

FINAL REPORT

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DTE ENERGY

DETROIT, MICHIGAN

MONROE POWER PLANT (MPP): EU-CASCADES SV-D3 PARTICULATE MATTER TESTING

RWDI #2305064

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SUBMITTED TO

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EXECUTIVE SUMMARY

RWDI USA LLC (RWDI) was retained by DTE Energy (DTE) to complete the emission sampling program at the Monroe Power Plant (MPP) located in Monroe, Michigan. RWDI performed particulate matter testing for particulate matter less than 2.5 microns in diameter in accordance with USEPA Method 201A (PM_{2.5} cyclone only). Triplicate 120-minute tests were conducted on the EU-CASCADES Unit 3 stack (SV-D3) of EU-CASCADES. Units SV-D2 and SV-D3 of EU-CASCADES units are considered “like” units and only one is required to be tested as described in the testing plan submitted by DTE.

Testing on SV-D3 was conducted on December 20, 2023. Testing for both units was conducted during the normal operating conditions.

Executive Table i: EU-CASCADES SV-D3 PM_{2.5} Particulate Matter Results

	Test 1	Test 2	Test 3	Average	ROP Limit
PM_{2.5} Emission Rate	0.067 lb/hr	0.075 lb/hr	0.080 lb/hr	0.074 lb/hr	5.95 lb/hr
Coal Processed	1020 tons/hr	1027 tons/hr	1028 tons/hr	1025 tons/hr	--
PM_{2.5} Emission Factor	6.57x10 ⁻⁵ lb PM / ton processed	6.21x10 ⁻⁵ lb PM / ton processed	6.62x10 ⁻⁵ lb PM / ton processed	6.47x10 ⁻⁵ lb PM / ton processed	--

Note: For gravimetric results that were below the lower detection limit of 0.5mg, the detection limit of 0.5mg was used



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1 INTRODUCTION

RWDI USA LLC (RWDI) was retained by DTE Energy (DTE) to complete the emission sampling program at the Monroe Power Plant (MPP) located in Monroe, Michigan. RWDI performed particulate matter testing for particulate matter less than 2.5 microns in diameter in accordance with USEPA Method 201A (PM2.5 cyclone only). Triplicate 120-minute tests were conducted on the EU-CASCADES Unit 3 stack (SV-D3) of EU-CASCADES. Units SV-D2 and SV-D3 of EU-CASCADES units are considered “like” units and only one is required to be tested as described in the testing plan submitted by DTE.

Testing on SV-D3 was conducted on December 20, 2023. Testing for both units was conducted during the normal operating conditions.

1.1 Location and Dates of Testing

The test program for EU-CASCADES SV-D3 was completed on December 20, 2023.

1.2 Purpose of Testing

The emissions test program is required by Michigan Department of Environment, Great Lakes, and Energy (EGLE) for DTE Monroe, SRN B2916, that operates under Permit MI-ROP-B2816-2019.

1.3 Description of Source

The Monroe Power Plant (MPP) is a DTE Facility located at 3500 East Front Street, Monroe, Michigan. The plant has four (4) coal-fired electric generating units, referred to as Units 1, 2, 3, and 4. These units were placed in service between 1971 and 1974, and have a total electric generating capacity of 3,135 megawatts (gross). The boiler (Babcock & Wilcox) for each unit is a similar supercritical pressure, pulverized coal-fired cell burner boiler. Units 1-4 exhaust into dedicated, separate stacks.

Units 1 and 4 have General Electric turbine generators, each having a current capability of 817 gross megawatts (GMW). Units 2 and 3 have Westinghouse turbine generators, each having current capability of 823 GMW.

The boiler exhausts are each equipped with Research Cottrell electrostatic precipitators (ESPs), with particulate removal efficiencies of 99.6%. There is a sulfur trioxide flue gas conditioning system on each unit that is only used on an “as needed basis” to lower the resistivity of the fly ash for better collection by the ESPs. None of the four units are equipped with sulfuric acid mist control equipment.

Coal is delivered to the plant primarily by rail car, unloaded and transferred to fuel supply. There are various coal handling stages and emissions are controlled by dust collectors.



Cascades dust collectors control emissions from coal handling in the Cascades room. Emissions are controlled by enclosures, water sprays, and/or dust suppressants and exhausted through stack IDs SV-D1-6. Stacks D2 and D3 are considered identical units and only one is required to be tested as a representative unit. DTE chose to test emissions through SV-D3.

1.4 Personnel Involved in Testing

Table 1.4.1: Testing Personnel

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Cade Smith Junior Field Technician Cade.Smith@rwdi.com		(734) 552-7270

2 SUMMARY OF RESULTS

2.1 Operating Data

Cascades dust collectors control emissions from coal handling feeding Units 1 and 2. The coal mixture and transfer rates can be found in **Appendix A**.

2.2 Applicable Permit Number

SRN B2816 operates under Permit MI-ROP-B2816-2019.



3 SOURCE DESCRIPTION

3.1 Description of Process and Emission Control Equipment

Refer to Section 1.3 for a description of the process.

3.1 Process Flow Sheet or Diagram

The EU-CASCADES SV-D3 exhausts into a single exhaust. An overall process diagram can be prepared upon request. The exhaust stack figures can be found in the **Figure Section**.

3.2 Type and Quantity of Raw and Finished Materials

The Monroe Power Plant produces electricity used throughout SE Michigan.

3.3 Normal Rated Capacity of Process

The dust collectors are designed to capture and collect particulate matter from the coal handling process and are rated to be greater than 99% efficient.

3.1 Process Instrumentation Monitored During the Test

DTE personnel monitored coal transfer rates during each test.

4 SAMPLING AND ANALYTICAL PROCEDURES

The emission test program utilized 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 3** – Determination of Molecular Weight of Dry Stack Gases (fyrte)
- **Method 4** – Determination of Moisture Content in Stack Gases
- **Method 201A** – Determination of Particulate Matter Emissions from Stationary Sources



4.1 Stack Velocity, Temperature, and Volumetric Flow Rate

The exhaust velocities and flow rates were determined following the USEPA 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 USEPA Method 2. Temperature measurements were made simultaneously with the velocity measurements and will be 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 USEPA Method 3, "Determination of Molecular Weight of Dry Stack Gas". Stack moisture content was determined through direct condensation and according to USEPA Method 4, "Determination of Moisture Content of Stack Gas". Moisture was collected during each of the Particulate Matter tests.

4.2 Particulate Matter and Condensable Particulate Matter

Particulate matter (PM_{2.5}) was sampled following procedures outlined in USEPA Method 201A. Testing was complete using an isokinetic constant sample rate. Particulate matter was collected in the PM_{2.5} cyclone head and on a stack-conditioned filter. Since the filtration temperature did not exceed 85°F, Method 202 was not followed for recovery of condensable particulate matter.

Method 201A acetone rinse and filters were analyzed by RWDI's inhouse laboratory.

4.3 Description of Recovery and Analytical Procedures

All sample recovery and analytical procedures following the prescribed methods of USEPA Method 1 to 201A.

4.4 Sampling Port Description

All sampling ports meet USEPA Method 1 and can be found in the **Figure Section**.



5 TEST RESULTS

The detailed results can be found in **Appendix B**.

5.1 Results

Table 5.1: EU-CASCADES SV-D3 PM_{2.5} Particulate Matter Results

	Test 1	Test 2	Test 3	Average	ROP Limit
PM_{2.5} Emission Rate	0.067 lb/hr	0.075 lb/hr	0.080 lb/hr	0.074 lb/hr	5.95 lb/hr
Coal Processed	1020 tons/hr	1027 tons/hr	1028 tons/hr	1025 tons/hr	--
PM_{2.5} Emission Factor	6.57x10 ⁻⁵ lb PM / ton processed	6.21x10 ⁻⁵ lb PM / ton processed	6.62x10 ⁻⁵ lb PM / ton processed	6.47x10 ⁻⁵ lb PM / ton processed	--

Note: For gravimetric results that were below the lower detection limit of 0.5mg, the detection limit of 0.5mg was used

5.2 Variations in Testing Procedures

There were no variations in testing.

5.3 Process Upset Conditions During Testing

There were normal process breaks during production.

5.4 Maintenance Performed in Last Three Months

Only routine general maintenance was performed in the last three (3) months.

5.5 Re-Test

This was not a re-test.

5.6 Audit Samples

This test did not require any audit samples.

5.7 Process Data

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



5.8 Particulate, Flows and Moisture

Results can be found in **Appendix B**.

5.9 Calibration Data

Calibration can be found in **Appendix C**.

5.10 Example Calculations

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

5.11 Field Notes

Field Notes can be found in **Appendix E**.

5.12 Laboratory Data

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

TABLES



Table 1: Summary of Sampling Parameters and Methodology

Source Location	No. of Tests per Stack	Sampling Parameter	Sampling Method
DC3A	3	Velocity, Temperature and Flow Rate	U.S. EPA [1] Methods 1-4
	3	Oxygen, Carbon Dioxide	U.S. EPA [1] Method 3
	3	PM2.5	U.S. EPA [1] Method 201A

Notes:

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

Table 2: Sampling Summary and Sample Log

Source and Test #	Sampling Date	Start Time	End Time
DC3A			
Test #1	20-Dec-23	9:33	11:31
Test #2	20-Dec-23	12:44	14:41
Test #3	20-Dec-23	16:45	18:45

Table 3: Sampling Summary - Flow Characteristics - DC3A

3TH-9 Dust Collector		Test No. 1	Test No. 2	Test No. 3	TOTAL AVERAGE
Test Date		20-Dec-23	20-Dec-23	20-Dec-23	-
Stack Temperature	°F	57	59	60	59
Moisture	%	1.7%	1.5%	1.6%	1.6%
Velocity	ft/s	41.8	41.7	42.7	42.0
Referenced Flow Rate	CFM	24,924	24,761	25,347	25,010
Isokinetic Rate	%	106.0	106.0	104.0	105.3

Notes:

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

Table 4: Summary of PM_{2.5} Results
DTE Monroe Power Point - SV-D3

Source: SV-D3

Parameter	Test #1			Test #2			Test #3			AVERAGE RESULTS	
	Lab Data (mg)	Concentration (gr./dscf)	Emission Rate (lb/hr)	Lab Data (mg)	Concentration (gr./dscf)	Emission Rate (lb/hr)	Lab Data (mg)	Concentration (gr./dscf)	Emission Rate (lb/hr)	Concentration (gr./dscf)	Emission Rate (lb/hr)
Total PM2.5 (no blank corrections)	1.0	0.00033	0.070	1.1	0.00036	0.077	1.2	0.00039	0.084	0.0004	0.077
Total PM2.5 (with blank corrections)	1.0	0.00031	0.067	1.1	0.00035	0.075	1.1	0.00037	0.080	0.0003	0.074

Notes:

[1] Sample volume and volumetric flow rate based on dry referenced conditions (101.325 kPa and 293.15 K)
 "c" indicates that laboratory results were below the detection limit. The detection limit was used to calculate the concentration and emission rate.
 Concentration and Emission Rate has been reported to 3 significant figures.

SV-D3 - Test 1

DTE Monroe Power Plant

Table 5a: Summary of PM_{2.5} Mass Gains with Blank Corrections (Reported Values)

Particulate Weight Gains	<2.5µm	Filter (<2.5µm)
particulate weight gains (mg) (no blank corrections)	0.50	0.50

201A Blank Corrections Data	<2.5µm	Filter (<2.5µm)
Acetone Sample Recovery Volume (mL):	50	N/A
Density of Acetone (g/mL)	0.784	N/A
Acetone Sample Recovery Mass (g):	39.2	N/A
Allowable Correction Factor (0.0001%) (mg):	0.0392	N/A

Total PM2.5 Fraction (blank corrected): mg

Total PM2.5 Fraction (no blank corrections):

1.00 mg

*Reference conditions: 68°F, 29.92 in. Hg or 20°C, 101.3 KPa

SV-D3 - Test 2

DTE Monroe Power Plant

Table 5b: Summary of PM_{2.5} Mass Gains with Blank Corrections (Reported Values)

Particulate Weight Gains		<2.5µm	Filter (<2.5µm)
particulate weight gains (mg) (no blank corrections)		0.50	0.60

201A Blank Corrections Data		<2.5µm	Filter (<2.5µm)
Acetone Sample Recovery Volume (mL):		50	N/A
Density of Acetone (g/mL)		0.784	N/A
Acetone Sample Recovery Mass (g):		39.2	N/A
Allowable Correction Factor (0.0001%) (mg):		0.0392	N/A

Total PM2.5 Fraction (blank corrected): mg

Total PM2.5 Fraction (no blank corrections):

1.10 mg

*Reference conditions: 68°F, 29.92 in. Hg or 20°C, 101.3 KPa

SV-D3 - Test 3

DTE Monroe Power Plant

Table 5c: Summary of PM_{2.5} Mass Gains with Blank Corrections (Reported Values)

Particulate Weight Gains	<2.5µm	Filter (<2.5µm)
particulate weight gains (mg) (no blank corrections)	0.50	0.70

201A Blank Corrections Data	<2.5µm	Filter (<2.5µm)
Acetone Sample Recovery Volume (mL):	75	
Density of Acetone (g/mL)	0.784	
Acetone Sample Recovery Mass (g):	58.8	N/A
Allowable Correction Factor (0.0001%) (mg):	0.0588	N/A

Total PM2.5 Fraction (blank corrected): mg

Total PM2.5 Fraction (no blank corrections):

1.20 mg

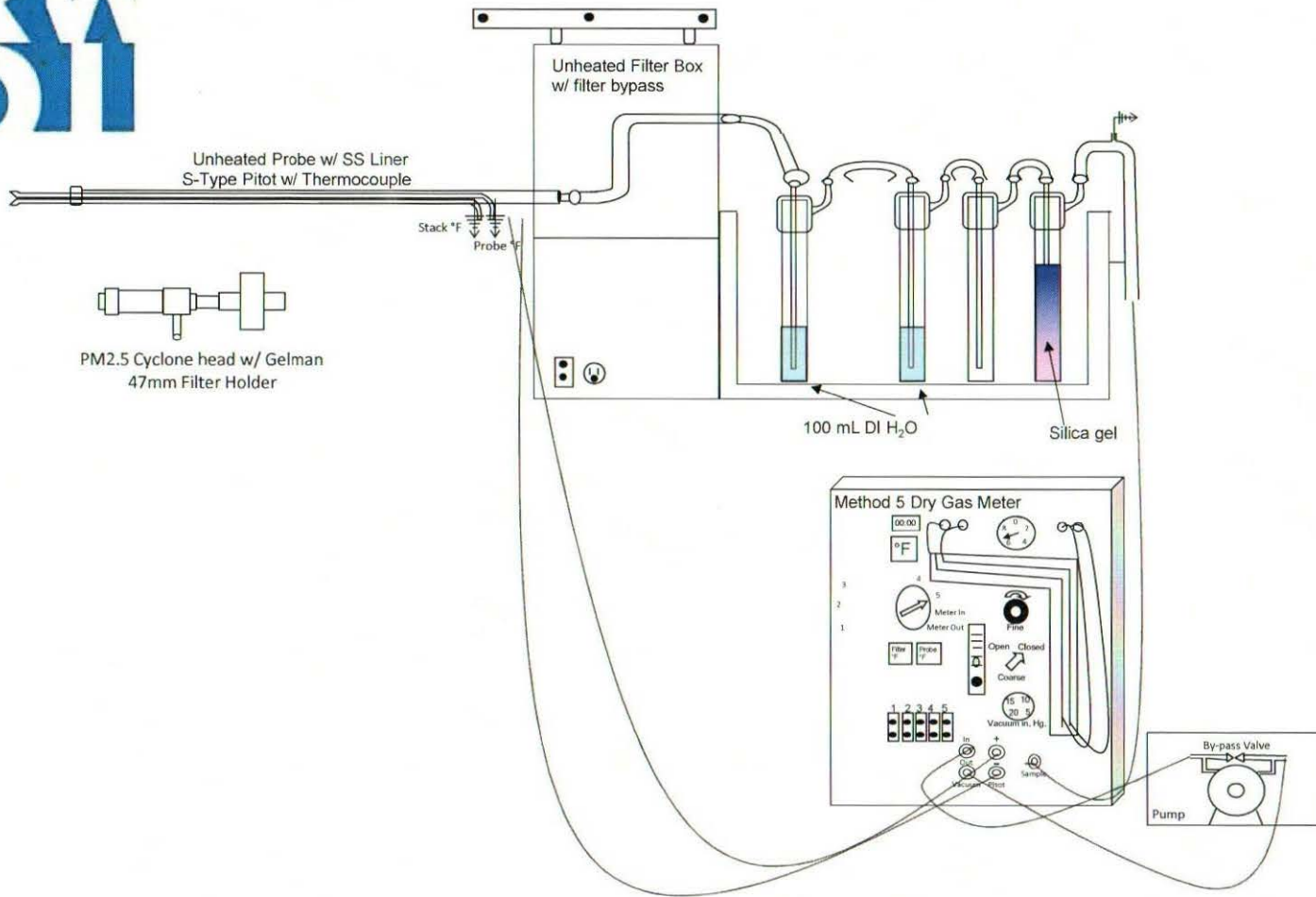
*Reference conditions: 68°F, 29.92 in. Hg or 20°C, 101.3 KPa

FIGURES





Figure No. 2: USEPA Method 201A



USEPA Method 201A

DTE Monroe Power Plant
DC3A
Monroe, Michigan

Project# 2305064

20-Dec-23

