

FINAL REPORT



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RIVERVIEW ENERGY SYSTEMS, LLC

RIVERVIEW, MICHIGAN

SOURCE TESTING REPORT: EURNGOPENFLARE

RWDI #2401318

March 13, 2024

SUBMITTED TO

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EXECUTIVE SUMMARY

RWDI USA LLC (RWDI) was retained by Riverview Energy Systems, LLC to complete the emission sampling program at their facility located in Riverview, Michigan. The purpose of the emissions test program was to satisfy the testing requirements under Flexible Group (FG) FGRNGOPENFLARE-OOO under State of Michigan Renewable Operating Permit (ROP) MI-ROP-M4469-2023 noted as:

1. The permittee must verify visible emissions from EURNGOPENFLARE, by testing at owner's expense, in accordance with Department requirements. Testing must be performed using an approved USEPA Method 22 listed in 40 CFR Part 60, Appendix A. No less than 30 days prior to testing, the permittee must submit a complete test plan to the AQD Technical Programs Unit and the appropriate District Office. The AQD must approve the final plan prior to testing. The permittee must submit a complete report of the test results to the AQD Technical Programs Unit and the appropriate District Office within 60 days following the last date of the test. (R 336.1213(3), R 336.2001, R 336.2003, R 336.2004, 40 CFR 60.18(f))
2. The permittee must verify the following:
 - a. The net heating value of the gas being combusted in the flare must be calculated and recorded using the equation provided in Appendix 7-1. (40 CFR 60.18(f)(3))
 - b. The exit velocity for non-assisted flares as determined by the methods provided in Appendix 7-1. (40 CFR 60.18(f)(5) and (6))
3. Within 180 days of permit issuance, the permittee must verify visible emissions, the net heating value, and exit velocity from EURNGOPENFLARE and at a minimum, every five years from the date of the last test, thereafter. (R 336.1213(3), R 336.2001, R 336.2003, R 336.2004, 40 CFR 60.18(f)).

Table i: EURNGOPENFLARE Results

Parameter	EURNGOPENFLARE			
	Test 1	Test 2	Test 3	Average
Net Heating Value	517.9 BTU/ft ³ 0.0155 MJ/scm	536.7 BTU/ft ³ 0.0160 MJ/scm	542.5 BTU/ft ³ 0.0162 MJ/scm	532.4 BTU/ft ³ 0.0159 MJ/scm
Methane Concentration	56.58%	58.35%	58.89%	57.94%
Exit Velocity	8.11 m/s 26.6 ft/s	8.11 m/s 26.6 ft/s	8.11 m/s 26.6 ft/s	8.11 m/s 26.6 ft/s
Visible Emissions	0%	0%	0%	0%
Temperature of Flare	Temp A – 1207°F Temp B – 1339°F	Temp A – 1172°F Temp B – 1401°F	Temp A – 1250°F Temp B – 1422°F	Temp A – 1210°F Temp B – 1387°F
Landfill Gas Flow Rate	1805 scfm	1713 scfm	1718 scfm	1745 scfm



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1 INTRODUCTION

RWDI USA LLC (RWDI) was retained by Riverview Energy Systems, LLC to complete the emission sampling program at their facility located in Riverview, Michigan. The purpose of the emissions test program was to satisfy the testing requirements under Flexible Group (FG) FGRNGOPENFLARE-000 under State of Michigan Renewable Operating Permit (ROP) MI-ROP-M4469-2023 noted as:

1. The permittee must verify visible emissions from EURNGOPENFLARE, by testing at owner's expense, in accordance with Department requirements. Testing must be performed using an approved USEPA Method 22 listed in 40 CFR Part 60, Appendix A. No less than 30 days prior to testing, the permittee must submit a complete test plan to the AQD Technical Programs Unit and the appropriate District Office. The AQD must approve the final plan prior to testing. The permittee must submit a complete report of the test results to the AQD Technical Programs Unit and the appropriate District Office within 60 days following the last date of the test. (R 336.1213(3), R 336.2001, R 336.2003, R 336.2004, 40 CFR 60.18(f))
2. The permittee must verify the following:
 - a. The net heating value of the gas being combusted in the flare must be calculated and recorded using the equation provided in Appendix 7-1. (40 CFR 60.18(f)(3))
 - b. The exit velocity for steam-assisted, air-assisted, or non-assisted flares as determined by the methods provided in Appendix 7-1. (40 CFR 60.18(f)(5) and (6))
3. Within 180 days of permit issuance, the permittee must verify visible emissions, the net heating value, and exit velocity from EURNGOPENFLARE and at a minimum, every five years from the date of the last test, thereafter. (R 336.1213(3), R 336.2001, R 336.2003, R 336.2004, 40 CFR 60.18(f)).

1.1 Location and Dates of Testing

The test program was completed on January 23, 2024.

1.2 Purpose of Testing

This testing was conducted to show compliance with MI-ROP-M4469-2023 under Flexible Group (FG) FGRNGOPENFLARE-000.

1.3 Description of Source

Open (non-enclosed) flare is an open combustor without enclosure or shroud (EURNGOPENFLARE).



1.4 Personnel Involved in Testing

Table 1.4.1: Testing Personnel

<p>Maureen Bennett Maureen.Bennett@dteenergy.com</p>	<p>Riverview Energy Systems, LLC 20000 Grange Road Riverview, MI 48193</p>	(734) 834-0005
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<p>Brad Bergeron Technical Director Brad.Bergeron@rwdi.com</p>		(248) 234-3885
<p>Michael Nummer Senior Field Technician Michael.Nummer@rwdi.com</p>		(248) 841-8442
<p>Cade Smith Field Technician Cade.smith@rwdi.com</p>		

2 SOURCE DESCRIPTION

2.1 Description of Process and Emission Control Equipment

Open (non-enclosed) flare is an open combustor without enclosure or shroud (EURNGOPENFLARE).

EURNGOPENFLARE is a control device for landfill gas or off-specification renewable natural gas.

2.2 Process Flow Sheet or Diagram (if applicable)

A process flow diagram can be supplied upon request.

2.3 Type and Quantity of Raw and Finished Materials

The raw material used in this process is landfill gas.

2.4 Normal Rated Capacity of Process

A 6,000 scfm flare that burns landfill gas or off-specification renewable natural gas during start-up, shut-down, malfunctions of the Renewable Gas Plant or when the gas is not pipeline quality.



2.5 Process Instrumentation Monitored During the Test

See section 2.1.

2.6 Operating Parameters

Process data is provided in **Appendix A** and contains the following:

- Flare Combustion Temperature
- Landfill gas or RNG flow rate

3 APPLICABLE PERMIT

The facility operates under Renewable Operating Permit (ROP) MI-ROP-M4469-2023

Table 3.1: Summary of Permit Limits

Parameter	Permit Limits
	EURNGOPENFLARE
Visible Emissions	No visible emissions from EURNGOPENFLARE except for periods not to exceed a total of 5 minutes during any 2 consecutive hours
Net Value	--
Exit Velocity	--

4 SAMPLING AND ANALYSIS PROCEDURES

Table 4.1: Summary of Testing Methodologies

Parameter	Method	Analytical Method
Exit Velocity	ROP Calculation Method Calculated as per ROP Appendix 7-1 Non-Assisted	Calculation Method
Net Heating Value	ASTM D-3588	Evacuated canister sampling
Visual Emissions	USEPA Method 22	Visual Emissions

ASTM D-3588 – Standard Practice for Calculating Heat Value, Compressibility Factor, and Relative Density of Gaseous Fuels

USEPA Method 22 – Visual Determination of Fugitive Emissions from Material Sources and Smoke Emissions from Flares



4.1 Exit Velocity Determination from EUOPENFLARE

Exit velocity was determined using the following calculations as outlined in Appendix 7-1 of the ROP.

Calculation for Vmax non-assisted flares.

The maximum permitted velocity, Vmax, for flares complying with 40 CFR 60.18(c)(4)(iii) shall be calculated and recorded using the equation provided in 40 CFR 60.18(f)(5). (40 CFR 60.18(f)(5)).

$$\text{Log}_{10}(\text{Vmax}) = (\text{HT} + 28.8) / 31.7$$

Where:

Vmax = Maximum permitted velocity, M/sec

28.8 = Constant

31.7 = Constant

HT = The net heating value as determined in 60.18(f)(3).

4.1 Net Heating Value from EURNGOPENFLARE

Three (3) tests of 60-minutes in duration were conducted on the EURNGOPENFLARE inlet (gas prior to combustion). A pre-evacuated canister was used to draw a sample from the inlet fuel source to the open flare. The canisters were sent to a laboratory for analysis for net heating value by ASTM D-3588. In addition, three (3) canisters were collected for gas constituents including methane.

4.2 Visible Emissions from EUOPENFLARE

Visual emissions from EURNGOPENFLARE were taken following USEPA Method 22. Three (3) 60-minute periods were observed for Visible Emissions (VE).

5 TEST RESULTS AND DISCUSSION

5.1 Discussion of Results

Table 5.1.1 summarizes the results from the testing and provides the maximum velocity based on the Net Heating Value of the landfill gas to EURNGOPENFLARE.



Table 5.1.1: EURNOPENFLARE Results

Parameter	EURNOPENFLARE			
	Test 1	Test 2	Test 3	Average
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Landfill Gas Flow Rate	1805 scfm	1713 scfm	1718 scfm	1745 scfm

5.2 Variations in Testing Procedures

There were no variations in testing procedures.

5.3 Process Upset Conditions During Testing

There were normal process breaks during production.

5.4 Maintenance Performed in Last Three Months

Regular maintenance is performed monthly.

5.5 Re-Test

This was not a retest.

5.6 Audit Samples

This test did not require any audit samples.

5.7 Laboratory Data

Laboratory data is provided in **Appendix B**.



5.8 Field Data Sheets

Visible Emissions Field data sheets can be found in **Appendix C**.

5.9 Calibration Data

Not applicable for program.

5.10 Example Calculations

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