

**CLEAN AIR ACT SECTION 114
INFORMATION COLLECTION REQUEST (ICR) TEST REPORT
FOR HYDROCHLORIC ACID RECOVERY UNIT**

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EXECUTIVE SUMMARY

Eastman Chemical Company, Texas Operations (Eastman) owns and operates a Hydrochloric Acid (HCl) Recovery Unit / Halogen Acid Furnace (HAF) at its facility located in Longview, Texas. This process is subject to the National Emissions Standards for Hazardous Air Pollutants (NESHAP) from Hazardous Waste Combustors (HWC) found at 40 CFR, Part 63, Subpart EEE. This standard is commonly referred to as the HWC Maximum Achievable Control Technology (MACT) Standard.

Pursuant to section 114 of the Clean Air Act (CAA), 42 U.S.C. §7414(a), the United States Environmental Protection Agency (EPA) has the authority to require facilities to perform emission testing in order to collect data and make decisions related to EPA's review of the NESHAPs. On January 31, 2024, EPA sent an Information Collection Request (ICR) letter to Eastman. The ICR instructed source testing to be performed on the HCl Recovery Unit. The letter directed Eastman to gather the requested information on the unit by August 30, 2024. Eastman requested an extension of that due date to October 31, 2024, which was granted on March 11, 2024 via electronic mail from Rachel Smoak in the Office of Air Quality Planning and Standards (EPA OAQPS).

Stack gas emissions were sampled for polycyclic aromatic hydrocarbons (PAH), polychlorinated biphenyls (PCB), and hydrogen cyanide (HCN). Oxygen (O₂), carbon dioxide (CO₂), carbon monoxide (CO), and total hydrocarbon (THC) emissions were also analyzed as prescribed in the ICR Letter dated January 31, 2024.

The feedstream used during the ICR test was liquid waste, consistent with normal operations. No spiking was performed as a part of this ICR testing.

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** Revision 1 of this document was issued to correctly format the Run 1 Acenaphthylene results in Table 5-3 and Table 5-4. The Acenaphthylene Run 1 values have been italicized with a "<(" to indicate that the compound's result was detected below the MDL. Per the ICR request, these values are calculated based on the method detection limit.*

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Appendix V	Feedstream Laboratory Analytical Data Package
Appendix VI	Emission Sampling Train Field Data (<i>submitted through Microsoft Access under folders labeled Appendix VI. Additional information is also available in the Appendix IV Microsoft Access folder</i>)

LIST OF ACRONYMS

ADL	Above Detection Level (ERT Flag)
APCS	Air Pollution Control System
ASTM	American Society for Testing and Materials
AWFCO	Automatic Waste Feed Cutoff
BDL	Below Detection Level (ERT Flag)
BIF	Boilers and Industrial Furnaces
CAA	Clean Air Act
CEMS	Continuous Emissions Monitoring System
CFR	Code of Federal Regulations
DLL	Detection Level Limited (ERT Flag)
Eastman	Texas Operations of Eastman Chemical Company
EMC	EPA Air Emission Measurement Center
EPA	Environmental Protection Agency
ERT	EPA's Electronic Reporting Tool
ESL	Environmental Services Laboratory
FIA	Flame Ionization Analyzer
HAF	Halogen Acid Furnace
HCl	Hydrochloric Acid
HHV	Higher Heating Value
HWC	Hazardous Waste Combustor
HWC MACT	Hazardous Waste Combustor Maximum Achievable Control Technology
IC	Ion Chromatography
ICR	Information Collection Request
MACT	Maximum Achievable Control Technology
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NOC	Notification of Compliance
OAQPS	[EPA] Office of Air Quality Planning and Standards
OPL	Operating Parameter Limit
OTM	Other Test Method
PETP	Performance Evaluation Test Plan
QA	Quality Assurance
QAO	Quality Assurance Objectives
QAPP	Quality Assurance Project Plan
QC	Quality Control
RCRA	Resource Conservation and Recovery Act

LIST OF ACRONYMS (CONTINUED)

THC	Total Hydrocarbons (as propane)
U.S. EPA	United States Environmental Protection Agency
VCS	Voluntary Consensus Standard

LIST OF UNITS AND MEASUREMENTS

%	Percent
Btu/lb	British thermal unit per pound
dscf	Dry standard cubic feet
dscfm	Dry standard cubic feet per minute
dscm	Dry standard cubic meter
°F	Degree Fahrenheit
klb/hr	Kilo-pound per hour
L	Liter
lb/hr	Pounds per hour
ng	Nanograms
ng/dscm	Nanograms per dry standard cubic meter
ng/dscm @ 7% O ₂	Nanograms per dry standard cubic meter, corrected to 7% O ₂
ppm	Parts per million
ppmvd	Parts per million by volume, dry basis
ppmvd @ 7% O ₂	Parts per million by volume, dry basis, corrected to 7% O ₂
µg	Micrograms

LIST OF CHEMICAL SYMBOLS AND FORMULAS

CO	Carbon Monoxide
CO ₂	Carbon Dioxide
Cl ₂	Chlorine Gas
HCN	Hydrogen Cyanide
H ₂ SO ₄	Sulfuric Acid
NaOH	Sodium Hydroxide
O ₂	Oxygen
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
SO ₂	Sulfur Dioxide
THC	Total Hydrocarbon

1.0 INTRODUCTION

Pursuant to section 114 of the Clean Air Act (CAA), 42 U.S.C. §7414(a), the United States Environmental Protection Agency (EPA) has the authority to require facilities to perform emission testing in order to collect data and make decisions related to EPA's review of the National Emissions Standards for Hazardous Air Pollutants (NESHAPs). On January 31, 2024, EPA sent an Information Collection Request (ICR) letter to Eastman. The ICR instructed source testing to be performed on the HCl Recovery Unit. The letter directed Eastman to gather the requested information by August 30, 2024. Eastman requested an extension of that due date to October 31, 2024, which was granted on March 11, 2024 via electronic mail from Rachel Smoak in the Office of Air Quality Planning and Standards (EPA OAQPS).

Between July 26 and July 31, 2024, Eastman conducted testing in accordance with the ICR letter. This Information Collection Request Test Report contains information regarding the operations and source testing of the HCl Recovery Unit.

1.1 Facility and Regulatory Overview

Eastman Chemical Company, Texas Operations (Eastman) owns and operates a Hydrochloric Acid (HCl) Recovery Unit / Halogen Acid Furnace (HAF) at its Longview, TX facility. The HCl Recovery Unit is defined as a halogen acid furnace (HAF) by RCRA and operates in compliance with the RCRA requirements for Boilers and Industrial Furnaces (BIF) under RCRA Part B Permit HW-50043.

This unit is also subject to the NESHAP from Hazardous Waste Combustors (HWC). This standard is commonly referred to as the HWC Maximum Achievable Control Technology (MACT) Standard. The HWC MACT standard is codified as 40 CFR, Part 63 Subpart EEE (§63.1200 to §63.1221). Specifically, the HCl Recovery Unit is a hydrochloric acid production furnace and is subject to the standards in 40 CFR §63.1218.

Additional information for the facility and the unit being tested is provided in Table 1-1.

1.2 Objectives of the ICR Test

The ICR Test was conducted under normal and representative operating conditions as requested by EPA in the ICR Letter dated January 31, 2024. The ICR test consisted of seven replicate runs.

A detailed discussion of the ICR Test operating conditions is provided in Section 3.0. The following emission parameters were measured during the test.

- Polycyclic Aromatic Hydrocarbons (PAH)
- Polychlorinated Biphenyls (PCB)
- Total Hydrocarbons (THC)
- Hydrogen Cyanide (HCN)
- Oxygen (O₂)
- Carbon Dioxide (CO₂)
- Carbon Monoxide (CO) via the facility CEMS

Emissions results for each run are presented in Section 5.0.

1.3 Scope and Purpose

This document reports the results of the ICR Test. The purpose of this report is to:

- Describe the activities associated with the ICR Test, including emissions and feedstream sampling and analysis and process operating conditions;
- Present the results of the ICR Test; and
- Discuss the impact of non-standard ICR Testing activities and the impact of those activities on data quality.

Table 1-1
Facility and Testing Information

Mailing Address	P.O. Box 7444, Longview, TX 75607
Actual Address	300 Kodak Blvd, Longview, TX 75602
Owner / Operator	Eastman Chemical Company
Responsible Official	Andrew Coggins
Email of Responsible Official	acoggins@eastman.com
Phone of Responsible Official	(903)-237-6200
Federal Registry Number for Facility	110000743704
Type of Unit	Halogen Acid Furnace
Source Classification Code of Unit	30101102
Longitude and Latitude of Unit (6 decimal points)	-94.6937, 32.4373
APCD ID	Halogen Acid Furnace (HCl Recovery Unit)
Release Point ID	EPN 035S703
Stack Testing Company	Eastman Environmental Services Laboratory (ESL)
Stack Testing Company Contact	Adam Brooks
Stack Testing Company Email	Brooks@Eastman.com

2.0 PROCESS DESCRIPTION SUMMARY

This section describes the HCl Recovery Unit, including the feed system, combustion chamber, product recovery equipment, and the air pollution control system (APCS). This unit is designed to combust hazardous waste liquids and waste gases in order to convert chlorinated organics from plant production processes to HCl product for use in production processes. Natural gas and off-gas are both used as supplemental fuels.

The equipment following the combustion chamber of the HCl Recovery Unit is contained in two functional sections: the product recovery section and the APCS section. The product recovery section includes equipment for producing the HCl product. The APCS section is the final caustic scrubber for treating the combustion gases. The scrubbed gases are vented to the atmosphere through a stack.

The HCl Recovery Unit and peripheral equipment are shown schematically in Figure 2-1. Each section of the unit is described in detail in subsequent paragraphs of this section.

2.1 Combustion Chamber

The HCl Recovery Unit was manufactured by T-Thermal of Conshohocken, PA. It is a Model No. 6-02-3825-D oxidizer furnace. The unit consists of a halogen acid furnace (HAF), a quench tank, a primary HCl absorption column, and a final caustic scrubber. The furnace burns liquid waste, process gas, and natural gas. The gaseous stream and the natural gas fuel are delivered via pipelines along with the combustion air to the main burner in the furnace.

The burner is mounted concentrically at the front end of the furnace. The furnace is equipped with a side burner that is fed natural gas and combustion air and is tangential to the main burner. The liquid waste is pumped via pipeline along with atomizing air to four injection nozzles that are mounted around the furnace. The combustion chamber temperature is measured in the final third of the furnace.

2.2 Feed Systems

The liquid waste stream is pumped to the furnace feed delivery system from a storage tank. The liquids are atomized within the injection nozzles that are mounted around the furnace. The injection nozzles use air as the atomizing agent.

The gaseous stream, natural gas fuel, and combustion air are delivered via pipelines. Natural gas and combustion air are also delivered via pipeline to the secondary burner that maintains the combustion zone temperature. The liquid waste feed is transported to the furnace via pipeline.

2.3 Automatic Waste Feed Cutoff (AWFCO) System

The HCl Recovery Unit operates in compliance with a Notification of Compliance (NOC) developed for the HWC MACT. The unit is equipped with an automatic hazardous waste (liquid waste) feed cut-off system that is actuated when various operating parameters exceed their specified set point. If any parameter output is outside the minimum or maximum levels of the operating parameter limits (OPL), the system automatically cuts off hazardous waste to the oxidizer furnace by closing a control valve in the hazardous waste feed line. To help ensure OPLs are not exceeded while waste remains in the combustion chamber, trip values are set at slightly above/below OPL values.

All AWFCOs were active during the ICR Test.

2.4 Product Recovery Equipment

The hot combustion gas exits the furnace and is discharged into a carbon downcomer that directs the gas to the bottom of a carbon-lined quench tank that contains hydrochloric acid. The gas is bubbled through the acid and is cooled. The cooled gas then enters the primary absorber column. Condensate is added to this absorber column to produce a hydrochloric acid product that is pumped to product storage.

2.5 Air Pollution Control System

The gas exits the top of the primary absorber column, E-701, and enters the caustic scrubber, E-703. E-703 is a packed column in which a caustic solution is continuously circulated to remove chlorine and residual HCl from the gas prior to its discharge to the atmosphere.

2.6 Stack

Treated combustion gases exit from the E-703 scrubber to vent to the atmosphere through a stack. The stack is equipped with continuous emission monitors and stack sampling ports to facilitate testing and compliance demonstration.

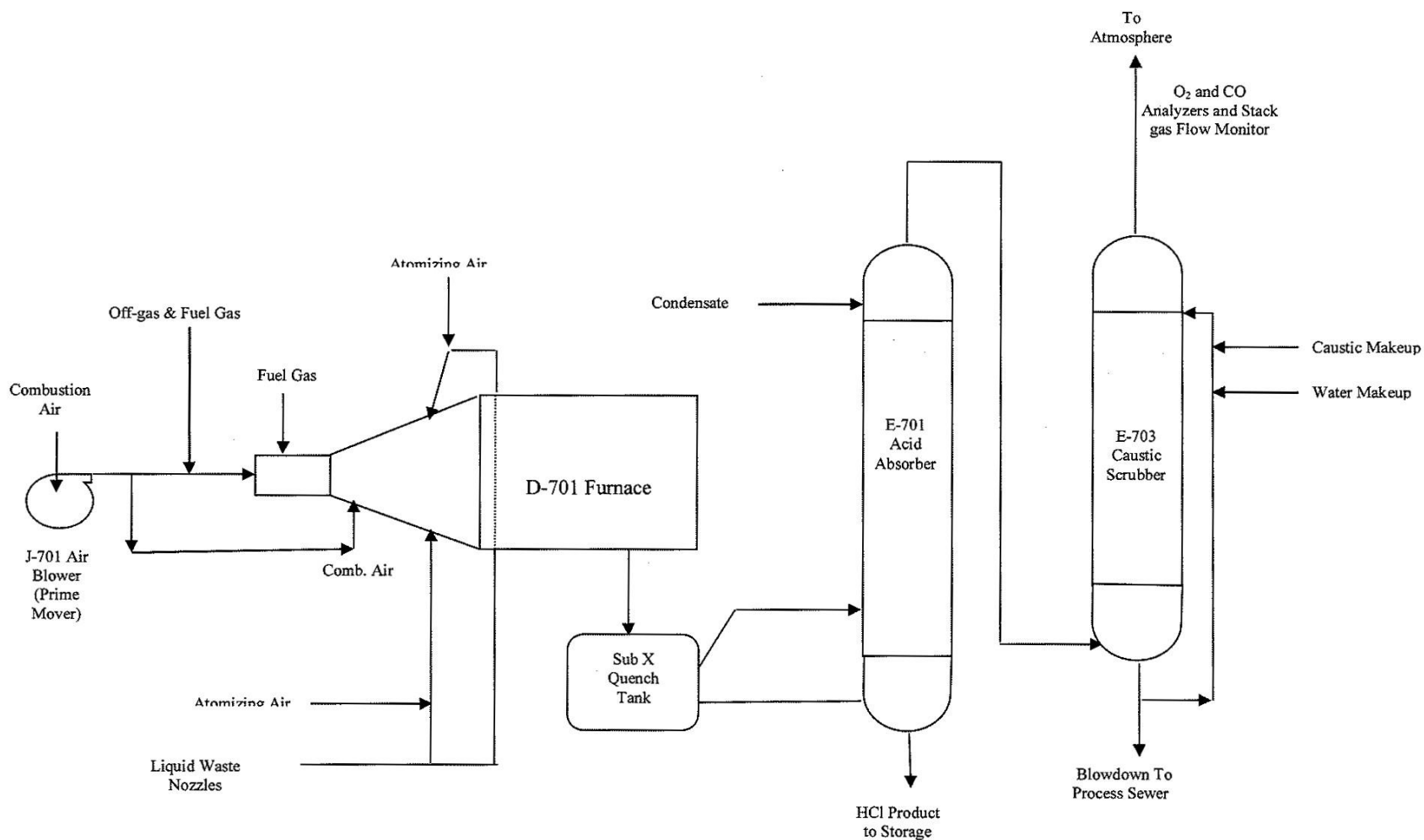


Figure 2-1
HCl Recovery Unit Process Flow Diagram

3.0 TESTING PROGRAM OVERVIEW

The purpose of this section is to provide an overview of the ICR Test. This overview includes a description of the ICR testing protocol and operating conditions, as well as a summary of the test activities. Section 3.3.3 addresses deviations from the ICR Test Plan and Quality Assurance Project Plan (QAPP), which are included as Appendix I to this report.

3.1 Test Protocol

The ICR Test consisted of seven runs. The protocol for the ICR Testing is presented in Table 3-1 and is summarized below. The test objective was to collect data as described in Enclosure 1 of the section 114 request.

The ICR Test was conducted under normal and representative conditions as specified in the ICR letter. The test was conducted using the normal liquid waste stream. The APCS was operated in accordance with the site-specific operating plans required by 40 CFR, Part 63, Subpart EEE during the test.

3.2 Chronology

The ICR Testing was conducted from July 26, 2024 through July 31, 2024. The ICR Test was executed effectively and successfully met all test objectives, except as discussed in Section 3.3.3. This section provides a brief overview of the ICR Test execution.

Test Overview

Testing operations commenced on July 26, 2024 and were completed on July 31, 2024. The testing consisted of seven replicate runs for each of the following sampling trains: EPA Method 23, EPA Method 25A (conducted concurrently with EPA Method 23), and OTM-29. The port start and stop times for each sampling train for each run can be found in Table 3-2.

3.3 Quality Assurance / Quality Control

The purpose of this section is to discuss any test objectives that were not met, the Quality Assurance/Quality Control (QA/QC) results, the non-standard test events, and the deviations from the test plan.

3.3.1 QA/QC Results

Quantitative QA/QC measures, also called quality assurance objectives (QAO), are presented and described in detail in the QAPP, which is an appendix to the ICR Test Plan. The ICR Test Plan and QAPP are attached to this report as Appendix I. QA/QC results for the ICR Test are presented

in the analytical data packages presented in Appendix IV and Appendix V. Any QAO that were not met were minor and did not compromise data quality.

3.3.2 Non-Standard Test Events

The purpose of this section is to provide a summary of the non-standard test events that occurred during testing. These events are considered minor and do not compromise the validity of the data generated.

Aborted OTM-29 Sampling Train During Run 1A

Both the EPA Method 23 and the OTM-29 sampling trains were started at the same time for Run 1. The OTM-29 sampling train was aborted in the middle of EPA Method 23 due to crystalline buildup in the last two impingers making it impossible to pull more sample and prematurely ending the OTM-29 run. However, there was still enough time to conduct a second OTM-29 sampling train during Run 1 while EPA Method 23 was still running. The data used for the second OTM-29 stack sampling train is labeled Run 1B.

Method 23 Run 2

During the Method 23 Run 2, there was an extra pause to investigate a loss of pressure in the cubic foot box. It was observed that the pitot tube had collected water. ESL verified that this does not jeopardize the validity of the sample taken, and upon fixing the issue, resumed testing. For specific run pause times, see Table 3-3.

3.3.3 Deviations between Test Execution and the Test Plan and QAPP

Details of any deviations from the ICR Test Plan and QAPP are discussed in this section. These deviations are considered minor and do not compromise the validity of the data generated.

Correction of Target Range for Combustion Chamber Temperature

Before commencement of the ICR test, it was noticed that the target range for Combustion Chamber Temperature as specified in the ICR Test Plan (Appendix I) was well outside normal operations. Upon investigating the 12-month data used to create averages for the target ranges, it was noted that the calculation was using an incorrect data range. The target range for temperature was corrected to 1,810 – 1,905 °F before the start of Run 1. This change is reflected in Tables 3-4, 3-5, and 3-6.

3.4 Operating Conditions

The ICR test was conducted under normal and representative process conditions. The HCl Recovery Unit is a dedicated furnace whose only hazardous waste feedstream is the liquid waste; therefore, actual waste typically fed into the furnace was used. No process gases were fed during the ICR Test. The process operating conditions were monitored and recorded by the CMS. The CMS continuously samples parameters and evaluates the detector response at least once every 15 seconds. The CMS uses these values to compute one-minute averages for each parameter. These one-minute averages are recorded in a database.

Table 3-4 summarizes the key operating parameters for the test, presenting the 7-run average for each sampling train timeframe. Tables 3-5 through 3-6 show the same key operating conditions but provide more detailed data for each sampling train timeframe, showing the average of the one-minute average values for each of the seven runs for a particular sampling train timeframe. Detailed one-minute average operating parameter data including minimums, maximums, and averages during each run for each sampling train timeframe are included in Appendix II for these key operating parameters and the process data required by the section 114 request (the same process data required for a Comprehensive Performance Test Report).

3.5 Continuous Monitoring System Performance Evaluations

The CMS performance evaluation test was performed on the HCl Recovery Unit in accordance with the approved CMS Performance Evaluation Test Plan (PETP). Eastman personnel used manufacturer's procedures, internal procedures, and working knowledge of specific instruments to conduct the calibrations. All instruments were within the calibration specifications noted in the calibration procedures.

The performance evaluations for the permanently-installed CO and O₂ Continuous Emissions Monitoring System (CEMS) followed the requirements in Performance Specification 4B for the CO and O₂ CEMS, found in 40 CFR Part 60, Appendix B. All instruments were within the calibration specifications according to the calibration procedures.

Table 3-1
HCl Recovery Unit ICR Test Protocol

Key Operating Conditions	Stack Test Sampling	Feedstreams / Process Sampling
<p>Below Average Combustion Chamber Temperature</p> <p>Above Average Combustion Gas Flowrate – Monitored as Stack Gas Flowrate</p> <p>Above Average Total Hazardous Waste Feedrate</p> <p>Below Average Caustic Scrubber Effluent pH</p> <p>Below Average Caustic Scrubber Liquid to Gas Ratio (L/G)</p>	<p><u>EPA Method 23</u></p> <ul style="list-style-type: none"> Polychlorinated Biphenyls (PCB) and Polycyclic Aromatic Hydrocarbons (PAH) <p><u>EPA Method 25A</u></p> <ul style="list-style-type: none"> Total Hydrocarbons (THC) <p><u>EPA Method OTM-29</u></p> <ul style="list-style-type: none"> Hydrogen Cyanide (HCN) <p><u>Permanently-installed CEMS</u></p> <ul style="list-style-type: none"> Carbon Monoxide (CO) Oxygen (O₂) 	<p><u>Natural Gas:</u></p> <p>Not Sampled</p> <p><u>Liquid Waste – 3 subsamples per run:</u></p> <p>Higher Heating Value (HHV)</p>

Table 3-2
ICR Testing Port Start and Stop Times by Run

Sampling Method	Emission Parameter	First Port		Second Port	
		Start	Stop	Start	Stop
Run 1 – 07/26/2024					
OTM-29	HCN	14:12	14:28	14:30	14:46
EPA Method 23	PAH/PCB	9:04	11:18	11:32	15:36
Run 2 – 07/27/2024					
OTM-29	HCN	8:25	8:41	13:03	13:19
EPA Method 23	PAH/PCB	8:25	11:44	13:03	15:23
Run 3 – 07/28/2024					
OTM-29	HCN	9:15	9:40	13:45	14:10
EPA Method 23	PAH/PCB	9:15	13:10	13:45	17:27
Run 4 – 07/29/2024					
OTM-29	HCN	8:23	8:48	11:25	11:50
EPA Method 23	PAH/PCB	8:23	11:10	11:25	14:13
Run 5 – 07/29/2024					
OTM-29	HCN	15:30	15:55	18:21	18:58
EPA Method 23	PAH/PCB	15:30	18:16	18:21	20:56
Run 6 – 07/30/2024					
OTM-29	HCN	7:56	8:21	11:08	11:33
EPA Method 23	PAH/PCB	7:56	10:36	11:08	13:55
Run 7 – 07/31/2024					
OTM-29	HCN	8:26	8:51	11:09	11:34
EPA Method 23	PAH/PCB	8:26	11:06	11:09	13:55

Table 3-3
ICR Testing Miscellaneous Pause Times by Run

Method and Run	Pause Times		Description ^{a,b}
	Pause	Resume	
Method 23 Run 1	10:04	10:18	Standard Pause
	12:17	13:38	Standard Pause
	13:53	14:31	Standard Pause
	15:01	15:06	Standard Pause
Method 23 Run 2	9:25	10:20	Standard Pause
	10:46	11:01	Standard Pause
	11:05	11:14	Pause to investigate loss of pressure in cubic foot box. See section 3.3.2.
	14:03	14:23	Standard Pause
Method 23 Run 3	10:02	10:15	Standard Pause
	11:00	11:25	Standard Pause
	12:21	12:35	Standard Pause
	14:36	14:51	Standard Pause
	15:48	16:01	Standard Pause
	16:57	17:10	Standard Pause
Method 23 Run 4	9:12	9:29	Standard Pause
	9:57	10:27	Standard Pause
	12:19	12:47	Standard Pause
	13:29	13:48	Standard Pause
OTM-29 Run 5	18:41	18:54	Standard Pause
Method 23 Run 5	16:25	16:42	Standard Pause
	17:17	17:46	Standard Pause
	18:41	18:53	Standard Pause
	19:48	20:11	Standard Pause
Method 23 Run 6	8:42	9:09	Standard Pause
	10:02	10:19	Standard Pause
	11:56	12:26	Standard Pause
	13:15	13:28	Standard Pause
Method 23 Run 7	9:22	9:42	Standard Pause
	10:37	10:57	Standard Pause
	11:50	12:02	Standard Pause
	12:21	12:44	Standard Pause
	13:37	13:48	Standard Pause

Notes:

^a Standard pauses occurred to conduct calibrations and bias checks on the Method 25A train as well as to address moisture and empty impingers as necessary.

^b All times reported in this table are in military time. For specific run dates and times, see Table 3-2.

Table 3-4
ICR Testing Operating Conditions Summary ^a

Operating Parameter	Units	Target Operating Range Presented in the ICR Test Plan	Average during the M23 Sampling Train Timeframe	Average during the OTM-29 Sampling Train Timeframe
Combustion Chamber Temperature	°F	1,810 - 1,905 ^b	1,900	1,900
Combustion Gas Flowrate	acfm	4,837 - 7,546	5,826	5,819
Total Hazardous Waste Feedrate	lb/hr	1,402 - 4,163	2,215	2,216
Caustic Scrubber Effluent pH	pH	7.46 - 8.51	8.30	8.30
Caustic Scrubber Liquid to Gas Ratio (L/G)	-	1.82 - 6.84	4.97	5.00

Notes:

^a As requested by the ICR, the maximum, minimum, and average of the one-minute average for each parameter for each test run is provided in Appendix II.

^b The planned targeted range for combustion chamber temperature was corrected before the commencement of testing. See Section 3.3.3 for more information.

Table 3-5
Operating Parameters Achieved during the EPA Method 23 (PAH/PCB) Sampling Train Timeframes ^a

Operating Parameter	Units	Target Operating Range	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Average
Combustion Chamber Temperature	°F	1,810 - 1,905 ^b	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900
Combustion Gas Flowrate	acfm	4,837 - 7,546	5,055	6,026	6,065	4,957	4,963	6,852	6,867	5,826
Total Hazardous Waste Feedrate	lb/hr	1,402 - 4,163	1,501	2,500	2,500	1,501	1,500	3,001	3,000	2,215
Caustic Scrubber Effluent pH	pH	7.46 - 8.51	8.44	8.37	8.20	8.28	8.31	8.24	8.26	8.30
Caustic Scrubber Liquid to Gas Ratio (L/G)	-	1.82 - 6.84	5.61	4.71	4.68	5.71	5.72	4.20	4.13	4.97

Notes:

^a As requested by the ICR, the maximum, minimum, and average of the one-minute average for each parameter for each test run is provided in Appendix II.

^b The planned targeted range for combustion chamber temperature was corrected before the commencement of testing. See Section 3.3.3 for more information.

Table 3-6
Operating Parameters Achieved during the OTM-29 (HCN) Sampling Train Timeframes ^a

Operating Parameter	Units	Target Operating Range	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Average
Combustion Chamber Temperature	°F	1,810 - 1,905 ^b	1,900	1,900	1,900	1,900	1,900	1,899	1,900	1,900
Combustion Gas Flowrate	acfm	4,837 - 7,546	5,075	6,036	6,024	4,976	4,962	6,784	6,872	5,819
Total Hazardous Waste Feedrate	lb/hr	1,402 - 4,163	1,499	2,510	2,499	1,502	1,501	3,001	3,000	2,216
Caustic Scrubber Effluent pH	pH	7.46 - 8.51	8.43	8.38	8.24	8.28	8.31	8.24	8.25	8.30
Caustic Scrubber Liquid to Gas Ratio (L/G)	-	1.82 - 6.84	5.58	4.74	4.72	5.69	5.73	4.37	4.14	5.00

Notes:

^a As requested by the ICR, the maximum, minimum, and average of the one-minute average for each parameter for each test run is provided in Appendix II.

^b The planned targeted range for combustion chamber temperature was corrected before the commencement of testing. See Section 3.3.3 for more information.

4.0 STACK GAS AND PROCESS SAMPLING AND ANALYSIS

This section provides an overview of the sampling and analysis activities for the ICR Test. The waste feedstream and stack emissions were sampled during the ICR Test and subsequently analyzed. Quantitative sampling and analysis results are summarized in Section 5.0.

4.1 Stack Gas Sampling and Analysis

The stack gas sampling and analytical methods are shown in Table 4-1. Stack gas sampling was performed at sampling ports installed in the breaching prior to the stack. Personnel from Eastman's Environmental Services Laboratory (ESL) performed all stack gas sampling.

Detailed descriptions of the sampling and analytical methods are included with the Quality Assurance Project Plan (QAPP) for the ICR Test Plan. The ICR Test Plan and its appendices are attached as an appendix to this report (see Appendix I).

EPA Method 23 was performed for the determination of PAH and PCB emissions. Using this method, stack gas emissions were withdrawn from the sampling port at an isokinetic sampling rate, and were collected in the sample probe, on front half glassware surfaces, on the glass fiber filter, on back half glassware surfaces, and in the solid sorbent module. This train was operated to allow collection of the minimum sample volume of 4 dscm as prescribed by EPA in Enclosure 1 of the section 114 request. The PAH and PCB, once extracted from the sample, were separated using high-resolution gas chromatography and measured using high-resolution mass spectrometry. Analysis of the EPA Method 23 samples was performed by Eurofins Knoxville.

Concurrent with the EPA Method 23 train, THC concentration was monitored using EPA Method 25A. A continuous emissions monitor was used to measure exhaust gas concentrations of THC. Using this method, a gas sample was extracted through a heated sample line to a flame ionization analyzer (FIA). Results from this analysis were reported as volume concentration equivalents of propane.

U.S. EPA's Other Test Method 29 (OTM-29) was used to collect gas samples for hydrogen cyanide (HCN) analysis. Using this method, the sample was isokinetically withdrawn from the gas stream and collected on a filter (which was not collected and analyzed per this method), four sodium hydroxide (NaOH) impingers, and a Silica Gel impinger. HCN present in the stack gas reacted with NaOH to form a cyanide ion, which was retained in the alkaline impinger and analyzed by ion chromatography (IC). As prescribed by EPA in Enclosure 1 of the section 114 request, breakthrough was determined according to section 9.2.1 of OTM-29 and reported. Samples were analyzed by Enthalpy Analytical, LLC of Durham, North Carolina.

4.2 Process Sampling and Analysis

The only stream fed to the HCl Recovery Unit during the test was the liquid waste feedstream. Table 4-2 presents a summary of the feedstream sampling location, frequency of sampling, and the analytical method used during the ICR Test. Results of the feedstream analysis are presented in Section 5.0.

Samples were collected at the beginning, middle, and end of each run and were then composited per run. Liquid waste chemicals were sampled from a tap in the waste feed line. The liquid chemical waste samples were analyzed by Eurofins Knoxville.

Table 4-1
ICR Test Stack Gas Sampling and Analysis

Sampling Method ^a	Number of Sampling Runs	Minimum Sampling Time/Volume per Run	Analytical Parameters	Analytical Method ^a
EPA Method 1	1	N/A	Sampling and Traverse Point Locations	EPA Method 1
EPA Method 2	7	Concurrent with isokinetic methods	Volumetric Flowrate	EPA Method 2
EPA Method 3A	7	Concurrent with isokinetic methods	Molecular Weight (CO ₂ and O ₂)	EPA Method 3A
EPA Method 4	7	Concurrent with isokinetic methods	Moisture	EPA Method 4
EPA Method 23	7	*collect a minimum sample volume of 141 dscf (4 dscm)	Polychlorinated Biphenyls/Polycyclic Aromatic Hydrocarbons (PCB/PAH)	EPA Method 23
EPA Method 25A	7	Concurrent with EPA Method 23	Total Hydrocarbons (THC)	EPA Method 25A
Other Test Method 29 (OTM-29)	7	*collect a maximum sample volume of 1 dscm	Hydrogen Cyanide (HCN)	OTM-29
Continuous Emissions Monitoring System (CEMS)	7	Continuous	Oxygen (O ₂)	Performance Specification-4B
			Carbon Monoxide (CO)	Performance Specification-4B

Notes:

^a Methods are from 40 CFR Part 60 Appendices A and B or EPA Air Emission Measurement Center (EMC) listed test methods.

Table 4-2
ICR Test Process Stream Sampling and Analysis

Stream	Sampling Method/ Location	Frequency of Sampling	Number of Composite Samples	Analytical Parameter	Analytical Method
Liquid Waste	Tap in waste feed line	Beginning, middle, and end of each run	1 for each run, plus a duplicate (archived)	HHV	ASTM D240

5.0 ICR TESTING RESULTS

The quantitative emission and feedstream results from the ICR Test are presented in this section. The data collected during the ICR Test are reported as specified in the ICR Letter dated January 31, 2024.

5.1 Stack Gas Emission Results

Tables 5-1 through 5-5 present the stack test results for the parameters specified in Enclosure 1 to the ICR Letter dated January 31, 2024. The tables are organized as follows:

PCB Results (including THC results)

Table 5-1 – results in ng/dscm @ 7% O₂

Table 5-2 – results in lb/hr

PAH Results (including THC results)

Table 5-3 – results in ng/dscm, 7% O₂

Table 5-4 – results in lb/hr

HCN Results

Table 5-5 – results in ppmvd @ 7% O₂ and in lb/hr

These tables show the results from each run and the 7-run average. Detailed quantitative results are presented in the stack gas analytical reports included in Appendix IV.

5.2 Feedstream Analytical Results

The feedstreams fed during this test were analyzed for higher heating value (HHV). These results are presented in Table 5-6.

A minimum of three subsamples were collected during each run to create the composite samples that were analyzed, consistent with the ICR letter dated January 31, 2024. Detailed feedstream analytical results are included in the laboratory feedstream analytical data packages included in Appendix V.

Table 5-1
PCB Emission Concentration Results

Compound	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Average
Test Date	7/26/2024	7/27/2024	7/28/2024	7/29/2024	7/29/2024	7/30/2024	7/31/2024	--
Start Time	9:04	8:25	9:15	8:23	15:30	7:56	8:26	--
Finish Time	15:36	15:23	17:27	14:12	20:56	13:55	13:55	--
Sample Volume, dscf	167	206	145	144	147	158	167	162
Gas Flowrate, dscfm	2,058	2,627	2,303	2,045	2,045	2,318	2,497	2,270
Moisture, % volume	47.7	45.9	51.0	47.9	49.1	54.8	53.0	49.9
O ₂ , % dry volume	8.9	7.2	7.3	9.1	9.1	7.0	7.0	7.9
CO ₂ , % dry volume	8.6	10.6	10.6	8.7	8.8	10.8	10.9	9.9
THC, ppmvd @ 7% O ₂ as propane ^a	0.0*	0.0	0.0*	0.0*	0.0	0.0*	0.0*	0.0
Percent Isokinetic	96.4	93.0	91.9	94.7	96.9	101.1	100.2	96.7
Polychlorinated Biphenyls (PCB) - Concentration, ng/dscm @ 7% O₂ ^{b,c,d}								
2,4'-DiCB - (PCB-8)	4.49E+00	1.62E-01	5.02E+00	1.02E+01	1.76E+00	2.47E+00	3.64E+00	3.96E+00
2,2',5-TrCB - (PCB-18)	2.52E+00	<(4.95E-02)	2.06E+00	6.31E+00	8.05E-01	1.27E+00	2.10E+00	<2.16E+00
2,4,4'-TrCB - (PCB-28)	7.38E+00	1.05E-01	4.85E+00	1.29E+01	1.46E+00	2.06E+00	2.92E+00	4.53E+00
2,2',3,5'-TeCB - (PCB-44)	8.94E+00	1.14E-01	4.00E+00	1.32E+01	1.42E+00	1.92E+00	3.20E+00	4.68E+00
2,2',5,5'-TeCB - (PCB-52)	8.99E+00	1.25E-01	5.17E+00	1.88E+01	2.05E+00	3.36E+00	5.21E+00	6.24E+00
2,3',4,4'-TeCB - (PCB-66)	9.70E+00	9.13E-02	4.05E+00	1.05E+01	1.33E+00	1.64E+00	2.63E+00	4.28E+00
3,3',4,4'-TeCB - (PCB-77)	5.06E+00	5.92E-02	2.06E+00	4.23E+00	5.20E-01	4.59E-01	7.54E-01	1.88E+00
3,4,4',5'-TeCB - (PCB-81)	2.21E-01	<(1.67E-02)	6.51E-01	2.80E-01	7.04E-02	5.27E-02	5.99E-02	<1.93E-01
2,2',4,5,5'-PeCB - (PCB-101)	3.74E+01	3.46E-01	1.63E+01	4.78E+01	5.82E+00	8.96E+00	1.48E+01	1.88E+01

Notes:

^a THC concentration values are derived from the performance of EPA Method 25A concurrent with EPA Method 23. Any negative values are reported as "0.0*".

^b Values with "()" indicate that the compound's result was below detection limit (BDL); therefore, the reported value is calculated based on the method detection limit (MDL).

^c Italicized values with "<()" indicate that the compound's result was detected below the MDL. Per the ICR request, these values are calculated based on the method detection limit.

^d If a value does not contain "()", the value was above the detection limit (ADL).

Table 5-1
PCB Emission Concentration Results (continued)

Compound	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Average
Polychlorinated Biphenyls (PCB) - Concentration, ng/dscm @ 7% O₂ ^{b,c,d} (continued)								
2,3,3',4,4'-PeCB - (PCB-105)	9.41E+00	1.72E-01	3.75E+00	1.13E+01	1.08E+00	1.39E+00	2.24E+00	4.20E+00
2,3,4,4',5-PeCB - (PCB-114)	7.06E-01	<(2.87E-02)	2.68E-01	8.09E-01	1.00E-01	1.44E-01	2.06E-01	<3.23E-01
2,3',4,4',5-PeCB - (PCB-118)	2.41E+01	4.41E-01	9.32E+00	2.99E+01	2.94E+00	3.90E+00	6.29E+00	1.10E+01
2',3,4,4',5-PeCB - (PCB-123)	5.33E-01	<(2.97E-02)	3.16E-01	5.87E-01	7.83E-02	9.26E-02	1.87E-01	<2.60E-01
3,3',4,4',5-PeCB - (PCB-126)	5.35E-01	<(2.14E-02)	1.75E-01	3.83E-01	5.54E-02	7.28E-02	6.18E-02	<1.86E-01
2,2',3,3',4,4'-HxCB - (PCB-128)	3.54E+00	8.13E-02	1.41E+00	3.66E+00	3.87E-01	4.44E-01	7.94E-01	1.47E+00
2,2',3,4,4',5'-HxCB - (PCB-138)	2.47E+01	5.77E-01	9.47E+00	2.67E+01	2.85E+00	3.27E+00	6.08E+00	1.05E+01
2,2',4,4',5,5'-HxCB - (PCB-153)	2.06E+01	4.19E-01	7.71E+00	2.21E+01	2.44E+00	2.89E+00	5.36E+00	8.79E+00
2,3,3',4,4',5-HxCB - (PCB-156)	1.46E+00	8.32E-02	7.08E-01	1.63E+00	1.92E-01	2.67E-01	3.85E-01	6.74E-01
2,3,3',4,4',5'-HxCB - (PCB-157)	1.46E+00	8.32E-02	7.08E-01	1.63E+00	1.92E-01	2.67E-01	3.85E-01	6.74E-01
2,3',4,4',5,5'-HxCB - (PCB-167)	6.50E-01	3.75E-02	2.76E-01	6.85E-01	9.07E-02	1.29E-01	1.56E-01	2.89E-01
3,3',4,4',5,5'-HxCB - (PCB-169)	(1.50E-01)	<(2.14E-02)	<(1.53E-01)	(3.54E-02)	(3.48E-02)	2.94E-02	<(2.60E-02)	<6.43E-02
2,2',3,3',4,4',5-HpCB - (PCB-170)	1.42E+00	1.01E-01	5.34E-01	1.53E+00	2.91E-01	2.98E-01	3.79E-01	6.51E-01
2,2',3,4,4',5,5'-HpCB - (PCB-180)	3.44E+00	2.33E-01	1.54E+00	4.43E+00	8.05E-01	7.58E-01	1.02E+00	1.75E+00
2,2',3,4',5,5',6-HpCB - (PCB-187)	4.30E+00	1.52E-01	1.70E+00	5.27E+00	6.22E-01	6.41E-01	1.17E+00	1.98E+00
2,3,3',4,4',5,5'-HpCB - (PCB-189)	<(1.80E-01)	2.64E-02	<(1.83E-01)	6.68E-02	4.15E-02	6.21E-02	3.11E-02	<8.43E-02
2,2',3,3',4,4',5,6-OcCB - (PCB-195)	<(1.94E-01)	2.83E-02	<(1.98E-01)	2.33E-01	7.12E-02	7.80E-02	6.29E-02	<1.24E-01
2,2',3,3',4,4',5,5',6-NoCB - (PCB-206)	(2.09E-01)	8.42E-02	(2.13E-01)	1.56E-01	1.44E-01	2.02E-01	1.25E-01	<1.62E-01
2,2',3,3',4,4',5,5',6,6'-DeCB - (PCB-209)	<(1.69E-01)	8.84E-02	2.93E-01	1.11E-01	1.11E-01	1.89E-01	1.53E-01	<1.59E-01

Notes:

- ^a THC concentration values are derived from the performance of EPA Method 25A concurrent with EPA Method 23. Any negative values are reported as "0.0*".
- ^b Values with "()" indicate that the compound's result was below detection limit (BDL); therefore, the reported value is calculated based on the method detection limit (MDL).
- ^c Italicized values with "< ()" indicate that the compound's result was detected below the MDL. Per the ICR request, these values are calculated based on the method detection limit.
- ^d If a value does not contain "()", the value was above the detection limit (ADL).

Table 5-2
PCB Emission Rate Results

Compound	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Average
Test Date	7/26/2024	7/27/2024	7/28/2024	7/29/2024	7/29/2024	7/30/2024	7/31/2024	--
Start Time	9:04	8:25	9:15	8:23	15:30	7:56	8:26	--
Finish Time	15:36	15:23	17:27	14:12	20:56	13:55	13:55	--
Sample Volume, dscf	167	206	145	144	147	158	167	162
Gas Flowrate, dscfm	2,058	2,627	2,303	2,045	2,045	2,318	2,497	2,270
Moisture, % volume	47.7	45.9	51.0	47.9	49.1	54.8	53.0	49.9
O ₂ , % dry volume	8.9	7.2	7.3	9.1	9.1	7.0	7.0	7.9
CO ₂ , % dry volume	8.6	10.6	10.6	8.7	8.8	10.8	10.9	9.9
THC, ppmvd @ 7% O ₂ as propane ^a	0.0*	0.0	0.0*	0.0*	0.0	0.0*	0.0*	0.0
Percent Isokinetic	96.4	93.0	91.9	94.7	96.9	101.1	100.2	96.7
Polychlorinated Biphenyls (PCB) - Emission Rate, lb/hr ^{b,c,d}								
2,4'-DiCB - (PCB-8)	2.99E-08	1.57E-09	4.24E-08	6.63E-08	1.15E-08	2.14E-08	3.41E-08	2.96E-08
2,2',5-TrCB - (PCB-18)	1.67E-08	<(4.80E-10)	1.74E-08	4.10E-08	5.24E-09	1.11E-08	1.96E-08	<1.59E-08
2,4,4'-TrCB - (PCB-28)	4.91E-08	1.02E-09	4.09E-08	8.41E-08	9.46E-09	1.79E-08	2.73E-08	3.28E-08
2,2',3,5'-TeCB - (PCB-44)	5.95E-08	1.10E-09	3.38E-08	8.58E-08	9.21E-09	1.67E-08	2.99E-08	3.37E-08
2,2',5,5'-TeCB - (PCB-52)	5.98E-08	1.22E-09	4.36E-08	1.22E-07	1.33E-08	2.92E-08	4.87E-08	4.55E-08
2,3',4,4'-TeCB - (PCB-66)	6.45E-08	8.86E-10	3.42E-08	6.85E-08	8.67E-09	1.42E-08	2.46E-08	3.08E-08
3,3',4,4'-TeCB - (PCB-77)	3.37E-08	5.74E-10	1.74E-08	2.75E-08	3.38E-09	3.99E-09	7.05E-09	1.34E-08
3,4,4',5-TeCB - (PCB-81)	1.47E-09	<(1.62E-10)	5.50E-09	1.82E-09	4.58E-10	4.57E-10	5.60E-10	<1.49E-09
2,2',4,5,5'-PeCB - (PCB-101)	2.49E-07	3.35E-09	1.38E-07	3.11E-07	3.79E-08	7.78E-08	1.38E-07	1.36E-07

Notes:

^a THC concentration values are derived from the performance of EPA Method 25A concurrent with EPA Method 23. Any negative values are reported as "0.0*".

^b Values with "()" indicate that the compound's result was below detection limit (BDL); therefore, the reported value is calculated based on the method detection limit (MDL).

^c Italicized values with "<()" indicate that the compound's result was detected below the MDL. Per the ICR request, these values are calculated based on the method detection limit.

^d If a value does not contain "()", the value was above the detection limit (ADL).

Table 5-2
PCB Emission Rate Results (continued)

Compound	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Average
Polychlorinated Biphenyls (PCB) - Emission Rate, lb/hr^{b,c,d} (continued)								
2,3,3',4,4'-PeCB - (PCB-105)	6.26E-08	1.67E-09	3.17E-08	7.38E-08	7.00E-09	1.21E-08	2.10E-08	3.00E-08
2,3,4,4',5-PeCB - (PCB-114)	4.70E-09	<(2.78E-10)	2.27E-09	5.26E-09	6.52E-10	1.25E-09	1.92E-09	<2.33E-09
2,3',4,4',5-PeCB - (PCB-118)	1.60E-07	4.28E-09	7.87E-08	1.95E-07	1.91E-08	3.39E-08	5.88E-08	7.85E-08
2',3,4,4',5-PeCB - (PCB-123)	3.54E-09	<(2.88E-10)	2.66E-09	3.82E-09	5.09E-10	8.04E-10	1.75E-09	<1.91E-09
3,3',4,4',5-PeCB - (PCB-126)	3.56E-09	<(2.07E-10)	1.47E-09	2.49E-09	3.60E-10	6.32E-10	5.78E-10	<1.33E-09
2,2',3,3',4,4'-HxCB - (PCB-128)	2.36E-08	7.88E-10	1.19E-08	2.38E-08	2.52E-09	3.85E-09	7.42E-09	1.05E-08
2,2',3,4,4',5'-HxCB - (PCB-138)	1.64E-07	5.59E-09	7.99E-08	1.73E-07	1.86E-08	2.84E-08	5.68E-08	7.53E-08
2,2',4,4',5,5'-HxCB - (PCB-153)	1.37E-07	4.06E-09	6.50E-08	1.44E-07	1.58E-08	2.51E-08	5.01E-08	6.30E-08
2,3,3',4,4',5-HxCB - (PCB-156)	9.71E-09	8.07E-10	5.98E-09	1.06E-08	1.25E-09	2.32E-09	3.60E-09	4.89E-09
2,3,3',4,4',5'-HxCB - (PCB-157)	9.71E-09	8.07E-10	5.98E-09	1.06E-08	1.25E-09	2.32E-09	3.60E-09	4.89E-09
2,3',4,4',5,5'-HxCB - (PCB-167)	4.32E-09	3.64E-10	2.33E-09	4.46E-09	5.90E-10	1.12E-09	1.46E-09	2.09E-09
3,3',4,4',5,5'-HxCB - (PCB-169)	(1.00E-09)	<(2.07E-10)	<(1.29E-09)	(2.30E-10)	(2.26E-10)	2.55E-10	<(2.44E-10)	<4.93E-10
2,2',3,3',4,4',5-HpCB - (PCB-170)	9.46E-09	9.82E-10	4.51E-09	9.98E-09	1.89E-09	2.59E-09	3.54E-09	4.71E-09
2,2',3,4,4',5,5'-HpCB - (PCB-180)	2.29E-08	2.26E-09	1.30E-08	2.88E-08	5.24E-09	6.58E-09	9.56E-09	1.26E-08
2,2',3,4',5,5',6-HpCB - (PCB-187)	2.86E-08	1.48E-09	1.43E-08	3.43E-08	4.04E-09	5.57E-09	1.10E-08	1.42E-08
2,3,3',4,4',5,5'-HpCB - (PCB-189)	<(1.19E-09)	2.56E-10	<(1.54E-09)	4.34E-10	2.70E-10	5.39E-10	2.91E-10	<6.47E-10
2,2',3,3',4,4',5,6-OcCB - (PCB-195)	<(1.29E-09)	2.75E-10	<(1.67E-09)	1.52E-09	4.63E-10	6.77E-10	5.88E-10	<9.26E-10
2,2',3,3',4,4',5,5',6-NoCB - (PCB-206)	(1.39E-09)	8.17E-10	(1.79E-09)	1.01E-09	9.37E-10	1.76E-09	1.17E-09	<1.27E-09
2,2',3,3',4,4',5,5',6,6'-DeCB - (PCB-209)	<(1.12E-09)	8.57E-10	2.48E-09	7.25E-10	7.19E-10	1.64E-09	1.44E-09	<1.28E-09

Notes:

- ^a THC concentration values are derived from the performance of EPA Method 25A concurrent with EPA Method 23. Any negative values are reported as "0.0*".
- ^b Values with "()" indicate that the compound's result was below detection limit (BDL); therefore, the reported value is calculated based on the method detection limit (MDL).
- ^c Italicized values with "<()" indicate that the compound's result was detected below the MDL. Per the ICR request, these values are calculated based on the method detection limit.
- ^d If a value does not contain "()", the value was above the detection limit (ADL).

Table 5-3
PAH Emission Concentration Results

Compound	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Average
Test Date	7/26/2024	7/27/2024	7/28/2024	7/29/2024	7/29/2024	7/30/2024	7/31/2024	--
Start Time	9:04	8:25	9:15	8:23	15:30	7:56	8:26	--
Finish Time	15:36	15:23	17:27	14:12	20:56	13:55	13:55	--
Sample Volume, dscf	167	206	145	144	147	158	167	162
Gas Flowrate, dscfm	2,058	2,627	2,303	2,045	2,045	2,318	2,497	2,270
Moisture, % volume	47.7	45.9	51.0	47.9	49.1	54.8	53.0	49.9
O ₂ , % dry volume	8.9	7.2	7.3	9.1	9.1	7.0	7.0	7.9
CO ₂ , % dry volume	8.6	10.6	10.6	8.7	8.8	10.8	10.9	9.9
THC, ppmvd @ 7% O ₂ as propane ^a	0.0*	0.0	0.0*	0.0*	0.0	0.0*	0.0*	0.0
Percent Isokinetic	96.4	93.0	91.9	94.7	96.9	101.1	100.2	96.7
Polycyclic Aromatic Hydrocarbons (PAH) - Concentration, ng/dscm @ 7% O₂ ^{b,c,d}								
Naphthalene	4.79E+02	9.92E+01	4.75E+02	6.94E+02	3.31E+02	2.67E+02	3.90E+02	3.91E+02
2-Methylnaphthalene	1.28E+02	4.85E+01	1.13E+02	1.98E+02	1.01E+02	8.20E+01	1.09E+02	1.11E+02
Acenaphthylene	<(2.20E+00)	<(1.56E+00)	<(2.24E+00)	<(2.59E+00)	<(2.54E+00)	<(2.02E+00)	<(1.91E+00)	<2.15E+00
Acenaphthene	4.86E+01	<(1.56E+01)	2.33E+01	4.72E+01	<(2.54E+01)	<(2.02E+01)	1.91E+01	<2.85E+01
Fluorene	9.16E+01	<(1.56E+01)	3.48E+01	8.09E+01	<(2.54E+01)	<(2.02E+01)	2.41E+01	<4.18E+01
Phenanthrene	5.33E+02	1.51E+01	4.55E+02	4.72E+02	8.85E+01	7.55E+01	9.84E+01	2.48E+02
Anthracene	<(2.20E+01)	(1.56E+01)	<(2.24E+01)	<(2.59E+01)	<(2.54E+01)	<(2.02E+01)	<(1.91E+01)	<2.15E+01
Fluoranthene	2.28E+02	1.08E+01	2.19E+02	1.84E+02	2.97E+01	3.18E+01	3.37E+01	1.05E+02

Notes:

^a THC concentration values are derived from the performance of EPA Method 25A concurrent with EPA Method 23. Any negative values are reported as "0.0*".

^b Values with "()" indicate that the compound's result was below detection limit (BDL); therefore, the reported value is calculated based on the method detection limit (MDL).

^c Italicized values with "<()" indicate that the compound's result was detected below the MDL. Per the ICR request, these values are calculated based on the method detection limit.

^d If a value does not contain "()", the value was above the detection limit (ADL).

Table 5-3
PAH Emission Concentration Results (continued)

Compound	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Average
Polycyclic Aromatic Hydrocarbons (PAH) - Concentration, ng/dscm @ 7% O₂ ^{b,c,d} (continued)								
Pyrene	1.68E+02	<(3.13E+01)	5.27E+01	1.29E+02	<(5.09E+01)	<(4.03E+01)	<(3.81E+01)	<7.28E+01
Benzo[a]anthracene	<(4.40E+00)	<(3.13E+00)	<(4.47E+00)	<(5.18E+00)	<(5.09E+00)	<(4.03E+00)	<(3.81E+00)	<4.30E+00
Chrysene	1.73E+01	3.98E+00	2.02E+01	2.04E+01	7.38E+00	8.31E+00	6.01E+00	1.19E+01
Benzo[b]fluoranthene	<(2.20E+01)	<(1.56E+01)	<(2.24E+01)	<(2.59E+01)	<(2.54E+01)	<(2.02E+01)	<(1.91E+01)	<2.15E+01
Benzo[k]fluoranthene	<(4.40E+00)	<(3.13E+00)	<(4.47E+00)	<(5.18E+00)	<(5.09E+00)	<(4.03E+00)	<(3.81E+00)	<4.30E+00
Benzo[e]pyrene	<(4.40E+00)	<(3.13E+00)	<(4.47E+00)	<(5.18E+00)	<(5.09E+00)	<(4.03E+00)	<(3.81E+00)	<4.30E+00
Benzo[a]pyrene	2.81E+00	<(1.56E+00)	<(2.24E+00)	<(2.59E+00)	<(2.54E+00)	<(2.02E+00)	<(1.91E+00)	<2.24E+00
Perylene	<(2.20E+00)	<(1.56E+00)	<(2.24E+00)	<(2.59E+00)	<(2.54E+00)	<(2.02E+00)	<(1.91E+00)	<2.15E+00
Indeno[1,2,3-cd]pyrene	3.59E+00	1.66E+00	<(2.24E+00)	2.99E+00	<(2.54E+00)	<(2.02E+00)	2.27E+00	<2.47E+00
Dibenz(a,h)anthracene	<(4.40E+00)	<(3.13E+00)	<(4.47E+00)	<(5.18E+00)	<(5.09E+00)	<(4.03E+00)	<(3.81E+00)	<4.30E+00
Benzo[g,h,i]perylene	6.23E+00	<(3.13E+00)	5.37E+00	7.26E+00	<(5.09E+00)	<(4.03E+00)	5.84E+00	<5.28E+00

Notes:

- ^a THC concentration values are derived from the performance of EPA Method 25A concurrent with EPA Method 23. Any negative values are reported as "0.0*".
- ^b Values with "()" indicate that the compound's result was below detection limit (BDL); therefore, the reported value is calculated based on the method detection limit (MDL).
- ^c Italicized values with "<()" indicate that the compound's result was detected below the MDL. Per the ICR request, these values are calculated based on the method detection limit.
- ^d If a value does not contain "()", the value was above the detection limit (ADL).

Table 5-4
PAH Emission Rate Results

Compound	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Average
Test Date	7/26/2024	7/27/2024	7/28/2024	7/29/2024	7/29/2024	7/30/2024	7/31/2024	--
Start Time	9:04	8:25	9:15	8:23	15:30	7:56	8:26	--
Finish Time	15:36	15:23	17:27	14:12	20:56	13:55	13:55	--
Sample Volume, dscf	167	206	145	144	147	158	167	162
Gas Flowrate, dscfm	2,058	2,627	2,303	2,045	2,045	2,318	2,497	2,270
Moisture, % volume	47.7	45.9	51.0	47.9	49.1	54.8	53.0	49.9
O ₂ , % dry volume	8.9	7.2	7.3	9.1	9.1	7.0	7.0	7.9
CO ₂ , % dry volume	8.6	10.6	10.6	8.7	8.8	10.8	10.9	9.9
THC, ppmvd @ 7% O ₂ as propane ^a	0.0*	0.0	0.0*	0.0*	0.0	0.0*	0.0*	0.0
Percent Isokinetic	96.4	93.0	91.9	94.7	96.9	101.1	100.2	96.7
Polycyclic Aromatic Hydrocarbons (PAH) - Emission Rate, lb/hr ^{b,c,d}								
Naphthalene	3.19E-06	9.62E-07	4.01E-06	4.51E-06	2.15E-06	2.32E-06	3.64E-06	2.97E-06
2-Methylnaphthalene	8.49E-07	4.70E-07	9.53E-07	1.29E-06	6.58E-07	7.12E-07	1.02E-06	8.50E-07
Acenaphthylene	<(1.46E-08)	<(1.52E-08)	<(1.89E-08)	<(1.69E-08)	<(1.65E-08)	<(1.75E-08)	<(1.78E-08)	<1.68E-08
Acenaphthene	3.24E-07	<(1.52E-07)	1.97E-07	3.07E-07	<(1.65E-07)	<(1.75E-07)	1.78E-07	<2.14E-07
Fluorene	6.10E-07	<(1.52E-07)	2.94E-07	5.26E-07	<(1.65E-07)	<(1.75E-07)	2.26E-07	<3.07E-07
Phenanthrene	3.54E-06	1.47E-07	3.84E-06	3.07E-06	5.75E-07	6.56E-07	9.21E-07	1.82E-06
Anthracene	<(1.46E-07)	(1.52E-07)	<(1.89E-07)	<(1.69E-07)	<(1.65E-07)	<(1.75E-07)	<(1.78E-07)	<1.68E-07
Fluoranthene	1.52E-06	1.04E-07	1.85E-06	1.20E-06	1.93E-07	2.76E-07	3.15E-07	7.79E-07

Notes:

^a THC concentration values are derived from the performance of EPA Method 25A concurrent with EPA Method 23. Any negative values are reported as "0.0*".

^b Values with "()" indicate that the compound's result was below detection limit (BDL); therefore, the reported value is calculated based on the method detection limit (MDL).

^c Italicized values with "<()" indicate that the compound's result was detected below the MDL. Per the ICR request, these values are calculated based on the method detection limit.

^d If a value does not contain "()", the value was above the detection limit (ADL).

Table 5-4
PAH Emission Rate Results (continued)

Compound	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Average
Polycyclic Aromatic Hydrocarbons (PAH) - Emission Rate, lb/hr^{b,c,d}								
Pyrene	1.12E-06	<(3.03E-07)	4.45E-07	8.39E-07	<(3.31E-07)	<(3.50E-07)	<(3.56E-07)	<5.34E-07
Benzo[a]anthracene	<(2.93E-08)	<(3.03E-08)	<(3.78E-08)	<(3.37E-08)	<(3.31E-08)	<(3.50E-08)	<(3.56E-08)	<3.35E-08
Chrysene	1.15E-07	3.86E-08	1.71E-07	1.32E-07	4.80E-08	7.22E-08	5.62E-08	9.04E-08
Benzo[b]fluoranthene	<(1.46E-07)	<(1.52E-07)	<(1.89E-07)	<(1.69E-07)	<(1.65E-07)	<(1.75E-07)	<(1.78E-07)	<1.68E-07
Benzo[k]fluoranthene	<(2.93E-08)	<(3.03E-08)	<(3.78E-08)	<(3.37E-08)	<(3.31E-08)	<(3.50E-08)	<(3.56E-08)	<3.35E-08
Benzo[e]pyrene	<(2.93E-08)	<(3.03E-08)	<(3.78E-08)	<(3.37E-08)	<(3.31E-08)	<(3.50E-08)	<(3.56E-08)	<3.35E-08
Benzo[a]pyrene	1.87E-08	<(1.52E-08)	<(1.89E-08)	<(1.69E-08)	<(1.65E-08)	<(1.75E-08)	<(1.78E-08)	<1.74E-08
Perylene	<(1.46E-08)	<(1.52E-08)	<(1.89E-08)	<(1.69E-08)	<(1.65E-08)	<(1.75E-08)	<(1.78E-08)	<1.68E-08
Indeno[1,2,3-cd]pyrene	2.39E-08	1.61E-08	<(1.89E-08)	1.95E-08	<(1.65E-08)	<(1.75E-08)	2.12E-08	<1.91E-08
Dibenz(a,h)anthracene	<(2.93E-08)	<(3.03E-08)	<(3.78E-08)	<(3.37E-08)	<(3.31E-08)	<(3.50E-08)	<(3.56E-08)	<3.35E-08
Benzo[g,h,i]perylene	4.15E-08	<(3.03E-08)	4.53E-08	4.72E-08	<(3.31E-08)	<(3.50E-08)	5.46E-08	<4.10E-08

Notes:

- ^a THC concentration values are derived from the performance of EPA Method 25A concurrent with EPA Method 23. Any negative values are reported as "0.0*".
- ^b Values with "()" indicate that the compound's result was below detection limit (BDL); therefore, the reported value is calculated based on the method detection limit (MDL).
- ^c Italicized values with "< ()" indicate that the compound's result was detected below the MDL. Per the ICR request, these values are calculated based on the method detection limit.
- ^d If a value does not contain "()", the value was above the detection limit (ADL).

Table 5-5
HCN Emission Results

	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Average
Test Date	7/26/2024	7/27/2024	7/28/2024	7/29/2024	7/29/2024	7/30/2024	7/31/2024	-
Start Time	14:12	8:25	9:15	8:23	15:30	7:56	8:26	-
Finish Time	14:46	13:19	14:10	11:50	18:58	11:33	11:34	-
Sample Volume, dscf	19.96	26.08	23.53	26.51	28.36	27.48	27.69	25.7
Gas Flowrate, dscfm	1,744	2,400	2,057	1,734	1,837	2,333	2,371	2,068
Moisture, % volume	51.3	49.4	55.2	50.2	49.9	55.1	53.5	52.1
O ₂ , % dry volume	8.8	7.1	7.3	9.2	9.1	6.9	7.0	7.9
CO ₂ , % dry volume	8.6	10.5	10.6	8.7	8.8	10.8	10.8	9.8
Percent Isokinetic	100.3	95.3	97.8	98.9	101.8	100.7	99.8	99.2
Results, µg/sample								
Hydrogen Cyanide (HCN) ^a	(71.1)	(85.7)	(75.5)	(77.0)	(74.1)	(75.5)	(64.6)	< 74.8
Hydrogen Cyanide (HCN) Breakthrough ^b	(15.50)	(12.90)	(14.80)	(14.10)	(22.10)	(17.40)	(14.10)	-
Concentration, ppmvd ^c								
Hydrogen Cyanide (HCN)	(0.112)	(0.103)	(0.101)	(0.091)	(0.082)	(0.086)	(0.073)	< 0.093
Concentration, ppmvd @ 7% O₂ ^c								
Hydrogen Cyanide (HCN)	(0.129)	(0.104)	(0.103)	(0.108)	(0.097)	(0.086)	(0.073)	< 0.100
Emission Rate, lb/hr ^c								
Hydrogen Cyanide (HCN)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	< 0.001

Notes:

^a All OTM-29 analytical results were above the detection limit (ADL).

^b Per the ICR request, the breakthrough was determined according to section 9.2.1 of OTM-29 and is reported on this line. All breakthrough analytical results were below detection level (BDL). The value shown within "()" is the method detection limit.

^c The breakthrough results are not included in the concentration and emission rate calculations.

Table 5-6
Feedstream Analytical Results ^a

Parameter	Units	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Average
Liquid Waste									
Higher Heating Value (HHV)	BTU/lb	1,430 ^b	1,530 ^b	1,580	1,700	1,610 ^b	1,690	1,720	1,609

Notes:

^a The waste samples were analyzed beyond the laboratory's specified holding time for heating value analysis, but were within the holding time specified in the QAPP.

^b These samples were less than the reporting limit, but greater than the method detection limit and are an approximate value.