



**Consumers Energy**

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# 40 CFR Part 63, Subpart HHH Compliance Test Report

## EUGLYCDEHY

Consumers Energy Company  
Muskegon River Compressor Station  
8613 Pine Road  
Marion, MI 49665  
SRN: N2901

February 23, 2024

**Test Date: January 30, 2024**

Test Performed by the Consumers Energy Company  
Regulatory Compliance Testing Section  
Air Emissions Testing Body  
Laboratory Services Section  
Work Order No. 42683479

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## EXECUTIVE SUMMARY

Consumers Energy Regulatory Compliance Testing Section (RCTS) conducted air emissions testing for benzene, toluene, ethylbenzene, and xylene (BTEX) on January 30, 2024 at the exhaust of the thermal oxidizer controlling emissions from the small glycol dehydration system installed and operating at the Muskegon River Compressor Station in Marion, Michigan.

The glycol dehydration system processes natural gas, upon withdrawal from underground storage reservoirs, using triethylene glycol (TEG) to remove impurities and water. The glycol dehydrator, equipped with a thermal oxidizer for VOC emissions control, is identified as EUGLYCDEHY within the Michigan Department of Environment, Great Lakes and Energy (EGLE) renewable operating permit (ROP) MI-ROP-N2901-2020 and is subject to National Emission Standards for Hazardous Air Pollutants (NESHAP) from Natural Gas Transmission and Storage Facilities, 40 CFR Part 63, Subpart HHH.

The performance test was conducted to evaluate if the thermal oxidizer meets the requirements of §63.1281(f)(1). Specifically, the testing:

- 1) Evaluated compliance of the EUGLYCDEHY system by comparing the emissions with the unit specific BTEX emission limit calculated using Equation 1 of 40 CFR Part 63, Subpart HHH:

$$EL_{BTEX} = 3.10 \times 10^{-4} \frac{g}{m^3 - ppmv} \times \text{Throughput} \frac{m^3}{day} \times C_{i,BTEX} ppmv \times 365 \frac{days}{yr} \times \frac{1 Mg}{1 \times 10^6 grams}$$

Where:

$EL_{BTEX}$	=	unit specific BTEX emission limit, Mg/yr
$3.10 \times 10^{-4}$	=	BTEX limit, g/m <sup>3</sup> -ppmv
Throughput	=	annual average daily natural gas throughput, m <sup>3</sup> /day
$C_{i,BTEX}$	=	annual average BTEX concentration of the natural gas at the inlet to the glycol dehydration unit, ppmv

The BTEX emission limit is based on the 2014 annual average of natural gas throughput and BTEX concentration measurements as 40 CFR Part 63, Subpart HHH rule revisions became effective in 2015. The unit specific BTEX emission limit evaluated is:

$$EL_{BTEX} = 3.10 \times 10^{-4} \frac{g}{m^3 - ppmv} \times 1,914,866 \frac{m^3}{day} \times 31 ppmv \times 365 \frac{days}{yr} \times \frac{1 Mg}{1 \times 10^6 grams}$$

$$EL_{BTEX} = 6.7 \frac{Mg}{year}$$

- 2) Re-establish the minimum combustion chamber temperature at which thermal oxidizer EUGLYCDEHY must maintain to achieve continuous compliance.

This subsequent periodic performance test program met the NESHAP §63.1282(d)(3)(vi)(B) requirement of *no longer than 60 months following the previous periodic performance test* timing specification as the previous performance test was conducted on December 3, 2019.

Triplicate 60-minute test runs were conducted in accordance with the approved test protocol following United States Environmental Protection Agency (USEPA) 40 CFR Part 60, Appendix A Reference Methods (RM) 1, 2, 3A, ALT-008, and 18. Because the exhaust stack lacked perpendicular sampling ports, flue gas velocity was measured from a single sample port.

The results summarized in Table E-1 indicate the EUGLYCDEHY source is operating in compliance with the applicable BTEX emission limit and established a new minimum thermal oxidizer combustion zone temperature of 1,170°F.

**Table E-1**  
**Summary of Test Results**

<b>Source Name</b>	<b>BTEX Compound Concentration (ppmvd)</b>	<b>BTEX Emission Rate (Mg/year)</b>	<b>BTEX Emission Limit (Mg/year)<sup>1</sup></b>	<b>Combustion Chamber Temperature (°F)</b>
<b>EUGLYCDEHY</b>	2.61	0.04	6.7	1,170
<sup>1</sup> BTEX emission limit was calculated as required per §63.1275(b)(1)(iii), Equation 1 – Refer to Appendix A				

Detailed results are presented in Appendix Table 1. Sample calculations, field data sheets, and laboratory data are presented in Appendices A, B, and C. System operating data and supporting documentation are provided in Appendices D and E.

## 1.0 INTRODUCTION

This report summarizes the results of compliance air emissions testing conducted January 30, 2024 at the exhaust stack of the thermal oxidizer EUGLYCDEHY serving the small glycol dehydration unit installed and operating at the Muskegon River Compressor Station in Marion, Michigan.

This document is compiled using the Michigan Department of Environment, Great Lakes and Energy (EGLE) reference document *Format for Submittal of Source Emission Test Plans and Reports*, dated November 2019. Reproducing portions of this document may cause omissions or contextual misinformation to occur. If any portion is reproduced, please exercise due care in this regard.

### 1.1 IDENTIFICATION, LOCATION, AND DATES OF TESTS

The small glycol dehydration unit described within EGLE renewable operating permit (ROP) MI-ROP-N2901-2020 is identified as EUGLYCDEHY. The testing was performed on January 30, 2024.

A test protocol was submitted to EGLE on November 30, 2023, describing compliance test objectives and quality assurance, and was subsequently approved by Daniel Droste, EGLE Environmental Quality Analyst, in a letter dated January 22, 2024. This test program was performed in accordance with the test protocol; however, because the exhaust stack lacked perpendicular sampling ports, flue gas velocity was measured from a single sample port.

### 1.2 PURPOSE OF TESTING

The performance test was conducted to evaluate if the thermal oxidizer meets the requirements of §63.1281(f)(1). Specifically, the testing:

- 1) Evaluated compliance of the EUGLYCDEHY system by comparing emissions with the unit specific BTEX emission limit calculated using Equation 1 of 40 CFR Part 63, Subpart HHH:

$$EL_{BTEX} = 3.10 \times 10^{-4} \frac{g}{m^3 - ppmv} \times \text{Throughput} \frac{m^3}{day} \times C_{i,BTEX} ppmv \times 365 \frac{days}{yr} \times \frac{1 Mg}{1 \times 10^6 grams}$$

Where:

$EL_{BTEX}$	=	unit specific BTEX emission limit, Mg/yr
$3.10 \times 10^{-4}$	=	BTEX limit, g/m <sup>3</sup> -ppmv
Throughput	=	annual average daily natural gas throughput, m <sup>3</sup> /day
$C_{i,BTEX}$	=	annual average BTEX concentration of the natural gas at the inlet to the glycol dehydration unit, ppmv

The BTEX emission limit is based on the 2014 annual average of natural gas throughput and BTEX concentration measurements as 40 CFR Part 63, Subpart HHH rule revisions became effective in 2015. The unit specific BTEX emission limit evaluated is:

$$EL_{BTEX} = 3.10 \times 10^{-4} \frac{g}{m^3 - ppmv} \times 1,914,866 \frac{m^3}{day} \times 31 ppmv \times 365 \frac{days}{yr} \times \frac{1 Mg}{1 \times 10^6 grams}$$

$$EL_{BTEX} = 6.7 \frac{Mg}{year}$$

- 2) Re-establish the minimum combustion chamber temperature at which thermal oxidizer EUGLYCDEHY must maintain to achieve continuous compliance.

This subsequent periodic performance test program met the NESHAP §63.1282(d)(3)(vi)(B) requirement of *no longer than 60 months following the previous periodic performance test* timing specification as the previous performance test was conducted on December 3, 2019.

The applicable emission limit is presented in Table 1-1. Refer to Appendix D for laboratory analysis of the natural gas at the inlet of the glycol dehydration unit.

**Table 1-1  
Applicable Emission Limits**

Source	40 CFR 63.1275(b)(1)(iii)			
	Parameter	Throughput (scm/day)	C <sub>i,BTEX</sub> (ppmv)	EL <sub>BTEX</sub> (Mg/year)
EUGLYCDEHY	BTEX	1,914,866	31.0	6.7
Throughput scm/day	Annual average facility wide natural gas throughput Standard cubic meters per day			
C <sub>i,BTEX</sub>	Annual average BTEX concentration of the natural gas at the inlet to the glycol dehydration unit, ppmv			
EL <sub>BTEX</sub> Mg/year	Unit-specific BTEX emission limit Megagrams per year			

### 1.3 BRIEF DESCRIPTION OF SOURCE

The Muskegon River Compressor Station maintains natural gas pipeline pressure in order to move gas in and out of storage reservoirs and along the pipeline system. Excess moisture in natural gas is removed by injecting the gas into a contact tower with active counter current lean triethylene glycol (TEG). The TEG absorbs the moisture and the dry gas exits the top of the absorption column for routing to pipeline systems, while moisture-rich TEG is fed to a flash vessel to remove hydrocarbon vapors and skim liquid hydrocarbons. The TEG is then heated in a reboiler and directed to a regenerator/separator column to remove excess water and restore purity. Remaining hydrocarbon vapors in the flash vessel or regenerator are routed to the thermal oxidizer for control prior to discharge to the atmosphere.

### 1.4 CONTACT INFORMATION

Table 1-2 presents the names, addresses, and telephone numbers of the contacts for information regarding the test and the test report, and names and affiliation of personnel involved in conducting the testing.

**Table 1-2  
Contact Information**

<b>Program Role</b>	<b>Contact</b>	<b>Address</b>
EPA Regional Contact	Compliance Tracker, ECA-18J Air Enforcement and Compliance Assurance Branch	U.S. EPA Region 5 77 W. Jackson Blvd. Chicago, Illinois 60604
EGLE AQD - Technical Programs Unit Supervisor	Jeremy Howe Technical Programs Unit Environmental Manager 517-878-6687 <a href="mailto:howej1@michigan.gov">howej1@michigan.gov</a>	EGLE Technical Programs Unit 525 W. Allegan, Constitution Hall, 2nd Floor S Lansing, Michigan 48933
EGLE AQD - Technical Programs Unit Inspector	Daniel Droste Environmental Quality Analyst 989-225-6052 <a href="mailto:drosted3@michigan.gov">drosted3@michigan.gov</a>	EGLE AQD - Bay City District 401 Ketchum Street, Suite B Bay City, Michigan 48708
EGLE AQD - District Inspector	Nathanael Gentle Environmental Quality Analyst 989-894-6219 <a href="mailto:gentlen@michigan.gov">gentlen@michigan.gov</a>	EGLE AQD - Bay City District 401 Ketchum Street, Suite B Bay City, Michigan 48708
Responsible Official	Avelock Robinson Director Gas Compression Operations 586-716-3326 <a href="mailto:avelock.robinson@cmsenergy.com">avelock.robinson@cmsenergy.com</a>	Consumers Energy Company St. Clair Compressor Station 10021 Marine City Highway Ira, Michigan 48023
Corporate Air Quality Contact	Amy Kapuga Principal Environmental Engineer 517-788-2201 <a href="mailto:amy.kapuga@cmsenergy.com">amy.kapuga@cmsenergy.com</a>	Consumers Energy Company Environmental Services Department 1945 West Parnall Road Jackson, Michigan 49201
Field Manager	Janet Simon Manager of Gas Compression 989-466-4215 <a href="mailto:janet.simon@cmsenergy.com">janet.simon@cmsenergy.com</a>	Consumers Energy Company Lansing Service Center (LAN-131B-NOA) 530 W. Willow Avenue Lansing, Michigan 48906
Field Leader	Dawn Biering Supervisor Gas Compression 231-743-4101 <a href="mailto:dawn.biering@cmsenergy.com">dawn.biering@cmsenergy.com</a>	Consumers Energy Company Muskegon River Compressor Station 8613 Pine Road Marion, Michigan 49665
Field Environmental Coordinator	Janet Zondlak Manager Environmental Compliance 616-738-3702 <a href="mailto:janet.zondlak@cmsenergy.com">janet.zondlak@cmsenergy.com</a>	Consumers Energy Company Marion Production (MCS-100A-REM) 7950 Partridge Ave. Marion, Michigan 49665
Test Team Representative	Thomas Schmelter, QSTI Sr. Engineering Technical Analyst 616-738-3234 <a href="mailto:thomas.schmelter@cmsenergy.com">thomas.schmelter@cmsenergy.com</a>	Consumers Energy Company L&D Training Center 17010 Croswell Street West Olive, Michigan 49460
Laboratory	David Myers Jr. Project Manager 919-850-4392 <a href="mailto:david.myers@enthalpy.com">david.myers@enthalpy.com</a>	Enthalpy Analytical 800-1 Capitola Dr. Durham, North Carolina 27713



## 2.0 SUMMARY OF RESULTS

### 2.1 OPERATING DATA

Operating data collected during the test runs included thermal oxidizer combustion chamber temperature (°F), fuel gas usage (Mcf/d), dry natural gas processing rate (MMscfd), dry gas water content (lbs H<sub>2</sub>O/MMscf), wet gas water content (lbs H<sub>2</sub>O/MMscf), and the glycol recirculation rate (gpm). Refer to Appendix D for detailed operating data.

### 2.2 APPLICABLE PERMIT INFORMATION

The Muskegon River Compressor Station, State of Michigan Registration Number (SRN) N2901, operates in accordance with air emissions permit MI-ROP-N2901-2020, which identifies EUGLYCDEHY as an existing, small glycol dehydration unit, which is subject to compliance evaluations specific to 40 CFR Part 63, Subpart HHH §63.1275(b)(1)(iii).

### 2.3 RESULTS

The results summarized in Table 2-1 indicate the EUGLYCDEHY source is operating in compliance with the applicable emission limits while establishing a new minimum thermal oxidizer combustion zone temperature of 1,170°F.

**Table 2-1**  
**Summary of Test Results**

Source Name	BTEX Compound Concentrations (ppmvd)	BTEX Emission Rate (Mg/year)	BTEX Emission Limit (Mg/year) <sup>1</sup>	Combustion Chamber Temperature (°F)
EUGLYCDEHY	2.61	0.04	6.7	1,170

<sup>1</sup> BTEX emission limit was calculated as required per §63.1275(b)(1)(iii), Equation 1 – Refer to Appendix A

Detailed results are presented in Appendix Table 1. A discussion of the results is presented in Section 5.0. Sample calculations, field data sheets, and laboratory results are presented in Appendices A, B, and C. Operating data and supporting information are provided in Appendices D and E.

## 3.0 SOURCE DESCRIPTION

EUGLYCDEHY is a glycol dehydration system used to remove excess moisture from natural gas that is withdrawn from underground storage reservoirs. The dehydrator is equipped with a thermal oxidizer used to control VOCs and hazardous air pollutant (HAP) emissions.

### 3.1 PROCESS

The Muskegon River Compressor Station maintains the pressure of natural gas to transport the gas in and out of storage reservoirs and along the pipeline system. The glycol dehydration unit installed at the Muskegon River Compressor Station is used to remove moisture from the natural gas withdrawn from underground storage reservoirs to meet State of Michigan pipeline gas quality specifications.

### 3.2 PROCESS FLOW

Liquid glycol flows down through four section of trays with bubble caps to allow gas to rise through the TEG. The withdrawn natural gas is routed up through the tower(s) where the glycol absorbs water and other impurities. After exiting the glycol contact tower(s), the natural gas is compressed and/or transported into the natural gas pipeline conveyance system.

The rich, or "dirty," glycol that contains water and impurities accumulates at the bottom of the contact tower where it is pumped through separator and filter systems prior to entering the glycol regeneration systems. The regeneration systems utilize a reboiler unit to evaporate water and other impurities from the rich glycol. The resulting lean, or "clean," glycol is recirculated into the glycol contact towers.

The moisture removed by the EUGLYCDEHY reboiler exits as vapor effluent. The effluent is directed to the thermal oxidizer for emissions control. A summary of the thermal oxidizer control device specifications is provided in Table 3-1.

**Table 3-1**  
**Summary of Thermal Oxidizer Specifications**

Parameter <sup>1</sup>	EUGLYCDEHY
Type	Forced - Draft
Fuel	Natural Gas
Maximum Throughput	450 MMscfd
Combustion Chamber Residence Time	> 1 second
Combustion Chamber Temperature <sup>2</sup>	≥ 1,170°F
Destruction Efficiency	≥ 98%

<sup>1</sup> Specifications are based upon vendor data and/or guarantees

<sup>2</sup> Combustion Chamber Temperature is based off the most recent air emissions test

Detailed operating data recorded during testing are provided in Appendix D.

### **3.3 MATERIALS PROCESSED**

The EUGLYCDEHY system processes "wet" natural gas as it is withdrawn from underground storage reservoirs. Water and impurities removed from the "wet" natural gas are absorbed in lean TEG. The enriched TEG, containing water and impurities, is processed within the glycol regeneration system. The lean glycol is then recirculated in the EUGLYCDEHY system. The finished material is "dry" natural gas that can be conveyed through the natural gas pipeline system. Refer to Appendix D for the natural gas composition during testing.

### **3.4 RATED CAPACITY**

The glycol dehydrator capacity is limited to the availability of lean TEG, which is continuously purified by the removal of excess moisture in the flash vessel, regenerator and reboiler process components.

The actual daily throughput of the station is heavily dependent on weather and overall statewide system conditions. Throughput rates are determined by Gas Control to meet the needs of the system and its customers. During the beginning of the withdrawal season, approximately 300 MMscfd of natural gas is processed through the EUGLYCDEHY system. This occurs when field pressures are high and the water content of the "wet" gas from the storage fields is low. During this time, the station may not need to dehydrate the gas to meet required pipeline specifications.

The Gas Flow Deliverability (GFD) targets for Muskegon River Compressor Station typically start off the season at ~300 MMscfd, but, based on historical data with field inventories and system demands, the target gradually decreases throughout the season. For example, on December 1<sup>st</sup>, 2023, the GFD target for Muskegon River compressor Station was 290 MMscfd. On December 31<sup>st</sup>, 2023, the GFD target was 243 MMscfd. During this testing, the average processed flow rate was 185 MMscfd.

During testing, approximately 27 MMscfd of natural gas was processed by the EUGLYCDEHY system. Refer to Appendix D for operating data recorded during testing.

### **3.5 PROCESS INSTRUMENTATION**

Instrumentation is installed on EUGLYCDEHY to continuously monitor and record the thermal oxidizer combustion chamber temperature. Instrumentation equipment is calibrated according to the manufacturer recommendations. The following operating parameters were collected during the test event:

- Thermal oxidizer combustion temperature (°F)
- Fuel gas usage (Mcf)
- Dry natural gas withdrawal / processing rate (MMscfd)
- Dry gas water content (lbs H<sub>2</sub>O/MMscf)
- Wet gas water content (lbs H<sub>2</sub>O/MMscf)
- Glycol recirculation rate, (gpm)

This data was recorded once every 15 minutes and then averaged for each test run. Refer to Attachment D for detailed operating data.

## 4.0 SAMPLING AND ANALYTICAL PROCEDURES

Consumers Energy RCTS measured flue gas velocity and volumetric flowrate, oxygen (O<sub>2</sub>) concentration, moisture, and BTEX concentrations at the EUGLYCDEHY thermal oxidizer exhaust stack using USEPA test methods presented in Table 4-1. The sampling and analytical procedures associated with each parameter are described in the following sections.

**Table 4-1  
Test Methods**

Parameter	Method	USEPA Title
Sample traverses	1	Sample and Velocity Traverses for Stationary Sources
Volumetric flow	2	Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)
Oxygen	3A	Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedure)
Moisture content	ALT-008	Alternative Moisture Measurement Method Midget Impingers
BTEX	18	Measurement of Gaseous Organic Compound Emissions by Gas Chromatography

### 4.1 DESCRIPTION OF SAMPLING TRAIN AND FIELD PROCEDURES

The test matrix presented in Table 4-2 summarizes the sampling and analytical methods performed for the specified parameters during this test program.

**Table 4-2  
Test Matrix**

Date (2024)	Run	Sample Type	Start Time (EDT)	Stop Time (EDT)	Test Duration (min)	EPA Test Method	Comment
January 30	1	Flow, O <sub>2</sub> , moisture, BTEX	10:45	11:45	60	1	Gaseous samples collected from single point near the stack centroid.
	2		12:00	12:45	60	2	
	3		13:15	14:15	60	3A ALT-008 18	

### 4.2 SAMPLE LOCATION AND TRAVERSE POINTS (USEPA METHOD 1)

The number and location of traverse points was evaluated according to the requirements in 40 CFR Part 63, Subpart HHH, and USEPA Method 1, Sample and Velocity Traverses for Stationary Sources. The sampling location for EUGLYCDEHY is presented in the following section:

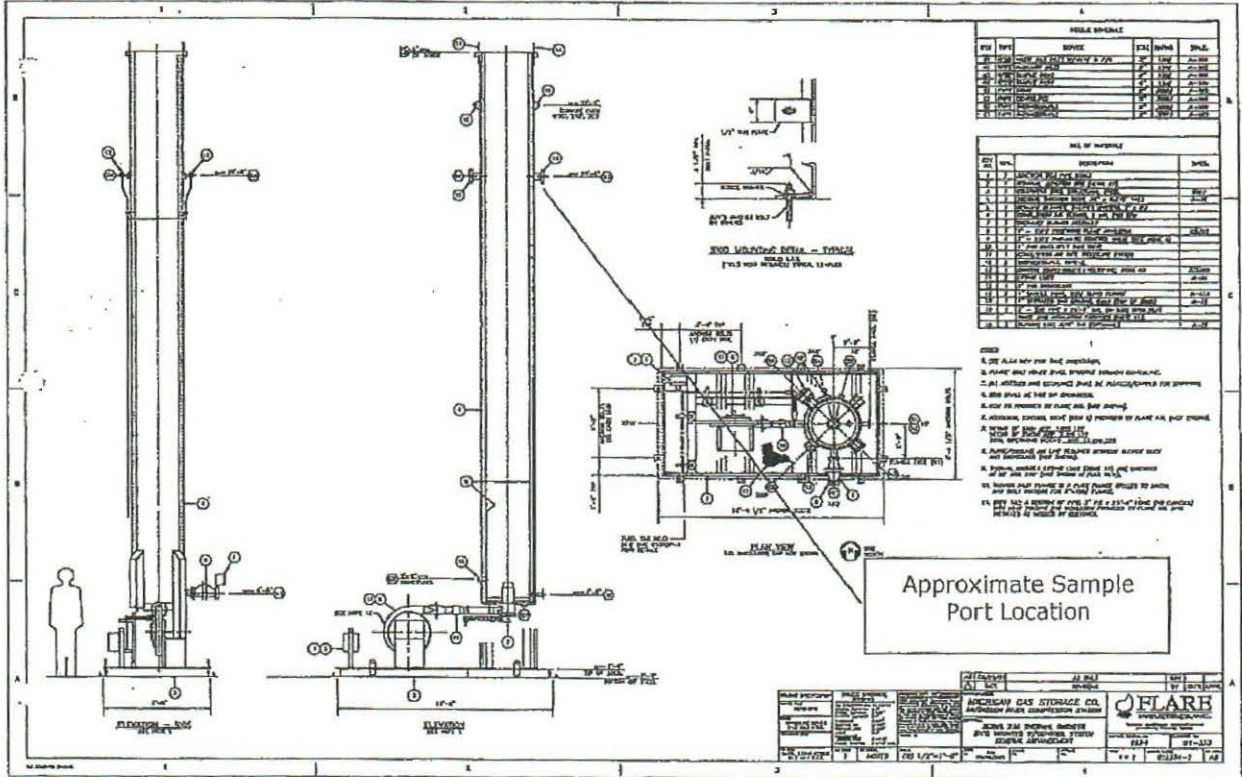
#### Reboiler Process Vent Sample Port Location:

- 286-inches or 9.7 duct diameters downstream of an open flame, and

- 84-inches or 2.85 duct diameters upstream of the stack exit.

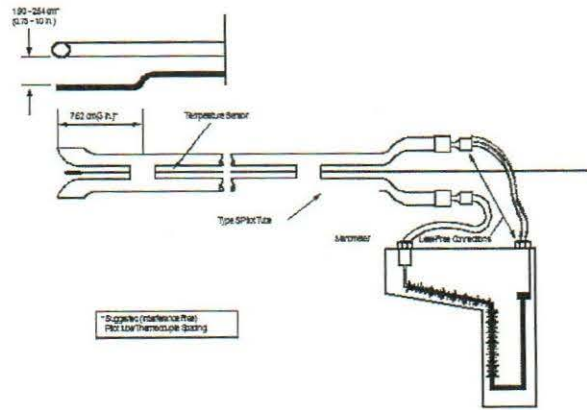
The inside of the stack is 29.5-inch in diameter. The sample ports are 2-inch in diameter and extend 4 inches beyond the stack wall. Because the stack is >12 inches in diameter and the sampling port location met the two and one-half diameter criterion of § 11.1.1 of Method 1 of 40 CFR Part 60, Appendix A-1, BTEX was sampled from a single point located in the centroid of the duct, in accordance with USEPA Reference Method 18, § 8.2.4.2.2.

**Figure 4-1. EUGLYCDEHY Sampling Location**





**Figure 4-3. Method 2 Sample Apparatus**

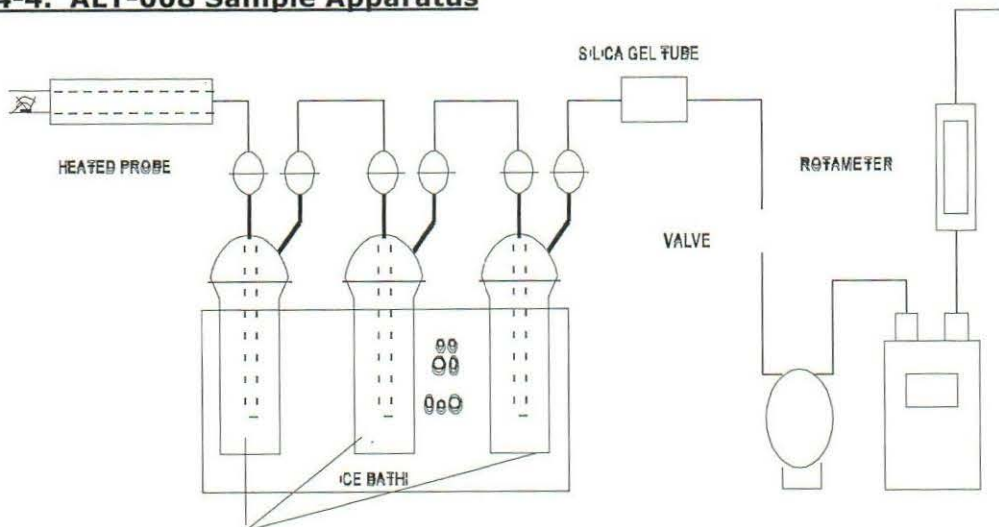


**4.4 MOISTURE CONTENT (USEPA APPROVED ALTERNATIVE METHOD 008)**

In lieu of USEPA Method 4 to conduct the moisture analysis of the flue gas sampled, RCTS employed the USEPA Broadly Applicable Approved Alternative ALT-008, *Alternative Moisture Measurement Method Midget Impingers*, to determine moisture content. ALT-008 is an alternative method for correcting pollutant concentration data to appropriate moisture conditions (e.g. pollutant and/or air flow data on a dry or wet basis) validated May 19, 1993 by the U.S. EPA Emission Measurement Branch. The procedure is incorporated into Method 6A of 40 CFR Part 60 and is based on field validation tests described in *An Alternative Method for Stack Gas Moisture Determination* (Jon Stanley, Peter Westlin, 1978, U.S. EPA Emissions Measurement Branch). The sample apparatus configuration follows the general guidelines contained in Figure 4-2 and § 8.2 of U.S. EPA Method 4, *Determination of Moisture Content in Stack Gases*, and ALT-008 Figure 1 or 2.

The exhaust gas was withdrawn from the stack at a constant rate through a sample probe, umbilical, 4 midget impingers and a metering console/pump. The moisture was removed from the gas stream in the impingers and determined gravimetrically. Refer to Figure 4-4 for a figure of the Alternative Method 008 Moisture Sample Apparatus.

**Figure 4-4. ALT-008 Sample Apparatus**

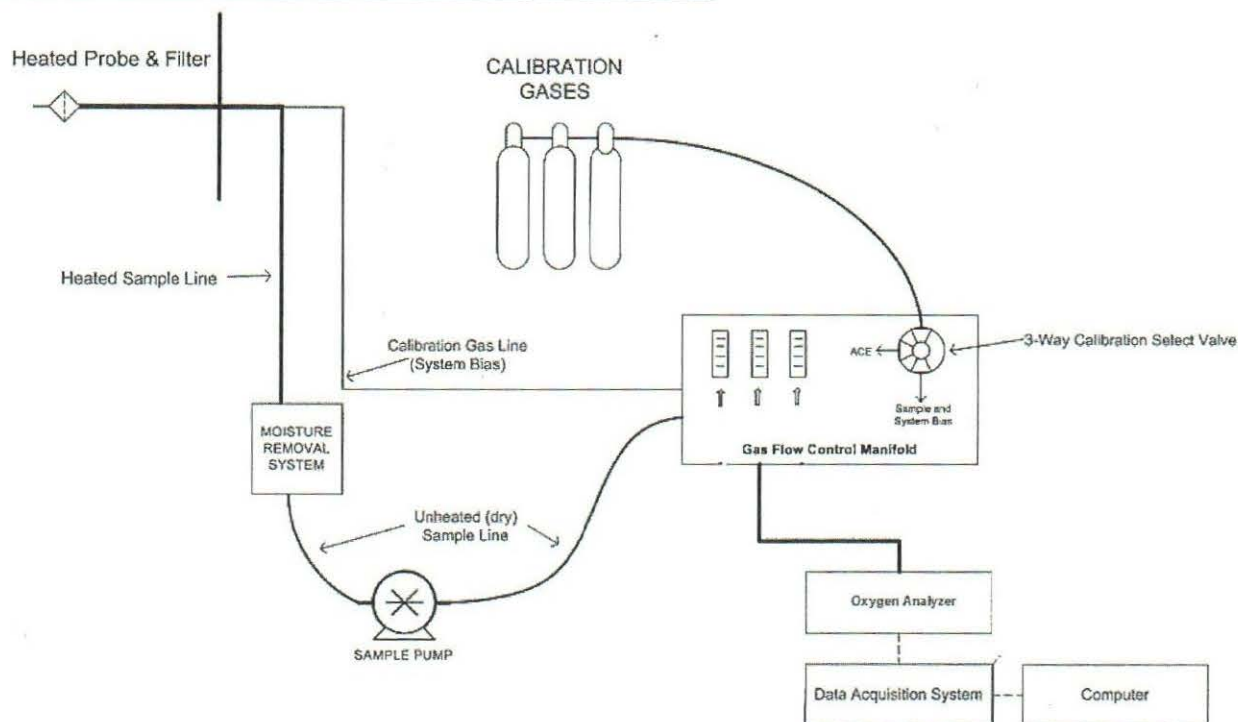


## 4.5 OXYGEN (USEPA METHOD 3A)

Oxygen concentrations were measured using USEPA Method 3A, *Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedure)*. Carbon dioxide concentrations were estimated based on the measured oxygen concentration subtracted from 20.9%.

Exhaust gas was extracted from the stack through a stainless steel probe, heated Teflon® sample line, and through a gas conditioning system to remove water and dry the sample before entering a sample pump, flow control manifold, and gas analyzer. Figure 4-5 depicts a drawing of the Method 3A sampling system.

**Figure 4-5. USEPA Method 3A Sampling System**



Prior to sampling, the analyzer was calibrated by performing a calibration error test where zero-, mid-, and high-level calibration gases were introduced directly to the back of the analyzer. The calibration error check was performed to evaluate if the analyzer's response was within  $\pm 2.0\%$  of the calibration gas span (i.e., high calibration gas concentration) or within  $\pm 0.5\%$  absolute difference to be acceptable. An initial system-bias test was performed where the zero- and mid- or high- calibration gases were introduced at the sample probe to measure the ability of the system to respond accurately to within  $\pm 5.0\%$  of span or  $\pm 0.5\%$  absolute difference.

Upon successful completion of the calibration error and initial system bias test, sample flow rate and component temperatures were verified, and the probe was inserted into the stack at the appropriate traverse point. After confirming the process was operating at established conditions, the test run was initiated. Gas concentrations were recorded at 1-minute intervals throughout each 60-minute test run.

A three traverse point stratification test was performed during Run 1 in accordance with USEPA Method 7E, §8.1.2. The gas stream was considered unstratified and diluent concentrations were measured from a single point near the centroid of the stack for Runs 2 and 3. Stratification results are summarized in Appendix B.



At the conclusion of each test run, a post-test system bias check was performed to compare analyzer bias and drift relative to pre-test system bias checks, ensuring analyzer bias was within  $\pm 5.0\%$  of span or  $\pm 0.5\%$  absolute difference. The RM drift is acceptable if the zero and upscale values are within  $\pm 3.0\%$  of the calibration span. The analyzer response is also used to correct measured gas concentrations for analyzer drift.

#### **4.6 BENZENE, TOLUENE, ETHYLBENZENE, AND XYLENES (USEPA METHOD 18)**

The adsorbent tube procedure identified in §8.2.4 of USEPA Method 18, *Measurement of Gaseous Organic Compound Emissions by Gas Chromatography*, was used to measure BTEX concentrations from the EUGLYCDEHY thermal oxidizer stack.

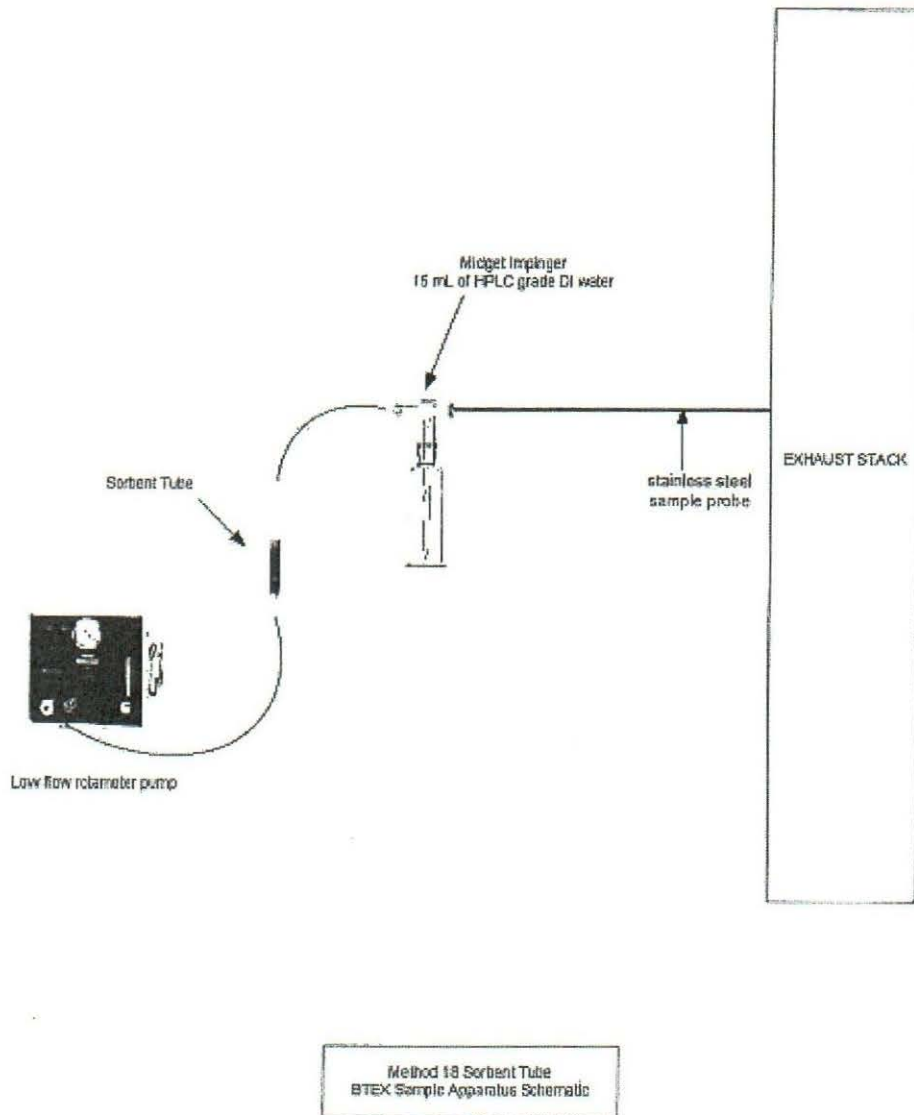
Prior to the test event, spiked and un-spiked adsorption tubes from the contracted laboratory, Enthalpy Analytical, Inc. (Enthalpy), were received in a tightly sealed cold pack insulated shipping container. The pre-spiked charcoal tubes were each labeled with pre-spiked concentrations of 65.9 micrograms ( $\mu\text{g}$ ) of benzene, 51.9  $\mu\text{g}$  of toluene, 52.0  $\mu\text{g}$  of ethylbenzene, and 51.5  $\mu\text{g}$  of p-xylene, 51.8  $\mu\text{g}$  of m-xylene, and 52.5  $\mu\text{g}$  of o-xylene.

For each run, two identical sample apparatus (one spiked and one un-spiked) were used. Each apparatus was configured by flowing sample gas through a midjet impinger for water condensate collection and two pre-labeled charcoal tubes connected in series, each containing a primary and backup sorbent section.

The sample flow rate for each train was controlled by low flow pumps, mass flow controllers, and/or dry gas meters. The spiked apparatus was equipped with one spiked and one un-spiked tube, while the un-spiked apparatus was configured with two un-spiked tubes.

After each run, the sorbent tube openings were capped and the tubes were placed in a chilled cooler. The recovered midjet impinger water catch was placed into a labeled sample bottle, and triplicate deionized water rinses of each impinger were performed and included in the same bottle. Deionized water was added to the impinger catch to ensure zero headspace existing within the sample bottle. Upon completion of the sampling program, the sorbent tubes and water catch samples were shipped with their associated chain of custody to the laboratory for analysis. The BTEX sample system apparatus diagram is shown in Figure 4-6.

**Figure 4-6. Method 18 Sample Apparatus**



## 5.0 TEST RESULTS AND DISCUSSION

The test program was conducted on January 30, 2024 to satisfy performance testing requirements and evaluate compliance with 40 CFR 63, Subpart HHH, "National Emissions Standards for Hazardous Air Pollutants (NESHAP) from Natural Gas Transmission and Storage Facilities," and MI-ROP-N2901-2020.

### 5.1 TABULATION OF RESULTS

The results of the testing indicate the EUGLYCDEHY source is compliant with applicable emissions limits as summarized in Table 2-1. Appendix Table 1 contains detailed tabulation of results, process operating conditions, and exhaust gas conditions.

### 5.2 SIGNIFICANCE OF RESULTS

The results of the testing indicate compliance with the applicable emission limit. During testing, the EUGLYCDEHY thermal oxidizer combustion chamber operated between 1,158°F

and 1,182°F with an average of 1,170°F, which will be used as the new minimum combustion chamber operating temperature.

### **5.3 VARIATIONS FROM SAMPLING OR OPERATING CONDITIONS**

No operating or sampling condition variations were observed during the test program.

### **5.4 PROCESS OR CONTROL EQUIPMENT UPSET CONDITIONS**

No process or control equipment upset conditions were observed during the test program.

### **5.5 AIR POLLUTION CONTROL DEVICE MAINTENANCE**

No significant maintenance had been performed on the glycol dehydrator system in the three months prior to this test program.

### **5.6 RE-TEST DISCUSSION**

Pursuant to §63.1282(d)(3)(vi)(B), subsequent periodic performance tests *shall be conducted at intervals no longer than 60 months following the previous periodic performance test or whenever a source desires to establish a new operating limit.* Thus, unless MRCS intends to establish a new operating limit, the next periodic performance test must be conducted no later than January 30, 2029.

### **5.7 RESULTS OF AUDIT SAMPLES**

USEPA Method 18 requires the successful passing of a spike recovery study for each compound of interest when using the adsorption tube procedure identified in § 8.2.4. Two sample trains are required, one sample train including a sorbent tube spiked with 40-60% of the mass of the expected compounds of interest.

Sampling on the two trains is performed simultaneously and the sorbent tubes are analyzed using the same analytical procedures and instruments to determine the fraction of the recovered spike compounds (R). The average fraction of recovered compounds from three runs must fall within  $0.70 \leq R \leq 1.30$  to validate the sampling procedures. The field measurements collected from the un-spiked sorbent tubes are then corrected to the calculated R-value. The average R-values for each compound are provided in Appendix C.

Audit samples for the reference methods utilized during this test program are not available from USEPA Stationary Source Audit Sample Program providers. The USEPA reference methods performed state reliable results are obtained by persons equipped with a thorough knowledge of the techniques associated with each method. Factors with the potential to cause measurement errors are minimized by implementing quality control (QC) and assurance (QA) programs into the applicable components of field-testing. QA/QC components were included in this test program. Table 5-1 summarizes the primary field quality assurance and quality control activities that were performed. Refer to Appendix E for supporting documentation.

**Table 5-1  
QA/QC Procedures**

QA/QC Activity	Purpose	Procedure	Frequency	Acceptance Criteria
M1: Sampling Location	Evaluates if the sampling location is suitable for sampling	Measure distance from ports to downstream and upstream flow disturbances	Pre-test	≥2 diameters downstream; ≥0.5 diameter upstream
M1: Duct diameter/dimensions	Verifies area of stack is accurately measured	Review as-built drawings and field measurement	Pre-test	Field measurement agreement with as-built drawings
M2: Pitot tube inspection	Verify Pitot and thermocouple assembly is free of aerodynamic interferences	Inspection	Pre-test and post-test	Refer to Section 6.1 and 10.0 of USEPA Method 2
M2: Pitot tube leak check	Verify leak free sampling system	Apply minimum pressure of 3.0 inches of H <sub>2</sub> O to Pitot tube	Pre-test and Post-test	±0.01 in H <sub>2</sub> O for 15 seconds at minimum 3.0 in H <sub>2</sub> O velocity head
M3A: Calibration gas standards	Ensures accurate calibration standards	Traceability protocol of calibration gases	Pre-test	Calibration gas uncertainty ≤2.0%
M3A: Calibration Error	Evaluates analyzer operation	Calibration gases introduced directly into analyzers	Pre-test	±2.0% of calibration span
M3A: System Bias and Analyzer Drift	Evaluates analyzer/sample system integrity and accuracy over test duration	Calibration gas introduced at sample probe tip, HSL, and into analyzers	Pre-test and Post-test	Bias: ±5.0% of calibration span Drift: ±3.0% of calibration span
ALT-008: Field balance calibration	Verify moisture measurement accuracy	Use Class 6 weight to check balance accuracy	Daily before use	The field balance must measure the weight within ±0.5 gram of the certified mass
M18: Spike Recovery Study	Demonstrate proper sampling/analysis procedures were selected	Compare compound mass collected on spiked sorbent traps against un-spiked sorbent traps	Once per test for all compounds analyzed	Average of 3 runs spike recovery must be within 70≤R≤130% of the spike mass

## 5.8 CALIBRATION SHEETS

Calibration sheets, including gas protocol sheets and analyzer quality control and assurance checks are presented in Appendix E.

## 5.9 SAMPLE CALCULATIONS

Sample calculations and formulas used to compute emissions data are presented in Appendix A.

## **5.10 FIELD DATA SHEETS**

Field data sheets are presented in Appendix B.

## **5.11 LABORATORY QUALITY ASSURANCE / QUALITY CONTROL PROCEDURES**

The method specific quality assurance and quality control procedures in each method employed during this test program were followed, without deviation. Refer to Appendix C for the laboratory data sheets.

## **5.12 QA/QC BLANKS**

Other than Method 18 QA/QC and calibration gases used for zero calibrations, no other reagent or media blanks were used. The analysis of laboratory blanks and those submitted with the samples (blank sorbent tube and deionized water) did not show any of the analytes of interest at concentrations greater than the detection limit.

Laboratory QA/QC data is contained in Appendix C.

# Appendix Table

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