Telephone:907.339.6600
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PETRO STAR INC.

3900 C Street Suite 802
Anchorage, AK 99503-963

October 26, 2023

Permit Intake Clerk
Alaska Department of Environmental Conservation
Air Permit Program
619 East Ship Creek, Suite 249
Anchorage, AK 99501

Subject: Minor Source Permit Application

Dear Permit Intake Clerk,

Attached please find an application to amend minor source permit AQ0034MSS03.

If you have any questions about this permit application, please contact me at (907) 339-6625.

Sincerely,

Catherine Bollinger
Petro Star, Inc.
Director, Government Compliance

cc: Robert Dayley/Petro Star

Attachment

1. Introduction

The Petro Star Inc. (PSI) Port of Alaska terminal (POA) in Anchorage, Alaska operates under minor source permit number AQ0034MSS03. Petro Star is submitting this application to request a revision of the permit to add new emission units and increase the potential to emit (PTE) as the result of the addition of a gasoline truck loading rack and vapor combustion unit (VCU) project (project).

This application contains the following elements:

- Project description (Section 2)
- Emission calculations (Section 3)
- Regulatory requirements (Section 4)
- Work Cited (Section 5)
- Application forms (Appendix A)
- Permit fee (attached)

2. Project Description

Petro Star Inc. (PSI) acquired the Delta Western property located at Track H, Port of Anchorage Addition Number 1, Anchorage, Alaska, 99501, on 7-27-2023. The emission units listed on Delta Western's Minor Air Permit (AQ1449MSS01, Revision 1), include:

- EU ID 1 – Methanol Storage Tank (2,100,000 gallons)
- EU ID 2 – Enclosed Vapor Combustion System (VCU/Flare) (2,316.28 scf/day)
- EU ID 3 – Loading Rack (8,400 gal/hr)

PSI intends to convert the Methanol Storage Tank (formerly EU ID 1, now EU ID 17) into a gasoline storage tank with a piping connection to Tank-6 at the PoA Terminal (AQ0034MSS03).

The VCU (formerly EU ID 2, now EU ID 18) and the north truck loading rack (formerly EU ID 3, now EU ID 18) will also be converted to handle gasoline loading as well. The VCU is currently configured to a loading rate of 1,200 gpm for gasoline/methanol with a minimum 98% destruction efficiency (see attachments). The north truck loading rack is currently configured with only one bottom loading arm. PSI intends to extend the north truck loading rack and add an additional bottom loading arm so that dual loading with be possible with an A-Train Tanker Truck combination. Loading rates at the truck rack will not exceed the rated capacity of the VCU.

Additionally, PSI had permitted a backup VCU unit (EU ID 16) that was rated at 2,100 gpm and 23.36 MMBtu/hr. Unfortunately, due to COVID-19 and market changes, that VCU was never installed. PSI wants to remove the backup VCU unit (EU ID 16) from the Port of Alaska Terminal air permit.

3. Emissions

PTE for POA will change as a result of this project. This section describes the changes by emission unit or group of emission units. Table 3-1 presents a summary of PTE from the existing and proposed sources. Supporting calculations are presented as attachments to the forms in Appendix A.

Table 3-1. Summary of Potential Emissions (tons per year)

Source	NO_x	PM	CO	SO_2	VOCs	HAPs
Terminal Permitted Sources						
Tank 2 – Premium Unleaded Storage Tank					1.6	2.4E-02
Tank 3 – Premium Unleaded Storage Tank					2.2	3.3E-02
Tank 4 – Diesel Fuel #2 Storage Tank					0.2	2.2E-02
Tank 5 – Unleaded Storage Tank					2.4	3.6E-02
Tank 6 – Unleaded Storage Tank					3.5	5.3E-02
Tank 7 – Diesel Fuel Arctic Storage Tank					0.7	2.4E-01
Tank 8 – Diesel Fuel #2 Storage Tank					0.4	3.7E-02
Tank 17 – Unleaded Storage Tank					3.4	5.1E-02
Tank Truck Loading Rack & Vapor Recovery Equipment					30.7	1.7E-02
Component Leaks					0.62	7.9E-04
Firewater Pump Generator Engine	1.8	8.6	0.6	0.6	0.7	8.5E-07
Additive Storage Tank					6.0E-03	9.1E-05
Additive Storage Tank					1.5E-03	1.4E-04
Additive Storage Tank					5.1E-04	7.7E-06
Boiler	5.9E-02	7.0E-02	5.4E-03	4.2E-04	3.9E-03	1.4E-03
Backup VCU	31.7	7.0	1.8E-03	1.2E-03	1.3E-01	1.9E-03
Existing PTE	**33.6**	**15.6**	**0.61**	**0.57**	**46.5**	**0.5**
Terminal Sources After Modification						
Tank 2 – Premium Unleaded Storage Tank					1.7	2.6E-02
Tank 3 – Unleaded Storage Tank					2.3	3.5E-02
Tank 4 – Diesel Fuel #2 Storage Tank					0.2	2.2E-02
Tank 5 – Unleaded Storage Tank					2.6	3.9E-02
Tank 6 – Unleaded Storage Tank					3.6	5.4E-02
Tank 7 – Diesel Fuel Arctic Storage Tank					0.7	2.4E-01
Tank 8 – Diesel Fuel #2 Storage Tank					0.4	3.7E-02
Tank 17 – Unleaded Storage Tank					3.6	5.5E-02
South Tank Truck Loading Rack & Vapor Recovery Unit					30.7	1.7E-02
North Tank Truck Loading Rack & Vapor Combustion Unit	20.0	4.4	0.002	0.000	26.3	4.0E-03
Component Leaks					0.70	1.0E-03
Firewater Pump Generator Engine	1.8	8.6	0.6	0.6	0.7	8.5E-07
Additive Storage Tank					6.8E-03	1.0E-04

Additive Storage Tank					1.5E-03	1.4E-04
Additive Storage Tank					5.9E-04	8.9E-06
Boiler	5.9E-02	7.0E-02	5.4E-03	4.2E-04	3.9E-03	1.4E-03
Backup VCU (Remove)	-31.7	-7.0	-1.8E-03	-1.2E-03	-1.3E-01	-1.9E-03
PTE after Project	**21.9**	**13.0**	**0.614**	**0.566**	**73.5**	**0.5**
Total Change in PTEs	**-11.8**	**-2.6**	**0.000**	**-0.001**	**27.0**	**1.3E-02**

3.1 Tanks

VOC and HAP PTE from loading gasoline, diesel, and Jet A at EU IDs 2 to 8, 12 to 14, and 17 were calculated using formulas presented in AP-42: Compilation of Air Pollutant Emissions Factors (AP-42), Section 7.1, Organic Liquid Storage Tanks (EPA, 2020). Throughputs were based on the maximum throughput in gallons per minute (gpm) at the truck and rail rack loading arms for diesel and Jet A and based on the capacity of the VRU and VCU for gasoline. Increases in PTE from the project were calculated by subtracting the PTE calculated for these tanks from the 2019 application from the PTE calculated for the facility after the project.

VOC and HAP PTE from loading additives into the horizontal tanks were also calculated using AP-42, Section 7.1, Organic Liquid Storage Tanks (EPA, 2020). Throughputs were based on the gallons of additive needed per thousand gallons of gasoline or diesel.

3.2 Truck and Rail Rack Loading

Uncontrolled VOC PTE from the truck and rail rack loading were calculated using formulas presented in AP-42: Compilation of Air Pollutant Emissions Factors (AP-42), Section 5.2, Transportation and Marketing of Petroleum Liquids (EPA, 2008) and the pump capacity of the loading arms. The submerged loading value is used for all fuels as the truck racks are configured to do bottom loading only for all loading arms per ADEC's Amendments to Volume II, Section IV Point Source Control Program Subpart I: "Air Quality Compliance Certification Procedures for Volatile Liquid Storage Tanks, Delivery Tanks, and Loading Racks", Section 3(c)(ii)(1)(a). The capacity of the existing loading arms at the south truck and rail rack is presented as 3,400 gpm for gasoline, 1,200 gpm for Jet A, and 1,200 gpm for diesel. The capacity of the loading arms at the north truck rack is presented as 1,000 gpm. This ratio of gasoline to Jet A and diesel is used to represent the highest potential emissions.

Controlled VOC PTE for gasoline only is calculated based on the ADEC-accepted 2019 source test results of the total organic compounds (TOC) emission rate for the VRU (EU ID 9). Controlled VOC PTE for gasoline only was calculated using formulas presented in AP-42: Compilation of Air Pollutant Emissions Factors (AP-42), Section 13.5, Industrial Flares (EPA, 2018) for the VCU (EU ID 18). The capacity used for controlled VOC PTE is 2,100 gpm on the VRU and 1,200 gpm on the VCU. Petro Star has requested to remove the backup VCU (EU ID 16) from the permit.

HAP PTE was calculated using HAP fractions from Table 4 of Chapter 19-4 of the American Petroleum Institute (API) Manual of Petroleum Measurement Standards (API, 2017) and physical properties of

relevant petrochemicals from AP-42, Section 7.1 (EPA, 2020).

3.3 Component Leaks

VOC PTE from leaks at the fittings, pump seals, valves, and other components were calculated using EPA's 1995 protocol for Equipment Leak Emission Estimates (EPA, 1995a). The component count from the previous minor permit application was used for existing emissions. The components from the project were added to this list to calculate the total VOC PTE.

HAP PTE was calculated using HAP fractions from Table 4 of Chapter 19-4 of the American Petroleum Institute Manual of Petroleum Measurement Standards (API, 2017) and physical properties of relevant petrochemicals from AP-42, Section 7.1 (EPA, 2018).

3.4 Building Boiler

Combustion PTE from the building boiler was calculated using AP-42, Section 1.4. A total of 8,760 hours per year of operation were assumed.

3.5 Firewater Pump Engine

Combustion PTE from the firewater pump engine was calculated using AP-42, Section 3.3. A total of 8,760 hours per year of operation for maintenance and readiness checks were assumed per EPA guidance (EPA, 1995b).

4. Regulatory Analysis

4.1 Permitting Requirements

ADEC is the lead air permitting authority for the proposed project. ADEC's air permitting requirements are codified in the Alaska Administrative Code, 18 AAC. They incorporate the federal program requirements listed in 40 Code of Federal Regulations (CFR) Parts 50 to 99 and establish permit review procedures for facilities that can emit pollutants to the ambient air. An owner or operator that proposes to modify a stationary source must obtain a construction permit before initiating construction.

For facilities located in areas that meet the national ambient air quality standards, EPA has established the Prevention of Significant Deterioration (PSD) program for major new air pollution sources and major modifications to existing major sources of air pollution in 40 CFR 52.21. ADEC has adopted the PSD requirements in 18 AAC 50.040 and 18 AAC 50.306.

According to both federal and ADEC regulations, a terminal would be a major stationary source for PSD if it had a PTE of more than 250 tons per year (tpy) of any new source review (NSR) pollutant. As shown in Table 4-1, POA does not have a PTE of more than 250 tpy of a regulated NSR pollutant (NOx); therefore, POA is not considered a major stationary source under the PSD program.

The terminal would be a major stationary source under the Title V operating permit program if it had a PTE of more than 100 tpy of any regulated pollutant. As shown in Table 4-1, POA does not have a PTE of more than 100 tpy of a regulated pollutant; therefore, POA is not considered a major stationary source under the Title V operating permit program.

Under 18 AAC 50.502(c)(3), an owner or operator must obtain a minor source permit before beginning a physical change or a change in the method of operation of an existing stationary source if its existing PTE is greater than the amount listed in 18 AAC 50.502(c)(1) for a pollutant and if the change will cause the pollutant to increase its PTE by the amount listed in 18 AAC 50.502(c)(3)(A). As shown in Table 4-1, POA does not have a PTE of more than the threshold for each regulated pollutant nor has POA exceeded the threshold for a physical change to an existing stationary source (see Table 3.1).

Under 18 AAC 50.508(6), an owner or operator may request a minor permit from the department for revising or rescinding the terms and conditions of a Title I permit. Petro Star is submitting this application for this purpose.

Table 4-1. Potential Emissions Compared to Thresholds (tons per year)

Source	NO_x	PM	CO	SO_2	VOCs	HAPs
Total PTE	**21.9**	**13.0**	**0.614**	**0.566**	**73.5**	**0.5**
PSD Threshold (40 CFR 52.21)	250	250	250	250	250	
Operating Permit Threshold (40 CFR 70.1)	100	100	100	100	100	10/25
Minor Permit Threshold [18 AAC 50.502(c)(1)]	40	15/10		40		

4.2 Applicable Requirements

4.2.1 New Source Performance Standards

EPA has adopted standards for new air pollution sources in 40 CFR Part 60.

Subpart A applies to the owner or operator of any stationary source that contains an affected facility, the construction or modification of which is commenced after the date of publication in this part of any standard.

Subparts K, Ka, and Kb apply to each storage vessel with a capacity greater than or equal to specified quantities that are used to store volatile organic liquids for which construction, reconstruction, or modification is commenced after specified dates. EU IDs 2 to 8 are not subject to the requirements because they were installed prior to the applicability dates of Subparts K (June 12, 1973), Ka (May 19, 1978), and Kb (July 23, 1984). EU IDs 11 to 13 are not subject to the requirements because their capacities are less than the thresholds for Subparts K and Ka (40,000 gallons) and Kb (20,000 gallons). The 50,000 bbl gasoline storage tank (EU ID 17) will be subject to Subpart Kb as it was constructed in 2015.

Subpart XX applies to the loading racks in volatile liquid loading service and the associated air pollution control equipment. EU ID 9 is subject to the requirements of Subpart XX, which includes reducing organic vapors emitted from the loading rack by collection and processing with a control device that emits no more than 35 milligrams of organic vapors per liter of volatile liquid. In addition, an annual test to determine and gauge pressure generated as a result of delivery tank loading is required.

4.2.2 National Emission Standards for Hazardous Air Pollutants

The EPA has established national emission standards for HAPs for several new or reconstructed sources in 40 CFR Parts 61 and 63.

Subpart A applies to the owner or operator of any stationary source that contains an affected facility, the construction or modification of which is commenced after the date of publication in this part of any standard.

Subpart BBBBBB applies to owners and operators of area-source bulk gasoline terminals. POA is subject to this subpart because this source is an area source bulk gasoline terminal that is not subject to the control requirements of 40 CFR Part 73, Subpart R or 40 CFR Part 63, Subpart CC. The facilities subject to requirements under Subpart BBBBBB include the gasoline loading rack (EU ID 9), the gasoline storage tanks (EU IDs 2,3, 5, 6, and now 17), and equipment components in vapor or liquid gasoline service.

Subpart R applies to owners and operators of bulk gasoline terminals that are major sources of HAPs. POA is not subject to this subpart because it is not a major source of HAPs.

Subpart JJJJJJ applies to owners and operators of industrial boilers located at area sources of HAPs. The building boiler located at POA is not subject to the rule because it is a gas-fired boiler.

The 63 hp firewater pump engine is subject to Subpart ZZZZ. Compliance requirements consist of the following:

- Operate/maintain engine and control device per manufacturer's instruction or owner-developed maintenance plan.
- Change oil/filter and inspect hoses/belts every 500 hours or annually.
- Inspect air cleaner every 1,000 hours or annually.
- Install and/or maintain an hour meter and record hours of operation.
- Keep records of maintenance.

4.2.3 Alaska Air Quality Management

18 AAC 50.085 contains control requirements applicable to the facilities' storage tanks. The owner, operator, or permittee of a stationary source located at the Port of Alaska that has volatile liquid storage tanks with a volume of 378,000 gallons or more must reduce organic vapor emitted to the atmosphere by using internal floating roofs and conducting inspections.

18 AAC 50.090 contains control requirements applicable to the facility's loading rack. The owner, operator or permittee of a stationary source located at the Port of Alaska that has a volatile liquid loading rack with a design throughput of 15 million gallons or more per year must reduce organic vapors emitted to the atmosphere by operating vapor collection system and liquid product loading equipment and preventing leaks in such equipment. EU ID 9 is subject to the requirements of 18 AAC 50.090 which includes reducing organic vapors emitted from the loading rack by collection and processing with a control device that emits no more than 10 milligrams of organic vapors per liter of volatile liquid.

ADEC has adopted emission opacity, particulate, and sulfur compound standards for fuel-burning equipment in 18 AAC 50.055. Opacity is limited to no more than 20 percent averaged over any 6 consecutive minutes. Particulate matter is limited to 0.05 grain per cubic foot of exhaust gas corrected to standard conditions and averaged over 3 hours.
Sulfur compounds are limited to the following:

1. For equipment burning only fuel gas, the concentration of uncontrolled emissions that would result from burning fuel gas containing 230 milligrams hydrogen sulfide per dry standard cubic meter for a 3-hour average.

2. For fuel-burning equipment that does not burn fuel gas, 500 parts per million for a 3-hour average.

3. For fuel-burning equipment that burns a combination of fuel gas and other fuels, a concentration based on the allowable emissions in (1) and (2), prorated by the proportion of fuel gas and other fuels to the total fuel burned in the equipment.

5. Work Cited

American Petroleum Institute (API). 2017. *Manual of Petroleum Measurement Standards*. Chapter 19.4 "Evaporative Loss Reference Information and Speciation Methodology." 3rd Edition, Addendum 2. June.

U.S. Environmental Protection Agency (EPA). 1995a. *Protocol for Equipment Leak Emission Estimates*. EPA-453/R 95-017. Research Triangle Park, NC: Office of Air Quality Planning and Standards.

U.S. Environmental Protection Agency (EPA). 1995b. Memorandum: *Calculating Potential to Emit (PTE) for Emergency Generators*. September 6. https://www.epa.gov/sites/production/files/2015-08/documents/emgen.pdf.

U.S. Environmental Protection Agency (EPA). 2018. *AP-42: Compilation of Air Pollutant Emissions Factors, Volume 1: Stationary Point and Area Sources*. 5th ed. Research Triangle Park, NC: Office of Air Quality Planning and Standards. Accessed December 1, 2018. https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emissions-factors#5thed.

Appendix A
Application Forms

Alaska Department of Environmental Conservation
Air Quality Minor Permit Application

STATIONARY SOURCE IDENTIFICATION FORM

Section 1 Stationary Source Information

Name: Petro Star Inc. Port of Alaska Terminal			SIC: 5171
Project Name (if different): Addition of Delta Western	Contact: Robert Dayley		
Physical Address: 1522 Anchorage Port Road	City: Anchorage	State: AK	Zip: 99501
	Telephone: 907-339-6618		
	E-Mail Address: rdayley@petrostar.com		
UTM Coordinates (m) or Latitude/Longitude: WGS 84	Northing: 6792299.5	Easting: 344909	Zone: 6
	Latitude: 61° 14' 03"	Longitude: 149° 53' 22"	

Section 2 Legal Owner

Name: Petro Star Inc.		
Mailing Address: 3900 C Street, Suite 802		
City: Anchorage	State: AK	Zip: 99503
Telephone #: 907-339-6600		
E-Mail Address:		

Section 3 Operator *(if different from owner)*

Name:		
Mailing Address:		
City:	State:	Zip:
Telephone #:		
E-Mail Address:		

Section 4 Designated Agent *(for service of process)*

Name: Lev Yampolsky		
Mailing Address: 3900 C Street, Suite 802		
City: Anchorage	State: AK	Zip: 99503
Telephone #: 907-339-6624		
E-Mail Address: lyampolsky@petrostar.com		

Section 5 Billing Contact Person *(if different from owner)*

Name: Catherine Bollinger		
Mailing Address: 3900 C Street, Suite 802		
City: Anchorage	State: AK	Zip: 99503
Telephone #: 907-339-6625		
E-Mail Address: cbollinger@petrostar.com		

Section 6 Application Contact

Name: Catherine Bollinger			
Mailing Address: 3900 C Street, Suite 802	City: Anchorage	State: AK	Zip: 99503
	Telephone: 907-339-6625		
	E-Mail Address: cbollinger@petrostar.com		

Section 7 Desired Process Method *(Check only one – see 18 AAC 50.542(a) for process descriptions and restrictions)*

☐ Fast track for a permit classification under 18 AAC 50.502 [18 AAC 50.542(b)]

☒ Public comment [18 AAC 50.542(d)]

Section 8 Source Classification(s) *(Check all that apply)*

[18 AAC 50.502(b)]

- ☐ Asphalt Plant [≥ 5 ton per hour]
- ☐ Thermal Soil Remediation Unit [≥ 5 ton per hour]
- ☐ Rock Crusher [≥ 5 ton per hour]
- ☐ Incinerator(s) [total rated capacity ≥ 1000 lb/hour]
- ☐ Coal Preparation Plant
- ☒ Port of Alaska Facility

If you checked any of the above, is (are) the emission unit(s) ☒ new, ☐ relocated*, or ☐ existing?

[18 AAC 50.502(c)(1)]

New or relocated* stationary source with potential emissions greater than:

- ☐ 40 tons per year (tpy) NOx
- ☐ 40 tpy SO_2
- ☐ 15 tpy PM-10
- ☐ 10 tpy PM-2.5
- ☐ 0.6 tpy lead
- ☐ 100 tpy CO in a nonattainment area

[18 AAC 50.502(c)(2)]

Construction or relocation* of a:

- ☐ Portable oil and gas operation
- ☐ ≥ 10 MMBtu/hr fuel burning equipment in a SO_2 special protection area

* *Relocation does NOT include moving equipment from one place to another within your current stationary source boundary.*

Section 9 Modification Classification(s) (*Check all that apply)*

[18 AAC 50.502(c)(3)]

- ☐ NOx Increase > 10 tpy [and existing PTE > 40 tpy]
- ☐ SO_2 Increase > 10 tpy [and existing PTE > 40 tpy]
- ☐ PM-10 Increase > 10 tpy [and existing PTE > 15 tpy]
- ☐ PM-2.5 Increase > 10 tpy [and existing PTE > 10 tpy]
- ☐ CO Increase > 100 tpy [and existing PTE > 100 tpy in a nonattainment area]

[18 AAC 50.502(c)(4)]

- ☐ NOx Increase > 40 tpy [and existing PTE ≤ 40 tpy]
- ☐ SO_2 Increase > 40 tpy [and existing PTE ≤ 40 tpy]
- ☐ PM-10 Increase > 15 tpy [and existing PTE ≤ 15 tpy]
- ☐ PM-2.5 Increase > 10 tpy [and existing PTE ≤ 10 tpy]
- ☐ CO Increase > 100 tpy [and Existing PTE ≤ 100 tpy in a nonattainment area]

Basis for calculating modification:

- ☐ Projected actual emissions minus baseline actual emissions
- ☒ New potential emissions minus existing potential emissions

Section 10 Permit Action Request (*Check all that apply)*

[18 AAC 50.508]

- ☐ Establish Plant-wide Applicability Limitation (PAL)
- ☐ Establish emission reductions to offset nonattainment pollutant
- ☐ Owner Requested Limit* (ORL)
- ☒ Revise or Rescind Title I Permit Conditions *

Permit Number: AQ0034MSS03 (Revise)

Date: May 31, 2019

**Which to use? See* http://www.dec.state.ak.us/air/ap/docs/orlrtc.pdf

Section 11 Existing Permits and Limits

For an existing stationary source, do you have an existing: *(Check all that apply)*

☒ Air quality permit Number(s)*: AQ0034MSS03

☐ Owner Requested Limit(s) Permit Number(s):

☐ Pre-Approved Emission Limit (PAEL) Number(s)**:

** All active construction, Title V, and minor permit numbers.*
***Optional. Please provide this number if possible.*
http://dec.alaska.gov/Applications/Air/airtoolsweb/

Section 12 Project Description

Provide a short narrative describing the project. Discuss the purpose for conducting this project, what emission units/activities will be added/modified under this project (i.e., project scope), and the project timeline. If the project is a modification to an existing stationary source, describe how this project will affect the existing process. Include any other discussion that may assist the Department in understanding your project or processing your application. Include a schedule of construction.

Please use additional copies of this sheet if necessary.

Petro Star Inc. (PSI) acquired the Delta Western property located at Track H, Port of Anchorage Addition Number 1, Anchorage, Alaska, 99501, on 07-27-2023. The emission units listed on Delta Western's Minor Air Permit (AQ1449MSS01, Revision 1), include:

- EU ID 1 – Methanol Storage Tank (2,100,000 gallons)
- EU ID 2 – Enclosed Vapor Combustion System (VCU/Flare) (14.7 MMBtu/hr)
- EU ID 3 – Loading Rack (8,400 gal/hr)

PSI intends to convert the Methanol Storage Tank (formerly EU ID 1, now EU ID 17) into a gasoline storage tank with a piping connection to Tank-6 at the PoA Terminal (AQ0034MSS03).

The VCU (formerly EU ID 2, now EU ID 18) and the north truck loading rack (formerly EU ID 3, now EU ID 18) will also be converted to handle gasoline loading as well. The VCU is currently configured to a loading rate of 1,200 gpm for gasoline/methanol with a minimum 98% destruction efficiency (see attachments). The north truck loading rack is currently configured with only one bottom loading arm. PSI intends to extend the north truck loading rack and add an additional bottom loading arm so that dual loading with be possible with an A-Train Tanker Truck combination. Loading rates at the truck rack will not exceed the rated capacity of the VCU.

Additionally, PSI had permitted a backup VCU unit (EU ID 16) that was rated at 2,100 gpm and 23.36 MMBtu/hr. Unfortunately, due to COVID-19 and market changes, that VCU was never installed. PSI wants to remove the backup VCU unit (EU ID 16) from the Port of Alaska Terminal air permit.

Petro Star recommends the following revisions to Condition 1, the emission unit inventory, of Permit No. AQ0034MSS03:

- Add emission unit 18.
- Remove emission unit 16.

In addition, Petro Star recommends the following revision to Condition 4.1:

- Increase the assessable potential to emit from 97 tpy to 110 tpy.

Section 12 Project Description Continued

For **PALs under Section 10** of this application, include the information listed in 40 C.F.R. 52.21(aa)(3), adopted by reference in 18 AAC 50.040 [18 AAC 50.540(h)].

For a **limit to establish offsetting emissions under Section 10** of this application, specify the physical or operational limitations necessary to provide actual emission reductions of the nonattainment air pollutant; including [18 AAC 50.540(i)]:

- A calculation of the expected reduction in actual emissions; and

- The emission limitation representing that quantity of emission reduction.

Section 12 Project Description Continued

For **ORLs under Section 10** of this application [18 AAC 50.540(j)], include:

A description of each proposed limit, including for each air pollutant a calculation of the effect the limit will have on the stationary source's potential to emit and the allowable emissions [18 AAC 50.225(b)(4)];

A description of a verifiable method to attain and maintain each limit, including monitoring and recordkeeping requirements [18 AAC 50.225(b)(5)];

Citation to each requirement that the person seeks to avoid, including an explanation of why the requirement would apply in the absence of the limit and how the limit allows the person to avoid the requirement [18 AAC 50.225(b)(6)];

A statement that the owner or operator of the stationary source will be able to comply with each limit [18 AAC 50.225(b)(8)];

Section 12 Project Description Continued

For **revising or rescinding Title I permit conditions under Section 10** of this application [18 AAC 50.540(k)], include:

An explanation of why the permit term or condition should be revised or rescinded [18 AAC 50.540(k)(2)];

The addition of the north truck loading rack and the VCU will cause changes to the emission unit inventory and increase PTE. Additionally, the backup VCU (EU ID 16) needs to be removed.

The effect of revising or revoking the permit term or condition on [18 AAC 50. 540 (k)(3)]:

- Emissions;

  Total PTE will increase.

- Other permit terms;

  Changes in the emission unit inventory due to the addition of the north truck loading rack and VCU, and the removal of the backup VCU (EU ID 16) must be reflected in permit condition 1. Correction to the emission unit inventory must be made to permit condition 1.

  Changes in the PTE due to the addition of the north truck loading rack and VCU, and the removal of the backup VCU (EU ID 16) must be reflected in permit condition 4.1.

- The underlying ambient demonstration, if any;

- Compliance monitoring; and

For revising a condition that allows avoidance of a permit classification, the information required for that type of permit, unless the revised condition would also allow the owner or operator to avoid the classification. [18 AAC 50.540(k)(4)]

Section 13 Other Application Material

The information listed below must be included in your air quality control minor permit application. *Note: These must be attached in order for your application to be complete.*

If required to submit an analysis of ambient air quality under 18 AAC 50.540(c)(2), or if otherwise requested by the Department:

☐ Attached are maps, plans, and/or aerial photographs as necessary to show the locations and distances of
- emissions units, buildings, emitting activities and boundaries of the associated with the stationary source, and
- nearby or adjacent residences, roads, other occupied structures and general topography within 15 kilometers.

(Indicate compass direction and scale on each.)

☐ Attached is a document (e.g., spreadsheet) showing coordinates and elevations of each modeled unit, along with parameters necessary to characterize each unit for dispersion modeling.

☐ Attached is an electronic copy of all modeling files.

Section 14 Certification

This certification applies to the Air Quality Control Minor Permit Application for the Port of Alaska Terminal (Stationary Source Name) submitted to the Department on: October 25, 2023.

Type of Application

☒ Initial Application

☐ Change to Initial Application

The application is **NOT** complete unless the certification of truth, accuracy, and completeness on this form bears the signature of a **Responsible Official**. Responsible Official is defined in 18 AAC 50.990. (18 AAC 50.205)

CERTIFICATION OF TRUTH, ACCURACY, AND COMPLETENESS

"Based on information and belief formed after reasonable inquiry, I certify that the statements and information in and attached to this document are true, accurate, and complete."

Signature:	Date: 10/26/2023
Printed Name: Rob Dayley	Title: Terminal Manager

Section 15 Attachments

☒ Attachments Included. List attachments: Emission Inventory, PTE calcs, etc.

Section 16 Mailing Address

Submit the minor permit application to the Permit Intake Clerk in the Department's Anchorage office. Submitting to a different office will delay processing. The mailing address and phone number for the Anchorage office is:

Permit Intake Clerk
Alaska Department of Environmental Conservation
Air Permit Program
555 Cordova Street
Anchorage, Alaska 99501
(907) 269-6881

Alaska Department of Environmental Conservation
Air Quality Control Minor Permit Application

MINOR PERMIT APPLICATION – EMISSION UNIT INFORMATION

FOR A NEW STATIONARY SOURCE: Complete this form for all emissions units.

FOR A MODIFICATION TO AN EXISTING STATIONARY SOURCE:
IF YOU HAVE A TITLE V PERMIT: Complete this form for each emissions unit that is new or that is affected by a physical change or change in the method of operation.
IF YOU DO NOT HAVE A TITLE V PERMIT or APPLICATION CLASSIFIED UNDER 18 AAC 50.508(5): Complete this form for all emissions units.

Section 1 Stationary Source Information

Stationary Source Name: Petro Star Inc. Port of Alaska Terminal

Section 2 Emissions Unit (EU) Identification (ID) and Description

Note: Do not use this section for emission units associated with asphalt plants, soil remediation, and rock crushers. Use the Supplementary Forms for these units.

EU ID No.	Description	Construction Date	Make / Model		Serial No.	Requested Limit* (specify units)	Max. Rated Capacity (kW, MMBtu), Horsepower (hp) or. Design Throughput
2	Premium Unleaded Storage Tank	1969					10,000 barrels
3	Premium Unleaded Storage Tank	1969					20,000 barrels
4	Diesel Fuel #2 Storage Tank	1969					20,000 barrels
5	Unleaded Storage Tank	1970					30,000 barrels
6	Unleaded Storage Tank	1970					50,000 barrels
7	Diesel Fuel Arctic Storage Tank	1970					50,000 barrels
8	Diesel Fuel #2 Storage Tank	1966					29,000 barrels

EU ID No.	Description	Construction Date	Make / Model		Serial No.	Requested Limit* (specify units)	Max. Rated Capacity (kW, MMBtu), Horsepower (hp) or. Design Throughput
9	South Tank Truck and Rail Car Loading Racks & Vapor Recovery Equipment	1969 (upgraded 1998-1999)					2,100 gallons/minute
10	Component Leaks	NA					NA
11	Additive Storage Tank						280 barrels
12	Additive Storage Tank						200 barrels
13	Additive Storage Tank						14 barrels
14	Firewater Pump Generator Engine	2002	Edwards EMI	EMI4JB1 R	06-1438277-1		63 horsepower
15	Boiler	5/23/2006	Burnham Gas-Fired Boiler	Model 2B	64877424		0.164 MMBtu/hr
~~16~~	~~Backup Enclosed Vapor Combustion Unit (VCU)~~	~~TBD~~					~~23.4 MMBtu/hr~~
17	Regular Unleaded Gasoline Storage Tank	2015					50,000 barrels
18 (New)	North Tank Truck Loading Racks and enclosed Vapor Combustion Unit (VCU)	2015					1,200 gallons/minute

**If no annual limit is applicable (e.g., hours, fuel), then specify not applicable (N/A).*
Please use additional copies of this sheet if necessary.

Have you identified each emission unit (if you do not have a Title V permit), or each new or affected emission unit (if you have an existing Title V permit) in Section 2 above? ☒ Yes ☐ No
If not, please explain:

Section 3 Emissions Unit Use

EU ID No.	Is unit portable?	Is the unit:			Is this unit a:		If limited operation, is the unit:		
[List same EUs as in Section 2.]	Yes No	a nonroad engine? Yes No	an intermittently used oil field support equipment per Policy 04.02.105? Yes No	an oil field construction unit per Policy 04.02.104? Yes No	primary (base load) unit?	or limited operation unit?	emergency or black start unit?	subject to a permit limit?	or other (specify)?
2	☐ ☒	☐ ☒	☐ ☒	☐ ☒	☐	☐	☐	☐	☐
3	☐ ☒	☐ ☒	☐ ☒	☐ ☒	☐	☐	☐	☐	☐
4	☐ ☒	☐ ☒	☐ ☒	☐ ☒	☐	☐	☐	☐	☐
5	☐ ☒	☐ ☒	☐ ☒	☐ ☒	☐	☐	☐	☐	☐
6	☐ ☒	☐ ☒	☐ ☒	☐ ☒	☐	☐	☐	☐	☐
7	☐ ☒	☐ ☒	☐ ☒	☐ ☒	☐	☐	☐	☐	☐
8	☐ ☒	☐ ☒	☐ ☒	☐ ☒	☐	☐	☐	☐	☐
9	☐ ☒	☐ ☒	☐ ☒	☐ ☒	☐	☐	☐	☐	☐
10	☐ ☒	☐ ☒	☐ ☒	☐ ☒	☐	☐	☐	☐	☐
11	☐ ☒	☐ ☒	☐ ☒	☐ ☒	☐	☐	☐	☐	☐
12	☐ ☒	☐ ☒	☐ ☒	☐ ☒	☐	☐	☐	☐	☐
13	☐ ☒	☐ ☒	☐ ☒	☐ ☒	☐	☐	☐	☐	☐
14	☐ ☒	☐ ☒	☐ ☒	☐ ☒	☐	☒	☒	☐	☐
15	☐ ☒	☐ ☒	☐ ☒	☐ ☒	☐	☐	☐	☐	☐
~~16~~ (Remove)	☐ ☒	☐ ☒	☐ ☒	☐ ☒	☐	☐	☐	☐	☐
17	☐ ☒	☐ ☒	☐ ☒	☐ ☒	☐	☐	☐	☐	☐
18 (New)	☐ ☒	☐ ☒	☐ ☒	☐ ☒	☐	☐	☐	☐	☐

Please use additional copies of this sheet if necessary.

Have you specified the use of each emission unit in Section 3 above? ☒ Yes ☐ No

If not, please explain:

Section 4 Fuel Information

Complete Section 4a or 4b for each emissions unit, as appropriate.

Section 4a Fuel Burning Equipment not Including Flares

EU ID No.	Fuel type(s)	Maximum fuel sulfur content	Fuel density (lb/gal) (if liquid fuel)	Higher heating value*	Maximum fuel consumption rate (gallons/hour or MMscf/hour)
14	Diesel	0.5 ☒ wt. % S ☐ ppmv H_2S	7.17	134,380 ☒ Btu/gal ☐ Btu/dscf Other	3 gallon/hour
15	Natural Gas	25 ☐ wt. % S ☒ ppmv H_2S		1,020 ☐ Btu/gal ☒ Btu/dscf Other	0.164 MMBtu/hr
~~16~~	~~Gasoline Vapor~~	~~0 ☒ wt. % S ☐ ppmv H_2S~~	~~——~~	~~—— ☐ Btu/gal ☐ Btu/dscf —— Other~~	~~0.0168 MMscf/hour~~
~~16~~	~~Propane~~	~~60 ☐ wt. % S ☒ ppmv H_2S~~	~~——~~	~~91,500 ☒ Btu/gal ☐ Btu/dscf —— Other~~	~~5,100 gallon/hour~~
18	Gasoline Vapor	0 ☒ wt. % S ☐ ppmv H_2S		☐ Btu/gal ☐ Btu/dscf Other	0.0096 MMscf/hour
18	Natural Gas	60 ☐ wt. % S ☒ ppmv H_2S		1,020 ☐ Btu/gal ☒ Btu/dscf Other	6,360 gallon/hour
		☐ wt. % S ☐ ppmv H_2S		☐ Btu/gal ☐ Btu/dscf Other	
		☐ wt. % S ☐ ppmv H_2S		☐ Btu/gal ☐ Btu/dscf Other	
		☐ wt. % S ☐ ppmv H_2S		☐ Btu/gal ☐ Btu/dscf Other	
		☐ wt. % S ☐ ppmv H_2S		☐ Btu/gal ☐ Btu/dscf Other	
		☐ wt. % S ☐ ppmv H_2S		☐ Btu/gal ☐ Btu/dscf Other	
		☐ wt. % S ☐ ppmv H_2S		☐ Btu/gal ☐ Btu/dscf Other	
		☐ wt. % S ☐ ppmv H_2S		☐ Btu/gal ☐ Btu/dscf Other	

**Use British thermal unit (Btu) per gallon (gal) for liquid fuels. Use Btu per dry standard cubic foot (dscf) for gaseous fuels.*
Please use additional copies of this sheet if necessary.

Have you provided the fuel details for each fuel-burning emission unit (excluding flares) in Section 4a above? ☒ Yes ☐ No
If not, please explain:

Section 4b Flares

Complete this section if the project/stationary source contains a flare.

Do you own or operate a flare? ☐ Yes ☒ No *(If not skip this section)*

EU ID No:	Heat release rate for pilot / purge operation (MMBtu/hr)	Maximum heat release rate (MMBtu/hr)	Flare gas heat content (Btu/scf)	Flare gas H_2S content (ppmv)

Please use additional copies of this sheet if necessary

Include additional notes as warranted.

Have you provided the fuel use details for all flares in Section 4b above? ☐ Yes ☐ No

If not, please explain:

Section 5 Materials Processed and Methods of Operation

Complete this section if the project/stationary source contains a materials-handling process.

Do you own or operate a flare? ☐ Yes ☒ No *(If not, skip this section)*

EU ID No.	Materials processed	Maximum material processing rate	Describe method of operation

Please use additional copies of this sheet if necessary

Include additional notes as warranted.

Have you specified the material processing details in Section 5 above? ☐ Yes ☐ No

If not, please explain:

Section 6 Emission Control Information (if applicable)

Complete this section if the project/stationary source contains emission control equipment.

Do you own or operate emission control equipment? ☒ Yes ☐ No *(If not, note below and skip this section.)*

EU ID No.	Control equipment	Pollutant(s) controlled:	Description of the control equipment	Description of significant operating parameters and set points for the control equipment	The control equipment is necessary:		
					To comply with an emission standard	To avoid a project classification	Other – give purpose of control equipment
9	Vapor Recovery Unit	VOC	Vapor Recovery Equipment	As detailed in VRU Operation and Maintenance (O&M) Manual approved by the Department on December 14, 2000	☒	☐	
~~16~~	~~Vapor Combustion Unit (Back-up)~~	~~VOC~~	~~Vapor Combustion Equipment~~	~~As detailed in the manufacturer's operation & maintenance~~	☒	☐	——
18	Vapor Combustion Unit	VOC	Vapor Combustion Equipment	As detailed in the manufacturer's operation & maintenance	☒	☐	
					☐	☐	
					☐	☐	
					☐	☐	
					☐	☐	
					☐	☐	
					☐	☐	

Please use additional copies of this sheet if necessary

Include additional notes as warranted.

Have you specified the details of any emission controls in Section 6 above? ☐ Yes ☐ No

If not, please explain:

Section 7 Emission Factors

Give exact citations of emission factor sources.

EU ID No.	Emission Factors								
	NOx	**CO**	**PM-2.5**	**PM-10**	**PM**	**SO_2**	**VOC**	**HAPs**	**Lead**
2							AP-42 Chapter 7.1	AP-42 Chapter 7.1	
3							AP-42 Chapter 7.1	AP-42 Chapter 7.1	
4							AP-42 Chapter 7.1	AP-42 Chapter 7.1	
5							AP-42 Chapter 7.1	AP-42 Chapter 7.1	
6							AP-42 Chapter 7.1	AP-42 Chapter 7.1	
7							AP-42 Chapter 7.1	AP-42 Chapter 7.1	
8							AP-42 Chapter 7.1	AP-42 Chapter 7.1	
12							AP-42 Chapter 7.1	AP-42 Chapter 7.1	
13							AP-42 Chapter 7.1	AP-42 Chapter 7.1	
14							AP-42 Chapter 7.1	AP-42 Chapter 7.1	
17							AP-42 Chapter 7.1	AP-42 Chapter 7.1	

EU ID No.	Sources and References for Emission Factors								
	NOx	**CO**	**PM-2.5**	**PM-10**	**PM**	**SO_2**	**VOC**	**HAPs**	**Lead**
10							EPA 1995 Protocol for Equipment Leak Emission Estimates	AP-42 Chapter 7.1	
11	AP-42 Chapter 3.3	AP-42 Chapter 3.3	AP-42 Chapter 3.3	AP-42 Chapter 3.3	AP-42 Chapter 3.3	AP-42 Chapter 3.3	AP-42 Chapter 3.3	AP-42 Chapter 3.3	
15	AP-42 Chapter 1.4	AP-42 Chapter 1.4	AP-42 Chapter 1.4	AP-42 Chapter 1.4	AP-42 Chapter 1.4	AP-42 Chapter 1.4	AP-42 Chapter 1.4	AP-42 Chapter 1.4	
~~16~~	~~AP-42 Chapter 13.5~~	~~AP-42 Chapter 13.5~~	~~AP-42 Chapter 13.5~~	~~AP-42 Chapter 13.5~~	~~AP-42 Chapter 13.5~~	~~AP-42 Chapter 13.5~~	~~AP-42 Chapter 13.5~~	~~AP-42 Chapter 13.5~~	~~———~~
~~16~~	~~AP-42 Chapter 1.5~~	~~AP-42 Chapter 1.5~~	~~AP-42 Chapter 1.5~~	~~AP-42 Chapter 1.5~~	~~AP-42 Chapter 1.5~~	~~AP-42 Chapter 1.5~~	~~AP-42 Chapter 1.5~~	~~AP-42 Chapter 1.5~~	~~———~~
18	AP-42 Chapter 13.5	AP-42 Chapter 13.5	AP-42 Chapter 13.5	AP-42 Chapter 13.5	AP-42 Chapter 13.5	AP-42 Chapter 13.5	AP-42 Chapter 13.5	AP-42 Chapter 13.5	
18	AP-42 Chapter 1.5	AP-42 Chapter 1.5	AP-42 Chapter 1.5	AP-42 Chapter 1.5	AP-42 Chapter 1.5	AP-42 Chapter 1.5	AP-42 Chapter 1.5	AP-42 Chapter 1.5	
19	AP-42 Chapter 1.4	AP-42 Chapter 1.4	AP-42 Chapter 1.4	AP-42 Chapter 1.4	AP-42 Chapter 1.4	AP-42 Chapter 1.4	AP-42 Chapter 1.4	AP-42 Chapter 1.4	

Please use additional copies of this sheet if necessary.

Include additional notes as warranted.

Have you specified all emission factors and reference sources in Section 7 above? ☒ Yes ☐ No

If not, please explain:

Section 8 Applicable State Emission Limits (listed in 18 AAC 50.050 through 18 AAC 50.090)

Complete this section for emissions units that are new or are affected by the physical change or change in operation.

EU ID No.	Emission Limit or Standard	Regulation Citation	Compliance Method
9	10 mg/L organic vapors	18 AAC 50.090(1)(D)(i)	Comply with the VRU Operation and Maintenance Manual approved by the Department on December 14, 2000
10	10,000 ppm volatile organic liquids or vapors	18 AAC 50.090(3)	Monthly leak inspections
~~16~~	~~10 mg/L organic vapors~~	~~18 AAC 50.090(1)(D)(i)~~	~~Comply with the VCU manufacturer's operation & maintenance manual~~
18	10 mg/L organic vapors	18 AAC 50.090(1)(D)(i)	Comply with the VCU manufacturer's operation & maintenance manual

Please use additional copies of this sheet if necessary.

Have you specified all applicable state emission limits in Section 8 above? ☐ Yes ☐ No

Have you specified a demonstration of compliance for each emission limit or standard? ☐ Yes ☐ No

If you answered "no" to either question, please explain:

Section 9 Incinerators

Complete this section if the project/stationary source contains an incinerator.
Do you own or operate an incinerator? ☐ Yes ☒ No *(If not, skip this section.)*

EU ID No.	Fuels Burned (type and consumption rate)	Rated capacity in pounds per hour	Type of waste burned

Please use additional copies of this sheet if necessary

Include additional notes as warranted.

Have you specified the details of all incinerators in Section 9 above? ☐ Yes ☐ No
If not, please explain:

Alaska Department of Environmental Conservation
Air Quality Control Minor Permit Application

EMISSIONS SUMMARY FORM
Modification of an Existing Stationary Source

Section 1 Stationary Source Information

Stationary Source Name: Petro Star Inc. Port of Alaska Terminal

Section 2 Existing Potential to Emit (PTE) for the Entire Stationary Source BEFORE the Modification

EU ID No.	*Does project affect the emissions unit?*	PTE (tpy)								
		CO	NOx[4]	PM-2.5[1]	PM-10[1]	PM	SO_2	VOC[2]	Fugitive VOC[3]	Fugitive PM[3]
2-8 & 17	☒ Yes ☐ No	--	--	--	--	--	--	14.4	0	0
9	☐ Yes ☒ No	--	--	--	--	--	--	30.7	0	0
10	☒ Yes ☐ No	--	--	--	--	--	--	0.62	0.62	0
11	☐ Yes ☒ No	1.84	8.55	0.61	0.61	0.61	0.57	0.69	0	0
12	☒ Yes ☐ No	--	--	--	--	--	--	6.0E-3	0	0
13	☒ Yes ☐ No	--	--	--	--	--	--	1.5E-3	0	0
14	☒ Yes ☐ No	--	--	--	--	--	--	5.1E-4	0	0
15	☐ Yes ☒ No	5.9E-2	7.0E-2	5.4E-3	5.4E-3	5.4E-3	4.2E-4	3.9E-3	0	0
16	☐ Yes ☒ No	31.7	7.0	1.8E-03	1.8E-03	1.8E-03	1.2E-03	1.3E-01	0	0
Total tons per year (tpy)		**33.6**	**15.6**	**0.61**	**0.61**	**0.61**	**0.57**	**46.5**	**0.62**	**0**

☒ Detailed Excel spreadsheet emissions calculations are attached. *These must be attached in order for your application to be complete.*
Include multiple copies of this page if more space is required.

☒ *Check this box if fugitive emissions are included in permit applicability under 18 AAC 50.502(i).*
Brief description of why fugitive emissions are included in permit applicability:

Notes:
1. Include condensable particulate matter for PM-10 and PM-2.5.
2. If total PTE for volatile organic compounds (VOCs) is at least 10 tpy, include a separate Excel spreadsheet that shows the HAP emissions.
3. Fugitive VOC and PM emissions are included as assessable emissions regardless of permit applicability.
4. Fugitive NOx emissions from blasting should be included in the PTE column for NOx.

Have you completed Section 2 above? ☒ Yes ☐ No
If not, please explain:

Section 3 Change in Emissions

Show ONLY existing emissions units that are affected by the project. Show EITHER the change in actual emissions (Sections 3a and 3b) OR the change in potential emissions (Sections 2 and 3c).

Section 3a Actual Emissions – NOx, CO, PM-2.5, PM-10, PM, SO_2 (18 AAC 50.502(c)(3)(B) or 18 AAC 50.508(5))

If an existing emissions unit is being removed, enter zero for "projected actual emissions" for that unit.

See 18 AAC 50.502 for directions on calculating "baseline actual emissions" and "projected actual emissions."

EU ID No.	Type of Modification		Baseline Actual Emissions (tpy)					Projected Actual Emissions (tpy)				
	Modified EU	Removed EU	CO	NO_X	PM-2.5[1]	PM-10[1]	SO_2	CO	NO_X	PM-2.5[1]	PM-10[1]	SO_2
	☐	☐										
	☐	☐										
	☐	☐										
	☐	☐										
	☐	☐										
	☐	☐										
	☐	☐										
	☐	☐										
	☐	☐										
	☐	☐										
	☐	☐										
Total												

Use this table only if the project does not include new emission units. See 18 AAC 50.502(e) and (h)(4)

☐ Detailed Excel spreadsheets emissions calculations are attached. *These must be attached in order for your application to be complete. You may give an example calculation where the method of calculation is identical for multiple emissions units.*

Notes:

[1] Include condensable particulate matter for PM-10 and PM-2.5.

Section 3b Change in Actual Emissions (18 AAC 50.502(c)(3)(B) or 18 AAC 50.502(c)(4)(B))

If you choose actual emissions as your basis, complete Sections 3a and 3b for each emissions unit for which you answered "YES" in Section 2. Change in actual emissions = "projected actual emissions" minus "baseline actual emissions" from Section 3a.

EU ID No.	Change in Actual Emissions (tpy)				
	CO	NOx	PM-2.5[1]	PM-10[1]	SO_2
Total	0	0	0	0	0

Use this table only if the project does not include new emission units. See 18 AAC 50.502(e) and (h)(4)

[1] Include condensable particulate matter for PM-10 and PM-2.5.

Have you completed Section 3a and 3b above? ☐ Yes ☒ No

If not, please explain:

Section 3c Change in Potential to Emit (PTE) (18 AAC 50.502(c)(3)(A) or 18 AAC 50.502(c)(4)(A))

If you choose PTE as your basis for calculation, complete this section for each emissions unit that is new and for each emissions unit for which you answered "YES" in Section 2.
Under "PTE AFTER the Modification", enter zero if you are removing the emissions unit.
Under "Change in PTE":
For each EXISTING emissions unit, subtract the amount of PTE BEFORE Modification in Section 2 from the "PTE AFTER the Modification"
For each NEW emissions unit, enter the amount from "PTE AFTER the Modification."

EU ID No.	PTE - AFTER the Modification (tpy) [only from modified and new emissions units. Do not list emission units for which you answered "NO" in Section 2.]								Change in PTE (tpy)							
	CO	NO_X	PM-2.5[1]	PM-10[1]	PM	SO_2	VOC	HAPs[2]	CO	NO_X	PM-2.5[1]	PM-10[1]	PM	SO_2	VOC	HAPs
2-8 & 17	--	--	--	--	--	--	15.1	0.51	--	--	--	--	--	--	0.7	0.011
9	--	--	--	--	--	--	30.7	0.018	--	--	--	--	--	--	--	--
10	--	--	--	--	--	--	0.70	0.001	--	--	--	--	--	--	0.09	0.000
11	1.8	8.6	0.6	0.6	0.7	0.000	1.8	8.6	--	--	--	--	--	--	--	--
12	--	--	--	--	--	--	0.007	0.00	--	--	--	--	--	--	0.001	0.000
13	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
14	--	--	--	--	--	--	0.001	0.00	--	--	--	--	--	--	0.000	0.000
15	0.059	0.07	0.005	0.005	0.005	0.000	0.004	0.001	--	--	--	--	--	--	--	--
~~**16**~~	~~31.7~~	~~7.0~~	~~0.002~~	~~0.002~~	~~0.002~~	~~0.001~~	~~0.125~~	~~0.002~~	-31.7	-7.0	-0.002	-0.002	-0.002	-0.001	-0.125	-0.002
18 (New)	20.0	4.4	0.002	0.002	0.002	0.000	26.3	0.004	20.0	4.4	0.002	0.002	0.002	0.000	26.3	0.004
Total	--	--	--	--	--	--	46.9	1.2	--	--	--	--	--	--	1.0	-0.1
Source-Wide	**21.9**	**13.0**	**0.614**	**0.614**	**0.614**	**0.566**	**73.5**	**0.5**	**-11.8**	**-2.6**	**0**	**0**	**0**	**-0.001**	**27.0**	**0.01**

Include multiple copies of this page if more space is required.
☒ Detailed Excel spreadsheet emissions calculations are attached. *These must be attached for your application to be complete.*
Notes:
[1] Include condensable particulate matter for PM-10 and PM-2.5
[2] If the total PTE for hazardous air pollutants (HAPs) for the entire stationary source is at least 10 tpy, include a separate Excel spreadsheet that shows the HAP emissions.

Have you completed all portions of Section 3c above? ☒ Yes ☐ No
If not, please explain:

Detailed Spreadsheet of Emissions Calculations - AQ0982MSS06 Revision
(also provided electronically)

Section 2 Existing Potential to Emit (PTE) for the Entire Stationary Source BEFORE the Modification

EU ID	Description	Tons Per Year (tpy)					
		CO	NOx	PM	SO_2	VOC	HAP
2	Premium Unleaded Storage Tank					1.6	2.4E-02
3	Premium Unleaded Storage Tank					2.2	3.3E-02
4	Diesel Fuel #2 Storage Tank					0.2	2.2E-02
5	Unleaded Storage Tank					2.4	3.6E-02
6	Unleaded Storage Tank					3.5	5.3E-02
7	Diesel Fuel Arctic Storage Tank					0.7	2.4E-01
8	Diesel Fuel #2 Storage Tank					0.4	3.7E-02
17	Unleaded Storage Tank					3.4	5.1E-02
9	Tank Truck Loading Rack & Vapor Recovery Equipment					30.7	1.7E-02
10	Component Leaks					0.62	7.9E-04
11	Firewater Pump Generator Engine	1.8	8.6	0.6	0.6	0.7	8.5E-07
12	Additive Storage Tank					6.0E-03	9.1E-05
13	Additive Storage Tank					1.5E-03	1.4E-04
14	Additive Storage Tank					5.1E-04	7.7E-06
15	Boiler	5.9E-02	7.0E-02	5.4E-03	4.2E-04	3.9E-03	1.4E-03
16	Backup VCU	31.7	7.0	1.8E-03	1.2E-03	1.3E-01	1.9E-03
	Totals:	**33.6**	**15.6**	**0.61**	**0.57**	**46.5**	**0.5**

Section 3c Potential to Emit (PTE) for the Entire Stationary Source AFTER the Modification

EU ID	Description	Tons Per Year (tpy)						Change in PTE (tpy)					
		CO	NOx	PM	SO_2	VOC	HAP	CO	NOx	PM	SO_2	VOC	HAP
2	Premium Unleaded Storage Tank					1.7	2.6E-02					0.1	1.2E-03
3	Premium Unleaded Storage Tank					2.3	3.5E-02					0.1	1.7E-03
4	Diesel Fuel #2 Storage Tank					0.2	2.2E-02					--	--
5	Unleaded Storage Tank					2.6	3.9E-02					0.2	2.3E-03
6	Unleaded Storage Tank					3.6	5.4E-02					0.1	1.8E-03
7	Jet A Storage Tank					0.7	2.4E-01					--	--
8	Diesel Fuel #2 Storage Tank					0.4	3.7E-02					--	--
17	Unleaded Storage Tank					3.6	5.5E-02					0.2	3.7E-03
9	South Tank Truck and Rail Loading Rack & Vapor Recovery Unit (VRU)					30.7	1.7E-02					--	--
18	*North Tank Truck and Rail Loading Rack & Vapor Combustion Unit (VCU)*	20.0	4.4	0.002	0.000	26.3	4.0E-03	20.0	4.4	0.0	0.0	26.3	4.0E-03
10	Component Leaks					0.70	1.0E-03					0.09	2.4E-04
11	Firewater Pump Generator Engine	1.8	8.6	0.6	0.6	0.7	8.5E-07	--	--	--	--	--	--
12	Additive Storage Tank					6.8E-03	1.0E-04					8.0E-04	1.2E-05
13	Additive Storage Tank					1.5E-03	1.4E-04					--	--
14	Additive Storage Tank					5.9E-04	8.9E-06					8.3E-05	1.3E-06
15	Boiler	5.9E-02	7.0E-02	5.4E-03	4.2E-04	3.9E-03	1.4E-03					--	--
16	Backup VCU *(Removed)*	-31.7	-7.0	-1.8E-03	-1.2E-03	-1.3E-01	-1.9E-03	-31.7	-7.0	0.0	0.0	-0.1	0.0
	Totals:	**21.9**	**13.0**	**0.614**	**0.566**	**73.5**	**0.5**	**-11.8**	**-2.6**	**0.000**	**-0.001**	**27.0**	**1.3E-02**

Loading Rack Emission Factors (Before)

Product Category	Avg. Loading Temperature, T (F)[1]	TVP @ 40 F, P (psi)[2]	MW vapor, M[1]	Uncontrolled EF (lb/1000 gal)[3]	2019 Source Test EF (lb/1000 gal)
Gasoline (RVP 15.0)	35.93	5.5802	62	5.2	0.0475
Jet A	35.93	0.0041	130	0.0080	
ULSD	35.93	0.0031	130	0.0061	

[1] *Air Quality Certification Procedures for Volatile Liquid Storage Tanks, Delivery Tanks, and Loading Racks, amendments to Volume II, Section IV, Point Source Control Program, Subpart I - Section 1©(iv), page IV.I.1-3, paragraph 2*

[2] AP-42 Table 7.1-2

[3] Product uncontrolled Loading Losses = 12.46 (S)(P)(M)/(T) lb/1,000 gal of liquid loaded, S(saturation factor)=0.6 (AP-42 equation 1, Chapter 5.2)

[4] Product controlled emissions based on regulatory limit of 10 mg/L for gasoline

Uncontrolled PTE[1]

Product Category	Capacity (gal/min)	Annual Operating Hours	Emission Factor (lb/1000 gal)	PTE (tpy)
Gasoline (RVP 15.0)	2,100	8760	5.2	2878.3
Jet A	1,200	8,760	0.0080	3
ULSD	1,200	8,760	0.0061	1.9
Total				**2882.7**

[1] Based on gasoline as giving the highest possible VOC emissions

PTE with only Gasoline Controlled[1]

Product Category	Capacity of VRU (gal/min)	Annual Operating Hours	Emission Factor (lb/1000 gal)	PTE (tpy)
Gasoline (RVP 15.0)	2,100	8,760	0.0475	26.2
Jet A	1,200	8,760	0.0080	3
ULSD	1,200	8,760	0.0061	1.9
Total				**30.7**

[1] Based on gasoline as giving the highest possible VOC emissions

Loading Rack Emission Factors (After)

Product Category	Avg. Loading Temperature, T (F)[1]	TVP @ 40 F, P (psi)[2]	MW vapor, M[1]	Uncontrolled EF (lb/1000 gal)[3]	2019 Source Test EF (lb/1000 gal)
Gasoline (RVP 13.0)	35.93	5.5802	62	5.215	0.0475
Jet A	35.93	0.0041	130	0.0080	
ULSD	35.93	0.0031	130	0.0061	

[1] *Air Quality Certification Procedures for Volatile Liquid Storage Tanks, Delivery Tanks, and Loading Racks, amendments to Volume II, Section IV, Point Source Control Program, Subpart I - Section 1©(iv), page IV.I.1-3, paragraph 2*

[2] AP-42 Table 7.1-2

[3] Product uncontrolled Loading Losses = 12.46 (S)(P)(M)/(T) lb/1,000 gal of liquid loaded, S(saturation factor)=0.6 (AP-42 equation 1, Chapter 5.2)

[4] Product controlled emissions based on regulatory limit of 10 mg/L for gasoline

Uncontrolled PTE (worst case scenario)[1]

Product Category	Capacity of Pumps (gal/min)	Annual Operating Hours	Emission Factor (lb/1000 gal)	PTE (tpy)
Gasoline (RVP 13.0)	3,300	8,760	5.2	4,523
Jet A	1,200	8,760	0.0080	3
ULSD	1,200	8,760	0.0061	1.9
Total				**4,527**

[1] Based on gasoline as giving the highest possible VOC emissions

PTE with only Gasoline Controlled[1]

Product Category	Capacity of VRU - gasoline Capacity of pumps - other fuels (gal/min)	Annual Operating Hours	Emission Factor (lb/1000 gal)	PTE (tpy)	
Gasoline (RVP 15.0) South	2,100	8,760	0.0475	26.2	
Gasoline (RVP 15.0) North	1,200	8,760	0.0834	26.3	(98% Destruction Efficiency)
Jet A	1,200	8,760	0.0080	2.5	
ULSD	1,200	8,760	0.0061	1.9	
South Truck Rack Total				**30.7**	
North Truck Rack Total				**26.3**	

[1] Based on gasoline as giving the highest possible VOC emissions

Scenario 1 - Worst Case (PTE)
(*As much Gasoline as possible)*

Location	Product Off-Loading	Product Loading	Arm Position	Flow Rate (gpm)	Flow Rate (Mgal/yr)	Flow Rate (bbls/yr)
Rail Rack Throughput:	Jet-A	--	Tank-7	1,200	630,720	15,017,143
	--	Gasoline	608	800	420,480	10,011,429
	--	Diesel	409	600	315,360	7,508,571
	--	Diesel	410	600	315,360	7,508,571
	--	*Gasoline*	*605*	*450*	236,520	5,631,429
	--	*Gasoline*	*606*	*450*	236,520	5,631,429
			Total Rail Rack Gasoline Loading:	**1,700**	**893,520**	**21,274,286**
			Total Rail Rack Diesel Loading:	**1,200**	**630,720**	**15,017,143**
			Total Rail Rack Jet A Unloading:	**1,200**	**630,720**	**15,017,143**

Location	Product Off-Loading	Product Loading	Arm Position	Flow Rate (gpm)	Flow Rate (Mgal/yr)	Flow Rate (bbls/yr)
South Truck Rack Throughput:	--	Gasoline	26	450	236,520	5,631,429
	--	Gasoline	16	450	236,520	5,631,429
	--	Gasoline	22	400	210,240	5,005,714
	--	Gasoline	12	400	210,240	5,005,714
			Total Rail Rack Gasoline Loading:	**1,700**	**893,520**	**21,274,286**

Location	Product Off-Loading	Product Loading	Arm Position	Flow Rate (gpm)	Flow Rate (Mgal/yr)	Flow Rate (bbls/yr)
North Truck Rack Throughput:	--	*Gasoline*	*1*	*500*	*262,800*	*6,257,143*
	--	*Gasoline*	*2*	*500*	*262,800*	*6,257,143*
			Total North Truck Rack Gasoline Loading:	**1,000**	***525,600***	***12,514,286***

Total Facility Gasoline Loading:	**4,400**	**2,312,640**	**55,062,857**
Total Facility Diesel Loading:	**1,200**	**630,720**	**15,017,143**
Total Facility Jet A Unloading:	**1,200**	**630,720**	**15,017,143**

Fugitives Emission Factors[1]

Component	Emission Factor (kg/hr/component)
Fittings (Light Liquid)	0.000008
Fittings (Gas Vapor)	0.000042
Pump Seals (Light Liquid)	0.00054
Pump Seals (Gas Vapor)	0.000065
Valves (Light Liquid)	0.000043
Valves (Gas Vapor)	0.000013
Other (Light Liquid)	0.000130
Other (Gas Vapor)	0.000120

[1] EPA 1995 Protocol for Equipment Leak Emission Estimates, Table 2-3

Equipment Type	Service	Current Component Count	Emission Factor kg/hr/source	VOC Emissions lbs/yr	VOC Emissions tons/yr	New Component Count	New VOC Emissions lbs/yr	New VOC Emissions tons/yr	Total VOC Emissions lbs/yr	Total VOC Emissions tons/yr
Fittings	DF2	59	8.00E-06	9.11	0.005		0.00	0.000	9.11	0.005
	DFA	157	8.00E-06	24.23	0.012		0.00	0.000	24.23	0.012
	Transmix	0	8.00E-06	0.00	0.000		0.00	0.000	0.00	0.000
	Gas Vapor	64	4.20E-05	51.87	0.026	201	162.89	0.081	214.76	0.107
	Jet A	104	8.00E-06	16.05	0.008		0.00	0.000	16.05	0.008
	PUL Gas	259	8.00E-06	39.98	0.020		0.00	0.000	39.98	0.020
	UL Gas	215	8.00E-06	33.19	0.017		0.00	0.000	33.19	0.017
Other	DF2	0	1.30E-04	0.00	0.000		0.00	0.000	0.00	0.000
	DFA	84	1.30E-04	210.70	0.105		0.00	0.000	210.70	0.105
	Gas Vapor	20	1.20E-04	46.31	0.023	1	2.32	0.001	48.62	0.024
	Jet A	20	1.30E-04	50.17	0.025		0.00	0.000	50.17	0.025
	PUL Gas	69	1.30E-04	173.08	0.087		0.00	0.000	173.08	0.087
	UL Gas	61	1.30E-04	153.01	0.077		0.00	0.000	153.01	0.077
Pumps	DF2	1	5.40E-04	10.42	0.005		0.00	0.000	10.42	0.005
	DFA	2	5.40E-04	20.84	0.010		0.00	0.000	20.84	0.010
	Gas Vapor	1	6.50E-05	1.25	0.001	1	1.25	0.001	2.51	0.001
	Jet A	2	5.40E-04	20.84	0.010		0.00	0.000	20.84	0.010
	PUL Gas	3	5.40E-04	31.26	0.016		0.00	0.000	31.26	0.016
	UL Gas	6	5.40E-04	62.52	0.031		0.00	0.000	62.52	0.031
Valves	DF2	30	4.30E-05	24.89	0.012		0.00	0.000	24.89	0.012
	DFA	36	4.30E-05	29.87	0.015		0.00	0.000	29.87	0.015
	Jet A	71	4.30E-05	58.91	0.029		0.00	0.000	58.91	0.029
	Gas Vapor	10	1.30E-05	2.51	0.001	18	4.52	0.002	7.02	0.004
	PUL Gas	79	4.30E-05	65.55	0.033		0.00	0.000	65.55	0.033
	UL Gas	113	4.30E-05	93.76	0.047		0.00	0.000	93.76	0.047
Total		1466		**1230.298**	**0.615**	221	170.974	0.085	**1401.272**	**0.701**
Diesel - Total				330.06	**0.17**		0.00	**0.00**	330.06	**0.17**
Gasoline - Total				754.27	**0.38**		170.97	**0.09**	925.24	**0.46**
Jet A - Total				145.97	**0.07**		0.00	**0.00**	145.97	**0.07**

VCU

	EF			tpy	
NOx	0.068	lb/MMBtu	AP 42 Table 13.5-1	4.378248	
CO	0.31	lb/MMBtu	AP 42 Table 13.5-2	19.95966	
PM	0	micrograms/L	AP 42 Table 13.5-1	0	smokeless unit
SO2				0	
VOC	0.0012	lb/MMBtu	AP 42 Table 13.5-1	0.077263	

	EF		tpy	
VOC	2.56	lb/MMscf	0.064586	AP 42 Table 13.5-1 alternate EF

1200 gpm

14.70 MMBtu/hr (VCU rating)

160	scfm (design gas vapor + air to VCU)
60	% gas vapor

0.0096 scfh

Natural Gas pilot combustion

	EF			tpy	
NOx	170	lb/MMscf	AP 42 Table 1.4-1	0.045	
CO	24	lb/MMscf	AP 42 Table 1.4-1	0.006	
PM10	5.7	lb/MMscf	AP 42 Table 1.4-2	0.001	(Condensable)
PM2.5	1.9	lb/MMscf	AP 42 Table 1.4-2	0.000	(Filterable)
SO2	0.6	lb/MMscf	AP 42 Table 1.4-2	0.0002	
VOC	5.5	lb/MMscf	AP 42 Table 1.4-2	0.001	

1	pilot	
60	scfh	Enstar Natural Gas flow
1,000	BTU/scf	Heat Value
8,760	hr	Annual operations
0.012	gal/cf	
6.4	Mgal/yr	
525,600	scf/yr	
0.526	MMscf/yr	
3.99	ppm	H_2S content
0.043	lb/ft3	Natural Gas density

Assumed Speciation of Liquid Gasoline Fuel [a]

Vapor Pressure @ 40 F (psia)	4.4369
Molecular Wt.-liquid (lb/lb-mole)	92
Molecular Wt.-vapor (lb/lb-mole)	62

Wt% Speciation in Vapor Phase						
Pollutant	**Wt% in Liquid** [a]	**Vapor Pressure at 40 F (psia)**	**Molecular Wt (lb/lb-mole)**	**Equations 4-3,4-4,4-5 and 4-6 From AP-42 Section 7.1-4**		
				Pi	**yi**	**Wt% in Vapor**
Benzene	0.018	0.64	78.1	1.4E-02	3.0E-03	3.8E-03
Cumene	0.005	0.05	120.2	2.0E-04	4.4E-05	8.5E-05
Ethylbenzene	0.014	0.11	106.2	1.3E-03	3.0E-04	5.1E-04
Hexane (n-hexane)	0.01	1.10	86.2	1.2E-02	2.7E-03	3.7E-03
1,2,4-Trimethylbenzene	0.025	0.0205	120.19	3.9E-04	8.8E-05	1.7E-04
Cyclohexane	0.0024	0.677	84.16	1.8E-03	4.0E-04	5.4E-04
Toluene	0.07	0.17	92.1	1.2E-02	2.7E-03	4.1E-03
Xylenes	0.07	0.13	106.2	7.9E-03	1.8E-03	3.0E-03

HAP Emissions for Venting Sources - Before Modification											
Location	**Quantity**	**VOC Emissions (ton/yr)**	**Benzene (ton/yr)**	**Cumene (ton/yr)**	**Ethylbenzene (ton/yr)**	**Hexane (ton/yr)**	**1,2,4-Trimethylbenzene (ton/yr)**	**Cyclohexane (ton/yr)**	**Toluene (ton/yr)**	**Xylenes (ton/yr)**	**Total HAP (ton/yr)**
Leaks	NA	0.38	1.45E-05	3.22E-07	1.92E-06	1.39E-05	6.46E-07	7.87E-11	1.54E-05	1.14E-05	5.81E-05
Loading Rack (South)	NA	26.2	1.01E-03	2.24E-05	1.33E-04	9.66E-04	4.49E-05	5.47E-09	1.07E-03	7.95E-04	4.04E-03
Notes:											**4.09E-03**

a = Speciation data from American Petroleum Institute (API), Manual of Petroleum Measurement Standards, Ch. 19-4, June 2017, Table 4.

HAP Emissions for Venting Sources - After Modification											
Location	**Quantity**	**VOC Emissions (ton/yr)**	**Benzene (ton/yr)**	**Cumene (ton/yr)**	**Ethylbenzene (ton/yr)**	**Hexane (ton/yr)**	**1,2,4-Trimethylbenzene (ton/yr)**	**Cyclohexane (ton/yr)**	**Toluene (ton/yr)**	**Xylenes (ton/yr)**	**Total HAP (ton/yr)**
Leaks	NA	1.92	7.36E-05	1.64E-06	9.74E-06	7.06E-05	9.74E-06	2.71E-09	7.80E-05	5.81E-05	3.01E-04
VCU	NA	0.1	4.72E-06	1.05E-07	6.24E-07	4.53E-06	4.53E-06	8.08E-12	5.00E-06	3.72E-06	2.32E-05
Loading Rack (South)	NA	26.2	1.01E-03	2.24E-05	1.33E-04	9.66E-04	4.49E-05	1.73E-09	1.07E-03	7.95E-04	4.04E-03
Loading Rack (North)	NA	26.3	1.01E-03	2.25E-05	1.34E-04	9.69E-04	4.51E-05	5.49E-09	1.07E-03	7.97E-04	4.05E-03
Notes:											**8.41E-03**

a = Speciation data from American Petroleum Institute (API), Manual of Petroleum Measurement Standards, Ch. 19-4, June 2017, Table 4.

Assumed Speciation of Liquid Diesel Fuel [a]

Vapor Pressure @ 40 F (psia)	0.0029
Molecular Wt.-liquid (lb/lb-mole)	185
Molecular Wt.-vapor (lb/lb-mole)	130

Wt% Speciation in Vapor Phase						
Pollutant	**Wt% in Liquid[a]**	**Vapor Pressure at 40 F (psia)**	**Molecular Wt (lb/lb-mole)**	**Equations 4-3,4-4,4-5 and 4-6 From AP-42 Section 7.1-4**		
				Pi	**yi**	**Wt% in Vapor**
Benzene	0.000008	0.64	78.1	1.2E-05	4.1E-03	2.5E-03
Ethylbenzene	0.00013	0.11	106.2	2.5E-05	8.3E-03	6.8E-03
Hexane (n-hexane)	0.000001	1.10	86.2	2.4E-06	8.0E-04	5.3E-04
1,2,4-Trimethylbenzene	0.01	0.0205	120.19	3.2E-04	1.1E-01	9.9E-02
Toluene	0.00032	0.17	92.1	1.1E-04	3.8E-02	2.7E-02
Xylenes	0.0029	0.13	106.2	6.5E-04	2.2E-01	1.8E-01

HAP Emissions for Venting Sources - Before Modification									
Location	**Quantity**	**VOC Emission (ton/yr)**	**Benzene (ton/yr)**	**Ethylbenzene (ton/yr)**	**Hexane (ton/yr)**	**1,2,4-Trimethylbenzene (ton/yr)**	**Toluene (ton/yr)**	**Xylenes (ton/yr)**	**Total HAP (ton/yr)**
Leaks	1	0.17	4.07E-06	1.12E-05	8.78E-07	1.63E-04	4.44E-05	2.99E-04	0.001
Notes:									**0.001**

a = Speciation data from American Petroleum Institute (API), Manual of Petroleum Measurement Standards, Ch. 19-4, June 2017, Table 4.

HAP Emissions for Venting Sources - After Modification									
Location	**Quantity**	**VOC Emission (ton/yr)**	**Benzene (ton/yr)**	**Ethylbenzene (ton/yr)**	**Hexane (ton/yr)**	**1,2,4-Trimethylbenzene (ton/yr)**	**Toluene (ton/yr)**	**Xylenes (ton/yr)**	**Total HAP (ton/yr)**
Leaks	1	0.17	4.07E-06	1.12E-05	8.78E-07	1.63E-04	4.44E-05	2.99E-04	0.001
Racks	1	1.92	4.72E-05	1.31E-04	1.02E-05	1.90E-03	5.15E-04	3.47E-03	0.01
Notes:									**0.007**

a = Speciation data from American Petroleum Institute (API), Manual of Petroleum Measurement Standards, Ch. 19-4, June 2017, Table 4.

Assumed Speciation of Liquid
Jet A Fuel [a]

Vapor Pressure @ 40 F (psia)	0.0037
Molecular Wt.-liquid (lb/lb-mole)	162
Molecular Wt.-vapor (lb/lb-mole)	130

Wt% Speciation in Vapor Phase						
Pollutant	Wt% in Liquid[a]	Vapor Pressure at 40 F (psia)	Molecular Wt (lb/lb-mole)	Equations 4-3,4-4,4-5 and 4-6 From AP-42 Section 7.1-4		
				Pi	yi	Wt% in Vapor
Benzene	0.00004	0.64	78.1	5.3E-05	1.4E-02	8.5E-03
Ethylbenzene	0.00127	0.11	106.2	2.1E-04	5.6E-02	4.6E-02
Hexane (n-hexane)	0.00005	1.10	86.2	1.0E-04	2.8E-02	1.8E-02
Toluene	0.00133	0.17	92.1	4.1E-04	1.1E-01	7.7E-02
Xylenes	0.0031	0.13	106.2	6.1E-04	1.6E-01	1.3E-01

HAP Emissions for Venting Sources - Before Modification								
Location	Quantity	VOC Emission (ton/yr)	Benzene (ton/yr)	Ethylbenzene (ton/yr)	Hexane (ton/yr)	Toluene (ton/yr)	Xylenes (ton/yr)	Total HAP (ton/yr)
Leaks	1	0.07	6.21E-06	3.36E-05	1.34E-05	5.63E-05	9.77E-05	0.00
Notes:								**0.00**

a = Speciation data from American Petroleum Institute (API), Manual of Petroleum Measurement Standards, Ch. 19-4, June 2017, Table 4.

HAP Emissions for Venting Sources - After Modification								
Location	Quantity	VOC Emission (ton/yr)	Benzene (ton/yr)	Ethylbenzene (ton/yr)	Hexane (ton/yr)	Toluene (ton/yr)	Xylenes (ton/yr)	Total HAP (ton/yr)
Leaks	1	0.07	6.21E-06	3.36E-05	1.34E-05	5.63E-05	9.77E-05	0.00
Loading Rack	1	2.53	2.16E-04	1.16E-03	4.66E-04	1.96E-03	3.39E-03	0.01
Notes:								**0.01**

a = Speciation data from American Petroleum Institute (API), Manual of Petroleum Measurement Standards, Ch. 19-4, June 2017, Table 4.

Firewater Pump Engine

Rated Horsepower	63	hp
Operational Hours	8760	hr/yr
Assumed Efficiency	7000	Btu/hp-hr
HHV	134,380	Btu/gal
Fuel Consumption	0.36	lb/hp-hr
Fuel Rate	3.2	gal/yr

CO		NOx		PM		SO_2		VOC		Tons Per Year (tpy)				
Value	Units	Value	Units	Value	Units	Value	Units	Value	Units	CO	NOx	PM	SO_2	VOC
0.00668	lb/hp-hr	0.031	lb/hp-hr	0.0022	lb/hp-hr	0.00205	lb/hp-hr	0.002514	lb/hp-hr	1.8E+00	8.6E+00	6.1E-01	5.7E-01	6.9E-01

AP-42, Table 3.3-1

HAP Calculations				
Organics				
Hazardous Air Pollutant	***CAS Number***	***E - Gen Emission Factor (lbs/MMBtu)***	***Emission Factor Source***	***Emissions (tons/yr) E-Gen***
Benzene	71432	9.33E-04	A	2.02E-07
Toluene	108883	4.09E-04	A	8.84E-08
Xylene	1330207	2.85E-04	A	6.16E-08
1,3 Butadiene		3.91E-05	A	8.45E-09
Formaldehyde	50000	1.18E-03	A	2.55E-07
Acetaldehyde	75070	7.67E-04	A	1.66E-07
Acrolein	107028	9.25E-05	A	2.00E-08
Polynuclear Aromatic Hydrocarbons	Total PAH	1.68E-04	A	3.63E-08
Trace Elements				
Hazardous Air Pollutant	***CAS Number***	***E-Gen Emission Factor (lbs/10^{12} Btu)***	***Emission Factor Source***	***Emissions (tons/yr) E-Gen***
Arsenic	7440382	4	B	8.6E-10
Beryllium	7440417	3	B	6.5E-10
Cadmium	35658652	3	B	6.5E-10
Chromium	1308389	3	B	6.5E-10
Copper	7440508	3	B	6.5E-10
Manganese	7439965	6	B	1.3E-09
Mercury	7439976	3	B	6.5E-10
Nickel	7440020	3	B	6.5E-10
Selenium	7782492	15	B	3.2E-09
Zinc	7440666	4	B	8.6E-10
			Total of All HAPS	**8.47E-07**

Notes:

A = AP-42, Table 3.3-2

B = There are no trace element emission factors for this source category in AP-2 Section 3.3.

Therefore fuel oil external combustion source emission factors were used from AP-42, Table 1.3-10,

Boiler

Fuel Type	Natural Gas	
Rating	0.164	MMBtu/hr
	164000	BTU/hr
BTU/SCF	1020	source AP 42, Section 1, Table 1.4-1 footnote
SCF/hr	160.8	
10^6 SCF/hr	0.000160784	
Annual Operating Hours	8760	

CO		NOx		PM		SO_2		VOC		Tons Per Year (tpy)				
Value	Units	Value	Units	Value	Units	Value	Units	Value	Units	CO	NOx	PM	SO_2	VOC
84	lb/MMscf	100	lb/MMscf	7.6	lb/MMscf	0.6	lb/MMscf	5.5	lb/MMscf	5.9E-02	7.0E-02	5.4E-03	4.2E-04	3.9E-03

AP-42, Tables 1.4-1 and 1.4-2

HAP Calculations

Organics

Hazardous Air Pollutant	*CAS Number*	*Emission Factor (lbs/10^6 scf)*	*Emission Factor Source*	*Emissions (tons/yr)*
2-Methylnaphthalene	91576	2.40E-05	A	1.69E-08
3-Methylchloranthrene	56495	1.80E-06	A	1.27E-09
7,12-Dimethylbenz(a)anthracene		1.60E-05	A	1.13E-08
Acenaphthene	83329	1.80E-06	A	1.27E-09
Acenaphthylene	203968	1.80E-06	A	1.27E-09
Anthracene	120127	2.40E-06	A	1.69E-09
Benz(a)anthracene	56553	1.80E-06	A	1.27E-09
Benzene	71432	2.10E-03	A	1.48E-06
Benzo(a)pyrene	50328	1.20E-06	A	8.45E-10
Benzo(b)fluoranthene	205992	1.80E-06	A	1.27E-09
Benzo(g,h,i)perylene	191242	1.20E-06	A	8.45E-10
Benzo(k)fluoranthene	205823	1.80E-06	A	1.27E-09
Chrysene	218019	1.80E-06	A	1.27E-09
Dibenzo(a,h)anthracene	53703	1.20E-06	A	8.45E-10
Dichlorobenzene	25321226	1.20E-03	A	8.45E-07
Fluoranthene	206440	3.00E-06	A	2.11E-09
Fluorene	86737	2.80E-06	A	1.97E-09
Formaldehyde	50000	7.50E-02	A	5.28E-05
Hexane	110543	7.50E-02	A	5.28E-05
Indeno(1,2,3-cd)pyrene	193395	1.80E+00	A	1.27E-03
Naphthalene	91203	6.10E-04	A	4.30E-07
Phenanthrene	85018	1.70E-05	A	1.20E-08
Pyrene	129000	5.00E-06	A	3.52E-09
Toluene	108883	3.40E-03	A	2.39E-06

HAP Calculations

Trace Elements

Hazardous Air Pollutant	*CAS Number*	*Emission Factor (lbs/10^6 s*	*Emission Factor Source*	*Emissions (tons/yr)*
Arsenic	7440382	2.0.E-04	B	1.41E-07
Barium	7440393	4.4.E-03	B	3.10E-06
Beryllium	7440417	1.2.E-05	B	8.45E-09
Cadmium	35658652	1.1.E-03	B	7.75E-07
Chromium	1308389	1.4.E-03	B	9.86E-07
Cobalt	7440484	8.4.E-05	B	5.92E-08
Copper	7440508	8.5.E-04	B	5.99E-07
Manganese	7439965	3.8.E-04	B	2.68E-07
Mercury	7439976	2.6.E-04	B	1.83E-07
Molybdenum	7439987	1.1.E-03	B	7.75E-07
Nickel	7440020	2.1.E-03	B	1.48E-06
Selenium	7782492	2.4.E-05	B	1.69E-08
Vanadium	7440622	2.3.E-03	B	1.62E-06
Zinc	7440666	2.9.E-02	B	2.04E-05
			Total of All HAPS	**1.41E-03**

Notes:

A = AP-42, Table 1.4-3

B = AP-42, Table 1.4-4

Tank Emission - Before

Tank Number (ID)	Contents	Total Emissions (lb/yr)	Total Emissions (Ton/yr)	HAPS (lb/yr)	HAPS (Ton/yr)
Tank 2	Premium Unleaded	3,225.01	1.61	48.82	0.02
Tank 3	Premium Unleaded	4,360.67	2.18	65.95	0.03
Tank 5	Regular Unleaded	4,801.47	2.40	72.65	0.04
Tank 6	Regular Unleaded	6,947.13	3.47	105.03	0.05
Tank 17	Regular Unleaded	6,718.10	3.36	101.77	0.05
Tank 4	Diesel	465.54	0.23	44.14	0.02
Tank 8	Diesel	788.37	0.39	74.75	0.04
Tank 7	Jet A (Jet Kerosene)	1,484.52	0.74	489.08	0.24
Tank 2100	NEMO 1128	12.08	6.0E-03	0.18	9.1E-05
Tank 2102	Lubricity (Kerosene)	2.97	1.5E-03	0.28	1.4E-04
Tank 2103	Keropur	1.02	5.1E-04	0.02	7.7E-06
Total		**28,812.92**	**14.41**	**945.50**	**0.47**

Tank Emissions - After

Tank Number (ID)	Contents	Total Emissions (lb/yr)	Total Emissions (Ton/yr)	HAPS (lb/yr)	HAPS (Ton/yr)
Tank 2	Premium Unleaded	3,383.44	1.69	51.22	0.03
Tank 3	Premium Unleaded	4,586.24	2.29	69.36	0.03
Tank 5	Regular Unleaded	5,109.89	2.55	77.31	0.04
Tank 6	Regular Unleaded	7,184.63	3.59	108.63	0.05
Tank 17	Regular Unleaded	7,201.40	3.60	109.09	0.05
Tank 4	Diesel	465.54	0.23	44.14	0.02
Tank 8	Diesel	788.37	0.39	74.75	0.04
Tank 7	Jet A (Jet Kerosene)	1,484.52	0.74	489.08	0.24
Tank 2100	NEMO 1128	13.69	6.8E-03	0.21	1.0E-04
Tank 2102	Lubricity (Kerosene)	2.97	1.5E-03	0.28	1.4E-04
Tank 2103	Keropur	1.18	5.9E-04	0.02	8.9E-06
Total		**30,221.87**	**15.11**	**1,024.09**	**0.51**

Anchorage Terminal I
Table 2: Storage Tank Information

Tank ID	Tank Diameter (ft)	Tank Height (ft)	Tank Type	Is Insulated	Shell Finish	Shell Condition	Roof Finish	Roof Condition/Type	Min. Vent Relieving Pressure (psig)	Max. Vent Relieving Pressure (psig)	Max. Liquid Level (ft)	Roof Slope (in/ft)	Rim Seal Type	Access Hatch Status	Access Hatch Qty	Gauge Float Status
Tank 2	48'	32'	cone-roof tank with IFR	N	White	Good	White	Good/ Cone	-0.03	0.03	31	0.75	Mechanical-Shoe Primary with No Secondary	bolted & gasketed	1	bolted & gasketed
Tank 3	67'	32'	cone-roof tank with IFR	N	White	Good	White	Good/ Cone	-0.03	0.03	31	0.75	Mechanical-Shoe Primary with No Secondary	bolted & gasketed	1	bolted & gasketed
Tank 4	67'	32'	FRT (no floating roof)	N	White	Good	White	Good/ Cone	-0.03	0.03	31	0.75			0	
Tank 5	73.4'	40'	cone-roof tank with IFR	N	White	Good	White	Good/ Cone	-0.03	0.03	29	0.75	Mechanical-Shoe Primary with No Secondary	bolted & gasketed	1	bolted & gasketed
Tank 6	95'	40'	cone-roof tank with IFR	N	White	Good	White	Good/ Cone	-0.03	0.03	39	0.75	Mechanical-Shoe Primary with No Secondary	bolted & gasketed	1	bolted & gasketed
Tank 7	95'	40'	FRT (no floating roof)	N	White	Good	White	Good/ Cone	-0.03	0.03	39	0.75			0	
Tank 8	82'	32'	FRT (no floating roof)	N	White	Good	White	Good/ Cone	-0.03	0.03	39	0.75			0	
Tank 17 (New)	*78*	*65*	*cone-roof tank with IFR*	*N*	*White*	*Good*	*White*	*Good/ Cone*	*-0.03*	*0.03*	*64*	*0.75*	*Mechanical-Shoe Primary with No Secondary*	*bolted & gasketed*	*1*	*bolted & gasketed*
Tank 2100	15.138795	17.67146	Horizontal Tank	N	K	G	K	G	-0.03	0.03	7.5	0			0	
Tank 2102	13.68087	16.49336	Horizontal Tank	N	K	G	K	G	-0.03	0.03	6.5	0			0	
Tank 2103	5.046265	3.926991	Horizontal Tank	N	k	g	k	g	-0.03	0.03	3.75	0			0	

Gauge Float Qty	Gauge Hatch Status	Gauge Hatch Qty	Vacuum Breaker Status	Vacuum Breaker Qty	Deck Drain Status	Deck Drain Qty	Leg Pontoon Area Status	Leg Pontoon Area Qty	Leg Center Area Status	Leg Center Area Qty	Rim Vent Status	Rim Vent Qty	Column Round Pipe Status	Column Round Pipe Qty	Column Built Up Status	Column Built Up Qty	Ladder Type	Ladder Quantity	Effective Column Diameter (ft)	Low Deck Leg Height (ft)
1	slit-fabric seal	1	gasketed	1	1" Diameter	20	IFR-type	14	No gasket or controls	0	Gasketed	0	Gasketed	0	Gasketed	1	Gasketed	1	1.1	0
1	slit-fabric seal	1	gasketed	1	1" Diameter	39	IFR-type	20	No gasket or controls	0	Gasketed	0	Gasketed	0	Gasketed	1	Gasketed	1	1.1	0
0		0		0		0		0		0		0		0		0		0	1	0
1	slit-fabric seal	1	gasketed	1	1" Diameter	39	IFR-type	20	No gasket or controls	0	Gasketed	0	Gasketed	0	Gasketed	1	Gasketed	1	1.1	0
1	slit-fabric seal	1	gasketed	1	1" Diameter	80	IFR-type	32	No gasket or controls	0	Gasketed	0	Gasketed	0	Gasketed	6	Gasketed	1	1.1	0
0		0		0		0		0		0		0		0		0		0	1	0
0		0		0		0		0		0		0		0		0		0	1	0
1	*slit-fabric seal*	*1*	*gasketed*	*1*	*1" Diameter*	*49*	*IFR-type*	*23*	*No gasket or controls*	*0*	*Gasketed*	*0*	*Gasketed*	*0*	*Gasketed*	*6*	*Gasketed*	*1*	*1.1*	*0*
0		0		0		0		0		0		0		0		0		0	1	0
0		0		0		0		0		0		0		0		0		0	1	0
0		0		0		0		0		0		0		0		0		0	1	0

Horizontal Tank Inputs (Before)

Tank ID	Tank Capacity (Gallons)	Tank Contents	Chemical	CAS	Percent	GTG per 1000 gallons	Note	Gasoline Throughput	GTG Throughput
2100	11,757	NEMO 1128	ligh aromatic solvent	64742-95-6	60	0.2949	GtG RUL	808,159,275	238,326
			1,2,4 trimethylbenzene	95-63-6	30	0.5588	GTG PUL	53,877,285	30,107
			Proprietary		19.9	**Total GTG added**			**268,433**
			Proprietary		19.9				
			1,3,5 trimethylbenzene	108-67-8	9.9				
			n-propylbenzene	103-65-1	9.9				
			xylene	1330-20-7	4.9				
			o-ethyltoluene	611-14-3	4.9				
			cumene	98-82-8	4.9				
			1,2,3 trimethylbenzene	526-73-8	4.9				
2102	8492	MCC Lubricity 2100CW	hydrotreated light petroleum distillates	64742-47-8	80	0.3	ghg ULSD #2	630,720,000	**189,216**
			hydrodesulfurized kerosene petroluem	64742-81-0	80				
			petroleum kerosene	8008-20-6	80				
			naphtalene	91-20-3	3				
			ethylbenzene	100-41-4	1				
			Toluene	108-88-3	1				
2103	588	KeroPur AP-205	Methylated homopolymer	Proprietary	50	0.2235	gtg	241,723,440	**54,025**
			Paraffins (petroleum), normal C5-20	64771-72-8	25				
			Xylene	1330-20-7	20				
			Naphtha (petroleum), hydrotreated heavy	64742-48-9	15				
			Ethylbenzene	100-41-4	5				

Horizontal Tank Inputs (After)

Tank ID	Tank Capacity (Gallons)	Tank Contents	Chemical	CAS	Percent	GTG per 1000 gallons	Note	Gasoline Throughput	GTG Throughput
2100		NEMO 1127	Solvent naphtha (petroleum), light aromatic	64742-95-6	45	0.2949	GtG RUL	1,269,964,575	374,513
			1,2,4-trimethylbenzene	95-63-6	15	0.5588	GTG PUL	23,740,695	13,266
			Polyolefin alkyl phenol alkyl amine (x2)	Proprietary	15	**Total GTG added**			**387,779**
			mesitylene	108-67-8	10				
			1,2,3-trimethylbenzene	526-73-8	3				
			2-ethylhexan-1-ol	104-76-7	3				
			cumene	98-82-8	1				
2102	8492	MCC Lubricity 2100CV	hydrotreated light petroleum distillates	64742-47-8	80	0.3	ghg ULSD #2	630,720,000	**189,216**
			hydrodesulfurized kerosene petroluem	64742-81-0	80				
			petroleum kerosene	8008-20-6	80				
			naphtalene	91-20-3	3				
			ethylbenzene	100-41-4	1				
			Toluene	108-88-3	1				
2103	588	KeroPur AP-205	Methylated homopolymer	Proprietary	50	0.2235	gtg	379,851,120	**84,897**
			Paraffins (petroleum), normal C5-20	64771-72-8	25				
			Xylene	1330-20-7	20				
			Naphtha (petroleum), hydrotreated heavy	64742-48-9	15				
			Ethylbenzene	100-41-4	5				

AP-42, Chapter 7 - TANKS
Emissions Report - Detail Format
PTE Emission Calculations

Emission Unit Identification: **Tank-2 (After)**
Company: Petro Star Inc. - Port of Anchorage Terminal
City: Anchorage
State: Alaska
Type of Tank: Internal Floating Roof Tank
Description: Premium Unleaded Gasoline Tank

Parameters	Values		
Seal Factor A (Kra)	5.8	(lb-mole/ft-yr)	
Seal Factor B (Krb)	0.3	lb-mole/ft-yr (mph)^n	
Average Ambient Wind Speed (v)	0	mph	(Note 1, pg 7.1-23 IFR = 0)
Seal-Related Wind Speed Component (n)	2.1	dimensionless	Mechanical-Shoe Primary with No Secondary
Tank Diameter (D)	48	ft	
Vapor Pressure at Daily Average Liquid Surface Temperature (P*)	0.0906	psia	
Vapor Molecular Weight (Mv)	62	lb/lb-mole	
Product Factor (Kc)	1		

Rim Seal Loss (LR):	**1564.3372**	**lb/yr**
	0.7822	**tpy**

Parameters	Values		
Annual Net Throughput (Q)	1,642,500	bbl/yr	
Shell Clingage Factor (Cs)	0.0015	bbl/1000 sqft	Clingage Factor - Table 7.1-10 [Light Rust])
Average Organic Liquid Density (WL)	5.6	lb/gal	
Number of Columns (Nc)	1		(support columns - Table 7.1-11)
Effective Column Diameter (Fc)	1.1	ft	

Withdrawal Loss (Lwd):	**277.2652**	**lb/yr**
	0.1386	**tpy**

Parameters	Values		
Column Well (Nc)	1		(24-in. Diam.)/Built-Up Col.-Sliding Cover, Gask.
Kfa	33	lb-mole/mph^M*yr	
Access Hatch (Na)	1		(24-in. Diam.)/Bolted Cover, Gasketed
Kfa	1.6	lb-mole/mph^M*yr	
Automatic Gauge Float Well (Ngfw)	1		Bolted Cover, Gasketed
Kfa	2.8	lb-mole/mph^M*yr	
Sample Pipe or Well (Nhsp)	1		(24-in. Diam.)/Slit Fabric Seal 10% Open
Kfa	12	lb-mole/mph^M*yr	
Vacuum Breaker (Nvb)	1		(10-in. Diam.)/Weighted Mech. Actuation, Gask.
KFa (lb-mole/yr)	6.2	lb-mole/mph^M*yr	
Roof Leg or Hanger Well (Nl)	14		Adjustable
Kfa	7.9	lb-mole/mph^M*yr	
Ladder Well (Nlw)	1		(36-in. Diam.)/Sliding Cover, Gasketed
Kfa	56	lb-mole/mph^M*yr	
Stub Drain (Nsd)	20		(1-in. Diameter)
Kfa	1.2	lb-mole/mph^M*yr	
Total Deck Fitting Loss Factor (Ff)	246.20	lb-mole/yr	

Deck Fitting Loss (Lf):	**1383.4046**	**lb/yr**
	0.6917	**tpy**

Total Loss (L_T):	***3225.0070***	***lb/yr***
	1.6125	***tpy***

NOTES:

	Vapor Molecular Weight M_V (lb/lb-mole)	Liquid Molecular Weight M_L (lb/lb-mole)	Condensed Vapor Density (at 60 °F) W_{VC} (lb/gal)	Liquid Density (see Note 2) W_L (lb/gal)
Gasoline (RVP 13)	62	92	5.6	5.6
Gasoline (RVP 13)				

	ASTM D86 Distillation Slope S	Vapor Pressure Equation Constants A (dimensionless)	B (°R)	True Vapor Pressure P_{VA}	RVP
Gasoline (RVP 13)	3	11.644	5043.6	4.4381	
Gasoline (RVP 13)	3	*11.64367929*	*5043.577678*	4.4369	13

A = $15.64-1.854\ S^{0.5} - (0.8742-0.3280\ S^{0.5})\ \ln(RVP)$

B = $8{,}742-1{,}042\ S^{0.5} - (1{,}049-179.4\ S^{0.5})\ \ln(RVP)$

P* = 0.09062948

Pa (Atmospheric Pressure, psia) = 14.558

0.304771951 **Pva/Pa**

0.833803364 **(1-Pva/Pa)^0.5**

3.362834777 **1+[(1-Pva/Pa)0.5]^2**

PVA (calculated) = 4.4369

	Tank-2
Shell Height (H_S) in ft	32
Tank Diameter (D) in ft	48

For internal & domed external floating roof.	T_{LA}	$2.86(H_S/D)+1.43$	T_{AA}	$3.52(H_S/D)+3.79$	T_B
Avg. Daily liquid surface temperature (TLA)	496.7216606	*3.34*	*495.5825*	6.14	*496.1530506*

Daily Max. Ambient Temp. (T_{AX}): 502.395 (deg. R)

42.725 (deg. F)

Daily Min. Ambient Temp. (T_{AN}): 488.77 (deg. R)

29.1 (deg. F)

Daily Total Solar Insulation Factor (I): 760.73 Btu/sqft day

Tank Paint Solar Absorptance (α): 0.25

Gasoline Fuel [a]

Vapor Pressure @ 40 F (psia) 4.4369

Molecular Wt.-liquid (lb/lb-mole) 92 **M_L [Liquid molecular weight of Gasoline (RVP 13)]**

Molecular Wt.-vapor (lb/lb-mole) 62 **M_V [Vapor molecular weight of Gasoline (RVP 13)]**

Wt% Speciation in Vapor Phase							
Pollutant	**Wt Fraction in Liquid** [a]	**Vapor Pressure at 40 F (psia)** [a]	**M_i (Molecular weight) (lb/lb-mole)** [a]	**Equations 4-3,4-4,4-5 and 4-6 From AP-42 Section 7.1-4**			**HAPs Emission (lbs/yr)**
				Pi	**yi**	**Wt% in Vapor**	
Benzene	0.00018	0.638	78.11	0.00014	0.00003	0.0038	12.3863
Cumene (Isopropyl benzene)	0.00005	0.051	120.2	0.00000	0.00000	0.0001	0.2757
Ethylbenzene	0.00014	0.109	106.17	0.00001	0.00000	0.0005	1.6388
Hexane (n-hexane)	0.0001	1.102	86.18	0.00012	0.00003	0.0037	11.8859
1,2,4-Trimethylbenzene	0.00025	0.021	120.19	0.00000	0.00000	0.0002	0.5528
Cyclohexane	0.000024	0.677	84.16	0.00002	0.00000	0.0005	1.7525
Toluene	0.0007	0.174	92.13	0.00012	0.00003	0.0041	13.1370
Xylenes	0.0007	0.129	106.17	0.00008	0.00002	0.0030	9.7739

Notes:

a = Speciation data from American Petroleum Institute (API), Manual of Petroleum Measurement Standards, Ch. 19-4, November 1997 (Table 4 divide by 100)

AP-42, Chapter 7 - TANKS
Emissions Report - Detail Format
PTE Emission Calculations

Emission Unit Identification: **Tank-2 (After)**
Company: Petro Star Inc. - Port of Anchorage Terminal
City: Anchorage
State: Alaska
Type of Tank: Internal Floating Roof Tank
Description: Premium Unleaded Gasoline Tank

Parameters	Values		
Seal Factor A (Kra)	5.8	(lb-mole/ft-yr)	
Seal Factor B (Krb)	0.3	lb-mole/ft-yr (mph)^n	
Average Ambient Wind Speed (v)	0	mph	(Note 1, pg 7.1-23 IFR = 0)
Seal-Related Wind Speed Component (n)	2.1	dimensionless	Mechanical-Shoe Primary with No Secondary
Tank Diameter (D)	48	ft	
Vapor Pressure at Daily Average Liquid Surface Temperature (P*)	0.0906	psia	
Vapor Molecular Weight (Mv)	62	lb/lb-mole	
Product Factor (Kc)	1		

Rim Seal Loss (LR):	**1564.3372**	**lb/yr**
	0.7822	**tpy**

Parameters	Values		
Annual Net Throughput (Q)	2,581,071	bbl/yr	
Shell Clingage Factor (Cs)	0.0015	bbl/1000 sqft	Clingage Factor - Table 7.1-10 [Light Rust])
Average Organic Liquid Density (WL)	5.6	lb/gal	
Number of Columns (Nc)	1		(support columns - Table 7.1-11)
Effective Column Diameter (Fc)	1.1	ft	

Withdrawal Loss (Lwd):	**435.7025**	**lb/yr**
	0.2179	**tpy**

Parameters	Values		
Column Well (Nc)	1		(24-in. Diam.)/Built-Up Col.-Sliding Cover, Gask.
Kfa	33	lb-mole/mph^M*yr	
Access Hatch (Na)	1		(24-in. Diam.)/Bolted Cover, Gasketed
Kfa	1.6	lb-mole/mph^M*yr	
Automatic Gauge Float Well (Ngfw)	1		Bolted Cover, Gasketed
Kfa	2.8	lb-mole/mph^M*yr	
Sample Pipe or Well (Nhsp)	1		(24-in. Diam.)/Slit Fabric Seal 10% Open
Kfa	12	lb-mole/mph^M*yr	
Vacuum Breaker (Nvb)	1		(10-in. Diam.)/Weighted Mech. Actuation, Gask.
KFa (lb-mole/yr)	6.2	lb-mole/mph^M*yr	
Roof Leg or Hanger Well (Nl)	14		Adjustable
Kfa	7.9	lb-mole/mph^M*yr	
Ladder Well (Nlw)	1		(36-in. Diam.)/Sliding Cover, Gasketed
Kfa	56	lb-mole/mph^M*yr	
Stub Drain (Nsd)	20		(1-in. Diameter)
Kfa	1.2	lb-mole/mph^M*yr	
Total Deck Fitting Loss Factor (Ff)	246.20	lb-mole/yr	

Deck Fitting Loss (Lf):	**1383.4046**	**lb/yr**
	0.6917	**tpy**

Total Loss (L_T):	***3383.4443***	***lb/yr***
	1.6917	***tpy***

NOTES:

	Vapor Molecular Weight M_V (lb/lb-mole)	Liquid Molecular Weight M_L (lb/lb-mole)	Condensed Vapor Density (at 60 °F) W_{VC} (lb/gal)	Liquid Density (see Note 2) W_L (lb/gal)
Gasoline (RVP 13)	62	92	5.6	5.6
Gasoline (RVP 13)				

	ASTM D86 Distillation Slope S	Vapor Pressure Equation Constants A (dimensionless)	B (°R)	True Vapor Pressure P_{VA}	RVP
Gasoline (RVP 13)	3	11.644	5043.6	4.4381	
Gasoline (RVP 13)	3	*11.64367929*	*5043.577678*	4.4369	13

A = $15.64-1.854\ S^{0.5} - (0.8742-0.3280\ S^{0.5})\ \ln(RVP)$

B = $8{,}742-1{,}042\ S^{0.5} - (1{,}049-179.4\ S^{0.5})\ \ln(RVP)$

P* = 0.09062948

Pa (Atmospheric Pressure, psia) = 14.558

0.304771951 **Pva/Pa**

0.833803364 **(1-Pva/Pa)^0.5**

3.362834777 **1+[(1-Pva/Pa)0.5]^2**

PVA (calculated) = 4.4369

	Tank-2
Shell Height (H_S) in ft	32
Tank Diameter (D) in ft	48

For internal & domed external floating roof.	T_{LA}	$2.86(H_S/D)+1.43$	T_{AA}	$3.52(H_S/D)+3.79$	T_B
Avg. Daily liquid surface temperature (TLA)	496.7216606	*3.34*	*495.5825*	6.14	*496.1530506*

Daily Max. Ambient Temp. (T_{AX}): 502.395 (deg. R)

42.725 (deg. F)

Daily Min. Ambient Temp. (T_{AN}): 488.77 (deg. R)

29.1 (deg. F)

Daily Total Solar Insulation Factor (I): 760.73 Btu/sqft day

Tank Paint Solar Absorptance (α): 0.25

Gasoline Fuel [a]

Vapor Pressure @ 40 F (psia) 4.4369

Molecular Wt.-liquid (lb/lb-mole) 92 **M_L [Liquid molecular weight of Gasoline (RVP 13)]**

Molecular Wt.-vapor (lb/lb-mole) 62 **M_V [Vapor molecular weight of Gasoline (RVP 13)]**

Wt% Speciation in Vapor Phase							
Pollutant	**Wt Fraction in Liquid** [a]	**Vapor Pressure at 40 F (psia)** [a]	**M_i (Molecular weight) (lb/lb-mole)** [a]	**Equations 4-3,4-4,4-5 and 4-6 From AP-42 Section 7.1-4**			**HAPs Emission (lbs/yr)**
				Pi	**yi**	**Wt% in Vapor**	
Benzene	0.00018	0.638	78.11	0.00014	0.00003	0.0038	12.9949
Cumene (Isopropyl benzene)	0.00005	0.051	120.2	0.00000	0.00000	0.0001	0.2892
Ethylbenzene	0.00014	0.109	106.17	0.00001	0.00000	0.0005	1.7193
Hexane (n-hexane)	0.0001	1.102	86.18	0.00012	0.00003	0.0037	12.4698
1,2,4-Trimethylbenzene	0.00025	0.021	120.19	0.00000	0.00000	0.0002	0.5799
Cyclohexane	0.000024	0.677	84.16	0.00002	0.00000	0.0005	1.8386
Toluene	0.0007	0.174	92.13	0.00012	0.00003	0.0041	13.7824
Xylenes	0.0007	0.129	106.17	0.00008	0.00002	0.0030	10.2541

Notes:

a = Speciation data from American Petroleum Institute (API), Manual of Petroleum Measurement Standards, Ch. 19-4, November 1997 (Table 4 divide by 100)

AP-42, Chapter 7 - TANKS
Emissions Report - Detail Format
PTE Emission Calculations

Emission Unit Identification: **Tank-3 (After)**
Company: Petro Star Inc. - Port of Anchorage Terminal
City: Anchorage
State: Alaska
Type of Tank: Internal Floating Roof Tank
Description: Premium Unleaded Gasoline Tank

Parameters	Values		
Seal Factor A (Kra)	5.8	(lb-mole/ft-yr)	
Seal Factor B (Krb)	0.3	lb-mole/ft-yr (mph)^n	
Average Ambient Wind Speed (v)	0	mph	(Note 1, pg 7.1-23 IFR = 0)
Seal-Related Wind Speed Component (n)	2.1	dimensionless	Mechanical-Shoe Primary with No Secondary
Tank Diameter (D)	67	ft	
Vapor Pressure at Daily Average Liquid Surface Temperature (P*)	0.0907	psia	
Vapor Molecular Weight (Mv)	62	lb/lb-mole	
Product Factor (Kc)	1		

Rim Seal Loss (LR):	**2186.0362**	**lb/yr**
	1.0930	**tpy**

Parameters	Values		
Annual Net Throughput (Q)	3,285,000	bbl/yr	
Shell Clingage Factor (Cs)	0.0015	bbl/1000 sqft	Clingage Factor - Table 7.1-10 [Light Rust])
Average Organic Liquid Density (WL)	5.6	lb/gal	
Number of Columns (Nc)	1		(support columns - Table 7.1-11)
Effective Column Diameter (Fc)	1.1	ft	

Withdrawal Loss (Lwd):	**394.7516**	**lb/yr**
	0.1974	**tpy**

Parameters	Values		
Column Well (Nc)	1		(24-in. Diam.)/Built-Up Col.-Sliding Cover, Gask.
Kfa	33	lb-mole/mph^M*yr	
Access Hatch (Na)	1		(24-in. Diam.)/Bolted Cover, Gasketed
Kfa	1.6	lb-mole/mph^M*yr	
Automatic Gauge Float Well (Ngfw)	1		Bolted Cover, Gasketed
Kfa	2.8	lb-mole/mph^M*yr	
Sample Pipe or Well (Nhsp)	1		(24-in. Diam.)/Slit Fabric Seal 10% Open
Kfa	12	lb-mole/mph^M*yr	
Vacuum Breaker (Nvb)	1		(10-in. Diam.)/Weighted Mech. Actuation, Gask.
KFa (lb-mole/yr)	6.2	lb-mole/mph^M*yr	
Roof Leg or Hanger Well (Nl)	20		Adjustable
Kfa	7.9	lb-mole/mph^M*yr	
Ladder Well (Nlw)	1		(36-in. Diam.)/Sliding Cover, Gasketed
Kfa	56	lb-mole/mph^M*yr	
Stub Drain (Nsd)	39		(1-in. Diameter)
Kfa	1.2	lb-mole/mph^M*yr	
Total Deck Fitting Loss Factor (Ff)	316.40	lb-mole/yr	

Deck Fitting Loss (Lf):	**1779.8812**	**lb/yr**
	0.8899	**tpy**

Total Loss (L_T):	***4360.6689***	***lb/yr***
	2.1803	***tpy***

NOTES:

	Vapor Molecular Weight	Liquid Molecular Weight	Condensed Vapor Density (at 60 °F)	Liquid Density (see Note 2)
	M_V (lb/lb-mole)	M_L (lb/lb-mole)	W_{VC} (lb/gal)	W_L (lb/gal)
Gasoline (RVP 13)	62	92	5.6	5.6
Gasoline (RVP 13)				

	ASTM D86 Distillation Slope	Vapor Pressure Equation Constants		True Vapor Pressure	RVP
	S	A (dimensionless)	B (°R)	P_{VA}	
Gasoline (RVP 13)	3	11.644	5043.6	4.4423	
Gasoline (RVP 13)	3	*11.64367929*	*5043.577678*	4.4411	13

A = $15.64-1.854\ S^{0.5} - (0.8742-0.3280\ S^{0.5})\ \ln(RVP)$

B = $8{,}742-1{,}042\ S^{0.5} - (1{,}049-179.4\ S^{0.5})\ \ln(RVP)$

P* = 0.09073250

Pa (Atmospheric Pressure, psia) = 14.558

0.305060756 **Pva/Pa**

0.83363016 **(1-Pva/Pa)^0.5**

3.362199564 **1+[(1-Pva/Pa)0.5]^2**

PVA (calculated) = 4.4411

	Tank-3
Shell Height (H_S) in ft	32
Tank Diameter (D) in ft	67

For internal & domed external floating roof.	T_{LA}	*$2.86(H_S/D)+1.43$*	T_{AA}	*$3.52(H_S/D)+3.79$*	T_B
Avg. Daily liquid surface temperature (TLA)	496.7680003	*2.80*	*495.5825*	5.47	*496.1530506*

Daily Max. Ambient Temp. (T_{AX}): 502.395 (deg. R)

42.725 (deg. F)

Daily Min. Ambient Temp. (T_{AN}): 488.77 (deg. R)

29.1 (deg. F)

Daily Total Solar Insulation Factor (*I*): 760.73 Btu/sqft day

Tank Paint Solar Absorptance (α): 0.25

Gasoline Fuel [a]

Vapor Pressure @ 40 F (psia) 4.4411

Molecular Wt.-liquid (lb/lb-mole) 92 **M_L [Liquid molecular weight of Gasoline (RVP 13)]**

Molecular Wt.-vapor (lb/lb-mole) 62 **M_V [Vapor molecular weight of Gasoline (RVP 13)]**

Wt% Speciation in Vapor Phase							
Pollutant	**Wt Fraction in Liquid**[a]	**Vapor Pressure at 40 F (psia)**[a]	**M_i (Molecular weight) (lb/lb-mole)**[a]	**Equations 4-3,4-4,4-5 and 4-6 From AP-42 Section 7.1-4**			**HAPs Emission (lbs/yr)**
				Pi	**yi**	**Wt% in Vapor**	
Benzene	0.00018	0.638	78.11	0.00014	0.00003	0.0038	16.7323
Cumene (Isopropyl benzene)	0.00005	0.051	120.2	0.00000	0.00000	0.0001	0.3724
Ethylbenzene	0.00014	0.109	106.17	0.00001	0.00000	0.0005	2.2138
Hexane (n-hexane)	0.0001	1.102	86.18	0.00012	0.00003	0.0037	16.0562
1,2,4-Trimethylbenzene	0.00025	0.021	120.19	0.00000	0.00000	0.0002	0.7467
Cyclohexane	0.000024	0.677	84.16	0.00002	0.00000	0.0005	2.3673
Toluene	0.0007	0.174	92.13	0.00012	0.00003	0.0041	17.7463
Xylenes	0.0007	0.129	106.17	0.00008	0.00002	0.0030	13.2033

Notes:

a = Speciation data from American Petroleum Institute (API), Manual of Petroleum Measurement Standards, Ch. 19-4, November 1997 (Table 4 divide by 100)

AP-42, Chapter 7 - TANKS
Emissions Report - Detail Format
PTE Emission Calculations

Emission Unit Identification: **Tank-3 (After)**
Company: Petro Star Inc. - Port of Anchorage Terminal
City: Anchorage
State: Alaska
Type of Tank: Internal Floating Roof Tank
Description: Premium Unleaded Gasoline Tank

Parameters	Values		
Seal Factor A (Kra)	5.8	(lb-mole/ft-yr)	
Seal Factor B (Krb)	0.3	lb-mole/ft-yr (mph)^n	
Average Ambient Wind Speed (v)	0	mph	(Note 1, pg 7.1-23 IFR = 0)
Seal-Related Wind Speed Component (n)	2.1	dimensionless	Mechanical-Shoe Primary with No Secondary
Tank Diameter (D)	67	ft	
Vapor Pressure at Daily Average Liquid Surface Temperature (P*)	0.0907	psia	
Vapor Molecular Weight (Mv)	62	lb/lb-mole	
Product Factor (Kc)	1		

Rim Seal Loss (LR):	**2186.0362**	**lb/yr**
	1.0930	**tpy**

Parameters	Values		
Annual Net Throughput (Q)	5,162,143	bbl/yr	
Shell Clingage Factor (Cs)	0.0015	bbl/1000 sqft	Clingage Factor - Table 7.1-10 [Light Rust])
Average Organic Liquid Density (WL)	5.6	lb/gal	
Number of Columns (Nc)	1		(support columns - Table 7.1-11)
Effective Column Diameter (Fc)	1.1	ft	

Withdrawal Loss (Lwd):	**620.3239**	**lb/yr**
	0.3102	**tpy**

Parameters	Values		
Column Well (Nc)	1		(24-in. Diam.)/Built-Up Col.-Sliding Cover, Gask.
Kfa	33	lb-mole/mph^M*yr	
Access Hatch (Na)	1		(24-in. Diam.)/Bolted Cover, Gasketed
Kfa	1.6	lb-mole/mph^M*yr	
Automatic Gauge Float Well (Ngfw)	1		Bolted Cover, Gasketed
Kfa	2.8	lb-mole/mph^M*yr	
Sample Pipe or Well (Nhsp)	1		(24-in. Diam.)/Slit Fabric Seal 10% Open
Kfa	12	lb-mole/mph^M*yr	
Vacuum Breaker (Nvb)	1		(10-in. Diam.)/Weighted Mech. Actuation, Gask.
KFa (lb-mole/yr)	6.2	lb-mole/mph^M*yr	
Roof Leg or Hanger Well (Nl)	20		Adjustable
Kfa	7.9	lb-mole/mph^M*yr	
Ladder Well (Nlw)	1		(36-in. Diam.)/Sliding Cover, Gasketed
Kfa	56	lb-mole/mph^M*yr	
Stub Drain (Nsd)	39		(1-in. Diameter)
Kfa	1.2	lb-mole/mph^M*yr	
Total Deck Fitting Loss Factor (Ff)	316.40	lb-mole/yr	

Deck Fitting Loss (Lf):	**1779.8812**	**lb/yr**
	0.8899	**tpy**

Total Loss (L_T):	***4586.2413***	***lb/yr***
	2.2931	***tpy***

NOTES:

	Vapor Molecular Weight	Liquid Molecular Weight	Condensed Vapor Density (at 60 °F)	Liquid Density (see Note 2)
	M_V (lb/lb-mole)	M_L (lb/lb-mole)	W_{VC} (lb/gal)	W_L (lb/gal)
Gasoline (RVP 13)	62	92	5.6	5.6
Gasoline (RVP 13)				

	ASTM D86 Distillation Slope	Vapor Pressure Equation Constants		True Vapor Pressure	RVP
	S	A (dimensionless)	B (°R)	P_{VA}	
Gasoline (RVP 13)	3	11.644	5043.6	4.4423	
Gasoline (RVP 13)	3	*11.64367929*	*5043.577678*	4.4411	13

A = $15.64-1.854\ S^{0.5} - (0.8742-0.3280\ S^{0.5})\ \ln(RVP)$

B = $8{,}742-1{,}042\ S^{0.5} - (1{,}049-179.4\ S^{0.5})\ \ln(RVP)$

P* = 0.09073250

Pa (Atmospheric Pressure, psia) = 14.558

0.305060756 **Pva/Pa**

0.83363016 **(1-Pva/Pa)^0.5**

3.362199564 **1+[(1-Pva/Pa)0.5]^2**

PVA (calculated) = 4.4411

	Tank-3
Shell Height (H_S) in ft	32
Tank Diameter (D) in ft	67

For internal & domed external floating roof.	T_{LA}	*$2.86(H_S/D)+1.43$*	T_{AA}	*$3.52(H_S/D)+3.79$*	T_B
Avg. Daily liquid surface temperature (TLA)	496.7680003	*2.80*	*495.5825*	5.47	*496.1530506*

Daily Max. Ambient Temp. (T_{AX}): 502.395 (deg. R)

42.725 (deg. F)

Daily Min. Ambient Temp. (T_{AN}): 488.77 (deg. R)

29.1 (deg. F)

Daily Total Solar Insulation Factor (*I*): 760.73 Btu/sqft day

Tank Paint Solar Absorptance (α): 0.25

Gasoline Fuel [a]

Vapor Pressure @ 40 F (psia) 4.4411

Molecular Wt.-liquid (lb/lb-mole) 92 **M_L [Liquid molecular weight of Gasoline (RVP 13)]**

Molecular Wt.-vapor (lb/lb-mole) 62 **M_V [Vapor molecular weight of Gasoline (RVP 13)]**

Wt% Speciation in Vapor Phase							
Pollutant	**Wt Fraction in Liquid** [a]	**Vapor Pressure at 40 F (psia)** [a]	**M_i (Molecular weight) (lb/lb-mole)** [a]	**Equations 4-3,4-4,4-5 and 4-6 From AP-42 Section 7.1-4**			**HAPs Emission (lbs/yr)**
				Pi	**yi**	**Wt% in Vapor**	
Benzene	0.00018	0.638	78.11	0.00014	0.00003	0.0038	17.5978
Cumene (Isopropyl benzene)	0.00005	0.051	120.2	0.00000	0.00000	0.0001	0.3917
Ethylbenzene	0.00014	0.109	106.17	0.00001	0.00000	0.0005	2.3284
Hexane (n-hexane)	0.0001	1.102	86.18	0.00012	0.00003	0.0037	16.8868
1,2,4-Trimethylbenzene	0.00025	0.021	120.19	0.00000	0.00000	0.0002	0.7853
Cyclohexane	0.000024	0.677	84.16	0.00002	0.00000	0.0005	2.4898
Toluene	0.0007	0.174	92.13	0.00012	0.00003	0.0041	18.6643
Xylenes	0.0007	0.129	106.17	0.00008	0.00002	0.0030	13.8862

Notes:

a = Speciation data from American Petroleum Institute (API), Manual of Petroleum Measurement Standards, Ch. 19-4, November 1997 (Table 4 divide by 100)

AP-42, Chapter 7 - TANKS
Emissions Report - Detail Format
PTE Emission Calculations

Emission Unit Identification: **Tank-5 (After)**
Company: Petro Star Inc. - Port of Anchorage Terminal
City: Anchorage
State: Alaska
Type of Tank: Internal Floating Roof Tank
Description: Unleaded Gasoline Tank

Parameters	Values		
Seal Factor A (Kra)	5.8	(lb-mole/ft-yr)	
Seal Factor B (Krb)	0.3	lb-mole/ft-yr (mph)^n	
Average Ambient Wind Speed (v)	0	mph	(Note 1, pg 7.1-23 IFR = 0)
Seal-Related Wind Speed Component (n)	2.1	dimensionless	Mechanical-Shoe Primary with No Secondary
Tank Diameter (D)	73.4	ft	
Vapor Pressure at Daily Average Liquid Surface Temperature (P*)	0.0907	psia	
Vapor Molecular Weight (Mv)	62	lb/lb-mole	
Product Factor (Kc)	1		

Rim Seal Loss (LR):	**2393.7960**	**lb/yr**
	1.1969	**tpy**

Parameters	Values		
Annual Net Throughput (Q)	4,927,500	bbl/yr	
Shell Clingage Factor (Cs)	0.0015	bbl/1000 sqft	Clingage Factor - Table 7.1-10 [Light Rust])
Average Organic Liquid Density (WL)	5.6	lb/gal	
Number of Columns (Nc)	1		(support columns - Table 7.1-11)
Effective Column Diameter (Fc)	1.1	ft	

Withdrawal Loss (Lwd):	**539.7365**	**lb/yr**
	0.2699	**tpy**

Parameters	Values		
Column Well (Nc)	1		(24-in. Diam.)/Built-Up Col.-Sliding Cover, Gask.
Kfa	33	lb-mole/mph^M*yr	
Access Hatch (Na)	1		(24-in. Diam.)/Bolted Cover, Gasketed
Kfa	1.6	lb-mole/mph^M*yr	
Automatic Gauge Float Well (Ngfw)	1		Bolted Cover, Gasketed
Kfa	2.8	lb-mole/mph^M*yr	
Sample Pipe or Well (Nhsp)	1		(24-in. Diam.)/Slit Fabric Seal 10% Open
Kfa	12	lb-mole/mph^M*yr	
Vacuum Breaker (Nvb)	1		(10-in. Diam.)/Weighted Mech. Actuation, Gask.
KFa (lb-mole/yr)	6.2	lb-mole/mph^M*yr	
Roof Leg or Hanger Well (Nl)	22		Adjustable
Kfa	7.9	lb-mole/mph^M*yr	
Ladder Well (Nlw)	1		(36-in. Diam.)/Sliding Cover, Gasketed
Kfa	56	lb-mole/mph^M*yr	
Stub Drain (Nsd)	39		(1-in. Diameter)
Kfa	1.2	lb-mole/mph^M*yr	
Total Deck Fitting Loss Factor (Ff)	332.20	lb-mole/yr	

Deck Fitting Loss (Lf):	**1867.9391**	**lb/yr**
	0.9340	**tpy**

Total Loss (L_T):	***4801.4716***	***lb/yr***
	2.4007	***tpy***

NOTES:

	Vapor Molecular Weight M_V (lb/lb-mole)	Liquid Molecular Weight M_L (lb/lb-mole)	Condensed Vapor Density (at 60 °F) W_{VC} (lb/gal)	Liquid Density (see Note 2) W_L (lb/gal)
Gasoline (RVP 13)	62	92	5.6	5.6
Gasoline (RVP 13)				

	ASTM D86 Distillation Slope S	Vapor Pressure Equation Constants A (dimensionless)	B (°R)	True Vapor Pressure P_{VA}	RVP
Gasoline (RVP 13)	3	11.644	5043.6	4.4407	
Gasoline (RVP 13)	3	*11.64367929*	*5043.577678*	4.4394	13

A = $15.64-1.854\ S^{0.5} - (0.8742-0.3280\ S^{0.5})\ \ln(RVP)$

B = $8{,}742-1{,}042\ S^{0.5} - (1{,}049-179.4\ S^{0.5})\ \ln(RVP)$

P* = 0.09069251

Pa (Atmospheric Pressure, psia) = 14.558

0.304948663 **Pva/Pa**

0.833697389 **(1-Pva/Pa)^0.5**

3.362446116 **1+[(1-Pva/Pa)0.5]^2**

PVA (calculated) = 4.4394

	Tank-5
Shell Height (H_S) in ft	40
Tank Diameter (D) in ft	73.4

For internal & domed external floating roof.	T_{LA}	*2.86(H_S/D)+1.43*	T_{AA}	*3.52(H_S/D)+3.79*	T_B
Avg. Daily liquid surface temperature (TLA)	496.7500187	*2.99*	*495.5825*	5.71	*496.1530506*

Daily Max. Ambient Temp. (T_{AX}): 502.395 (deg. R)

42.725 (deg. F)

Daily Min. Ambient Temp. (T_{AN}): 488.77 (deg. R)

29.1 (deg. F)

Daily Total Solar Insulation Factor (I): 760.73 Btu/sqft day

Tank Paint Solar Absorptance (α): 0.25

Gasoline Fuel [a]

Vapor Pressure @ 40 F (psia) 4.4394

Molecular Wt.-liquid (lb/lb-mole) 92 **M_L [Liquid molecular weight of Gasoline (RVP 13)]**

Molecular Wt.-vapor (lb/lb-mole) 62 **M_V [Vapor molecular weight of Gasoline (RVP 13)]**

Wt% Speciation in Vapor Phase							
Pollutant	**Wt Fraction in Liquid** [a]	**Vapor Pressure at 40 F (psia)** [a]	**M_i (Molecular weight) (lb/lb-mole)** [a]	**Equations 4-3,4-4,4-5 and 4-6 From AP-42 Section 7.1-4**			**HAPs Emission (lbs/yr)**
				Pi	**yi**	**Wt% in Vapor**	
Benzene	0.00018	0.638	78.11	0.00014	0.00003	0.0038	18.4304
Cumene (Isopropyl benzene)	0.00005	0.051	120.2	0.00000	0.00000	0.0001	0.4102
Ethylbenzene	0.00014	0.109	106.17	0.00001	0.00000	0.0005	2.4385
Hexane (n-hexane)	0.0001	1.102	86.18	0.00012	0.00003	0.0037	17.6858
1,2,4-Trimethylbenzene	0.00025	0.021	120.19	0.00000	0.00000	0.0002	0.8225
Cyclohexane	0.000024	0.677	84.16	0.00002	0.00000	0.0005	2.6076
Toluene	0.0007	0.174	92.13	0.00012	0.00003	0.0041	19.5474
Xylenes	0.0007	0.129	106.17	0.00008	0.00002	0.0030	14.5433

Notes:

a = Speciation data from American Petroleum Institute (API), Manual of Petroleum Measurement Standards, Ch. 19-4, November 1997 (Table 4 divide by 100)

AP-42, Chapter 7 - TANKS
Emissions Report - Detail Format
PTE Emission Calculations

Emission Unit Identification: **Tank-5 (After)**
Company: Petro Star Inc. - Port of Anchorage Terminal
City: Anchorage
State: Alaska
Type of Tank: Internal Floating Roof Tank
Description: Unleaded Gasoline Tank

Parameters	Values		
Seal Factor A (Kra)	5.8	(lb-mole/ft-yr)	
Seal Factor B (Krb)	0.3	lb-mole/ft-yr (mph)^n	
Average Ambient Wind Speed (v)	0	mph	(Note 1, pg 7.1-23 IFR = 0)
Seal-Related Wind Speed Component (n)	2.1	dimensionless	Mechanical-Shoe Primary with No Secondary
Tank Diameter (D)	73.4	ft	
Vapor Pressure at Daily Average Liquid Surface Temperature (P*)	0.0907	psia	
Vapor Molecular Weight (Mv)	62	lb/lb-mole	
Product Factor (Kc)	1		

Rim Seal Loss (LR):	**2393.7960**	**lb/yr**
	1.1969	**tpy**

Parameters	Values		
Annual Net Throughput (Q)	7,743,214	bbl/yr	
Shell Clingage Factor (Cs)	0.0015	bbl/1000 sqft	Clingage Factor - Table 7.1-10 [Light Rust])
Average Organic Liquid Density (WL)	5.6	lb/gal	
Number of Columns (Nc)	1		(support columns - Table 7.1-11)
Effective Column Diameter (Fc)	1.1	ft	

Withdrawal Loss (Lwd):	**848.1573**	**lb/yr**
	0.4241	**tpy**

Parameters	Values		
Column Well (Nc)	1		(24-in. Diam.)/Built-Up Col.-Sliding Cover, Gask.
Kfa	33	lb-mole/mph^M*yr	
Access Hatch (Na)	1		(24-in. Diam.)/Bolted Cover, Gasketed
Kfa	1.6	lb-mole/mph^M*yr	
Automatic Gauge Float Well (Ngfw)	1		Bolted Cover, Gasketed
Kfa	2.8	lb-mole/mph^M*yr	
Sample Pipe or Well (Nhsp)	1		(24-in. Diam.)/Slit Fabric Seal 10% Open
Kfa	12	lb-mole/mph^M*yr	
Vacuum Breaker (Nvb)	1		(10-in. Diam.)/Weighted Mech. Actuation, Gask.
KFa (lb-mole/yr)	6.2	lb-mole/mph^M*yr	
Roof Leg or Hanger Well (Nl)	22		Adjustable
Kfa	7.9	lb-mole/mph^M*yr	
Ladder Well (Nlw)	1		(36-in. Diam.)/Sliding Cover, Gasketed
Kfa	56	lb-mole/mph^M*yr	
Stub Drain (Nsd)	39		(1-in. Diameter)
Kfa	1.2	lb-mole/mph^M*yr	
Total Deck Fitting Loss Factor (Ff)	332.20	lb-mole/yr	

Deck Fitting Loss (Lf):	**1867.9391**	**lb/yr**
	0.9340	**tpy**

Total Loss (L_T):	***5109.8925***	***lb/yr***
	2.5549	***tpy***

NOTES:

	Vapor Molecular Weight M_V (lb/lb-mole)	Liquid Molecular Weight M_L (lb/lb-mole)	Condensed Vapor Density (at 60 °F) W_{VC} (lb/gal)	Liquid Density (see Note 2) W_L (lb/gal)
Gasoline (RVP 13)	62	92	5.6	5.6
Gasoline (RVP 13)				

	ASTM D86 Distillation Slope S	Vapor Pressure Equation Constants A (dimensionless)	B (°R)	True Vapor Pressure P_{VA}	RVP
Gasoline (RVP 13)	3	11.644	5043.6	4.4407	
Gasoline (RVP 13)	3	*11.64367929*	*5043.577678*	4.4394	13

$A = 15.64-1.854\ S^{0.5} - (0.8742-0.3280\ S^{0.5})\ \ln(RVP)$

$B = 8{,}742-1{,}042\ S^{0.5} - (1{,}049-179.4\ S^{0.5})\ \ln(RVP)$

P* = 0.09069251

Pa (Atmospheric Pressure, psia) = 14.558

0.304948663 **Pva/Pa**

0.833697389 **(1-Pva/Pa)^0.5**

3.362446116 **1+[(1-Pva/Pa)0.5]^2**

PVA (calculated) = 4.4394

	Tank-5
Shell Height (H_S) in ft	40
Tank Diameter (D) in ft	73.4

For internal & domed external floating roof.	T_{LA}	$2.86(H_S/D)+1.43$	T_{AA}	$3.52(H_S/D)+3.79$	T_B
Avg. Daily liquid surface temperature (TLA)	496.7500187	*2.99*	*495.5825*	5.71	*496.1530506*

Daily Max. Ambient Temp. (T_{AX}): 502.395 (deg. R)

42.725 (deg. F)

Daily Min. Ambient Temp. (T_{AN}): 488.77 (deg. R)

29.1 (deg. F)

Daily Total Solar Insulation Factor (I): 760.73 Btu/sqft day

Tank Paint Solar Absorptance (α): 0.25

Gasoline Fuel [a]

Vapor Pressure @ 40 F (psia) 4.4394

Molecular Wt.-liquid (lb/lb-mole) 92 **M_L [Liquid molecular weight of Gasoline (RVP 13)]**

Molecular Wt.-vapor (lb/lb-mole) 62 **M_V [Vapor molecular weight of Gasoline (RVP 13)]**

Wt% Speciation in Vapor Phase							
Pollutant	**Wt Fraction in Liquid** [a]	**Vapor Pressure at 40 F (psia)** [a]	**M_i (Molecular weight) (lb/lb-mole)** [a]	**Equations 4-3,4-4,4-5 and 4-6 From AP-42 Section 7.1-4**			**HAPs Emission (lbs/yr)**
				Pi	**yi**	**Wt% in Vapor**	
Benzene	0.00018	0.638	78.11	0.00014	0.00003	0.0038	19.6143
Cumene (Isopropyl benzene)	0.00005	0.051	120.2	0.00000	0.00000	0.0001	0.4366
Ethylbenzene	0.00014	0.109	106.17	0.00001	0.00000	0.0005	2.5952
Hexane (n-hexane)	0.0001	1.102	86.18	0.00012	0.00003	0.0037	18.8218
1,2,4-Trimethylbenzene	0.00025	0.021	120.19	0.00000	0.00000	0.0002	0.8753
Cyclohexane	0.000024	0.677	84.16	0.00002	0.00000	0.0005	2.7751
Toluene	0.0007	0.174	92.13	0.00012	0.00003	0.0041	20.8030
Xylenes	0.0007	0.129	106.17	0.00008	0.00002	0.0030	15.4774

Notes:

a = Speciation data from American Petroleum Institute (API), Manual of Petroleum Measurement Standards, Ch. 19-4, November 1997 (Table 4 divide by 100)

AP-42, Chapter 7 - TANKS
Emissions Report - Detail Format
PTE Emission Calculations

Emission Unit Identification: **Tank-6 (After)**
Company: Petro Star Inc. - Port of Anchorage Terminal
City: Anchorage
State: Alaska
Type of Tank: Internal Floating Roof Tank
Description: Unleaded Gasoline Tank

Parameters	Values		
Seal Factor A (Kra)	5.8	(lb-mole/ft-yr)	
Seal Factor B (Krb)	0.3	lb-mole/ft-yr (mph)^n	
Average Ambient Wind Speed (v)	0	mph	(Note 1, pg 7.1-23 IFR = 0)
Seal-Related Wind Speed Component (n)	2.1	dimensionless	Mechanical-Shoe Primary with No Secondary
Tank Diameter (D)	95	ft	
Vapor Pressure at Daily Average Liquid Surface Temperature (P*)	0.0908	psia	
Vapor Molecular Weight (Mv)	62	lb/lb-mole	
Product Factor (Kc)	1		

Rim Seal Loss (LR):	**3100.8661**	**lb/yr**
	1.5504	**tpy**

Parameters	Values		
Annual Net Throughput (Q)	4,927,500	bbl/yr	
Shell Clingage Factor (Cs)	0.0015	bbl/1000 sqft	Clingage Factor - Table 7.1-10 [Light Rust])
Average Organic Liquid Density (WL)	5.6	lb/gal	
Number of Columns (Nc)	1		(support columns - Table 7.1-11)
Effective Column Diameter (Fc)	1.1	ft	

Withdrawal Loss (Lwd):	**415.6175**	**lb/yr**
	0.2078	**tpy**

Parameters	Values		
Column Well (Nc)	6		(24-in. Diam.)/Built-Up Col.-Sliding Cover, Gask.
Kfa	33	lb-mole/mph^M*yr	
Access Hatch (Na)	1		(24-in. Diam.)/Bolted Cover, Gasketed
Kfa	1.6	lb-mole/mph^M*yr	
Automatic Gauge Float Well (Ngfw)	1		Bolted Cover, Gasketed
Kfa	2.8	lb-mole/mph^M*yr	
Sample Pipe or Well (Nhsp)	1		(24-in. Diam.)/Slit Fabric Seal 10% Open
Kfa	12	lb-mole/mph^M*yr	
Vacuum Breaker (Nvb)	1		(10-in. Diam.)/Weighted Mech. Actuation, Gask.
KFa (lb-mole/yr)	6.2	lb-mole/mph^M*yr	
Roof Leg or Hanger Well (Nl)	30		Adjustable
Kfa	7.9	lb-mole/mph^M*yr	
Ladder Well (Nlw)	1		(36-in. Diam.)/Sliding Cover, Gasketed
Kfa	56	lb-mole/mph^M*yr	
Stub Drain (Nsd)	80		(1-in. Diameter)
Kfa	1.2	lb-mole/mph^M*yr	
Total Deck Fitting Loss Factor (Ff)	609.60	lb-mole/yr	

Deck Fitting Loss (Lf):	**3430.6496**	**lb/yr**
	1.7153	**tpy**

Total Loss (L_T):	***6947.1332***	***lb/yr***
	3.4736	***tpy***

NOTES:

	Vapor Molecular Weight	Liquid Molecular Weight	Condensed Vapor Density (at 60 °F)	Liquid Density (see Note 2)
	M_V (lb/lb-mole)	M_L (lb/lb-mole)	W_{VC} (lb/gal)	W_L (lb/gal)
Gasoline (RVP 13)	62	92	5.6	5.6
Gasoline (RVP 13)				

	ASTM D86 Distillation Slope	Vapor Pressure Equation Constants		True Vapor Pressure	RVP
	S	A (dimensionless)	B (°R)	P_{VA}	
Gasoline (RVP 13)	3	11.644	5043.6	4.4438	
Gasoline (RVP 13)	3	*11.64367929*	*5043.577678*	4.4426	13

A = $15.64-1.854\ S^{0.5} - (0.8742-0.3280\ S^{0.5})\ \ln(RVP)$

B = $8{,}742-1{,}042\ S^{0.5} - (1{,}049-179.4\ S^{0.5})\ \ln(RVP)$

P* = 0.09076945

Pa (Atmospheric Pressure, psia) = 14.558

0.305164336 **Pva/Pa**

0.833568032 **(1-Pva/Pa)^0.5**

3.361971728 **1+[(1-Pva/Pa)0.5]^2**

PVA (calculated) = 4.4426

	Tank-6
Shell Height (H_S) in ft	40
Tank Diameter (D) in ft	95

For internal & domed external floating roof.	T_{LA}	$2.86(H_S/D)+1.43$	T_{AA}	$3.52(H_S/D)+3.79$	T_B
Avg. Daily liquid surface temperature (TLA)	496.7846114	*2.63*	*495.5825*	5.27	*496.1530506*

Daily Max. Ambient Temp. (T_{AX}): 502.395 (deg. R)

42.725 (deg. F)

Daily Min. Ambient Temp. (T_{AN}): 488.77 (deg. R)

29.1 (deg. F)

Daily Total Solar Insulation Factor (I): 760.73 Btu/sqft day

Tank Paint Solar Absorptance (α): 0.25

Gasoline Fuel [a]

Vapor Pressure @ 40 F (psia) 4.4426

Molecular Wt.-liquid (lb/lb-mole) 92 **M_L [Liquid molecular weight of Gasoline (RVP 13)]**

Molecular Wt.-vapor (lb/lb-mole) 62 **M_V [Vapor molecular weight of Gasoline (RVP 13)]**

Wt% Speciation in Vapor Phase							
Pollutant	**Wt Fraction in Liquid** [a]	**Vapor Pressure at 40 F (psia)** [a]	**M_i (Molecular weight) (lb/lb-mole)** [a]	**Equations 4-3,4-4,4-5 and 4-6 From AP-42 Section 7.1-4**			**HAPs Emission (lbs/yr)**
				Pi	**yi**	**Wt% in Vapor**	
Benzene	0.00018	0.638	78.11	0.00014	0.00003	0.0038	26.6477
Cumene (Isopropyl benzene)	0.00005	0.051	120.2	0.00000	0.00000	0.0001	0.5931
Ethylbenzene	0.00014	0.109	106.17	0.00001	0.00000	0.0005	3.5258
Hexane (n-hexane)	0.0001	1.102	86.18	0.00012	0.00003	0.0037	25.5710
1,2,4-Trimethylbenzene	0.00025	0.021	120.19	0.00000	0.00000	0.0002	1.1892
Cyclohexane	0.000024	0.677	84.16	0.00002	0.00000	0.0005	3.7702
Toluene	0.0007	0.174	92.13	0.00012	0.00003	0.0041	28.2627
Xylenes	0.0007	0.129	106.17	0.00008	0.00002	0.0030	21.0274

Notes:

a = Speciation data from American Petroleum Institute (API), Manual of Petroleum Measurement Standards, Ch. 19-4, November 1997 (Table 4 divide by 100)

AP-42, Chapter 7 - TANKS
Emissions Report - Detail Format
PTE Emission Calculations

Emission Unit Identification: **Tank-6 (After)**
Company: Petro Star Inc. - Port of Anchorage Terminal
City: Anchorage
State: Alaska
Type of Tank: Internal Floating Roof Tank
Description: Unleaded Gasoline Tank

Parameters	Values		
Seal Factor A (Kra)	5.8	(lb-mole/ft-yr)	
Seal Factor B (Krb)	0.3	lb-mole/ft-yr (mph)^n	
Average Ambient Wind Speed (v)	0	mph	(Note 1, pg 7.1-23 IFR = 0)
Seal-Related Wind Speed Component (n)	2.1	dimensionless	Mechanical-Shoe Primary with No Secondary
Tank Diameter (D)	95	ft	
Vapor Pressure at Daily Average Liquid Surface Temperature (P*)	0.0908	psia	
Vapor Molecular Weight (Mv)	62	lb/lb-mole	
Product Factor (Kc)	1		

Rim Seal Loss (LR):	**3100.8661**	**lb/yr**
	1.5504	**tpy**

Parameters	Values		
Annual Net Throughput (Q)	7,743,214	bbl/yr	
Shell Clingage Factor (Cs)	0.0015	bbl/1000 sqft	Clingage Factor - Table 7.1-10 [Light Rust])
Average Organic Liquid Density (WL)	5.6	lb/gal	
Number of Columns (Nc)	1		(support columns - Table 7.1-11)
Effective Column Diameter (Fc)	1.1	ft	

Withdrawal Loss (Lwd):	**653.1132**	**lb/yr**
	0.3266	**tpy**

Parameters	Values		
Column Well (Nc)	6		(24-in. Diam.)/Built-Up Col.-Sliding Cover, Gask.
Kfa	33	lb-mole/mph^M*yr	
Access Hatch (Na)	1		(24-in. Diam.)/Bolted Cover, Gasketed
Kfa	1.6	lb-mole/mph^M*yr	
Automatic Gauge Float Well (Ngfw)	1		Bolted Cover, Gasketed
Kfa	2.8	lb-mole/mph^M*yr	
Sample Pipe or Well (Nhsp)	1		(24-in. Diam.)/Slit Fabric Seal 10% Open
Kfa	12	lb-mole/mph^M*yr	
Vacuum Breaker (Nvb)	1		(10-in. Diam.)/Weighted Mech. Actuation, Gask.
KFa (lb-mole/yr)	6.2	lb-mole/mph^M*yr	
Roof Leg or Hanger Well (Nl)	30		Adjustable
Kfa	7.9	lb-mole/mph^M*yr	
Ladder Well (Nlw)	1		(36-in. Diam.)/Sliding Cover, Gasketed
Kfa	56	lb-mole/mph^M*yr	
Stub Drain (Nsd)	80		(1-in. Diameter)
Kfa	1.2	lb-mole/mph^M*yr	
Total Deck Fitting Loss Factor (Ff)	609.60	lb-mole/yr	

Deck Fitting Loss (Lf):	**3430.6496**	**lb/yr**
	1.7153	**tpy**

Total Loss (L_T):	***7184.6289***	***lb/yr***
	3.5923	***tpy***

NOTES:

	Vapor Molecular Weight M_V (lb/lb-mole)	Liquid Molecular Weight M_L (lb/lb-mole)	Condensed Vapor Density (at 60 °F) W_{VC} (lb/gal)	Liquid Density (see Note 2) W_L (lb/gal)
Gasoline (RVP 13)	62	92	5.6	5.6
Gasoline (RVP 13)				

	ASTM D86 Distillation Slope S	Vapor Pressure Equation Constants A (dimensionless)	B (°R)	True Vapor Pressure P_{VA}	RVP
Gasoline (RVP 13)	3	11.644	5043.6	4.4438	
Gasoline (RVP 13)	3	*11.64367929*	*5043.577678*	4.4426	13

A = $15.64-1.854\ S^{0.5} - (0.8742-0.3280\ S^{0.5})\ \ln(RVP)$

B = $8{,}742-1{,}042\ S^{0.5} - (1{,}049-179.4\ S^{0.5})\ \ln(RVP)$

P* = 0.09076945

Pa (Atmospheric Pressure, psia) = 14.558

0.305164336 **Pva/Pa**

0.833568032 **(1-Pva/Pa)^0.5**

3.361971728 **1+[(1-Pva/Pa)0.5]^2**

PVA (calculated) = 4.4426

	Tank-6
Shell Height (H_S) in ft	40
Tank Diameter (D) in ft	95

For internal & domed external floating roof.	T_{LA}	*$2.86(H_S/D)+1.43$*	T_{AA}	*$3.52(H_S/D)+3.79$*	T_B
Avg. Daily liquid surface temperature (TLA)	496.7846114	*2.63*	*495.5825*	5.27	*496.1530506*

Daily Max. Ambient Temp. (T_{AX}): 502.395 (deg. R)

42.725 (deg. F)

Daily Min. Ambient Temp. (T_{AN}): 488.77 (deg. R)

29.1 (deg. F)

Daily Total Solar Insulation Factor (I): 760.73 Btu/sqft day

Tank Paint Solar Absorptance (α): 0.25

Gasoline Fuel [a]

Vapor Pressure @ 40 F (psia) 4.4426

Molecular Wt.-liquid (lb/lb-mole) 92 **M_L [Liquid molecular weight of Gasoline (RVP 13)]**

Molecular Wt.-vapor (lb/lb-mole) 62 **M_V [Vapor molecular weight of Gasoline (RVP 13)]**

Wt% Speciation in Vapor Phase							
Pollutant	**Wt Fraction in Liquid** [a]	**Vapor Pressure at 40 F (psia)** [a]	**M_i (Molecular weight) (lb/lb-mole)** [a]	**Equations 4-3,4-4,4-5 and 4-6 From AP-42 Section 7.1-4**			**HAPs Emission (lbs/yr)**
				Pi	**yi**	**Wt% in Vapor**	
Benzene	0.00018	0.638	78.11	0.00014	0.00003	0.0038	27.5587
Cumene (Isopropyl benzene)	0.00005	0.051	120.2	0.00000	0.00000	0.0001	0.6134
Ethylbenzene	0.00014	0.109	106.17	0.00001	0.00000	0.0005	3.6463
Hexane (n-hexane)	0.0001	1.102	86.18	0.00012	0.00003	0.0037	26.4452
1,2,4-Trimethylbenzene	0.00025	0.021	120.19	0.00000	0.00000	0.0002	1.2299
Cyclohexane	0.000024	0.677	84.16	0.00002	0.00000	0.0005	3.8991
Toluene	0.0007	0.174	92.13	0.00012	0.00003	0.0041	29.2289
Xylenes	0.0007	0.129	106.17	0.00008	0.00002	0.0030	21.7463

Notes:

a = Speciation data from American Petroleum Institute (API), Manual of Petroleum Measurement Standards, Ch. 19-4, November 1997 (Table 4 divide by 100)

EPA AP-42
Emissions Report - Detail Format

Emission Unit Identification: **Tank-17 (EU ID 17)**
Company: Petro Star Inc. - Port of Anchorage Terminal
City: Anchorage
State: Alaska
Type of Tank: Internal Floating Roof Tank
Description: Regular Unleaded Gasoline Tank
Volume (gallons): 2,100,000.00
Type of Product: Unleaded Gasoline
Q = annual net throughput, bbl/yr 8,212,500 *(PTE assumes one turnover a month)*
Q = annual net throughput, bbl/yr 201,254 *(Actual in 2022)*

Parameters	Values	
Seal Factor A (Kra)	6.7 (lb-mole/ft-yr)	
Seal Factor B (Krb)	0.2 lb-mole/ft-yr (mph)^n	
Average Ambient Wind Speed (v)	0 mph	(Note 1, pg 7.1-23 IFR = 0)
Seal-Related Wind Speed Component (n)	3 dimensionless	Vapor-mounted seal - Primary only (Table 7.1-8, note c)
Tank Diameter (D)	78 ft	
Vapor Pressure at Daily Average Liquid Surface Temperature (P*)	0.0906 psia	
Vapor Molecular Weight (Mv)	62 lb/lb-mole	
Product Factor (Kc)	1	
Rim Seal Loss (LR):	**2,934.20 lb/yr**	
	1.47 tpy	

Parameters	Values	
Annual Net Throughput (Q)	8,212,500 bbl/yr	
Shell Clingage Factor (Cs)	0.0015 bbl/1000 sqft	Clingage Factor - Table 7.1-10 [Light Rust])
Average Organic Liquid Density (WL)	5.6 lb/gal	
Number of Columns (Nc)	1	(support columns - Table 7.1-11)
Effective Column Diameter (Fc)	1.1 ft	
Withdrawal Loss (Lwd):	**845.77 lb/yr**	
	0.42 tpy	

Parameters	Values	
Column Well (Nc)	6	(24-in. Diam.)/Built-Up Col.-Sliding Cover, Gask.
Kfa	33 lb-mole/mph^M*yr	
Access Hatch (Na)	1	(24-in. Diam.)/Bolted Cover, Gasketed
Kfa	1.6 lb-mole/mph^M*yr	
Automatic Gauge Float Well (Ngfw)	1	Bolted Cover, Gasketed
Kfa	2.8 lb-mole/mph^M*yr	
Sample Pipe or Well (Nhsp)	1	(24-in. Diam.)/Slit Fabric Seal 10% Open
Kfa	12 lb-mole/mph^M*yr	
Vacuum Breaker (Nvb)	2	(10-in. Diam.)/Weighted Mech. Actuation, Gask.
KFa (lb-mole/yr)	6.2 lb-mole/mph^M*yr	
Roof Leg or Hanger Well (Nl)	23	Adjustable
Kfa	7.9 lb-mole/mph^M*yr	
Ladder Well (Nlw)	1	(36-in. Diam.)/Sliding Cover, Gasketed
Kfa	56 lb-mole/mph^M*yr	
Stub Drain (Nsd)	49	(1-in. Diameter)
Kfa	1.2 lb-mole/mph^M*yr	
Total Deck Fitting Loss Factor (Ff)	523.30 lb-mole/yr	
Deck Fitting Loss (Lf):	**2,938.13 lb/yr**	
	1.47 tpy	
Total Loss (L_T):	***6,718.10 lb/yr***	
	3.36 tpy	

NOTES:

	Vapor Molecular Weight M_V (lb/lb-mole)	Liquid Molecular Weight M_L (lb/lb-mole)	Condensed Vapor Density (at 60 °F) W_{VC} (lb/gal)	Liquid Density (see Note 2) W_L (lb/gal)
Gasoline (RVP 13)	62	92	5.6	5.6
Gasoline (RVP 13)				

	ASTM D86 Distillation Slope S	Vapor Pressure Equation Constants A (dimensionless)	B (°R)	True Vapor Pressure P_{VA}	RVP
Gasoline (RVP 13)	3	11.644	5043.6	4.4352	
Gasoline (RVP 13)	3	*11.64367929*	*5043.577678*	4.4340	13

A = $15.64-1.854\ S^{0.5} - (0.8742-0.3280\ S^{0.5})\ \ln(RVP)$

B = $8{,}742-1{,}042\ S^{0.5} - (1{,}049-179.4\ S^{0.5})\ \ln(RVP)$

P* = 0.09055829

Pa (Atmospheric Pressure, psia) = 14.558

0.304572314 **Pva/Pa**

0.83392307 **(1-Pva/Pa)^0.5**

3.363273826 **1+[(1-Pva/Pa)0.5]^2**

PVA (calculated) = 4.4340

	Tank-10
Shell Height (H_S) in ft	65
Tank Diameter (D) in ft	78

For internal & domed external floating roof.	T_{LA}	*$2.86(H_S/D)+1.43$*	T_{AA}	*$3.52(H_S/D)+3.79$*	T_B
Avg. Daily liquid surface temperature (TLA)	496.6896076	*3.81*	*495.5825*	6.72	*496.1530506*

Daily Max. Ambient Temp. (T_{AX}): 502.395 (deg. R)

42.725 (deg. F)

Daily Min. Ambient Temp. (T_{AN}): 488.77 (deg. R)

29.1 (deg. F)

Daily Total Solar Insulation Factor (I): 760.73 Btu/sqft day

Tank Paint Solar Absorptance (α): 0.25

Gasoline Fuel [a]

Vapor Pressure @ 40 F (psia) 4.4340

Molecular Wt.-liquid (lb/lb-mole) 92 **M_L [Liquid molecular weight of Gasoline (RVP 13)]**

Molecular Wt.-vapor (lb/lb-mole) 62 **M_V [Vapor molecular weight of Gasoline (RVP 13)]**

Wt% Speciation in Vapor Phase							
Pollutant	**Wt Fraction in Liquid** [a]	**Vapor Pressure at 40 F (psia)** [a]	**M_i (Molecular weight) (lb/lb-mole)** [a]	**Equations 4-3,4-4,4-5 and 4-6 From AP-42 Section 7.1-4**			**HAPs Emission (lbs/yr)**
				Pi	**yi**	**Wt% in Vapor**	
Benzene	0.00018	0.638	78.11	0.00014	0.00003	0.0038	25.8192
Cumene (Isopropyl benzene)	0.00005	0.051	120.2	0.00000	0.00000	0.0001	0.5747
Ethylbenzene	0.00014	0.109	106.17	0.00001	0.00000	0.0005	3.4161
Hexane (n-hexane)	0.0001	1.102	86.18	0.00012	0.00003	0.0037	24.7760
1,2,4-Trimethylbenzene	0.00025	0.021	120.19	0.00000	0.00000	0.0002	1.1522
Cyclohexane	0.000024	0.677	84.16	0.00002	0.00000	0.0005	3.6530
Toluene	0.0007	0.174	92.13	0.00012	0.00003	0.0041	27.3840
Xylenes	0.0007	0.129	106.17	0.00008	0.00002	0.0030	20.3737

Notes:

a = Speciation data from American Petroleum Institute (API), Manual of Petroleum Measurement Standards, Ch. 19-4, November 1997 (Table 4 divide by 100)

EPA AP-42
Emissions Report - Detail Format

Emission Unit Identification: **Tank-17 (EU ID 17)**
Company: Petro Star Inc. - Port of Anchorage Terminal
City: Anchorage
State: Alaska
Type of Tank: Internal Floating Roof Tank
Description: Regular Unleaded Gasoline Tank
Volume (gallons): 2,100,000.00
Type of Product: Unleaded Gasoline
Q = annual net throughput, bbl/yr 12,905,357 *(PTE assumes one turnover a month)*
Q = annual net throughput, bbl/yr 201,254 *(Actual in 2022)*

Parameters	Values	
Seal Factor A (Kra)	6.7 (lb-mole/ft-yr)	
Seal Factor B (Krb)	0.2 lb-mole/ft-yr (mph)^n	
Average Ambient Wind Speed (v)	0 mph	(Note 1, pg 7.1-23 IFR = 0)
Seal-Related Wind Speed Component (n)	3 dimensionless	Vapor-mounted seal - Primary only (Table 7.1-8, note c)
Tank Diameter (D)	78 ft	
Vapor Pressure at Daily Average Liquid Surface Temperature (P*)	0.0906 psia	
Vapor Molecular Weight (Mv)	62 lb/lb-mole	
Product Factor (Kc)	1	
Rim Seal Loss (LR):	**2,934.20 lb/yr**	
	1.47 tpy	

Parameters	Values	
Annual Net Throughput (Q)	12,905,357 bbl/yr	
Shell Clingage Factor (Cs)	0.0015 bbl/1000 sqft	Clingage Factor - Table 7.1-10 [Light Rust])
Average Organic Liquid Density (WL)	5.6 lb/gal	
Number of Columns (Nc)	1	(support columns - Table 7.1-11)
Effective Column Diameter (Fc)	1.1 ft	
Withdrawal Loss (Lwd):	**1,329.07 lb/yr**	
	0.66 tpy	

Parameters	Values	
Column Well (Nc)	6	(24-in. Diam.)/Built-Up Col.-Sliding Cover, Gask.
Kfa	33 lb-mole/mph^M*yr	
Access Hatch (Na)	1	(24-in. Diam.)/Bolted Cover, Gasketed
Kfa	1.6 lb-mole/mph^M*yr	
Automatic Gauge Float Well (Ngfw)	1	Bolted Cover, Gasketed
Kfa	2.8 lb-mole/mph^M*yr	
Sample Pipe or Well (Nhsp)	1	(24-in. Diam.)/Slit Fabric Seal 10% Open
Kfa	12 lb-mole/mph^M*yr	
Vacuum Breaker (Nvb)	2	(10-in. Diam.)/Weighted Mech. Actuation, Gask.
KFa (lb-mole/yr)	6.2 lb-mole/mph^M*yr	
Roof Leg or Hanger Well (Nl)	23	Adjustable
Kfa	7.9 lb-mole/mph^M*yr	
Ladder Well (Nlw)	1	(36-in. Diam.)/Sliding Cover, Gasketed
Kfa	56 lb-mole/mph^M*yr	
Stub Drain (Nsd)	49	(1-in. Diameter)
Kfa	1.2 lb-mole/mph^M*yr	
Total Deck Fitting Loss Factor (Ff)	523.30 lb-mole/yr	
Deck Fitting Loss (Lf):	**2,938.13 lb/yr**	
	1.47 tpy	
Total Loss (L_T):	***7,201.40 lb/yr***	
	3.60 tpy	

NOTES:

	Vapor Molecular Weight	Liquid Molecular Weight	Condensed Vapor Density (at 60 °F)	Liquid Density (see Note 2)
	M_V *(lb/lb-mole)*	M_L *(lb/lb-mole)*	W_{VC} *(lb/gal)*	W_L *(lb/gal)*
Gasoline (RVP 13)	62	92	5.6	5.6
Gasoline (RVP 13)				

	ASTM D86 Distillation Slope	Vapor Pressure Equation Constants		True Vapor Pressure	RVP
	S	*A (dimensionless)*	*B (°R)*	P_{VA}	
Gasoline (RVP 13)	3	11.644	5043.6	4.4352	
Gasoline (RVP 13)	3	*11.64367929*	*5043.577678*	4.4340	13

A = $15.64-1.854\ S^{0.5} - (0.8742-0.3280\ S^{0.5})\ \ln(RVP)$

B = $8{,}742-1{,}042\ S^{0.5} - (1{,}049-179.4\ S^{0.5})\ \ln(RVP)$

P* = 0.09055829

Pa (Atmospheric Pressure, psia) = 14.558

0.304572314 **Pva/Pa**

0.83392307 **(1-Pva/Pa)^0.5**

3.363273826 **1+[(1-Pva/Pa)0.5]^2**

PVA (calculated) = 4.4340

	Tank-10
Shell Height (H_S) in ft	65
Tank Diameter (D) in ft	78

For internal & domed external floating roof.	T_{LA}	*$2.86(H_S/D)+1.43$*	T_{AA}	*$3.52(H_S/D)+3.79$*	T_B
Avg. Daily liquid surface temperature (TLA)	496.6896076	*3.81*	*495.5825*	6.72	*496.1530506*

Daily Max. Ambient Temp. (T_{AX}): 502.395 (deg. R)

42.725 (deg. F)

Daily Min. Ambient Temp. (T_{AN}): 488.77 (deg. R)

29.1 (deg. F)

Daily Total Solar Insulation Factor (I): 760.73 Btu/sqft day

Tank Paint Solar Absorptance (α): 0.25

Gasoline Fuel [a]

Vapor Pressure @ 40 F (psia) 4.4340

Molecular Wt.-liquid (lb/lb-mole) 92 **M_L [Liquid molecular weight of Gasoline (RVP 13)]**

Molecular Wt.-vapor (lb/lb-mole) 62 **M_V [Vapor molecular weight of Gasoline (RVP 13)]**

Wt% Speciation in Vapor Phase							
Pollutant	**Wt Fraction in Liquid** [a]	**Vapor Pressure at 40 F (psia)** [a]	**M_i (Molecular weight) (lb/lb-mole)** [a]	**Equations 4-3,4-4,4-5 and 4-6 From AP-42 Section 7.1-4**			**HAPs Emission (lbs/yr)**
				Pi	**yi**	**Wt% in Vapor**	
Benzene	0.00018	0.638	78.11	0.00014	0.00003	0.0038	27.6767
Cumene (Isopropyl benzene)	0.00005	0.051	120.2	0.00000	0.00000	0.0001	0.6160
Ethylbenzene	0.00014	0.109	106.17	0.00001	0.00000	0.0005	3.6619
Hexane (n-hexane)	0.0001	1.102	86.18	0.00012	0.00003	0.0037	26.5584
1,2,4-Trimethylbenzene	0.00025	0.021	120.19	0.00000	0.00000	0.0002	1.2351
Cyclohexane	0.000024	0.677	84.16	0.00002	0.00000	0.0005	3.9158
Toluene	0.0007	0.174	92.13	0.00012	0.00003	0.0041	29.3540
Xylenes	0.0007	0.129	106.17	0.00008	0.00002	0.0030	21.8394

Notes:

a = Speciation data from American Petroleum Institute (API), Manual of Petroleum Measurement Standards, Ch. 19-4, November 1997 (Table 4 divide by 100)

AP-42, Chapter 7 - TANKS
Emissions Report - Detail Format
PTE Emission Calculations

Emission Unit ID: **Tank-4 (After)**
Company: Petro Star Inc. - Port of Anchorage Terminal
City: Anchorage
State: Alaska
Type of Tank: Vertical Fixed Roof Tank
Description: #1 & #2 Diesel Fuel Tank

Parameters	Values	
Maximum Liquid Volume (V_{LX}):	109,295.22	ft^3
	817,585.10	gallons
Tank Diameter:	67	ft
Maximum Liquid Height (H_{LX}):	31.00	ft
Average Liquid Height (H_L):	20.80	ft
Shell Height (H_S):	32	ft
Vapor Molecular Weight (M_V):	130	lb/lb-mole
True Vapor Pressure (P_{VA}):	0.0029	psia (AP-42, Table 7.1-2)
Tank Annual Net Throughput (Q):	3,033,766.23	bbl/yr
Number of Turnover per year (N):	155.83	
Working Loss Turnover Saturation Factor (K_N):	0.359183147	(>36 turnovers per year)
Working Loss Product Factor (K_P):	1	(AP-42, Eq 1-31)
Vent Setting Correction Factor (K_B):	1	(AP-42, Eq 1-35)
Net Working Loss Throughput (V_Q):	17,031,563.64	ft3/yr
Working Loss (L_W):	**439.01**	**lb/yr**

Parameters	Values	
Vapor Space Outage (H_{VO}):	11.8979	ft
Roof Outage (H_{RO}):	0.6979	ft (cone)
Tank Vapor Space Volume (V_V):	41947.92	cu ft
Stock Vapor Density (W_V):	7.18E-05	lb/ft^3
Vented Vapor Saturation Factor (K_S):	0.9981	
Vapor Space Expansion Factor (K_E):	0.0242	
Daily Avg. Liquid Surface Temp. (T_{LA}):	496.82	(deg. R)
	37.15	(deg. F)
Daily Max. Ambient Temp. (T_{AX}):	502.395	(deg. R)
	42.725	(deg. F)
Daily Min. Ambient Temp. (T_{AN}):	488.77	(deg. R)
	29.1	(deg. F)
Daily Total Solar Insulation Factor (I):	760.734143	Btu/sqft day
Tank Paint Solar Absorptance (α):	0.25	
Ideal Gas Constant R:	10.731	psia cu ft /(lb-mol-deg R)
Standing Storage Loss (L_S):	**26.5291**	**lb/yr**

Total Loss (L_T):	***465.54***	***lb/yr***
	0.2328	***tpy***

NOTES:

$2.2(H_S/D)+1.1$	T_B	T_V
2.15	496.15	*497.49*
$2.2(H_S/D)+1.9$	ΔT_A	ΔT_V
2.95	13.63	13.44

$4.4(H_S/D)+3.8$ $T_{AA} = (T_{AX} + T_{AN})/2$ $T_B = T_{AA} + 0.003 \alpha_S I$

5.90	495.58	496.15	
	For an uninsulated fixed roof tank		T_{LA}
180.61	315.33	0.88	496.82

	Vapor Molecular Weight M_V *(lb/lb-mole)*	**Liquid Molecular Weight** M_L *(lb/lb-mole)*	**Condensed Vapor Density (at 60 °F)** W_{VC} *(lb/gal)*	**Liquid Density** W_L *(lb/gal)*
Jet Kerosene (Jet A)	130	162	6.1	7
No. 2 Fuel Oil (Diesel)	130	188	6.1	7.1

	Vapor Pressure Equation Constants		**True Vapor Pressure**
	A (dimensionless)	*B (°R)*	P_{VA}
Jet Kerosene (Jet A)	12.39	8933	0.0037
No. 2 Fuel Oil (Diesel)	12.101	8907	0.0029

Diesel Fuel [a]

Vapor Pressure @ 70 F (psia)	0.0029
Molecular Wt.-liquid (lb/lb-mole)	188
Molecular Wt.-vapor (lb/lb-mole)	130

Wt% Speciation in Vapor Phase							
Pollutant	**Wt Fraction in Liquid**[a]	**Vapor Pressure at 40 F (psia)**[a]	**Molecular Wt (lb/lb-mole)**[a]	**Equations 4-3,4-4,4-5 and 4-6 From AP-42 Section 7.1-4**			**HAPs Emission**
				Pi	**yi**	**Wt% in Vapor**	**(lbs/yr)**
Benzene	0.000008	0.6543	78.11	1.3E-05	4.3E-03	2.6E-03	1.20
Ethylbenzene	0.00013	0.0498	106.17	1.1E-05	3.9E-03	3.2E-03	1.48
Hexane (n-hexane)	0.000001	1.1079	86.18	2.4E-06	8.2E-04	5.4E-04	0.25
1,2,4-Trimethylbenzene	0.01	0.0088	120.19	1.4E-04	4.7E-02	4.3E-02	20.09
Toluene	0.00032	0.1726	92.14	1.1E-04	3.8E-02	2.7E-02	12.61
Xylenes	0.0029	0.0432	106.17	2.2E-04	7.5E-02	6.1E-02	28.59

Notes:

a = Speciation data from American Petroleum Institute (API), Manual of Petroleum Measurement Standards, Ch. 19-4, November 1997 (Table 4 divide by 100)

AP-42, Chapter 7 - TANKS
Emissions Report - Detail Format
PTE Emission Calculations

Emission Unit ID: **Tank-8 (After)**
Company: Petro Star Inc. - Port of Anchorage Terminal
City: Anchorage
State: Alaska
Type of Tank: Vertical Fixed Roof Tank
Description: #1 & #2 Diesel Fuel Tank

Parameters	Values	
Maximum Liquid Volume (V_{LX}):	205,959.67	ft^3
	1,540,685.45	gallons
Tank Diameter:	82	ft
Maximum Liquid Height (H_{LX}):	39.00	ft
Average Liquid Height (H_L):	26.00	ft
Shell Height (H_S):	40	ft
Vapor Molecular Weight (M_V):	130	lb/lb-mole
True Vapor Pressure (P_{VA}):	0.0029	psia (AP-42, Table 7.1-2)
Tank Annual Net Throughput (Q):	4,398,961.04	bbl/yr
Number of Turnover per year (N):	119.91	
Working Loss Turnover Saturation Factor (K_N):	0.41686299	(>36 turnovers per year)
Working Loss Product Factor (K_P):	1	(AP-42, Eq 1-31)
Vent Setting Correction Factor (K_B):	1	(AP-42, Eq 1-35)
Net Working Loss Throughput (V_Q):	24,695,767.27	ft3/yr
Working Loss (L_W):	**738.72**	**lb/yr**

Parameters	Values	
Vapor Space Outage (H_{VO}):	14.8542	ft
Roof Outage (H_{RO}):	0.8542	ft (cone)
Tank Vapor Space Volume (V_V):	78445.11	cu ft
Stock Vapor Density (W_V):	7.18E-05	lb/ft^3
Vented Vapor Saturation Factor (K_S):	0.9977	
Vapor Space Expansion Factor (K_E):	0.0242	
Daily Avg. Liquid Surface Temp. (T_{LA}):	496.82	(deg. R)
	37.15	(deg. F)
Daily Max. Ambient Temp. (T_{AX}):	502.395	(deg. R)
	42.725	(deg. F)
Daily Min. Ambient Temp. (T_{AN}):	488.77	(deg. R)
	29.1	(deg. F)
Daily Total Solar Insulation Factor (I):	760.734143	Btu/sqft day
Tank Paint Solar Absorptance (α):	0.25	
Ideal Gas Constant R:	10.731	psia cu ft /(lb-mol-deg R)
Standing Storage Loss (L_S):	**49.6512**	**lb/yr**

Total Loss (L_T):	***788.37***	***lb/yr***
	0.3942	***tpy***

NOTES:

$2.2(H_S/D)+1.1$	T_B	T_V
2.17	496.15	*497.48*
$2.2(H_S/D)+1.9$	ΔT_A	ΔT_V
2.97	13.63	13.46

$4.4(H_S/D)+3.8$ $T_{AA} = (T_{AX} + T_{AN})/2$ $T_B = T_{AA} + 0.003 \alpha_S I$

5.95	495.58	496.15	
	For an uninsulated fixed roof tank		T_{LA}
181.12	314.83	0.87	496.82

	Vapor Molecular Weight M_V *(lb/lb-mole)*	**Liquid Molecular Weight** M_L *(lb/lb-mole)*	**Condensed Vapor Density (at 60 °F)** W_{VC} *(lb/gal)*	**Liquid Density** W_L *(lb/gal)*
Jet Kerosene (Jet A)	130	162	6.1	7
No. 2 Fuel Oil (Diesel)	130	188	6.1	7.1

	Vapor Pressure Equation Constants		**True Vapor Pressure**
	A (dimensionless)	*B (°R)*	P_{VA}
Jet Kerosene (Jet A)	12.39	8933	0.0037
No. 2 Fuel Oil (Diesel)	12.101	8907	0.0029

Diesel Fuel [a]

Vapor Pressure @ 70 F (psia)	0.0029
Molecular Wt.-liquid (lb/lb-mole)	188
Molecular Wt.-vapor (lb/lb-mole)	130

Wt% Speciation in Vapor Phase							
Pollutant	**Wt Fraction in Liquid**[a]	**Vapor Pressure at 40 F (psia)**[a]	**Molecular Wt (lb/lb-mole)**[a]	**Equations 4-3,4-4,4-5 and 4-6 From AP-42 Section 7.1-4**			**HAPs Emission**
				Pi	**yi**	**Wt% in Vapor**	**(lbs/yr)**
Benzene	0.000008	0.6543	78.11	1.3E-05	4.3E-03	2.6E-03	2.03
Ethylbenzene	0.00013	0.0498	106.17	1.1E-05	3.9E-03	3.2E-03	2.51
Hexane (n-hexane)	0.000001	1.1079	86.18	2.4E-06	8.2E-04	5.4E-04	0.43
1,2,4-Trimethylbenzene	0.01	0.0088	120.19	1.4E-04	4.7E-02	4.3E-02	34.02
Toluene	0.00032	0.1726	92.14	1.1E-04	3.8E-02	2.7E-02	21.36
Xylenes	0.0029	0.0432	106.17	2.2E-04	7.5E-02	6.1E-02	48.43

Notes:

a = Speciation data from American Petroleum Institute (API), Manual of Petroleum Measurement Standards, Ch. 19-4, November 1997 (Table 4 divide by 100)

AP-42, Chapter 7 - TANKS
Emissions Report - Detail Format
PTE Emission Calculations

Emission Unit ID: **Tank-7 (After)**
Company: Petro Star Inc. - Port of Anchorage Terminal
City: Anchorage
State: Alaska
Type of Tank: Vertical Fixed Roof Tank
Description: Jet-A Fuel Tank

Parameters	Values	
Maximum Liquid Volume (V_{LX}):	276,440.52	ft^3
	2,067,918.83	gallons
Tank Diameter:	95	ft
Maximum Liquid Height (H_{LX}):	39.00	ft
Average Liquid Height (H_L):	26.00	ft
Shell Height (H_S):	40	ft
Vapor Molecular Weight (M_V):	130	lb/lb-mole
True Vapor Pressure (P_{VA}):	0.0037	psia (AP-42, Table 7.1-2)
Tank Annual Net Throughput (*Q*):	7,584,415.58	bbl/yr
Number of Turnover per year (*N*):	154.03	
Working Loss Turnover Saturation Factor (K_N):	0.361439519	(>36 turnovers per year)
Working Loss Product Factor (K_P):	1	(AP-42, Eq 1-31)
Vent Setting Correction Factor (K_B):	1	(AP-42, Eq 1-35)
Net Working Loss Throughput (V_O):	42,578,909.09	ft3/yr
Working Loss (L_W):	**1,400.10**	**lb/yr**

Parameters	Values	
Vapor Space Outage (H_{VO}):	14.9896	ft
Roof Outage (H_{RO}):	0.9896	ft (cone)
Tank Vapor Space Volume (V_V):	106249.44	cu ft
Stock Vapor Density (W_V):	9.10E-05	lb/ft^3
Vented Vapor Saturation Factor (K_S):	0.9970	
Vapor Space Expansion Factor (K_E):	0.0240	
Daily Avg. Liquid Surface Temp. (T_{LA}):	496.84	(deg. R)
	37.17	(deg. F)
Daily Max. Ambient Temp. (T_{AX}):	502.395	(deg. R)
	42.725	(deg. F)
Daily Min. Ambient Temp. (T_{AN}):	488.77	(deg. R)
	29.1	(deg. F)
Daily Total Solar Insulation Factor (*I*):	760.734143	Btu/sqft day
Tank Paint Solar Absorptance (α):	0.25	
Ideal Gas Constant R:	10.731	psia cu ft /(lb-mol-deg R)
Standing Storage Loss (L_S):	**84.4121**	**lb/yr**

Total Loss (L_T):	***1484.52***	***lb/yr***
	0.7423	***tpy***

NOTES:

$2.2(H_S/D)+1.1$	T_B	T_V
2.03	496.15	*497.53*
$2.2(H_S/D)+1.9$	ΔT_A	ΔT_V
2.83	13.63	13.33

$4.4(H_S/D)+3.8$ $T_{AA} = (T_{AX} + T_{AN})/2$ $T_B = T_{AA} + 0.003\,\alpha_S\, I$

5.65	495.58	496.15	
	For an uninsulated fixed roof tank		T_{LA}
177.65	318.30	0.89	496.84

	Vapor Molecular Weight M_V (lb/lb-mole)	Liquid Molecular Weight M_L (lb/lb-mole)	Condensed Vapor Density (at 60 °F) W_{VC} (lb/gal)	Liquid Density W_L (lb/gal)
Jet Kerosene (Jet A)	130	162	6.1	7
No. 2 Fuel Oil (Diesel)	130	188	6.1	7.1

	Vapor Pressure Equation Constants		True Vapor Pressure
	A (dimensionless)	*B (°R)*	P_{VA}
Jet Kerosene (Jet A)	12.39	8933	0.0037
No. 2 Fuel Oil (Diesel)	12.101	8907	0.0029

Jet Fuel [a]

Vapor Pressure @ 70 F (psia)	0.0037
Molecular Wt.-liquid (lb/lb-mole)	188
Molecular Wt.-vapor (lb/lb-mole)	130

Wt% Speciation in Vapor Phase							
Pollutant	Wt Fraction in Liquid[a]	Vapor Pressure at 40 F (psia)[a]	Molecular Wt (lb/lb-mole)[a]	Equations 4-3,4-4,4-5 and 4-6 From AP-42 Section 7.1-4			HAPs Emission (lbs/yr)
				Pi	yi	Wt% in Vapor	
Benzene	0.00004	0.64	78.11	6.1E-05	1.6E-02	9.9E-03	14.66
Ethylbenzene	0.00127	0.11	106.17	2.4E-04	6.5E-02	5.3E-02	79.20
Hexane (n-hexane)	0.00005	1.10	86.18	1.2E-04	3.2E-02	2.1E-02	31.66
Toluene	0.00133	0.17	92.14	4.7E-04	1.3E-01	9.0E-02	132.97
Xylenes	0.0031	0.13	106.17	7.1E-04	1.9E-01	1.6E-01	230.59

Notes:

a = Speciation data from American Petroleum Institute (API), Manual of Petroleum Measurement Standards, Ch. 19-4, November 1997 (Table 4 divide by 100)

TANKS 4.0.9d
Emissions Report - Detail Format
Fee Calculations--January 1 thru December 31, 2022

Emission Unit Identification: **Tank-2100 (After)**
Company: Petro Star Inc. - Port of Anchorage Terminal
City: Anchorage
State: Alaska
Type of Tank: Horizontal Tank
Description: NEMO 1127 Shell Gasoline Additive

Parameters	Values
Maximum Liquid Volume (V_{LX}):	1,130.97 ft^3 8,460.27 gallons
Tank Diameter:	15.14 ft
Maximum Liquid Height (H_{LX}):	6.16 ft
Average Liquid Height (H_L):	5.97 ft
Shell Height (H_S):	6.28 ft
Vapor Molecular Weight (M_V):	100 lb/lb-mole
True Vapor Pressure (P_{VA}):	0.0135 psia
Tank Annual Net Throughput (Q):	6,391.26 bbl/yr
Number of Turnover per year (N):	31.73
Working Loss Turnover Saturation Factor (K_N):	1 (>36 turnovers per year)
Working Loss Product Factor (K_P):	1 (AP-42, Eq 1-31)
Working Loss (L_W):	**8.63 lb/yr**

Parameters	Values
Vapor Space Outage (H_{VO}):	4.0000 ft
Roof Outage (H_{RO}):	0.1577 ft (cone)
Tank Vapor Space Volume (V_V):	720.00 cu ft
Stock Vapor Density (W_V):	0.0002 lb/ft^3
Vented Vapor Saturation Factor (K_S):	0.9971
Vapor Space Expansion Factor (K_E):	0.0528
Daily Avg. Liquid Surface Temp. (T_{LA}):	503.3616 (deg. R) (deg. F)
Daily Max. Ambient Temp. (T_{AX}):	502.395 (deg. R) 42.725 (deg. F)
Daily Min. Ambient Temp. (T_{AN}):	488.77 (deg. R) 29.1 (deg. F)
Daily Total Solar Insulation Factor (I):	760.734143 Btu/sqft day
Tank Paint Solar Absorptance (α):	0.89
Ideal Gas Constant R:	10.731 psia cu ft /(lb-mol-deg R)
Standing Storage Loss (L_S):	**3.4557 lb/yr**

Total Loss (L_T):	***12.0839 lb/yr***
	0.0060 tpy

Gasoline Fuel [a]

Vapor Pressure @ 40 F (psia) 4.4369
Molecular Wt.-liquid (lb/lb-mole) 92 **M_L [Liquid molecular weight of Gasoline (RVP 13)]**
Molecular Wt.-vapor (lb/lb-mole) 62 **M_V [Vapor molecular weight of Gasoline (RVP 13)]**

Wt% Speciation in Vapor Phase							
Pollutant	**Wt Fraction in Liquid**[a]	**Vapor Pressure at 40 F (psia)**[a]	**M_i (Molecular weight) (lb/lb-mole)**[a]	**Equations 4-3,4-4,4-5 and 4-6 From AP-42 Section 7.1-4**			**HAPs Emission (lbs/yr)**
				Pi	**yi**	**Wt% in Vapor**	
Benzene	0.00018	0.638	78.11	0.00014	0.00003	0.0038	0.05
Cumene (Isopropyl benzene)	0.00005	0.051	120.2	0.00000	0.00000	0.0001	0.00
Ethylbenzene	0.00014	0.109	106.17	0.00001	0.00000	0.0005	0.01
Hexane (n-hexane)	0.0001	1.102	86.18	0.00012	0.00003	0.0037	0.04
1,2,4-Trimethylbenzene	0.00025	0.021	120.19	0.00000	0.00000	0.0002	0.00
Cyclohexane	0.000024	0.677	84.16	0.00002	0.00000	0.0005	0.01
Toluene	0.0007	0.174	92.13	0.00012	0.00003	0.0041	0.05
Xylenes	0.0007	0.129	106.17	0.00008	0.00002	0.0030	0.04

Notes:

a = Speciation data from American Petroleum Institute (API), Manual of Petroleum Measurement Standards, Ch. 19-4, November 1997 (Table 4 divide by 100)

TANKS 4.0.9d
Emissions Report - Detail Format
Fee Calculations--January 1 thru December 31, 2022

Emission Unit Identification: **Tank-2100 (After)**
Company: Petro Star Inc. - Port of Anchorage Terminal
City: Anchorage
State: Alaska
Type of Tank: Horizontal Tank
Description: NEMO 1127 Shell Gasoline Additive

Parameters	Values
Maximum Liquid Volume (V_{LX}):	1,130.97 ft^3 8,460.27 gallons
Tank Diameter:	15.14 ft
Maximum Liquid Height (H_{LX}):	6.16 ft
Average Liquid Height (H_L):	5.97 ft
Shell Height (H_S):	6.28 ft
Vapor Molecular Weight (M_V):	100 lb/lb-mole
True Vapor Pressure (P_{VA}):	0.0135 psia
Tank Annual Net Throughput (Q):	9,232.83 bbl/yr
Number of Turnover per year (N):	45.83
Working Loss Turnover Saturation Factor (K_N):	0.821252177 (>36 turnovers per year)
Working Loss Product Factor (K_P):	1 (AP-42, Eq 1-31)
Working Loss (L_W):	**10.24 lb/yr**

Parameters	Values
Vapor Space Outage (H_{VO}):	4.0000 ft
Roof Outage (H_{RO}):	0.1577 ft (cone)
Tank Vapor Space Volume (V_V):	720.00 cu ft
Stock Vapor Density (W_V):	0.0002 lb/ft^3
Vented Vapor Saturation Factor (K_S):	0.9971
Vapor Space Expansion Factor (K_E):	0.0528
Daily Avg. Liquid Surface Temp. (T_{LA}):	503.3616 (deg. R) (deg. F)
Daily Max. Ambient Temp. (T_{AX}):	502.395 (deg. R) 42.725 (deg. F)
Daily Min. Ambient Temp. (T_{AN}):	488.77 (deg. R) 29.1 (deg. F)
Daily Total Solar Insulation Factor (I):	760.734143 Btu/sqft day
Tank Paint Solar Absorptance (α):	0.89
Ideal Gas Constant R:	10.731 psia cu ft /(lb-mol-deg R)
Standing Storage Loss (L_S):	**3.4557 lb/yr**

Total Loss (L_T):	***13.6921 lb/yr***
	0.0068 tpy

Gasoline Fuel [a]

Vapor Pressure @ 40 F (psia)	4.4369	
Molecular Wt.-liquid (lb/lb-mole)	92	**M_L [Liquid molecular weight of Gasoline (RVP 13)]**
Molecular Wt.-vapor (lb/lb-mole)	62	**M_V [Vapor molecular weight of Gasoline (RVP 13)]**

Wt% Speciation in Vapor Phase							
Pollutant	**Wt Fraction in Liquid** [a]	**Vapor Pressure at 40 F (psia)** [a]	**M_i (Molecular weight) (lb/lb-mole)** [a]	**Equations 4-3,4-4,4-5 and 4-6 From AP-42 Section 7.1-4**			**HAPs Emission (lbs/yr)**
				Pi	**yi**	**Wt% in Vapor**	
Benzene	0.00018	0.638	78.11	0.00014	0.00003	0.0038	0.05
Cumene (Isopropyl benzene)	0.00005	0.051	120.2	0.00000	0.00000	0.0001	0.00
Ethylbenzene	0.00014	0.109	106.17	0.00001	0.00000	0.0005	0.01
Hexane (n-hexane)	0.0001	1.102	86.18	0.00012	0.00003	0.0037	0.05
1,2,4-Trimethylbenzene	0.00025	0.021	120.19	0.00000	0.00000	0.0002	0.00
Cyclohexane	0.000024	0.677	84.16	0.00002	0.00000	0.0005	0.01
Toluene	0.0007	0.174	92.13	0.00012	0.00003	0.0041	0.06
Xylenes	0.0007	0.129	106.17	0.00008	0.00002	0.0030	0.04

Notes:

a = Speciation data from American Petroleum Institute (API), Manual of Petroleum Measurement Standards, Ch. 19-4, November 1997 (Table 4 divide by 100)

TANKS 4.0.9d
Emissions Report - Detail Format
Fee Calculations--January 1 thru December 31, 2022

Emission Unit Identification: **Tank-2102 (After)**
Company: Petro Star Inc. - Port of Anchorage Terminal
City: Anchorage
State: Alaska
Type of Tank: Horizontal Tank
Description: Lubricity Diesel Additive

Parameters	Values
Maximum Liquid Volume (V_{LX}):	633.78 ft^3 4,741.03 gallons
Tank Diameter:	12.04 ft
Maximum Liquid Height (H_{LX}):	5.45 ft
Average Liquid Height (H_L):	5.29 ft
Shell Height (H_S):	5.56 ft
Vapor Molecular Weight (M_V):	130 lb/lb-mole
True Vapor Pressure (P_{VA}):	0.0041 psia
Tank Annual Net Throughput (Q):	4,505.14 bbl/yr
Number of Turnover per year (N):	39.91
Working Loss Turnover Saturation Factor (K_N):	0.918430768 (>36 turnovers per year)
Working Loss Product Factor (K_P):	1 (AP-42, Eq 1-31)
Working Loss (L_W):	**2.2054 lb/yr**

Parameters	Values
Vapor Space Outage (H_{VO}):	3.5417 ft
Roof Outage (H_{RO}):	0.1255 ft (cone)
Tank Vapor Space Volume (V_V):	403.48 cu ft
Stock Vapor Density (W_V):	0.0001 lb/ft^3
Vented Vapor Saturation Factor (K_S):	0.9992
Vapor Space Expansion Factor (K_E):	0.0528
Daily Avg. Liquid Surface Temp. (T_{LA}):	503.3616 (deg. R) (deg. F)
Daily Max. Ambient Temp. (T_{AX}):	502.395 (deg. R) 42.725 (deg. F)
Daily Min. Ambient Temp. (T_{AN}):	488.77 (deg. R) 29.1 (deg. F)
Daily Total Solar Insulation Factor (I):	760.734143 Btu/sqft day
Tank Paint Solar Absorptance (α):	0.89
Ideal Gas Constant R:	10.731 psia cu ft /(lb-mol-deg R)
Standing Storage Loss (L_S):	**0.7662 lb/yr**

Total Loss (L_T):	***2.9716 lb/yr***
	0.00149 tpy

Diesel Fuel [a]

Vapor Pressure @ 70 F (psia)	0.0029
Molecular Wt.-liquid (lb/lb-mole)	188
Molecular Wt.-vapor (lb/lb-mole)	130

Wt% Speciation in Vapor Phase							
Pollutant	**Wt Fraction in Liquid**[a]	**Vapor Pressure at 40 F (psia)**[a]	**Molecular Wt (lb/lb-mole)**[a]	**Equations 4-3,4-4,4-5 and 4-6 From AP-42 Section 7.1-4**			**HAPs Emission (lbs/yr)**
				Pi	**yi**	**Wt% in Vapor**	
Benzene	0.000008	0.6543	78.11	1.3E-05	4.3E-03	2.6E-03	0.01
Ethylbenzene	0.00013	0.0498	106.17	1.1E-05	3.9E-03	3.2E-03	0.01
Hexane (n-hexane)	0.000001	1.1079	86.18	2.4E-06	8.2E-04	5.4E-04	0.00
1,2,4-Trimethylbenzene	0.01	0.0088	120.19	1.4E-04	4.7E-02	4.3E-02	0.13
Toluene	0.00032	0.1726	92.14	1.1E-04	3.8E-02	2.7E-02	0.08
Xylenes	0.0029	0.0432	106.17	2.2E-04	7.5E-02	6.1E-02	0.18

Notes:

a = Speciation data from American Petroleum Institute (API), Manual of Petroleum Measurement Standards, Ch. 19-4, November 1997 (Table 4 divide by 100)

TANKS 4.0.9d
Emissions Report - Detail Format
Fee Calculations--January 1 thru December 31, 2022

Emission Unit Identification: **Tank-2103 (After)**
Company: Petro Star Inc. - Port of Anchorage Terminal
City: Anchorage
State: Alaska
Type of Tank: Horizontal Tank
Description: KeroPure AP-205

Parameters	Values
Maximum Liquid Volume (V_{LX}):	70.20 ft^3 525.12 gallons
Tank Diameter:	5.36 ft
Maximum Liquid Height (H_{LX}):	3.11 ft
Average Liquid Height (H_L):	3.02 ft
Shell Height (H_S):	3.174317577 ft
Vapor Molecular Weight (M_V):	100 lb/lb-mole
True Vapor Pressure (P_{VA}):	0.0135 psia
Tank Annual Net Throughput (*Q*):	1,286.31 bbl/yr
Number of Turnover per year (*N*):	102.87
Working Loss Turnover Saturation Factor (K_N):	0.458296763 (>36 turnovers per year)
Working Loss Product Factor (K_P):	1 (AP-42, Eq 1-31)
Working Loss (L_W):	**0.7958 lb/yr**

Parameters	Values
Vapor Space Outage (H_{VO}):	2.0208 ft
Roof Outage (H_{RO}):	0.0558 ft (cone)
Tank Vapor Space Volume (V_V):	45.60 cu ft
Stock Vapor Density (W_V):	0.0002 lb/ft^3
Vented Vapor Saturation Factor (K_S):	0.9986
Vapor Space Expansion Factor (K_E):	0.0528
Daily Avg. Liquid Surface Temp. (T_{LA}):	503.3616 (deg. R) -- (deg. F)
Daily Max. Ambient Temp. (T_{AX}):	502.395 (deg. R) 42.725 (deg. F)
Daily Min. Ambient Temp. (T_{AN}):	488.77 (deg. R) 29.1 (deg. F)
Daily Total Solar Insulation Factor (*I*):	760.734143 Btu/sqft day
Tank Paint Solar Absorptance (α):	0.89
Ideal Gas Constant R:	10.731 psia cu ft /(lb-mol-deg R)
Standing Storage Loss (L_S):	**0.2192 lb/yr**

Total Loss (L_T):	***1.0150 lb/yr***
	0.00051 tpy

Gasoline Fuel [a]

Vapor Pressure @ 40 F (psia)	4.4369	
Molecular Wt.-liquid (lb/lb-mole)	92	**M_L [Liquid molecular weight of Gasoline (RVP 13)]**
Molecular Wt.-vapor (lb/lb-mole)	62	**M_V [Vapor molecular weight of Gasoline (RVP 13)]**

Wt% Speciation in Vapor Phase							
Pollutant	**Wt Fraction in Liquid**[a]	**Vapor Pressure at 40 F (psia)**[a]	**M_i (Molecular weight) (lb/lb-mole)**[a]	**Equations 4-3,4-4,4-5 and 4-6 From AP-42 Section 7.1-4**			**HAPs Emission (lbs/yr)**
				Pi	**yi**	**Wt% in Vapor**	
Benzene	0.00018	0.638	78.11	0.00014	0.00003	0.0038	0.00
Cumene (Isopropyl benzene)	0.00005	0.051	120.2	0.00000	0.00000	0.0001	0.00
Ethylbenzene	0.00014	0.109	106.17	0.00001	0.00000	0.0005	0.00
Hexane (n-hexane)	0.0001	1.102	86.18	0.00012	0.00003	0.0037	0.00
1,2,4-Trimethylbenzene	0.00025	0.021	120.19	0.00000	0.00000	0.0002	0.00
Cyclohexane	0.000024	0.677	84.16	0.00002	0.00000	0.0005	0.00
Toluene	0.0007	0.174	92.13	0.00012	0.00003	0.0041	0.00
Xylenes	0.0007	0.129	106.17	0.00008	0.00002	0.0030	0.00

Notes:

a = Speciation data from American Petroleum Institute (API), Manual of Petroleum Measurement Standards, Ch. 19-4, November 1997 (Table 4 divide by 100)

TANKS 4.0.9d
Emissions Report - Detail Format
Fee Calculations--January 1 thru December 31, 2022

Emission Unit Identification: **Tank-2103 (After)**
Company: Petro Star Inc. - Port of Anchorage Terminal
City: Anchorage
State: Alaska
Type of Tank: Horizontal Tank
Description: KeroPure AP-205

Parameters	Values
Maximum Liquid Volume (V_{LX}):	70.20 ft^3 525.12 gallons
Tank Diameter:	5.36 ft
Maximum Liquid Height (H_{LX}):	3.11 ft
Average Liquid Height (H_L):	3.02 ft
Shell Height (H_S):	3.174317577 ft
Vapor Molecular Weight (M_V):	100 lb/lb-mole
True Vapor Pressure (P_{VA}):	0.0135 psia
Tank Annual Net Throughput (Q):	2,021.35 bbl/yr
Number of Turnover per year (N):	161.65
Working Loss Turnover Saturation Factor (K_N):	0.352249456 (>36 turnovers per year)
Working Loss Product Factor (K_P):	1 (AP-42, Eq 1-31)
Working Loss (L_W):	**0.9612 lb/yr**

Parameters	Values
Vapor Space Outage (H_{VO}):	2.0208 ft
Roof Outage (H_{RO}):	0.0558 ft (cone)
Tank Vapor Space Volume (V_V):	45.60 cu ft
Stock Vapor Density (W_V):	0.0002 lb/ft^3
Vented Vapor Saturation Factor (K_S):	0.9986
Vapor Space Expansion Factor (K_E):	0.0528
Daily Avg. Liquid Surface Temp. (T_{LA}):	503.3616 (deg. R) -- (deg. F)
Daily Max. Ambient Temp. (T_{AX}):	502.395 (deg. R) 42.725 (deg. F)
Daily Min. Ambient Temp. (T_{AN}):	488.77 (deg. R) 29.1 (deg. F)
Daily Total Solar Insulation Factor (I):	760.734143 Btu/sqft day
Tank Paint Solar Absorptance (α):	0.89
Ideal Gas Constant R:	10.731 psia cu ft /(lb-mol-deg R)
Standing Storage Loss (L_S):	**0.2192 lb/yr**

Total Loss (L_T):	***1.1804 lb/yr***
	0.00059 tpy

Gasoline Fuel [a]

Vapor Pressure @ 40 F (psia) 4.4369
Molecular Wt.-liquid (lb/lb-mole) 92 **M_L [Liquid molecular weight of Gasoline (RVP 13)]**
Molecular Wt.-vapor (lb/lb-mole) 62 **M_V [Vapor molecular weight of Gasoline (RVP 13)]**

Wt% Speciation in Vapor Phase							
Pollutant	**Wt Fraction in Liquid** [a]	**Vapor Pressure at 40 F (psia)** [a]	**M_i (Molecular weight) (lb/lb-mole)** [a]	**Equations 4-3,4-4,4-5 and 4-6 From AP-42 Section 7.1-4**			**HAPs Emission (lbs/yr)**
				Pi	**yi**	**Wt% in Vapor**	
Benzene	0.00018	0.638	78.11	0.00014	0.00003	0.0038	0.00
Cumene (Isopropyl benzene)	0.00005	0.051	120.2	0.00000	0.00000	0.0001	0.00
Ethylbenzene	0.00014	0.109	106.17	0.00001	0.00000	0.0005	0.00
Hexane (n-hexane)	0.0001	1.102	86.18	0.00012	0.00003	0.0037	0.00
1,2,4-Trimethylbenzene	0.00025	0.021	120.19	0.00000	0.00000	0.0002	0.00
Cyclohexane	0.000024	0.677	84.16	0.00002	0.00000	0.0005	0.00
Toluene	0.0007	0.174	92.13	0.00012	0.00003	0.0041	0.00
Xylenes	0.0007	0.129	106.17	0.00008	0.00002	0.0030	0.00

Notes:

a = Speciation data from American Petroleum Institute (API), Manual of Petroleum Measurement Standards, Ch. 19-4, November 1997 (Table 4 divide by 100)

BUDGET PROPOSAL
JOHN ZINK® Enclosed Flame Vapor Combustion Unit Proposal

Prepared for:

Randy Downing

of

Great Northern Engineering

Palmer, AK

PREPARED BY	*BRAD IRWIN*
DATE	*22-DEC-2014*
REVISION	*0*
JZ FILE NUMBER	*VC-201410-48704-B*

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Table of Contents

I. Introduction

John Zink Company, LLC is pleased to provide this proposal for a JOHN ZINK® **Model ZCT-2-5-35-X-1/6** Enclosed Vapor Combustion System (VCU) for Delta Westerns in Anchorage, Alaska. The proposed unit includes a self-supported, vertical, carbon steel cylindrical shell lined with ceramic blanket refractory, anti-flashback burners, pilot, air assist blower, detonation arrestor with temperature switch and a burner safety control valve. This proposal describes the operating characteristics of a John Zink smokeless, natural draft, air assisted, enclosed, hydrocarbon vapor combustion unit.

Through the execution of hundreds of vapor control projects, John Zink has developed a thorough understanding that our customers value safety, efficiency, and ease of installation, operation and maintenance in their equipment. The design of the proposed VCU incorporates several features which enhance safety, performance and reliability. John Zink also understands that, in addition to high-quality equipment, our customers value excellence in project execution and service. Purchasing a system from John Zink provides many advantages not limited to the following:

- Experienced design and project management staff dedicated to providing excellent customer service during the execution and installation phases of a project.
- In-house fabrication ability. Because John Zink owns its own 250,000 square foot manufacturing facility, we are able to assemble most systems in our own shop which allows us to better control quality and schedule. We also assemble our control panels in-house and perform a functional test of the control panel and VCU skids prior to shipment.
- Large service organization. Our factory trained technicians provide both preventative maintenance and emergency call-out assistance 24/7.
- Spare parts inventory for quick turnarounds.
- Portable Emission Control Systems (PECS®) for temporary compliance needs.
- Installation assistance.
- John Zink proprietary anti-flashback burners. John Zink is the only VCU supplier to design and manufacture our own anti-flashback burners.
- Elimination of liquid seal. John Zink's anti-flashback burners allow for an additional level of safety so that liquid seal can be removed, reducing equipment maintenance.

Scope of Supply Summary

Engineering

The following items are included as "Engineering Deliverables"

1. Piping and Instrument Diagrams (P&ID)
2. Combustor emission data
3. Utility requirements
4. Design and specification for:
   Vapor Staging Unit (VSU)
   Vapor Combustion Unit (VCU)
5. General arrangement drawings with complete tagging and assembly information.
6. Control panel(s) and junction box schematics.
7. Electrical one line diagrams.
8. Structural design of combustor with foundation information for design by others.
9. Structural design of skids with foundation information for design by others.
10. Written operational procedure.

Equipment

The proposed Vapor Combustion Unit (VCU) is designed to control hydrocarbon emissions from vapors generated at the waste water treatment plant. The VCU consists of two main process units, one (1) Vapor Staging Unit (VSU), and one (1) Vapor Combustion Unit (VCU).

The VSU skid contains all vapor piping, isolation/staging block valves, pilot/assist gas piping, and flashback protection. The control system used to monitor both process and safety conditions of the unit is located on a panel rack located on skid. The panel can be either operated locally or interact with the customer's DCS. The control panel uses a programmable logic controller (PLC) to coordinate these interactions.

Vapors are transferred to the VCU, a cylindrical vessel with a heat-resistant blanket refractory material rated for a maximum service temperature of 2,400 °F, where they are thermally destroyed in a controlled manner.

II. Design Basis

The John Zink® Vapor Combustion System is based on proprietary technology and sound engineering. Vapor Stream characteristics and other design data as furnished by GNE are summarized below:

PROCESS INFORMATION

Model: ZCT-2-5-35-X-1/6

Loading Rates:.....1,200 GPM maximum
.....160 SCFM maximum

Products Loaded: ..... Gasoline, Methanol
Vapor Hydrocarbon Concentration: ..... 60 vol% maximum
Note: 60 vol. % (Measured as Propane) is equivalent to approximately 1,389 BTU/scf lower heating value (LHV).

Estimated Heat Release:..... 14.7 MMBTU/hr
Estimated Pilot Gas: .....1.0 scfm natural gas
Estimated Assist Gas Range [(1)]: ..... 0-16 scfm
Destruction Efficiency [(2)]: .....98% minimum
Estimated Pressure Drop through System: .....10" w.c.

Area Electrical Classification
VSU/VCU:..... Outdoor Unclassified (Non-Hazardous)
Motor Type:..... TEFC
VCU Enclosure Type: .....NEMA 4
Detonation Arrestor Classification: ..... Group C Vapors
Earthquake Zone:..... IBC 2006 Site Class D
Wind Velocity:.....100 mph
Ambient Temperature:..... -20-100 °F
Electrical Power: .....230/480 V, 3 Ph, 60 Hz and 120 V, 1 Ph, 60 Hz
Pilot/Assist Gas: .....Natural Gas @ 30 psig minimum
Instrument Air/Nitrogen:.....80 psig (-40 °F dew point)

Notes to Design Basis

1. Assist gas will be injected at the VSU when the BTU value of the vapors is too lean to burn properly and maintain the combustor operating temperature or if Methanol loading occurs. As the hydrocarbon concentration becomes higher in the vapor stream or Methanol loading ceases, the assist gas flow rate will automatically be reduced. A dry contact is required to verify when Methanol is loading otherwise 16 scfm of Assist Gas will be injected during all loading cases.

2. Refer to the Performance Guarantee in Section V.

III. Process Description

The system normally consists of a combustion chamber, special anti-flashback burners, automatic ignition pilot with continuous flame monitoring, motor operated vapor isolation block valves, detonation arrestors, air-assist blowers, piping, instrumentation and a master control panel packaged as an assembled unit ready for convenient field installation.

Typically, until loading occurs at the truck rack, the vapor combustion system is in a standby mode with no pilot flame, the vapor isolation valves are closed, and the air-assist blowers are off. Automatic start-up of the vapor combustion system is initiated by an electrical signal from the loading rack indicating that product loading will occur shortly.

The start-up sequence consists of a short air purge using the air-assist blowers to purge the stack of any combustibles that may be present around the pilots prior to ignition. This brief air purge is followed by automatic electronic ignition of the pilots. After pilot ignition, a permit to load signal is passed to the customer. Once this signal is received product loading begins at the loading rack and an air-hydrocarbon vapor mixture is sent from the transports being loaded to the vapor combustion unit.

As soon as sufficient flow is available at the VSU skid, it will be detected by the pressure monitoring controls which will automatically open the first stage burner isolation block valve allowing the air-vapor mixture to flow through the detonation arrestor to the burners, where the combustible vapors are ignited by the pilot and burned. The first stage air-assist blower provides partial combustion air and mixing energy to the burner tips to assure smokeless combustion.

As the loading operation at the loading rack is completed, vapor flow to the combustion system decreases resulting in a decrease in system pressure. The pressure monitoring system closes the vapor isolation block valves when the line pressure has drop to 0.5 inch of water column pressure. The pilot and the first stage air-assist blower remains on for a brief time period after loading is complete. If no further loading occurs, the combustion unit will shut down into a standby mode to await automatic re-start as described above.

This application may require maintenance of an elevated combustion temperature to achieve peak emission control efficiency. The temperature will automatically be maintained during operation by a combination of assist gas and combustion air damper modulation, as required.

After the pilot is proven, assist gas is allowed into the system. Because the stack temperature is below the set point, the temperature control valve will begin to open allowing more assist gas into the system. As the temperature begins to rise toward the set point the temperature control valve will begin to back off. The temperature control valve modulates based on the amount of loading at the rack, but a minimum temperature of 400 °F is normally maintained using both assist gas and rack vapors. The louvers start to open at 1,400 °F to cool the stack temperature.

The safety design considerations for a vapor combustion unit used in methanol applications is very important in that the vapors to be burned contain sufficient air concentration to present flashback potential. The maximum vapor concentration of methanol at 100 °F is 30.6%. The flammability limits for methanol is 6.7% to 36%. Therefore, whenever you handle methanol, you are always in the flammable zone. The John Zink vapor combustion systems used in methanol service provides four (4)

levels of flashback protection and prevention. These include: (1) proprietary anti-flashback burners with a thermocouple mounted on the bottom side of the burners, (2) burner safety shutoff motor operated valve, (3) Type “C” detonation arrestor with high temperature shutdown thermocouple, which serves as a final backup flashback protection device to minimize the risk for any flashback to reach the loading area.

IV. Equipment Specification

A John Zink® Vapor Combustion Unit (VCU) is comprised of the items described below. Equipment specifications are preliminary and subject to change based on final engineering and only include the components of this purchase:

Vapor Staging Unit (VSU) Components

The VSU is designed to handle the vapors from loading up to 1,200 GPM. The VSU is expected to be installed in a non-hazardous area. The main VSU components are described below.

Burner Safety Controls / Isolation Block Valve

One (1) automatic 4" 150# ball isolation block valve with electric actuator. The valve opens, allowing gas to flow to the burners only when the combustor is operable and pilot is proven. The valve closes when the unit shuts down or the loading rate decreases. The motor operated valve prevents vapor flow to the VCU, when the VCU is inoperable and/or pilot is not proven.

Detonation Arrestor

As flashback protection, one (1) 4" 150# flanged spiral wound crimped ribbon type detonation arrestor. It is a passive device that uses the element to extinguish a flame by absorbing its heat and is designed to withstand the velocities and high pressures that occur in a detonation. The arrester is designed for group C vapors and is constructed with a carbon steel body and a stainless steel element. A high temperature shutdown switch is provided on the element face to detect the presence of a flame on the face of the element. The element is removable for cleaning and inspection. John Zink Company has found that arrestors designed for group D vapors do not work in this application.

Pilot System

A carbon steel pilot gas system will be provided to control the pilot gas flow including a strainer, regulator, pressure gauge, shutdown valve, high- and low-pressure shutdown switches, and manual valves.

Assist Gas System

Assist gas will be added to the waste vapor stream to control temperature. For most cases, it is not anticipated that assist gas will be required as the vapors will provide the heat release necessary to maintain the VCU at a sufficient temperature. However, assist gas is provide for low flow conditions or for any pre-heat requirements if applicable. A carbon steel assist gas system will be provided to control the assist gas flow including a regulator, pressure gauge, shutdown valve, control valve, and manual valve.

Note: For Methanol only loading, assist gas is injected to keep the flame off the anti-flashback burner tip. If a dry contact is provided to verify Methanol only loading, assist gas will stage accordingly, otherwise it will be injected continuously during all loading cases as a safeguard.

VSU Skid

The structural steel skid will be fabricated in accordance with AWS D1.1 and will be constructed of A36 carbon steel.

Control Panel

One (1) John Zink control panel mounted on a panel rack consisting of the following:

1. NEMA 4 weatherproof enclosures
2. One (1) master control panel with status lights.
   - Power "ON" (white)
   - Pilot flame "ON" (green)
   - Detonation Arrestor High Temperature (red)
   - Assist Air Blower Failure (red)
   - High Stack Temperature (red)
   - Pilot Flame Failure (red)
   - Block Valve Failure (red)
   - Remote Emergency Shutdown (red)
3. Solid state programmable controller
4. Combination motor starter for air assist blower.
5. Space heater in master panel enclosure.

Electrical Construction

Electrical construction is in accordance with the National Electric Code (NEC). Please advise if any unusual conditions or local codes are to be specified. The unit is designed to be installed in a non-classified area and complies with the NEC with the following exception, Article 515 - Table 512-3, NFPA-70 of the National Electrical Code.

Combustion Stack

The VCU consists of an enclosed vapor combustor sized to handle the maximum loading rate from the loading rack to be installed in a non-hazardous area. It is a self-supported vertical stack that uses natural draft to provide combustion and quench air.

Mechanical Design

The combustor has a diameter of 5 feet and an overall height of 35 feet. Two (2) 2" NPT sample ports, one sight glass per stage, various instrument and component connections, and lifting lugs are provided. A ladder and 120° service platform is an option that can be provided for access to elevated stack instrumentation and sample ports that is designed in accordance with OSHA standards.

The design conditions used are a shell temperature of 500 °F, MDMT of –20 °F and no corrosion allowance. Material of construction is A-36 carbon steel welded in accordance with AWS D1.1.

The structural design is as follows

Earthquake ..... IBC 2006 Site Class D
Wind Velocity..... ASCE 7-05 100 mph

Refractory

Ceramic fiber refractory with Inconel pins and keepers will be provided in the enclosed combustor to protect it from the radiation and high temperature of combustion. This refractory does not require curing and does not limit the combustor heat-up or cool-down rates. A rainshield is installed on the top edge of the refractory to help protect it from the weather. The hot face temperature rating of the ceramic fiber is 2,400 °F.

Anti-flashback Vapor Burners

One (1) combustion stage equipped with one (1) 6" stainless steel anti-flashback burner will be provided for the introduction of the marine vapors into the combustion chamber. These proprietary burners help prevent flashbacks into the vapor piping by using technology similar to that used in flame and detonation arrestors.

Assist Air Blower

A tube-axial assist air blower will be provided for each stage to ensure the vapors are combusted quickly and efficiently. The assist air helps ensure smokeless operation by using a part of the combustion air to enhance mixing. It also cools the burners and extends their operating life. One (1) 2 HP 480 V TEFC motor drives the blower. The assist air blower has a manual inlet damper that can be used to fine tuning of assist air flow.

Quench Air Damper

One (1) 3 foot by 3 foot quench air damper with an automatic actuator will be provided to introduce combustion and quench air into the combustor. The damper blades operate in an opposed manner to maximize the control with the low available differential pressure. The damper frame is galvanized carbon steel, and the blades and bearings are stainless steel. The damper is hinged for easy entry to the inside of the combustor.

Pilot Gas System

One (1) high-efficiency pilot will be provided for each section of vapor burners ensure that a stable, continuous ignition source is available for each stream. The pilot inspirates air from outside the combustor and mix it with fuel gas to provide a pre-mix stream to the tips. Fuel gas use is approximately one scfm per pilot due to the high efficiency design. An automatic ignition assembly will be provided.

Instrumentation

- One (1) ultraviolet flame detector for the pilot. The detector is used to ensure that the pilot has a stable flame.

- The combustor will have two thermocouples near the exit of the exhaust. One is used to control the assist gas / quench air dampers and the other is used as a safety shutdown.

Stack Temperature Control

The following equipment is added to the base equipment described to control combustion stack temperature:

1. One (1) panel mounted temperature indicating controller with two outputs complete with stack mounted thermocouple. The controller modulates both the assist gas and the quench air louver at different set temperatures.
1. Enclosed combustion stack bottom with automatic modulating air dampers. The dampers will be hinged for easy access into the combustion stack.
3. Assist gas automatic control valve with electric actuator.
4. Solenoid shutoff valve, pressure regulator and manual block valves are provided in the assist gas line.

With these added features, the controller will automatically control the combustion zone to a minimum temperature by modulation of the combustion air dampers and automatic injection of assist gas to ensure maximum vapor destruction. Dual control allows the operator to set the assist gas at a much lower temperature than the temperature to open the quench air louvers. This feature saves considerable assist gas over a single control system.

John Zink Fabrication Standards

Packaging, Shop Test

The above equipment packaged to include piping, electrical wiring, conduit, paint, and other miscellaneous materials requiring only minor field assembly. A shop functional test of the packaged assembly is included.

Piping

Vapor piping is carbon steel designed to ANSI B31.3 150# class. All piping 1.5” and smaller to be SCH 80, piping greater than 1.5” to be schedule 40. All piping connections greater than 2” will utilize 150# flanges; small-bore piping will have NPT connections with appropriately positioned unions to facilitate maintenance.

Paint

Piping, skids, racks, and combustor stack will have a commercial blast surface preparation (SSPC-SP-6) and one coat of Sherwin Williams Zinc Clad II Low VOC Inorganic Zinc Rich Primer (one coat, 2.0-4.0 mils DFT).

Components with a manufacturer’s finish coat will not be painted. Components that could be damaged by blasting such as valves will be hand-tool cleaned (SSPC-SP-2) instead of blasted. Sherwin-Williams products are used.

Estimated Equipment Dimensions and Weights

Vapor Staging Unit (VSU):	9’-0” L x 2’-8” W x 6’-4” H 1,700 lbs. in weight
Vapor Combustion Unit (VCU):	5’-0” OD X 35’-0” OAH 7,500 lbs. in weight

Optional Features

In the discussion that follows some optional features are offered. Each of the optional features offered are identified by a number and the pricing of each option is included in the Commercial Section of this proposal.

1. **Ladder and Platform**
   A 120 degree ladder with a platform to access the stack thermocouples an emission ports will be provided. Ladder and platform will be John Zink's standard design and fabricated per AISC standards with welding per AWS D1.1 standards. The ladder and platform will be galvanized per ASTM.

2. **Knockout Tank and Instrumentation**
   One (1) vertical 24" OD x 36" O.A.L. above ground carbon steel tank with the following:

   - 150# Flanged Vapor Inlet/Outlet
   - One (1)1" Drain Connection
   - Two (2) 2" NPT Level Switches
   - One (1) 24" C-C Level Gauge with Isolation Valves

3. **Pressure Relief Valve**
   One (1) Enardo Model 951 3" pressure relief valve set at 18" W.C. to protect trucks from over pressure. Federal Regulations require that you install a relief valve between the loading rack and the vapor combustion unit. CFR 60.52(I) states that no pressure vent in the vapor collection line shall begin to open at a system pressure lower than 4500 Pascals (18" W.C.). It is recommended that this valve be installed at least 10' in the air and away from the unit, so that during any venting, vapors do not travel across the skid.

4. **Temperature Recorder**
   One (1) digital chart recorder to record stack exhaust temperature, pilot "on" and valve open.

5. **Pilot Gas Low Pressure Switch**
   One (1) pilot gas low-pressure switch to shutdown the unit in case of low pilot gas pressure.

6. **Pilot Gas High Pressure Switch**
   One (1) pilot gas high-pressure switch to shutdown the unit in case of high pilot gas pressure

7. **High Stack Temperature Switch**
   One (1) high temperature shutdown thermocouple on the combustion stack to monitor high operating temperature. High operating temperature indicates problems with the combustion system and can cause refractory problems.

8. **Alarm Horn**
   One (1) alarm horn to sound upon shutdown of the vapor combustion system. The horn is conveniently mounted on the control panel and is loud enough to alert terminal personnel of a safety shutdown. This horn is suitable for a non-hazardous area.

9. Auxiliary Outlet

One (1) 110 volt auxiliary outlet receptacle to be mounted on the main control panel.

10. Underwriters Laboratories Classification

John Zink Company is dedicated to ensuring the highest level of quality and safety standards in its products. This performance level is reflected in all products and provides the opportunity to apply the UL listing symbol for Industrial Control Panels on motor starters and a UL classification symbol of the control panels.

V. Performance Guarantee

The John Zink® Enclosed Vapor Combustion Unit is designed to combust the hydrocarbon vapors from the incoming air/hydrocarbon vapor mixture in order to comply with guaranteed emission limits as stated below.

Guaranteed Hydrocarbon Emissions Level

- The total hydrocarbon emissions to be a maximum of 10 mg Hydrocarbon per Liter product loaded.
- Nitrogen Oxides (NOx) emissions to be a maximum of 4 mg per liter of product loaded.
- Carbon Monoxide (CO) emissions to be a maximum of 10 mg per liter of product loaded.

The above stated performance guarantee is contingent upon the following conditions or clarifications:

1. The equipment is transported, stored, installed, operated, and maintained in compliance with manufactures' operating and maintenance guidelines (including operation records), accepted good industry practices, and within conditions as defined in "Design Basis" of this proposal.

2. Volatile organic compounds are considered to be those hydrocarbons normally found in gasoline vapors displaced when transports are loaded.

3. Determination of hydrocarbon emissions shall be measured according to the EPA Reference Methods 2A, 2B, 25A & 25B or any other equivalent test method acceptable by John Zink. Emissions are to be averaged over a 6 hour test period.

4. This VCU is designed to control only hydrocarbon emissions that pass through the vapor control system.

5. Assist gas may be required to meet performance guarantee. John Zink reserves the right to increase the stack temperature limits using assist gas.

6. The process guarantees apply only to the time period when loading is occurring. System purge, stack heat up, etc. are not included as part of the process performance test.

7. The performance guarantee as stated above is the only performance guarantee offered. Values stated for other parameters are good faith estimates and not to be construed as performance guarantees.

8. Any defects are reported immediately to John Zink.

9. Performance testing shall be conducted by customer within sixty (60) days after the equipment has been placed in operation. John Zink Company shall be notified in writing

prior to the test so that their representative may be present. It shall be the customer's responsibility to maintain equipment in good working order prior to and during the testing. Performance testing is the Customer's responsibility. However, if due to no fault of John Zink Company the equipment cannot be put into operation or for other reasons not tested within 12 months after equipped is ready to ship, then the Performance Guarantee shall be deemed to have been met for any and all purposes.

10. Should the equipment not meet the Performance Guarantee, John Zink and the Customer shall jointly determine, in accordance with recognized engineering procedures and practices, whether the failure is a result of a design deficiency. If it is established that the equipment failed to meet the Performance Guarantee and such failure is due to design deficiency, John Zink will take such action as it may determine necessary to correct the equipment to meet such guarantees. Customer agrees to give John Zink free and necessary access to the equipment when requested for the purpose of making correction.

11. The Performance Guarantees shall terminate 18 months after the date that the equipment is available for shipment or one year after start-up, whichever occurs first (the "Guarantee Period").

VI. Commercial

Budget Pricing, Delivery, Terms

Price

Budget Price (all prices are in US Dollars) for the John Zink Vapor Combustion System proposed herein includes design and fabrication. The sales price excludes freight and handling to job site, field installation, commissioning (start-up) services, applicable taxes, fees, permits, or any other charges.

Price for VCU with all standard features,	$120,000

Price Adder

Option Number & Description		
1.	Ladder and Platform	$8,400
2.	Knockout Drum and Instrumentation	$6,200
3.	Pressure Relief Valve	$1,300
4.	Temperature Recorder	$6,500
5.	Pilot Gas Low Pressure Switch	$1,300
6.	Pilot Gas High Pressure Switch	$1,300
7.	High Temperature Shutdown	$1,300
8.	Alarm Horn	$900
9.	Auxiliary Outlet	$400
10.	Underwriters Laboratories Classification	$2,400

One (1) hard copy and three (3) CD electronic copies of Installation/Operation/Maintenance Manuals are included. Extra copies ordered after the original manuals are printed will be supplied at $1,000.00 per copy. One (1) electronic set of customer drawings will be furnished in AutoCAD DWF format or PDF file format. Hard copies will be furnished on request.

This budgetary proposal is intended only as an estimate to facilitate your planning processes and does not constitute a commitment or offer to sell goods or services at the prices and terms referenced herein. Any firm offer or binding quotation will be the subject of a formal proposal at a future date.

Price is based on Buyer's acceptance of attached John Zink Company Standard Terms of Sale.

Except as otherwise noted in this proposal, the prices quoted are valid for thirty (30) days from the date of the proposal. Should delivery be delayed past the quoted delivery by acts of Buyer or its agent, the quoted price will be subject to escalation.

Based on approval of credit, invoices will be submitted for payment as follows:

- 10% of net price on receipt of purchase order
- 60% of net price six (6) weeks after receipt of order
- 30% of net price when notified that the unit is ready for shipment.

Payments for invoices are due net 30 from the date of invoice.

A guaranteed form of payment such as a letter of credit may be required.

Trade Terms are FCA Point of Manufacture. John Zink will make shipping arrangements and prepay freight on behalf of customer. Freight and handling costs will be added to customer invoices. Risk of loss during shipment rests with customer.

SCHEDULE

The estimated readiness to ship is approximately 16-18 weeks after receipt of mutually agreed upon order. If drawing review and approval by customer is required this will extend the delivery. A detailed schedule will be provided after receipt of such order.

COMMISSIONING/START-UP

Commissioning (start-up) service rates are per the attached Standard Technical Assistance Agreement. Start-up services by a John Zink representative are required to retain the limited warranty. Start-up performed by others voids both the limited warranty and the performance guarantee.

VII. Clarifications and Exceptions

Not applicable

VIII. Owner Requirements

Note: This section is only intended to supply a general set of installation related comments. For a specific set of instructions please refer to the John Zink Operation and Maintenance Manual.

1. Provide suitable skid and stack foundation, which will completely support the structural members.

2. Inspection of the equipment for any damage or shortages and document such damages or shortages with the shipper.

3. Unloading the VSU, VCU and other equipment. Any equipment or rigging needed to unload the unit is by the customer.

4. Set, level, and grout the VCU skid and stack on the foundations. Weld the washer plates over the combustor anchor bolts. Install the top portion of combustor on the skid-mounted base, if applicable. Provide 6" thick layer of 1" diameter aggregate to cover floor underneath combustion stack to protect concrete from cracking.

5. Assemble the ladders and platforms and install on the combustor, if applicable.

6. Installing and apply power to the VCU control panel. If the unit is not going to be installed and connected to electrical power for an extended period of time, measures should be taken to prevent condensation from forming in the electrical control boxes.

7. Assemble and install any ship loose equipment using the O&M and GA drawings for reference.

   DO NOT INSTALL THE RELIEF VALVE ON THE INLET TO THE VSU SKID. ANY VENTING WILL ALLOW VAPORS TO BLOW ACROSS THE SKID AND MAY CAUSE AN EXPLOSION. THE UNIT IS TO BE INSTALLED IN A NON-HAZARDOUS AREA AND MUST REMAIN IN A NON-HAZARDOUS AREA. Make sure the relief valve is installed a minimum of 12’ in the air so that in the event of a release no operators will be exposed to vapors.

8. Run conduit, pull and terminate wire for the following VCU components:

   Stack thermocouples
   Stack flame scanners
   Stack assist air blower
   Stack air dampers
   Ignition for pilots
   Knockout tank level switches
   Ground wires to stack, skid, and other equipment as needed by NEC and local codes

9. Provide and install vapor and natural gas piping as is appropriate to the VCU. Estimated flow rates and pressure requirements will be shown on the final P&ID.

10. Corrections of minor misfits by moderate amount of reaming, cutting, bending, welding, etc. are a part of fit up and installation. It is the intent of John Zink Company to minimize errors leading to misfits. If there are changes requiring more than moderate corrections, contact John Zink Company for instructions.

11. John Zink is not responsible for the supply and application of touch up paint for damaged caused by transportation, unloading, and installation of supplied equipment.

12. Check alignment and maintain bearings on all rotating equipment.

13. Provide heat trace and insulation, if required.

14. After a suitable run-in and test period, if electrical conduits are used, the customer is responsible to provide the necessary materials to pour the conduit sealant per appropriate electrical code requirements. It is recommended to wait till after commissioning before pouring the seals.

IX. Scope of Supply Summary

The following Scope of Supply is to confirm items provided by John Zink in our proposal. The attached Scope of Supply is provided to help the customer compare proposals and should include the minimum safety features included in any design.

Stack

Stack Size:	5’ O.D. x 35’ O.A.L.
Sized for possible vapors:	Yes
No. of Burners :	One (1) 6” O.D. x 6” thick element
Anti-flashback Burner :	Yes
Burner Manufacture:	John Zink
Emission Test Ports:	Two (2)
View Ports:	Two (2) 4” sight glass
Refractory:	1” 2,400 °F top layer 1” 2,400 °F bottom layer
Refractory Pins and Keepers:	
• 304 SS rated for 1,500°F:	No
• 310 SS rated for 2,000°F:	No
• Inconel rated for 2,300°F:	Yes
Sandblasted:	Yes
Coated:	Zinc Primer
Ladder and Platform:	Optional (120° top platform)

Pilot

No. of Pilot(s):	One (1)
Pilot Manufacture:	John Zink
Adjustable Pilot:	Yes
Pilot Monitor:	Flame Scanner
Pilot body:	Stainless Steel
High/Low Pressure Switches:	Optional

Assist Air/Purge Blower

Assist Air/Purge Blower Provided:	Yes (qty. 1)
Blower Horsepower:	2 HP

Safety / Isolation Block Valve

Valve provided:	Yes (qty. 1)
Valve size:	4”, 150# Wafer Butterfly
Actuator:	Electric

Detonation Arrestor

High Temperature Shutdown:	Yes (qty. 1)
Size:	4”, 150# Flanged
Vapor Group:	C

Piping

Waste Gas Piping Size:	4” (inlet) x 4” (stages)

Piping provided between skid and stack:	Yes (ship loose)

Control Panel

Panel Rack Provided:	Yes
PLC Control:	Yes
Automatic Start Feature:	Yes
Panel Heater:	Yes
Combination Motor Starter:	Yes (rack mounted)
Panel Enclosure Rating:	NEMA 4
Horn:	Optional
Stack High Temperature:	Optional
Auxiliary Outlet:	Optional
Digital Temp Recorder:	Optional
UL Labeled:	Optional

Relief Valve

Relief Valve offered:	Optional
Size:	3”

Knockout tank

Vessel:	Optional (ship loose)
Size:	24” O.D. x 36” O.A.L. Vertical
Level Switch:	Yes (quantity 2)
Drain:	Yes
Sump pump:	Yes

Experience

Number of units sold	Over 1,200

X. Attachments

The following attachments are contained in this section:

A. General Terms and Conditions of Sale
B. Technical Assistance Agreement

ATTACHMENT A - GENERAL TERMS AND CONDITIONS OF SALE

This proposal is subject in all regards to the General Terms and Conditions of Sale attached hereto, which are hereby incorporated herein.

GENERAL TERMS AND CONDITIONS OF SALE
(GOODS AND SERVICES)

1. **APPLICATION.** These General Terms and Conditions of Sale ("**Terms and Conditions**") will apply to all quotations and sales for goods, material, equipment and services by John Zink Company, LLC ("**Seller**") and are hereby incorporated into the quotation, invoice or other document to which they are attached ("**Order**" and, together with the Terms and Conditions, the "**Contract**"). All purchases by customer, owner or its agent ("**Buyer**") are expressly limited and conditioned upon acceptance of the Terms and Conditions. Seller objects to and rejects any provision additional to or different from the Terms and Conditions that may appear in Buyer's purchase order, acknowledgement, confirmation, writing, or in any other prior or later communication from Buyer to Seller, unless such provision is expressly agreed to by Seller in a writing signed by Seller. For the purposes of these Terms and Conditions, the term "**Goods**" shall refer to the goods, material and equipment listed on the Order as well as all equipment or other materials provided in connection with any Services, and the term "**Services**" shall refer to the services listed on the Order as well as all ancillary services provided with any Goods. Terms not defined herein shall have the meanings set forth in the Order.

2. **QUOTATIONS.** Unless otherwise stated in the Order, any quotation from Seller is valid for 30 days from the date of the quotation. The quotation supersedes all previous quotations or correspondence concerning the same transaction or inquiry. Quotations contain proprietary information of Seller and are provided to Buyer solely for Buyer's internal purposes. Quotations may not be disclosed to any third party or used in preparation of any request for quotation for goods similar to, or as a substitution for, Goods quoted by Seller.

3. **PRICE MODIFICATION AND OTHER CHARGES.** Unless otherwise stated in the Order, Seller's price does not include: (a) transportation, handling, crating or packaging charges, or (b) sales, harmonized sales, goods and services, use or value-added tax or any other tax, excises, duties, tariffs, fees or other governmental charges that Seller may be required to pay or collect under any existing or future law, with respect to the import/export, sale, transportation, delivery or storage of any Goods or the provision of any Services sold by Seller.

4. **PAYMENT TERMS.** (a) Unless otherwise specified in the Order, payment must be received by Seller net 30 days from invoice date. (b) All payments shall be made in the currency listed in the Order, or, if not so listed, then in U.S. dollars. (c) If the payment due date is not a business day, Seller must receive such payment on the next business day after such due date. (d) Each shipment of Goods and each provision of Services is a separate transaction and payment shall be made accordingly. (e) Interest may be charged on all past due amounts owed by Buyer hereunder at an interest rate equal to the prevailing EURIBOR rate of interest, expressed as an annual percent, plus 3% from the payment due date until paid in full, or the highest interest rate allowed by applicable law, whichever is less.

5. **CREDIT TERMS.** If, in Seller's judgment, the creditworthiness or future performance of Buyer is impaired or unsatisfactory, Seller may suspend performance hereunder. Buyer will be responsible for any costs associated with such suspension (including charges for reactivation). In addition, Seller may, for any reason, (a) require prepayment by wire transfer at least two business days prior to a scheduled shipment of Goods or provision of Services, and/or (b) require Performance Assurance at least three business days prior to a scheduled shipment of Goods or provision of Services. "**Performance Assurance**" means collateral in the form of either cash or letter(s) of credit in a form, and from an issuing bank, acceptable to Seller.

6. **DELIVERY.** (a) Unless otherwise stated in the Order, all Goods will be delivered to Buyer EX Works the manufacturing facility of the Goods (the "**Facility**"). (b) If Buyer has not issued inspection and shipping instructions by the time the Goods are available to Buyer, Seller may either, at its sole discretion, (i) store the Goods at Buyer's risk and cost, or (ii) select any reasonable method of shipment, without liability by reason of its selection, costs and risk of shipment to be paid for by Buyer. (c) Shipments or Goods in storage may be insured at Buyer's expense, and Seller will not place a valuation upon shipments or Goods stored unless specifically requested in writing by Buyer or required for export purposes. (d) Unless otherwise stated in the Order, the provisions of the most current version of INCOTERMS, International Chamber of Commerce Publication, are incorporated herein by reference.

7. **TITLE/RISK OF LOSS.** Title in the Goods shall pass to Buyer only upon payment in full. The risk of loss or damage to the Goods shall pass to Buyer upon delivery in accordance with the Contract.

8. **INSPECTION/REJECTION OF GOODS.** All Goods shall be received subject to Buyer's reasonable inspection and rejection. If Buyer finds any of the Goods not to comply with any of the specifications contained in the Contract, Buyer, may, at its sole election, reject that portion of the Goods that fail to comply. Rejected Goods will be held at Seller's risk for a reasonable time, to be returned or disposed of by Buyer at Seller's written instruction and at Seller's sole cost and expense. A failure by Buyer to reject the Goods in writing within 30 days after receipt shall constitute an unqualified acceptance of such Goods by Buyer and a waiver by Buyer of all claims with respect thereto.

9. **WARRANTY.** (a) Seller warrants that (i) the Goods shall be new and good quality and shall conform to the specifications specifically set forth in the Order and title to the Goods shall be free from any security interest, lien or encumbrance upon Seller's receipt of full payment for the Goods, and (ii) Seller shall perform the Services in a workmanlike manner in accordance with the specifications specifically set forth in the Order. (b) The foregoing warranties will last for the following period (the "Warranty Period"): (i) for Goods, 18 months after the date that the Goods are available for shipment or one year after first start-up, whichever occurs first, and (ii) for Services, three months after completion of the Services. If during the Warranty Period any Goods or Services prove upon examination by Seller not to meet the warranties set forth above, Seller will repair the Goods or supply identical or substantially similar replacement Goods EX Works the Facility, at Seller's sole discretion, or re-perform the Services (as applicable). Any replacement Goods or re-performed Services will be warranted for the unexpired portion of the Warranty Period applicable to the particular Goods or Services. (c) Seller will not be responsible for transportation costs or for the costs of removal, installation, re-installation or making of access of any Goods or items, where such transportation, removal, installation, re-installation or making of access is required to repair or replace any defective Goods or to re-perform Services. Furthermore, Seller will not be responsible for and assumes no liability for materials or workmanship, labor costs or other related expenses for any work performed by third parties in the repair or replacement of defective Goods or the re-performance of Services. (d) This warranty will be voided if (i) the Goods or the subject of the Services have not been stored, installed, maintained or operated in accordance with accepted industrial practice or any specific instructions provided by Seller; (ii) the Goods or the subject of the Services have been subjected to any accident, misapplication, environmental contaminant, corrosion, damage, debris, improper passivation, abuse or misuse; (iii) Buyer has modified the Goods or the subject of the Services without Seller's prior written consent; (iv) Buyer has used or repaired the Goods or the subject of the Services after discovery of the defect without Seller's prior written consent; (v) Buyer refuses to permit Seller to examine the Goods or the subject of the Services and operating data to determine the nature of the defect claimed; or (vi) Buyer fails to meet its obligations. (e) Goods not manufactured by Seller are subject only to warranties of Seller's vendors and Seller hereby assigns to Buyer all rights in such vendor's warranties, however, Seller shall furnish to Buyer reasonable assistance in enforcing such rights. (f) Inexpensive items requiring repair or replacement and routine maintenance-related or consumable items shall be outside the scope of these limited warranties. (g) Seller's performance guarantees, if any, shall be deemed to be met by a satisfactory demonstration of the guaranteed performance parameters during a performance test, which shall be the responsibility of Buyer and to be based on test procedures as specified in the Order or, if not specified in the Order, to be based on test procedures mutually agreed upon by Seller and Buyer. In the absence of a performance test within 60 days of first startup, unless otherwise specified in the Order, Seller's performance guarantees are deemed to have been met. (h) ALL WARRANTIES OR REPRESENTATIONS NOT SPECIFICALLY INCLUDED IN THE TERMS AND CONDITIONS, INCLUDING THOSE WITH RESPECT TO MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE WHETHER EXPRESSED, IMPLIED, STATUTORY OR ARISING FROM A COURSE OF DEALING, USAGE OF THE TRADE OR OTHERWISE WITH RESPECT TO ANY GOODS OR SERVICES, ARE EXPRESSLY EXCLUDED. NO EXPRESS OR IMPLIED WARRANTY IS GIVEN AS TO THE CAPACITY, EFFICIENCY OR PERFORMANCE OF ANY GOODS, EXCEPT AS MAY BE PROVIDED IN A SEPARATE WRITTEN AGREEMENT SIGNED BY SELLER. (i) BUYER'S REMEDIES ARE SPECIFICALLY LIMITED TO THE REPAIR OR REPLACEMENT OF THE GOODS OR THE RE-PERFORMANCE OF THE SERVICES, AS APPLICABLE, DURING THE WARRANTY PERIOD, AND ARE EXCLUSIVE OF ALL OTHER REMEDIES. SHOULD THESE REMEDIES BE FOUND INADEQUATE OR TO HAVE FAILED OF THEIR ESSENTIAL PURPOSE FOR ANY REASON WHATSOEVER, BUYER AGREES THAT RETURN OF THE AMOUNT PAID BY BUYER TO SELLER UNDER THE CONTRACT SHALL PREVENT THE REMEDIES FROM FAILING OF THEIR ESSENTIAL PURPOSE AND SHALL BE CONSIDERED BY BUYER AS A FAIR AND ADEQUATE REMEDY.

10. **OBLIGATION OF BUYER.** Buyer is solely responsible for identifying and defining all processes and mechanical considerations and site requirements, which may affect the performance, reliability or operation of the Goods. Seller's quotation and any sale is based upon the covenant by Buyer that all information and data provided to Seller by or for Buyer is current, complete, accurate and does not contain information which is misleading.

11. **LIMITATION OF LIABILITY.** (a) THE LIABILITY OF SELLER AND ITS AFFILIATES IS LIMITED TO THE PRICE ALLOCABLE TO THE GOODS OR SERVICES DETERMINED DEFECTIVE, AND IN NO EVENT WILL THE CUMULATIVE LIABILITY OF SELLER AND ITS AFFILIATES BE IN EXCESS OF THE TOTAL PAYMENTS RECEIVED FROM BUYER UNDER THE CONTRACT, WHETHER ARISING UNDER WARRANTY/GUARANTEE, CONTRACT, NEGLIGENCE, STRICT LIABILITY, INDEMNIFICATION, DEFENSE OR ANY OTHER CAUSE OR COMBINATION OF CAUSES WHATSOEVER. ALL INSURANCE, BOND AND BANK GUARANTEE OR LETTER OF CREDIT PROCEEDS WHICH MAY BE PAID TO BUYER BY THE INSURERS, SURETIES OR BANKS OF SELLER OR ITS AFFILIATES WILL BE CREDITED AGAINST THE LIMITATION STATED ABOVE AND REDUCE THE AMOUNT OF THE CUMULATIVE LIABILITY OF SELLER AND ITS AFFILIATES. (b) NEITHER PARTY WILL BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING LOSS OF PROFITS, REVENUES OR OTHER ECONOMIC LOSSES, WHETHER ARISING UNDER WARRANTY/GUARANTEE, CONTRACT, NEGLIGENCE (INCLUDING NEGLIGENT MISREPRESENTATION), STRICT LIABILITY, INDEMNIFICATION, OR ANY OTHER CAUSE OR COMBINATION OF CAUSES, INCLUDING ANY THEORIES OF CONCURRENT LIABILITY ARISING FROM A DUTY OF CARE BY OPERATION OF LAW OR OTHERWISE. (c) THESE LIMITATIONS SHALL APPLY NOTWITHSTANDING ANY FUNDAMENTAL BREACH OR FAILURE OF ESSENTIAL PURPOSE OF ANY LIMITED REMEDY. BUYER'S REMEDIES ARE LIMITED TO THOSE REMEDIES STATED HEREIN AND THESE REMEDIES SHALL NOT FAIL THEIR ESSENTIAL PURPOSE BECAUSE BUYER IS LIMITED TO THE EXCLUSIVE REMEDIES AS STATED HEREIN. THIS SECTION 11 SHALL APPLY TO ANY ADDITIONAL PURCHASES OF EQUIPMENT (INCLUDING SPARE PARTS AND AFTER MARKET PARTS) BY BUYER FROM SELLER AFTER THE DATE OF THE ORDER.

12. **DEFAULT.** Upon the occurrence of any of the following events: (a) Seller, or any affiliate of Seller, shall not have received a payment due from Buyer, or any affiliate of Buyer, hereunder by the date such payment is due under the Contract, and such failure shall remain uncured for a period of three business days after Buyer's receipt of written notice from Seller of such non-payment; (b) the failure of Buyer or Seller to perform any other obligation in the Contract (excluding Section 5, CREDIT TERMS, which is subject to (d) below) and such failure is not excused or cured within 30 days after written notice thereof; (c) the occurrence of a Bankruptcy Event; or (d) the failure of Buyer to timely provide prepayment or Performance Assurance as set forth in Section 5, CREDIT TERMS, then the non-defaulting party, in its sole discretion and without prior notice (other than as provided above) to the defaulting party, may do any one or more of the following: (x) suspend performance under the Contract; or (y) terminate the Contract, whereby any and all obligations of the defaulting party, including payments or deliveries due, will, at the option of the non-defaulting party, become immediately due and payable or deliverable, as applicable. If, as a result of a default by Buyer, Seller suspends performance and withholds delivery of the Goods as permitted above, it may sell the Goods to a third party and deduct from the proceeds of such sale the purchase price and all reasonable costs resulting from Buyer's default as identified above, including all costs associated with the transportation (including demurrage and other vessel or shipping related charges), storage, and sale of the Goods. The foregoing rights, which shall include specific performance, shall be cumulative and alternative and in addition to any other rights or remedies to which the non-defaulting party may be entitled at law or in equity. The non-defaulting party shall be entitled to recover from the defaulting party all court costs, reasonable attorneys' fees and expenses incurred by the non-defaulting party in connection with the defaulting party's default, and interest on past due amounts as set forth in Section 4, PAYMENT TERMS. In addition, Seller will have the right to maintain a lien on the Goods until payment in full is received by Seller. "**Bankruptcy Event**" means the occurrence of any of the following events with respect to either Buyer or Seller : (a) filing of a petition or otherwise commencing, authorizing or acquiescesing in the commencement of a proceeding or cause of action under any bankruptcy, insolvency, reorganization or similar law; (b) making of an assignment or any general arrangement for the benefit of creditors; (c) having a bankruptcy petition filed against it and such petition is not withdrawn or dismissed within 30 days after such filing; (d) otherwise becoming bankrupt or insolvent (however evidenced); (e) having a liquidator, administrator, custodian, receiver, trustee, conservator or similar official appointed with respect to it or any substantial portion of its property or assets; or (f) being generally unable to pay its debts as they fall due.

13. **INTELLECTUAL PROPERTY.** (a) Seller will defend and indemnify Buyer from any claim, suit or proceeding brought against Buyer based on a claim that the Goods as manufactured and furnished by Seller and used in the manner for which it was intended and sold to Buyer constitutes an infringement of any United States, Canadian or European Union-member patent, if Seller is notified promptly in writing and

given authority, information and assistance for the defense of such claim, suit or proceeding. All aspects of the defense and settlement of any such claim, suit or proceeding shall be within Seller's sole discretion. Buyer remains solely responsible for its own costs, including all fees and expenses of its own counsel, if any, or its personnel, which are incurred in conjunction with the defense of such claim, suit or proceeding. Should it be held that the Goods constitute infringement and the use of the Goods is enjoined, Seller will, at its sole discretion and at its own expense, either procure for Buyer the right to continue using the Goods, replace the Goods with noninfringing goods, modify the Goods to become noninfringing or refund the purchase price for the infringing Goods. This indemnification does not apply to any liability for infringement (i) of any method patent where the Goods are used with other apparatus for carrying out a process resulting in a combination of steps which is deemed to infringe a method patent or patent directed to a combination of steps, (ii) the Goods are modified by Buyer, (iii) the Goods are used by Buyer in a manner different than the use communicated to and understood by Seller at the time the Goods were sold to Buyer and such use constitutes infringement, or (iv) with respect to claims of infringement where the Goods were designed and manufactured in accordance with the design or specifications furnished or required by Buyer. Seller's obligations under this indemnity, including all of its costs associated with the defense of any such suit or proceeding, shall in no event exceed the purchase price of the infringing Goods. (b) Buyer will indemnify and hold harmless Seller from any suit or proceeding brought against Seller by any third party based on claims resulting from exceptions (i), (ii), (iii) or (iv) as stated above. (c) Seller retains all intellectual property rights, whether registered or un-registered, including trademarks, patents, and copyright of all documents, drawing rights, design rights, developed programs, software, models and other data provided or developed in the course of the Contract. Seller will, if so required by Buyer, grant Buyer a non-exclusive, non-assignable royalty free license to use the same only for the purposes of operating or maintenance of the equipment by Buyer. (d) Buyer represents and warrants to Seller that Buyer has all necessary rights and permissions to provide all information provided by or on behalf of Buyer to Seller and shall indemnify Seller from any third party with respect to Seller's use of such information in connection with the Contract.

14. **DELIVERY DATE.** Seller shall use reasonable efforts to meet Buyer's requested delivery date, but Seller does not guarantee a specific delivery date.

15. **BACKCHARGES.** No backcharges will be paid or allowed by Seller unless: (a) Seller is notified in writing of any defect claim or omission pursuant to Section 9, WARRANTY, and (b) Seller provides prior approval of such backcharges in writing.

16. **CANCELLATION FEE.** Buyer may not cancel any part of the Contract except upon written notice and payment to Seller of: (a) all reasonable costs arising from the Order prior to the date of cancellation. (b) all reasonable costs arising due to the cancellation, plus (c) a cancellation fee. Unless otherwise specified in the Order, the cancellation fee shall be the higher of 35% of the total price of the Contract or $250.00. The parties agree that Seller's damages following a termination of any part of the Contract by Buyer are difficult to determine and that the cancellation fee provided by this provision is a genuine pre-estimate of loss and not a penalty and is reasonable in light of the circumstances. Seller shall be entitled to the payments set forth above if Seller terminates the Contract pursuant to Section 12, DEFAULT, or Section 17, SUSPENSION. Title to all works in progress and all materials not delivered to Buyer prior to the date of cancellation will remain with Seller.

17. **SUSPENSION AND DELAYS.** (a) Buyer may only suspend an Order upon receipt of Seller's prior written consent, which may be withheld by Seller for any reason. (b) If Buyer or any of its agents delays Seller's performance due to failure to promptly approve drawings or procedures or due to any other action or non-action on part of Buyer or its agents: (i) Buyer shall reimburse Seller for all costs incurred by Seller as of a result of such delay (including costs of reactivation), (ii) the delivery time shall be adjusted, and (iii) milestone payments (if applicable) will be adjusted to keep Seller whole for verifiable costs incurred up to the date of delay or suspension. (c) If, due to any action or non-action on the part of Buyer or its agents, Seller is delayed for more than 45 days, or such longer period of time as deemed reasonable by Seller in its sole discretion, Seller may elect to terminate the Agreement, such termination to be at Seller's sole discretion. Seller will be entitled to the payments provided in Section 16 following any such termination.

18. **FORCE MAJEURE.** Force Majeure means any circumstances beyond the reasonable control of either party, including fire, explosion, breakdown of machinery or equipment, plant shutdown, strikes or other labor disputes, acts of terrorism or war, riots or other civil disturbances or voluntary or involuntary compliance with any law, order regulation, recommendation or request of any governmental authority, inability to obtain materials necessary for manufacturer of the Goods, total or partial failure of any of Seller's usual means of transportation of the Goods, or for failure to obtain necessary governmental approvals, permits or licenses. Neither party will have any liability, other than for the payment of monies owing, for their failure to perform any of their contractual obligations arising out of or in connection with events of Force Majeure.

19. **ASSIGNABILITY.** The rights and duties under the Contract are not assignable or transferable by Buyer, in whole or in part, by operation of law or otherwise, without the prior written consent of Seller that may be granted or withheld in its sole discretion. Any assignment or attempted assignment in contravention of the foregoing shall be null and void, shall be considered a breach of the Contract and shall permit Seller, in addition to any other rights which it may have, to terminate the Contract. Seller shall have the right to assign any rights or obligations under the Contract to any third party.

20. **GOVERNING LAW.** The Contract and its execution, performance, interpretation, construction and enforcement shall be governed by the law, both procedural and substantive, of the State of Kansas, without regard to its conflicts of law rules. Any action or proceeding between Buyer and Seller relating to the Contract shall be commenced and maintained exclusively in the State or federal courts in Wichita, Kansas, and Buyer submits itself unconditionally and irrevocably to the personal jurisdiction of such courts. BUYER AND SELLER EACH WAIVE, TO THE FULLEST EXTENT PERMITTED BY LAW, ANY RIGHT IT MAY HAVE TO A TRIAL BY JURY IN RESPECT OF ANY SUIT, ACTION, CLAIM OR PROCEEDING RELATING TO THE CONTRACT.

21. **NOTICE.** All notices, consents, communications or transmittals under the Contract shall be in writing and shall be deemed received on the day of delivery if personally hand delivered or sent by facsimile or electronic transmission (with written confirmation of the completed transmittal); or within two business days if mailed as certified or registered mail with return receipt, postage prepaid addressed to the party to whom such notice is given at the address of such party stated in the Contract.

22. **ENTIRE AGREEMENT; AMENDMENT; WAIVERS.** The Contract shall supersede all prior negotiations, discussions, and dealings concerning the subject matter hereof, and shall constitute the entire agreement between Seller and Buyer concerning the subject matter hereof. There are no understandings, inducements, commitments, conditions, representations or warranties of any kind, whether direct, indirect, collateral, express or implied, oral or written, from either party to the other, other than as contained in this Agreement. Neither party shall claim any amendment, modification or release of any provisions hereof unless the same is in writing and signed by both parties. No waiver by Buyer of any breach of any terms, conditions or obligations under the Contract shall be deemed a waiver of any continuing or subsequent breach of the same or any other terms, conditions or obligations hereunder.

23. **ELECTRONIC TRANSACTIONS.** The Contract may be digitally copied and stored on computer tapes and disks (the "**Imaged Agreement**"). The Imaged Agreement (once digitally regenerated to paper form), and any facsimile, and all computer records of the foregoing, if introduced as evidence in any judicial, arbitration, mediation or administrative proceedings, will be admissible as between the parties to the same extent and under the same conditions as other business records originated and maintained in documentary form and neither party shall object on the basis that such business records were not originated or maintained in documentary form under any rule of evidence.

24. **COMPLIANCE.** (a) Buyer and Seller shall comply fully with all applicable laws and regulations in their respective performances of the Contract and shall neither take nor refrain from taking any action that could result in liability for either Buyer or Seller under applicable law, including the U.S. Foreign Corrupt Practices Act, the OECD Anti-Bribery Convention or any other applicable anti-bribery law or treaty, or those regulations maintained by the U.S. Treasury Department's Office of Foreign Assets Control (31 C. F. R. Chapter V) or the U.S. Commerce Department's Bureau of Industry and Security (15 C.F.R. Parts 730 et. Seq.). Neither Buyer nor Seller shall be required to take or refrain from taking any action impermissible or penalized under United States or other applicable laws. (b) Without restricting the generality of the foregoing: (i) Buyer does hereby acknowledge that any distribution, sale, transfer or re-export of the Goods is governed by and subject to the trade control laws of the United States. (ii) Buyer will not distribute, sell, transfer or re-export the Goods, except in conformance with United States law. (iii) If Buyer knows or has reason to know that any of its customers intends to distribute, sell, transfer or re-export the Goods, either directly or through incorporation into other products, then Buyer shall inform the customer that the customer is responsible for obtaining any licenses or other approvals from the U.S. Government before such distribution, sale, transfer or re-export, by including the following language in Buyer's purchase order acknowledgement or other appropriate documentation to its customer: *NOTICE: The products, technical data, and/or software included in this Order were provided in compliance with the laws and regulations of the United States. Customer is responsible for obtaining all licenses, permits or other approvals that may be necessary under the laws of the United States before any distribution, sale, transfer or re-export of such items and for ensuring that the end-user and end use of these products are permitted under U.S. law. Re-export, diversion, transshipment, or use contrary to U.S. law is prohibited and is cause for cancellation of this [purchase order]."* (c) Buyer's breach of this Section shall constitute cause for immediate termination of the Contract by Seller.

25. **INDEPENDENT CONTRACTORS.** Seller and Buyer are independent contractors only and are not partners, master/servant, principal/agent or involved herein as parties to any other similar legal relationship with respect to the transactions contemplated under the Contract or otherwise, and no fiduciary, trust, or advisor relationship, nor any other relationship imposing vicarious liability shall exist between the parties under the Contract or otherwise at law.

26. **NO THIRD PARTY BENEFICIARIES.** The Contract is solely for the benefit of, and shall inure to the benefit of, Buyer and Seller, and shall not otherwise be deemed to confer upon or give to any third party any right, claim, cause of action or other interest herein.

27. **SEVERABILITY.** The invalidity or unenforceability of any provision of the Contract shall not affect the validity or enforceability of its other provisions and the remaining provisions shall remain in full force and effect.

28. **CONFIDENTIALITY.** All information that Buyer acquires from Seller hereunder, directly or indirectly, and all information that arises out of the sale of the Goods or Services hereunder, concerning such Goods, Services, and/or proprietary processes involved, including information concerning Seller's current and future business plans, information relating to Seller's operations, know-how, and other Seller-furnished information shall be deemed Seller's "**Proprietary Information**". Buyer shall (a) hold Seller's Proprietary Information in strictest confidence, (b) not disclose it to others, (c) use it solely for purposes of this Agreement and (d) upon Seller's request, either promptly deliver to Seller all such Proprietary Information that is in written, electronic or other form, including copies and summaries, or, at Seller's option, destroy such Proprietary Information and provide Buyer certification of such destruction. The obligations under this Section shall survive the expiration or termination of the Contract.

29. **MISCELLANEOUS.** The captions and section headings set forth in the Contract are used for convenience only and shall not be used in defining or construing any of the terms and conditions set forth in the Contract. The term "**days**", as used herein, shall mean actual days occurring, including, Saturdays, Sundays and holidays where banks are authorized to be closed in the city where Seller's chief executive office is located. The term "**business days**" shall mean days other than Saturdays, Sundays and holidays where banks are authorized to be closed in the city where Seller's chief executive office is located. The term "**including**" or any variation thereof means "**including, without limitation**" and shall not be construed to limit any general statement that it follows to the specific items immediately following it. Unless the context indicate otherwise, words importing the singular number shall include the plural and vice versa, and words importing person shall include firms, association, partnerships and corporations, including public bodies and governmental entities, as well as natural persons, and words of masculine gender shall be deemed to include correlative words of the feminine gender and vice versa as the circumstances may require. The United Nations Convention on Contracts for the International Sale of Goods shall not apply.

[End of General Terms and Conditions of Sale]

ATTACHMENT B - TECHNICAL ASSISTANCE AGREEMENT

JOHN ZINK HAMWORTHY COMBUSTION

DOMESTIC - TECHNICAL ASSISTANCE AGREEMENT "H" (VAPOR CONTROLS)

Scheduled Starting Date of Services: _____ Scheduled Completion Date of Services: _____

Is work tax exempt? ☐ ***Yes or*** ☐ ***No - If yes, return a tax exempt certificate with this agreement other wise tax will be charged.***

"COMPANY": _____
Address: _____
_____
Billing Address: _____
_____
Work Site Address: _____
_____
Point of Contact: _____
Phone: _____
FAX: _____
E-mail: _____

"CONTRACTOR":
John Zink Company, LLC
11920 East Apache, Tulsa, Oklahoma 74116
Point of Contact: _____
Phone: _____
FAX: _____
E-mail: _____
Service Required: _____
_____
_____
Equipment S.O. No.: _____

CALCULATION AND PAYMENT OF CHARGES

Calculations of rates for Labor, Travel Time, Travel Expenses, Living Expenses, Standby Time, Training, Field Materials, OEM Replacement Parts, Subcontracted Work, Rental Equipment, JZ Owned Equipment, and Freight shipments shall be governed by Exhibit 1 "Domestic Reimbursable Hourly Rate Schedule" hereto attached. Payment of invoices shall be made net 30 days after submittal of the invoice. Documents supporting the invoices shall be furnished upon request. Payments due hereunder are not subject to any setoffs with any other contract.

WORKING HOURS

The normal working hours, consists of •"**Straight Time**" rates apply to the first eight (8) hours *(per shift)* of the workday on Monday, Tuesday, Wednesday, Thursday, or Friday. •"**Overtime**" rates apply for all hours in excess of Straight Time, except for Double Time situations. •"**Double Time**" rates apply on nationally recognized Holidays and on Saturday, Sunday after the first eight (8) hours *(per shift)* of the workday.

SERVICES PROVIDED

The sole function of the Contractor's service personnel shall be to provide the technical advice and assistance expressly stated above. All services performed by the Contractor are expressly limited and conditioned upon the Company's acceptance of this Technical Assistance Agreement and the terms stated therein and any provision or differing terms proposed by Company shall be void and of no effect, unless accepted in writing by Contractor. No change to this Agreement shall be valid unless in writing, signed by the Company and Contractor. If this Agreement is incorporated into the purchase order or other agreement issued by the Company, which shall only be done with the approval of the Contractor, the terms of this Agreement shall take precedence over all conflicting terms stated in such other documents.

THE SERVICES PROVIDED BY THE CONTRACTOR HEREUNDER DO NOT SERVE TO MODIFY, WAIVE OR OTHERWISE LIMIT OR EXPAND THE TERMS OF THE CONTRACT WHICH APPLY TO THE SALE OF THE EQUIPMENT UPON WHICH SERVICES ARE TO BE PERFORMED BY THE CONTRACTOR.

In witness whereof, the parties to this Agreement have executed this Agreement effective as of the latest date stated below.

COMPANY

(Signature) _____
Company (print): _____
Name (print): _____
Title (print): _____
Date: _____

CONTRACTOR

(Signature) _____
Contractor: John Zink Company, LLC
Name (print): _____
Title (print): _____
Date: _____

DOMESTIC - TECHNICAL ASSISTANCE AGREEMENT "H" (VAPOR CONTROLS)

1. RELATIONSHIP OF THE PARTIES. The parties hereto are independent contractors and neither the Contractor nor the Contractor's personnel are agents, servants or employees of the Company or its contractors or subcontractors. The Contractor shall notify the Company before proceeding with and upon completion of the services. At all times when Contractor's service personnel are present or performing services at the Company's work site, the Company shall provide an authorized representative to whom the Contractor's service personnel shall report and who shall be responsible for the safety of all persons and protection of all property in and adjacent to the work site. In providing the services hereunder, the Contractor assumes no right or duty to control or shut down the project or equipment or to control or direct the safety, operational, or maintenance procedures or methods utilized at the work site. Contractor assumes no responsibility for workmanship, productivity, technical qualification or training and qualification requirements of the personnel of the Company or others. Company shall provide emergency medical aid to Contractor's service personnel. Contractor shall reimburse Company for the cost of such aid.

2. ACCESS TO EQUIPMENT. Contractor shall have free access to the work site and the equipment.

3. EXCLUSIONS. Parts used shall be to the Company's account and shall be approved by the Company. Removed components shall be disposed of by, and decontamination shall be the responsibility of, the Company.

4. WARRANTY. All services shall be performed by Contractor in a workmanlike manner, consistent with U.S. industry practices. If, within three months of performance of the services, any services prove deficient, Contractor will correct the deficiency. THERE ARE NO OTHER WARRANTIES, EXPRESS OR IMPLIED, EXCEPT AS EXPRESSLY STATED HEREIN. CONTRACTOR EXTENDS NO IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE. The Contractor shall not be responsible for goods and services furnished by the Company or others, or the costs thereof, without the Contractor's prior written agreement. Company's remedies under warranty are specifically limited to the correction of any deficient services performed by Contractor and are exclusive of all other remedies.

5. INSURANCE. Contractor shall maintain, and at Company's request shall provide Company with certificates evidencing, the following insurance coverage: (a) Statutory Workers' Compensation and Employer's Liability Insurance, with limits of $500,000.00 per occurrence; (b) Commercial General Liability Insurance, with a combined single limit for bodily injury and property damage of $1,000,000.00 per occurrence and in the aggregate; and (c) Automobile Liability Insurance, with a combined single limit for bodily injury and property damage of $1,000,000.00 per accident. Contractor's certificate of insurance shall include insurers' statement that should any of the above described policies be cancelled before the expiration date thereof, notice will be delivered in accordance with the policy provisions. Contractor shall not be required to provide endorsements of additional insured or waiver or subrogation. Company shall maintain the risk of physical loss or damage to its property and the work site, including, but not limited to, materials, equipment and supplies being shipped to, entering into, forming part of, or intended to be incorporated into the property at or near the work site.

6. INDEMNITY. CONTRACTOR SHALL, AT ITS OWN COST AND EXPENSE AND TO THE FULLEST EXTENT ALLOWED BY APPLICABLE LAWS, SUBJECT TO THE LIMIT ON CONTRACTOR'S LIABILITY, DEFEND, INDEMNIFY AND HOLD HARMLESS COMPANY, ITS PARENT, AFFILIATES, SUBSIDIARIES, OFFICERS, DIRECTORS, EMPLOYEES AND AGENTS, AND THEIR SUCCESSORS AND ASSIGNS AGAINST ALL DAMAGES, LOSSES, COSTS, CLAIMS, STRICT LIABILITY CLAIMS, LIENS, ENCUMBRANCES, LIABILITIES, AND EXPENSES (INCLUDING ATTORNEYS' FEES), AS AND TO THE EXTENT ARISING OUT OF OR RESULTING FROM THE NEGLIGENT ACTS OR OMISSIONS OF CONTRACTOR. COMPANY SHALL, AT ITS OWN COST AND EXPENSE AND TO THE FULLEST EXTENT ALLOWED BY APPLICABLE LAWS, SUBJECT TO THE LIMITS ON COMPANY'S LIABILITY, DEFEND, INDEMNIFY AND HOLD HARMLESS CONTRACTOR, ITS PARENT, AFFILIATES, SUBSIDIARIES, OFFICERS, DIRECTORS, EMPLOYEES AND AGENTS, AND THEIR SUCCESSORS AND ASSIGNS, AGAINST ALL DAMAGES, LOSSES, COSTS, CLAIMS, STRICT LIABILITY CLAIMS, LIENS, ENCUMBRANCES, LIABILITIES, AND EXPENSES (INCLUDING ATTORNEYS' FEES), AS AND TO THE EXTENT ARISING OUT OF OR RESULTING FROM THE NEGLIGENT ACTS OR OMISSIONS OF COMPANY. ALL LIABILITY, LOSSES, DAMAGES, COSTS OR EXPENSES RESULTING FROM PERSONAL INJURY, INCLUDING DEATH, LOSS OF OR PHYSICAL DAMAGE TO PROPERTY, CAUSED BY THE JOINT OR CONCURRING ACTS OF COMPANY AND CONTRACTOR, AND THEIR RESPECTIVE OFFICERS, DIRECTORS, EMPLOYEES OR AGENTS, SHALL BE BORNE BY COMPANY AND CONTRACTOR TO THE EXTENT EACH IS DETERMINED NEGLIGENT EITHER BY AGREEMENT OF THE PARTIES OR BY A COURT OF COMPETENT JURISDICTION. THE OBLIGATIONS OF THE PARTIES UNDER THIS PARAGRAPH SHALL SURVIVE THE EXPIRATION OR OTHER TERMINATION OF THIS AGREEMENT.

7. LIMITATIONS OF LIABILITY. In no event, whether based on contract, indemnification, warranty, tort, or any other cause or combination of causes whatsoever, shall either party be liable to the other party or the other party's parent, affiliates, officers, directors, employees or agents, for loss of profit or special, incidental, indirect, or consequential damages. This limitation shall apply notwithstanding any failure of essential purpose of any limited remedy. Contractor's cumulative liability on all claims of any kind, whether based on contract, indemnification, warranty, tort, or any other cause or combination of causes whatsoever, shall in no event exceed the order price.

8. MISCELLANEOUS: (a) The Company's audit rights shall consist of Contractor making available for Company's examination, at Contractor's home offices, the directly relevant and pertinent time sheets. (b) This Agreement supersedes all previous agreements and understandings of the parties on this subject matter and constitutes the entire Agreement between the parties. (c) If any provision of this Agreement is held to be illegal or invalid for any reason by a court of competent jurisdiction, the remaining provisions hereof shall be unimpaired and the illegal or invalid provision shall be construed and applied so as to most closely effectuate its intent.

9. APPLICABLE LAW. These terms and conditions, this order and the legal relations of the parties shall be determined in accordance with the laws of the State of Texas, irrespective of Texas choice of law provisions. The parties disclaim any applicability of the U.N. Convention of the International Sale of Goods to the order. The parties hereby consent to the exclusive jurisdiction of either the District Court of Harris County, Texas, or the United States District Court for the Southern District of Texas, Houston Division (whichever is applicable), with respect to disputes relating to the order.

JOHN ZINK HAMWORTHY COMBUSTION

EXHIBIT 1
Domestic Reimbursable Hourly Rate Schedule

2014 *(Rev 0)*

*Hourly Rates for Locations **without a Preventative Maintenance (PM) Contract in place** with JZ*
(These rates are our standard rates)

Craft Description	Straight Time	Overtime	Double Time
Service Technicians	$133.00	$200.00	$266.00

Engineering Description	Straight Time	Overtime
Drafting	$110.00	$165.00
Engineers	$200.00	$300.00
Senior Engineers / Project Manager	$275.00	$413.00

*Hourly Rates for Locations **with a Preventative Maintenance (PM) Contract in place** with JZ*
(These rates are discounted 10% from our standard rates)

Craft Description	Straight Time	Overtime	Double Time
Service Technicians	$120.00	$180.00	$240.00

Engineering Description	Straight Time	Overtime
Drafting	$99.00	$149.00
Engineers	$180.00	$270.00
Senior Engineers / Project Manager	$247.50	$371.25

Notes: •The above hourly rates include those taxes imposed on income, gross receipts and contributions and taxes for unemployment insurance, old age retirement benefits, pensions, annuities imposed by the United States or any state or political sub-division thereof, however measured. •The above rates do not include VAT, sales taxes, use taxes, and/or excise taxes. •The above rates do not include travel and living expenses. •All rates are in US dollars.

OTHER FIELD CHARGES

A. **Travel Time:** Man-hours for travel are calculated on a portal to portal basis and are in addition to hours worked.
B. **Travel Expenses:** JZ truck(s) will be billed at $0.70 per mile. Airline tickets, rental cars, parking fees, toll roads, etc. will be invoiced at cost plus 15%.
C. **Airline Travel:** Airline travel that takes eight (8) hours or more will be Business Class Travel. Airline travel that is less than eight (8) hours will be Economy Plus Travel.
D. **Living Expenses:** Meals and hotels will be invoiced at a cost plus 15%.
E. **Standby Time:** Service Technicians put on stand-by will be paid 8 hours/day. The minimum 8-hour shift can be combined with time worked during the shift. Overtime rates are paid when the work extends past the 8-hour minimum.
F. **Training:** Training required to enter the facility will be billed at cost plus 15%.for the training, plus the man-hours required for the training.
G. **Field Materials:** Field materials such as, pipe, fittings, flanges, gaskets, pipe supports, etc. will be billed at cost plus 20%.
H. **OEM Replacement Parts:** John Zink OEM parts and replacement equipment will be invoiced at normal pricing.
I. **Subcontracted Work:** will be billed at vendor's invoice plus 20%.
J. **Rental Equipment:** including, but not limited to cranes, forklifts, trailers, scaffold, welding machines, power tools, hand tools, breathing air, etc. will be billed at invoice plus 20%.
K. **JZ Owned Equipment:** (i.e.; trucks, tools, etc.) shall be billed at $100.00 per day.
L. **Freight shipments:** ExWorks Tulsa, OK, or corresponding fabrication facility. Freight charges will be pre-paid and added to invoice.