Consumers Energy
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40 CFR Part 63, Subpart HHH Test Report

EUDEHY: SVTHERMOX_B

Consumers Energy Company
Overisel Compressor Station
4131 138th Avenue
Hamilton, MI 49419
SRN: N5792

January 19, 2023

Test Date: December 6, 2022

Test Performed by the Consumers Energy Company
Regulatory Compliance Testing Section
Air Emissions Testing Body
Laboratory Services Section
Work Order No. 6515411
Version No.: 0

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EXECUTIVE SUMMARY

Consumers Energy Regulatory Compliance Testing Section (RCTS) conducted air emissions testing for benzene, toluene, ethylbenzene, and xylenes (BTEX) on December 6, 2022, at the exhaust stack of the SVTHERMOX_B (TO Unit 2) thermal oxidizer controlling emissions from the small glycol dehydration system (EUDEHY) installed and operating at the Overisel Compressor Station in Hamilton, Michigan.

The glycol dehydration system processes natural gas, upon withdrawal from underground storage reservoirs, using triethylene glycol (TEG) to remove impurities and water. The system consists of two identical halves, where each half has two contact towers, a flash tank, a surge tank, a reboiler, and a thermal oxidizer. The system is identified as EUDEHY and is subject to conditions of Permit to Install (PTI) 202-19 issued by the Michigan Department of Environment, Great Lakes, and Energy (EGLE) on June 11, 2020, which incorporates federal requirements in 40 CFR Part 63, Subpart HHH.

The performance test was performed to evaluate if the thermal oxidizer meets the requirements of §63.1281(f)(1) at the same combustion chamber operating temperature (1,460 °F) as established for SVTHERMOX_A during testing on March 1, 2022. Specifically, the testing:

1) Evaluated compliance of the SVTHERMOX_B portion of the EUDEHY system by comparing the combined emissions from the control device with the unit specific BTEX emission limit calculated using Equation 2 of 40 CFR Part 63, Subpart HHH:

$$EL_{BTEX} = 5.44x10^{-5} \frac{g}{m^3 - ppmv} \times Throughput \frac{m^3}{day} \times C_{i,BTEX} ppmv \times 365 \frac{days}{yr} \times \frac{1\,Mg}{1 \times 10^6\,grams}$$

Where:
EL_{BTEX} = unit specific BTEX emission limit, Mg/yr
5.44×10^{-5} = BTEX limit, g/m^3-ppmv
Throughput = annual average daily natural gas throughput, m^3/day
$C_{i,BTEX}$ = annual average BTEX concentration of the natural gas at the inlet to the glycol dehydration unit, ppmv

Based on the average of five years of throughput and natural gas BTEX concentration measurements, the unit specific BTEX emission limit evaluated is:

$$EL_{BTEX} = 5.44x10^{-5} \frac{g}{m^3 - ppmv} \times 2{,}667{,}996 \frac{m^3}{day} \times 13\,ppmv \times 365 \frac{days}{yr} \times \frac{1\,Mg}{1 \times 10^6\,grams}$$

$$EL_{BTEX} = 0.7 \frac{Mg}{year}$$

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

Triplicate 60-minute test runs were conducted without deviation following the test protocol approved by EGLE on November 28, 2022, and United States Environmental Protection Agency (USEPA) 40 CFR Part 60, Appendix A Reference Methods (RM) 1, 2, 3A, 4 (ALT-008), and 18.

The results summarized in Table E-1 indicate the EUDEHY source is operating in compliance with the applicable emission limits, while establishing the minimum thermal oxidizer combustion zone temperature of 1,460°F for SVTHERMOX_B.

Table E-1
Summary of BTEX Test Results

Source Name Test Date (2022)	Combustion Chamber Temperature (°F)	BTEX Emission Rate (Mg/year)[1]	Total EUDEHY BTEX Emission Rate (Mg/year)[1]	BTEX Emission Limit (Mg/year)[2]
SVTHERMOX_A March 1	1,460	0.02	0.04	0.7
SVTHERMOX_B December 6	1,460	0.02		

[1] BTEX sample concentrations were below the laboratory's detectable limit. For these instances, the minimum detection limit (MDL) of these compounds were used to calculate the average compound concentrations for this test event. Additional information is presented in the Laboratory Report presented in Appendix C.

[2] BTEX emission limit was calculated as required per §63.1275(b)(1)(iii), Equation 2

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 air emissions testing conducted on December 6, 2022, at the exhaust stack of the thermal oxidizer SVTHERMOX_B serving the small glycol dehydration unit, EUDEHY, installed and operating at the Overisel Compressor Station in Hamilton, 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 Permit to Install (PTI) 202-19 dated June 11, 2020 is identified as EUDEHY. The EUDEHY system replaced EUGLYCDEHY, which is referenced in the facility's renewable operating permit (ROP) MI-ROP-N5792-2018. Two thermal oxidizers control emissions from the EUDEHY system and exhaust through stacks SVTHERMOX_A and SVTHERMOX_B. The testing was performed on December 6, 2022.

A test protocol was submitted to EGLE on October 5, 2022, describing compliance test objectives and quality assurance, and was approved by Lindsey Wells, EGLE Environmental Quality Analyst, in a letter dated November 28, 2022. This test program was performed in accordance with the test protocol and no deviations were encountered during the test event.

1.2 PURPOSE OF TESTING

The performance test was performed to evaluate if the thermal oxidizer meets the requirements of §63.1281(f)(1) at the same combustion chamber operating temperature (1,460 °F) as established for SVTHERMOX_A during testing on March 1, 2022. Specifically, the testing:

1) Evaluated compliance of the SVTHERMOX_B portion of the EUDEHY system by comparing the combined emissions from the control device with the unit specific BTEX emission limit calculated using Equation 2 of 40 CFR Part 63, Subpart HHH:

$$EL_{BTEX} = 5.44x10^{-5}\frac{g}{m^3 - ppmv} \times Throughput\,\frac{m^3}{day} \times C_{i,BTEX}ppmv \times 365\,\frac{days}{yr} \times \frac{1\,Mg}{1 \times 10^6\,grams}$$

Where:
EL_{BTEX} = unit specific BTEX emission limit, Mg/yr
5.44×10^{-5} = BTEX limit, g/m^3-ppmv
Throughput = annual average daily natural gas throughput, m^3/day
$C_{i,BTEX}$ = annual average BTEX concentration of the natural gas at the inlet to the glycol dehydration unit, ppmv

Based on the average of five years of throughput and natural gas BTEX concentration measurements, the unit specific BTEX emission limit evaluated is:

$$EL_{BTEX} = 5.44x10^{-5}\,\frac{g}{m^3 - ppmv} \times 2{,}667{,}996\frac{m^3}{day} \times 13\,ppmv \times 365\,\frac{days}{yr} \times \frac{1\,Mg}{1 \times 10^6\,grams}$$

$$EL_{BTEX} = 0.7\,\frac{Mg}{year}$$

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

The applicable emission limit is presented in Table 1-1. Refer to Appendix D for 2022 laboratory analysis of the natural gas at the inlet to the glycol dehydration unit.

Table 1-1
Applicable Emission Limits

Source	40 CFR 63.1275(b)(1)(iii)			
	Parameter	Throughput[1] (scm/day)	$C_{i,BTEX}$ [1] (ppmv)	EL_{BTEX} (Mg/year)
EUDEHY SVTHERMOX_A and SVTHERMOX_B	BTEX	2,667,996	13	0.7

Throughput	Maximum annual facility wide natural gas throughput
scm/day	Standard cubic meters per day
$C_{i,BTEX}$	Annual average BTEX concentration of the natural gas at the inlet to the glycol dehydration unit, ppmv
EL_{BTEX}	Unit-specific BTEX emission limit
Mg/year	Megagrams per year

[1] Based on the average of five years of natural gas throughput and BTEX concentrations

1.3 BRIEF DESCRIPTION OF SOURCE

The Overisel Compressor Station maintains natural gas pipeline pressure to move it in and out of storage reservoirs and along the pipeline system. Excess moisture in natural gas withdrawn from storage reservoirs is removed by flowing the gas into contact towers 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 directed 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 a thermal oxidizer for control prior to discharge to 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

Program Role	Contact	Address
Statewide Regulatory Oversite	Jeremiah Brown Technical Programs Unit Supervisor 517-599-7825 BrownJ9@michigan.gov	EGLE Technical Programs Unit Constitutional Hall , 2nd Floor S 525 West Allegan Street Lansing, Michigan 48933-1502
State Technical Programs Inspector	Lindsey Wells Environmental Quality Analyst 517-282-2345 wellsl8@michigan.gov	EGLE – Air Quality Division Technical Programs Unit Constitutional Hall , 2nd Floor S 525 West Allegan Street Lansing, Michigan 48933-1502
State Technical Programs Inspector	Trevor Drost Environmental Quality Analyst 517-245-5781 drostt@michigan.gov	EGLE Technical Programs Unit Constitution Hall, 2nd Floor S 525 W. Allegan Street Lansing, Michigan 48933
District Regulatory Oversight	Rex Lane District Supervisor 269-312-1540 laner@michigan.gov	EGLE – Air Quality Division Kalamazoo / Southwest Michigan District 7953 Adobe Road Kalamazoo, Michigan 49009-5026
District Regulatory Inspector	Cody Yazzie Environmental Engineer 269-567-3554 Yazziec@michigan.gov/air	EGLE – Air Quality Division Kalamazoo / Southwest Michigan District 7953 Adobe Road Kalamazoo, Michigan 49009-5026
Responsible Official	Avelock Robinson Director of Gas Compression Operations 586-716-3326 avelock.robinson@cmsenergy.com	Consumers Energy Company St. Clair Compressor Station 10021 Marine City Highway Ira, Michigan 48023
Corporate Air Quality Contact	Amy Kapuga Senior Engineer II 517-788-2201 amy.kapuga@cmsenergy.com	Consumers Energy Company Environmental Services Department 1945 West Parnall Road Jackson, Michigan 49201
Field Environmental Coordinator	Frank Rand Senior Environmental Analyst 734-807-0935 frank.randjr@cmsenergy.com	Consumers Energy Company South Monroe Customer Service Center 7116 Crabb Road Temperance, Michigan 48182
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Facility Leader	Dean Lampen Supervisor Compression Operations 269-751-3042 dean.lampen@cmsenergy.com	Consumers Energy Company Overisel Compressor Station 4131 138th Avenue Hamilton, Michigan 49419
Test Team Representative	Thomas Schmelter Engineering Technical Analyst 248-388-1525 thomas.schmelter@cmsenergy.com	Consumers Energy Company L & D Training Center 17010 Croswell Street West Olive, Michigan 49460
Laboratory	David Myers Jr. Project Manager 919-850-4392 david.myers@enthalpy.com	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), dry natural gas processing rate (MMscfd), and the glycol recirculation rate (gpm). Refer to Appendix D for detailed operating data.

2.2 APPLICABLE PERMIT INFORMATION

The Overisel Compressor Station is assigned State of Michigan Registration Number (SRN) N5792 and operates to comply with Renewable Operating Permit (ROP) MI-ROP-N5792-2018 issued April 20, 2018. The ROP references EUGLYCDEHY as the emissions source associated with the glycol dehydration system; however, this emission unit has been replaced by EUDEHY, which was issued PTI 202-19 on June 11, 2020. Specifically, the PTI incorporates federal requirements of 40 CFR Part 63, Subpart HHH within the flexible group conditions for FGMACTHHHSMALL.

2.3 RESULTS

The results summarized in Table E-1 indicate the EUDEHY source is operating in compliance with the applicable emission limits and vendor guarantees while establishing a new minimum thermal oxidizer combustion zone temperature of 1,460°F for SVTHERMOX_B. Refer to Table 2-1 for a summary of test results.

Table 2-1
Summary of BTEX Test Results

Source Name Test Date (2022)	Combustion Chamber Temperature (°F)	BTEX Emission Rate (Mg/year)[1]	Total EUDEHY BTEX Emission Rate (Mg/year)[1]	BTEX Emission Limit (Mg/year)[2]
SVTHERMOX_A March 1	1,460	0.02	0.04	0.7
SVTHERMOX_B December 6	1,460	0.02		

[1] BTEX sample concentrations were below the laboratory's detectable limit. For these instances, the minimum detection limit (MDL) of these compounds were used to calculate the average compound concentrations for this test event. Additional information is presented in the Laboratory Report presented in Appendix C.

[2] BTEX emission limit was calculated as required per §63.1275(b)(1)(iii), Equation 2

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.

3.0 SOURCE DESCRIPTION

EUDEHY is the glycol dehydration system used to remove excess moisture from natural gas that is withdrawn from underground storage reservoirs. The dehydrators are equipped with thermal oxidizers used to control VOCs and hazardous air pollutant (HAP) emissions.

3.1 PROCESS

The Overisel 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 Overisel 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

The dehydration system process flows liquid glycol down through a section of structured packing within each contact tower. 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 EUDEHY reboilers exits as vapor effluent. The effluent is directed to the thermal oxidizer(s) 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[1]	EUDEHY System A SVTHERMOX_A	EUDEHY System B SVTHERMOX_B
Type	Forced - Draft	Forced - Draft
Fuel	Natural Gas	Natural Gas
Maximum Throughput	360 MMscfd	360 MMscfd
Combustion Chamber Residence Time	>1 Second	>1 Second
Combustion Chamber Temperature Setpoint	≥1,400°F	≥1,400°F
Destruction Efficiency	≥98%	≥98%

[1] Specifications are based upon vendor data and/or guarantees

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

3.3 MATERIALS PROCESSED

The EUDEHY system processes "wet" natural gas as it is withdrawn from underground storage reservoirs. The finished material is "dry" natural gas that can be conveyed through the natural gas pipeline system. Water and impurities removed from the "wet" natural gas are absorbed in lean triethylene glycol. The rich glycol containing water and impurities is processed within the glycol regeneration system. The lean glycol is then recirculated in the EUDEHY system.

3.4 RATED CAPACITY

The station has a maximum design throughput capacity of 450 million standard cubic feet per day (MMscfd). The new dehydration system consists of two identical halves (system A and B), each capable of processing up to 80% of the maximum design capacity, or approximately 360 MMscfd. The facility can operate the two systems independently or in combination.

During the first to second week of the withdrawal season, approximately 350 MMscfd of natural gas is processed through the EUDEHY 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 Overisel Compressor Station typically start off the season at ~350 MMscfd, but, based on historical data with field inventories and system demands, the target gradually decreases throughout the season. For example, on January 1st, 2022, the GFD target for Overisel was 230 MMscfd. On January 31st, 2022, the GFD target for Overisel was 190 MMscfd.

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 testing, approximately 60 MMscfd of natural gas were processed by the EUDEHY system. This maximum throughput was dictated by gas control as maintenance of the natural gas conveyance system was occurring in Eastern Michigan. Refer to Appendix D for operating data recorded during testing.

3.5 PROCESS INSTRUMENTATION

A continuous parameter monitoring system (CPMS) is installed on the glycol dehydration system to continuously monitor and record the thermal oxidizer combustion chamber temperatures. CPMS equipment is calibrated according the manufacturer recommendations. The following operating parameters were collected during the test event:

- Thermal oxidizer combustion temperature (°F)
- Glycol recirculation rate, (gpm)
- Natural gas withdrawal / processing rate (MMscfd)

This data was recorded once every minute and then averaged to determine the test run averages. 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_2), and carbon dioxide (CO_2) concentrations, moisture, and BTEX concentrations at the SVTHERMOX_B 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, Carbon Dioxide	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 (2022)	Run	Sample Type	Start Time (EDT)	Stop Time (EDT)	Test Duration (min)	EPA Test Method	Comment
EUDEHY – SVTHERMOX_B							
December 6	1	Flow O_2, CO_2, Moisture BTEX	09:25	10:25	60	1 2 3A ALT-008 18	Gaseous samples collected from single point near the stack centroid.
	2		11:10	12:10	60		
	3		12:45	13:45	60		

4.2 SAMPLE LOCATION AND TRAVERSE POINTS (USEPA METHOD 1)

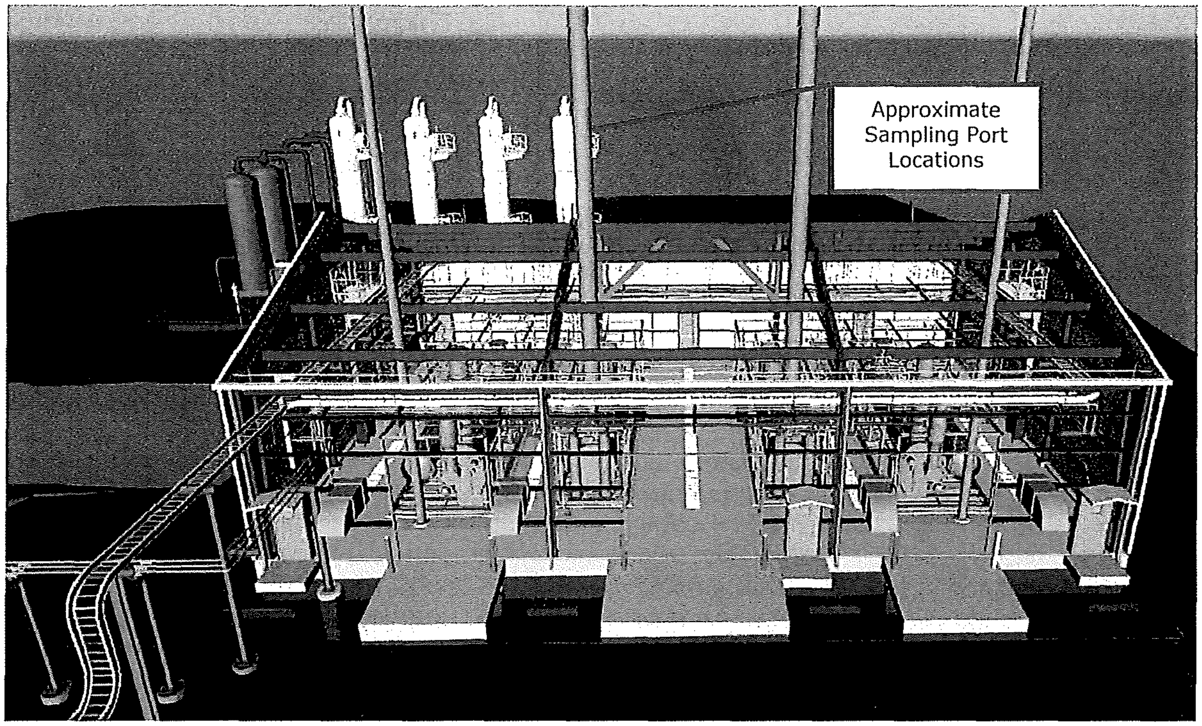
The number and location of traverse points was evaluated according to the requirements in 40 CFR Part 63, Subpart HHH, and USEPA Method 1, Sample and Velocity Traverses for Stationary Sources. Both SVTHERMOX_A and SVTHERMOX_B exhaust stacks have the same configuration.

Two 2-inch diameter sample ports extending approximately 3-inches beyond the stack wall and at 90° to one another are installed on the same plane in a 24-inch diameter vertical exhaust duct exiting the thermal oxidizer. The port locations are located:

- Approximately 380 inches (15.8 duct diameters) downstream from the horizontal to vertical exhaust stack confluence, and
- Approximately 222 inches (9.25 duct diameters) upstream of the stack exit

Because the duct is >12 inches in diameter and the sampling port locations meet the two and half-diameter criterion of Section 11.1.1 of Method 1 of 40 CFR Part 60, Appendix A-1, 6 traverse points per sample port located at 1.1, 3.5, 7.1, 16.9, 20.5, and 22.9 inches from the stack wall were used to measure flue gas velocity. Prior to Run 1, the stacks were sampled at 3 traverse points located at 16.7, 50.0, and 83.3% of the measurement line ('3-point long line') to measure O_2 and CO_2. A 3D layout of the EUDEHY glycol dehydration building, with approximate exhaust stack sampling locations, is presented as Figure 4-1.

Figure 4-1. EUDEHY Thermal Oxidizer Exhaust Stack Sampling Location

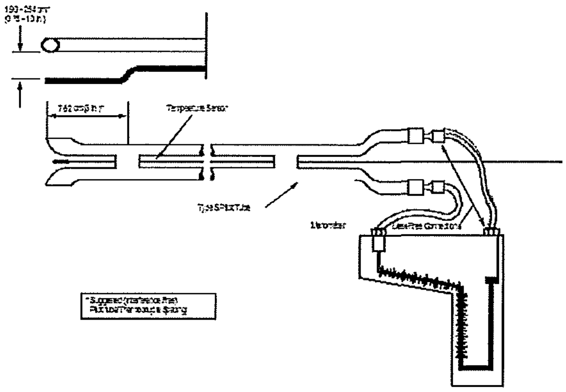


4.3 STACK GAS VELOCITY AND VOLUMETRIC FLOW RATE (USEPA METHOD 2)

The exhaust gas velocity and temperature measurements were conducted in accordance with USEPA Method 2, *Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)*.

The pressure differential (Δ P) across the positive and negative openings of the Pitot tube inserted in the exhaust duct at each traverse point were measured using an "S Type" (Stauscheibe or reverse type) Pitot tube connected to an appropriately sized oil filled manometer, magnehelic gauge, or pressure transducer. Exhaust gas temperatures were measured using a chromel/alumel "Type K" or similar thermocouple and a temperature indicator. Refer to Figure 4-2 for the Method 2 Pitot tube, thermocouple, and inclined oil-filled manometer configuration.

Figure 4-2. Method 2 Sample Apparatus



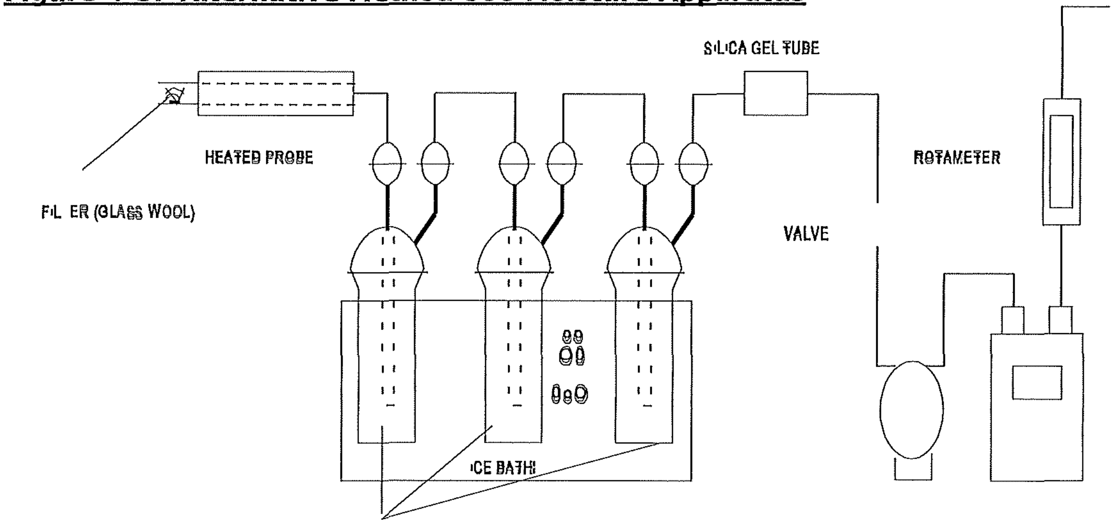
Method 1, § 11.4.2 states "if the average (null angle) is greater than 20°, the overall flow condition in the stack is unacceptable, and alternative methodology…must be used." The average null yaw angle previously measured at the SVTHERMOX_B exhaust stack was 1.5°, thus meeting the less than 20° requirement.

4.4 MOISTURE CONTENT (USEPA METHOD 4 / APPROVED ALTERNATIVE 008)

Moisture content was determined using USEPA Broadly Applicable Approved Alternative ALT-008, *Alternative Moisture Measurement Method Midget Impingers*. ALT-008, an alternate method for correcting pollutant concentration data to a dry or wet basis, was validated May 19, 1993 by the USEPA Emission Measurement Branch. The procedure, incorporated into Method 6A of 40 CFR Part 60, is based on field validation tests described in *An Alternative Method for Stack Gas Moisture Determination* (Jon Stanley, Peter Westlin, 1978, USEPA Emissions Measurement Branch). The sample apparatus, shown in Figure 4-3, follows general USEPA Method 4, *Determination of Moisture Content in Stack Gases* § 8.2 and ALT-008 Figure 1 or 2 guidelines.

Exhaust gas is withdrawn from the stack at a constant rate through a sample probe, umbilical, 4 midget impingers and a metering console and pump. Moisture is condensed from the gas stream in the impingers and determined gravimetrically.

Figure 4-3. Alternative Method 008 Moisture Apparatus



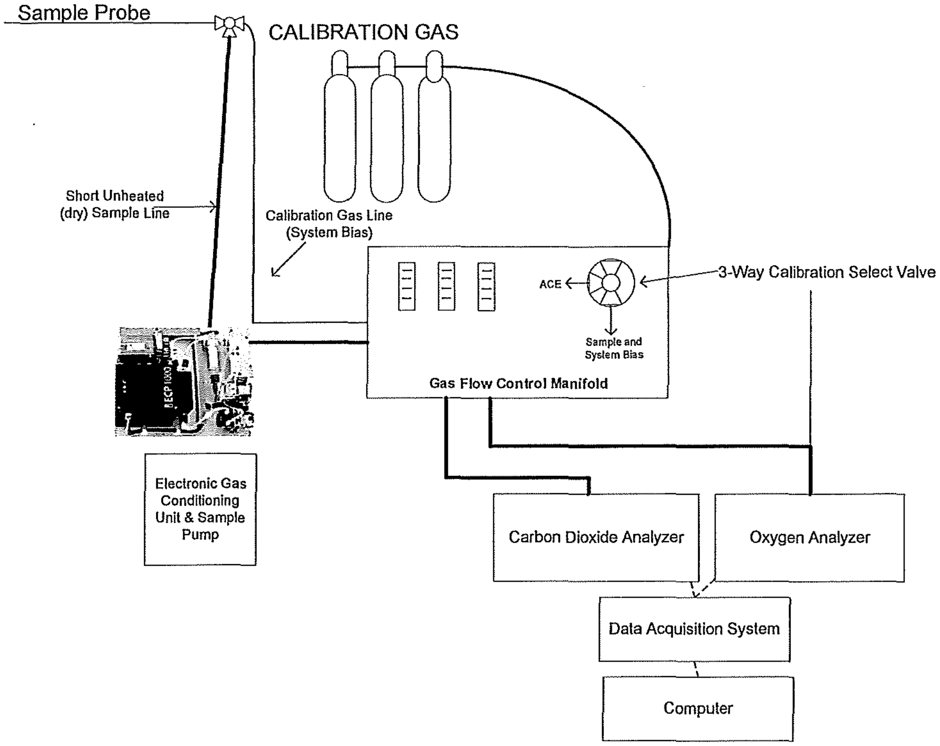
The silica gel tube depicted in this figure was replaced with a midget impinger (bubbler) with a straight tube insert, as allowed in ALT-008, §1

4.5 O_2 AND CO_2 (USEPA METHOD 3A)

Oxygen and carbon dioxide concentrations were measured using the following sampling and analytical procedures of USEPA Method 3A, *Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedure).*

Exhaust gas was extracted from the stacks 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 analyzers (Figure 4-4).

Figure 4-4. USEPA Method 3A Sampling System



Prior to sampling, the analyzers were calibrated by performing a calibration error test where zero-, mid-, and high-level calibration gases were introduced directly to the back of the analyzers. The calibration error check was performed to evaluate if the analyzers response was within ±2.0% of the calibration gas span or high calibration gas concentration or within ±0.5% absolute difference to be acceptable. An initial system-bias test was then 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 ±5.0% of span or ±0.5% absolute difference.

Upon successful completion of the calibration error and initial system bias tests, sample flow rate and component temperatures were verified, and the probes inserted into the stacks 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 prior to 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 1, 2, and 3. Stratification results are summarized in Appendix E.

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 ±5.0% of span or ±0.5% absolute difference. The RM drift is acceptable if the zero and upscale values are within ±3.0% of the calibration span. The analyzer response is also used to correct measured gas concentrations for analyzer drift.

4.6 BTEX (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 EUDEHY SVTHERMOX_B thermal oxidizer stack.

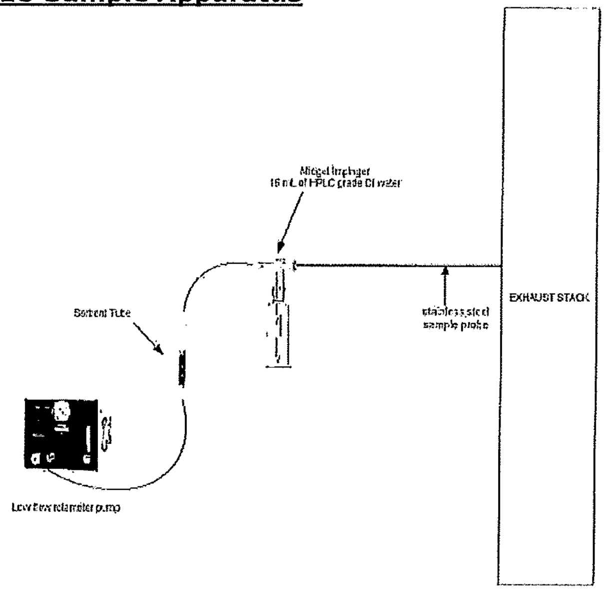
Prior to the test event, spiked and un-spiked adsorption tubes from the contracted laboratory, Enthalpy Analytical, Inc. (Enthalpy), were received in a tightly sealed cold pack insulated shipping container. The pre-spiked charcoal tubes were each labeled with pre-spiked concentrations of 52.7 micrograms (µg) of benzene (plus an additional 22.0 µg for the benzene fortification solution, 51.8 µg of toluene, 52.0 µg of ethylbenzene, and 51.6 µg of p-xylene, 51.8 µg of m-xylene, and 52.5 µg 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 midget 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 midget 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 4-5.

Figure 4-5. Method 18 Sample Apparatus



5.0 TEST RESULTS AND DISCUSSION

This test was performed to evaluate if the thermal oxidizer meets the requirements of §63.1281(f)(1) at the same combustion chamber operating temperature (1,460 °F) as established for SVTHERMOX_A during testing on March 1, 2022.

5.1 TABULATION OF RESULTS

The results summarized in Table E-1 indicate the EUDEHY source is operating in compliance with the applicable emission limits, while establishing the minimum thermal oxidizer combustion zone temperature of 1,460°F for SVTHERMOX_B. Appendix Table 1 contains detailed tabulation of results.

5.2 SIGNIFICANCE OF RESULTS

The results of the testing indicate compliance with the applicable emission limit and establish the minimum combustion chamber temperature of the SVTHERMOX_B thermal oxidizer.

5.3 VARIATIONS FROM SAMPLING OR OPERATING CONDITIONS

No operating condition variations were observed during the test program. No sampling variations from the approved test protocol were enacted.

5.4 PROCESS OR CONTROL EQUIPMENT UPSET CONDITIONS

No process or control equipment upset conditions were observed during this test program. However, during testing, maintenance of natural gas conveyance piping in Eastern Michigan limited the amount of natural gas that could be processed by the station. The operating conditions were discussed with Mr. Cody Yazzie who indicated it was acceptable to perform the air emissions testing at the reduced gas flow rate.

5.5 AIR POLLUTION CONTROL DEVICE MAINTENANCE

Other than final construction, startup, testing, and optimization, 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)(2), combustion control devices that demonstrate, during the initial performance test, that the combustion zone temperature is an indicator of destruction efficiency and operate at a minimum temperature of 760 degrees C (1400 degrees F) are not required to conduct periodic performance tests. Based on the results of this test program, periodic performance tests are not required.

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 were.

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_2O to Pitot tube	Pre-test and Post-test	±0.01 in H_2O for 15 seconds at minimum 3.0 in H_2O 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
M4 (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 $70 \leq R \leq 130\%$ 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