases through a stainless-steel probe attached to a heated filter and a heated sample line that is attached to the MAX Analytical ASC-10ST sampling console. Lengths of unheated sample line was kept to a minimum and insulated. The ASC-10ST sampling console delivers a continuous sample to the MKS MultiGas 2030 FTIR and oxygen analyzer for analysis. The heated filter and line were maintained at approximately 191°C (375°F) and the MKS MultiGas 2030 FTIR and ASC-10ST gas components were kept at 191°C (375°F).

The end of the probe was connected to a heated Teflon sample line, which deliver the sample gases from the stack to the FTIR system. The heated sample line was designed to maintain the gas temperature at approximately 375°F to prevent condensation of stack gas moisture within the line and condition air to the same temperature as the FTIR. A schematic of the sampling system setup is depicted in **Figure 5.2a.**

Figure 5.2a: MKS 2030 Multigas FTIR/ASC-10ST/Model 4710 Oxygen Analyzer Sampling System Schematic



The ASC-10ST was used to deliver calibration gases (Calibration Transfer Standard (CTS), QA Spike and Nitrogen) to the FTIR in direct (to analyzer) and system (to probe) modes.

A laptop computer was utilized for operating the MKS MultiGas 2030 FTIR and MAX Analytical ASC-10ST sampling console and logging the multi-gas FTIR data. Data was logged as one-minute averages for the actual test period (FTIR PRN files and Spectra). All concentration data was determined using the MKS 2030 MultiGas FTIR software. A typical MKS 2030 FTIR and ASC-10 ST configuration is depicted in **Figure 5.2b.**

For oxygen measurement only, 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. The analyzer will measure the respective gas concentrations on a wet volumetric basis which was converted to a dry volumetric number.

The probe tip was equipped with a heated filter for particulate removal. The end of the probe was connected to a heated Teflon sample line, which will deliver the sample gases from the stack to the FTIR/4710 Oxygen analyzer system. The heated sample line was designed to maintain the gas temperature at approximately 375°F to prevent condensation of stack gas moisture within the line.

Figure 5.2b: Typical MKS 2030 Multigas FTIR and ASC-10ST Configuration

5.3 O_2 by USEPA Method 3A and CO by USEPA Method 10

For the CO reduction efficiency of EU-02-PEAKGEN, USEPA Method 3A was used to measure O_2 concentrations, and USEPA Method 10 was used to measure CO concentrations at the inlet and outlet of the source.

For O_2 and CO measurement, 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.

The end of the probe was connected to a heated Teflon sample line, which will deliver the sample gases from the stack to the O_2 and CO analyzer system. The heated sample line was designed to maintain the gas temperature at approximately 250°F to prevent condensation of stack gas moisture within the line.

6 NUMBER AND LENGTH OF SAMPLING RUNS

Testing consisted of one (1) 15-minute test on the EU-02-PEAKGEN and three (3) 1-hour tests on each of EU-ENGINE9 and EU-ENGINE10.

7 STACK INFORMATION

EU-ENGINE9 and EU-ENGINE10 had identical stack measurements.

Table 7.1: Summary of the Stack Characteristics

Source	Diameter	Number of Ports	Points per Traverse	Total Points per Test
EU-ENGINE9 EU-ENGINE10	19.5"	2	8	16 Flow

8 FLUE GAS CONDITIONS

Table 8.1: Flue Gas Conditions

Parameter	Flue Gas Conditions		
	Stack Temperature (°F)	Flow Rate (dscfm)	Moisture (%)
EU-ENGINE9	725.5	6,316	11.10
EU-ENGINE10	698.0	6,062	11.07

9 TEST RESULTS AND DISCUSSION

9.1 Detailed Results

Detailed results for all analytes are provided in **Appendices B, C, and D** for EU-02-PEAKGEN, EU-ENGINE9, and EU-ENGINE10, respectively. Flow data for EU-ENGINE9 and EU-ENGINE10 can be found in **Appendix E.**

9.2 Discussion of Results

The following tables give a summary of the results.

Table 9.2.1: Results Summary – EU-02-PEAKGEN

Source	Analyte	Sub-Source	Units	Average	Limit
EU-02-PEAKGEN	O2	Inlet	%	9.39	-
		Outlet	%	10.11	-
	CO	Inlet	ppmv$_d$ @ 15% O_2	205.77	-
		Outlet	ppmv$_d$ @ 15% O_2	5.04	47
		System	Reduction Efficiency %	97.6%	93%

Table 9.2.2: Results Summary – EU-ENGINE9

Source	Analyte	Units	Average	Limit
EU-ENGINE9	NO_x	ppmv$_d$ @ 15% O_2	63.3	82
		g/hp-hr[1]	0.78	1.0
	CO	ppmv$_d$ @ 15% O_2	16.56	270
		g/hp-hr[1]	0.12	2.0
	VOC[2]	ppmv$_d$ @ 15% O_2	2.61	60
		g/hp-hr[1]	0.03	0.7
	CH_2O	lb/hr	0.59	6.4

[1]Based on electric output which is conservative as it does not account for generator efficiency.

[2]VOC results exclude formaldehyde per NSPS.

Table 9.2.3: Results Summary – EU-ENGINE10

Source	Analyte	Units	Average	Limit
EU-ENGINE10	NO_x	ppmv$_d$ @ 15% O_2	77.34	82
		g/hp-hr[1]	0.90	1.0
	CO	ppmv$_d$ @ 15% O_2	35.49	270
		g/hp-hr[1]	0.25	2.0
	VOC[2]	ppmv$_d$ @ 15% O_2	3.33	60
		g/hp-hr[1]	0.04	0.7
	CH_2O	lb/hr	0.84	6.4

[1]Based on electric output which is conservative as it does not account for generator efficiency.

[2]VOC results exclude formaldehyde per NSPS.

9.3 Variations in Testing Procedures

Testing was completed as detailed in the test plan, dated December 15, 2023, submitted to EGLE.

9.4 Modifications to Testing Program

There were no modifications to the testing program.

9.5 Process Upset Conditions During Testing

There were no upsets in the process during testing.

9.6 Maintenance Performed in Last Three Months

All maintenance performed on EU-02-PEAKGEN, EU-ENGINE9, and EU-ENGINE10 in the previous three months has been routine.

9.7 Re-Test

This was not a re-test.

9.8 Audit Samples

This test did not require any audit samples.

9.9 Process Data

Process data can be found in **Appendix A**.

9.10 Field Notes

Field notes can be found in **Appendix D**.

9.11 Calibration Data

Calibration data can be found in **Appendix F**.

9.12 Example Calculations

Example calculations can be found in **Appendix H**.

9.13 Source Testing Plan and EGLE Correspondence

Copy of the correspondence received from the Source Testing Plan from EGLE and the Source Testing Plan submitted can be found in **Appendix I.** Process data can be found in **Appendix A** and was provided to Michael Cox of EGLE on February 23, 2024.

9.14 Laboratory Data

There was no laboratory data affiliated with this testing.

TABLES

Table 1: Summary of Sampling Parameters and Methodology

Source Location	No. of Tests	Sampling Parameter	Sampling Method
EU-02-PEAKGEN (Inlet & Outlet)	3	Oxygen	U.S. EPA [1] Method 3A
		Carbon Monoxide	U.S. EPA [1] Method 10
EU-ENGINE9 EU-ENGINE10	3	Oxygen	U.S. EPA [1] Method 3A
		Nitrogen Oxides, Carbon Monoxide, VOC, Formaldehyde, Carbon Dioxide, Moisture	U.S. EPA [1] Method 320

Notes:

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

Table 2: Sampling Summary

Unit	Test #	Sampling Date	Start Time	End Time
EU-02-PEAKGEN	Test #1	19-Feb-24	2:00 PM	2:14 PM
EU-ENGINE9	Test #1	20-Feb-24	4:15 PM	5:14 PM
EU-ENGINE9	Test #2	20-Feb-24	6:05 PM	7:04 PM
EU-ENGINE9	Test #3	20-Feb-24	7:40 PM	8:39 PM
EU-ENGINE10	Test #1	20-Feb-24	10:10 AM	11:09 AM
EU-ENGINE10	Test #2	20-Feb-24	12:05 PM	1:04 PM
EU-ENGINE10	Test #3	20-Feb-24	1:55 PM	2:54 PM

Table 3: EU-02-PEAKGEN Emissions Results Summary

RWDI Project #2401188

Inlet				O_2		CO		CO		CO Reduction Efficiency	Permit Limit	
Test ID	Date	Start	End	%		ppm		ppm @ 15% O_2		%	Outlet CO ppm @ 15% O_2	Reduction Efficiency
				Inlet	Outlet	Inlet	Outlet	Inlet	Outlet			
1	2024-02-19	14:00	14:14	9.39	10.11	401.4	9.2	205.77	5.04	97.6%	47	93%

Table 4: Summary of Emissions - EUENGINE9

WMU

Facility: WMU
City: Kalamazoo, Michigan
Source: EUENGINE9
Date: 2/20/2024

	Symbol	Units	Test 1	Test 2	Test 3	Average	Corrected to 15% O_2	Limits
Nitrogen Oxides Concentration	NO_x	ppmvd	125.53	124.29	124.35	124.72	63.30	82.0
Carbon Monoxide Concentration	CO	ppmvd	31.93	33.69	32.27	32.63	16.56	270
Formaldehyde Concentration	CH2O	ppmvd	20.02	20.23	20.30	20.18	-	
Oxygen Concentration	O_2	$\%_{wet}$	8.26	8.25	8.22	8.25	-	-
Oxygen Concentration	O_2	$\%_{dry}$	9.29	9.28	9.25	9.27	-	-
VOC (as propane) Concentration	C3H8	ppmvd	5.05	5.36	5.00	5.13	2.61	60
Formaldehyde Emission Rate	CH2O	pph	0.57	0.60	0.61	0.59	-	6.4
Nitrogen Oxides Concentration	NO_x	g/HP-hr	0.76	0.78	0.79	0.78	-	1.0
Carbon Monoxide Concentration	CO	g/HP-hr	0.12	0.13	0.13	0.12	-	2.0
VOC (as propane) Concentration	C3H8	g/HP-hr	0.03	0.03	0.03	0.03	-	0.7

g/HP-hr is calculated based on electrical output and is a conservative calculation as it does not account for generator efficiency

Table 5: EUENGINE9 Flow Measurements

WMU

Facility: WMU
City: Kalamazoo, Michigan
Source: EUENGINE9

Parameter	Units	Test 1	Test 2	Test 3	Average
Stack Gas Temperature	°F	725.0	725.6	726.1	725.6
Stack Gas Moisture	%	11.06	11.10	11.13	11.10
Velocity	ft/sec	127.7	132.2	134.3	131.4
Actual Flowrate	acfm	15,888	16,451	16,709	16,349
Dry Reference Flowrate	dscfm	6142	6356	6450	6,316
Dry Reference Flowrate	m^3/s	2.90	3.00	3.04	2.98

Table 6: EUENGINE9 Process Data

WMU

Facility: WMU
City: Kalamazoo, Michigan
Source: EUENGINE9
Max BHP: 3,448

Test	Time	Kilowatts (KW)	Brake Horse Power (BHP)	Load (%)
1	16:15	2,445	3,278.8	95.1%
	16:30	2,463	3,302.9	95.8%
	16:45	2,495	3,345.8	97.0%
	17:00	2,418	3,242.6	94.0%
	17:15	2,391	3,206.4	93.0%
	Average	**2,442**	**3,275.3**	**95.0%**
2	18:05	2,474	3,317.7	96.2%
	18:20	2,466	3,307.0	95.9%
	18:35	2,490	3,339.1	96.8%
	18:50	2,413	3,235.9	93.8%
	19:05	2,413	3,235.9	93.8%
	Average	**2,451**	**3,287.1**	**95.3%**
3	19:40	2,461	3,300.3	95.7%
	19:55	2,397	3,214.4	93.2%
	20:10	2,415	3,238.6	93.9%
	20:25	2,487	3,335.1	96.7%
	20:40	2,421	3,246.6	94.2%
	Average	**2,436**	**3,267.0**	**94.8%**

KW to BHP Conversion Factor: 1.341

Table 7: Summary of Emissions - EUENGINE10

WMU

Facility: WMU
City: Kalamazoo, Michigan
Source: EUENGINE10
Date: 2/20/2024

	Symbol	Units	Test 1	Test 2	Test 3	Average	Corrected to 15% O_2	Limits
Nitrogen Oxides Concentration	NO_x	ppmvd	152.40	150.75	152.47	151.87	77.34	82.0
Carbon Monoxide Concentration	CO	ppmvd	68.65	69.80	70.63	69.69	35.49	270
Formaldehyde Concentration	CH2O	ppmvd	29.50	29.86	30.03	29.80	-	
Oxygen Concentration	O_2	$\%_{wet}$	8.29	8.30	8.26	8.28	-	-
Oxygen Concentration	O_2	$\%_{dry}$	9.32	9.33	9.29	9.31	-	-
VOC (as propane) Concentration	C3H8	ppmvd	6.22	6.63	6.75	6.53	3.33	60
Formaldehyde Emission Rate	CH2O	pph	0.833	0.84	0.85	0.84	-	6.4
Nitrogen Oxides Concentration	NO_x	g/HP-hr	0.91	0.89	0.92	0.90	-	1.00
Carbon Monoxide Concentration	CO	g/HP-hr	0.25	0.25	0.26	0.25	-	2.00
VOC (as propane) Concentration	C3H8	g/HP-hr	0.04	0.04	0.04	0.04	-	0.70

g/HP-hr is calculated based on electrical output and is a conservative calculation as it does not account for generator efficiency

Table 8: EUENGINE10 Flow Measurements

WMU

Facility: WMU
City: Kalamazoo, Michigan
Source: EUENGINE10

Parameter	Units	Test 1	Test 2	Test 3	Average
Stack Gas Temperature	°F	702.8	696.6	694.7	698.0
Stack Gas Moisture	%	11.1	11.065	11.075	11.07
Velocity	ft/sec	123.4	121.9	123.4	122.9
Actual Flowrate	acfm	15351.0	15,172	15,358	15,294
Dry Reference Flowrate	dscfm	6059.5	6,022	6,105	6,062
Dry Reference Flowrate	m^3/s	2.9	2.85	2.88	2.86

Table 9: EUENGINE10 Process Data

WMU

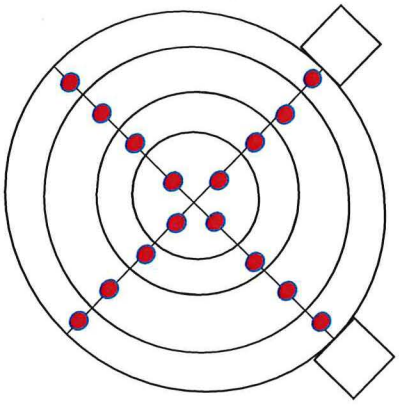
Facility: WMU
City: Kalamazoo, Michigan
Source: EUENGINE10
Max BHP: 3448

Test	Time	Kilowatts (KW)	Brake Horse Power (BHP)	Load (%)
1	10:10	2,533	3,396.8	98.5%
	10:25	2,405	3,225.2	93.5%
	10:40	2,466	3,307.0	95.9%
	10:55	2,455	3,292.2	95.5%
	11:10	2,439	3,270.7	94.9%
	Average	**2,460**	**3,298.4**	**95.7%**
2	12:05	2,442	3,274.8	95.0%
	12:20	2,431	3,260.0	94.5%
	12:35	2,455	3,292.2	95.5%
	12:50	2,487	3,335.1	96.7%
	13:05	2,455	3,292.2	95.5%
	Average	**2,454**	**3,290.9**	**95.4%**
3	13:55	2,405	3,225.2	93.5%
	14:10	2,482	3,328.4	96.5%
	14:25	2,514	3,371.3	97.8%
	14:40	2,453	3,289.5	95.4%
	14:55	2,426	3,253.3	94.4%
	Average	**2,456**	**3,293.5**	**95.5%**

KW to BHP Conversion Factor: 1.341

FIGURES

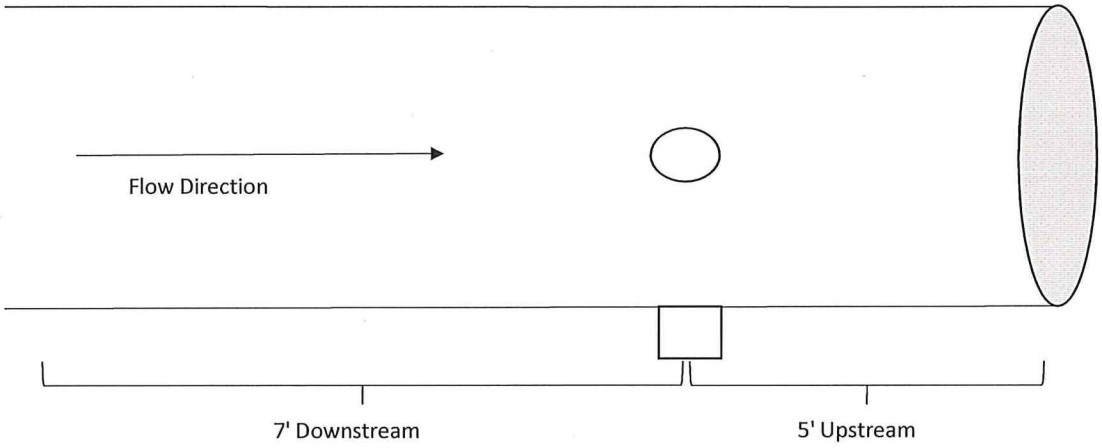
Figure No. 1: EU-ENGINE9 & EU-ENGINE 10 Stack Diagram



Not to Scale

Diameter: 19.5

Sampling Points (in.)	
1	0.62
2	2.05
3	3.78
4	6.30
5	13.20
6	15.72
7	17.45
8	18.88

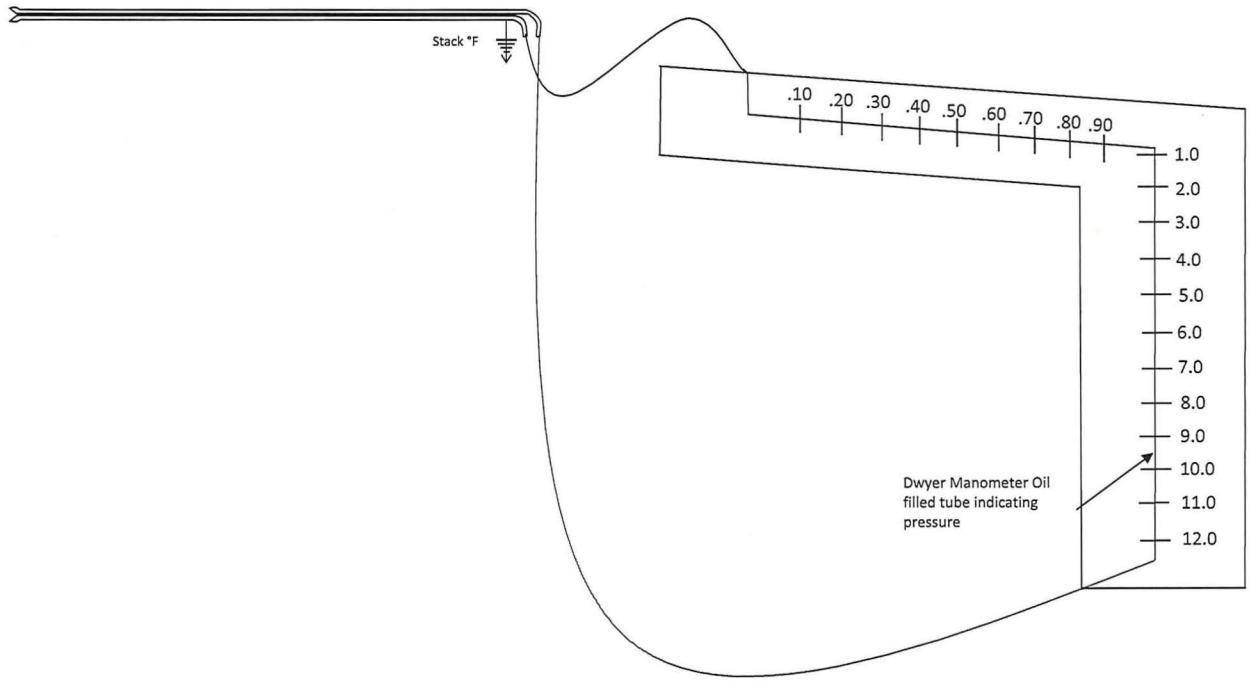


EU-ENGINE9, EU-ENGINE10
WMU
Robert M. Beam Power Plant
Kalamazoo, MI

Date:
20-Feb-2024

RWDI USA LLC
2239 Star Court
Rochester Hills, MI 48309

Figure No. 2: US EPA Method 2 Schematic



USEPA Method 2

WMU

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EU-ENGINE9, EU-ENGINE10

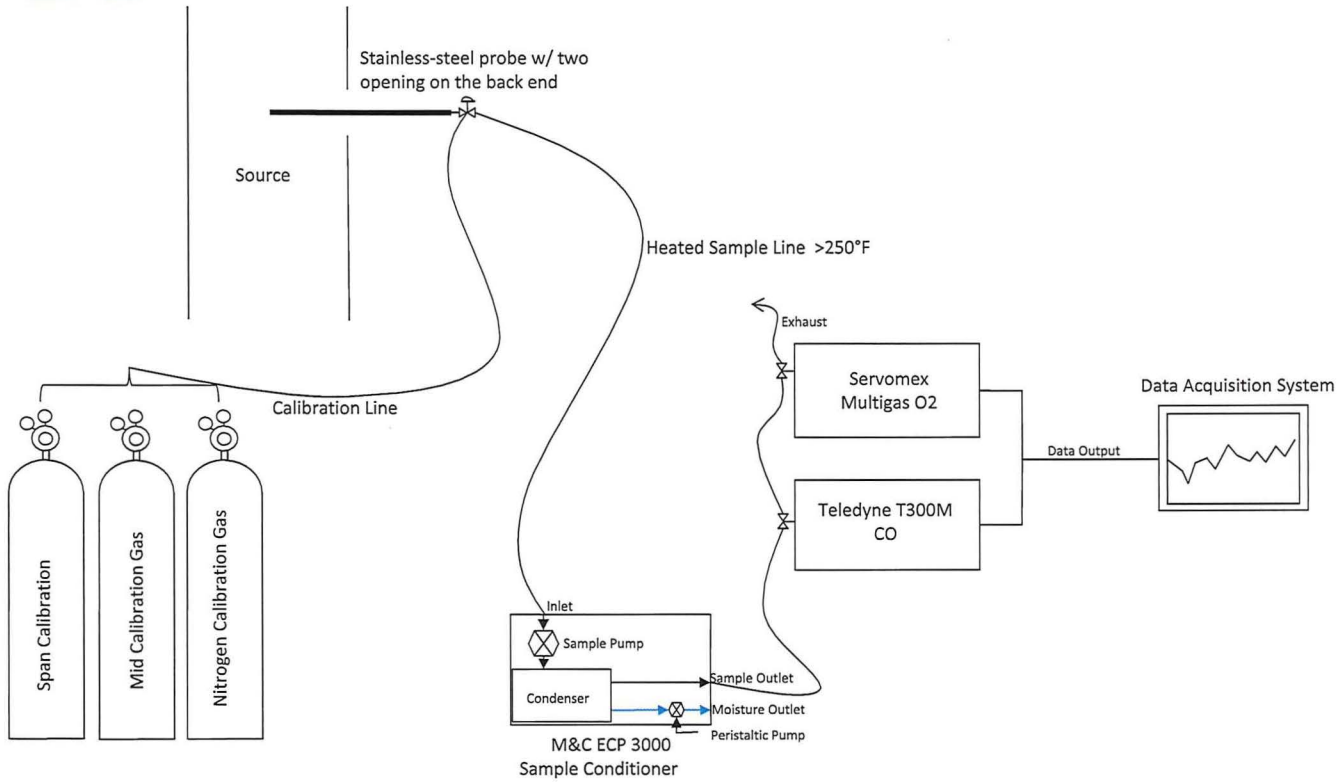
Kalamazoo, MI

Project #2401188

Figure No. 2

Date: February 20, 2024

Figure No. 3: USEPA Method 3A and 10 Schematic



USEPA Method 3A, 10

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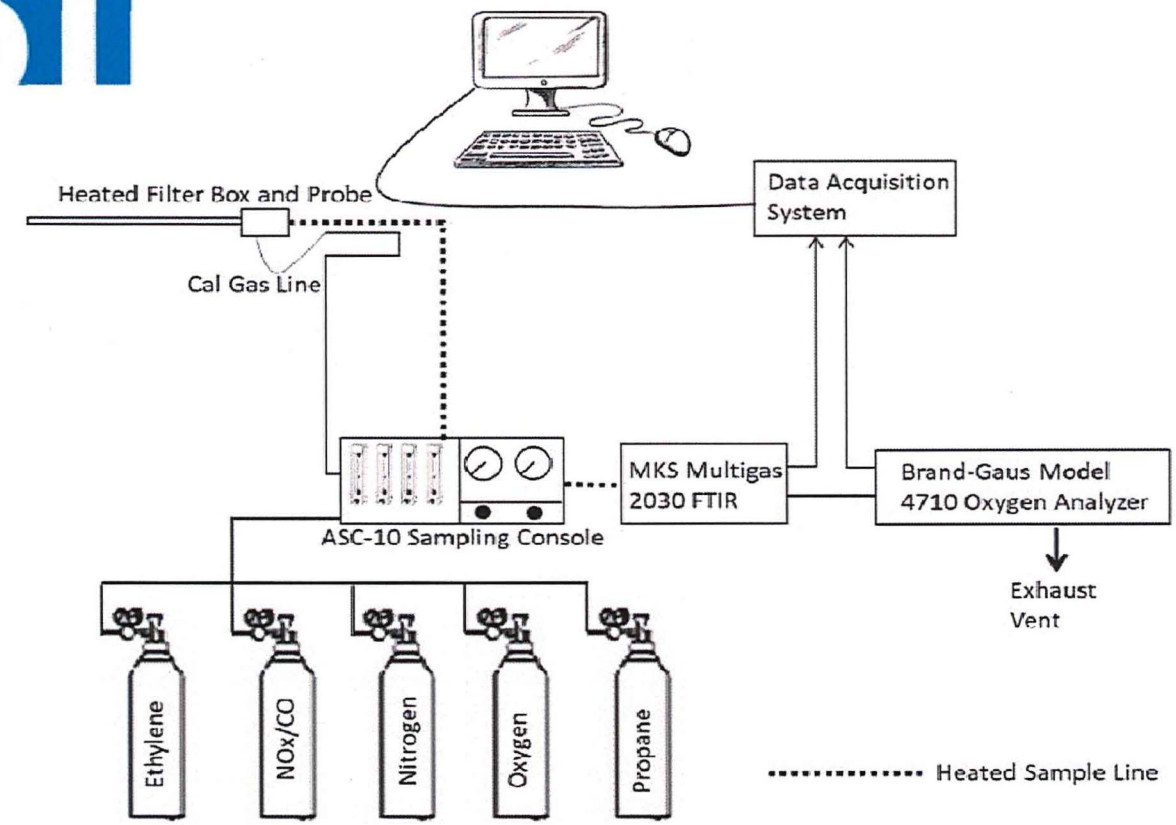
EU-ENGINE9, EU-ENGINE10

Kalamazoo, MI

Project# 2401188

Date: February 20, 2024

Figure No. 4: US EPA Method 320/3A Schematic



USEPA Method 320

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EU-ENGINE9, EU-ENGINE10

Kalamazoo, MI

Project 2401188

Date: February 20, 2024