COMPREHENSIVE PERFORMANCE TEST PLAN
F-57180 INDUSTRIAL FURNACE
LYONDELL CHEMICAL COMPANY
EPA I.D. NO. TXD 083472266

PREPARED FOR:

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REVISION 3B
FEBRUARY 2020
FOCUS PROJECT NO. P-001365

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List of Acronyms

AMA	alternative monitoring application
APC	air pollution control
ASTM	American Society for Testing and Materials
AWFCO	automatic waste feed cutoff
BDO	1.4-butanediol
BIF	Boiler and Industrial Furnace Rule (40 CFR 266, Subpart H)
Btu	British thermal unit
Cd	cadmium
CEM	continuous emissions monitoring/monitor
CEMS	continuous emissions monitoring system
CFR	Code of Federal Regulations
Cl^-	chloride ion
Cl_2	molecular chlorine
CMS	continuous monitoring system
CMS PETP	continuous monitoring system performance evaluation test plan
CO	carbon monoxide
CPT	comprehensive performance test
Cr	chromium
CVAA or CVAAS	cold vapor atomic absorption spectrometry
D/F	dioxins/furans
DRE	destruction and removal efficiency
DQO	data quality objective
dscf	dry standard cubic foot
dscm	dry standard cubic meter
EPA	U.S. Environmental Protection Agency
FAP	feedstream analysis plan
ft	foot
g	gram
gpm	gallons per minute
gr	grain
HC or THC	total hydrocarbons
HCl	hydrogen chloride (gas) or hydrochloric acid (aqueous)
Hg	mercury
hr	hour
HWC	hazardous waste combustor
I&E	instrumentation and electrical
ICP or ICAP	inductively coupled argon plasma
inwc	inches water column
kg	kilogram
l or L	liter
Lb or lb	pound
LVM	low volatility metals
MACT	Maximum Achievable Control Technology
mg	milligram
ml	milliliter
MMBtu/hr	million British thermal units per hour
MHWTC	Maximum Hazardous Waste Thermal Concentration
MTEC	Maximum Theoretical Emission Concentration
NDIR	non-dispersive infrared
Pb	lead
PCB	polychlorinated biphenyl
PCDD	polychlorinated dibenzo-p-dioxin
PCDF	polychlorinated dibenzofuran

PEP	performance evaluation plan
PETP	performance evaluation test plan
PIC	product of incomplete combustion
POHC	principal organic hazardous constituent
ppm	parts per million
ppmv	parts per million by volume
PM	particulate matter
psid	pounds per square inch, differential
psig	pounds per square inch, gauge
QA	quality assurance
QAPP	quality assurance project plan
QC	quality control
RCRA	Resource Conservation and Recovery Act
scfh	standard cubic feet per hour
scfm	standard cubic feet per minute
SVM	semi volatile metals
TAC	Texas Administrative Code
TCEQ	Texas Commission on Environmental Quality
TEQ	toxicity equivalents
THC or HC	total hydrocarbons
vol%	volume percent
WFE	wiped film evaporator
wt%	weight percent
µg or ug	microgram
ηg or ng	nanogram

1.0 TEST PROGRAM SUMMARY

1.1 Facility and Test Plan Background

This comprehensive performance test (CPT) plan describes the protocol for testing of the Lyondell Chemical Company's (Lyondell) industrial furnace, Hot Oil Heater F-57180. Treatment of hazardous wastes in this unit is regulated under the Hazardous Waste Combustor (HWC) Maximum Achievable Control Technology (MACT) final rule promulgated on October 12, 2005. The HWC MACT rules at 40 CFR 63 Subpart EEE are incorporated by reference into the State of Texas regulations at 30 TAC 113.620. The initial CPT of this unit was performed in September 2010. This test plan is for the second periodic CPT required to be performed 61 months from the commencement of the previous CPT [40 CFR 63.1207(d)(1)]. The previous CPT was conducted December 2015 making the next periodic test required by January 2021.

1.2 Test Performance and Emissions Objectives [40 CFR 63.1217]

As a process heater, F-57180 industrial furnace is classified as a liquid-fuel-fired boiler (LFB) under the HWC MACT rule (Federal Register, Vol. 70, No. 196, Page 59404, Footnote 1; October 12, 2005). The as-fired or aggregate as-fired heating value of the waste streams treated exceeds 10,000 Btu/lb. The CPT program will demonstrate compliance of F-57180 with the following applicable HWC MACT performance and emissions standards:

- Demonstrate the feed rate of mercury (Hg) is less than 4.2E-05 pounds per million Btu (lb/MMBtu) of waste fired for wastes with heating values of 10,000 Btu/lb or greater based on Maximum Hazardous Waste Thermal Concentration (MHWTC) (no system removal approach) [40 CFR 63.1217(a)(2)(ii), 63.1207(m)(2), & 63.1209(l)(1)(ii)];
- Demonstrate the emissions of the semivolatile metals (SVM) [the combined emissions of lead (Pb) and cadmium (Cd)] are less than 8.2E-05 lb/MMBtu of waste fired for wastes with heating values of 10,000 Btu/lb or greater based on MHWTC [40 CFR 63.1217(a)(3)(ii), 63.1207(m)(2), & 63.1209(n)(2)(v)(A)];
- Demonstrate the emissions of chromium (Cr) [low volatility metal (LVM)] are less than 1.3E-04 lb/MMBtu of waste fired for wastes with heating values of 10,000 Btu/lb or greater based on MHWTC [40 CFR 63.1217(a)(4)(ii), 63.1207(m)(2), & 63.1209(n)(2)(v)(B)];
- Demonstrate the stack gas carbon monoxide (CO) hourly rolling average concentration is less than or equal to 100 parts per million, dry volume (ppmdv), corrected to 7% oxygen [40 CFR 63.1217(a)(5)(i)];
- Demonstrate the stack gas total hydrocarbons (HC or THC) hourly rolling average concentration is less than or equal to 10 ppmdv as propane, corrected to 7% oxygen [40 CFR 63.1217(a)(5)(ii)];
- Demonstrate the combined feed rates of chloride and chlorine or emissions of HCl and Cl_2 are less than 5.1E-02 lb/MMBtu of waste fired for wastes with heating values of 10,000 Btu/lb or greater expressed as chloride (Cl^-) equivalents [40 CFR 63.1217(a)(6)(ii) & 63.1209(o)(1)(ii)];

- Demonstrate the stack gas particulate matter (PM) concentration is less than or equal to 80 milligrams per dry standard cubic meter (mg/dscm) [0.036 grains per dry standard cubic foot (gr/dscf)] corrected to 7% oxygen [40 CFR 63.1217(a)(7)];
- Demonstrate the organic destruction removal efficiency (DRE) of 99.99% for the selected principle organic hazardous constituent (POHC) [40 CFR 63.1217(c)(1)].

Provisions at 40 CFR 63.1206(b)(7) and 63.1207(c)(2)(iv) do not require re-demonstrating organic destruction and removal efficiency (DRE) performance. DRE testing was not repeated during the 2015 CPT. The DRE-related operating parameter limits (OPLs) of maximum waste feed rate, minimum combustion temperature, and maximum combustion gas velocity established via the 2010 CPT were retained. However, Lyondell desires to reduce the minimum combustion temperature limit, and increase the maximum waste feed rate and maximum combustion gas velocity indicator limits. This CPT plan includes re-demonstrating DRE at a lower minimum combustion temperature, and at a higher maximum waste feed rate and associated indicator of maximum combustion gas velocity.

There is no specific numerical performance standard for polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDD/PCDFs) emissions from liquid fuel-fired boilers not equipped with dry air pollution control (APC) systems. PCDD/PCDF emissions were measured during the initial (2010) CPT as required by 63.1207(b)(3). Measurement of PCDD/PCDF emissions will be repeated during this CPT as required by 40 CFR 63.1207(b)(3)(v).

1.3 Test Operating Objectives

Target unit operating conditions are presented in Section 4.0 of this CPT plan. The HWC MACT operating parameter limits (OPLs) from 40 CFR 63.1209(j)-(p) applicable to the Lyondell HWC industrial furnace are summarized in Table 1-1. Values for some operating limits will be demonstrated during the CPT, while others will be set independently of the CPT demonstrated values or results.

The F-57180 industrial furnace has no air pollution control equipment. Lyondell has examined the potential emissions from treatment of the waste streams in this unit and has determined F-57180 can comply with HWC MACT HCl/Cl_2 and metals emission limits via MHWTC. The MHWTC compliance analyses presented in Section 3.0 show the combustion of wastes in F-57180 complies with the HWC MACT thermal-input based emission limits with no control. MHWTC compliance is based on the total feed rate of the respective HWC MACT constituents (Cl, Hg, LVM, and SVM) divided by the total heat input from waste in accordance with the performance test waiver provisions of 40 CFR 63.1207(m)(2).

Details on how the CPT results and operating data will be translated into established limits are presented in Section 7.0 of this CPT plan. The CPT process operating data will be used to establish the maximum ash feed rate [40 CFR 63.1209(m)(3)]. New values for the following DRE-related OPLs will be established via the testing performed under this CPT plan:

- Maximum hazardous waste feed rate [40 CFR 63.1209(j)(3), (k)(4)]
- Minimum combustion temperature [40 CFR 63.1209(j)(1), (k)(2)]
- Maximum combustion gas flow rate [40 CFR 63.1209(j)(2), (k)(3)].

Commensurate with the original CPT plan submittal, Lyondell submitted an Alternative Monitoring Application (AMA) in accordance with 40 CFR 63.1209(g) and 63.8(f) [MACT *General Provisions*]. In the AMA, Lyondell proposed alternative CMS operating limits that provided equivalent or better assurance of compliance with specific HWC MACT performance standards. This version of the CPT reflects the resolution of the AMA items between Lyondell, the Texas Commission on Environmental Quality (TCEQ), and U.S. Environmental Protection Agency (EPA) Region 6, and post-CPT negotiations with EPA Region 6.

1.4 Test Protocol [40 CFR 63.1207(f)]

The test program will be composed of two test conditions with three replicate sampling runs conducted at each set of operating conditions:

- Test 1 is the minimum combustion temperature DRE test. The test condition will demonstrate organic DRE performance and carbon monoxide and total hydrocarbon emissions compliance at a new lower minimum combustion temperature limit.
- Test 2 is the maximum waste feed rate and maximum combustion air flow rate DRE test. The test condition will demonstrate DRE performance and carbon monoxide and total hydrocarbon emissions compliance at new, higher maximum waste feed rate and maximum combustion air flow limits, and establish the maximum ash feed rate. Compliance with the metals and HCl/Cl_2 emissions standards will be demonstrated via MHWTC.

The sampling protocols for the CPT are provided in Section 5.0 of this CPT plan and summarized in Table 1-2. An ash surrogate will be spiked (metered to the waste feed) during Test 2 to demonstrate the desired ash feed rate limit. Additionally, the selected POHC naphthalene will be metered to the waste feed to demonstrate DRE during both test conditions. Detailed information on ash and naphthalene spiking is provided in Section 4.0 of this CPT plan. The previous CPT programs included collection of additional metals data for demonstrating emissions compliance with the Resource Conservation and Recovery Act (RCRA) Boiler and Industrial Furnace (BIF) emission standards. Lyondell's RCRA permit modification request in accordance with 40 CFR 270.22 to remove certain hazardous waste permit provisions including the RCRA BIF monitoring and testing requirements was approved by TCEQ. Therefore, concurrent collection of the RCRA BIF compliance data is removed from this test plan.

1.5 CPT Plan Organization

The CPT plan is organized into eight sections as follows:

- Section 1.0 – Test Program Summary;

- Section 2.0 - Feed Stream Description;
- Section 3.0 - Engineering Description;
- Section 4.0 - Test Design and Protocol;
- Section 5.0 - Sampling, Analysis, and Monitoring Procedures;
- Section 6.0 - Test Schedule;
- Section 7.0 - Operating Permit Objectives; and
- Section 8.0 - Test Report.

The Quality Assurance Project Plan (QAPP) is included as Appendix A. The Continuous Monitoring System Performance Evaluation Test Plan (CMS PETP) is provided in Appendix B.

Any modification to this plan or any appendix will be submitted to the TCEQ for approval.

1.6 Reference Documents

Reference documents that have been used in developing the plan include the following:

- Title 30 Texas Administrative Code Chapter 335 (30 TAC 335) Industrial Solid Waste and Municipal Hazardous Waste.
- National Emission Standards for Hazardous Air Pollutants from Hazardous Waste Combustors, 40 CFR 63 Subpart EEE, September 30, 1999, as amended through February 14, 2002, and Phase II changes effective October 12, 2005.
- American Society for Testing and Materials, "Annual Book of ASTM Standards," latest annual edition.
- EPA, "New Source Performance Standards, Test Methods and Procedures," Appendix A, 40 CFR 60.
- EPA, "Test Methods for Evaluating Solid Wastes Physical/Chemical Methods (SW-846)," Third Edition, 1986 and updates.
- Quality Assurance/Quality Control (QA/QC) Procedures for Hazardous Waste Incineration, EPA/625/6-89/023, January 1990.
- EPA Requirements for Quality Assurance Project Plans (EPA QA/R-5 EPA/240/B-01/003), March 2001.
- Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans (QAMS-005/80).

Table 1-1. HWC MACT Operating Limits Applicable to the Lyondell F-57180 Industrial Furnace

LIMIT	REGULATORY CITATION	HOW ESTABLISHED	AVERAGING TIME	ASSOCIATED STANDARD						
				DRE	D/Fs	Hg	SVM	LVM	PM	HCl/Cl_2
LIMITS ASSOCIATED WITH THE COMBUSTION ZONE										
Minimum combustion temperature	63.1209(j)(1), (k)(2)	Average of test run averages	Hourly rolling average	X Note 1	Note 2					
Maximum combustion chamber pressure	63.1206(c)(5), 63.1209(p)	Sealed unit or lower than ambient pressure	Instantaneous; no averaging	For control of fugitive emissions - no quantified limits established by the HWC MACT rule.						
Maximum flue gas flow rate or production rate	63.1209(j)(2), (k)(3)	Average of the maximum hourly rolling averages	Hourly rolling average	X Note 1	Note 2				X	
Operation of waste firing system	63.1209(j)(4)	Operator to specify parameters and limits	Parameter specific	X Note 1						
LIMITS ASSOCIATED WITH THE WASTE FEED STREAMS										
Maximum hazardous waste feed rate	63.1209(j)(3), (k)(4)	Maximum total as the average of the maximum rolling hour averages	Hourly rolling average	Note 1	Note 2					
Maximum feed rate of mercury	63.1209(l)(1)(ii); 63.1217(a)(2)	Maximum total feed/emissions rate	Annual average			X				
Maximum ash feed rate	63.1209(m)(3); 63.1217(a)(7)	Average of the test run average feed rates	12-hour rolling average						X	
Maximum feed rate of SVM (Cd+Pb)	63.1209(n)(2)(i)(A), (n)(2)(v)(A); 63.1217(a)(3)	Maximum total feed/emissions rate	Annual average				X			
Maximum feed rate of LVM (Cr Only)	63.1209(n)(2)(i)(B), (n)(2)(v)(B); 63.1217(a)(4)	Maximum total feed/emissions rate	12-hour rolling average					X		
Maximum feed rate of total chlorine and chloride	63.1209(o)(1)(ii); 63.1217(a)(6)	Maximum total feed/emissions rate	12-hour rolling average				X	X		X

Table 1-1. Operating Limits Applicable to the Lyondell F-57180 Industrial Furnace (continued)

Notes:

[1] Organic destruction and removal efficiency (DRE) compliance will be demonstrated using the Class 1 principal organic hazardous constituent (POHC), naphthalene. The Test 1 operating data will be used to establish a new minimum combustion temperature limit. The Test 2 operating data will be used to establish new maximum waste feed rate and maximum combustion gas velocity indication limits.

[2] There is no specific numerical performance standard for polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDD/PCDFs) emissions from liquid fuel-fired boilers. PCDD/PCDF emissions were measured during the initial (2010) CPT as required by 63.1207(b)(3). Measurement of PCDD/PCDF emissions is being repeated during this CPT as required by 40 CFR 63.1207(b)(3)(v).

Table 1-2. Sampling and Analysis Data Collection and Use

Sample	Sampling Method	Analytical Method	Target Analytes	Collected During:	
				Test 1	Test 2
Waste Feeds	ASTM E-300-03	ASTM D-240	Heating Value	X	X
		ASTM D-445	Viscosity	X	X
		ASTM D-1475	Density	X	X
		ASTM D-482	Ash Content	X	X
		ASTM D-4017	Moisture	X	X
		SW-846 5050/9056A	Total Chlorine	X	X
		ICP (SW-846 Method 3050B & 6010C)	Metals: Cd, total Cr, Pb		X
		CVAA (SW-846 7471A)	Hg		X
Ash Spike	ASTM E-300-03	ASTM D-482	Ash Content		X
POHC Spike	ASTM E-300-03	SW-846 8015	Naphthalene Content	X	X
Stack Gas	EPA Method 5	EPA Method 5	Particulate (Filterable and Condensable)		X
	SW-846 Method 0023A	SW-846 Method 8290A SW-846 Method 8270C	PCDD/PCDF Naphthalene	X	X
	Carbon Monoxide Installed CEMS	40 CFR 60, Appendix B, Performance Specification 4B	Carbon Monoxide	X	X
	Oxygen Installed CEMS	40 CFR 60, Appendix B, Performance Specification 4B	Oxygen	X[1]	X[1]
	Temporary CEMS	40 CFR 60, Appendix A, Method 25A	Hydrocarbons	X	X

Notes:

[1] Oxygen Correction Only.

2.0 FEED STREAM DESCRIPTION [40 CFR 63.1207(f)(1)(i), (ii), (xi)]

2.1 Feed Stream Characteristics [40 CFR 63.1207(f)(1)(i), (ii), (xi)]

Lyondell has included the liquid waste streams that may be treated in the F-57180 industrial furnace in the RCRA Part A application. F-57180 is a captive system that treats only wastes generated by manufacturing processes owned and operated by Lyondell. The liquid wastes treated are fed from storage tanks (Refer to Figure 2-1). The as-fired characteristics of the liquid wastes are summarized in Table 2-1. Potential waste feed organic constituents are presented in Table 2-2.

2.2 HWC MACT Chloride and Metals Emissions Compliance [40 CFR 63.1217(a)(2)-(4) & (6); 63.1209(l)(1)(ii), (n)(2)(v), (o)(1)(ii)]

Table 2-3 compares the potential chloride and metals emissions of F-57180 to the HWC MACT emissions limits for LFBs. Per the Preamble to the Phase II HWC MACT final rule (See Federal Register / Vol. 70, No. 196 / Wednesday, October 12, 2005 / Page 59404), the LFB standards also apply to process heaters like F-57180. The HWC MACT emission standards are technology-based standards applicable to F-57180 and are independent of the other HWC units operating at any given time. The analyses presented in Table 2-3 shows that no pollution control is required for F-57180. F57180 complies with the HWC MACT chloride and metals emissions standards via a MHWTC approach [40 CFR 63.1207(m)(2), and 63.1209(l)(1)(ii)(B), (n)(2)(v), (o)(1)(ii)].

The waste streams treated in F-57180 are consistently above 10,000 Btu/lb such that the aggregate as-fired heating values of the wastes treated is greater than 10,000 Btu/lb. For waste streams with heating values equal to or greater than 10,000 Btu/lb, the HWC MACT chloride and metals emissions limits are normalized to the heating value (thermal concentration) of the waste expressed in lb/MMBtu of waste fired. Therefore, the potential-to-emit compliance analysis for any individual waste stream is independent of the combustion system configuration, especially for units with no APC equipment

For compliance with HWC MACT, individual waste streams that have the potential to exceed the emissions standards if fed individually at the maximum permitted waste feed rates can be mixed with or co-fired at appropriate ratios with individually-compliant waste feed streams to achieve overall compliance. The analyses in Table 2-3 shows that thermal treatment of all the waste streams, at the proportions normally generated and treated by Lyondell, complies with HWC MACT emissions standards via MHWTC. Lyondell will treat the waste streams as they are generated and are accumulated in the respective storage/feed tanks. Periodic sampling and analysis of the waste streams will be conducted, and feed rates continuously monitored to demonstrate continued compliance with the HWC MACT metals and chloride emission standards.

2.3 HWC MACT Particulate Matter Emissions Compliance [40 CFR 63.1209(m)(3)]

The CPT program will establish maximum ash feed rate limits based on the test average ash feed rates and corresponding demonstrated compliance with the HWC MACT particulate matter emissions standard. The periodic waste sampling and analysis will include analysis for ash content to demonstrate continued compliance with the ash feed rate limits for F-57180.

2.4 Auxiliary Fuel [40 CFR 63.1207(f)(1)(xi)]

Natural gas is used to bring the combustion temperature to the minimum temperature to start hazardous waste feed. Typical characteristics of the natural gas are summarized in Table 2-4. The potential contribution of HWC MACT constituents from natural gas are summarized in Table 2-5.

The liquid waste streams are fed through the burner assemblies once the waste feed permissive temperature is reached. When liquid waste is not being burned and/or F-57180 is operating in a standby mode, or when liquid waste feed rates are low, natural gas can be used as a supplemental or auxiliary fuel to maintain minimum combustion temperature.

Natural gas is not expected to contain ash, chloride, or HWC MACT regulated metals. Samples of the natural gas will not be collected during testing. In accordance with 40 CFR 63.1207(f)(1)(xi), natural gas characterization information from the Gas Research Institute is provided in Table 2-4.

2.5 Other Feed Streams [40 CFR 63.1207(f)(1)(xi)]

Other feed streams to F-57180 include combustion air and atomizing steam. Neither of these feed streams are expected to contain ash or HWC MACT regulated metals. These streams will not be sampled during testing.

2.6 Feed Stream Management

2.6.1 Liquid Waste

The liquid wastes treated in F-57180 are from various on-site production processes as noted in Figure 2-1. These production processes exhibit little variation over time. Therefore, the wastes generated correspondingly do not vary appreciably. The liquid wastes are normally pumped directly from the collection tanks to F-57180.

Lyondell does not specifically blend or premix hazardous liquid waste streams for purposes of achieving or controlling specific waste characteristics prior to their thermal treatment in F-57180. Therefore, 40 CFR 63.1207(f)(1)(ii)(C) does not apply.

Multiple liquid waste feeds are continuously accumulated in and fed from Tank TK-57637 (BDO Liquid Fuel) as portrayed in the schematic flow diagram. R-311 THF Heavies and GBL Lights are fed via separate lines and are relatively low volume streams. The R-311 THF Heavies and GBL Lights streams are combined with the TK-57637 BDO Liquid Fuel in the waste feed line just prior to the F-57180 burners. The analysis results presented in the CPT plan are of the “as-fired” properties of the three respective waste streams. For characterization purposes, Lyondell has on occasion sampled and separately analyzed many of the intermediate contributing waste streams to TK-57637 for identification of their respective regulated constituent contributions. However, the continuing compliance analysis point under HWC MACT is proposed as the waste feeds from the three respective streams identified as BDO Liquid Fuel (TK-57637), R-311 THF Heavies, and GBL Lights.

2.6.2 Feedstream Analysis Plan [40 CFR 63.1209(c)(2)]

Lyondell has developed and implemented a Feedstream Analysis Plan (FAP) as required by 40 CFR 63.1209(c)(2). The FAP addresses the HWC MACT compliance of F-57180 with the feed limits for ash, chloride, and metals

Table 2-1. Waste Feed Characterization

Parameter	Units	Stat.	F-57180 Streams		
			R-311 THF Heavies	GBL Lights	TK-57637
Cadmium (Cd)	mg/kg	Average	0.016	0.028	0.016
		Maximum	0.016	0.040	0.016
		Minimum	0.016	0.016	0.016
		St. Dev.	0.000	0.014	0.000
Chromium (Cr)	mg/kg	Average	4.8	0.175	0.100
		Maximum	8.0	0.250	0.100
		Minimum	2.0	0.100	0.100
		St. Dev.	2.5	0.087	0.000
Lead (Pb)	mg/kg	Average	0.008	0.014	0.008
		Maximum	0.008	0.020	0.008
		Minimum	0.008	0.008	0.008
		St. Dev.	0.000	0.007	0.000
Mercury (Hg)	mg/kg	Average	0.004	0.007	0.004
		Maximum	0.004	0.010	0.004
		Minimum	0.004	0.004	0.004
		St. Dev.	0.000	0.003	0.000
Chloride	mg/kg	Average	5.0	5.0	5.0
		Maximum	5.0	5.0	5.0
		Minimum	5.0	5.0	5.0
		St. Dev.	0.0	0.0	0.0
Ash	wt%	Average	0.009	0.006	0.003
		Maximum	0.026	0.018	0.006
		Minimum	0.001	0.001	0.001
		St. Dev.	0.011	0.008	0.002
Heating Value	Btu/lb	Average	11,275	13,325	10,555
		Maximum	12,000	15,400	11,700
		Minimum	10,500	11,000	9,230
		St. Dev.	838	1,931	1,279

Table 2-2. Waste Feed Organic Constituents

Constituent		F-57180 Streams		
		TK-57637	GBL Lights	R-311 THF Heavies
	CAS No.	Normalized Wt%		
1,4 Butanediol (BDO)	110-63-4	0.11		71.89
n-Butanol	71-36-3	0.03	35.12	
Acetone	67-64-1	18.77		
Acrolein	107-02-8	1.1		
Allyl Alcohol	107-18-6	3.71		
Allyl Alcohol Lights	NA	3.45		
Butyric Acid	107-92-6		19.97	
Gamma Butyrolactone	96-48-0	0.3	30.16	
Methylpropanediol	NA	5.72		2.48
Paratoluene Sulfonic Acid	6192-52-5			5.96
n-Propanol	71-23-8	10.73	1.36	
Propionaldehyde	123-38-6	38.36		
Propylene Oxide (PO)	75-56-9	1.28		
Tetrahydrofuran (THF)	109-99-9	5.4	9.09	14.22
Toluene	108-88-3	2.57	4.3	
Water	7732-18-5	8.48		5.45
TOTAL		100.0	100.0	100.0

Table 2-3. HWC MACT Metals and Chloride Compliance Analysis-Hot Oil Heater F-57180

Constituent	R-311 THF Heavies	GBL Lights	TK-57637	Aggregate Feed Rate	Meets HWC MACT Std.
Chromium (LVM) Std., lb/MMBtu				1.3E-04	Yes
Avg. Conc., mg/kg	4.8	0.175	0.100	0.330	
lb/MMBtu	4.2E-04	1.3E-05	9.5E-06	3.0E-05	
Total SVM (Cd+Pb) Std., lb/MMBtu				8.2E-05	Yes
Avg. Conc., mg/kg	0.024	0.042	0.024	0.025	
lb/MMBtu @ Avg. Conc.	2.1E-06	3.2E-06	2.3E-06	2.3E-06	
Mercury Std., lb/MMBtu				4.2E-05	Yes
Avg. Conc., mg/kg	0.004	0.007	0.004	0.004	
lb/MMBtu	3.5E-07	5.3E-07	3.8E-07	3.9E-07	
Chlorine Std., lb/MMBtu				5.1E-02	Yes
Avg. Conc., mg/kg	5.0	5.0	5.0	5.0	
lb/MMBtu	4.4E-04	3.8E-04	4.7E-04	4.6E-04	
Average Heating Value (Btu/lb)	11,275	13,325	10,555	10,807	
Feed Rate (lb/hr)	110	180	2,000	2,290	

Table 2-4. Typical Characteristics of Natural Gas

Constituent/Property	Units	Value	
		Typical	Range
Major Organic Constituents			
Methane	vol%	93.7	93.4 - 93.9
Ethane	vol%	3.3	2.8 - 3.6
Propane	vol%	0.5	0.5
i-Butane	vol%	0.07	0.06 - 0.1
n-Butane	vol%	0.09	0.08 - 0.1
i-Pentane	vol%	0.03	0.02 - 0.05
n-Pentane	vol%	0.02	0.02 - 0.03
Hexane	vol%	0.05	0.04 - 0.06
Inorganic Constituents			
Water	vol%	~0	~0
Carbon dioxide	vol%	0.9	0.7 - 1.0
Nitrogen	vol%	1.4	1.4 - 1.5
Oxygen/Argon	vol%	0.03	0.03 - 0.04
Ash	vol%	~0	~0
HWC MACT Metals			
Chromium	ug/m^3	<0.01	<0.01
Cadmium	ug/m^3	<0.01	<0.01
Lead	ug/m^3	<0.05	<0.05
Mercury	ug/m^3	<0.01	<0.01
Physical/Chemical Properties			
Heating Value	Btu/scf	1,030	1,028 - 1,033
Vapor Specific Gravity	NA	0.594	0.593 - 0.595
Typical Elemental Composition			
Carbon	wt%	74.8	
Hydrogen	wt%	24	
Oxygen	wt%	0	
Nitrogen	wt%	1.2	
Sulfur	wt%	0	
Chlorine/Chloride	ug/m^3	<1.6	
Bromine/Bromide	ug/m^3	~0	
Fluorine/Fluoride	ug/m^3	~0	
Iodine/Iodide	ug/m^3	~0	

Source: "Analysis of Trace Level Compounds in Natural Gas" Gas Research Institute, Document Number GRI-99/0111, February, 2000

Table 2-5. Potential HWC MACT Constituent Feed Rates from Natural Gas

Constituent/Property	Typical Value	Units	Feed Rate per MMBtu Fired	Units
Chromium	< 0.01	ug/m^3	< 6.1E-10	lb/MMBtu
Cadmium	< 0.01	ug/m^3	< 6.1E-10	lb/MMBtu
Lead	< 0.05	ug/m^3	< 3.9E-09	lb/MMBtu
Mercury	< 0.01	ug/m^3	< 6.1E-10	lb/MMBtu
Chlorine/chloride	< 1.6	ug/m^3	< 9.7E-08	lb/MMBtu

Heating Value	Range	Typical	
	1,028 - 1,033	1,030	Btu/scf

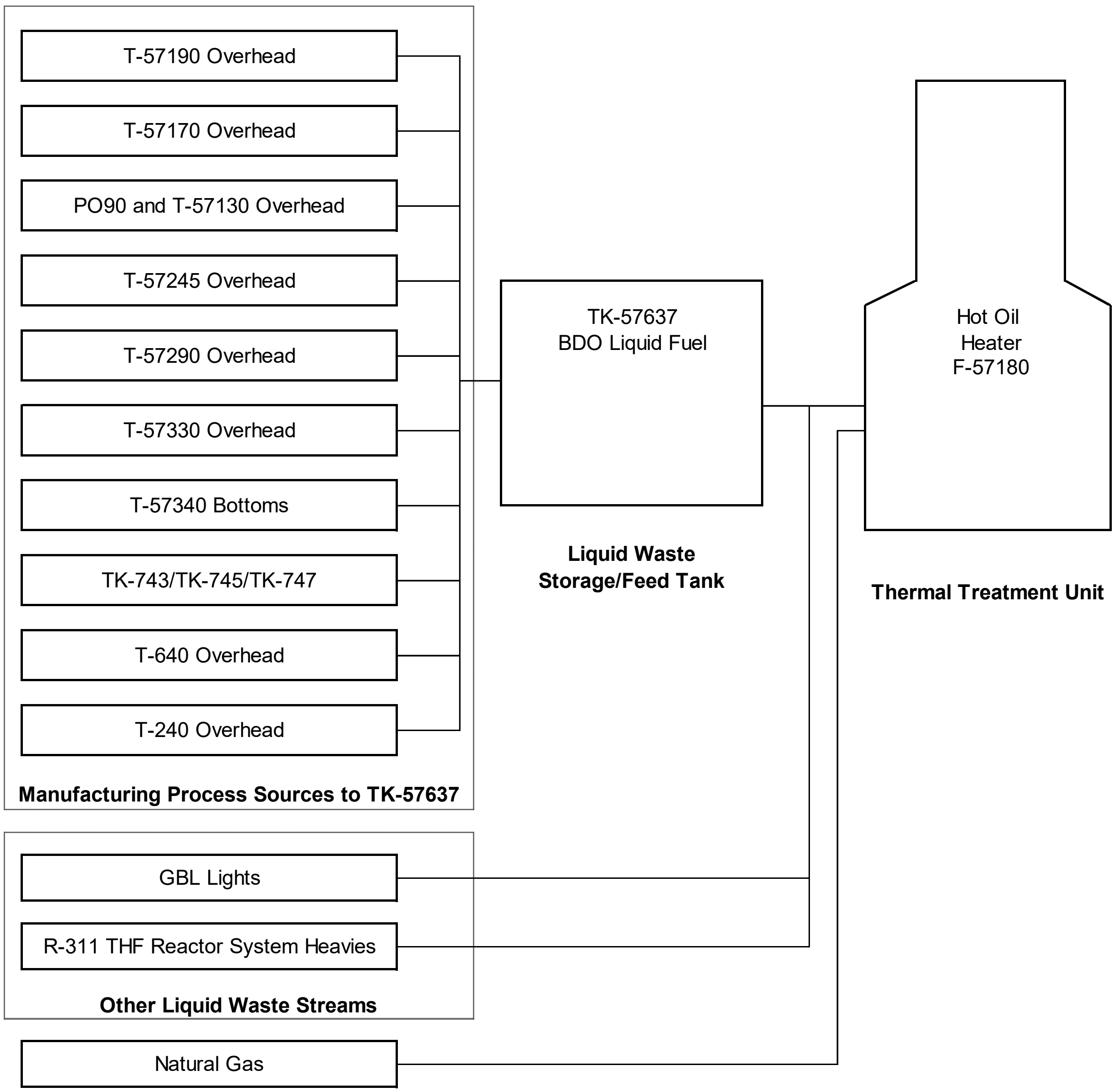


Figure 2-1. Hot Oil Heater F-57180 Feed Streams

3.0 ENGINEERING DESCRIPTION [40 CFR 63.1207(f)(iii)]

3.1 General

Lyondell operates an industrial furnace, Hot Oil Heater F-57180, at its facility located in Channelview, Texas. F-57180 treats a number of liquid hazardous wastes produced by the Lyondell manufacturing operations. F-57180 is used to heat thermal transfer fluid (hot oil) for use in the manufacturing processes. Natural gas is used to bring the industrial furnace to waste feed permissive operating temperatures, to maintain minimum combustion temperature when not treating liquid wastes, and/or to meet the minimum combustion rating. Engineering design information for F-57180 is summarized in Table 3-1.

3.2 Manufacturer's Name and Model Number [40 CFR 63.1207(f)(1)(iii)(A)]

F-57180 was custom built for Lyondell. The manufacturer name and model number are noted in Table 3-1.

3.3 Combustor Type [40 CFR 1207(f)(1)(iii)(B)]

F-57180 is a natural draft unit constructed of two sections (radiant and convective). The unit is equipped with a stack; there are no APC devices. The natural draft provided by the F-57180 stack maintains an induced-draft on the unit's combustion zone.

3.4 Maximum Capacity [40 CFR 1207(f)(1)(iii)(C)]

The designed maximum thermal capacity of F-57180 is noted in Table 3-1.

3.5 Feed System Description [40 CFR 1207(f)(1)(iii)(D)]

3.5.1 Burner Assembly Description

The type of burner feed system is noted in Table 3-1. All hazardous waste feeds are pumpable liquids and are pumped to the F-57180's fuel delivery system from tanks located in the process areas or tank storage areas.

F-57180 is equipped with four (4) liquid and vapor burners that fire natural gas and liquid waste. The majority of the liquid waste feed to the F-57180 burners is pumped from tank TK-57637. The R-311 and GBL Lights streams are relatively low volume streams that are combined with the TK-57637 fuel in the waste feed line just prior to the F-57180 burners. The maximum liquid waste hydraulic feed capacity of each burner is 525 pounds per hour (lb/hr) (nominally 1 gpm). Steam is used as the atomizing media for the liquid waste. The nominally rated firing capacity of F-57180 is 26.9 MMBtu/hr including the burner pilots. The flow of natural gas and/or natural gas/by-product gas mixture is varied to control the product oil temperature.

3.5.2 Combustion Air

F-57180 operates entirely on natural draft with combustion air provided through vented louvers. The natural draft in F-57180 is controlled via a manually operated damper in the unit's stack.

3.5.3 Auxiliary Fuel System

Natural gas is used as fuel gas for the pilot and as auxiliary fuel to raise the operating temperature to acceptable levels before liquid wastes are introduced and/or to maintain combustion temperature when operating at low waste feed rates. The supply of fuel gas is provided from a plant supply line. Feed pressure to the burners is regulated using pressure control valves. An additional pressure control valve provides control of the pilot fuel gas supply pressure.

3.6 Feed System Capacity [40 CFR 1207(f)(1)(iii)(E)]

The designed maximum waste feed rate for F-57180 is noted in Table 3-1.

3.7 Continuous Monitoring System (CMS) and AWFCO System [40 CFR 1207(f)(1)(iii)(F)]

Table 3-2 lists the major process instrumentation for F-57180. Waste feeds are rapidly stopped either due to a regulatory automatic waste feed cutoff (AWFCO) or a safety shutoff. An AWFCO will occur following any of the below conditions:

- When an emission-related parameter set point is reached or exceeded
- When a span value of any parameter CMS is met or exceeded
- When a CMS or CEMS malfunctions.

When any of the above occurs, waste feed is rapidly stopped by either automatic waste feed control valves or the cessation of the waste feed transfer pump or a combination of the two.

Integral to F-57180's control system and AWFCO system is a continuous monitoring system (CMS). The CMS maintains an electronic record of the system's operation. The CMS's electronic records include three types of data: 1) one-minute average values for each continuously monitored regulatory parameter, including carbon monoxide and oxygen, 2) data registers for calculating and recording rolling average values for rolling average limited regulatory parameters (These will be hourly rolling averages for carbon monoxide and oxygen.), and 3) an alarm and AWFCO history log. The CMS's electronic data records are periodically transferred from the CMS data storage to electronic storage media for long-term record storage.

3.8 Design, Operation and Maintenance of APC Systems [40 CFR 63.1207(f)(1)(iii)(G)]

F-57180 is not equipped with an APC system. Therefore, this section is not applicable. However, general unit operations and maintenance are discussed in the following sections.

3.8.1 System Operation

The HWC systems, including F-57180, are operated and maintained in accordance with Lyondell's Operation and Maintenance Plan (O&M Plan). A summary of the associated operating and maintenance procedures is provided in this section of the CPT plan.

The procedures for operating the HWC systems during startup and shutdown are delineated in detailed standard operating procedures (SOPs). The latest approved versions of the SOPs are maintained within Lyondell's in-house computer network, which can be accessed by all F-57180 operators. This online system is configured to support easy access during operation as well as informal reviews of specific information by individual operators. On-line access to SOPs is available in the F-57180 control room, the F-57180 supervisor's office, and other facility locations.

The SOPs are designed to ensure that F-57180 is operated safely with procedures to minimize hazards and emissions. F-57180's control system provides the unit operators with two types of alarms; advisory and critical. Advisory alarms are intended to be used for operator information by warning of unexpected operation. The critical alarm is intended to be used for operator warning of imminent dangerous or improper operation that in some cases might result in excess or non-compliant emissions.

3.8.2 Maintenance

Lyondell maintains an extensive array of maintenance inspections, calibration, and/or preventive maintenance schedules and procedures. Some of these maintenance schedules and procedures are listed below:

- Regular inspection
- Cleaning, repair, or replacement
- Re-calibration of CEM/CMS systems/components
- Routine repair of malfunctioning equipment
- Preventive maintenance of HWC unit equipment
- Predictive maintenance on critical rotating equipment based on periodic vibration testing and analysis.

These inspection maintenance schedules/procedures are routinely used on a plant-wide basis and include F-57180.

3.9 Design, Operation and Maintenance of the CEMS and CMS [40 CFR 63.1207(f)(1)(iii)(H)]

The continuous emissions monitoring system (CEMS) is the primary emission monitoring system. The CEMS continuously monitors stack gas for carbon monoxide (CO) and oxygen (O_2).

All CMS equipment that measure the flows of auxiliary fuel, waste feed rate, combustion air, temperature, etc., is maintained and operated according to procedures associated with Lyondell's CMS Performance

Evaluation Plan (PEP). Each F-57180 CMS has an appropriate calibration and maintenance procedure and schedule. These procedures utilize either regulatory-specified procedures or equipment manufacture's recommendations and require regular inspection, calibration, cleaning, servicing, and maintenance.

3.10 CMS Performance Evaluation Test Plan [40 CFR 63.8(e)]

Included with this CPT plan is a CMS Performance Evaluation Test Plan (PETP). This plan outlines the performance evaluation testing of the parameter CMS' (flow, temperature, pressure, etc.), and the CEMS. This test plan is submitted for agency review. The testing of the CMS and CEMS will be completed in accordance with the plan commensurate with the CPT schedule.

3.11 CMS Performance Evaluation Plan [40 CFR 63.8(d), 63.1207(f)(1)(iii)(H)]

Lyondell has developed and maintains a CMS PEP that includes the detailed procedures and frequencies for calibration and maintenance of the parameter CMS' (flow, temperature, pressure, etc.), and CO and O_2 CEMS. See Section 3.9 for additional discussion of the CMS PEP.

3.12 Determination of Hazardous Waste Residence Time [40 CFR 63.1207(f)(1)(ix]

Table 3-3 presents the determinations of the F-57180 hazardous waste residence time from data obtained during the 2010 CPT. New residence times will be calculated based on the testing performed under this test plan.

3.13 Startup, Shutdown, and Malfunction Procedures [40 CFR 63.1206(c)(2)]

Lyondell has organized its SOPs as components of the startup, shutdown and malfunction plan (SSMP). These SOPs include procedures for rapidly stopping the hazardous waste feed in the event of an equipment malfunction. In most cases, the AWFCO system and safety interlocks will shut off waste feed immediately in the event of an equipment malfunction. When such an event occurs, an alarm sounds to notify the operator there is a problem. Whether the waste feed is stopped by the operator or the AWFCO/safety interlocks, the HWC burner(s) will usually continue to operate on auxiliary fuel until F-57180 is returned to safe and permissible operating conditions. The SOPs for rapidly stopping the hazardous waste feed ensure that emissions are controlled in the event of an equipment malfunction.

Table 3-1. Engineering Data-Hot Oil Heater F-57180

Parameter	F-57180
Manufacturer:	Born, Inc.
Model No.:	Born File H – 158 – 88
Type:	Vertical Cylindrical with Convection
Date of Mfr.:	1989
No. of Burners:	Four (4)
Burner Type:	High pressure steam atomized liquid burner
Maximum Liquid Feed per Burner	525 lbs/hr
Heated Oil Conditions:	150 psig, 625ºF
Maximum Heated Oil Production:	880,000 lbs/hr
Minimum Heated Oil Production	210,000 lbs/hr
Maximum Heat Release:	29.6 MM Btu/hr
CO CEMS Manufacturer/Type	Siemens Ultramat 6F Non-dispersive Infrared (NDIR) Analyzer
O_2 CEMS Manufacturer/Type	Servomex Series 2200A Paramagnetic Analyzer

Table 3-2. Major Instrumentation – Hot Oil Heater F-57180

Parameter[1]	Instrument Location [1]	Instrument. No.	Instrument Type	Units	Instrument Scale	Accuracy (% Full Scale)	Typical Value
BDO Liquid Fuel Flow Rate	F1	FT-57144	Orifice Flow Meter	lb/hr	0 – 2,000	2 – 3%	1,000 – 1,700
GBL Lights Feed Rate	F2	FT-57410	Orifice Flow Meter	lb/hr	0 – 180	2 – 3%	40 – 120
THF Reactor Heavies Feed Rate (R-311 Stream)	F3	FT-57320	Micromotion Flow Meter	lb/hr	0 – 110	0.25%	10 – 60
Natural Gas Feed Rate	F4	FT-57143	Orifice Flow Meter	scfm	0 – 450	2 – 3%	20 – 60
Atomizing Steam/Waste Differential Pressure	P1	PDT-1090 A, B, C	Pressure Transmitters	psig	0 – 50	1%	25 – 30
Combustion Temperature	T1	TT-57180	Thermocouple	°F	300 – 1,800	0.1%	1,300 – 1,450
Combustion Zone Pressure	P4	PT-57109 A, B	Pressure Transmitter	inwc	-3 to +1	1%	-0.4 to -0.2
Stack Gas CO	A1	AT-57110 A, B	Non-Dispersive Infrared (NDIR) analyzer	ppmv, dry	0 - 200 (Low) 0 - 3,000 (High)	3%	0 – 10
Stack Gas O_2	A2	AT-57112, AT-57113	Paramagnetic analyzer	%vol, dry	0 – 25%	0.5% vol.	5 – 10

[1] Refer to the Figure 3-1 process schematic for the generalized locations of the monitoring instruments.

Table 3-3. F-57180 Combustion Gas Residence Times-2010 CPT

Minimum Combustion Temperature F-57180 Operating Conditions

Total Liquid Waste Feed Rate	794 lb/hr	
Stack Gas Temperature	541 deg F	
Total Stack Gas Flow	380,672 ft3/hr	
Total Stack Gas Flow	14,856 lb/hr	
Barometric Pressure	29.91 in Hg	
Static Pressure	-0.31 in H2O	
Absolute Pressure	29.89 in Hg	
Stack Gas Oxygen	9.8 % dry volume	8.6 % volume
Stack Gas Carbon Dioxide	10.0 % dry volume	8.8 % volume
Stack Gas Nitrogen	80.2 % dry volume	70.3 % volume
Stack Gas Moisture	12.40 % volume	
Stack Gas Wet Mol Wt	28.50	
Total Stack Gas Flow	521 lbmol/hr	
Dry Stack Gas	457 lbmol/hr	
Dry Stack Gas	13,693 lb/hr	
Radiant Chamber Temperature	1,152 deg F	
Radiant Chamber Pressure	-0.08 in H2O	
Total Flue Gas Volume Flow @ Radiant Chamber Conditions	615,064 ft3/hr	
Gas Constant	21.9 ft3 in Hg / R lbmol	
F-57180 Combustion Zone Volume	2,990 ft3	
F-57180 Combustion Chamber Dimensions		
ID	11.93 ft	
H	26.75 ft	

F-57180 Combustion Zone Residence Time = 17.5 seconds

Maximum Firing Rate F-57180 Operating Conditions

Total Liquid Waste Feed Rate	1,903 lb/hr	
Stack Gas Temperature	648 deg F	
Total Stack Gas Flow	709,771 ft3/hr	
Total Stack Gas Flow	24,808 lb/hr	
Barometric Pressure	29.97 in Hg	
Static Pressure	-0.30 in H2O	
Absolute Pressure	29.95 in Hg	
Stack Gas Oxygen	10.9 % dry volume	9.4 % volume
Stack Gas Carbon Dioxide	9.5 % dry volume	8.2 % volume
Stack Gas Nitrogen	79.6 % dry volume	68.3 % volume
Stack Gas Moisture	14.20 % volume	
Stack Gas Wet Mol Wt	28.26	
Total Stack Gas Flow	878 lbmol/hr	
Dry Stack Gas	753 lbmol/hr	
Dry Stack Gas	22,564 lb/hr	
Radiant Chamber Temperature	1,415 deg F	
Radiant Chamber Pressure	-0.42 in H2O	
Total Flue Gas Volume Flow @ Radiant Chamber Conditions	1,206,095 ft3/hr	
Gas Constant	21.9 ft3 in Hg / R lbmol	
F-57180 Combustion Zone Volume	2,990 ft3	
F-57180 Combustion Chamber Dimensions		
ID	11.93 ft	
H	26.75 ft	

F-57180 Combustion Zone Residence Time = 8.9 seconds

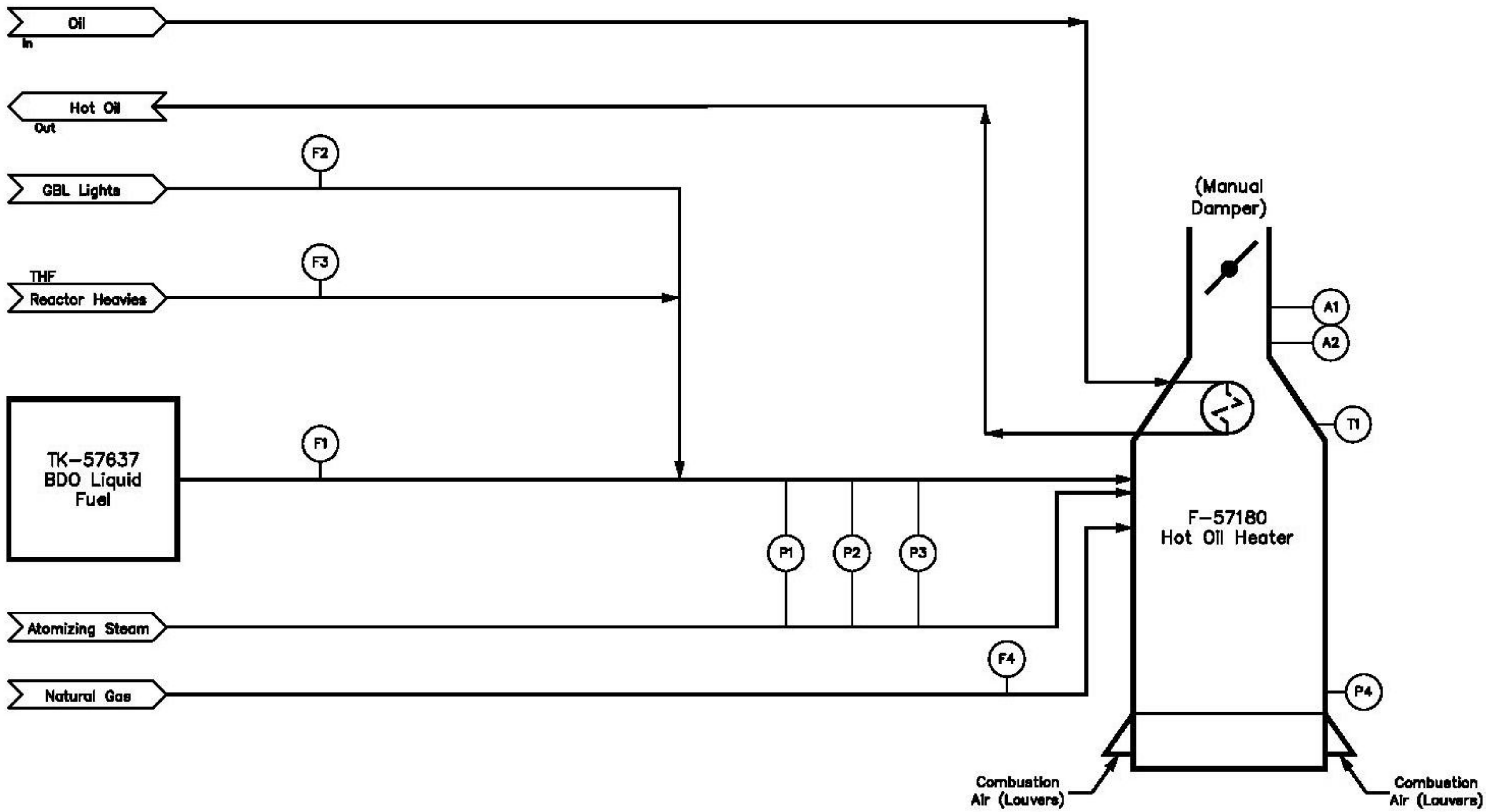


Figure 3-1. Hot Oil Heater F-57180 Process Monitoring Instrument Locations

4.0 TEST DESIGN AND PROTOCOL

4.1 GENERAL

This section describes the CPT performance targets and test protocol that will be used to obtain the data necessary to demonstrate compliance of F-57180 with the HWC MACT regulations.

The test program will be composed of two test conditions with three replicate sampling runs conducted at each set of operating conditions. One test condition will be performed at the established minimum combustion temperature for organic DRE. The second test condition will be performed at the established maximum waste feed rate and maximum combustion air flow limits.

4.2 Performance and Emissions Standards

The applicable HWC MACT performance and emissions standards for existing liquid-fired process heaters are delineated in Section 1.2 of this CPT plan.

4.3 CPT Operating Objectives

This CPT is designed to demonstrate compliance with the performance requirements and operating standards for HWC MACT. HWC MACT requires demonstrating compliance with DRE at conditions of minimum combustion temperature, maximum waste feed rate, and maximum combustion gas velocity. The configuration of F-57180 does not allow for simultaneous demonstration of these three operating parameters. Therefore, the 2010 CPT program included testing at two test conditions with measurement performance and emissions during both tests. Test 1 was designed to demonstrate the minimum combustion temperature limit for organic DRE. Test 2 was designed to demonstrate the maximum waste feed rate and maximum combustion air flow limits.

Unit operating and emissions data collected during the 2010 CPT was used to demonstrate compliance with the HWC MACT performance standards noted above. The 2010 CPT process operating data were used to establish the following DRE-related permissible operating limits under the HWC MACT regulations:

- Maximum hazardous waste feed rate [40 CFR 63.1209(j)(3), (k)(4)]
- Minimum combustion temperature [40 CFR 63.1209(j)(1), (k)(2)]
- Maximum combustion gas flow rate [40 CFR 63.1209(j)(2), (k)(3)].

The testing performed under this test plan will be similar to the 2010 CPT. Lyondell desires to establish a new, lower minimum combustion temperature limit, and new, higher maximum waste feed rate and maximum indicator of combustion gas velocity limits during the testing performed under this test plan. The CPT conducted under this test plan will also be used to establish the maximum ash feed rate [40

CFR 63.1209(m)(3)]. Compliance with the HWC MACT waste feed thermal-input based metals and chlorine feed rate limits will be demonstrated via waste feed analyses and waste feed rate data.

Table 4-1 summarizes the target operating conditions for each test condition. How the target operating conditions relate to the expected final established operating limits is presented in Section 7.0 of this CPT plan.

4.4 Test Protocol [40 CFR 63.1207(f)(1)(vi)]

The unit will be subjected to two test conditions, similar to the 2010 and 2015 CPT programs, with three replicate sampling runs conducted at each set of operating conditions.

- Test 1 is the minimum combustion temperature DRE test. The test condition will demonstrate DRE performance and carbon monoxide and total hydrocarbon emissions compliance at a new minimum combustion temperature limit.
- Test 2 is the maximum waste feed rate and maximum combustion air flow rate DRE test. The test condition will demonstrate DRE performance and carbon monoxide and total hydrocarbon emissions compliance at new, higher maximum waste feed rate and maximum combustion air flow limits, and establish the maximum ash feed rate. Compliance with the metals and HCl/Cl_2 emissions standards will be demonstrated via MHWTC.

The sampling protocols for the CPT are provided in Section 5.0 of this CPT plan.

4.5 Waste Feed Characteristics [40 CFR 63.1207(f)(1)(vi)]

Lyondell generated liquid wastes will be treated during the CPT at the rates noted in Table 4-1. Characterization data on the waste streams are provided in Section 2.0. The wastes fed during Test 2 of the CPT will be spiked with ash for demonstrating particulate matter emissions compliance performance at maximum ash feed rate. The wastes fed during Test 1 and Test 2 of the CPT will also be spiked with naphthalene for demonstrating organic DRE performance.

4.5.1 Spiking Procedures

Lyondell will utilize the services of a spiking contractor to provide the waste feed spiking. Ash surrogate (titanium dioxide in a mineral oil dispersion) and naphthalene dissolved in toluene will be metered to the waste feed line. The spiking systems will consist of variable speed, positive displacement pumps, which will transfer the materials from containers directly into the waste feed line. The injection point will be downstream of the point where waste feed samples are collected. The contractor's certification of composition of the spiking materials and the spiking logs (differential weights or equivalent) will be used to determine the amount of material metered to the waste feed line. Samples of the spiking materials will be collected during testing for confirmation analysis.

4.5.2 POHC Selection Rationale [40 CFR 63.1217(c)(3)(ii)]

To evaluate the ability of combustion systems to destroy organic compounds, EPA developed the POHC Thermal Stability Index (circa 1989). The Thermal Stability Index is based on laboratory studies of the destruction of organic compounds under low oxygen conditions in a non-flame environment. The EPA's Thermal Stability Index divides specific organic compounds into seven thermal stability classes, with Class 1 compounds being the most stable, and Class 7 compounds being the least thermally stable. The EPA Thermal Stability Index is structured on the principle that if a combustion system is successful in destroying compounds in a particular class, it is appropriate to assume that other compounds within the same and lower classes will be destroyed at efficiencies equal to or greater than the destruction efficiencies demonstrated.

Since the HWC MACT regulations do not mention any specific incinerability hierarchy, Lyondell used naphthalene as the POHC for demonstrating the DRE during the 2010 CPT. Naphthalene is a Class 1 compound (most thermally stable) on EPA's Thermal Stability Index. Naphthalene is chemically compatible with the organics treated in HWC units. Because naphthalene is chemically distinguishable from, and generally more thermally stable than, the organic constituents routinely present in the Lyondell waste streams, naphthalene provided an excellent indicator of DRE performance during the 2010 CPT. Naphthalene is proposed as the POHC to demonstrate DRE during the CPT conducted under this test plan.

After reviewing the 37 Class 1 compounds on the Thermal Stability Index, Lyondell selected naphthalene as the CPT POHC. Many of the Class 1 compounds have undesirable aspects or properties:

- Analytical properties (e.g., water soluble or hydrolyze [acetonitrile or acrylonitrile]);
- Gases [sulfur hexafluoride]);
- Toxicity, gases and/or ozone depleters (e.g., hydrogen cyanide, cyanogen, cyanogen chloride, cyanogen bromide, methyl chloride, methyl bromide and Freon 13);
- Common products of incomplete combustion (PICs) (e.g., benzene); or
- Exotic or difficult to obtain mass quantities of pure compounds (e.g., the many polynuclear aromatic hydrocarbon compounds [PAHs] and the two dioxin/furan compounds).

As a result, the list of potential and viable POHCs from Class 1 narrows to naphthalene, chloronaphthalene, and the multiple chlorinated benzene compounds.

For the reasons noted above, the two compounds most commonly selected from Class 1 for use as POHCs are monochlorobenzene and naphthalene. Both compounds have well-established records as DRE POHCs. Lyondell originally considered using monochlorobenzene as the target POHC. However, when the expected DRE, sampling method, and analytical detection limits were examined, the amount of monochlorobenzene necessary to demonstrate 99.99% DRE would exceed the applicable HWC MACT chlorine feed rate limits for F-57180. Additionally, chlorinated organics generate HCl when burned leading to unnecessary corrosion to F-57180 components not designed for such service. The choice of POHC from Class 1 then defaulted to naphthalene since naphthalene is the only non-chlorinated compound on the short list of possible of Class 1 POHC compounds. Lyondell believes that the choice of naphthalene as a POHC provided, and will provide, a significant challenge to the thermal destruction capabilities of F-57180.

During 2010 CPT Test 1 and Test 2 DRE testing, Lyondell metered naphthalene to the waste feed line and measured naphthalene emissions to assess DRE performance. The naphthalene was dissolved in toluene for metering to the liquid waste feed. Liquid waste feed analyses were performed to determine the native feed rate of naphthalene; no detectable naphthalene was found in any of the waste feed samples. The total naphthalene feed rate utilized in determining DRE was solely from the amount metered to the waste feed. The emission rate of naphthalene was determined via split analysis of the SW-846 Method 0023A sampling train also used to concurrently measure PCDD/PCDF emissions during both test conditions. Summary DRE performance and PCDD/PCDF emissions results from the 2010 CPT are presented in Table 4-2.

During Test 1 and Test 2 of the CPT conducted under this test plan, Lyondell will meter naphthalene to the F-57180 liquid waste feed and measure the resulting emissions using SW-846 Method 0023A. Provided that 99.99% DRE of naphthalene is demonstrated during Test 1, the new minimum combustion temperature limit should be based on the values demonstrated during Test 1. Provided that 99.99% DRE of naphthalene is demonstrated during Test 2, the new maximum waste feed rate and maximum combustion velocity indicator limits should be based on the values demonstrated during Test 2. Measurement of PCDD/PCDF emissions will be repeated during this CPT as required by 40 CFR 63.1207(b)(3)(v).

Since naphthalene ranks among the most difficult to destroy on the Thermal Stability Index, successful demonstration of 99.99% DRE allows Lyondell to burn all wastes represented by the waste codes in the facility’s most current RCRA Part A permit application.

4.5.3 Ash Content [40 CFR 63.1209(m)(3)]

During Test 2, Lyondell will feed actual liquid wastes at maximum rates. Test 2 will include measurement of particulate emissions. To provide a greater margin of operational flexibility in the ash content of the wastes treated in F-57180, Lyondell will meter an ash surrogate, titanium dioxide, to the liquid waste used during Test 2. Samples of the waste feeds will be analyzed for native ash content. The ash surrogate will be metered to the liquid waste feed line by the spiking contractor. Samples of the ash spiking material will be collected for confirmation ash analysis. The waste feed ash analyses and the total waste feed rate will be used to determine the native ash feed rate. Provided that the particulate matter emissions results during Test 2 are in compliance with the particulate matter emissions standard, the permit limit for ash feed rate will be proposed as the total ash feed rate, native plus spiked, demonstrated during Test 2.

4.5.4 Chloride Content [40 CFR 63.1209(o)(1)(ii)]

Data presented in Section 2.0 include the typical chloride contents for the waste streams treated by Lyondell. Analysis presented in this CPT plan show that the potential HCl/Cl_2 emissions from the HWC industrial furnace comply with the HWC MACT chloride emissions limit via MHWTC. Therefore, there will be no spiking of chloride during the CPT. Waste feed analyses and waste feed rates will be used to assess compliance with the HWC MACT chloride emissions limit via MHWTC.

4.5.5 Metals Content [40 CFR 63.1209(l)(1)(ii), (n)(2)(v)]

Data presented in Section 2.0 include the typical metals content for the waste streams treated by Lyondell. Analysis presented in this CPT plan show that the potential metals emissions from the HWC industrial furnace comply with the HWC MACT emissions limits via MHWTC. Therefore, there will be no spiking of metals during the CPT. Waste feed analyses and waste feed rates will be used to assess compliance with HWC MACT mercury, SVM, and LVM limits via MHWTC.

4.5.6 Expected Constituent Levels in Auxiliary Fuel and Other Feed Streams [40 CFR 63.1207(f)(1)(i)(A), (xi)]

The HWC MACT rule requires that all feed streams be assessed [40 CFR 63.1207(f)(1)(i)(A), (xi)]. The ash, chloride, and metals contents of natural gas, combustion air, and atomizing steam are such that their quantification would be meaningless to the facility operating records. Therefore, these streams will not be sampled or analyzed during the test.

4.6 Process Operating Conditions [40 CFR 63.1207(f)(1)(vii)]

Table 4-1 summarizes the planned operating conditions (temperatures, flow rates, etc.) for the two CPT conditions. Actual CPT results will be used to establish some operating specifications and to compute feed and emission rates. Some of Lyondell's current AWFCO set points will be modified so that the CPT target operating limit can be demonstrated. The modified AWFCO set points to be in effect during the CPT are presented in Table 4-1.

Steady-state operating conditions will be achieved when the liquid waste feed rate and combustion temperature have stabilized at the target operating conditions, at which time CPT sampling may commence.

4.7 CMS Performance Evaluation Test Plan [40 CFR 63.8(e), 63.1209(e)]

To satisfy HWC MACT requirements at 40 CFR 63.8(e) and 63.1209(e), the CMS instrumentation will be calibrated in accordance with Lyondell's instrumentation and electrical (I&E) maintenance department's SOPs. Calibrations will be verified before the commencement of the CPT. Copies of the calibration records will be included in the CPT report.

Lyondell will perform daily calibrations of the CO and O_2 CEMS in accordance with its normal operating procedures. Lyondell will include a copy of the most recent annual RATA report with the CPT report.

As allowed by HWC MACT at 40 CFR 63.1206(b)(6), a temporary CEMS operated in accordance with 40 CFR 60 Appendix A, Method 25A will be used to sample for hydrocarbons during the test to demonstrate compliance with the hydrocarbon standard of 40 CFR 63.1217(a)(5)(ii).

Table 4-1. Comprehensive Performance Test Targets-Hot Oil Heater F-57180

Parameter	Units	Test 1	Test 2	AWFCO Set Point [1]	AWFCO Set Point Basis
Total Waste Feed Rate (TK-57637 BDO Liquid, R-311 THF Reactor Heavies and GBL Lights)	lb/hr	As Needed	2,290	2,500	Current Maximum Limit +~10%
Ash Feed Rate	g/hr	N/A	1,000	N/A	N/A
	lb/hr	N/A	2.2	N/A	N/A
Natural Gas Feed Rate	scfh	As Needed	As Needed	N/A	As Needed
Differential Atomizing Steam/Waste Feed Pressure	psig	>13	>13	5	Mfr. Minimum
Combustion Temperature	ºF	1,152	N/A	1,052	Current Minimum Limit –100ºF
Heat Release [2]	MMBtu/hr	N/A	30	35	Current Maximum Limit +~10%
Stack Gas CO	ppmdv, HRA @ 7% O_2	< 100	< 100	100	Regulation

[1] Automatic waste feed cutoff (AWFCO) set point during operational shakedown and testing periods.
[2] The F-57180 is a damper controlled, natural draft device. Maximum heat release is used as a maximum combustion gas velocity indicator.

N/A-Not applicable

Table 4-2. Summary F-57180 DRE Test Results-2010 Comprehensive Performance Test

Parameter	Units	HWC MACT Standard	Test 1, Minimum Combustion Temperature			
			Run 1	Run 2	Run 3	Average
Waste Feed Rate	Maximum lb/hr, HRA	N/A	770	755	752	759
Combustion Temperature	°F average	N/A	1,156	1,152	1,147	1,152
Heat Release	Maximum MMBtu/hr	N/A	10.6	10.1	10.1	10.3
Naphthalene DRE	%	99.99	99.999908	99.99986	99.999917	99.99989
Stack Gas PCDD/PCDF	ng TEQ/dscm @ 7% O_2	NA	0.026	0.0065	0.018	0.017
Stack Gas CO	ppmv, dry @ 7% O_2 HRA	100	1.0	1.1	1.0	1.1
Stack Gas THC	ppmv, dry @7% O_2	10	<0.1	<0.1	<0.1	<0.1

Parameter	Units	HWC MACT Standard	Test 2, Maximum Waste Feed Rate			
			Run 4A	Run 5	Run 6	Average
Waste Feed Rate	Maximum lb/hr, HRA	N/A	1,894	1,910	1,903	1,902
Combustion Temperature	°F average	N/A	1,440	1,413	1,424	1,426
Heat Release	Maximum MMBtu/hr	N/A	22.8	22.8	22.7	22.8
Naphthalene DRE (Note c)	%	99.99	99.99982	99.99962	99.99988	99.99978
Stack Gas PCDD/PCDF	ng TEQ/dscm @ 7% O_2	NA	0.0036	0.073	0.055	0.044
Stack Gas CO	ppmv, dry @ 7% O_2 HRA	100	1.2	1.1	1.1	1.1
Stack Gas THC	ppmv, dry @7% O_2	10	<0.1	<0.1	<0.1	<0.1

5.0 SAMPLING, ANALYSIS, AND MONITORING PROCEDURES [40 CFR 63.1207(f)(1)(iv)]

5.1 General

This section of the CPT plan describes the sampling procedures at each sample location, the associated analytical procedures, and process monitoring procedures pertinent to the collection of CPT data.

Sampling, analytical, and monitoring protocols for the tests are summarized below. It should be noted that the reference to SW-846 sampling and analysis methods within this test plan may be presented without suffix letter designations. When a new method is published in SW-846 its method number does not include a suffix letter. However, each time the method is revised and promulgated as part of an SW-846 update, it receives a new letter suffix (e.g., a suffix of "A" indicates revision one of that method, a suffix of "B" indicates revision two, etc.). Specific method numbers and suffix designations used in the implementation of the project will be documented in the final project report.

5.2 CPT Sampling and Analysis Protocol

The CPT involves sampling and analysis protocols for wastes, and HWC MACT particulate matter, HCl/Cl_2, and metals emissions standards. As noted in the preceding section, sampling will be performed on the unit at two operating modes. The sampling and analytical protocols for Tests 1 and 2 are summarized in Tables 5-1 and 5-2, respectively. The CPT data use is summarized in Table 1-2. The sampling and analysis are discussed in more detail in the following sections.

5.2.1 Process Sampling Locations and Procedures

The sampling procedure methods to be used during the test are summarized in Table 5-1 and 5-2.

5.2.1.1 Waste Feed Sampling

Grab samples of each liquid waste feed will be taken at regular intervals during the course of each test run and will be used to build a run composite sample for each of the respective waste feeds. The composite samples will be maintained on ice in coolers between each sampling interval. At the end of the test run, discrete aliquots will be collected from each of the respective homogenized composite samples for the various analyses as noted in Tables 5-1 and 5-2. After collection from the run composite samples, the samples for analysis will be maintained on ice in coolers.

The waste feed samples will be analyzed for non-mercury metals using SW-846 Methods 6010C, SW-846 Method 7471A for mercury, and physical parameters (ash content, total chloride, heating value, density, and viscosity) using SW-846 and/or ASTM methods.

5.2.1.2 Spiking Solutions

The preparer's certified composition for the ash surrogate and naphthalene spiking materials will be provided by the spiking contractor and will be used for determining the ash and naphthalene spike rates. Grab samples of the spiking materials will be collected during testing for confirmation analysis.

5.2.2 Stack Gas Sampling Procedures

Sampling of the stack gas will be performed from the ports located on the vent stack. Stack sampling location schematics are shown on Figure 5-1. Each stack sampling method is briefly described below.

5.2.2.1 Stack Gas Method 5 (Filterable and Condensable Particulate)

The HWC MACT particulate emissions standard is a performance based standard established using filterable particulate matter data only, and excludes soot-blow corrected data. However, the TCEQ Air Rules require consideration of both filterable (front-half) and condensable (back-half) particulate matter. Therefore, Lyondell will operate and recover the Method 5 sampling train to include measurement and reporting of filterable and condensable particulate matter emissions (TCEQ Method 23). Samples of the system exhaust will be collected isokinetically for particulate according to EPA Method 5 during Test 2. Filterable (front-half) particulate matter emissions will be determined via EPA Method 5 analysis of the filter and sampling probe rinses. Condensable (back-half) particulate matter emissions will be determined via TCEQ Method 23 analysis of the impinger water.

5.2.2.2 Stack Gas Method 0023A (PCDD/PCDF and Naphthalene)

A single SW-846 Method 0023A sampling train will be used during Test 1 and Test 2 to concurrently determine the emissions of the semivolatile POHC, naphthalene, for DRE determination, and the emissions of PCDD/PCDFs. The extracts from the Method 0023A sampling train will be split two ways for analysis.

- One portion will be analyzed for PCDD/PCDFs via Method 8290A [high resolution gas chromatography/high resolution mass spectrometry (HRGC/HRMS)].
- The second portion will be analyzed for naphthalene via Method 8270C [gas chromatography/mass spectrometry (GC/MS) with selected ion monitoring (SIM) and isotope dilution internal standard (IDIS) quantification. (Refer to Section 7.5.5 of Method 8270D.)

The SIM/IDIS approach is comparable to the HRGC/HRMS methodology used for PCDD/PCDFs. Analysis of the Method 0010 samples for naphthalene via GC/MS with SIM/IDIS results in substantially lower detection limits. The GC/MS with SIM/IDIS approach will result in a detection limits for the XAD-2 resin fraction of approximately 100 nanograms (ng), and the front half/probe rinse and condensate fractions of approximately 10 ng each. The resulting sampling train total naphthalene detection limit is approximately 120 ng total. Comparatively, the routine naphthalene reporting limit for Method 8270C (GC/MS) is typically 10 micrograms (ug) per semivolatile sampling train fraction, resulting in a sampling train total of 30 ug for the three distinct fractions that comprise the sampling train analysis.

The naphthalene spiking rates to demonstrate DRE in this CPT program are based a naphthalene sampling train detection limit of 120 ng. This approach is possible because naphthalene does not present any particular analysis difficulties and is highly distinguishable as a target analyte. Naphthalene can be exhibited as an artifact of the XAD-2 resin manufacturing process. The GC/MS with SIM/IDIS detection limit includes consideration of the normal background naphthalene concentrations on the resin.

5.2.2.3 Continuous Emissions Monitoring

During the CPT, the stack gas will be continuously monitored by installed CEMS using the following procedures:

- Stack gas carbon monoxide by non-dispersive infrared (NDIR) analyzer according to the protocols of 40 CFR 60, Appendix B, Performance Specification 4B; and
- Stack gas oxygen by paramagnetic analyzer according to the protocols of 40 CFR 60, Appendix B, Performance Specification 4B.

The carbon monoxide and oxygen stack gas monitors will be checked daily during the test for calibration stability in accordance with standard operating procedures.

In addition, during the test, the stack gas will be continuously monitored for HCs to demonstrate compliance with the HWC MACT performance standard [40 CFR 63.1217(a)(5)(ii)]. As allowed by 40 CFR 63.1206(b)(6), HC monitoring will be performed using a temporary CEMS. The temporary HC CEMS will be calibrated and operated in accordance with the procedures in 40 CFR 60 Appendix A, Method 25A. HC concentration will be reported as propane, corrected to 7% oxygen dry basis.

5.2.3 Analytical Procedures

Analytical methods planned for the test are summarized in Tables 5-1 and 5-2. The anticipated detection limits presented in the QAPP are reporting limits (RLs) and method detection limits (MDLs) based on other similar testing.

5.3 Quality Assurance and Quality Control Procedures

Appendix A contains the QAPP that has been prepared according to EPA Guidance.

5.4 Monitoring Procedures

Continuous monitoring of emissions and process operating variables is conducted as described in Section 3.0 of the CPT plan. Pertinent process parameters listed in Table 3-2 will be monitored during the CPT to provide information necessary to set operational limits and to allow calculations necessary to demonstrate compliance with performance criteria.

Table 5-1. Planned Sampling and Analysis-Test 1

Sample Name	Sampling Location/ Access	Sampling Equipment	Sampling Reference Method [1]	Sample Size/Frequency-	Analytical Parameters	Analytical Reference Method [1]
Liquid Waste Feed	Tap on line	250 mL bottle for grab sampling; 4 L glass jug; 250 mL glass bottles	ASTM E-300-03	For each waste feed stream, collect a 250 mL grab sample at each 30-minute interval during each test run. The grab samples of each stream will be used to build composite samples in 4L jugs for each waste feed stream. The run composites are maintained on ice between sampling intervals. At the end of the test run, collect one-250 mL sample bottle for properties analysis of each feed stream from the respective homogenized composite samples.	Heating Value Viscosity Density Ash Content Total Chloride Moisture	ASTM D-240 ASTM D-445 ASTM D-1475 ASTM D-482 SW846 5050/9056A ASTM D-4017
Naphthalene Spiking Material	Tap on line	100 mL sample bottle	ASTM E-300-30	Collect one 100 mL sample bottle of solution once during test	Naphthalene	SW846 Method 8015
Stack Gas	Isokinetic Port	Method 0023A	SW846 Method 0023A	180 minutes to sample a minimum of 3.0 dscm [2, 3]	PCDD/PCDF Naphthalene	SW846 Method 8290A SW846 Method 8270C with SIM/IDIS
Stack Gas	CEMS Port	Installed CO and O_2 CEMS	40 CFR 60 Appendix B Performance Specification 4B	Continuous	CO and O_2	40 CFR 60, Appendix B, Performance Specification 4B
Stack Gas	CEMS Port	Temporary HC CEMS	40 CFR 60 Appendix A Method 25A	Continuous	HC	40 CFR 60 Appendix A Method 25A

Table 5-1. Planned Sampling and Analysis-Test 1 (continued)

Notes:
[1] Reference Method Sources:
"ASTM" refers to American Society for Testing Materials, Annual Book of ASTM Standards, Annual Series
"SW846" refers to Test Methods for Evaluating Solid Waste, Third Edition, November 1986, and Updates.
"EPA Method" refers to New Source Performance Standards, Test Methods and Procedures, Appendix A, 40 CFR 60.
[2] The exact volume of gas sampled will depend on the isokinetic sampling rate.

[3] Isokinetic sampling trains include:

- Collecting one set of bag samples (or using CEM) for oxygen and carbon dioxide to determine stack gas molecular weight (EPA Method 3A).
- Performing stack gas velocity, pressure and temperature profile measurement for each sampling location (EPA Method 2)
- Determining the moisture content of the stack gas for each sampling train sample (EPA Method 4).

Table 5-2. Planned Sampling and Analysis-Test 2

Sample Name	Sampling Location/ Access	Sampling Equipment	Sampling Reference Method [1]	Sample Size/Frequency	Analytical Parameters	Analytical Reference Method [1]
Liquid Waste Feed	Tap on line	250 mL bottle for grab sampling; 4 L glass jug; 250 mL glass bottles	ASTM E-300-03	For each waste feed stream, collect a 250 mL grab sample at each 30-minute interval during each test run. The grab samples of each stream will be used to build composite samples in 4L jugs for each waste feed stream. The run composites are maintained on ice between sampling intervals. At the end of the test run, collect one-250 mL sample bottle for properties analysis and one-250 mL sample bottle for metals analysis of each feed stream from the respective homogenized composite samples.	Heating Value Viscosity Density Ash Content Total Chloride Moisture HWC MACT Metals: Cd, Cr, Pb, & Hg	ASTM D-240 ASTM D-445 ASTM D-1475 ASTM D-482 SW846 5050/9056A ASTM D-4017 ICAP (SW846 3050B/6010C) Hg: CVAAS (SW846 7471A)
Ash Spiking Material	Tap on line	100 mL sample bottle	ASTM E-300-03	Collect one 100 mL sample bottle of solution once during test	Ash	ASTM D-482
Naphthalene Spiking Material	Tap on line	100 mL sample bottle	ASTM E-300-03	Collect one 100 mL sample bottle of solution once during test	Naphthalene	SW846 Method 8015
Stack Gas	Isokinetic Port	Method 0023A	SW846 Method 0023A	180 minutes to sample a minimum of 3.0 dscm [2, 3]	PCDD/PCDF Naphthalene	SW846 Method 8290A SW846 Method 8270C with SIM/IDIS
Stack Gas	Isokinetic Port	Method 5	40 CFR 60; App A, Method 5	96 minutes (12 points @ 8 minutes per point) [2, 3]	Filterable and Condensable Particulate	EPA Method 5 (Filterable Particulate) TCEQ Method 23 (Condensable Particulate)

Table 5-2. Planned Sampling and Analysis-Test 2

Sample Name	Sampling Location/ Access	Sampling Equipment	Sampling Reference Method [1]	Sample Size/Frequency	Analytical Parameters	Analytical Reference Method [1]
Stack Gas	CEMS Port	Installed CO and O_2 CEMS	40 CFR 60 Appendix B Performance Specification 4B	Continuous	CO and O_2	40 CFR 60, Appendix B, Performance Specification 4B
Stack Gas	CEMS Port	Temporary HC CEMS	40 CFR 60 Appendix A Method 25A	Continuous	HC	40 CFR 60 Appendix A Method 25A

Notes:

[1] Reference Method Sources:

"ASTM" refers to American Society for Testing Materials, Annual Book of ASTM Standards, Annual Series
"SW846" refers to Test Methods for Evaluating Solid Waste, Third Edition, November 1986, and Updates.
"EPA Method" refers to New Source Performance Standards, Test Methods and Procedures, Appendix A, 40 CFR 60.
"TCEQ Method 23" refers to Texas Commission on Environmental Quality, Method 23 Determination of Particulate Matter in Stack Gases.

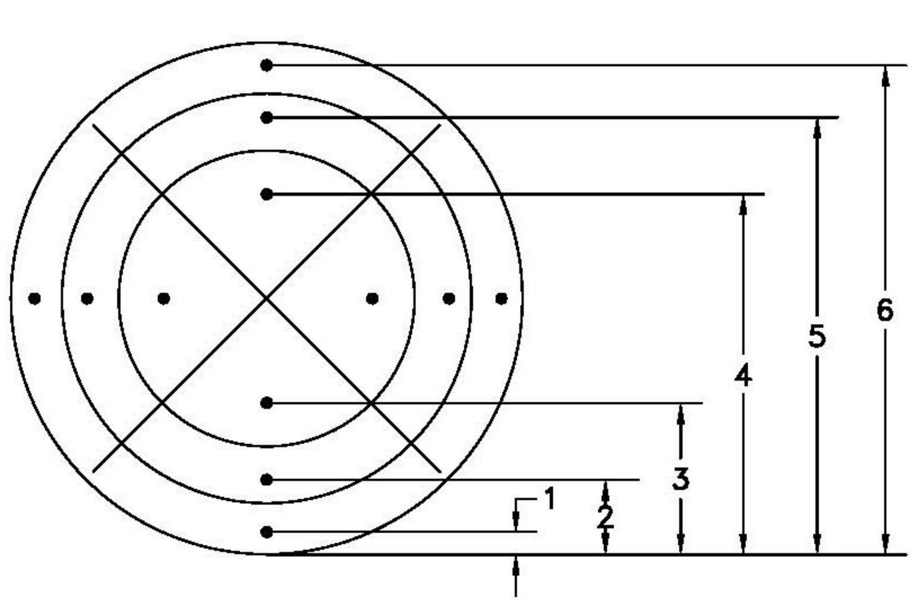
[2] The exact volume of gas sampled will depend on the isokinetic sampling rate.

[3] Isokinetic sampling trains include:

- Collecting one set of bag samples (or using CEM) for oxygen and carbon dioxide to determine stack gas molecular weight (EPA Method 3A).
- Performing stack gas velocity, pressure and temperature profile measurement for each sampling location (EPA Method 2)
- Determining the moisture content of the stack gas for each sampling train sample (EPA Method 4).

TRAVERSE POINT	DISTANCE % of diameter	DISTANCE FROM STACK WALL (inches)
1	4.4	1.85
2	14.6	6.13
3	29.6	12.43
4	70.4	29.57
5	85.4	35.87
6	95.6	40.15

	LINEAR DIMENSION	DUCT DIAMETERS
A	21'	6.0
B	27'	7.7
C	42"	



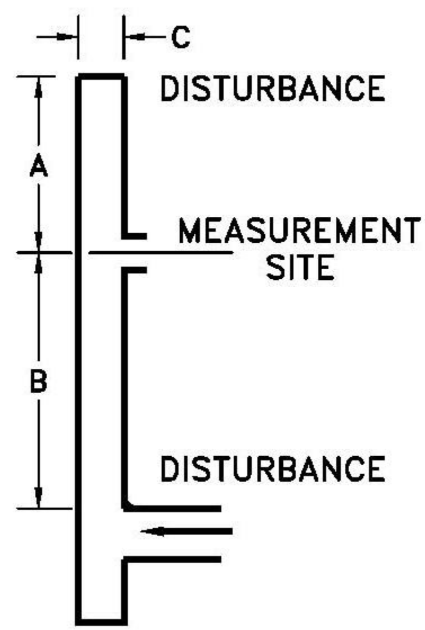


Figure 5-1. Stack Sampling Ports – Hot Oil Heater F-57180

6.0 TEST SCHEDULE [40 CFR 63.1207(f)(1)(v)]

6.1 General Test Schedule

The CPT of F-57180 is expected to occur during a one-week period. Prior to the CPT, process instruments will be calibrated, testing of the CEMS will be performed, and the AWFCOs will be tested. The planned daily activities for the test are as follows:

- Day 1 – The sampling team will mobilize to the test site and set-up equipment at the industrial furnace. A coordination meeting will be conducted. Test levels for AWFCOs will be confirmed.
- Day 2 – F-57180 will be brought to the desired steady-state operating conditions for Test 1. Naphthalene spiking will be initiated at least 15 minutes before sampling is started. When all sampling team preparations are complete, Test 1, Runs 1 and 2 will be conducted.
- Day 3 – F-57180 will be brought to the desired steady-state operating conditions for Test 1. Naphthalene spiking will be initiated at least 15 minutes before sampling is started. When all sampling team preparations are complete, Test 1, Run 3 will be conducted. Once Test 1 is completed, the unit operation will begin ramping up to the Test 2 target operating conditions. Ramping up operation of F-57180 will require time. Therefore, test 2 will likely not begin until the following day.
- Day 4 – F-57180 will be brought to the desired steady-state operating conditions for Test 2. Naphthalene and ash surrogate spiking will be initiated at least 15 minutes before sampling is started. Once the unit is at the desired steady-state operating conditions for Test 2 and when all sampling team preparations are complete, Test 2, Runs 1 and 2 will be performed.
- Day 5 – F-57180 will be brought to the desired steady-state operating conditions for Test 2. Naphthalene and ash surrogate spiking will be initiated at least 15 minutes before sampling is started. When all sampling team preparations are complete, Test 2, Run 3 will be performed. Once Test 2 is completed, the sampling team will recover testing equipment and prepare to de-mobilize from the test site.
- Day 6 – Testing contingency day if there are testing delays.

The above proposed schedule of testing is a general schedule. Preparation of the CPT report will begin following completion of the on-site testing. The final CPT report will be submitted within 90 days after completion of the CPT.

6.2 Duration of Each Test Condition

The anticipated sampling time during each test run will be approximately four (4) hours. The sequencing of stack sampling trains is noted in Figures 6-1 and 6-2. Installed CEMS measurements will be made throughout each sampling run. Process conditions will remain at the same target conditions throughout the sampling run. Prior to each sampling run, the industrial furnace will be operated at target operating conditions for approximately one (1) hour to establish hourly rolling average values. Minimal change from the target operating values for the rolling averages will indicate steady-state operation. Target operating parameter values are noted in Table 4-1 of this CPT plan.

In order to establish operating conditions proposed in this test plan, periods of operation will be necessary prior to and during the test that will require temporary operating limits proposed in this test plan to be in place rather than current AWFCO limits. These temporary limits are listed in Table 4-1.

6.3 Planned Test Start Date

The test will be tentatively scheduled for within 180 days of test plan approval by TCEQ and EPA, but no later than January 31, 2021. Lyondell may conduct pre-CPT shakedown testing in this 180-day period. Lyondell will notify TCEQ at least 30 days before the planned date for starting of the test. The test start date will be confirmed the Friday before the Monday planned start of the testing.

6.4 Quantity of Waste to be Burned During Testing

The estimated hours of operation to complete testing are summarized in Table 6-1. The amount of liquid waste feed and spiking materials are also summarized in Table 6-1. Any excess spiking materials may be fed to the unit, returned to the vendor, or disposed of off-site. Amounts are based on four (4) hours per test run plus one contingency run (16 hours total) of testing, and one (1) hour of ramp up time per test run (20 hours total).

6.5 Pre-test Shakedown Operation and Testing

The primary objective of the CPT is to establish limits for the Lyondell HWC industrial furnace's operating parameters that ensure compliance with the emission standards during subsequent, less rigorous operations. In accordance with the HWC MACT regulations at 40 CFR 63.1207(h)(2), Lyondell requests up to 720 hours of shakedown operation for the HWC industrial furnace. The specific language from 40 CFR 63.1207(h)(2) is:

> *"Current operating parameter limits are also waived during pre-testing prescribed in the approved test plan prior to comprehensive performance testing for an aggregate time not to exceed 720 hours of operation."*

This shakedown operational period will be at the proposed CPT operating limit targets, which may exceed the operating limits in the current Notification of Compliance (NOC). The purpose of the shakedown operation is to verify the operational readiness of industrial furnace for the formal CPT. This testing may include emissions measurements to assess the potential compliance of the unit at the proposed operating targets. Demonstrating the proposed target operating limits will require modifying AWFCO interlock set points as noted in Table 4-1.

6.6 Test Interruptions

In the event of an AWFCO or similar test interruption, all emissions sampling will be suspended immediately. Emissions sampling pumps will be switched off, but probes may remain in the sampling ports. The waste feed sampling will continue pending a determination and assessment of the expected stoppage or test delay time by the test manager.

Should the situation be resolved shortly (15 minutes or less), and waste feed instantaneous rates are resumed at or above 90% of the rates prior to the test stoppage event, and other target conditions are comparable to before the test interruption, emissions sampling may be resumed at the discretion of the test manager and after consultation with the unit operations staff. Optionally, the test manager may elect to hold off the re-start of sampling until hourly rolling averages have re-established at or closer to test target values.

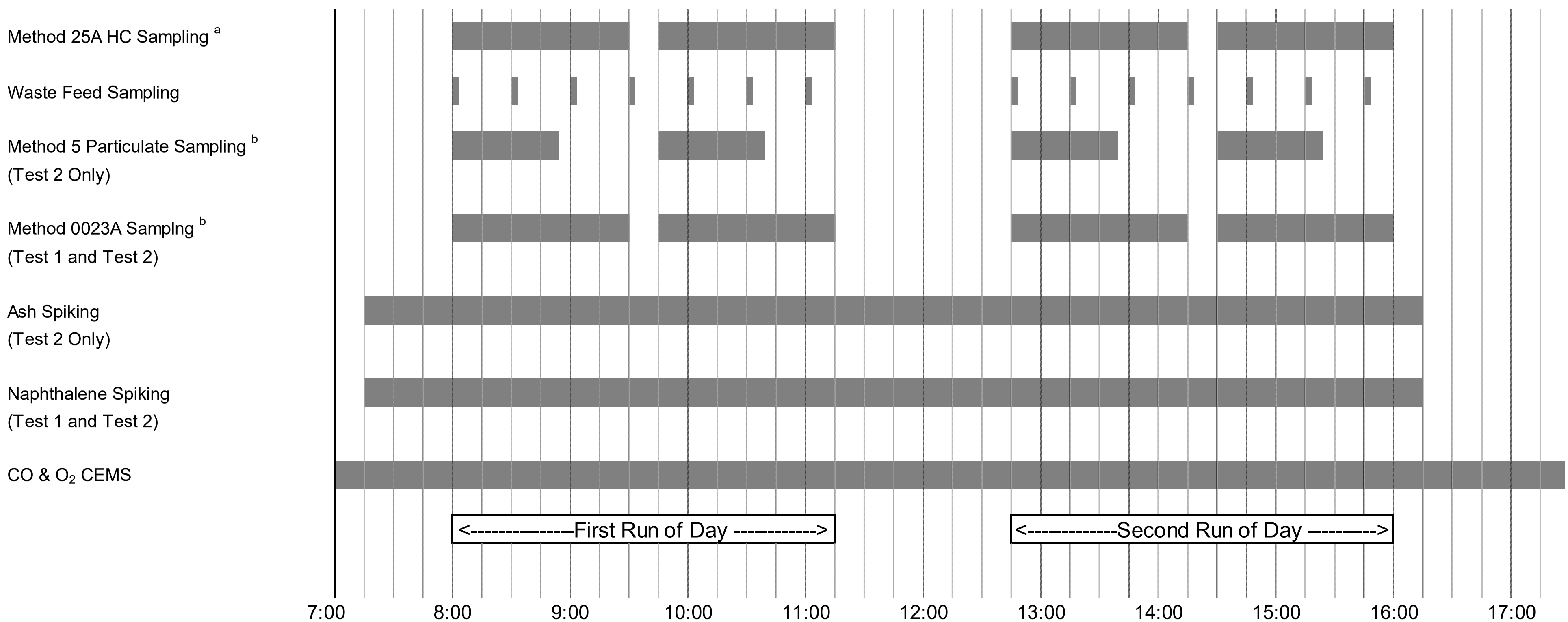
Should the situation take longer to be resolved (more than 15 minutes), all sampling will be suspended until the hourly rolling averages have re-established at or close to test target values. The emissions sampling probes will be removed from the sampling ports and the nozzles sealed with Teflon tape. Emissions sampling equipment will be maintained on hot standby pending a test re-start decision. Once the situation is corrected, waste feed has resumed, and the hourly rolling averages are re-established, testing will resume at the direction of the test manager.

Should the situation become evident that testing cannot be resumed in 1-2 hours, or will take even longer to resolve, the test manager may suspend testing for the day. The test manager will assess whether any emissions sampling trains that have been completed should be retained or discarded. Most incomplete sampling trains may be held for up to 24 hours and then resumed. Waste feed samples may be held over as well. If testing can be resumed the following day, the incomplete stack gas sampling trains, the process sampling equipment, and completed sampling train samples will be secured for the night in such manner as to properly preserve the samples. Sampling will resume the following day where testing the previous day ended once the unit is back at the target test conditions. Optionally, the test run may be scrubbed altogether with all samples to that point being discarded, and all emissions and waste feed sampling started anew when testing can be resumed. No incomplete sampling train or waste feed samples will be held over for more than 24 hours.

All test start/stop/suspension/scrub decisions will be communicated to the regulatory observers present at the time of testing. Such decisions may include consultations between the test manager, the unit operations staff, and the regulatory observers present.

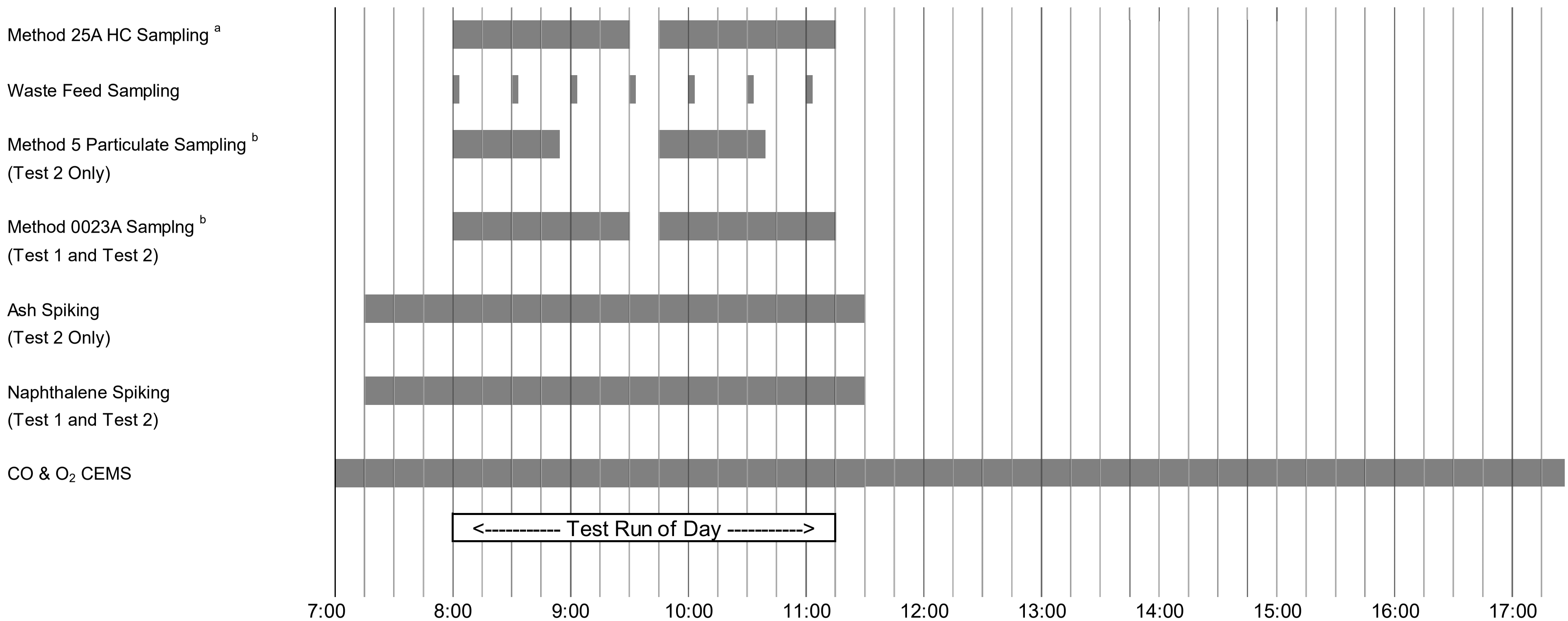
Table 6-1. Quantity of Feed Materials for Testing

Parameter	Test	Feed Rate	Units	Hours	Total lbs
Hot Oil Heater F-57180					
Waste	1	700	lb/hr	20	14,000 lbs
	2	2,290	lb/hr	20	45,800 lbs
Ash Surrogate	2	1,000	g/hr	20	20 kg
		2.2	lb/hr		44 lbs
Naphthalene	1	5	lb/hr	20	100 lbs
	2	5	lb/hr	20	100 lbs



Notes:
[a] Non-isokinetic sampling port.
[b] Isokinetic sampling port.

Figure 6-1. Stack Gas and Waste Feed Sampling - Hot Oil Heater F-57180, Two Test Run Days



Notes:
[a] Non-isokinetic sampling port.
[b] Isokinetic sampling port.

Figure 6-2. Stack Gas and Waste Feed Sampling - Hot Oil Heater F-57180, One Test Run Days

7.0 OPERATING PERMIT OBJECTIVES

7.1 Control Parameters

Based on the results of the testing, Lyondell will propose operating limits for F-57180 in the CPT report. Some parameters will be established directly from the operating conditions demonstrated during the CPT, however, other limits will be based on established regulatory guidance, manufacturer's recommendations, good operating practice, or past operating experience. The operating parameters discussed in this section that will have permit limits associated with them will provide equivalent or better assurance of compliance with the applicable emissions performance standards. Should the required objectives from testing be achieved, Lyondell requests that F-57180 be allowed to operate under the conditions proposed in this section.

Table 7-1 summarizes the expected HWC MACT operating limits. In order to achieve the desired operating conditions and demonstrate unit operations at the proposed limits, the AWFCO set points for certain operating parameters must be set higher or lower (as applicable) during testing periods. The recommended AWFCO interlock set points during testing periods are presented in Table 4-1. The following sections present a discussion of each parameter. To facilitate review, the control parameters are grouped into the following categories:

- Group 1 parameter limits are established from test operating data, and are used to ensure that HWC system operating conditions are not significantly less rigorous than those demonstrated during the test. Most Group 1 parameters are continuously monitored and recorded, and are interlocked with the AWFCO system. During the test periods (pre-test shakedown and formal test), continuously monitored and interlocked Group 1 parameters will be operational, but will be set at values, which will allow the desired operating limits to be demonstrated.
- Group 2 parameter limits are regulatory specified limits, and are not based on the test operating conditions (e.g., the maximum stack CO concentration). Some Group 2 parameters are continuously monitored and recorded, and are interlocked with the AWFCO system. Interlocks for continuously monitored Group 2 parameters will be operational during the test periods, without modification to the interlock set points.
- Group 3 parameter limits are based on manufacturer's recommendations, operational safety, and historical operating practice considerations rather than on the test operating conditions. Group 3 parameter limits may be regulatory specified limits. Some Group 3 parameters may be continuously monitored and recorded, and may be interlocked with the AWFCO system. Interlocks for continuously monitored Group 3 parameters will be operational during the test periods.

7.2 Development of Permit Limits

The following sections describe how each control parameter limit will be established. In addition to establishing specific operating limits, Lyondell anticipates having limits on the types of waste that can be burned in F-57180. Since Lyondell demonstrated and will demonstrate 99.99% DRE using naphthalene, a Class 1 (most thermally stable) compound, it is expected that Lyondell will be permitted to burn all the wastes represented by the waste codes in the facility's most recent RCRA Part A permit application. Specific prohibitions are expected for wastes containing greater than 50 mg/kg of polychlorinated biphenyls (PCBs) and those wastes listed with the waste codes F020, F021, F022, F023, F026, or F027.

7.2.1 Parameters Demonstrated During the Test (Group 1 Limits)

Group 1 parameter limits are based on the results of the testing. The following parameters are proposed as Group 1 parameters for F-57180.

7.2.1.1 Maximum Hazardous Waste Feed Rates [40 CFR 63.1209(j)(3), (k)(4)]

The maximum waste feed rate operating limit is established for maintaining compliance with the organic DRE performance under HWC MACT. During the 2010 CPT, Test 2 was conducted to demonstrate the maximum feed rates of liquid wastes for the industrial furnace. The liquid waste feed rates were monitored on a continuous basis. Based on successful demonstration of the DRE performance standard during the 2010 maximum waste feed rate test, the maximum allowable liquid waste feed rate for F-57180 was established as hourly rolling average limit from the averages of the maximum hourly rolling average feed rates demonstrated during the three runs of the maximum waste feed rate test.

During Test 2 of the CPT conducted under this test plan, Lyondell intends to demonstrate a higher waste feed rate limit. Based on successful demonstration of the DRE performance standard during the CPT conducted under this test plan, the maximum allowable liquid waste feed rate limit for F-57180 will be established as hourly rolling average limit from the averages of the maximum hourly rolling average total waste feed rates demonstrated during the three runs of the maximum waste feed rate test.

7.2.1.2 Minimum Combustion Temperatures [40 CFR 63.1209(j)(1), (k)(2)]

The minimum combustion temperature operating limit is established for maintaining compliance with the organic DRE performance under HWC MACT. During the 2010 CPT, Test 1 was conducted in order to demonstrate the minimum combustion temperature for HWC industrial furnace for DRE. Combustion gas temperature was monitored on a continuous basis. Based on successful demonstration of the DRE performance standard during the minimum combustion temperature test, the minimum combustion temperature limit was established as an hourly rolling average equal to the average of the 2010 minimum temperature DRE test run average values.

During Test 1 of the CPT conducted under this test plan, Lyondell intends to demonstrate a lower minimum combustion temperature limit. Based on successful demonstration of the DRE performance standard during the CPT conducted under this test plan, the minimum combustion temperature limit for F-57180 will be established as hourly rolling average limit from the average of the average combustion temperatures demonstrated during the three runs of the minimum combustion temperature test.

7.2.1.3 Maximum Combustion Gas Velocity [40 CFR 63.1209(j)(2), (k)(3)]

The maximum combustion gas velocity flow rate operating limit is established for maintaining compliance with the organic DRE performance under HWC MACT. During the 2010 CPT, the combustion gas velocity was maximized during Test 2. Measurement of DRE performance during Test 2 demonstrated that DRE is being met at conditions of maximum waste feed rate and maximum combustion gas velocity.

During Test 2 of the CPT conducted under this test plan, Lyondell intends to demonstrate a higher maximum combustion gas velocity limit. Measurement of DRE performance during Test 2 will be demonstrated at conditions of maximum waste feed rate and maximum combustion gas velocity.

F-57180 is a louver vented, natural draft unit with no combustion air flow measurement instrumentation. Since heat input correlates directly with combustion air demand, Lyondell proposed setting maximum waste feed heat input in terms of MMBtu/hr as indirect indicator of combustion gas velocity. The maximum waste feed heat input for F-57180 was established from the average of the average total waste feed heat input demonstrated during the three runs of the 2010 CPT Test 2. Appendix C includes a graphical presentation of total heat release versus stack flow data from the 2010 CPT.

During Test 2 of the CPT conducted under this test plan, Lyondell intends to demonstrate a higher total waste feed heat input. Based on successful demonstration of the DRE performance standard during the CPT conducted under this test plan, the maximum total waste feed heat input limit for F-57180 will be established as an hourly rolling average limit from the averages of the average total waste feed heat input demonstrated during the three runs of the maximum waste feed rate test.

7.2.1.4 Maximum Ash Feed Rates [40 CFR 63.1209(m)(3)]

To provide some operational flexibility should the ash content of the wastes vary, Lyondell will augment the native ash content of the waste during Test 2 via spiking of an ash surrogate during the maximum waste feed rate test. Provided that the particulate emissions measured during the maximum waste feed rate test is in compliance with the particulate matter emissions standard, the final total ash feed rate limit for the unit should be the test demonstrated feed rate. The total ash feed rate limit for the unit should be expressed as a rolling average, equal to the average of the average ash feed rate during the three runs of the maximum feed rate test. For HWC MACT compliance, the ash feed rate limit is expressed in terms of 12-hour rolling average. Records of waste feed analyses, and the electronic waste feed operational data, will be maintained to demonstrate compliance with the ash feed rate limit.

7.2.2 Parameters Established by Regulatory Requirements (Group 2 Limits)

Group 2 parameter limits are based on regulatory requirements.

7.2.2.1 Maximum Chloride and Metals Feed Rates [40 CFR 63.1209(l)(1)(ii), (o)(1)(ii), (n)(2)(v); 63.1207(m)(2)]

Lyondell will feed waste normally treated during the testing. Waste feed analyses will be performed to measure the total chloride and metals contents of the waste feeds. These analyses and the system operating feed rate will be used to demonstrate compliance of F-57180 with the applicable HWC MACT hazardous waste thermal input based or stack gas mass concentration emissions limits for metals and chloride. As stated previously in this CPT plan, Lyondell will comply with the HCl/Cl_2 and metals emissions standards via MHWTC.

The applicable chloride and metals emissions limit for F-57180 are based on the thermal (heat) input from hazardous waste only expressed in lb/MMBtu of hazardous waste. Compliance with the chloride and metals emissions limits are continuously calculated from the total constituent feed rates in all hazardous waste feeds (lb/hr) divided by the total hazardous waste thermal feed rate (MM Btu/hr). Compliance with the chromium and HCl/Cl_2 standards for this unit will be via a 12-hour rolling average basis. Compliance with the mercury and SVM emission standards for this unit must be demonstrated on a not-to-exceed annual average basis. Per agreement with EPA Region 6, the chloride feed rate limit for F-57180 is set at 80% of the HWC MACT emissions standard. The SVM, chromium, and mercury feed rate limits are set at 100% of the HWC MACT emissions standards.

Records of waste feed analyses, and the electronic waste feed operational data, will be maintained to demonstrate compliance of F-57180 with the chloride and metals feed rate limits.

7.2.2.2 Maximum Stack CO Concentration [40 CFR 63.1217(a)(5)(i)]

Lyondell expects a permit limit specifying a maximum allowable stack gas carbon monoxide concentration of 100 ppmv hourly rolling average corrected to 7% oxygen, dry basis the HWC industrial furnace.

7.2.2.3 Fugitive Emissions [40 CFR 63.1206(c)(5)(i)(A), (B)]

The HWC MACT regulations require controlling combustion system leaks. F-57180 is an entirely natural draft unit. Instrumentation has been recently installed to measure draft pressure. F-57180 will therefore comply with 40 CFR 63.1206(c)(5)(i)(B) and immediately stop hazardous waste feed if the combustion chamber pressure limit is exceeded. A maximum value of 0.0 inches water column (inwc) draft pressure (equal to atmospheric pressure) is proposed.

7.2.3 Parameters Established by Manufacturer's Recommendations, Operational Safety and Good Operating Practice (Group 3 Limits)

Group 3 parameter limits are based on manufacturer's recommendations, operational safety, and good operating practice considerations. The only Group 3 parameter proposed is waste feed atomization pressure. Limits for waste feed atomization are proposed on the operation of the waste firing systems for maintaining compliance of F-57180with the DRE standard [40 CFR 63.1209(j)(4)].

The HWC MACT rule at 40 CFR 63.1209(j)(4) requires that the operator *"…specify operating parameters and limits to ensure that good operation of each hazardous waste firing system is maintained"*. The rule is not specific as to parameters or monitoring frequency. Generally, for liquid waste feed systems, this rule requirement has resulted in minimum atomization media pressure limits.

Steam is used as the waste feed atomization media for F-57180. A minimum waste feed atomization pressure limit is proposed for the F-57180 based on historical operating experience. Instrumentation is installed to monitor atomization pressure on a continuous basis. Compliance with minimum atomization pressure limits will be via an hourly rolling average.

Table 7-1. Summary of Established HWC MACT Operating Limits- Hot Oil Heater F-57180

Operational Parameter	Units	Limit	AWFCO	Averaging Period	Method of Setting Limit
Group 1 Parameters					
Maximum liquid waste feed rate	lb/hr	TBD	Yes	Hourly Rolling Average	Average of the maximum rolling average feed rate during the three runs of the 2021 CPT maximum waste feed rate DRE test. [40 CFR 63.1209(j)(3), (k)(4)]
Maximum ash feed rate	g/hr	TBD	Yes	12-Hour Rolling Average	Mass ash feed rate limit based on the average of the average feed rate during the three maximum waste feed rate test runs. [40 CFR 63.1209(m)(3)]
Minimum combustion temperature	°F	TBD	Yes	Hourly Rolling Average	Average of the average combustion temperature during the three runs of the 2021 CPT minimum combustion temperature DRE test. [40 CFR 63.1209(j)(1), (k)(2)]
Maximum heat release as an indirect indicator of combustion air flow (Note 1)	MMBtu/hr	TBD	Yes	Hourly Rolling Average	Average of the maximum rolling heat release rate during the three runs of the 2021 CPT maximum waste feed rate DRE test. [40 CFR 63.1209(j)(2), (k)(3)]
Group 2 Parameters					
Maximum total chloride feed rate	lb/MMBtu	4.1 E-02	Yes	12-Hour Rolling Average	Set at 80% of the HWC MACT standard. Continuously calculated by the control system based on waste feed rate and analyses. [40 CFR 63.1217(a)(6)(ii), 63.1209(o)(1)(ii), & 63.1207(m)(2)]
Maximum mercury (Hg) feed rate	lb/MMBtu	4.2 E-05	Yes	Annual Average (not to exceed)	Continuously calculated by the control system based on waste feed rate and analyses. [40 CFR 63.1217(a)(2)(ii), 63.1209(l)(1)(ii), & 63.1207(m)(2)]
Maximum total semivolatile metals (SVM) [cadmium (Cd) + lead (Pb)] feed rate	lb/MMBtu	8.2 E-05	Yes	Annual Average (not to exceed)	Continuously calculated by the control system based on waste feed rate and analyses. [40 CFR 63.1217(a)(3)(ii), 63.1209(n)(2)(v), & 63.1207(m)(2)]
Maximum total low volatility metals (LVM) [chromium Cr) only] feed rate	lb/MMBtu	1.3 E-04	Yes	12-Hour Rolling Average	Continuously calculated by the control system based on waste feed rate and analyses. [40 CFR 63.1217(a)(4)(ii), 63.1209(n)(2)(v), & 63.1207(m)(2)]
Maximum stack gas CO concentration	ppmvd @ 7% O_2	100	Yes	Hourly Rolling Average	HWC MACT Rule [40 CFR 63.1217(a)(1)(ii) and (a)(5)(i)]
Maximum Combustion Zone Pressure	inwc	0.0		None; instantaneous (w/1-second delay)	HWC MACT Rule [40 CFR 63.1206(c)(5)(i)(B)]
Group 3 Parameters					
Minimum waste atomization differential pressure	psig	TBD	Yes	Hourly Rolling Average	Operating experience [40 CFR 63.1209(j)(4)]

Note 1- The F-57180 is a damper controlled, natural draft device. Maximum heat release is used as a maximum combustion gas velocity indicator.
AWFCO - Automatic waste feed cutoff

8.0 TEST REPORT

The final test report will be postmarked before the close of business on the 90th day after completion of the test unless a time extension is requested. The final test report will be a comprehensive test report that contains a discussion of the test objectives; sampling, analysis, and QA/QC activities performed; summaries of process operating conditions; the results of the test determinations; and proposed permit conditions. The planned outline of the test report is shown in Table 8-1 and is as prescribed by the Industrial and Hazardous Waste Permits Division of TCEQ.

Table 8-1. Example Test Report Outline

NOTIFICATION OF COMPLIANCE (ENCLOSED)
- 1.0 SUMMARY OF TEST RESULTS
  - 1.1 HWC MACT CPT RESULTS
    - 1.1.1 EMISSIONS RESULTS
    - 1.1.2 OPERATING PARAMETER LIMIT RESULTS
      - 1.1.2.1 GROUP 1 LIMITS
        - 1.1.2.1.1 MAXIMUM HAZARDOUS WASTE FEED RATE
        - 1.1.2.1.2 MINIMUM COMBUSTION TEMPERATURE
        - 1.1.2.1.3 MAXIMUM COMBUSTION GAS FLOW RATE
        - 1.1.2.1.4 MAXIMUM ASH FEED RATE
      - 1.1.2.2 GROUP 2 LIMITS
        - 1.1.2.2.1 MAXIMUM CHLORINE FEED RATE
        - 1.1.2.2.2 MAXIMUM MERCURY FEED RATE
        - 1.1.2.2.3 MAXIMUM SVM FEED RATE
        - 1.1.2.2.4 MAXIMUM LVM FEED RATE
        - 1.1.2.2.5 MAXIMUM STACK GAS CO CONCENTRATION
      - 1.1.2.3 GROUP 3 LIMITS
        - 1.1.2.3.1 MINIMUM ATOMIZING MEDIA DIFFERENTIAL PRESSURE
  - 1.2 DEVIATIONS FROM THE APPROVED CPT PLAN AND THEIR IMPACTS
    - 1.2.1 ACTUAL VERSUS PLAN OPERATIONS
    - 1.2.2 DATA QUALITY OBJECTIVES (DQOS)
    - 1.2.3 SAMPLING AND SAMPLE HANDLING
  - 1.3 PERFORMANCE EVALUATION (AUDIT) RESULTS SUMMARY
- 2.0 INTRODUCTION/PROCESS DESCRIPTION
  - 2.1 BRIEF UNIT DESCRIPTION
  - 2.2 TEST OBJECTIVES OVERVIEW
    - 2.2.1 APPLICABLE EMISSIONS STANDARDS
    - 2.2.2 TEST OPERATING OBJECTIVES
    - 2.2.3 PLANNED TEST PROTOCOL
  - 2.3 TEST RESPONSIBLE PARTIES
  - 2.4 TEST CHRONOLOGY
  - 2.5 CONTINUOUS MONITORING SYSTEMS
  - 2.6 PROCESS FLOW DIAGRAM
- 3.0 OPERATING PARAMETER DATA SUMMARY
  - 3.1 FEED RATE DATA
    - 3.1.1 HAZARDOUS AND NONHAZARDOUS WASTE
    - 3.1.2 OTHER FEEDSTREAMS
      - 3.1.2.1 COMBUSTION AIR
      - 3.1.2.2 AUXILIARY FUEL
      - 3.1.2.3 VAPOR RECOVERY (VENT STREAM) FEEDSTREAM
  - 3.2 COMBUSTION AIR
  - 3.3 HAZARDOUS WASTE FEEDSTREAM ATOMIZING PARAMETERS
  - 3.4 STACK GAS FLOW RATE, PRODUCTION RATE, OR SURROGATE PARAMETER
  - 3.5 CONTINUOUS EMISSION MONITORING PARAMETERS
  - 3.6 FUGITIVE EMISSION CONTROL PARAMETERS
  - 3.7 AIR POLLUTION CONTROL (APC) DEVICE PARAMETERS
  - 3.8 OTHER MONITORING METHODS FOR DETERMINING CONTINUING COMPLIANCE
  - 3.9 DATA-IN LIEU-OF TESTING PARAMETER SUMMARY

Table 8-1. Example Test Report Outline (cont'd)

4.0 FEEDSTREAM SAMPLING AND ANALYSIS
- 4.1 SAMPLING LOCATIONS
- 4.2 SAMPLING AND ANALYTICAL METHODS
- 4.3 CHARACTERIZATIONS
  - 4.3.1 WASTE FEEDS
  - 4.3.2 OTHER FEEDSTREAMS
- 4.4 HWC MACT CONSTITUENT FEED RATES
  - 4.4.1 MERCURY
  - 4.4.2 SEMIVOLATILE METALS (SVM)
  - 4.4.3 LOW VOLATILITY METALS (LVM)
  - 4.4.4 TOTAL CHLORINE AND CHLORIDES
  - 4.4.5 ASH
  - 4.4.6 PRINCIPAL ORGANIC HAZARDOUS CONSTITUENTS (POHCs)

5.0 HWC MACT COMPLIANCE RESULTS
- 5.1 APPLICABLE EMISSION STANDARDS
- 5.2 DIOXINS AND FURANS
  - 5.2.1 SAMPLING AND ANALYTICAL METHODS
  - 5.2.2 DIOXINS AND FURANS EMISSION RESULTS
  - 5.2.3 TOXICITY EQUIVALENCY RESULTS (TEQ)
- 5.3 METALS
  - 5.3.1 SAMPLING AND ANALYTICAL METHODS
  - 5.3.2 MERCURY EMISSION RESULTS
  - 5.3.3 SEMIVOLATILE METAL (SVM) EMISSION RESULTS
  - 5.3.4 LOW VOLATILITY METAL (LVM) EMISSION RESULTS
- 5.4 HYDROGEN CHLORIDE AND CHLORINE
  - 5.4.1 SAMPLING AND ANALYTICAL METHODS
  - 5.4.2 HYDROGEN CHLORIDE AND CHLORINE EMISSION RESULTS
- 5.5 PARTICULATE MATTER
  - 5.5.1 SAMPLING AND ANALYTICAL METHODS
  - 5.5.2 PARTICULATE MATTER (PM) EMISSION RESULTS
- 5.6 DESTRUCTION AND REMOVAL EFFICIENCY (DRE)
  - 5.6.1 SAMPLING AND ANALYTICAL METHODS
  - 5.6.2 POHC EMISSION RESULTS
  - 5.6.3 DRE CALCULATIONS
- 5.7 CONTINUOUS EMISSIONS MONITORING SYSTEMS
- 5.8 METALS EXTRAPOLATION
- 5.9 CONTINUOUS MONITORING SYSTEM (CMS) PERFORMANCE EVALUATION TEST SUMMARY

6.0 HAZARDOUS WASTE PERMIT-BASED RESULTS

Table 8-1. Example Test Report Outline (cont'd)

7.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) DOCUMENTATION
- 7.1 SUMMARY OF QA/QC DATA QUALITY ASSESSMENT
  - 7.1.1 QA/QC ACTIVITIES AND IMPLEMENTATION
    - 7.1.1.1 QA SURVEILLANCE
    - 7.1.1.2 SAMPLE COLLECTION
    - 7.1.1.3 SAMPLE ANALYSIS
    - 7.1.1.4 PROCESS INSTRUMENTATION
    - 7.1.1.5 STACK SAMPLING EQUIPMENT
  - 7.1.2 AUDITS
  - 7.1.3 DATA VALIDATION
    - 7.1.3.1 DETECTION AND REPORTING LIMIT DETERMINATION
    - 7.1.3.2 EVALUATION OF COMPLETENESS
    - 7.1.3.3 ANALYTICAL PROCEDURES AND INTERNAL QC CHECK RESULTS
    - 7.1.3.4 QAPP DEVIATIONS AND CORRECTIVE ACTIONS
  - 7.1.4 CALCULATIONS
- 7.2 SUMMARY OF DEVIATIONS FROM THE APPROVED QAPP
- 7.3 LABORATORY ACCREDITATIONS
- 7.4 RESUMES

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APPENDIX A	STACK SAMPLING REPORT
APPENDIX B	FEEDSTREAM SAMPLING REPORT
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APPENDIX F	EXAMPLE CALCULATIONS
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