Denbury

June 3, 2025

Mississippi Department of Environmental Quality
Office of Pollution Control
Environmental Permits Division
515 E. Amite Street
Jackson, MS 39201

**RE: Notice of Intent for Coverage Under the Oil Production General Permit**
**Denbury Onshore, LLC**
**Brookhaven Central Processing Facility**
**AI No.: 19606; Permit No.: 1620-00050**
**Lincoln County, MS**

In accordance with MAC Title 11, Part 2, submitted with this are two (2) bound sets of the referenced material. An electronic copy has also been submitted through the EPD Electronic Application Submittal webpage. Request is hereby made for coverage under the Oil Production General Permit (OPGP).

The facility functions as an oil & gas production site and operates controls such that criteria pollutant emissions will not exceed emission rates restricted in the Oil Production General Permit, nor will hazardous air pollutant (HAP) emissions exceed any HAP emission rates restricted in the Oil Production General Permit. Details of the operations, emission estimates, and associated emission programs are included herein and verify that the facility should be classified as a synthetic minor source under the State and Federal air permitting programs. All measures should be taken in the review process to assure that the minor classification is federally recognized.

A copy of the public notice is enclosed and will be published in the Daily Leader. Additionally, a copy of the public notice and the complete OPGP NOI will be provided to the Lincoln County Public Library. The public notice, notarized proof of publication, and library proof of receipt will be submitted to MDEQ when available.

If any other information is required regarding these matters, please do not hesitate to contact HLP Engineering, Inc. at (337) 839-1075. All written correspondence should be directed to my attention at: **Denbury Onshore, LLC, 5851 Legacy Circle, Suite 1200, Plano, TX 75024**. Thank you in advance for your assistance with this matter.

Sincerely,
**DENBURY ONSHORE, LLC**

Kevin Hendricks
Enclosures

# Notice of Intent for Oil Production General Permit

***Denbury Onshore, LLC***

***Brookhaven Central Processing Facility***
***Lincoln County, MS***

***June 2025***

Denbury

# Table of Contents

# MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE

**Facility (Agency Interest) Information** | **Section OPGP - A**

## 1. Name, Address, and Location of Facility

A. Owner/Company Name: Denbury Onshore, LLC

B. Facility Name (*if different than A. above)* : Brookhaven Central Processing Facility

C. Facility Air Permit/Coverage No. *(if known)* : 1620-00050

D. Agency Interest No. *(if known)* : 19606

E. Physical Address

1. Street Address: 1030 California Road
2. City: Brookhaven
3. State: MS
4. County: Lincoln
5. Zip Code: 39601
6. Telephone No.: 972-673-2529
7. Fax No.:
8. Are facility records kept at this location? ☐ Yes ☑ No. Please complete Item 10.

F. Mailing Address

1. Street Address or P.O. Box: 5851 Legacy Circle, Suite 1200
2. City: Plano
3. State: TX
4. Zip Code: 75024

G. Latitude/Longitude Data

1. Collection Point (*check one* ):
   ☐ Site Entrance ☑ Other: Facility Center
2. Method of Collection (*check one* ):
   ☐ GPS Specify coordinate system (NAD 83, etc.)
   ☑ Map Interpolation (Google Earth, etc.) ☐ Other: Plot plan
3. Latitude (*degrees/minutes/seconds)* : 31 35 29.10
4. Longitude (*degrees/minutes/seconds* ): 90 31 05.90
5. Elevation (*feet* ): 480±

H. SIC Code: 1311

## 2. Name and Address of Facility Contact

A. Name: Kevin Hendricks Title: Environmental Compliance Coordinator

B. Mailing Address

1. Street Address or P.O. Box: 5851 Legacy Circle, Suite 1200
2. City: Plano
3. State: TX
4. Zip Code: 75024
5. Fax No.:
6. Telephone No.: 972-673-2529
7. Email: kevin.hendricks@exxonmobil.com

# MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE

**Facility (Agency Interest) Information** | **Section OPGP - A**

## 3. Name and Address of Air Contact (*if different from Facility Contact*)

A. Name: _____ Title: _____

B. Mailing Address
1. Street Address or P.O. Box: _____
2. City: _____ 3. State: _____
4. Zip Code: _____ 5. Fax No.: _____
6. Telephone No.: _____
7. Email: _____

## 4. Name and Address of Responsible Official for the Facility

*The Form must be signed by a Responsible Official as defined in 11 Miss. Admin. Code Pt.2, R. 2.1.C(24).*

A. Name: Rusty Shaw Title: Director of Regulatory Affairs

B. Mailing Address
1. Street Address or P.O. Box: 5851 Legacy Circle, Suite 1200
2. City: Plano 3. State: TX
4. Zip Code: 75024 5. Fax No.: _____
6. Telephone No.: 972-673-2777
7. Email: rusty.shaw@exxonmobil.com

C. Is the person above a duly authorized representative and not a corporate officer?
☑ Yes ☐ No
If yes, has written notification of such authorization been submitted to MDEQ?
☑ Yes ☐ No ☐ Request for authorization is attached

## 5. Type of Oil Production Notice of Intent (*Check all that apply*)

☑ Initial Coverage
☐ Re-Coverage for existing Coverage
☐ Modification with Public Notice
☐ Modification without Public Notice
☐ Update Compliance Plan

# MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE

**Facility (Agency Interest) Information** | **Section OPGP - A**

## 6. Equipment List (*Check all that apply*)

*Complete supporting emission calculations must be included for each potential emission unit selected below.*

- ☑ Heater Treater. Include a completed Section OPGP-C Form for each unit.
- ☑ Condensation Storage Vessel. Include a completed Section OPGP-E Form for each unit.
- ☑ Water Storage Vessel. Include a completed Section OPGP-E Form for each unit.
- ☐ Internal Combustion Engine. Include a completed Section OPGP-D Form for each unit.
- ☑ Flare. Include a completed Section OPGP-F Form for each unit.
- ☐ Oil Truck Loading (Section OPGP-B Form)
- ☑ Component Fugitive Emissions (Section OPGP-B Form)
- ☑ Other: Compressor Blowdowns, Heater Treater Flash Gas, Water Flash Vessel Flash Gas

## 7. Process/Product Details

Maximum Anticipated Well(s) Production for Faciltiy:

| Produced Material | Throughput | Units |
|---|---|---|
| Gas | | MMCF/day |
| Oil | 2,000 | barrels/day |
| Water | 12,000 | barrels/day |
| Other (Specify) | | |

Maximum Anticipated Throughput for Principal Product(s) (*as applicable*):

| Produced Material | Throughput | Units |
|---|---|---|
| Flared Gas | 0.27 | MMCF/day |
| Oil | 2,000 | barrels/day |
| Water | 12,000 | barrels/day |
| Other (Specify) | | |

## 8. Zoning

A. Is the facility (either existing or proposed) located in accordance with any applicable city and/or county zoning ordinances? If no, please explain
Yes

B. Is the facility (either existing or proposed) required to obtain any zoning variance to locate/expand the facility at this site? If yes, please explain.
No

C. Is the required USGS quadrangle map or equivalent attached? ☑ Yes ☐ No

# MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE

**Facility (Agency Interest) Information** | **Section OPGP - A**

## 9. MS Secretary of State Registration / Certificate of Good Standing

*No permit will be issued to a company that is not authorized to conduct business in Mississippi. If the company applying for the permit is a corporation, limited liability company, a partnership or a business trust, the application package should include proof of registration with the Mississippi Secretary of State and/or a copy of the company's Certificate of Good Standing. The name listed on the permit will include the company name as it is registered with the Mississippi Secretary of State.*

*It should be noted that for an application submitted in accordance with 11 Miss. Admin. Code Pt. 2, R. 2.8.B. to renew a State Permit to Operate or in accordance with 11 Miss. Admin. Code Pt. 2, R. 6.2.A(1)(c). to renew a Title V Permit to be considered timely and complete, the applicant shall be registered and in good standing with the Mississippi Secretary of State to conduct business in Mississippi.*

## 10. Address and Location of Facility Records

Physical Address

1. Street Address: 5851 Legacy Circle, Suite 1200
2. City: Plano
3. State: TX
4. County: Collin
5. Zip Code: 75024
6. Telephone No.: 972-673-2529
7. Fax No.:

# MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE

| Facility (Agency Interest) Information | Section OPGP - A |
|---|---|

**11. Certification**

*The Form must be signed by a Responsible Official as defined in 11 Miss. Admin. Code Pt. 2, R. 2.1.C.(24).*

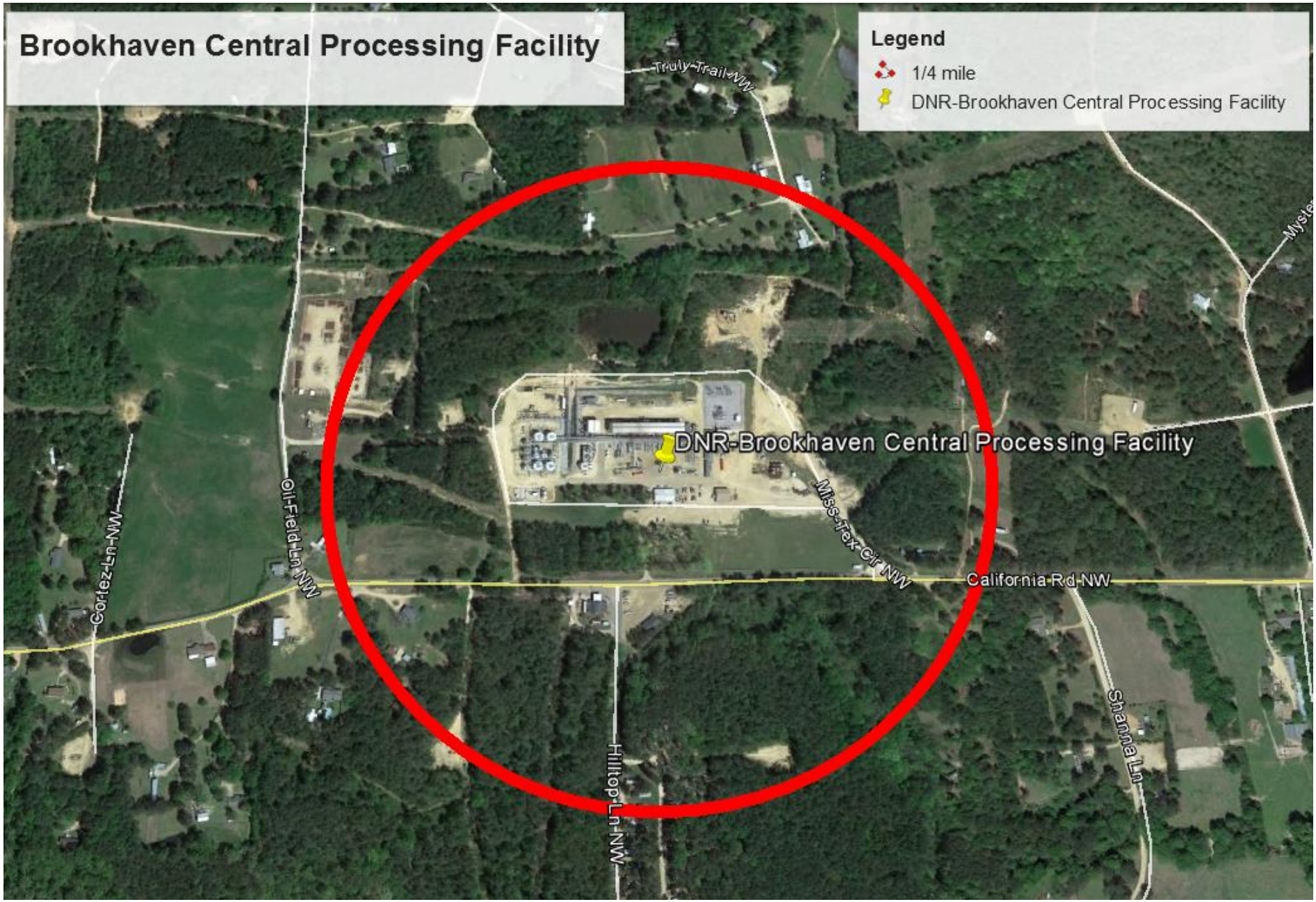
*I certify that to the best of my knowledge and belief formed after reasonable inquiry, the statements and information in this application are true, complete, and accurate, and that as a responsible official, my signature shall constitute an agreement that the applicant assumes the responsibility for any alteration, additions, or changes in operation that may be necessary to achieve and maintain compliance with all applicable Rules and Regulations. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.*

Rusty Shaw
**Signature of Responsible Official/DAR**

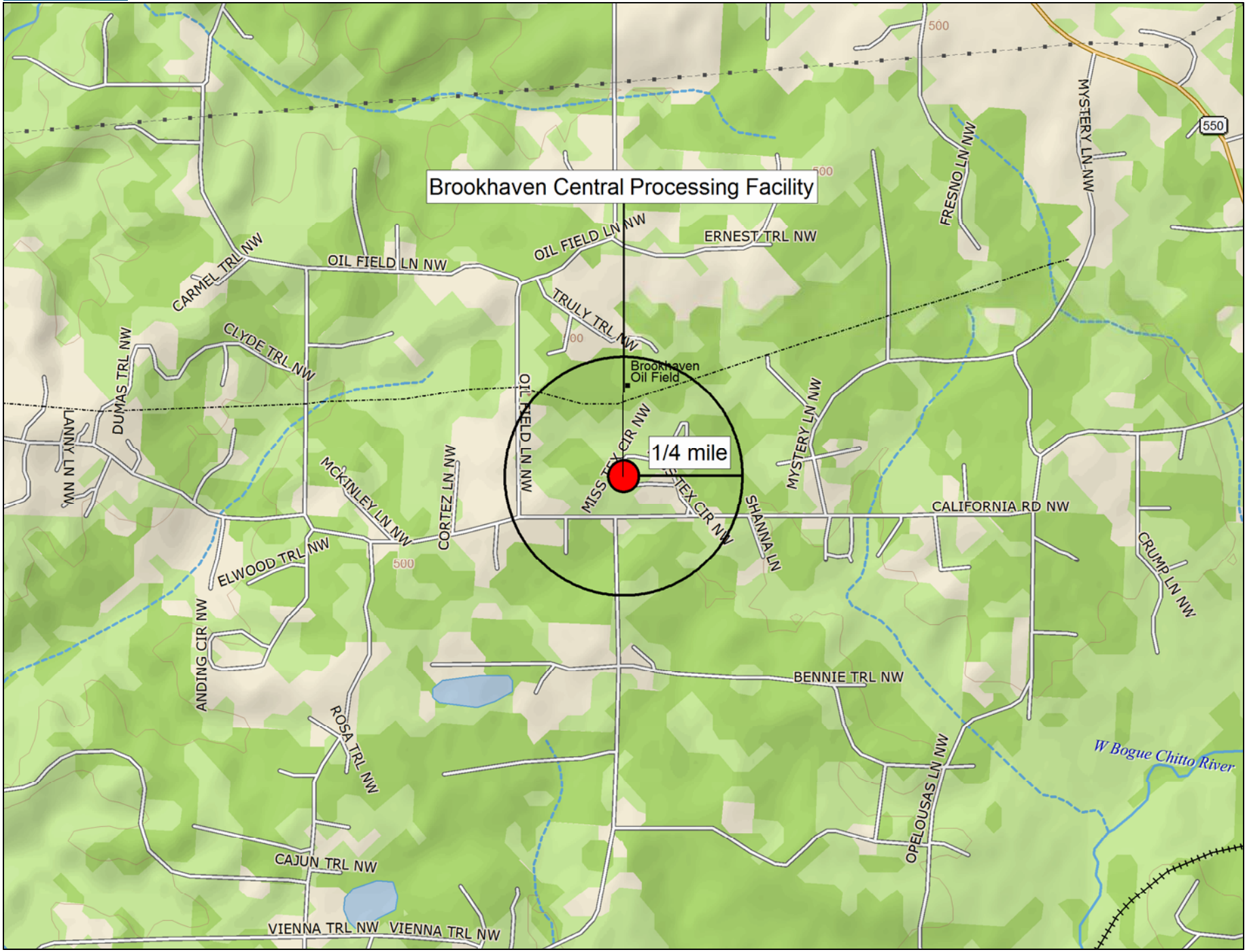
5/29/25
**Date**

Rusty Shaw
**Printed Name**

Director of Regulatory Affairs
**Title**


Brookhaven Central Processing Facility
Legend
1/4 mile
DNR-Brookhaven Central Processing Facility
DNR-Brookhaven Central Processing Facility
Truly Trail NW
Cortez Ln NW
Oil Field Ln NW
Miss Tex Cir NW
California Rd NW
Hilltop Ln NW
Shanna Ln


DNR-Brookhaven Central Processing Facility






TN

MN (0.7°W)

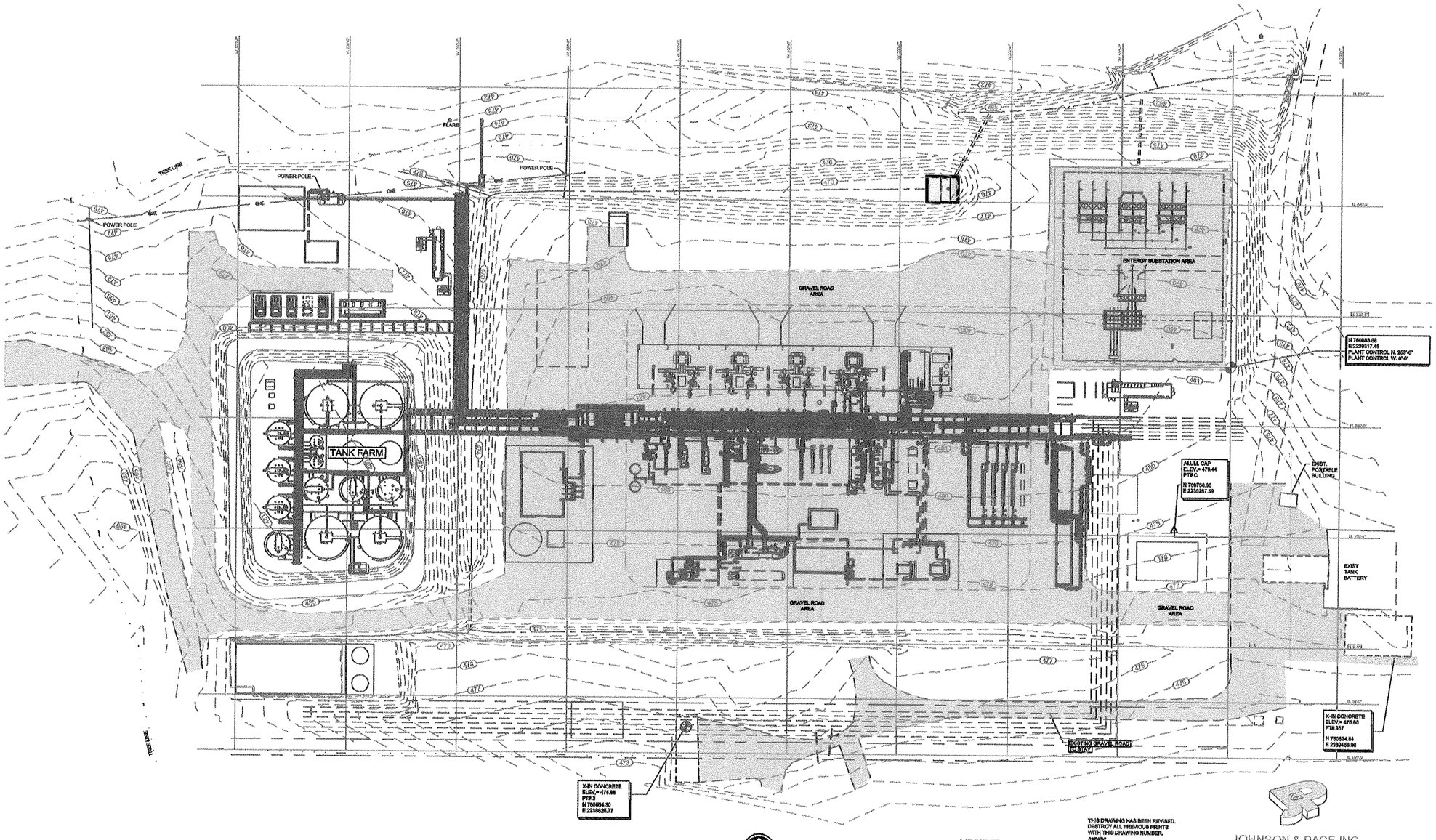
Scale 1 : 20,000

0 600 1200 1800 2400 3000 ft

0 180 360 540 720 900 m

1" = 1,666.7 ft

Data Zoom 13-0




FACILITY SITE PLAN

(SCALE 1" =40')

**LEGEND:**

FINISHED GRADE CONTOUR

GRAVEL OR LIMESTONE

THIS DRAWING HAS BEEN REVISED. DESTROY ALL PREVIOUS PRINTS WITH THIS DRAWING NUMBER. 03/09/05

THIS DRAWING IS BASED ON SITE ELEVATIONS AS OF 02/28/05

THE EQUIPMENT SHOWN IS BASED ON ATLAS'S DRAWING DATED 08/04/05

THE TANK FARM SHOWN IS BASED ON ATLAS'S DRAWING DATED 02/21/05

JOHNSON & PACE INC.
ENGINEERS · SURVEYORS · PLANNERS
UNION PLAZA 1, 1201 NW LOOP 281 LB1, LONGVIEW, TEXAS 75604
(903)753-0663 FAX (903)753-0603
website: www.johnsonpace.com

Bowlin & Associates, Inc.
General Contracting & Engineering
442 Ontario Street
Shreveport, LA 71106
Phone: (318) 868-3368 Cell: (318) 426-1640

DENBURY RESOURCES INC.
LINCOLN COUNTY, MISSISSIPPI
BROOKHAVEN CENTRAL PROCESS FACILITY

| NO. | BY | DATE | REVISIONS |
|---|---|---|---|
| 4 | BS | 03/09/05 | UPDATED |
| 3 | BS | 09/07/04 | ISSUED FOR REVIEW |
| 2 | BW | 09/07/04 | REVISED DATUM |
| 1 | BW | 08/27/04 | RECEIVED COMMENTS |
| 0 | BS | 08/11/04 | PER ATLAS COMMENTS |
| NO. | BY | DATE | ISSUING |
| 2 | BS | 01/24/05 | UPDATED ATLAS MACHINERY |

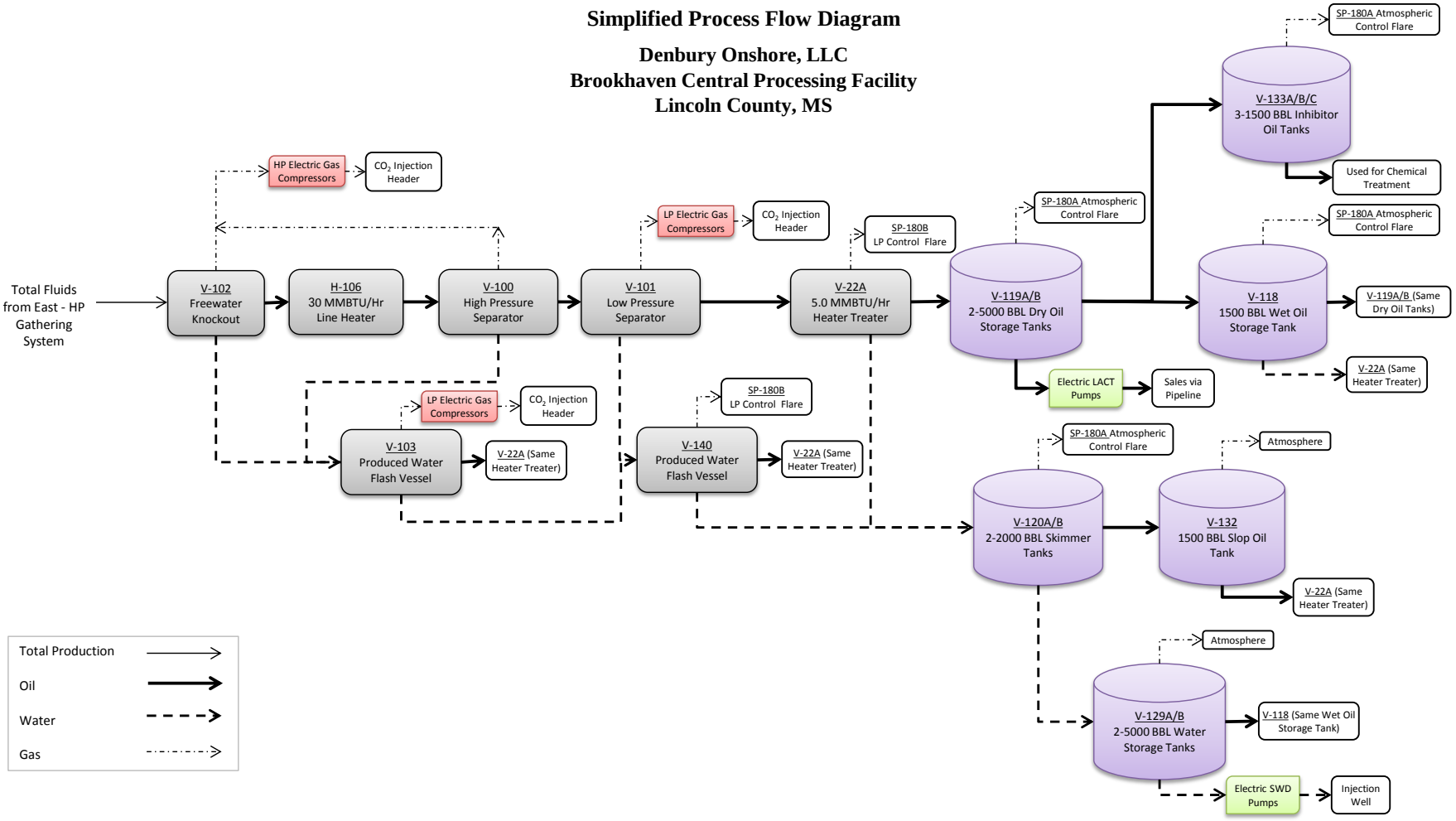
DESIGNED BY: BS
DRAWN BY: BS
CHECKED BY: BS
APPROVED BY:
DATE: 08/19/04
SCALE: 1"=40'
SHEET NO. 3
JOB NUMBER: 10100-08

EDIT DATE & TIME: 03/09/05

FACILITY SITE PLAN

# Simplified Process Flow Diagram

## Denbury Onshore, LLC
## Brookhaven Central Processing Facility
## Lincoln County, MS



## Section OPGP-B.1: Maximum Uncontrolled Emissions (under normal operating conditions)

## MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE

Maximum Uncontrolled Emissions are the emissions at maximum capacity and prior to (in the absence of) pollution control, emission-reducing process equipment, or any other emission reduction. Calculate the hourly emissions using the worst case hourly emissions for each pollutant. For each pollutant, calculate the annual emissions as if the facility were operating at maximum plant capacity without pollution controls for 8760 hours per year, unless otherwise approved by the Department. List Hazardous Air Pollutants (HAP) in Section OGP-B.3 and GHGs in Section OGP-B.4. Emission Point numbering must be consistent throughout the application package. Fill all cells in this table with the emission numbers or a "-" symbol. A "-" symbol indicates that emissions of this pollutant are not expected. Emissions > 0.01 TPY must be included. Please do not change the column widths on this table.

| Emission Point ID | TSP[1] (PM) | | PM-10[1] | | PM-2.5[1] | | $SO_2$ | | NOx | | CO | | VOC | | TRS[2] | | Lead | | Total HAPs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | lb/hr | ton/yr | lb/hr | ton/yr | lb/hr | ton/yr | lb/hr | ton/yr | lb/hr | ton/yr | lb/hr | ton/yr | lb/hr | ton/yr | lb/hr | ton/yr | lb/hr | ton/yr | lb/hr | ton/yr |
| 1-05-LH-BS | 0.27 | 1.20 | 0.27 | 1.20 | 0.27 | 1.20 | 0.04 | 0.19 | 3.59 | 15.73 | 3.02 | 13.22 | 0.20 | 0.87 | 0.00 | 0.00 | - | - | 0.07 | 0.30 |
| 2-05-HT-BS | 0.05 | 0.20 | 0.05 | 0.20 | 0.05 | 0.20 | 0.01 | 0.03 | 0.60 | 2.62 | 0.50 | 2.20 | 0.03 | 0.14 | 0.00 | 0.00 | - | - | 0.01 | 0.05 |
| 3-05-LH-BS | 0.02 | 0.10 | 0.02 | 0.10 | 0.02 | 0.10 | 0.00 | 0.02 | 0.30 | 1.31 | 0.25 | 1.10 | 0.02 | 0.07 | 0.00 | 0.00 | - | - | 0.01 | 0.02 |
| 4-05-SBP | - | - | - | - | - | - | - | - | - | - | - | - | 0.61 | 0.22 | 0.00 | 0.00 | - | - | 0.04 | 0.01 |
| 5-05-OST-V | - | - | - | - | - | - | - | - | - | - | - | - | 3.00 | 13.15 | 0.00 | 0.00 | - | - | 0.16 | 0.69 |
| 6a-05-OST-CV | - | - | - | - | - | - | - | - | - | - | - | - | 9.03 | 39.54 | 0.00 | 0.00 | - | - | 0.47 | 2.07 |
| 6b-05-OST-CV | - | - | - | - | - | - | - | - | - | - | - | - | 9.03 | 39.54 | 0.00 | 0.00 | - | - | 0.47 | 2.07 |
| 7a-05-ST-CV | - | - | - | - | - | - | - | - | - | - | - | - | 13.25 | 58.00 | 0.00 | 0.00 | - | - | 0.69 | 3.04 |
| 7b-05-ST-CV | - | - | - | - | - | - | - | - | - | - | - | - | 13.25 | 58.00 | 0.00 | 0.00 | - | - | 0.69 | 3.04 |
| 8a-05-WST-CV | - | - | - | - | - | - | - | - | - | - | - | - | 2.37 | 10.36 | 0.00 | 0.00 | - | - | 0.16 | 0.72 |
| 8b-05-WST-CV | - | - | - | - | - | - | - | - | - | - | - | - | 2.37 | 10.36 | 0.00 | 0.00 | - | - | 0.16 | 0.72 |
| 9-05-SOT-V | - | - | - | - | - | - | - | - | - | - | - | - | 0.50 | 2.18 | 0.00 | 0.00 | - | - | 0.05 | 0.20 |
| 10-05-IOT-V | - | - | - | - | - | - | - | - | - | - | - | - | 1.18 | 5.17 | 0.00 | 0.00 | - | - | 0.08 | 0.33 |
| 11-05-IOT-V | - | - | - | - | - | - | - | - | - | - | - | - | 1.18 | 5.17 | 0.00 | 0.00 | - | - | 0.08 | 0.33 |
| 12-05-IOT-V | - | - | - | - | - | - | - | - | - | - | - | - | 1.18 | 5.17 | 0.00 | 0.00 | - | - | 0.08 | 0.33 |
| 13-05-ITT-V | - | - | - | - | - | - | - | - | - | - | - | - | 0.01 | 0.05 | 0.00 | 0.00 | - | - | 0.01 | 0.05 |
| 14-05-ITT-V | - | - | - | - | - | - | - | - | - | - | - | - | 0.01 | 0.05 | 0.00 | 0.00 | - | - | 0.01 | 0.05 |
| 15-05-ITT-V | - | - | - | - | - | - | - | - | - | - | - | - | 0.05 | 0.21 | 0.00 | 0.00 | - | - | 0.05 | 0.21 |
| 17-05-GST | - | - | - | - | - | - | - | - | - | - | - | - | 0.02 | 0.07 | 0.00 | 0.00 | - | - | 0.02 | 0.07 |
| 19-05-SUMP | - | - | - | - | - | - | - | - | - | - | - | - | 0.12 | 0.50 | 0.00 | 0.00 | - | - | 0.12 | 0.50 |
| 20-05-SUMP | - | - | - | - | - | - | - | - | - | - | - | - | 0.12 | 0.50 | 0.00 | 0.00 | - | - | 0.12 | 0.50 |
| 21-05-ST | - | - | - | - | - | - | - | - | - | - | - | - | 0.01 | 0.02 | 0.00 | 0.00 | - | - | 0.01 | 0.02 |
| 22-05-ST | - | - | - | - | - | - | - | - | - | - | - | - | 0.01 | 0.02 | 0.00 | 0.00 | - | - | 0.01 | 0.02 |
| 23-05-ST | - | - | - | - | - | - | - | - | - | - | - | - | 0.01 | 0.02 | 0.00 | 0.00 | - | - | 0.01 | 0.02 |
| 24-05-FE | - | - | - | - | - | - | - | - | - | - | - | - | 0.39 | 1.74 | 0.00 | 0.00 | - | - | 0.01 | 0.05 |
| 25-05-F | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 26-05-CB | - | - | - | - | - | - | - | - | - | - | - | - | 83.39 | 1.50 | 0.00 | 0.00 | - | - | 5.47 | 0.10 |
| 28-05-HT-WG | - | - | - | - | - | - | - | - | - | - | - | - | 32.28 | 141.40 | 0.00 | 0.00 | - | - | 1.73 | 7.56 |
| 29-05-WFV-WG | - | - | - | - | - | - | - | - | - | - | - | - | 5.03 | 22.02 | 0.00 | 0.00 | - | - | 0.27 | 1.18 |
| 30-10-LH-BS | 0.23 | 1.00 | 0.23 | 1.00 | 0.23 | 1.00 | 0.04 | 0.15 | 2.99 | 13.11 | 2.51 | 11.01 | 0.16 | 0.72 | 0.00 | 0.00 | - | - | 0.06 | 0.25 |
| 31-05-F | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 32-10-H-BS | 0.00 | 0.02 | 0.00 | 0.02 | 0.00 | 0.02 | 0.00 | 0.00 | 0.06 | 0.26 | 0.05 | 0.22 | 0.00 | 0.01 | 0.00 | 0.00 | - | - | 0.00 | 0.00 |
| 33-17-LH-BS | 0.03 | 0.14 | 0.03 | 0.14 | 0.03 | 0.14 | 0.00 | 0.02 | 0.42 | 1.84 | 0.35 | 1.54 | 0.02 | 0.10 | 0.00 | 0.00 | - | - | 0.01 | 0.03 |
| 34-17-SEP | - | - | - | - | - | - | - | - | - | - | - | - | 0.01 | 0.04 | 0.00 | 0.00 | - | - | 0.00 | 0.00 |
| 35-17-IWT | - | - | - | - | - | - | - | - | - | - | - | - | 0.01 | 0.05 | 0.00 | 0.00 | - | - | 0.00 | 0.00 |
| 36-17-IWT | - | - | - | - | - | - | - | - | - | - | - | - | 0.01 | 0.05 | 0.00 | 0.00 | - | - | 0.00 | 0.00 |
| 37-17-TWP | - | - | - | - | - | - | - | - | - | - | - | - | 0.12 | 0.50 | 0.00 | 0.00 | - | - | 0.00 | 0.00 |
| 38-17-RWT | - | - | - | - | - | - | - | - | - | - | - | - | 0.05 | 0.23 | 0.00 | 0.00 | - | - | 0.00 | 0.00 |
| **Totals** | **0.60** | **2.66** | **0.60** | **2.66** | **0.60** | **2.66** | **0.09** | **0.41** | **7.96** | **34.87** | **6.68** | **29.29** | **179.03** | **417.74** | **0.00** | **0.00** | **0.00** | **0.00** | **11.13** | **24.53** |

[1] **Condensables:** Include condensable particulate matter emissions in particulate matter calculations for PM-10 and PM-2.5, but not for TSP (PM).

[2] **TRS:** Total reduced sulfur (TRS) is the sum of the sulfur compounds hydrogen sulfide ($H_2S$), methyl mercaptan ($CH_4S$), dimethyl sulfide ($C_2H_6S$), and dimethyl disulfide ($C_2H_6S_2$).

# Section OPGP-B.2: Proposed Allowable Emissions

# MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE

Proposed Allowable Emissions (Potential to Emit) are those emissions the facility is currently permitted to emit as limited by a specific permit requirement or federal/state standard (e.g., a MACT standard); or the emission rate at which the facility proposes to emit considering emissions control devices, restrictions to operating rates/hours, or other requested permit limits that reduce the maximum emission rates. Emission Point numbering must be consistent throughout the application package. Fill all cells in this table with the emission numbers or a "-" symbol. A "-" symbol indicates that emissions of this pollutant are not expected. Additional columns may be added if there are regulated pollutants (other than HAPs and GHGs) emitted at the facility.

| Emission Point ID | TSP[1] | | PM10[1] | | PM2.5[1] | | $SO_2$ | | NOx | | CO | | VOC | | TRS | | Lead | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | lb/hr | ton/yr | lb/hr | ton/yr | lb/hr | ton/yr | lb/hr | ton/yr | lb/hr | ton/yr | lb/hr | ton/yr | lb/hr | ton/yr | lb/hr | ton/yr | lb/hr | ton/yr |
| 1-05-LH-BS | 0.27 | 1.20 | 0.27 | 1.20 | 0.27 | 1.20 | 0.04 | 0.19 | 3.59 | 15.73 | 3.02 | 13.22 | 0.20 | 0.87 | 0.00 | 0.00 | - | - |
| 2-05-HT-BS | 0.05 | 0.20 | 0.05 | 0.20 | 0.05 | 0.20 | 0.01 | 0.03 | 0.60 | 2.62 | 0.50 | 2.20 | 0.03 | 0.14 | 0.00 | 0.00 | - | - |
| 3-05-LH-BS | 0.02 | 0.10 | 0.02 | 0.10 | 0.02 | 0.10 | 0.00 | 0.02 | 0.30 | 1.31 | 0.25 | 1.10 | 0.02 | 0.07 | 0.00 | 0.00 | - | - |
| 4-05-SBP | - | - | - | - | - | - | - | - | - | - | - | - | 0.61 | 0.22 | 0.00 | 0.00 | - | - |
| 5-05-OST-V | - | - | - | - | - | - | - | - | - | - | - | - | 0.01 | 0.05 | 0.00 | 0.00 | - | - |
| 6a-05-OST-CV | - | - | - | - | - | - | - | - | - | - | - | - | 0.06 | 0.25 | 0.00 | 0.00 | - | - |
| 6b-05-OST-CV | - | - | - | - | - | - | - | - | - | - | - | - | 0.06 | 0.25 | 0.00 | 0.00 | - | - |
| 7a-05-ST-CV | - | - | - | - | - | - | - | - | - | - | - | - | 0.10 | 0.42 | 0.00 | 0.00 | - | - |
| 7b-05-ST-CV | - | - | - | - | - | - | - | - | - | - | - | - | 0.10 | 0.42 | 0.00 | 0.00 | - | - |
| 8a-05-WST-CV | - | - | - | - | - | - | - | - | - | - | - | - | 2.37 | 10.36 | 0.00 | 0.00 | - | - |
| 8b-05-WST-CV | - | - | - | - | - | - | - | - | - | - | - | - | 2.37 | 10.36 | 0.00 | 0.00 | - | - |
| 9-05-SOT-V | - | - | - | - | - | - | - | - | - | - | - | - | 0.50 | 2.18 | 0.00 | 0.00 | - | - |
| 10-05-IOT-V | - | - | - | - | - | - | - | - | - | - | - | - | 0.09 | 0.39 | 0.00 | 0.00 | - | - |
| 11-05-IOT-V | - | - | - | - | - | - | - | - | - | - | - | - | 0.09 | 0.39 | 0.00 | 0.00 | - | - |
| 12-05-IOT-V | - | - | - | - | - | - | - | - | - | - | - | - | 0.09 | 0.39 | 0.00 | 0.00 | - | - |
| 13-05-ITT-V | - | - | - | - | - | - | - | - | - | - | - | - | 0.01 | 0.05 | 0.00 | 0.00 | - | - |
| 14-05-ITT-V | - | - | - | - | - | - | - | - | - | - | - | - | 0.01 | 0.05 | 0.00 | 0.00 | - | - |
| 15-05-ITT-V | - | - | - | - | - | - | - | - | - | - | - | - | 0.05 | 0.21 | 0.00 | 0.00 | - | - |
| 17-05-GST | - | - | - | - | - | - | - | - | - | - | - | - | 0.02 | 0.07 | 0.00 | 0.00 | - | - |
| 19-05-SUMP | - | - | - | - | - | - | - | - | - | - | - | - | 0.12 | 0.50 | 0.00 | 0.00 | - | - |
| 20-05-SUMP | - | - | - | - | - | - | - | - | - | - | - | - | 0.12 | 0.50 | 0.00 | 0.00 | - | - |
| 21-05-ST | - | - | - | - | - | - | - | - | - | - | - | - | 0.01 | 0.02 | 0.00 | 0.00 | - | - |
| 22-05-ST | - | - | - | - | - | - | - | - | - | - | - | - | 0.01 | 0.02 | 0.00 | 0.00 | - | - |
| 23-05-ST | - | - | - | - | - | - | - | - | - | - | - | - | 0.01 | 0.02 | 0.00 | 0.00 | - | - |
| 24-05-FE | - | - | - | - | - | - | - | - | - | - | - | - | 0.39 | 1.74 | 0.00 | 0.00 | - | - |
| 25-05-F | 0.04 | 0.18 | 0.04 | 0.18 | 0.04 | 0.18 | 0.00 | 0.00 | 0.07 | 0.31 | 0.60 | 2.62 | 0.55 | 2.39 | 0.00 | 0.00 | - | - |
| 26-05-CB | - | - | - | - | - | - | - | - | - | - | - | - | 83.39 | 1.50 | 0.00 | 0.00 | - | - |
| 28-05-HT-WG | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 29-05-WFV-WG | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

| Emission Point ID | TSP[1] | | PM10[1] | | PM2.5[1] | | $SO_2$ | | NOx | | CO | | VOC | | TRS | | Lead | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | lb/hr | ton/yr | lb/hr | ton/yr | lb/hr | ton/yr | lb/hr | ton/yr | lb/hr | ton/yr | lb/hr | ton/yr | lb/hr | ton/yr | lb/hr | ton/yr | lb/hr | ton/yr |
| 30-10-LH-BS | 0.23 | 1.00 | 0.23 | 1.00 | 0.23 | 1.00 | 0.04 | 0.15 | 2.99 | 13.11 | 2.51 | 11.01 | 0.16 | 0.72 | 0.00 | 0.00 | - | - |
| 31-05-F | 0.08 | 0.36 | 0.08 | 0.36 | 0.08 | 0.36 | 0.00 | 0.00 | 0.10 | 0.42 | 0.82 | 3.61 | 0.78 | 3.35 | 0.00 | 0.00 | - | - |
| 32-10-H-BS | 0.00 | 0.02 | 0.00 | 0.02 | 0.00 | 0.02 | 0.00 | 0.00 | 0.06 | 0.26 | 0.05 | 0.22 | 0.00 | 0.01 | 0.00 | 0.00 | - | - |
| 33-17-LH-BS | 0.03 | 0.14 | 0.03 | 0.14 | 0.03 | 0.14 | 0.00 | 0.02 | 0.42 | 1.84 | 0.35 | 1.54 | 0.02 | 0.10 | 0.00 | 0.00 | - | - |
| 34-17-SEP | - | - | - | - | - | - | - | - | - | - | - | - | 0.01 | 0.04 | 0.00 | 0.00 | - | - |
| 35-17-IWT | - | - | - | - | - | - | - | - | - | - | - | - | 0.01 | 0.05 | 0.00 | 0.00 | - | - |
| 36-17-IWT | - | - | - | - | - | - | - | - | - | - | - | - | 0.01 | 0.05 | 0.00 | 0.00 | - | - |
| 37-17-TWP | - | - | - | - | - | - | - | - | - | - | - | - | 0.12 | 0.50 | 0.00 | 0.00 | - | - |
| 38-17-RWT | - | - | - | - | - | - | - | - | - | - | - | - | 0.05 | 0.23 | 0.00 | 0.00 | - | - |
| **Totals** | **0.72** | **3.20** | **0.72** | **3.20** | **0.72** | **3.20** | **0.09** | **0.41** | **8.13** | **35.60** | **8.10** | **35.52** | **92.55** | **38.88** | **0.00** | **0.00** | **0.00** | **0.00** |

[1] **Condensables:** Include condensable particulate matter emissions in particulate matter calculations for PM-10 and PM-2.5, but not for TSP (PM).

[2] **TRS:** Total reduced sulfur (TRS) is the sum of the sulfur compounds hydrogen sulfide ($H_2S$), methyl mercaptan ($CH_4S$), dimethyl sulfide ($C_2H_6S$), and dimethyl disulfide ($C_2H_6S_2$).

# Section OPGP-B.3: Proposed Allowable Hazardous Air Pollutants (HAPs)

# MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE

In the table below, report the Proposed Allowable Emissions (Potential to Emit) for each HAP from each regulated emission unit if the HAP > 0.01 tpy. Each facility-wide Individual HAP total and the facility-wide Total HAPs shall be the sum of all HAP sources. Use the HAP nomenclature as it appears in the Instructions. Emission Point numbering must be consistent throughout the application package. For each HAP listed, fill all cells in this table with the emission numbers or a "-" symbol. A "-" symbol indicates that emissions of this pollutant are not expected or the pollutant is emitted in a quantity less than the threshold amounts described above. Additional columns may be added as necessary to address each HAP.

| Emission Point ID | Total HAPs | | 2,2,4-Trimethylpentane | | Benzene | | Ethylbenzene | | Formaldehyde | | N-Hexane | | Toluene | | Xylene | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | lb/hr | ton/yr | lb/hr | ton/yr | lb/hr | ton/yr | lb/hr | ton/yr | lb/hr | ton/yr | lb/hr | ton/yr | lb/hr | ton/yr | lb/hr | ton/yr |
| 1-05-LH-BS | 0.06 | 0.29 | - | - | 0.00 | 0.00 | - | - | 0.00 | 0.01 | 0.06 | 0.28 | - | - | - | - |
| 2-05-HT-BS | 0.01 | 0.05 | - | - | 0.00 | 0.00 | - | - | 0.00 | 0.00 | 0.01 | 0.05 | - | - | - | - |
| 3-05-LH-BS | 0.01 | 0.02 | - | - | 0.00 | 0.00 | - | - | 0.00 | 0.00 | 0.01 | 0.02 | - | - | - | - |
| 4-05-SBP | 0.04 | 0.01 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | - | - | 0.02 | 0.01 | 0.00 | 0.00 | 0.01 | 0.00 |
| 5-05-OST-V | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | - | - | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 6a-05-OST-CV | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | - | - | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| 6b-05-OST-CV | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | - | - | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| 7a-05-ST-CV | 0.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | - | - | 0.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| 7b-05-ST-CV | 0.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | - | - | 0.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| 8a-05-WST-CV | 0.16 | 0.71 | 0.00 | 0.00 | 0.02 | 0.09 | 0.00 | 0.01 | - | - | 0.10 | 0.42 | 0.01 | 0.05 | 0.03 | 0.14 |
| 8b-05-WST-CV | 0.16 | 0.71 | 0.00 | 0.00 | 0.02 | 0.09 | 0.00 | 0.01 | - | - | 0.10 | 0.42 | 0.01 | 0.05 | 0.03 | 0.14 |
| 9-05-SOT-V | 0.04 | 0.20 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | - | - | 0.04 | 0.20 | 0.00 | 0.00 | 0.00 | 0.00 |
| 10-05-IOT-V | 0.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | - | - | 0.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| 11-05-IOT-V | 0.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | - | - | 0.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| 12-05-IOT-V | 0.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | - | - | 0.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| 13-05-ITT-V | 0.01 | 0.05 | - | - | - | - | - | - | - | - | 0.01 | 0.05 | - | - | - | - |
| 14-05-ITT-V | 0.01 | 0.05 | - | - | - | - | - | - | - | - | 0.01 | 0.05 | - | - | - | - |
| 15-05-ITT-V | 0.05 | 0.21 | - | - | - | - | - | - | - | - | 0.05 | 0.21 | - | - | - | - |
| 17-05-GST | 0.02 | 0.07 | - | - | - | - | - | - | - | - | 0.02 | 0.07 | - | - | - | - |
| 19-05-SUMP | 0.12 | 0.50 | - | - | - | - | - | - | - | - | 0.12 | 0.50 | - | - | - | - |
| 20-05-SUMP | 0.12 | 0.50 | - | - | - | - | - | - | - | - | 0.12 | 0.50 | - | - | - | - |

| Emission Point ID | Total HAPs | | 2,2,4-Trimethylpentane | | Benzene | | Ethylbenzene | | Formaldehyde | | N-Hexane | | Toluene | | Xylene | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | lb/hr | ton/yr | lb/hr | ton/yr | lb/hr | ton/yr | lb/hr | ton/yr | lb/hr | ton/yr | lb/hr | ton/yr | lb/hr | ton/yr | lb/hr | ton/yr |
| 21-05-ST | 0.01 | 0.02 | - | - | - | - | - | - | - | - | 0.01 | 0.02 | - | - | - | - |
| 22-05-ST | 0.01 | 0.02 | - | - | - | - | - | - | - | - | 0.01 | 0.02 | - | - | - | - |
| 23-05-ST | 0.01 | 0.02 | - | - | - | - | - | - | - | - | 0.01 | 0.02 | - | - | - | - |
| 24-05-FE | 0.00 | 0.05 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | - | - | 0.00 | 0.02 | 0.00 | 0.01 | 0.00 | 0.01 |
| 25-05-F | 0.02 | 0.13 | 0.00 | 0.01 | 0.00 | 0.02 | 0.00 | 0.00 | - | - | 0.02 | 0.10 | 0.00 | 0.00 | 0.00 | 0.00 |
| 26-05-CB | 5.47 | 0.09 | 0.00 | 0.00 | 0.79 | 0.01 | 0.10 | 0.00 | - | - | 2.72 | 0.05 | 0.51 | 0.01 | 1.35 | 0.02 |
| 28-05-HT-WG | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | - | - | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 29-05-WFV-WG | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | - | - | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 30-10-LH-BS | 0.05 | 0.25 | - | - | 0.00 | 0.00 | - | - | 0.00 | 0.01 | 0.05 | 0.24 | - | - | - | - |
| 31-05-F | 0.04 | 0.19 | 0.00 | 0.01 | 0.01 | 0.03 | 0.00 | 0.00 | - | - | 0.03 | 0.14 | 0.00 | 0.01 | 0.00 | 0.00 |
| 32-10-H-BS | 0.00 | 0.00 | - | - | 0.00 | 0.00 | - | - | 0.00 | 0.00 | 0.00 | 0.00 | - | - | - | - |
| 33-17-LH-BS | 0.01 | 0.03 | - | - | 0.00 | 0.00 | - | - | 0.00 | 0.00 | 0.01 | 0.03 | - | - | - | - |
| 34-17-SEP | 0.01 | 0.04 | - | - | - | - | - | - | - | - | 0.01 | 0.04 | - | - | - | - |
| 35-17-IWT | 0.01 | 0.05 | - | - | - | - | - | - | - | - | 0.01 | 0.05 | - | - | - | - |
| 36-17-IWT | 0.01 | 0.05 | - | - | - | - | - | - | - | - | 0.01 | 0.05 | - | - | - | - |
| 37-17-TWP | 0.12 | 0.50 | - | - | - | - | - | - | - | - | 0.12 | 0.50 | - | - | - | - |
| 38-17-RWT | 0.05 | 0.23 | - | - | - | - | - | - | - | - | 0.05 | 0.23 | - | - | - | - |
| **Totals:** | 6.63 | 5.16 | 0.00 | 0.02 | 0.85 | 0.25 | 0.10 | 0.02 | 0.00 | 0.02 | 3.73 | 4.41 | 0.53 | 0.13 | 1.42 | 0.31 |

# Section OPGP-B.4: Greenhouse Gas Emissions

# MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE

Applicants must report potential emission rates in SHORT TONS per year, as opposed to metric tons required by Part 98. Emission Point numbering must be consistent throughout the application package and, for existing emission points, should match any MDEQ ID's in the current permit.

| | | $CO_2$ (non-biogenic) ton/yr | $CO_2$ (biogenic)[2] ton/yr | $N_2O$ ton/yr | $CH_4$ ton/yr | $SF_6$ ton/yr | PFC/HFC[3] ton/yr | | | | | Total GHG Mass Basis ton/yr[5] | Total $CO_2e$ ton/yr[6] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Emission Point ID** | **GWPs [1]** | **1** | **1** | **265** | **28** | **22,800** | **footnote 4** | | | | | | |
| **1-05-LH-BS** | **mass GHG** | 19199.03 | 0.00 | 0.00 | 0.36 | 0.00 | 0.00 | | | | | 19199.39 | |
| | **$CO_2e$** | 19199.03 | 0.00 | 0.00 | 10.19 | 0.00 | 0.00 | | | | | | 19209.21 |
| **2-05-HT-BS** | **mass GHG** | 3199.83 | 0.00 | 0.00 | 0.06 | 0.00 | 0.00 | | | | | 3199.89 | |
| | **$CO_2e$** | 3199.83 | 0.00 | 0.00 | 1.54 | 0.00 | 0.00 | | | | | | 3201.38 |
| **3-05-LH-BS** | **mass GHG** | 1599.92 | 0.00 | 0.00 | 0.03 | 0.00 | 0.00 | | | | | 1599.95 | |
| | **$CO_2e$** | 1599.92 | 0.00 | 0.00 | 0.93 | 0.00 | 0.00 | | | | | | 1600.84 |
| **4-05-SBP** | **mass GHG** | 16.16 | 0.00 | 0.00 | 0.58 | 0.00 | 0.00 | | | | | 16.74 | |
| | **$CO_2e$** | 16.16 | 0.00 | 0.00 | 16.36 | 0.00 | 0.00 | | | | | | 32.52 |
| **5-05-OST-V** | **mass GHG** | 0.61 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | | | | 0.61 | |
| | **$CO_2e$** | 0.61 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | | | | | 0.61 |
| **6a-05-OST-CV** | **mass GHG** | 3.42 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | | | | | 3.43 | |
| | **$CO_2e$** | 3.42 | 0.00 | 0.00 | 0.31 | 0.00 | 0.00 | | | | | | 3.73 |
| **6b-05-OST-CV** | **mass GHG** | 3.42 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | | | | | 3.43 | |
| | **$CO_2e$** | 3.42 | 0.00 | 0.00 | 0.31 | 0.00 | 0.00 | | | | | | 3.73 |
| **7a-05-ST-CV** | **mass GHG** | 5.65 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | | | | | 5.68 | |
| | **$CO_2e$** | 5.65 | 0.00 | 0.00 | 0.62 | 0.00 | 0.00 | | | | | | 6.27 |
| **7b-05-ST-CV** | **mass GHG** | 5.65 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | | | | | 5.68 | |
| | **$CO_2e$** | 5.65 | 0.00 | 0.00 | 0.62 | 0.00 | 0.00 | | | | | | 6.27 |
| **8a-05-WST-CV** | **mass GHG** | 640.38 | 0.00 | 0.00 | 23.47 | 0.00 | 0.00 | | | | | 663.84 | |
| | **$CO_2e$** | 640.38 | 0.00 | 0.00 | 657.11 | 0.00 | 0.00 | | | | | | 1297.49 |
| **8b-05-WST-CV** | **mass GHG** | 640.38 | 0.00 | 0.00 | 23.47 | 0.00 | 0.00 | | | | | 663.84 | |
| | **$CO_2e$** | 640.38 | 0.00 | 0.00 | 657.11 | 0.00 | 0.00 | | | | | | 1297.49 |
| **9-05-SOT-V** | **mass GHG** | 0.00 | 0.00 | 0.00 | 0.15 | 0.00 | 0.00 | | | | | 0.15 | |
| | **$CO_2e$** | 0.00 | 0.00 | 0.00 | 4.32 | 0.00 | 0.00 | | | | | | 4.32 |
| **10-05-IOT-V** | **mass GHG** | 4.81 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | | | | | 4.83 | |
| | **$CO_2e$** | 4.81 | 0.00 | 0.00 | 0.62 | 0.00 | 0.00 | | | | | | 5.42 |
| **11-05-IOT-V** | **mass GHG** | 4.81 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | | | | | 4.83 | |
| | **$CO_2e$** | 4.81 | 0.00 | 0.00 | 0.62 | 0.00 | 0.00 | | | | | | 5.42 |
| **12-05-IOT-V** | **mass GHG** | 4.81 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | | | | | 4.83 | |
| | **$CO_2e$** | 4.81 | 0.00 | 0.00 | 0.62 | 0.00 | 0.00 | | | | | | 5.42 |
| **13-05-ITT-V** | **mass GHG** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | | | | 0.00 | |
| | **$CO_2e$** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | | | | | 0.00 |
| **14-05-ITT-V** | **mass GHG** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | | | | 0.00 | |
| | **$CO_2e$** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | | | | | 0.00 |
| **15-05-ITT-V** | **mass GHG** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | | | | 0.00 | |
| | **$CO_2e$** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | | | | | 0.00 |

| | | $CO_2$ (non-biogenic) ton/yr | $CO_2$ (biogenic)[2] ton/yr | $N_2O$ ton/yr | $CH_4$ ton/yr | $SF_6$ ton/yr | PFC/HFC[3] ton/yr | | | | | Total GHG Mass Basis ton/yr[5] | Total $CO_2e$ ton/yr[6] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Emission Point ID** | **GWPs [1]** | **1** | **1** | **265** | **28** | **22,800** | **footnote 4** | | | | | | |
| **17-05-GST** | **mass GHG** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | | | | 0.00 | |
| | **$CO_2e$** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | | | | | 0.00 |
| **19-05-SUMP** | **mass GHG** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | | | | 0.00 | |
| | **$CO_2e$** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | | | | | 0.00 |
| **20-05-SUMP** | **mass GHG** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | | | | 0.00 | |
| | **$CO_2e$** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | | | | | 0.00 |
| **21-05-ST** | **mass GHG** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | | | | 0.00 | |
| | **$CO_2e$** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | | | | | 0.00 |
| **22-05-ST** | **mass GHG** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | | | | 0.00 | |
| | **$CO_2e$** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | | | | | 0.00 |
| **23-05-ST** | **mass GHG** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | | | | 0.00 | |
| | **$CO_2e$** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | | | | | 0.00 |
| **24-05-FE** | **mass GHG** | 38.97 | 0.00 | 0.00 | 1.42 | 0.00 | 0.00 | | | | | 40.39 | |
| | **$CO_2e$** | 38.97 | 0.00 | 0.00 | 39.82 | 0.00 | 0.00 | | | | | | 78.78 |
| **25-05-F** | **mass GHG** | 2125.10 | 0.00 | 0.00 | 1.50 | 0.00 | 0.00 | | | | | 2126.60 | |
| | **$CO_2e$** | 2125.10 | 0.00 | 0.00 | 41.98 | 0.00 | 0.00 | | | | | | 2167.08 |
| **26-05-CB** | **mass GHG** | 108.41 | 0.00 | 0.00 | 3.96 | 0.00 | 0.00 | | | | | 112.37 | |
| | **$CO_2e$** | 108.41 | 0.00 | 0.00 | 110.80 | 0.00 | 0.00 | | | | | | 219.22 |
| **30-10-LH-BS** | **mass GHG** | 15999.18 | 0.00 | 0.00 | 0.30 | 0.00 | 0.00 | | | | | 15999.48 | |
| | **$CO_2e$** | 15999.18 | 0.00 | 0.00 | 8.33 | 0.00 | 0.00 | | | | | | 16007.52 |
| **31-05-F** | **mass GHG** | 4147.75 | 0.00 | 0.00 | 2.04 | 0.00 | 0.00 | | | | | 4149.79 | |
| | **$CO_2e$** | 4147.75 | 0.00 | 0.00 | 57.10 | 0.00 | 0.00 | | | | | | 4204.85 |
| **32-10-H-BS** | **mass GHG** | 319.98 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | | | | | 319.99 | |
| | **$CO_2e$** | 319.98 | 0.00 | 0.00 | 0.31 | 0.00 | 0.00 | | | | | | 320.29 |
| **33-17-LH-BS** | **mass GHG** | 2239.88 | 0.00 | 0.00 | 0.04 | 0.00 | 0.00 | | | | | 2239.93 | |
| | **$CO_2e$** | 2239.88 | 0.00 | 0.00 | 1.23 | 0.00 | 0.00 | | | | | | 2241.12 |
| **34-17-SEP** | **mass GHG** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | | | | 0.00 | |
| | **$CO_2e$** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | | | | | 0.00 |
| **35-17-IWT** | **mass GHG** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | | | | 0.00 | |
| | **$CO_2e$** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | | | | | 0.00 |
| **36-17-IWT** | **mass GHG** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | | | | 0.00 | |
| | **$CO_2e$** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | | | | | 0.00 |

| | | $CO_2$ (non-biogenic) ton/yr | $CO_2$ (biogenic)[2] ton/yr | $N_2O$ ton/yr | $CH_4$ ton/yr | $SF_6$ ton/yr | PFC/HFC[3] ton/yr | | | | | Total GHG Mass Basis ton/yr[5] | Total $CO_2e$ ton/yr[6] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Emission Point ID** | **GWPs [1]** | **1** | **1** | **265** | **28** | **22,800** | **footnote 4** | | | | | | |
| **37-17-TWP** | **mass GHG** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | | | | 0.00 | |
| | **$CO_2e$** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | | | | | 0.00 |
| **38-17-RWT** | **mass GHG** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | | | | 0.00 | |
| | **$CO_2e$** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | | | | | 0.00 |
| **FACILITY TOTAL** | **mass GHG** | **50308.14** | **0.00** | **0.00** | **57.53** | **0.00** | **0.00** | | | | | **50365.67** | **0.00** |
| | **$CO_2e$** | **50308.14** | **0.00** | **0.00** | **1610.83** | **0.00** | **0.00** | | | | | **0.00** | **51918.97** |

[1] **GWP** (Global Warming Potential): Applicants must use the most current GWPs codified in Table A-1 of 40 CFR part 98. GWPs are subject to change, therefore, applicants need to check 40 CFR 98 to confirm GWP values.

[2] Biogenic CO2 is defined as carbon dioxide emissions resulting from the combustion or decomposition of non-fossilized and biodegradable organic material originating from plants, animals, or micro-organisms.

[3] For **HFCs** or **PFCs** describe the specific HFC or PFC compound and use a separate column for each individual compound.

[4] For each new compound, enter the appropriate GWP for each HFC or PFC compound from Table A-1 in 40 CFR 98.

[5] Greenhouse gas emissions on a **mass basis** is the ton per year greenhouse gas emission before adjustment with its GWP. Do not include biogenic $CO_2$ in this total.

[6] **$CO_2e$** means Carbon Dioxide Equivalent and is calculated by multiplying the TPY mass emissions of the greenhouse gas by its GWP. Do not include biogenic $CO_2e$ in this total.

# Section OPGP-B.5: Stack Parameters and Exit Conditions

# MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE

Emission Point numbering must be consistent throughout the application package.

| Emission Point ID | Orientation (H-Horizontal V=Vertical) | Rain Caps (Yes or No) | Height Above Ground (ft) | Base Elevation (ft) | Exit Temp. ($^{o}$F) | Inside Diameter or Dimensions (ft) | Velocity (ft/sec) | Moisture by Volume (%) | Geographic Position (degrees/minutes/seconds) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Latitude | Longitude |
| 1-05-LH-BS | V | No | 25± | 480± | 500 | 1.0 | 280 | 0 | 31 35 29.10 | 90 31 05.90 |
| 2-05-HT-BS | V | No | 20± | 480± | 500 | 3.0 | 5.2 | 0 | 31 35 29.10 | 90 31 05.90 |
| 3-05-LH-BS | V | No | 25± | 480± | 500 | 1.5 | 10 | 0 | 31 35 29.10 | 90 31 05.90 |
| 5-05-OST-V | V | No | 24± | 480± | 80 | 0.6 | <0.01 | 0 | 31 35 29.10 | 90 31 05.90 |
| 6a-05-OST-CV | V | No | 24± | 480± | 80 | 0.6 | 0 | 0 | 31 35 29.10 | 90 31 05.90 |
| 6b-05-OST-CV | V | No | 24± | 480± | 80 | 0.6 | 0.0 | 0 | 32 35 29.10 | 91 31 05.90 |
| 7a-05-ST-CV | V | No | 24± | 480± | 80 | 0.6 | 0 | 0 | 31 35 29.10 | 90 31 05.90 |
| 7b-05-ST-CV | V | No | 24± | 480± | 80 | 0.6 | 0.0 | 0 | 31 35 29.10 | 90 31 05.90 |
| 8a-05-WST-CV | V | No | 24± | 480± | 80 | 0.6 | 1 | 0 | 31 35 29.10 | 90 31 05.90 |
| 8b-05-WST-CV | V | No | 24± | 480± | 80 | 0.6 | 1.4 | 0 | 31 35 29.10 | 90 31 05.90 |
| 9-05-SOT-V | V | No | 24± | 480± | 80 | 0.6 | <0.01 | 0 | 31 35 29.10 | 90 31 05.90 |
| 10-05-IOT-V | V | No | 24± | 480± | 80 | 0.6 | 0.0 | 0 | 31 35 29.10 | 90 31 05.90 |
| 11-05-IOT-V | H | No | 24± | 480± | 80 | 0.6 | 0 | 0 | 31 35 29.10 | 90 31 05.90 |
| 12-05-IOT-V | H | No | 24± | 480± | 80 | 0.6 | 0.0 | 0 | 31 35 29.10 | 90 31 05.90 |
| 25-05-F | V | No | 25± | 480± | 1500 | 1 | 106 | 0 | 31 35 29.10 | 90 31 05.90 |
| 30-10-LH-BS | H | No | 25± | 480± | 500 | 1 | 233.4 | 0 | 31 35 29.10 | 90 31 05.90 |
| 31-05-F | H | No | 25± | 480± | 1500 | 0.5 | 598 | 0 | 31 35 29.10 | 90 31 05.90 |
| 32-10-H-BS | V | No | 25± | 480± | 500 | 1 | 4.7 | 0 | 31 35 29.10 | 90 31 05.90 |
| 33-17-LH-BS | V | No | 25± | 480± | 500 | 1 | 33 | 0 | 31 35 29.10 | 90 31 05.90 |

[1] A WAAS-capable GPS receiver should be used and in the WGS84 or NAD83 coordinate system.

***Denbury Onshore, LLC***
***Brookhaven Central Processing Facility***
***Lincoln County, MS***

## Section B.6: EMISSION POINT SOURCE LIST

| Emission Point ID: | MDEQ EPN: | Footnote: | Emission Point Description: | Routes To: | Operating Rate/Capacity | Operating Schedule: | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Hrs/Day or (Hrs/Yr) | Days/Wk | Wks/Yr |
| 1-05-LH-BS | AA-001 | | 30 MMBTU/Hr Line Heater-Burner Stack (H-106) | | 30 MMBTU/Hr | 24 | 7 | 52.143 |
| 2-05-HT-BS | AA-002 | | 5.0 MMBTU/Hr Heater Treater-Burner Stack (V-22A) | | 5.0 MMBTU/Hr | 24 | 7 | 52.143 |
| 3-05-LH-BS | AA-003 | | 2.5 MMBTU/Hr Inhibitor Oil Line Heater-Burner Stack (H-129) | | 2.5 MMBTU/Hr | 24 | 7 | 52.143 |
| 4-05-SBP | AA-004 | | Sand Blowdown Pit (SP-130) | | 1,533 BWPY | (730) | - | - |
| 5-05-OST-V | AA-005 | a | 1500 BBL Wet Oil Tank-Common Vent (V-118) | 25-05-F | 730,000 BOPY | 24 | 7 | 52.143 |
| 6a-05-OST-CV | AA-006 | a | 5000 BBL Dry Oil Tank-Common Vent (V-119A) | 25-05-F | 365,000 BOPY | 24 | 7 | 52.143 |
| 6b-05-OST-CV | AA-007 | a | 5000 BBL Dry Oil Tank-Common Vent (V-119B) | 25-05-F | 365,000 BOPY | 24 | 7 | 52.143 |
| 7a-05-ST-CV | AA-008 | a | 2000 BBL Skimmer Tank-Common Vent (V-120A) | 25-05-F | 2,190,000 BWPY & 2,190 BOPY | 24 | 7 | 52.143 |
| 7b-05-ST-CV | AA-009 | a | 2000 BBL Skimmer Tank-Common Vent (V-120B) | 25-05-F | 2,190,000 BWPY & 2,190 BOPY | 24 | 7 | 52.143 |
| 8a-05-WST-CV | AA-010 | | 5000 BBL Water Storage Tank-Common Vent (V-129A) | | 2,190,000 BWPY | 24 | 7 | 52.143 |
| 8b-05-WST-CV | AA-011 | | 5000 BBL Water Storage Tank-Common Vent (V-129B) | | 2,190,000 BWPY | 24 | 7 | 52.143 |
| 9-05-SOT-V | AA-012 | | 1500 BBL Slop Oil Tank-Vent (V-132) | | 10,950 BOPY | 24 | 7 | 52.143 |
| 10-05-IOT-V | AA-013 | a | 1500 BBL Inhibitor Oil Tank-Vent (V-133A) | 25-05-F | 36,500 BOPY | 24 | 7 | 52.143 |
| 11-05-IOT-V | AA-014 | a | 1500 BBL Inhibitor Oil Tank-Vent (V-133B) | 25-05-F | 36,500 BOPY | 24 | 7 | 52.143 |
| 12-05-IOT-V | AA-015 | a | 1500 BBL Inhibitor Oil Tank-Vent (V-133C) | 25-05-F | 36,500 BOPY | 24 | 7 | 52.143 |
| 13-05-ITT-V | AA-016 | | 500 Gallon Inhibitor Transfer Tank (V-134A) | | 5,000 Gallons/Yr | 24 | 7 | 52.143 |
| 14-05-ITT-V | AA-017 | | 500 Gallon Inhibitor Transfer Tank (V-134B) | | 5,000 Gallons/Yr | 24 | 7 | 52.143 |
| 15-05-ITT-V | AA-018 | | 2000 Gallon Inhibitor Transfer Tank (V-134C) | | 20,000 Gallons/Yr | 24 | 7 | 52.143 |
| 17-05-GST | AA-019 | | 100 BBL Glycol Storage Tank (V-137) | | 1,000 BBL/Yr | 24 | 7 | 52.143 |
| 18-05-WST | AA-020 | b | 100 BBL Demineralized Water Storage Tank (V-138) | | N/A | 24 | 7 | 52.143 |
| 19-05-SUMP | AA-035 | | Drainage Sump (SP-141) | | 20 BBL/Yr | 24 | 7 | 52.143 |
| 20-05-SUMP | AA-034 | | Compressor Building Sump (SP-142) | | 20 BBL/Yr | 24 | 7 | 52.143 |
| 21-05-ST | AA-021 | | Chemical Storage Tank | | 36 BBL/Yr | 24 | 7 | 52.143 |
| 22-05-ST | AA-022 | | Chemical Storage Tank | | 36 BBL/Yr | 24 | 7 | 52.143 |
| 23-05-ST | AA-023 | | Chemical Storage Tank | | 36 BBL/Yr | 24 | 7 | 52.143 |
| 24-05-FE | AA-028 | | Fugitive Emissions | | N/A | 24 | 7 | 52.143 |
| 25-05-F | AA-024 | c | Atmospheric Control Flare (ZZZ-180A) | | 32.9 MMSCF/Yr | 24 | 7 | 52.143 |

| Emission Point ID: | MDEQ EPN: | Footnote: | Emission Point Description: | Routes To: | Operating Rate/Capacity | Operating Schedule: | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Hrs/Day or (Hrs/Yr) | Days/Wk | Wks/Yr |
| 26-05-CB | AA-026 | | Compressor Blowdowns | | 2.08 MMSCF/Yr | (36) | - | - |
| 28-05-HT-WG | AA-029 | d | Heater Treater-Flash Gas | 31-05-F | 53.4 MMSCF/Yr | 24 | 7 | 52.143 |
| 29-05-WFV-WG | AA-036 | d | Water Flash Vessel-Flash Gas | 31-05-F | 8.32 MMSCF/Yr | 24 | 7 | 52.143 |
| 30-10-LH-BS | AA-033 | | 25 MMBTU/Hr Line Heater-Burner Stack (H-104) | | 25 MMBTU/Hr | 24 | 7 | 52.143 |
| 31-05-F | AA-025 | e | Atmospheric Control Flare (ZZZ-180B) | | 66.2 MMSCF/Yr | 24 | 7 | 52.143 |
| 32-10-H-BS | AA-030 | | 500 MBTU/Hr Heater Treater-Burner Stack (V-23) | | 500 MBTU/Hr | 24 | 7 | 52.143 |
| 33-17-LH-BS | AA-040 | | 3.5 MMBTU/Hr Line Heater-Burner Stack (H-108) | | 3.5 MMBTU/Hr | 24 | 7 | 52.143 |
| 34-17-SEP | AA-037 | | API Separator (SP-128) | | 20 BBL/Yr | 24 | 7 | 52.143 |
| 35-17-IWT | AA-031 | | 480 BBL Injection Water Tank (V-181A) | | 9,600 BBL/Yr | 24 | 7 | 52.143 |
| 36-17-IWT | AA-032 | | 480 BBL Injection Water Tank (V-181B) | | 9,600 BBL/Yr | 24 | 7 | 52.143 |
| 37-17-TWP | AA-041 | | Truck Washdown Pit (SP-183) | | 20 BBL/Yr | 24 | 7 | 52.143 |
| 38-17-RWT | AA-042 | | 3000 BBL Raw Water Tank (V-121) | | 28,571 BBL/Yr | 24 | 7 | 52.143 |
| | | | | | | | | |

*Footnotes:*

**a** *Vapors from this source are routed to the atmospheric control flare (EPN: 25-05-F) for combustion, except during brief intervals when thief hatches are opened for purposes of sampling, gauging, etc.*

**b** *It should be noted that there are no emissions associated with this source.*

**c** *Routine emission limits for this source account for vapors from the storage tanks (EPNs: 5-05-OST-V through 7b-05-ST-CV & 10-05-IOT-V through 12-05-IOT-V), and the pilot, purge and assist gas streams. This source may also combust gas from the facility's pressure release system on an emergency and non-routine basis.*

**d** *Off-gas from this source is routed to the low pressure control flare (EPN: 31-05-F) for combustion.*

**e** *Routine emission limits for this source account for off-gas from the heater treater & water flash vessel, and the pilot, purge, and assist gas streams. This source may also combust gas from the facility's pressure release system on an emergency and non-routine basis.*

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Fuel Burning Equipment – External Combustion Sources

# Section OPGP-C

## 1. Emission Point Description

A. Emission Point Designation (Ref. No.): AA-001 [1-05-LH-BS (H-106)]

B. Equipment Description: 30 MMBTU/Hr Line Heater-Burner Stack

C. Manufacturer: Unknown D. Date of Manufacture and No.: Unknown

E. Maximum Heat Input (higher heating value): 30 MMBtu/hr F. Nominal Heat Input Capacity: 30 MMBtu/hr

G. Use: ☒ Line Heater ☐ Heater Treater ☐ TEG Burner

☐ Space Heat ☐ Process Heat ☐ Other (describe): _____

H. Heat Mechanism: ☐ Direct ☒ Indirect

I. Burner Type (e.g., forced draft, natural draft, etc.): _____

J. Additional Design Controls (e.g., FGR, etc.): N/A

K. Status: ☒ Operating ☐ Proposed ☐ Under Construction

2005

## 2. Fuel Type

Complete the following table, identifying each type of fuel and the amount used. Specify the units for heat content, hourly usage, and yearly usage.

| FUEL TYPE | HEAT CONTENT | % SULFUR | % ASH | MAXIMUM HOURLY USAGE | MAXIMUM YEARLY USAGE |
|---|---|---|---|---|---|
| Field Gas | 1044 BTU/ft$^3$ | <0.0007 | N/A | 35,919.54 scf | 314.66 MMscf |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Please list any fuel components that are hazardous air pollutants and the percentage in the fuel:

_____

_____

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Fuel Burning Equipment – External Combustion Sources

# Section OPGP-C

## 1. Emission Point Description

A. Emission Point Designation (Ref. No.): AA-002 [2-05-HT-BS (V-22A)]

B. Equipment Description: 5.0 MMBTU/Hr Heater Treater-Burner Stack

C. Manufacturer: Unknown D. Date of Manufacture and No.: Unknown

E. Maximum Heat Input (higher heating value): 5.0 MMBtu/hr F. Nominal Heat Input Capacity: 5.0 MMBtu/hr

G. Use: ☐ Line Heater ☒ Heater Treater ☐ TEG Burner

☐ Space Heat ☐ Process Heat ☐ Other (describe): _____

H. Heat Mechanism: ☐ Direct ☒ Indirect

I. Burner Type (e.g., forced draft, natural draft, etc.): _____

J. Additional Design Controls (e.g., FGR, etc.): N/A

K. Status: ☒ Operating ☐ Proposed ☐ Under Construction

2005

## 2. Fuel Type

Complete the following table, identifying each type of fuel and the amount used. Specify the units for heat content, hourly usage, and yearly usage.

| FUEL TYPE | HEAT CONTENT | % SULFUR | % ASH | MAXIMUM HOURLY USAGE | MAXIMUM YEARLY USAGE |
|---|---|---|---|---|---|
| Field Gas | 1044 BTU/$ft^3$ | <0.0007 | N/A | 5,986.59 scf | 52.44 MMscf |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Please list any fuel components that are hazardous air pollutants and the percentage in the fuel:

_____

_____

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Fuel Burning Equipment – External Combustion Sources

# Section OPGP-C

## 1. Emission Point Description

A. Emission Point Designation (Ref. No.): AA-003 [3-05-LH-BS (H-129)]

B. Equipment Description: 2.5 MMBTU/Hr Inhibitor Oil Line Heater-Burner Stack

C. Manufacturer: Unknown D. Date of Manufacture and No.: Unknown

E. Maximum Heat Input (higher heating value): 2.5 MMBtu/hr F. Nominal Heat Input Capacity: 2.5 MMBtu/hr

G. Use: ☒ Line Heater ☐ Heater Treater ☐ TEG Burner

☐ Space Heat ☐ Process Heat ☐ Other (describe): _____

H. Heat Mechanism: ☐ Direct ☒ Indirect

I. Burner Type (e.g., forced draft, natural draft, etc.): _____

J. Additional Design Controls (e.g., FGR, etc.): N/A

K. Status: ☒ Operating ☐ Proposed ☐ Under Construction

2005

## 2. Fuel Type

Complete the following table, identifying each type of fuel and the amount used. Specify the units for heat content, hourly usage, and yearly usage.

| FUEL TYPE | HEAT CONTENT | % SULFUR | % ASH | MAXIMUM HOURLY USAGE | MAXIMUM YEARLY USAGE |
|---|---|---|---|---|---|
| Field Gas | 1044 BTU/ft$^3$ | <0.0007 | N/A | 2,993.30 scf | 26.22 MMscf |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Please list any fuel components that are hazardous air pollutants and the percentage in the fuel:

_____

_____

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Fuel Burning Equipment – External Combustion Sources

# Section OPGP-C

## 1. Emission Point Description

A. Emission Point Designation (Ref. No.): AA-033 [30-10-LH-BS (H-104)]

B. Equipment Description: 25 MMBTU/Hr Line Heater-Burner Stack

C. Manufacturer: Unknown D. Date of Manufacture and No.: Unknown

E. Maximum Heat Input (higher heating value): 25 MMBtu/hr F. Nominal Heat Input Capacity: 25 MMBtu/hr

G. Use: ☒ Line Heater ☐ Heater Treater ☐ TEG Burner

☐ Space Heat ☐ Process Heat ☐ Other (describe): _____

H. Heat Mechanism: ☐ Direct ☒ Indirect

I. Burner Type (e.g., forced draft, natural draft, etc.): _____

J. Additional Design Controls (e.g., FGR, etc.): N/A

K. Status: ☒ Operating ☐ Proposed ☐ Under Construction

2005

## 2. Fuel Type

Complete the following table, identifying each type of fuel and the amount used. Specify the units for heat content, hourly usage, and yearly usage.

| FUEL TYPE | HEAT CONTENT | % SULFUR | % ASH | MAXIMUM HOURLY USAGE | MAXIMUM YEARLY USAGE |
|---|---|---|---|---|---|
| Field Gas | 1044 BTU/ft$^3$ | <0.0007 | N/A | 29,932.95 scf | 262.21 MMscf |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Please list any fuel components that are hazardous air pollutants and the percentage in the fuel:

_____

_____

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Fuel Burning Equipment – External Combustion Sources

# Section OPGP-C

## 1. Emission Point Description

A. Emission Point Designation (Ref. No.): AA-030 [32-10-H-BS (V-23)]

B. Equipment Description: 500 MBTU/Hr Heater Treater-Burner Stack

C. Manufacturer: Unknown D. Date of Manufacture and No.: Unknown

E. Maximum Heat Input (higher heating value): 0.500 MMBtu/hr F. Nominal Heat Input Capacity: 0.500 MMBtu/hr

G. Use: ☐ Line Heater ☒ Heater Treater ☐ TEG Burner

☐ Space Heat ☐ Process Heat ☐ Other (describe): _____

H. Heat Mechanism: ☐ Direct ☒ Indirect

I. Burner Type (e.g., forced draft, natural draft, etc.): _____

J. Additional Design Controls (e.g., FGR, etc.): N/A

K. Status: ☒ Operating ☐ Proposed ☐ Under Construction

2005

## 2. Fuel Type

Complete the following table, identifying each type of fuel and the amount used. Specify the units for heat content, hourly usage, and yearly usage.

| FUEL TYPE | HEAT CONTENT | % SULFUR | % ASH | MAXIMUM HOURLY USAGE | MAXIMUM YEARLY USAGE |
|---|---|---|---|---|---|
| Field Gas | 1044 BTU/ft$^3$ | <0.0007 | N/A | 598.66 scf | 5.24 MMscf |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Please list any fuel components that are hazardous air pollutants and the percentage in the fuel:

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Fuel Burning Equipment – External Combustion Sources

# Section OPGP-C

## 1. Emission Point Description

A. Emission Point Designation (Ref. No.): AA-040 [33-17-LH-BS (H-108)]

B. Equipment Description: 3.5 MMBTU/Hr Line Heater-Burner Stack

C. Manufacturer: Unknown D. Date of Manufacture and No.: Unknown

E. Maximum Heat Input (higher heating value): 3.5 MMBtu/hr F. Nominal Heat Input Capacity: 3.5 MMBtu/hr

G. Use: ☒ Line Heater ☐ Heater Treater ☐ TEG Burner

☐ Space Heat ☐ Process Heat ☐ Other (describe): _____

H. Heat Mechanism: ☐ Direct ☒ Indirect

I. Burner Type (e.g., forced draft, natural draft, etc.): _____

J. Additional Design Controls (e.g., FGR, etc.): N/A

K. Status: ☒ Operating ☐ Proposed ☐ Under Construction

2005

## 2. Fuel Type

Complete the following table, identifying each type of fuel and the amount used. Specify the units for heat content, hourly usage, and yearly usage.

| FUEL TYPE | HEAT CONTENT | % SULFUR | % ASH | MAXIMUM HOURLY USAGE | MAXIMUM YEARLY USAGE |
|---|---|---|---|---|---|
| Field Gas | 1044 BTU/ft$^3$ | <0.0007 | N/A | 4,190.61 scf | 36.71 MMscf |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Please list any fuel components that are hazardous air pollutants and the percentage in the fuel:

_____

_____

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary | Section OPGP-E

## 1. Emission Point Description

A. Emission Point Designation (Ref. No.): AA-005 [5-05-OST-V (V-118)]

B. Product(s) Stored: Produced Oil

C. Status: ☒ Operating ☐ Proposed ☐ Under Construction

D. Date of construction, reconstruction, or most recent modification (for existing sources) or date of anticipated construction: 2005

## 2. Tank Data

A. Tank Specifications:

| | | | | | |
|---|---|---|---|---|---|
| 1. | Design capacity | 63,000 | gallons | | |
| 2. | True vapor pressure at storage temperature: | 3.892 | psia @ | 70.74 | ºF |
| 3. | Maximum true vapor pressure (as defined in §60.111b) | 4.567 | psia @ | 79.50 | ºF |
| 4. | Reid vapor pressure at storage temperature: | 5.37 | psia @ | 70.74 | ºF |
| 5. | Density of product at storage temperature: | N/A | lb/gal | | |
| 6. | Molecular weight of product vapor at storage temp. | 50 | lb/lbmol | | |

B. Tank Orientation: ☒ Vertical ☐ Horizontal

C. Type of Tank:

☒ Fixed Roof ☐ External Floating Roof ☐ Internal Floating Roof

☐ Pressure ☐ Variable Vapor Space ☐ Other: _____

D. Is the tank equipped with a Vapor Recovery System and/or flare? ☒ Yes ☐ No

*If yes, describe below and include the efficiency of each.*

Vapors from these sources are routed to the control flare (EPN: 25-05-F) for combustion with a combustion efficiency of 98%.

E. Closest City:

☒ Jackson, MS ☐ Meridian, MS ☐ Tupelo, MS ☐ Mobile, AL

☐ New Orleans, LA ☐ Memphis, TN ☐ Baton Rouge, LA

F. Is an E&P or similar report described in Condition 5.4(5) of the General Permit included for this tank in the Notice of Intent? ☒ Yes ☐ No

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary | Section OPGP-E

## 3. Horizontal Fixed Roof Tank

A. Shell Length: _____ feet
B. Shell Diameter: _____ feet
C. Working Volume: _____ gal
D. Maximum Throughput: _____ gal/yr
E. Is the tank heated? ☐ Yes ☐ No
F. Is the tank underground? ☐ Yes ☐ No
G. Shell Color/Shade:
☐ ☐ Aluminum/Specular ☐ Aluminum/Diffuse
☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer
H. Shell Condition: ☐ Good ☐ Poor

## 4. Vertical Fixed Roof Tank

A. Dimensions:
1. Shell Height: 24.00 feet
2. Shell Diameter: 21.00 feet
3. Maximum Liquid Height: 23.00 feet
4. Average Liquid Height: 11.50 feet
5. Working Volume: 63,000 gal
6. Turnovers per year: 514.45
7. Maximum throughput: 730,000 BBLs/yr
8. Is the tank heated? ☐ Yes ☒ No

B. Shell Characteristics:
1. Shell Color/Shade:
☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
☐ Gray/Light ☒ Gray/Medium ☐ Red/Primer
2. Shell Condition: ☒ Good ☐ Poor

C. Roof Characteristics:
1. Roof Color/Shade:
☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
☐ Gray/Light ☒ Gray/Medium ☐ Red/Primer
2. Roof Condition: ☒ Good ☐ Poor
3. Type: ☒ Cone ☐ Dome
4. Height: 0.66 feet

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary | Section OPGP-E

## 5. Internal Floating Roof Tank

A. Tank Characteristics:

1. Diameter: _____ feet
2. Tank Volume: _____ gal
3. Turnovers per year: _____
4. Maximum Throughput: _____ gal/yr
5. Number of Columns: _____
6. Self-Supporting Roof? ☐ Yes ☐ No
7. Effective Column Diameter:
   ☐ 9"x7" Built-up Column ☐ 8" Diameter Pipe ☐ Unknown
8. Internal Shell Condition:
   ☐ Light Rust ☐ Dense Rust ☐ Gunite Lining
9. External Shell Color/Shade:
   ☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
   ☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer
10. External Shell Condition: ☐ Good ☐ Poor
11. Roof Color/Shade:
    ☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
    ☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer
12. Roof Condition: ☐ Good ☐ Poor

B. Rim Seal System:

1. Primary Seal: ☐ Mechanical Shoe ☐ Liquid-mounted ☐ Vapor-mounted
2. Secondary Seal: ☐ Shoe-mounted ☐ Rim-mounted ☐ None

C. Deck Characteristics:

1. Deck Type: ☐ Bolted ☐ Welded
2. Deck Fitting Category: ☐ Typical ☐ Detail

## 6. External Floating Roof Tank

A. Tank Characteristics

1. Diameter: _____ feet
2. Tank Volume: _____ gal
3. Turnovers per year: _____
4. Maximum Throughput: _____ gal/yr
5. Internal Shell Condition:
   ☐ Light Rust ☐ Dense Rust ☐ Gunite Lining

## 6. External Floating Roof Tank (continued)

A. Tank Characteristics (continued):

6. Paint Color/Shade:

☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse

☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer

7. Paint Condition: ☐ Good ☐ Poor

B. Roof Characteristics

1. Roof Type: ☐ Pontoon ☐ Double Deck

2. Roof Fitting Category: ☐ Typical ☐ Detail

C. Tank Construction and Rim-Seal System:

1. Tank Construction: ☐ Welded ☐ Riveted

2. Primary Seal:

☐ Mechanical Shoe ☐ Liquid-mounted ☐ Vapor-mounted

3. Secondary Seal

☐ None ☐ Shoe-mounted ☐ Rim-mounted ☐ Weather shield

## 7. Pollutant Emissions

A. Fixed Roof Emissions:

| Pollutant[1] | Working Loss (tons/yr) | Breathing Loss (tons/yr) | Total Emissions (tons/yr) |
|---|---|---|---|
| VOC | 11.75* | 1.40* | 13.15* |
| | | | |
| | | | |

**It should be noted that the emissions listed above represent the fixed roof emissions prior to emissions being routed to the control flare for combustion.*

B. Floating Roof Emissions:

| Pollutant[1] | Rim Seal Loss (tons/yr) | Withdrawal Loss (tons/yr) | Deck Fitting Loss (tons/yr) | Deck Seam Loss (tons/yr) | Landing Loss[2] (tons/yr) | Total Emissions (tons/yr) |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |

1. All regulated air pollutants including hazardous air pollutants emitted from this source should be listed in accordance with the OGP Application Instructions. A list of regulated air pollutants and a link to EPA's list of hazardous air pollutants is provided in the OGP Application Instructions.
2. Landing losses should be determined according to the procedures in *Organic Liquid Storage Tanks* chapter of EPA's AP-42 emission factors. If the roof is not landed at least once/yr, enter "NA".

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary | Section OPGP-E

## 1. Emission Point Description

A. Emission Point Designation (Ref. No.): AA-006 & AA-007 [6a-05-OST-V (V-119A) & 6b-05-OST-V (V-119B)]

B. Product(s) Stored: Produced Oil

C. Status: ☒ Operating ☐ Proposed ☐ Under Construction

D. Date of construction, reconstruction, or most recent modification (for existing sources) or date of anticipated construction: 2005

## 2. Tank Data

A. Tank Specifications:

| | | | | | |
|---|---|---|---|---|---|
| 1. | Design capacity | 210,000 | gallons | | |
| 2. | True vapor pressure at storage temperature: | 3.927 | psia @ | 71.23 | ºF |
| 3. | Maximum true vapor pressure (as defined in §60.111b) | 4.607 | psia @ | 79.99 | ºF |
| 4. | Reid vapor pressure at storage temperature: | 5.37 | psia @ | 71.23 | ºF |
| 5. | Density of product at storage temperature: | N/A | lb/gal | | |
| 6. | Molecular weight of product vapor at storage temp. | 50 | lb/lbmol | | |

B. Tank Orientation: ☒ Vertical ☐ Horizontal

C. Type of Tank:

☒ Fixed Roof ☐ External Floating Roof ☐ Internal Floating Roof

☐ Pressure ☐ Variable Vapor Space ☐ Other: _____

D. Is the tank equipped with a Vapor Recovery System and/or flare? ☒ Yes ☐ No

*If yes, describe below and include the efficiency of each.*

Vapors from these sources are routed to the control flare (EPN: 25-05-F) for combustion with a combustion efficiency of 98%.

E. Closest City:

☒ Jackson, MS ☐ Meridian, MS ☐ Tupelo, MS ☐ Mobile, AL

☐ New Orleans, LA ☐ Memphis, TN ☐ Baton Rouge, LA

F. Is an E&P or similar report described in Condition 5.4(5) of the General Permit included for this tank in the Notice of Intent? ☒ Yes ☐ No

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary | Section OPGP-E

## 3. Horizontal Fixed Roof Tank

A. Shell Length: _____ feet
B. Shell Diameter: _____ feet
C. Working Volume: _____ gal
D. Maximum Throughput: _____ gal/yr
E. Is the tank heated? ☐ Yes ☐ No
F. Is the tank underground? ☐ Yes ☐ No
G. Shell Color/Shade:
☐ ☐ Aluminum/Specular ☐ Aluminum/Diffuse
☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer

H. Shell Condition: ☐ Good ☐ Poor

## 4. Vertical Fixed Roof Tank

A. Dimensions:
1. Shell Height: 24.13 feet
2. Shell Diameter: 38.64 feet
3. Maximum Liquid Height: 23.13 feet
4. Average Liquid Height: 11.57 feet
5. Working Volume: 210,000 gal
6. Turnovers per year: 75.55
7. Maximum throughput: 365,000 BBLs/yr
8. Is the tank heated? ☐ Yes ☒ No

B. Shell Characteristics:
1. Shell Color/Shade:
☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
☐ Gray/Light ☒ Gray/Medium ☐ Red/Primer

2. Shell Condition: ☒ Good ☐ Poor

C. Roof Characteristics:
1. Roof Color/Shade:
☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
☐ Gray/Light ☒ Gray/Medium ☐ Red/Primer

2. Roof Condition: ☒ Good ☐ Poor

3. Type: ☒ Cone ☐ Dome

4. Height: 1.21 feet

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary | Section OPGP-E

## 5. Internal Floating Roof Tank

A. Tank Characteristics:

1. Diameter: _____ feet
2. Tank Volume: _____ gal
3. Turnovers per year: _____
4. Maximum Throughput: _____ gal/yr
5. Number of Columns: _____
6. Self-Supporting Roof? ☐ Yes ☐ No
7. Effective Column Diameter:
   ☐ 9"x7" Built-up Column ☐ 8" Diameter Pipe ☐ Unknown
8. Internal Shell Condition:
   ☐ Light Rust ☐ Dense Rust ☐ Gunite Lining
9. External Shell Color/Shade:
   ☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
   ☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer
10. External Shell Condition: ☐ Good ☐ Poor
11. Roof Color/Shade:
    ☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
    ☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer
12. Roof Condition: ☐ Good ☐ Poor

B. Rim Seal System:

1. Primary Seal: ☐ Mechanical Shoe ☐ Liquid-mounted ☐ Vapor-mounted
2. Secondary Seal: ☐ Shoe-mounted ☐ Rim-mounted ☐ None

C. Deck Characteristics:

1. Deck Type: ☐ Bolted ☐ Welded
2. Deck Fitting Category: ☐ Typical ☐ Detail

## 6. External Floating Roof Tank

A. Tank Characteristics

1. Diameter: _____ feet
2. Tank Volume: _____ gal
3. Turnovers per year: _____
4. Maximum Throughput: _____ gal/yr
5. Internal Shell Condition:
   ☐ Light Rust ☐ Dense Rust ☐ Gunite Lining

## 6. External Floating Roof Tank (continued)

A. Tank Characteristics (continued):

6. Paint Color/Shade:
☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer

7. Paint Condition: ☐ Good ☐ Poor

B. Roof Characteristics

1. Roof Type: ☐ Pontoon ☐ Double Deck

2. Roof Fitting Category: ☐ Typical ☐ Detail

C. Tank Construction and Rim-Seal System:

1. Tank Construction: ☐ Welded ☐ Riveted

2. Primary Seal:
☐ Mechanical Shoe ☐ Liquid-mounted ☐ Vapor-mounted

3. Secondary Seal
☐ None ☐ Shoe-mounted ☐ Rim-mounted ☐ Weather shield

## 7. Pollutant Emissions

A. Fixed Roof Emissions:

| Pollutant[1] | Working Loss (tons/yr) | Breathing Loss (tons/yr) | Total Emissions (tons/yr) |
|---|---|---|---|
| VOC | 26.32* | 4.79* | 31.11* |
| | | | |
| | | | |

**It should be noted that the emissions listed above represent the fixed roof emissions prior to emissions being routed to the control flare for combustion.*

B. Floating Roof Emissions:

| Pollutant[1] | Rim Seal Loss (tons/yr) | Withdrawal Loss (tons/yr) | Deck Fitting Loss (tons/yr) | Deck Seam Loss (tons/yr) | Landing Loss[2] (tons/yr) | Total Emissions (tons/yr) |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |

1. All regulated air pollutants including hazardous air pollutants emitted from this source should be listed in accordance with the OGP Application Instructions. A list of regulated air pollutants and a link to EPA's list of hazardous air pollutants is provided in the OGP Application Instructions.
2. Landing losses should be determined according to the procedures in *Organic Liquid Storage Tanks* chapter of EPA's AP-42 emission factors. If the roof is not landed at least once/yr, enter "NA".

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary | Section OPGP-E

## 1. Emission Point Description

A. Emission Point Designation (Ref. No.): AA-008 & AA-009 [7a-05-ST-V (V-120A) & 7b-05-ST-V (V-120B)]

B. Product(s) Stored: Produced Water & Oil

C. Status: ☒ Operating ☐ Proposed ☐ Under Construction

D. Date of construction, reconstruction, or most recent modification (for existing sources) or date of anticipated construction: 2005

## 2. Tank Data

A. Tank Specifications:

| | | | | | |
|---|---|---|---|---|---|
| 1. | Design capacity | 84,000 | gallons | | |
| 2. | True vapor pressure at storage temperature: | 0.373 | psia @ | 70.53 | ºF |
| 3. | Maximum true vapor pressure (as defined in §60.111b) | 0.500 | psia @ | 79.30 | ºF |
| 4. | Reid vapor pressure at storage temperature: | 5.37 | psia @ | 70.53 | ºF |
| 5. | Density of product at storage temperature: | N/A | lb/gal | | |
| 6. | Molecular weight of product vapor at storage temp. | 18.35 | lb/lbmol | | |

B. Tank Orientation: ☒ Vertical ☐ Horizontal

C. Type of Tank:

☒ Fixed Roof ☐ External Floating Roof ☐ Internal Floating Roof

☐ Pressure ☐ Variable Vapor Space ☐ Other: _____

D. Is the tank equipped with a Vapor Recovery System and/or flare? ☒ Yes ☐ No

*If yes, describe below and include the efficiency of each.*

Vapors from these sources are routed to the control flare (EPN: 25-05-F) for combustion with a combustion efficiency of 98%.

E. Closest City:

☒ Jackson, MS ☐ Meridian, MS ☐ Tupelo, MS ☐ Mobile, AL

☐ New Orleans, LA ☐ Memphis, TN ☐ Baton Rouge, LA

F. Is an E&P or similar report described in Condition 5.4(5) of the General Permit included for this tank in the Notice of Intent? ☒ Yes ☐ No

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary | Section OPGP-E

## 3. Horizontal Fixed Roof Tank

A. Shell Length: _____ feet
B. Shell Diameter: _____ feet
C. Working Volume: _____ gal
D. Maximum Throughput: _____ gal/yr
E. Is the tank heated? ☐ Yes ☐ No
F. Is the tank underground? ☐ Yes ☐ No
G. Shell Color/Shade:
☐ ☐ Aluminum/Specular ☐ Aluminum/Diffuse
☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer
H. Shell Condition: ☐ Good ☐ Poor

## 4. Vertical Fixed Roof Tank

A. Dimensions:
1. Shell Height: 32.00 feet
2. Shell Diameter: 21.50 feet
3. Maximum Liquid Height: 31.00 feet
4. Average Liquid Height: 15.50 feet
5. Working Volume: 84,000 gal
6. Turnovers per year: 1,093.51
7. Maximum throughput: 2,192,190 BBLs/yr
8. Is the tank heated? ☐ Yes ☒ No

B. Shell Characteristics:
1. Shell Color/Shade:
☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
☐ Gray/Light ☒ Gray/Medium ☐ Red/Primer
2. Shell Condition: ☒ Good ☐ Poor

C. Roof Characteristics:
1. Roof Color/Shade:
☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
☐ Gray/Light ☒ Gray/Medium ☐ Red/Primer
2. Roof Condition: ☒ Good ☐ Poor
3. Type: ☒ Cone ☐ Dome
4. Height: 0.67 feet

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary — Section OPGP-E

## 5. Internal Floating Roof Tank

A. Tank Characteristics:

1. Diameter: _____ feet
2. Tank Volume: _____ gal
3. Turnovers per year: _____
4. Maximum Throughput: _____ gal/yr
5. Number of Columns: _____
6. Self-Supporting Roof? ☐ Yes ☐ No
7. Effective Column Diameter:
   ☐ 9"x7" Built-up Column ☐ 8" Diameter Pipe ☐ Unknown
8. Internal Shell Condition:
   ☐ Light Rust ☐ Dense Rust ☐ Gunite Lining
9. External Shell Color/Shade:
   ☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
   ☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer
10. External Shell Condition: ☐ Good ☐ Poor
11. Roof Color/Shade:
    ☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
    ☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer
12. Roof Condition: ☐ Good ☐ Poor

B. Rim Seal System:

1. Primary Seal: ☐ Mechanical Shoe ☐ Liquid-mounted ☐ Vapor-mounted
2. Secondary Seal: ☐ Shoe-mounted ☐ Rim-mounted ☐ None

C. Deck Characteristics:

1. Deck Type: ☐ Bolted ☐ Welded
2. Deck Fitting Category: ☐ Typical ☐ Detail

## 6. External Floating Roof Tank

A. Tank Characteristics

1. Diameter: _____ feet
2. Tank Volume: _____ gal
3. Turnovers per year: _____
4. Maximum Throughput: _____ gal/yr
5. Internal Shell Condition:
   ☐ Light Rust ☐ Dense Rust ☐ Gunite Lining

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary | Section OPGP-E

## 6. External Floating Roof Tank (continued)

A. Tank Characteristics (continued):

6. Paint Color/Shade:
☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer

7. Paint Condition: ☐ Good ☐ Poor

B. Roof Characteristics

1. Roof Type: ☐ Pontoon ☐ Double Deck

2. Roof Fitting Category: ☐ Typical ☐ Detail

C. Tank Construction and Rim-Seal System:

1. Tank Construction: ☐ Welded ☐ Riveted

2. Primary Seal:
☐ Mechanical Shoe ☐ Liquid-mounted ☐ Vapor-mounted

3. Secondary Seal
☐ None ☐ Shoe-mounted ☐ Rim-mounted ☐ Weather shield

## 7. Pollutant Emissions

A. Fixed Roof Emissions:

| Pollutant[1] | Working Loss (tons/yr) | Breathing Loss (tons/yr) | Total Emissions (tons/yr) |
|---|---|---|---|
| VOC | 8.32* | 0.12* | 8.44* |
| | | | |
| | | | |

**It should be noted that the emissions listed above represent the fixed roof emissions prior to emissions being routed to the control flare for combustion.*

B. Floating Roof Emissions:

| Pollutant[1] | Rim Seal Loss (tons/yr) | Withdrawal Loss (tons/yr) | Deck Fitting Loss (tons/yr) | Deck Seam Loss (tons/yr) | Landing Loss[2] (tons/yr) | Total Emissions (tons/yr) |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |

1. All regulated air pollutants including hazardous air pollutants emitted from this source should be listed in accordance with the OGP Application Instructions. A list of regulated air pollutants and a link to EPA's list of hazardous air pollutants is provided in the OGP Application Instructions.
2. Landing losses should be determined according to the procedures in *Organic Liquid Storage Tanks* chapter of EPA's AP-42 emission factors. If the roof is not landed at least once/yr, enter "NA".

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary | Section OPGP-E

## 1. Emission Point Description

A. Emission Point Designation (Ref. No.): AA-010 & AA-011 [8a-05-WST-V (V-129A) & 8b-05-WST-V (V-129B)]

B. Product(s) Stored: Produced Water

C. Status: ☒ Operating ☐ Proposed ☐ Under Construction

D. Date of construction, reconstruction, or most recent modification (for existing sources) or date of anticipated construction: 2005

## 2. Tank Data

A. Tank Specifications:

| | | | | | |
|---|---|---|---|---|---|
| 1. | Design capacity | 210,000 | gallons | | |
| 2. | True vapor pressure at storage temperature: | 0.376 | psia @ | 71.23 | ºF |
| 3. | Maximum true vapor pressure (as defined in §60.111b) | 0.507 | psia @ | 79.99 | ºF |
| 4. | Reid vapor pressure at storage temperature: | 0.379 | psia @ | 71.23 | ºF |
| 5. | Density of product at storage temperature: | N/A | lb/gal | | |
| 6. | Molecular weight of product vapor at storage temp. | 18.02 | lb/lbmol | | |

B. Tank Orientation: ☒ Vertical ☐ Horizontal

C. Type of Tank:

☒ Fixed Roof ☐ External Floating Roof ☐ Internal Floating Roof

☐ Pressure ☐ Variable Vapor Space ☐ Other: _____

D. Is the tank equipped with a Vapor Recovery System and/or flare? ☐ Yes ☒ No

*If yes, describe below and include the efficiency of each.*

E. Closest City:

☒ Jackson, MS ☐ Meridian, MS ☐ Tupelo, MS ☐ Mobile, AL

☐ New Orleans, LA ☐ Memphis, TN ☐ Baton Rouge, LA

F. Is an E&P or similar report described in Condition 5.4(5) of the General Permit included for this tank in the Notice of Intent? ☒ Yes ☐ No

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary | Section OPGP-E

## 3. Horizontal Fixed Roof Tank

A. Shell Length: _____ feet
B. Shell Diameter: _____ feet
C. Working Volume: _____ gal
D. Maximum Throughput: _____ gal/yr
E. Is the tank heated? ☐ Yes ☐ No
F. Is the tank underground? ☐ Yes ☐ No
G. Shell Color/Shade:
☐ ☐ Aluminum/Specular ☐ Aluminum/Diffuse
☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer
H. Shell Condition: ☐ Good ☐ Poor

## 4. Vertical Fixed Roof Tank

A. Dimensions:
1. Shell Height: 24.13 feet
2. Shell Diameter: 38.64 feet
3. Maximum Liquid Height: 23.13 feet
4. Average Liquid Height: 11.57 feet
5. Working Volume: 210,000 gal
6. Turnovers per year: 453.29
7. Maximum throughput: 2,190,000 BBLs/yr
8. Is the tank heated? ☐ Yes ☒ No

B. Shell Characteristics:
1. Shell Color/Shade:
☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
☐ Gray/Light ☒ Gray/Medium ☐ Red/Primer
2. Shell Condition: ☒ Good ☐ Poor

C. Roof Characteristics:
1. Roof Color/Shade:
☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
☐ Gray/Light ☒ Gray/Medium ☐ Red/Primer
2. Roof Condition: ☒ Good ☐ Poor
3. Type: ☒ Cone ☐ Dome
4. Height: 1.21 feet

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary — Section OPGP-E

## 5. Internal Floating Roof Tank

A. Tank Characteristics:

1. Diameter: _____ feet
2. Tank Volume: _____ gal
3. Turnovers per year: _____
4. Maximum Throughput: _____ gal/yr
5. Number of Columns: _____
6. Self-Supporting Roof? ☐ Yes ☐ No
7. Effective Column Diameter:
   ☐ 9"x7" Built-up Column ☐ 8" Diameter Pipe ☐ Unknown
8. Internal Shell Condition:
   ☐ Light Rust ☐ Dense Rust ☐ Gunite Lining
9. External Shell Color/Shade:
   ☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
   ☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer
10. External Shell Condition: ☐ Good ☐ Poor
11. Roof Color/Shade:
    ☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
    ☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer
12. Roof Condition: ☐ Good ☐ Poor

B. Rim Seal System:

1. Primary Seal: ☐ Mechanical Shoe ☐ Liquid-mounted ☐ Vapor-mounted
2. Secondary Seal: ☐ Shoe-mounted ☐ Rim-mounted ☐ None

C. Deck Characteristics:

1. Deck Type: ☐ Bolted ☐ Welded
2. Deck Fitting Category: ☐ Typical ☐ Detail

## 6. External Floating Roof Tank

A. Tank Characteristics

1. Diameter: _____ feet
2. Tank Volume: _____ gal
3. Turnovers per year: _____
4. Maximum Throughput: _____ gal/yr
5. Internal Shell Condition:
   ☐ Light Rust ☐ Dense Rust ☐ Gunite Lining

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary | Section OPGP-E

## 6. External Floating Roof Tank (continued)

A. Tank Characteristics (continued):

6. Paint Color/Shade:
☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer

7. Paint Condition: ☐ Good ☐ Poor

B. Roof Characteristics

1. Roof Type: ☐ Pontoon ☐ Double Deck

2. Roof Fitting Category: ☐ Typical ☐ Detail

C. Tank Construction and Rim-Seal System:

1. Tank Construction: ☐ Welded ☐ Riveted

2. Primary Seal:
☐ Mechanical Shoe ☐ Liquid-mounted ☐ Vapor-mounted

3. Secondary Seal
☐ None ☐ Shoe-mounted ☐ Rim-mounted ☐ Weather shield

## 7. Pollutant Emissions

A. Fixed Roof Emissions:

| Pollutant[1] | Working Loss (tons/yr) | Breathing Loss (tons/yr) | Total Emissions (tons/yr) |
|---|---|---|---|
| VOC | 1.27 | 0.22 | 1.49 |
| | | | |
| | | | |

B. Floating Roof Emissions:

| Pollutant[1] | Rim Seal Loss (tons/yr) | Withdrawal Loss (tons/yr) | Deck Fitting Loss (tons/yr) | Deck Seam Loss (tons/yr) | Landing Loss[2] (tons/yr) | Total Emissions (tons/yr) |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |

1. All regulated air pollutants including hazardous air pollutants emitted from this source should be listed in accordance with the OGP Application Instructions. A list of regulated air pollutants and a link to EPA's list of hazardous air pollutants is provided in the OGP Application Instructions.
2. Landing losses should be determined according to the procedures in *Organic Liquid Storage Tanks* chapter of EPA's AP-42 emission factors. If the roof is not landed at least once/yr, enter "NA".

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary | Section OPGP-E

## 1. Emission Point Description

A. Emission Point Designation (Ref. No.): AA-012 [9-05-SOT-V (V-132)]

B. Product(s) Stored: Produced Oil

C. Status: ☒ Operating ☐ Proposed ☐ Under Construction

D. Date of construction, reconstruction, or most recent modification (for existing sources) or date of anticipated construction: 2005

## 2. Tank Data

A. Tank Specifications:

| | | | | | |
|---|---|---|---|---|---|
| 1. | Design capacity | 63,000 | gallons | | |
| 2. | True vapor pressure at storage temperature: | 3.892 | psia @ | 70.74 | ºF |
| 3. | Maximum true vapor pressure (as defined in §60.111b) | 4.567 | psia @ | 79.50 | ºF |
| 4. | Reid vapor pressure at storage temperature: | 5.37 | psia @ | 70.74 | ºF |
| 5. | Density of product at storage temperature: | N/A | lb/gal | | |
| 6. | Molecular weight of product vapor at storage temp. | 50.00 | lb/lbmol | | |

B. Tank Orientation: ☒ Vertical ☐ Horizontal

C. Type of Tank:

☒ Fixed Roof ☐ External Floating Roof ☐ Internal Floating Roof

☐ Pressure ☐ Variable Vapor Space ☐ Other: _____

D. Is the tank equipped with a Vapor Recovery System and/or flare? ☐ Yes ☒ No

*If yes, describe below and include the efficiency of each.*

E. Closest City:

☒ Jackson, MS ☐ Meridian, MS ☐ Tupelo, MS ☐ Mobile, AL

☐ New Orleans, LA ☐ Memphis, TN ☐ Baton Rouge, LA

F. Is an E&P or similar report described in Condition 5.4(5) of the General Permit included for this tank in the Notice of Intent? ☒ Yes ☐ No

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary | Section OPGP-E

## 3. Horizontal Fixed Roof Tank

A. Shell Length: _____ feet
B. Shell Diameter: _____ feet
C. Working Volume: _____ gal
D. Maximum Throughput: _____ gal/yr
E. Is the tank heated? ☐ Yes ☐ No
F. Is the tank underground? ☐ Yes ☐ No
G. Shell Color/Shade:
☐ ☐ Aluminum/Specular ☐ Aluminum/Diffuse
☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer

H. Shell Condition: ☐ Good ☐ Poor

## 4. Vertical Fixed Roof Tank

A. Dimensions:
1. Shell Height: 24.00 feet
2. Shell Diameter: 21.00 feet
3. Maximum Liquid Height: 23.00 feet
4. Average Liquid Height: 11.50 feet
5. Working Volume: 63,000 gal
6. Turnovers per year: 7.72
7. Maximum throughput: 10,950 BBLs/yr
8. Is the tank heated? ☐ Yes ☒ No

B. Shell Characteristics:
1. Shell Color/Shade:
☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
☐ Gray/Light ☒ Gray/Medium ☐ Red/Primer

2. Shell Condition: ☒ Good ☐ Poor

C. Roof Characteristics:
1. Roof Color/Shade:
☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
☐ Gray/Light ☒ Gray/Medium ☐ Red/Primer

2. Roof Condition: ☒ Good ☐ Poor

3. Type: ☒ Cone ☐ Dome

4. Height: 0.66 feet

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary — Section OPGP-E

## 5. Internal Floating Roof Tank

A. Tank Characteristics:

1. Diameter: _____ feet
2. Tank Volume: _____ gal
3. Turnovers per year: _____
4. Maximum Throughput: _____ gal/yr
5. Number of Columns: _____
6. Self-Supporting Roof? ☐ Yes ☐ No
7. Effective Column Diameter:
   ☐ 9"x7" Built-up Column ☐ 8" Diameter Pipe ☐ Unknown
8. Internal Shell Condition:
   ☐ Light Rust ☐ Dense Rust ☐ Gunite Lining
9. External Shell Color/Shade:
   ☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
   ☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer
10. External Shell Condition: ☐ Good ☐ Poor
11. Roof Color/Shade:
    ☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
    ☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer
12. Roof Condition: ☐ Good ☐ Poor

B. Rim Seal System:

1. Primary Seal: ☐ Mechanical Shoe ☐ Liquid-mounted ☐ Vapor-mounted
2. Secondary Seal: ☐ Shoe-mounted ☐ Rim-mounted ☐ None

C. Deck Characteristics:

1. Deck Type: ☐ Bolted ☐ Welded
2. Deck Fitting Category: ☐ Typical ☐ Detail

## 6. External Floating Roof Tank

A. Tank Characteristics

1. Diameter: _____ feet
2. Tank Volume: _____ gal
3. Turnovers per year: _____
4. Maximum Throughput: _____ gal/yr
5. Internal Shell Condition:
   ☐ Light Rust ☐ Dense Rust ☐ Gunite Lining

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary | Section OPGP-E

## 6. External Floating Roof Tank (continued)

A. Tank Characteristics (continued):

6. Paint Color/Shade:
☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer

7. Paint Condition: ☐ Good ☐ Poor

B. Roof Characteristics

1. Roof Type: ☐ Pontoon ☐ Double Deck

2. Roof Fitting Category: ☐ Typical ☐ Detail

C. Tank Construction and Rim-Seal System:

1. Tank Construction: ☐ Welded ☐ Riveted

2. Primary Seal:
☐ Mechanical Shoe ☐ Liquid-mounted ☐ Vapor-mounted

3. Secondary Seal
☐ None ☐ Shoe-mounted ☐ Rim-mounted ☐ Weather shield

## 7. Pollutant Emissions

A. Fixed Roof Emissions:

| Pollutant[1] | Working Loss (tons/yr) | Breathing Loss (tons/yr) | Total Emissions (tons/yr) |
|---|---|---|---|
| VOC | 0.78 | 1.40 | 2.18 |
| | | | |
| | | | |

B. Floating Roof Emissions:

| Pollutant[1] | Rim Seal Loss (tons/yr) | Withdrawal Loss (tons/yr) | Deck Fitting Loss (tons/yr) | Deck Seam Loss (tons/yr) | Landing Loss[2] (tons/yr) | Total Emissions (tons/yr) |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |

1. All regulated air pollutants including hazardous air pollutants emitted from this source should be listed in accordance with the OGP Application Instructions. A list of regulated air pollutants and a link to EPA's list of hazardous air pollutants is provided in the OGP Application Instructions.
2. Landing losses should be determined according to the procedures in *Organic Liquid Storage Tanks* chapter of EPA's AP-42 emission factors. If the roof is not landed at least once/yr, enter "NA".

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary | Section OPGP-E

## 1. Emission Point Description

A. Emission Point Designation (Ref. No.): AA-013, AA-014, & AA-015 [10-05-IOT-V, 11-05-IOT-V, & 12-05-IOT-V (V-133A, V-133B, & V-133C)]

B. Product(s) Stored: Produced Oil, Corrosion Inhibitor, Paraffin Inhibitor, Asphaltene Inhibitor

C. Status: ☒ Operating ☐ Proposed ☐ Under Construction

D. Date of construction, reconstruction, or most recent modification (for existing sources) or date of anticipated construction: 2005

## 2. Tank Data

A. Tank Specifications:

| | | | | | |
|---|---|---|---|---|---|
| 1. | Design capacity | 63,000 | gallons | | |
| 2. | True vapor pressure at storage temperature: | 3.893 | psia @ | 70.76 | ºF |
| 3. | Maximum true vapor pressure (as defined in §60.111b) | 4.568 | psia @ | 79.52 | ºF |
| 4. | Reid vapor pressure at storage temperature: | 5.37 | psia @ | 70.76 | ºF |
| 5. | Density of product at storage temperature: | N/A | lb/gal | | |
| 6. | Molecular weight of product vapor at storage temp. | 50 | lb/lbmol | | |

B. Tank Orientation: ☒ Vertical ☐ Horizontal

C. Type of Tank:

☒ Fixed Roof ☐ External Floating Roof ☐ Internal Floating Roof

☐ Pressure ☐ Variable Vapor Space ☐ Other: _____

D. Is the tank equipped with a Vapor Recovery System and/or flare? ☒ Yes ☐ No

*If yes, describe below and include the efficiency of each.*

Vapors from these sources are routed to the control flare (EPN: 25-05-F) for combustion with a combustion efficiency of 98%.

E. Closest City:

☒ Jackson, MS ☐ Meridian, MS ☐ Tupelo, MS ☐ Mobile, AL

☐ New Orleans, LA ☐ Memphis, TN ☐ Baton Rouge, LA

F. Is an E&P or similar report described in Condition 5.4(5) of the General Permit included for this tank in the Notice of Intent? ☒ Yes ☐ No

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary | Section OPGP-E

## 3. Horizontal Fixed Roof Tank

A. Shell Length: _____ feet
B. Shell Diameter: _____ feet
C. Working Volume: _____ gal
D. Maximum Throughput: _____ gal/yr
E. Is the tank heated? ☐ Yes ☐ No
F. Is the tank underground? ☐ Yes ☐ No
G. Shell Color/Shade:
☐ ☐ Aluminum/Specular ☐ Aluminum/Diffuse
☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer
H. Shell Condition: ☐ Good ☐ Poor

## 4. Vertical Fixed Roof Tank

A. Dimensions:
1. Shell Height: 24.10 feet
2. Shell Diameter: 21.60 feet
3. Maximum Liquid Height: 23.10 feet
4. Average Liquid Height: 11.55 feet
5. Working Volume: 63,000 gal
6. Turnovers per year: 24.21
7. Maximum throughput: 36,500 BBLs/yr
8. Is the tank heated? ☐ Yes ☒ No

B. Shell Characteristics:
1. Shell Color/Shade:
☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
☐ Gray/Light ☒ Gray/Medium ☐ Red/Primer
2. Shell Condition: ☒ Good ☐ Poor

C. Roof Characteristics:
1. Roof Color/Shade:
☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
☐ Gray/Light ☒ Gray/Medium ☐ Red/Primer
2. Roof Condition: ☒ Good ☐ Poor
3. Type: ☒ Cone ☐ Dome
4. Height: 0.68 feet

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary — Section OPGP-E

## 5. Internal Floating Roof Tank

A. Tank Characteristics:

1. Diameter: _____ feet
2. Tank Volume: _____ gal
3. Turnovers per year: _____
4. Maximum Throughput: _____ gal/yr
5. Number of Columns: _____
6. Self-Supporting Roof? ☐ Yes ☐ No
7. Effective Column Diameter:
   ☐ 9"x7" Built-up Column ☐ 8" Diameter Pipe ☐ Unknown
8. Internal Shell Condition:
   ☐ Light Rust ☐ Dense Rust ☐ Gunite Lining
9. External Shell Color/Shade:
   ☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
   ☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer
10. External Shell Condition: ☐ Good ☐ Poor
11. Roof Color/Shade:
    ☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
    ☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer
12. Roof Condition: ☐ Good ☐ Poor

B. Rim Seal System:

1. Primary Seal: ☐ Mechanical Shoe ☐ Liquid-mounted ☐ Vapor-mounted
2. Secondary Seal: ☐ Shoe-mounted ☐ Rim-mounted ☐ None

C. Deck Characteristics:

1. Deck Type: ☐ Bolted ☐ Welded
2. Deck Fitting Category: ☐ Typical ☐ Detail

## 6. External Floating Roof Tank

A. Tank Characteristics

1. Diameter: _____ feet
2. Tank Volume: _____ gal
3. Turnovers per year: _____
4. Maximum Throughput: _____ gal/yr
5. Internal Shell Condition:
   ☐ Light Rust ☐ Dense Rust ☐ Gunite Lining

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary | Section OPGP-E

## 6. External Floating Roof Tank (continued)

A. Tank Characteristics (continued):

6. Paint Color/Shade:
☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer

7. Paint Condition: ☐ Good ☐ Poor

B. Roof Characteristics

1. Roof Type: ☐ Pontoon ☐ Double Deck

2. Roof Fitting Category: ☐ Typical ☐ Detail

C. Tank Construction and Rim-Seal System:

1. Tank Construction: ☐ Welded ☐ Riveted

2. Primary Seal:
☐ Mechanical Shoe ☐ Liquid-mounted ☐ Vapor-mounted

3. Secondary Seal
☐ None ☐ Shoe-mounted ☐ Rim-mounted ☐ Weather shield

## 7. Pollutant Emissions

A. Fixed Roof Emissions:

| Pollutant[1] | Working Loss (tons/yr) | Breathing Loss (tons/yr) | Total Emissions (tons/yr) |
|---|---|---|---|
| VOC | 2.61* | 1.48* | 4.09* |
| | | | |
| | | | |

**It should be noted that the emissions listed above represent the fixed roof emissions prior to emissions being routed to the control flare for combustion.*

B. Floating Roof Emissions:

| Pollutant[1] | Rim Seal Loss (tons/yr) | Withdrawal Loss (tons/yr) | Deck Fitting Loss (tons/yr) | Deck Seam Loss (tons/yr) | Landing Loss[2] (tons/yr) | Total Emissions (tons/yr) |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |

1. All regulated air pollutants including hazardous air pollutants emitted from this source should be listed in accordance with the OGP Application Instructions. A list of regulated air pollutants and a link to EPA's list of hazardous air pollutants is provided in the OGP Application Instructions.
2. Landing losses should be determined according to the procedures in *Organic Liquid Storage Tanks* chapter of EPA's AP-42 emission factors. If the roof is not landed at least once/yr, enter "NA".

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary | Section OPGP-E

## 1. Emission Point Description

A. Emission Point Designation (Ref. No.): AA-016 & AA-017 [13-05-ITT-V (V-134A) & 14-05-ITT-V (V-134B)]

B. Product(s) Stored: Organic Chemical Blend (Assumes 100% N-Hexane as worst case)

C. Status: ☒ Operating ☐ Proposed ☐ Under Construction

D. Date of construction, reconstruction, or most recent modification (for existing sources) or date of anticipated construction: 2005

## 2. Tank Data

A. Tank Specifications:

| | | | | | |
|---|---|---|---|---|---|
| 1. | Design capacity | 500 | gallons | | |
| 2. | True vapor pressure at storage temperature: | 2.594 | psia @ | 72.04 | ºF |
| 3. | Maximum true vapor pressure (as defined in §60.111b) | 3.311 | psia @ | 82.17 | ºF |
| 4. | Reid vapor pressure at storage temperature: | 2.594 | psia @ | 72.04 | ºF |
| 5. | Density of product at storage temperature: | N/A | lb/gal | | |
| 6. | Molecular weight of product vapor at storage temp. | 86.18 | lb/lbmol | | |

B. Tank Orientation: ☐ Vertical ☒ Horizontal

C. Type of Tank:

☒ Fixed Roof ☐ External Floating Roof ☐ Internal Floating Roof

☐ Pressure ☐ Variable Vapor Space ☐ Other: _____

D. Is the tank equipped with a Vapor Recovery System and/or flare? ☐ Yes ☒ No

*If yes, describe below and include the efficiency of each.*

E. Closest City:

☒ Jackson, MS ☐ Meridian, MS ☐ Tupelo, MS ☐ Mobile, AL

☐ New Orleans, LA ☐ Memphis, TN ☐ Baton Rouge, LA

F. Is an E&P or similar report described in Condition 5.4(5) of the General Permit included for this tank in the Notice of Intent? ☒ Yes ☐ No

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary | Section OPGP-E

## 3. Horizontal Fixed Roof Tank

A. Shell Length: 6.10 feet
B. Shell Diameter: 4.00 feet
C. Working Volume: 500 gal
D. Maximum Throughput: 5,000 gal/yr
E. Is the tank heated? ☐ Yes ☒ No
F. Is the tank underground? ☐ Yes ☒ No
G. Shell Color/Shade:

☐ ☐ Aluminum/Specular ☐ Aluminum/Diffuse

☐ Gray/Light ☐ Gray/Medium ☒ Red/Primer

H. Shell Condition: ☒ Good ☐ Poor

## 4. Vertical Fixed Roof Tank

A. Dimensions:
1. Shell Height: _____ feet
2. Shell Diameter: _____ feet
3. Maximum Liquid Height: _____ feet
4. Average Liquid Height: _____ feet
5. Working Volume: _____ gal
6. Turnovers per year: _____
7. Maximum throughput: _____ BBLs/yr
8. Is the tank heated? ☐ Yes ☐ No

B. Shell Characteristics:
1. Shell Color/Shade:

☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse

☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer

2. Shell Condition: ☐ Good ☐ Poor

C. Roof Characteristics:
1. Roof Color/Shade:

☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse

☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer

2. Roof Condition: ☐ Good ☐ Poor

3. Type: ☐ Cone ☐ Dome

4. Height: _____ feet

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary — Section OPGP-E

## 5. Internal Floating Roof Tank

A. Tank Characteristics:

1. Diameter: _____ feet
2. Tank Volume: _____ gal
3. Turnovers per year: _____
4. Maximum Throughput: _____ gal/yr
5. Number of Columns: _____
6. Self-Supporting Roof? ☐ Yes ☐ No
7. Effective Column Diameter:
   ☐ 9"x7" Built-up Column ☐ 8" Diameter Pipe ☐ Unknown
8. Internal Shell Condition:
   ☐ Light Rust ☐ Dense Rust ☐ Gunite Lining
9. External Shell Color/Shade:
   ☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
   ☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer
10. External Shell Condition: ☐ Good ☐ Poor
11. Roof Color/Shade:
    ☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
    ☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer
12. Roof Condition: ☐ Good ☐ Poor

B. Rim Seal System:

1. Primary Seal: ☐ Mechanical Shoe ☐ Liquid-mounted ☐ Vapor-mounted
2. Secondary Seal: ☐ Shoe-mounted ☐ Rim-mounted ☐ None

C. Deck Characteristics:

1. Deck Type: ☐ Bolted ☐ Welded
2. Deck Fitting Category: ☐ Typical ☐ Detail

## 6. External Floating Roof Tank

A. Tank Characteristics

1. Diameter: _____ feet
2. Tank Volume: _____ gal
3. Turnovers per year: _____
4. Maximum Throughput: _____ gal/yr
5. Internal Shell Condition:
   ☐ Light Rust ☐ Dense Rust ☐ Gunite Lining

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary | Section OPGP-E

## 6. External Floating Roof Tank (continued)

A. Tank Characteristics (continued):

6. Paint Color/Shade:
☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer

7. Paint Condition: ☐ Good ☐ Poor

B. Roof Characteristics

1. Roof Type: ☐ Pontoon ☐ Double Deck

2. Roof Fitting Category: ☐ Typical ☐ Detail

C. Tank Construction and Rim-Seal System:

1. Tank Construction: ☐ Welded ☐ Riveted

2. Primary Seal:
☐ Mechanical Shoe ☐ Liquid-mounted ☐ Vapor-mounted

3. Secondary Seal
☐ None ☐ Shoe-mounted ☐ Rim-mounted ☐ Weather shield

## 7. Pollutant Emissions

A. Fixed Roof Emissions:

| Pollutant[1] | Working Loss (tons/yr) | Breathing Loss (tons/yr) | Total Emissions (tons/yr) |
|---|---|---|---|
| VOC | 0.01 | 0.04 | 0.05 |
| | | | |
| | | | |

B. Floating Roof Emissions:

| Pollutant[1] | Rim Seal Loss (tons/yr) | Withdrawal Loss (tons/yr) | Deck Fitting Loss (tons/yr) | Deck Seam Loss (tons/yr) | Landing Loss[2] (tons/yr) | Total Emissions (tons/yr) |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |

1. All regulated air pollutants including hazardous air pollutants emitted from this source should be listed in accordance with the OGP Application Instructions. A list of regulated air pollutants and a link to EPA's list of hazardous air pollutants is provided in the OGP Application Instructions.
2. Landing losses should be determined according to the procedures in *Organic Liquid Storage Tanks* chapter of EPA's AP-42 emission factors. If the roof is not landed at least once/yr, enter "NA".

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary | Section OPGP-E

## 1. Emission Point Description

A. Emission Point Designation (Ref. No.): AA-018 [15-05-ITT-V (V-134C)]

B. Product(s) Stored: Organic Chemical Blend (Assumes 100% N-Hexane as worst case)

C. Status: ☒ Operating ☐ Proposed ☐ Under Construction

D. Date of construction, reconstruction, or most recent modification (for existing sources) or date of anticipated construction: 2005

## 2. Tank Data

A. Tank Specifications:

| | | | | | |
|---|---|---|---|---|---|
| 1. | Design capacity | 2,000 | gallons | | |
| 2. | True vapor pressure at storage temperature: | 2.625 | psia @ | 72.54 | ºF |
| 3. | Maximum true vapor pressure (as defined in §60.111b) | 3.349 | psia @ | 82.66 | ºF |
| 4. | Reid vapor pressure at storage temperature: | 2.625 | psia @ | 72.54 | ºF |
| 5. | Density of product at storage temperature: | N/A | lb/gal | | |
| 6. | Molecular weight of product vapor at storage temp. | 86.18 | lb/lbmol | | |

B. Tank Orientation: ☒ Vertical ☐ Horizontal

C. Type of Tank:

☒ Fixed Roof ☐ External Floating Roof ☐ Internal Floating Roof

☐ Pressure ☐ Variable Vapor Space ☐ Other: _____

D. Is the tank equipped with a Vapor Recovery System and/or flare? ☐ Yes ☒ No

*If yes, describe below and include the efficiency of each.*

E. Closest City:

☒ Jackson, MS ☐ Meridian, MS ☐ Tupelo, MS ☐ Mobile, AL

☐ New Orleans, LA ☐ Memphis, TN ☐ Baton Rouge, LA

F. Is an E&P or similar report described in Condition 5.4(5) of the General Permit included for this tank in the Notice of Intent? ☒ Yes ☐ No

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary | Section OPGP-E

## 3. Horizontal Fixed Roof Tank

A. Shell Length: _____ feet
B. Shell Diameter: _____ feet
C. Working Volume: _____ gal
D. Maximum Throughput: _____ gal/yr
E. Is the tank heated? ☐ Yes ☐ No
F. Is the tank underground? ☐ Yes ☐ No
G. Shell Color/Shade:
☐ ☐ Aluminum/Specular ☐ Aluminum/Diffuse
☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer
H. Shell Condition: ☐ Good ☐ Poor

## 4. Vertical Fixed Roof Tank

A. Dimensions:
1. Shell Height: 7.00 feet
2. Shell Diameter: 7.50 feet
3. Maximum Liquid Height: 6.00 feet
4. Average Liquid Height: 3.00 feet
5. Working Volume: 2000 gal
6. Turnovers per year: 10.09
7. Maximum throughput: 476.19 BBLs/yr
8. Is the tank heated? ☐ Yes ☒ No

B. Shell Characteristics:
1. Shell Color/Shade:
☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
☐ Gray/Light ☐ Gray/Medium ☒ Red/Primer
2. Shell Condition: ☒ Good ☐ Poor

C. Roof Characteristics:
1. Roof Color/Shade:
☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
☐ Gray/Light ☐ Gray/Medium ☒ Red/Primer
2. Roof Condition: ☒ Good ☐ Poor
3. Type: ☒ Cone ☐ Dome
4. Height: 0.23 feet

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary — Section OPGP-E

## 5. Internal Floating Roof Tank

A. Tank Characteristics:

1. Diameter: _____ feet
2. Tank Volume: _____ gal
3. Turnovers per year: _____
4. Maximum Throughput: _____ gal/yr
5. Number of Columns: _____
6. Self-Supporting Roof? ☐ Yes ☐ No
7. Effective Column Diameter:
   ☐ 9"x7" Built-up Column ☐ 8" Diameter Pipe ☐ Unknown
8. Internal Shell Condition:
   ☐ Light Rust ☐ Dense Rust ☐ Gunite Lining
9. External Shell Color/Shade:
   ☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
   ☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer
10. External Shell Condition: ☐ Good ☐ Poor
11. Roof Color/Shade:
    ☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
    ☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer
12. Roof Condition: ☐ Good ☐ Poor

B. Rim Seal System:

1. Primary Seal: ☐ Mechanical Shoe ☐ Liquid-mounted ☐ Vapor-mounted
2. Secondary Seal: ☐ Shoe-mounted ☐ Rim-mounted ☐ None

C. Deck Characteristics:

1. Deck Type: ☐ Bolted ☐ Welded
2. Deck Fitting Category: ☐ Typical ☐ Detail

## 6. External Floating Roof Tank

A. Tank Characteristics

1. Diameter: _____ feet
2. Tank Volume: _____ gal
3. Turnovers per year: _____
4. Maximum Throughput: _____ gal/yr
5. Internal Shell Condition:
   ☐ Light Rust ☐ Dense Rust ☐ Gunite Lining

## 6. External Floating Roof Tank (continued)

A. Tank Characteristics (continued):

6. Paint Color/Shade:

☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse

☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer

7. Paint Condition: ☐ Good ☐ Poor

B. Roof Characteristics

1. Roof Type: ☐ Pontoon ☐ Double Deck

2. Roof Fitting Category: ☐ Typical ☐ Detail

C. Tank Construction and Rim-Seal System:

1. Tank Construction: ☐ Welded ☐ Riveted

2. Primary Seal:

☐ Mechanical Shoe ☐ Liquid-mounted ☐ Vapor-mounted

3. Secondary Seal

☐ None ☐ Shoe-mounted ☐ Rim-mounted ☐ Weather shield

## 7. Pollutant Emissions

A. Fixed Roof Emissions:

| Pollutant[1] | Working Loss (tons/yr) | Breathing Loss (tons/yr) | Total Emissions (tons/yr) |
|---|---|---|---|
| VOC | 0.05 | 0.15 | 0.20 |
| | | | |
| | | | |

B. Floating Roof Emissions:

| Pollutant[1] | Rim Seal Loss (tons/yr) | Withdrawal Loss (tons/yr) | Deck Fitting Loss (tons/yr) | Deck Seam Loss (tons/yr) | Landing Loss[2] (tons/yr) | Total Emissions (tons/yr) |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |

1. All regulated air pollutants including hazardous air pollutants emitted from this source should be listed in accordance with the OGP Application Instructions. A list of regulated air pollutants and a link to EPA's list of hazardous air pollutants is provided in the OGP Application Instructions.
2. Landing losses should be determined according to the procedures in *Organic Liquid Storage Tanks* chapter of EPA's AP-42 emission factors. If the roof is not landed at least once/yr, enter "NA".

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary | Section OPGP-E

## 1. Emission Point Description

A. Emission Point Designation (Ref. No.): AA-019 [17-05-GST (V-137)]

B. Product(s) Stored: Organic Chemical Blend (Assumes 100% Toluene as worst case)

C. Status: ☒ Operating ☐ Proposed ☐ Under Construction

D. Date of construction, reconstruction, or most recent modification (for existing sources) or date of anticipated construction: 2005

## 2. Tank Data

A. Tank Specifications:

| | | | | | |
|---|---|---|---|---|---|
| 1. | Design capacity | 4,200 | gallons | | |
| 2. | True vapor pressure at storage temperature: | 0.485 | psia @ | 72.70 | ºF |
| 3. | Maximum true vapor pressure (as defined in §60.111b) | 0.649 | psia @ | 82.82 | ºF |
| 4. | Reid vapor pressure at storage temperature: | 0.485 | psia @ | 72.70 | ºF |
| 5. | Density of product at storage temperature: | N/A | lb/gal | | |
| 6. | Molecular weight of product vapor at storage temp. | 92.14 | lb/lbmol | | |

B. Tank Orientation: ☒ Vertical ☐ Horizontal

C. Type of Tank:

☒ Fixed Roof ☐ External Floating Roof ☐ Internal Floating Roof

☐ Pressure ☐ Variable Vapor Space ☐ Other: _____

D. Is the tank equipped with a Vapor Recovery System and/or flare? ☐ Yes ☒ No

*If yes, describe below and include the efficiency of each.*

E. Closest City:

☒ Jackson, MS ☐ Meridian, MS ☐ Tupelo, MS ☐ Mobile, AL

☐ New Orleans, LA ☐ Memphis, TN ☐ Baton Rouge, LA

F. Is an E&P or similar report described in Condition 5.4(5) of the General Permit included for this tank in the Notice of Intent? ☒ Yes ☐ No

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary | Section OPGP-E

## 3. Horizontal Fixed Roof Tank

A. Shell Length: _____ feet
B. Shell Diameter: _____ feet
C. Working Volume: _____ gal
D. Maximum Throughput: _____ gal/yr
E. Is the tank heated? ☐ Yes ☐ No
F. Is the tank underground? ☐ Yes ☐ No
G. Shell Color/Shade:
☐ ☐ Aluminum/Specular ☐ Aluminum/Diffuse
☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer

H. Shell Condition: ☐ Good ☐ Poor

## 4. Vertical Fixed Roof Tank

A. Dimensions:
1. Shell Height: 8.00 feet
2. Shell Diameter: 10.00 feet
3. Maximum Liquid Height: 7.00 feet
4. Average Liquid Height: 3.50 feet
5. Working Volume: 4,200 gal
6. Turnovers per year: 10.21
7. Maximum throughput: 1,000 BBLs/yr
8. Is the tank heated? ☐ Yes ☒ No

B. Shell Characteristics:
1. Shell Color/Shade:
☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
☐ Gray/Light ☐ Gray/Medium ☒ Red/Primer

2. Shell Condition: ☒ Good ☐ Poor

C. Roof Characteristics:
1. Roof Color/Shade:
☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
☐ Gray/Light ☐ Gray/Medium ☒ Red/Primer

2. Roof Condition: ☒ Good ☐ Poor

3. Type: ☒ Cone ☐ Dome

4. Height: 0.31 feet

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary — Section OPGP-E

## 5. Internal Floating Roof Tank

A. Tank Characteristics:

1. Diameter: _____ feet
2. Tank Volume: _____ gal
3. Turnovers per year: _____
4. Maximum Throughput: _____ gal/yr
5. Number of Columns: _____
6. Self-Supporting Roof? ☐ Yes ☐ No
7. Effective Column Diameter:
   ☐ 9"x7" Built-up Column ☐ 8" Diameter Pipe ☐ Unknown
8. Internal Shell Condition:
   ☐ Light Rust ☐ Dense Rust ☐ Gunite Lining
9. External Shell Color/Shade:
   ☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
   ☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer
10. External Shell Condition: ☐ Good ☐ Poor
11. Roof Color/Shade:
    ☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
    ☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer
12. Roof Condition: ☐ Good ☐ Poor

B. Rim Seal System:

1. Primary Seal: ☐ Mechanical Shoe ☐ Liquid-mounted ☐ Vapor-mounted
2. Secondary Seal: ☐ Shoe-mounted ☐ Rim-mounted ☐ None

C. Deck Characteristics:

1. Deck Type: ☐ Bolted ☐ Welded
2. Deck Fitting Category: ☐ Typical ☐ Detail

## 6. External Floating Roof Tank

A. Tank Characteristics

1. Diameter: _____ feet
2. Tank Volume: _____ gal
3. Turnovers per year: _____
4. Maximum Throughput: _____ gal/yr
5. Internal Shell Condition:
   ☐ Light Rust ☐ Dense Rust ☐ Gunite Lining

# Tank Summary — Section OPGP-E

## 6. External Floating Roof Tank (continued)

A. Tank Characteristics (continued):

6. Paint Color/Shade:
☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer

7. Paint Condition: ☐ Good ☐ Poor

B. Roof Characteristics

1. Roof Type: ☐ Pontoon ☐ Double Deck

2. Roof Fitting Category: ☐ Typical ☐ Detail

C. Tank Construction and Rim-Seal System:

1. Tank Construction: ☐ Welded ☐ Riveted

2. Primary Seal:
☐ Mechanical Shoe ☐ Liquid-mounted ☐ Vapor-mounted

3. Secondary Seal
☐ None ☐ Shoe-mounted ☐ Rim-mounted ☐ Weather shield

## 7. Pollutant Emissions

A. Fixed Roof Emissions:

| Pollutant[1] | Working Loss (tons/yr) | Breathing Loss (tons/yr) | Total Emissions (tons/yr) |
|---|---|---|---|
| VOC | 0.03 | 0.04 | 0.07 |
| | | | |
| | | | |

B. Floating Roof Emissions:

| Pollutant[1] | Rim Seal Loss (tons/yr) | Withdrawal Loss (tons/yr) | Deck Fitting Loss (tons/yr) | Deck Seam Loss (tons/yr) | Landing Loss[2] (tons/yr) | Total Emissions (tons/yr) |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |

1. All regulated air pollutants including hazardous air pollutants emitted from this source should be listed in accordance with the OGP Application Instructions. A list of regulated air pollutants and a link to EPA's list of hazardous air pollutants is provided in the OGP Application Instructions.
2. Landing losses should be determined according to the procedures in *Organic Liquid Storage Tanks* chapter of EPA's AP-42 emission factors. If the roof is not landed at least once/yr, enter "NA".

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary | Section OPGP-E

## 1. Emission Point Description

A. Emission Point Designation (Ref. No.): AA-035 & AA-034 [19-05-SUMP (SP-141) & 20-05-SUMP (SP-142)]

B. Product(s) Stored: Residual Oil (shown as Crude Oil)

C. Status: ☒ Operating ☐ Proposed ☐ Under Construction

D. Date of construction, reconstruction, or most recent modification (for existing sources) or date of anticipated construction: 2005

## 2. Tank Data

A. Tank Specifications:

| | | | | | |
|---|---|---|---|---|---|
| 1. | Design capacity | 10,000 | gallons | | |
| 2. | True vapor pressure at storage temperature: | 3.979 | psia @ | 71.94 | °F |
| 3. | Maximum true vapor pressure (as defined in §60.111b) | 4.781 | psia @ | 82.07 | °F |
| 4. | Reid vapor pressure at storage temperature: | 5.37 | psia @ | 71.94 | °F |
| 5. | Density of product at storage temperature: | N/A | lb/gal | | |
| 6. | Molecular weight of product vapor at storage temp. | 50 | lb/lbmol | | |

B. Tank Orientation: ☐ Vertical ☒ Horizontal

C. Type of Tank:

☒ Fixed Roof ☐ External Floating Roof ☐ Internal Floating Roof

☐ Pressure ☐ Variable Vapor Space ☐ Other: _____

D. Is the tank equipped with a Vapor Recovery System and/or flare? ☐ Yes ☒ No

*If yes, describe below and include the efficiency of each.*

E. Closest City:

☒ Jackson, MS ☐ Meridian, MS ☐ Tupelo, MS ☐ Mobile, AL

☐ New Orleans, LA ☐ Memphis, TN ☐ Baton Rouge, LA

F. Is an E&P or similar report described in Condition 5.4(5) of the General Permit included for this tank in the Notice of Intent? ☒ Yes ☐ No

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary — Section OPGP-E

## 3. Horizontal Fixed Roof Tank

A. Shell Length: 17.00 feet
B. Shell Diameter: 10.00 feet
C. Working Volume: 10,000 gal
D. Maximum Throughput: 840 gal/yr
E. Is the tank heated? ☐ Yes ☒ No
F. Is the tank underground? ☐ Yes ☒ No
G. Shell Color/Shade:

☐ ☐ Aluminum/Specular ☐ Aluminum/Diffuse

☐ Gray/Light ☐ Gray/Medium ☒ Red/Primer

H. Shell Condition: ☒ Good ☐ Poor

## 4. Vertical Fixed Roof Tank

A. Dimensions:
1. Shell Height: _____ feet
2. Shell Diameter: _____ feet
3. Maximum Liquid Height: _____ feet
4. Average Liquid Height: _____ feet
5. Working Volume: _____ gal
6. Turnovers per year: _____
7. Maximum throughput: _____ BBLs/yr
8. Is the tank heated? ☐ Yes ☐ No

B. Shell Characteristics:
1. Shell Color/Shade:

☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse

☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer

2. Shell Condition: ☐ Good ☐ Poor

C. Roof Characteristics:
1. Roof Color/Shade:

☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse

☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer

2. Roof Condition: ☐ Good ☐ Poor

3. Type: ☐ Cone ☐ Dome

4. Height: _____ feet

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary — Section OPGP-E

## 5. Internal Floating Roof Tank

A. Tank Characteristics:

1. Diameter: _____ feet
2. Tank Volume: _____ gal
3. Turnovers per year: _____
4. Maximum Throughput: _____ gal/yr
5. Number of Columns: _____
6. Self-Supporting Roof? ☐ Yes ☐ No
7. Effective Column Diameter:
   ☐ 9"x7" Built-up Column ☐ 8" Diameter Pipe ☐ Unknown
8. Internal Shell Condition:
   ☐ Light Rust ☐ Dense Rust ☐ Gunite Lining
9. External Shell Color/Shade:
   ☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
   ☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer
10. External Shell Condition: ☐ Good ☐ Poor
11. Roof Color/Shade:
    ☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
    ☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer
12. Roof Condition: ☐ Good ☐ Poor

B. Rim Seal System:

1. Primary Seal: ☐ Mechanical Shoe ☐ Liquid-mounted ☐ Vapor-mounted
2. Secondary Seal: ☐ Shoe-mounted ☐ Rim-mounted ☐ None

C. Deck Characteristics:

1. Deck Type: ☐ Bolted ☐ Welded
2. Deck Fitting Category: ☐ Typical ☐ Detail

## 6. External Floating Roof Tank

A. Tank Characteristics

1. Diameter: _____ feet
2. Tank Volume: _____ gal
3. Turnovers per year: _____
4. Maximum Throughput: _____ gal/yr
5. Internal Shell Condition:
   ☐ Light Rust ☐ Dense Rust ☐ Gunite Lining

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary | Section OPGP-E

## 6. External Floating Roof Tank (continued)

A. Tank Characteristics (continued):

6. Paint Color/Shade:
   ☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
   ☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer

7. Paint Condition: ☐ Good ☐ Poor

B. Roof Characteristics

1. Roof Type: ☐ Pontoon ☐ Double Deck

2. Roof Fitting Category: ☐ Typical ☐ Detail

C. Tank Construction and Rim-Seal System:

1. Tank Construction: ☐ Welded ☐ Riveted

2. Primary Seal:
   ☐ Mechanical Shoe ☐ Liquid-mounted ☐ Vapor-mounted

3. Secondary Seal
   ☐ None ☐ Shoe-mounted ☐ Rim-mounted ☐ Weather shield

## 7. Pollutant Emissions

A. Fixed Roof Emissions:

| Pollutant[1] | Working Loss (tons/yr) | Breathing Loss (tons/yr) | Total Emissions (tons/yr) |
|---|---|---|---|
| VOC | 0.00 | 0.50 | 0.50 |
| | | | |
| | | | |

B. Floating Roof Emissions:

| Pollutant[1] | Rim Seal Loss (tons/yr) | Withdrawal Loss (tons/yr) | Deck Fitting Loss (tons/yr) | Deck Seam Loss (tons/yr) | Landing Loss[2] (tons/yr) | Total Emissions (tons/yr) |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |

1. All regulated air pollutants including hazardous air pollutants emitted from this source should be listed in accordance with the OGP Application Instructions. A list of regulated air pollutants and a link to EPA's list of hazardous air pollutants is provided in the OGP Application Instructions.
2. Landing losses should be determined according to the procedures in *Organic Liquid Storage Tanks* chapter of EPA's AP-42 emission factors. If the roof is not landed at least once/yr, enter "NA".

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary | Section OPGP-E

## 1. Emission Point Description

A. Emission Point Designation (Ref. No.): AA-021, AA-022, & AA-023 [21-05-ST, 22-05-ST, & 23-05-ST]

B. Product(s) Stored: Organic Chemical Blend (assumes 100% N-Hexane as worst case)

C. Status: ☒ Operating ☐ Proposed ☐ Under Construction

D. Date of construction, reconstruction, or most recent modification (for existing sources) or date of anticipated construction: 2005

## 2. Tank Data

A. Tank Specifications:

| | | | | | |
|---|---|---|---|---|---|
| 1. | Design capacity | 150 | gallons | | |
| 2. | True vapor pressure at storage temperature: | 2.588 | psia @ | 71.96 | °F |
| 3. | Maximum true vapor pressure (as defined in §60.111b) | 3.304 | psia @ | 82.09 | °F |
| 4. | Reid vapor pressure at storage temperature: | 2.588 | psia @ | 71.96 | °F |
| 5. | Density of product at storage temperature: | N/A | lb/gal | | |
| 6. | Molecular weight of product vapor at storage temp. | 86.18 | lb/lbmol | | |

B. Tank Orientation: ☐ Vertical ☒ Horizontal

C. Type of Tank:

☒ Fixed Roof ☐ External Floating Roof ☐ Internal Floating Roof

☐ Pressure ☐ Variable Vapor Space ☐ Other: _____

D. Is the tank equipped with a Vapor Recovery System and/or flare? ☐ Yes ☒ No

*If yes, describe below and include the efficiency of each.*

E. Closest City:

☒ Jackson, MS ☐ Meridian, MS ☐ Tupelo, MS ☐ Mobile, AL

☐ New Orleans, LA ☐ Memphis, TN ☐ Baton Rouge, LA

F. Is an E&P or similar report described in Condition 5.4(5) of the General Permit included for this tank in the Notice of Intent? ☒ Yes ☐ No

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary — Section OPGP-E

## 3. Horizontal Fixed Roof Tank

A. Shell Length: 5.00 feet
B. Shell Diameter: 3.00 feet
C. Working Volume: 150 gal
D. Maximum Throughput: 1,512 gal/yr
E. Is the tank heated? ☐ Yes ☒ No
F. Is the tank underground? ☐ Yes ☒ No
G. Shell Color/Shade:

☐ ☐ Aluminum/Specular ☐ Aluminum/Diffuse

☐ Gray/Light ☐ Gray/Medium ☒ Red/Primer

H. Shell Condition: ☒ Good ☐ Poor

## 4. Vertical Fixed Roof Tank

A. Dimensions:
1. Shell Height: _____ feet
2. Shell Diameter: _____ feet
3. Maximum Liquid Height: _____ feet
4. Average Liquid Height: _____ feet
5. Working Volume: _____ gal
6. Turnovers per year: _____
7. Maximum throughput: _____ BBLs/yr
8. Is the tank heated? ☐ Yes ☐ No

B. Shell Characteristics:
1. Shell Color/Shade:

☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse

☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer

2. Shell Condition: ☐ Good ☐ Poor

C. Roof Characteristics:
1. Roof Color/Shade:

☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse

☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer

2. Roof Condition: ☐ Good ☐ Poor

3. Type: ☐ Cone ☐ Dome

4. Height: _____ feet

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary — Section OPGP-E

## 5. Internal Floating Roof Tank

A. Tank Characteristics:

1. Diameter: _____ feet
2. Tank Volume: _____ gal
3. Turnovers per year: _____
4. Maximum Throughput: _____ gal/yr
5. Number of Columns: _____
6. Self-Supporting Roof? ☐ Yes ☐ No
7. Effective Column Diameter:
   ☐ 9"x7" Built-up Column ☐ 8" Diameter Pipe ☐ Unknown
8. Internal Shell Condition:
   ☐ Light Rust ☐ Dense Rust ☐ Gunite Lining
9. External Shell Color/Shade:
   ☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
   ☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer
10. External Shell Condition: ☐ Good ☐ Poor
11. Roof Color/Shade:
    ☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
    ☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer
12. Roof Condition: ☐ Good ☐ Poor

B. Rim Seal System:

1. Primary Seal: ☐ Mechanical Shoe ☐ Liquid-mounted ☐ Vapor-mounted
2. Secondary Seal: ☐ Shoe-mounted ☐ Rim-mounted ☐ None

C. Deck Characteristics:

1. Deck Type: ☐ Bolted ☐ Welded
2. Deck Fitting Category: ☐ Typical ☐ Detail

## 6. External Floating Roof Tank

A. Tank Characteristics

1. Diameter: _____ feet
2. Tank Volume: _____ gal
3. Turnovers per year: _____
4. Maximum Throughput: _____ gal/yr
5. Internal Shell Condition:
   ☐ Light Rust ☐ Dense Rust ☐ Gunite Lining

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary | Section OPGP-E

## 6. External Floating Roof Tank (continued)

A. Tank Characteristics (continued):

6. Paint Color/Shade:
☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer

7. Paint Condition: ☐ Good ☐ Poor

B. Roof Characteristics

1. Roof Type: ☐ Pontoon ☐ Double Deck

2. Roof Fitting Category: ☐ Typical ☐ Detail

C. Tank Construction and Rim-Seal System:

1. Tank Construction: ☐ Welded ☐ Riveted

2. Primary Seal:
☐ Mechanical Shoe ☐ Liquid-mounted ☐ Vapor-mounted

3. Secondary Seal
☐ None ☐ Shoe-mounted ☐ Rim-mounted ☐ Weather shield

## 7. Pollutant Emissions

A. Fixed Roof Emissions:

| Pollutant[1] | Working Loss (tons/yr) | Breathing Loss (tons/yr) | Total Emissions (tons/yr) |
|---|---|---|---|
| VOC | 0.00 | 0.02 | 0.02 |
| | | | |
| | | | |

B. Floating Roof Emissions:

| Pollutant[1] | Rim Seal Loss (tons/yr) | Withdrawal Loss (tons/yr) | Deck Fitting Loss (tons/yr) | Deck Seam Loss (tons/yr) | Landing Loss[2] (tons/yr) | Total Emissions (tons/yr) |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |

1. All regulated air pollutants including hazardous air pollutants emitted from this source should be listed in accordance with the OGP Application Instructions. A list of regulated air pollutants and a link to EPA's list of hazardous air pollutants is provided in the OGP Application Instructions.
2. Landing losses should be determined according to the procedures in *Organic Liquid Storage Tanks* chapter of EPA's AP-42 emission factors. If the roof is not landed at least once/yr, enter "NA".

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary | Section OPGP-E

## 1. Emission Point Description

A. Emission Point Designation (Ref. No.): AA-037 [34-17-SEP (SP-128)]

B. Product(s) Stored: Residual Oil (shown as Crude Oil) & Water

C. Status: ☒ Operating ☐ Proposed ☐ Under Construction

D. Date of construction, reconstruction, or most recent modification (for existing sources) or date of anticipated construction: Prior to 2013

## 2. Tank Data

A. Tank Specifications:

| | | | | | |
|---|---|---|---|---|---|
| 1. | Design capacity | 10,000 | gallons | | |
| 2. | True vapor pressure at storage temperature: | 0.395 | psia @ | 71.94 | ºF |
| 3. | Maximum true vapor pressure (as defined in §60.111b) | 0.551 | psia @ | 82.07 | ºF |
| 4. | Reid vapor pressure at storage temperature: | 5.37 | psia @ | 71.94 | ºF |
| 5. | Density of product at storage temperature: | N/A | lb/gal | | |
| 6. | Molecular weight of product vapor at storage temp. | 18.68 | lb/lbmol | | |

B. Tank Orientation: ☐ Vertical ☒ Horizontal

C. Type of Tank:

☒ Fixed Roof ☐ External Floating Roof ☐ Internal Floating Roof

☐ Pressure ☐ Variable Vapor Space ☐ Other: _____

D. Is the tank equipped with a Vapor Recovery System and/or flare? ☐ Yes ☒ No

*If yes, describe below and include the efficiency of each.*

E. Closest City:

☒ Jackson, MS ☐ Meridian, MS ☐ Tupelo, MS ☐ Mobile, AL

☐ New Orleans, LA ☐ Memphis, TN ☐ Baton Rouge, LA

F. Is an E&P or similar report described in Condition 5.4(5) of the General Permit included for this tank in the Notice of Intent? ☒ Yes ☐ No

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary — Section OPGP-E

## 3. Horizontal Fixed Roof Tank

A. Shell Length: 17.00 feet
B. Shell Diameter: 10.00 feet
C. Working Volume: 10,000 gal
D. Maximum Throughput: 404,040 gal/yr
E. Is the tank heated? ☐ Yes ☒ No
F. Is the tank underground? ☐ Yes ☒ No
G. Shell Color/Shade:

☐ ☐ Aluminum/Specular ☐ Aluminum/Diffuse

☐ Gray/Light ☐ Gray/Medium ☒ Red/Primer

H. Shell Condition: ☒ Good ☐ Poor

## 4. Vertical Fixed Roof Tank

A. Dimensions:
1. Shell Height: _____ feet
2. Shell Diameter: _____ feet
3. Maximum Liquid Height: _____ feet
4. Average Liquid Height: _____ feet
5. Working Volume: _____ gal
6. Turnovers per year: _____
7. Maximum throughput: _____ BBLs/yr
8. Is the tank heated? ☐ Yes ☐ No

B. Shell Characteristics:
1. Shell Color/Shade:

☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse

☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer

2. Shell Condition: ☐ Good ☐ Poor

C. Roof Characteristics:
1. Roof Color/Shade:

☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse

☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer

2. Roof Condition: ☐ Good ☐ Poor

3. Type: ☐ Cone ☐ Dome

4. Height: _____ feet

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary — Section OPGP-E

## 5. Internal Floating Roof Tank

A. Tank Characteristics:

1. Diameter: _____ feet
2. Tank Volume: _____ gal
3. Turnovers per year: _____
4. Maximum Throughput: _____ gal/yr
5. Number of Columns: _____
6. Self-Supporting Roof? ☐ Yes ☐ No
7. Effective Column Diameter:
   ☐ 9"x7" Built-up Column ☐ 8" Diameter Pipe ☐ Unknown
8. Internal Shell Condition:
   ☐ Light Rust ☐ Dense Rust ☐ Gunite Lining
9. External Shell Color/Shade:
   ☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
   ☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer
10. External Shell Condition: ☐ Good ☐ Poor
11. Roof Color/Shade:
    ☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
    ☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer
12. Roof Condition: ☐ Good ☐ Poor

B. Rim Seal System:

1. Primary Seal: ☐ Mechanical Shoe ☐ Liquid-mounted ☐ Vapor-mounted
2. Secondary Seal: ☐ Shoe-mounted ☐ Rim-mounted ☐ None

C. Deck Characteristics:

1. Deck Type: ☐ Bolted ☐ Welded
2. Deck Fitting Category: ☐ Typical ☐ Detail

## 6. External Floating Roof Tank

A. Tank Characteristics

1. Diameter: _____ feet
2. Tank Volume: _____ gal
3. Turnovers per year: _____
4. Maximum Throughput: _____ gal/yr
5. Internal Shell Condition:
   ☐ Light Rust ☐ Dense Rust ☐ Gunite Lining

## 6. External Floating Roof Tank (continued)

A. Tank Characteristics (continued):

6. Paint Color/Shade:

☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse

☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer

7. Paint Condition: ☐ Good ☐ Poor

B. Roof Characteristics

1. Roof Type: ☐ Pontoon ☐ Double Deck

2. Roof Fitting Category: ☐ Typical ☐ Detail

C. Tank Construction and Rim-Seal System:

1. Tank Construction: ☐ Welded ☐ Riveted

2. Primary Seal:

☐ Mechanical Shoe ☐ Liquid-mounted ☐ Vapor-mounted

3. Secondary Seal

☐ None ☐ Shoe-mounted ☐ Rim-mounted ☐ Weather shield

## 7. Pollutant Emissions

A. Fixed Roof Emissions:

| Pollutant[1] | Working Loss (tons/yr) | Breathing Loss (tons/yr) | Total Emissions (tons/yr) |
|---|---|---|---|
| VOC | 0.03 | 0.01 | 0.04 |
| | | | |
| | | | |

B. Floating Roof Emissions:

| Pollutant[1] | Rim Seal Loss (tons/yr) | Withdrawal Loss (tons/yr) | Deck Fitting Loss (tons/yr) | Deck Seam Loss (tons/yr) | Landing Loss[2] (tons/yr) | Total Emissions (tons/yr) |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |

1. All regulated air pollutants including hazardous air pollutants emitted from this source should be listed in accordance with the OGP Application Instructions. A list of regulated air pollutants and a link to EPA's list of hazardous air pollutants is provided in the OGP Application Instructions.
2. Landing losses should be determined according to the procedures in *Organic Liquid Storage Tanks* chapter of EPA's AP-42 emission factors. If the roof is not landed at least once/yr, enter "NA".

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary | Section OPGP-E

## 1. Emission Point Description

A. Emission Point Designation (Ref. No.): AA-031 &AA-032 [35-17-IWT (V-181A) & 36-17-IWT (V-181B)]

B. Product(s) Stored: Water

C. Status: ☒ Operating ☐ Proposed ☐ Under Construction

D. Date of construction, reconstruction, or most recent modification (for existing sources) or date of anticipated construction: Prior to 2013

## 2. Tank Data

A. Tank Specifications:

| | | | | | |
|---|---|---|---|---|---|
| 1. | Design capacity | 20,160 | gallons | | |
| 2. | True vapor pressure at storage temperature: | 0.386 | psia @ | 71.79 | °F |
| 3. | Maximum true vapor pressure (as defined in §60.111b) | 0.540 | psia @ | 81.92 | °F |
| 4. | Reid vapor pressure at storage temperature: | 0.386 | psia @ | 71.79 | °F |
| 5. | Density of product at storage temperature: | N/A | lb/gal | | |
| 6. | Molecular weight of product vapor at storage temp. | 18.02 | lb/lbmol | | |

B. Tank Orientation: ☒ Vertical ☐ Horizontal

C. Type of Tank:

☒ Fixed Roof ☐ External Floating Roof ☐ Internal Floating Roof

☐ Pressure ☐ Variable Vapor Space ☐ Other: _____

D. Is the tank equipped with a Vapor Recovery System and/or flare? ☐ Yes ☒ No

*If yes, describe below and include the efficiency of each.*

E. Closest City:

☒ Jackson, MS ☐ Meridian, MS ☐ Tupelo, MS ☐ Mobile, AL

☐ New Orleans, LA ☐ Memphis, TN ☐ Baton Rouge, LA

F. Is an E&P or similar report described in Condition 5.4(5) of the General Permit included for this tank in the Notice of Intent? ☒ Yes ☐ No

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary | Section OPGP-E

## 3. Horizontal Fixed Roof Tank

A. Shell Length: _____ feet
B. Shell Diameter: _____ feet
C. Working Volume: _____ gal
D. Maximum Throughput: _____ gal/yr
E. Is the tank heated? ☐ Yes ☐ No
F. Is the tank underground? ☐ Yes ☐ No
G. Shell Color/Shade:
☐ ☐ Aluminum/Specular ☐ Aluminum/Diffuse
☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer
H. Shell Condition: ☐ Good ☐ Poor

## 4. Vertical Fixed Roof Tank

A. Dimensions:
1. Shell Height: 24.10 feet
2. Shell Diameter: 12.00 feet
3. Maximum Liquid Height: 23.10 feet
4. Average Liquid Height: 11.55 feet
5. Working Volume: 20,160 gal
6. Turnovers per year: 20.63
7. Maximum throughput: 9,600 BBLs/yr
8. Is the tank heated? ☐ Yes ☒ No

B. Shell Characteristics:
1. Shell Color/Shade:
☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
☐ Gray/Light ☐ Gray/Medium ☒ Red/Primer
2. Shell Condition: ☒ Good ☐ Poor

C. Roof Characteristics:
1. Roof Color/Shade:
☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
☐ Gray/Light ☐ Gray/Medium ☒ Red/Primer
2. Roof Condition: ☒ Good ☐ Poor
3. Type: ☒ Cone ☐ Dome
4. Height: 0.38 feet

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary — Section OPGP-E

## 5. Internal Floating Roof Tank

A. Tank Characteristics:

1. Diameter: _____ feet
2. Tank Volume: _____ gal
3. Turnovers per year: _____
4. Maximum Throughput: _____ gal/yr
5. Number of Columns: _____
6. Self-Supporting Roof? ☐ Yes ☐ No
7. Effective Column Diameter:
   ☐ 9"x7" Built-up Column ☐ 8" Diameter Pipe ☐ Unknown
8. Internal Shell Condition:
   ☐ Light Rust ☐ Dense Rust ☐ Gunite Lining
9. External Shell Color/Shade:
   ☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
   ☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer
10. External Shell Condition: ☐ Good ☐ Poor
11. Roof Color/Shade:
    ☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
    ☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer
12. Roof Condition: ☐ Good ☐ Poor

B. Rim Seal System:

1. Primary Seal: ☐ Mechanical Shoe ☐ Liquid-mounted ☐ Vapor-mounted
2. Secondary Seal: ☐ Shoe-mounted ☐ Rim-mounted ☐ None

C. Deck Characteristics:

1. Deck Type: ☐ Bolted ☐ Welded
2. Deck Fitting Category: ☐ Typical ☐ Detail

## 6. External Floating Roof Tank

A. Tank Characteristics

1. Diameter: _____ feet
2. Tank Volume: _____ gal
3. Turnovers per year: _____
4. Maximum Throughput: _____ gal/yr
5. Internal Shell Condition:
   ☐ Light Rust ☐ Dense Rust ☐ Gunite Lining

## 6. External Floating Roof Tank (continued)

A. Tank Characteristics (continued):

6. Paint Color/Shade:

☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse

☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer

7. Paint Condition: ☐ Good ☐ Poor

B. Roof Characteristics

1. Roof Type: ☐ Pontoon ☐ Double Deck

2. Roof Fitting Category: ☐ Typical ☐ Detail

C. Tank Construction and Rim-Seal System:

1. Tank Construction: ☐ Welded ☐ Riveted

2. Primary Seal:

☐ Mechanical Shoe ☐ Liquid-mounted ☐ Vapor-mounted

3. Secondary Seal

☐ None ☐ Shoe-mounted ☐ Rim-mounted ☐ Weather shield

## 7. Pollutant Emissions

A. Fixed Roof Emissions:

| Pollutant[1] | Working Loss (tons/yr) | Breathing Loss (tons/yr) | Total Emissions (tons/yr) |
|---|---|---|---|
| VOC | 0.03 | 0.02 | 0.05 |
| | | | |
| | | | |

B. Floating Roof Emissions:

| Pollutant[1] | Rim Seal Loss (tons/yr) | Withdrawal Loss (tons/yr) | Deck Fitting Loss (tons/yr) | Deck Seam Loss (tons/yr) | Landing Loss[2] (tons/yr) | Total Emissions (tons/yr) |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |

1. All regulated air pollutants including hazardous air pollutants emitted from this source should be listed in accordance with the OGP Application Instructions. A list of regulated air pollutants and a link to EPA's list of hazardous air pollutants is provided in the OGP Application Instructions.
2. Landing losses should be determined according to the procedures in *Organic Liquid Storage Tanks* chapter of EPA's AP-42 emission factors. If the roof is not landed at least once/yr, enter "NA".

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary | Section OPGP-E

## 1. Emission Point Description

A. Emission Point Designation (Ref. No.): AA-041 [37-17-TWP (SP-183)]

B. Product(s) Stored: Residual Oil (shown as Crude Oil)

C. Status: ☒ Operating ☐ Proposed ☐ Under Construction

D. Date of construction, reconstruction, or most recent modification (for existing sources) or date of anticipated construction: 2017

## 2. Tank Data

A. Tank Specifications:

| | | | | | |
|---|---|---|---|---|---|
| 1. | Design capacity | 10,000 | gallons | | |
| 2. | True vapor pressure at storage temperature: | 3.979 | psia @ | 71.94 | ºF |
| 3. | Maximum true vapor pressure (as defined in §60.111b) | 4.781 | psia @ | 82.07 | ºF |
| 4. | Reid vapor pressure at storage temperature: | 5.37 | psia @ | 71.94 | ºF |
| 5. | Density of product at storage temperature: | N/A | lb/gal | | |
| 6. | Molecular weight of product vapor at storage temp. | 50 | lb/lbmol | | |

B. Tank Orientation: ☐ Vertical ☒ Horizontal

C. Type of Tank:

☒ Fixed Roof ☐ External Floating Roof ☐ Internal Floating Roof

☐ Pressure ☐ Variable Vapor Space ☐ Other: _____

D. Is the tank equipped with a Vapor Recovery System and/or flare? ☐ Yes ☒ No

*If yes, describe below and include the efficiency of each.*

E. Closest City:

☒ Jackson, MS ☐ Meridian, MS ☐ Tupelo, MS ☐ Mobile, AL

☐ New Orleans, LA ☐ Memphis, TN ☐ Baton Rouge, LA

F. Is an E&P or similar report described in Condition 5.4(5) of the General Permit included for this tank in the Notice of Intent? ☒ Yes ☐ No

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary — Section OPGP-E

## 3. Horizontal Fixed Roof Tank

A. Shell Length: 17.00 feet
B. Shell Diameter: 10.00 feet
C. Working Volume: 10,000 gal
D. Maximum Throughput: 840 gal/yr
E. Is the tank heated? ☐ Yes ☒ No
F. Is the tank underground? ☐ Yes ☒ No
G. Shell Color/Shade:

☐ ☐ Aluminum/Specular ☐ Aluminum/Diffuse

☐ Gray/Light ☐ Gray/Medium ☒ Red/Primer

H. Shell Condition: ☒ Good ☐ Poor

## 4. Vertical Fixed Roof Tank

A. Dimensions:
1. Shell Height: _____ feet
2. Shell Diameter: _____ feet
3. Maximum Liquid Height: _____ feet
4. Average Liquid Height: _____ feet
5. Working Volume: _____ gal
6. Turnovers per year: _____
7. Maximum throughput: _____ BBLs/yr
8. Is the tank heated? ☐ Yes ☐ No

B. Shell Characteristics:
1. Shell Color/Shade:

☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse

☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer

2. Shell Condition: ☐ Good ☐ Poor

C. Roof Characteristics:
1. Roof Color/Shade:

☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse

☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer

2. Roof Condition: ☐ Good ☐ Poor

3. Type: ☐ Cone ☐ Dome

4. Height: _____ feet

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary — Section OPGP-E

## 5. Internal Floating Roof Tank

A. Tank Characteristics:

1. Diameter: _____ feet
2. Tank Volume: _____ gal
3. Turnovers per year: _____
4. Maximum Throughput: _____ gal/yr
5. Number of Columns: _____
6. Self-Supporting Roof? ☐ Yes ☐ No
7. Effective Column Diameter:
   ☐ 9"x7" Built-up Column ☐ 8" Diameter Pipe ☐ Unknown
8. Internal Shell Condition:
   ☐ Light Rust ☐ Dense Rust ☐ Gunite Lining
9. External Shell Color/Shade:
   ☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
   ☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer
10. External Shell Condition: ☐ Good ☐ Poor
11. Roof Color/Shade:
    ☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
    ☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer
12. Roof Condition: ☐ Good ☐ Poor

B. Rim Seal System:

1. Primary Seal: ☐ Mechanical Shoe ☐ Liquid-mounted ☐ Vapor-mounted
2. Secondary Seal: ☐ Shoe-mounted ☐ Rim-mounted ☐ None

C. Deck Characteristics:

1. Deck Type: ☐ Bolted ☐ Welded
2. Deck Fitting Category: ☐ Typical ☐ Detail

## 6. External Floating Roof Tank

A. Tank Characteristics

1. Diameter: _____ feet
2. Tank Volume: _____ gal
3. Turnovers per year: _____
4. Maximum Throughput: _____ gal/yr
5. Internal Shell Condition:
   ☐ Light Rust ☐ Dense Rust ☐ Gunite Lining

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary | Section OPGP-E

## 6. External Floating Roof Tank (continued)

A. Tank Characteristics (continued):

6. Paint Color/Shade:
   ☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
   ☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer

7. Paint Condition: ☐ Good ☐ Poor

B. Roof Characteristics

1. Roof Type: ☐ Pontoon ☐ Double Deck

2. Roof Fitting Category: ☐ Typical ☐ Detail

C. Tank Construction and Rim-Seal System:

1. Tank Construction: ☐ Welded ☐ Riveted

2. Primary Seal:
   ☐ Mechanical Shoe ☐ Liquid-mounted ☐ Vapor-mounted

3. Secondary Seal
   ☐ None ☐ Shoe-mounted ☐ Rim-mounted ☐ Weather shield

## 7. Pollutant Emissions

A. Fixed Roof Emissions:

| Pollutant[1] | Working Loss (tons/yr) | Breathing Loss (tons/yr) | Total Emissions (tons/yr) |
|---|---|---|---|
| VOC | 0.00 | 0.50 | 0.50 |
| | | | |
| | | | |

B. Floating Roof Emissions:

| Pollutant[1] | Rim Seal Loss (tons/yr) | Withdrawal Loss (tons/yr) | Deck Fitting Loss (tons/yr) | Deck Seam Loss (tons/yr) | Landing Loss[2] (tons/yr) | Total Emissions (tons/yr) |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |

1. All regulated air pollutants including hazardous air pollutants emitted from this source should be listed in accordance with the OGP Application Instructions. A list of regulated air pollutants and a link to EPA's list of hazardous air pollutants is provided in the OGP Application Instructions.
2. Landing losses should be determined according to the procedures in *Organic Liquid Storage Tanks* chapter of EPA's AP-42 emission factors. If the roof is not landed at least once/yr, enter "NA".

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary | Section OPGP-E

## 1. Emission Point Description

A. Emission Point Designation (Ref. No.): AA-042 [38-17-RWT (V-121)]

B. Product(s) Stored: Water

C. Status: ☒ Operating ☐ Proposed ☐ Under Construction

D. Date of construction, reconstruction, or most recent modification (for existing sources) or date of anticipated construction: Prior to 2018

## 2. Tank Data

A. Tank Specifications:

| | | | | | |
|---|---|---|---|---|---|
| 1. | Design capacity | 126,000 | gallons | | |
| 2. | True vapor pressure at storage temperature: | 0.397 | psia @ | 72.66 | ºF |
| 3. | Maximum true vapor pressure (as defined in §60.111b) | 0.555 | psia @ | 82.78 | ºF |
| 4. | Reid vapor pressure at storage temperature: | 0.397 | psia @ | 72.66 | ºF |
| 5. | Density of product at storage temperature: | N/A | lb/gal | | |
| 6. | Molecular weight of product vapor at storage temp. | 18.02 | lb/lbmol | | |

B. Tank Orientation: ☒ Vertical ☐ Horizontal

C. Type of Tank:

☒ Fixed Roof ☐ External Floating Roof ☐ Internal Floating Roof

☐ Pressure ☐ Variable Vapor Space ☐ Other: _____

D. Is the tank equipped with a Vapor Recovery System and/or flare? ☐ Yes ☒ No

*If yes, describe below and include the efficiency of each.*

E. Closest City:

☒ Jackson, MS ☐ Meridian, MS ☐ Tupelo, MS ☐ Mobile, AL

☐ New Orleans, LA ☐ Memphis, TN ☐ Baton Rouge, LA

F. Is an E&P or similar report described in Condition 5.4(5) of the General Permit included for this tank in the Notice of Intent? ☒ Yes ☐ No

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary | Section OPGP-E

## 3. Horizontal Fixed Roof Tank

A. Shell Length: _____ feet
B. Shell Diameter: _____ feet
C. Working Volume: _____ gal
D. Maximum Throughput: _____ gal/yr
E. Is the tank heated? ☐ Yes ☐ No
F. Is the tank underground? ☐ Yes ☐ No
G. Shell Color/Shade:
☐ ☐ Aluminum/Specular ☐ Aluminum/Diffuse
☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer
H. Shell Condition: ☐ Good ☐ Poor

## 4. Vertical Fixed Roof Tank

A. Dimensions:
1. Shell Height: 24.50 feet
2. Shell Diameter: 29.50 feet
3. Maximum Liquid Height: 23.50 feet
4. Average Liquid Height: 11.75 feet
5. Working Volume: 126,000 gal
6. Turnovers per year: 9.99
7. Maximum throughput: 28,571 BBLs/yr
8. Is the tank heated? ☐ Yes ☒ No

B. Shell Characteristics:
1. Shell Color/Shade:
☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
☐ Gray/Light ☐ Gray/Medium ☒ Red/Primer
2. Shell Condition: ☒ Good ☐ Poor

C. Roof Characteristics:
1. Roof Color/Shade:
☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
☐ Gray/Light ☐ Gray/Medium ☒ Red/Primer
2. Roof Condition: ☒ Good ☐ Poor
3. Type: ☒ Cone ☐ Dome
4. Height: 0.92 feet

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary — Section OPGP-E

## 5. Internal Floating Roof Tank

A. Tank Characteristics:

1. Diameter: _____ feet
2. Tank Volume: _____ gal
3. Turnovers per year: _____
4. Maximum Throughput: _____ gal/yr
5. Number of Columns: _____
6. Self-Supporting Roof? ☐ Yes ☐ No
7. Effective Column Diameter:
   ☐ 9"x7" Built-up Column ☐ 8" Diameter Pipe ☐ Unknown
8. Internal Shell Condition:
   ☐ Light Rust ☐ Dense Rust ☐ Gunite Lining
9. External Shell Color/Shade:
   ☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
   ☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer
10. External Shell Condition: ☐ Good ☐ Poor
11. Roof Color/Shade:
    ☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
    ☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer
12. Roof Condition: ☐ Good ☐ Poor

B. Rim Seal System:

1. Primary Seal: ☐ Mechanical Shoe ☐ Liquid-mounted ☐ Vapor-mounted
2. Secondary Seal: ☐ Shoe-mounted ☐ Rim-mounted ☐ None

C. Deck Characteristics:

1. Deck Type: ☐ Bolted ☐ Welded
2. Deck Fitting Category: ☐ Typical ☐ Detail

## 6. External Floating Roof Tank

A. Tank Characteristics

1. Diameter: _____ feet
2. Tank Volume: _____ gal
3. Turnovers per year: _____
4. Maximum Throughput: _____ gal/yr
5. Internal Shell Condition:
   ☐ Light Rust ☐ Dense Rust ☐ Gunite Lining

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Tank Summary | Section OPGP-E

## 6. External Floating Roof Tank (continued)

A. Tank Characteristics (continued):

6. Paint Color/Shade:
☐ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse
☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer

7. Paint Condition: ☐ Good ☐ Poor

B. Roof Characteristics

1. Roof Type: ☐ Pontoon ☐ Double Deck

2. Roof Fitting Category: ☐ Typical ☐ Detail

C. Tank Construction and Rim-Seal System:

1. Tank Construction: ☐ Welded ☐ Riveted

2. Primary Seal:
☐ Mechanical Shoe ☐ Liquid-mounted ☐ Vapor-mounted

3. Secondary Seal
☐ None ☐ Shoe-mounted ☐ Rim-mounted ☐ Weather shield

## 7. Pollutant Emissions

A. Fixed Roof Emissions:

| Pollutant[1] | Working Loss (tons/yr) | Breathing Loss (tons/yr) | Total Emissions (tons/yr) |
|---|---|---|---|
| VOC | 0.08 | 0.15 | 0.23 |
| | | | |
| | | | |

B. Floating Roof Emissions:

| Pollutant[1] | Rim Seal Loss (tons/yr) | Withdrawal Loss (tons/yr) | Deck Fitting Loss (tons/yr) | Deck Seam Loss (tons/yr) | Landing Loss[2] (tons/yr) | Total Emissions (tons/yr) |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |

1. All regulated air pollutants including hazardous air pollutants emitted from this source should be listed in accordance with the OGP Application Instructions. A list of regulated air pollutants and a link to EPA's list of hazardous air pollutants is provided in the OGP Application Instructions.
2. Landing losses should be determined according to the procedures in *Organic Liquid Storage Tanks* chapter of EPA's AP-42 emission factors. If the roof is not landed at least once/yr, enter "NA".

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Flare | Section OPGP-F

## 1. Equipment Description

A. Emission Point Designation (Ref. No.): AA-024 [25-05-F (ZZZ-180A)]

B. Equipment Description (include the process(es) that the flare controls emissions from): Control flare to combust emissions from storage tanks (EPNs: 5-05-OST-V, 6a-05-OST-CV, 6b-05-OST-CV, 7a-05-ST-CV, 7b-05-ST-CV, 10-05-IOT-V, 11-05-IOT-V, & 12-05-IOT-V).

C. Manufacturer: Unknown D. Model: Unknown

E. Status: ☒ Operating ☐ Proposed ☐ Under Construction

F. ☐ Requesting a federally enforceable condition to route tank emissions to the flare.

## 2. System Data

A. Efficiency: 98 % Controlling the following pollutant(s): VOC, HAPs
Efficiency: _____ % Controlling the following pollutant(s): _____
Reason for different efficiency: _____

B. Flare Data (if applicable):

1. Flare type: ☒ Non-assisted ☐ Steam-assisted ☐ Air-assisted ☐ Other: _____

2. Net heating value of combusted gas: 297 Btu/scf

3. Design exit velocity: 106 ft/sec

4. System: ☒ Auto-ignitor ☒ Continuous Flame

5. Is the presence of a flare pilot flame monitored? ☒ Yes ☐ No

If yes, please describe the monitoring: The presence of the flare pilot flame is continuously monitored by use of a thermocouple.*

6. Is the auto-ignitor system monitored? ☒ Yes ☐ No

If yes, please describe the monitoring: The flare is equipped with an auto-ignitor.*

*Denbury will maintain a flare pilot flame or auto-igniter system at all times when emissions may be vented to the flare. Denbury will either continuously monitor & record the presence of the flare pilot flame by use of a thermocouple OR maintain & operate an auto-igniter system on the flare to ensure a flame is immediately restored when emissions are being sent to the flare.

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Flare | Section OPGP-F

## 1. Equipment Description

A. Emission Point Designation (Ref. No.): AA-025 [31-05-F (ZZZ-180B)]

B. Equipment Description (include the process(es) that the flare controls emissions from): Control flare to combust emissions from heater treater flash gas (EPN: 28-05-HT-WG) and water flash vessel flash gas (EPN: 29-05-WFV-WG).

C. Manufacturer: Unknown D. Model: Unknown

E. Status: ☒ Operating ☐ Proposed ☐ Under Construction

F. ☐ Requesting a federally enforceable condition to route tank emissions to the flare.

## 2. System Data

A. Efficiency: 98 % Controlling the following pollutant(s): VOC, HAPs
Efficiency: _____ % Controlling the following pollutant(s): _____
Reason for different efficiency: _____

B. Flare Data (if applicable):

1. Flare type: ☒ Non-assisted ☐ Steam-assisted ☐ Air-assisted ☐ Other: _____

2. Net heating value of combusted gas: 202 Btu/scf

3. Design exit velocity: 599 ft/sec

4. System: ☒ Auto-ignitor ☒ Continuous Flame

5. Is the presence of a flare pilot flame monitored? ☒ Yes ☐ No

If yes, please describe the monitoring: The presence of the flare pilot flame is continuously monitored by use of a thermocouple.*

6. Is the auto-ignitor system monitored? ☒ Yes ☐ No

If yes, please describe the monitoring: The flare is equipped with an auto-ignitor.*

*Denbury will maintain a flare pilot flame or auto-igniter system at all times when emissions may be vented to the flare. Denbury will either continuously monitor & record the presence of the flare pilot flame by use of a thermocouple OR maintain & operate an auto-igniter system on the flare to ensure a flame is immediately restored when emissions are being sent to the flare.

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Compliance Plan — Section OPGP-G

## Part 1. Equipment List

List all equipment and the corresponding federal and/or state regulation that is applicable. Clearly identify federal regulations from state requirements. Provide the expected or actual construction date, startup date and removal date if the equipment is no longer on site.

| EMISSION UNIT (Ref No.) | FEDERAL or STATE REGULATION<br>Ex. 40 CFR Part _____, Subpart _____<br>Ex. 11 Miss. Admin. Code Pt. 2, R. 1.4.B(2). | CONSTRUCTION DATE | STARTUP DATE | REMOVAL DATE |
|---|---|---|---|---|
| 1-05-LH-BS<br>*Line Heater*<br>2-05-HT-BS<br>*Heater Treater*<br>3-05-LH-BS<br>*Line Heater*<br>30-10-LH-BS<br>*Line Heater*<br>32-10-H-BS<br>*Heater Treater*<br>33-17-LH-BS<br>*Line Heater* | 11 Miss. Admin. Code Pt. 2, R. 1.3.A. | 2005 | 2005 | N/A |
| 1-05-LH-BS<br>*Line Heater*<br>2-05-HT-BS<br>*Heater Treater*<br>3-05-LH-BS<br>*Line Heater*<br>30-10-LH-BS<br>*Line Heater*<br>32-10-H-BS<br>*Heater Treater*<br>33-17-LH-BS<br>*Line Heater* | 11 Miss. Admin. Code Pt. 2, R. 1.3.B. | 2005 | 2005 | N/A |

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Compliance Plan — Section OPGP-G

## Part 1. Equipment List

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| EMISSION UNIT (Ref No.) | FEDERAL or STATE REGULATION<br>Ex. 40 CFR Part _____, Subpart _____<br>Ex. 11 Miss. Admin. Code Pt. 2, R. 1.4.B(2). | CONSTRUCTION DATE | STARTUP DATE | REMOVAL DATE |
|---|---|---|---|---|
| 1-05-LH-BS<br>*Line Heater*<br>2-05-HT-BS<br>*Heater Treater*<br>3-05-LH-BS<br>*Line Heater*<br>30-10-LH-BS<br>*Line Heater*<br>32-10-H-BS<br>*Heater Treater*<br>33-17-LH-BS<br>*Line Heater* | 11 Miss. Admin. Code Pt. 2, R. 1.3.D(1)(a) | 2005 | 2005 | N/A |
| 1-05-LH-BS<br>*Line Heater*<br>2-05-HT-BS<br>*Heater Treater*<br>3-05-LH-BS<br>*Line Heater*<br>30-10-LH-BS<br>*Line Heater*<br>32-10-H-BS<br>*Heater Treater*<br>33-17-LH-BS<br>*Line Heater* | 11 Miss. Admin. Code Pt. 2, R. 1.3.D(1)(b) | 2005 | 2005 | N/A |

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Compliance Plan — Section OPGP-G

## Part 1. Equipment List

List all equipment and the corresponding federal and/or state regulation that is applicable. Clearly identify federal regulations from state requirements. Provide the expected or actual construction date, startup date and removal date if the equipment is no longer on site.

| EMISSION UNIT (Ref No.) | FEDERAL or STATE REGULATION<br>Ex. 40 CFR Part _____, Subpart _____<br>Ex. 11 Miss. Admin. Code Pt. 2, R. 1.4.B(2). | CONSTRUCTION DATE | STARTUP DATE | REMOVAL DATE |
|---|---|---|---|---|
| 1-05-LH-BS<br>*Line Heater*<br>2-05-HT-BS<br>*Heater Treater*<br>3-05-LH-BS<br>*Line Heater*<br>30-10-LH-BS<br>*Line Heater*<br>32-10-H-BS<br>*Heater Treater*<br>33-17-LH-BS<br>*Line Heater* | 11 Miss. Admin. Code Pt. 2, R. 1.4.A(1) | 2005 | 2005 | N/A |
| 4-05-SBP<br>*Sand Blowdown Pit* | 11 Miss. Admin. Code Pt. 2, R.2.2.B(10). | 2005 | 2005 | N/A |
| 25-05-F<br>*Control Flare*<br>31-05-F<br>*Control Flare* | 11 Miss. Admin. Code Pt. 2, R.1.4.B(2) | 2005 | 2005 | N/A |
| 25-05-F<br>*Control Flare*<br>31-05-F<br>*Control Flare* | 11 Miss. Admin. Code Pt. 2, R.2.2.B(10). | 2005 | 2005 | N/A |
| 25-05-F<br>*Control Flare*<br>31-05-F<br>*Control Flare* | 11 Miss. Admin. Code Pt. 2, R.2.2.B(11). | 2005 | 2005 | N/A |
| 24-05-FE<br>*Fugitive Emissions* | Standards of Performance for Crude Oil and Natural Gas Facilities<br>(40 CFR 60-Subpart OOOOa) | After 9/18/2015 | After 9/18/2015 | N/A |

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Compliance Plan — Section OPGP-G

## Part 2. Applicable Requirements

List all applicable state and federal requirements, including emission limits, operating restrictions, etc., and the applicable test methods or monitoring used to demonstrate compliance with each applicable requirement. Clearly identify federal regulations from state requirements. Provide the compliance status as of the day the application is signed.

| EMISSION UNIT (Ref No.) | APPLICABLE REQUIREMENT (Specific Regulatory citation) | POLLUTANT | LIMITS/ REQUIREMENTS | TEST METHOD/ COMPLIANCE MONITORING |
|---|---|---|---|---|
| 1-05-LH-BS *Line Heater* 2-05-HT-BS *Heater Treater* 3-05-LH-BS *Line Heater* 30-10-LH-BS *Line Heater* 32-10-H-BS *Heater Treater* 33-17-LH-BS *Line Heater* | 11 Miss. Admin. Code Pt. 2, R. 1.3.A. | Opacity | 40% | N/A |
| 1-05-LH-BS *Line Heater* 2-05-HT-BS *Heater Treater* 3-05-LH-BS *Line Heater* 30-10-LH-BS *Line Heater* 32-10-H-BS *Heater Treater* 33-17-LH-BS *Line Heater* | 11 Miss Admin Code Pt. 2, R. 1.3 B. | Opacity | Equivalent Opacity | N/A |

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Compliance Plan — Section OPGP-G

## Part 2. Applicable Requirements

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| EMISSION UNIT (Ref No.) | APPLICABLE REQUIREMENT (Specific Regulatory citation) | POLLUTANT | LIMITS/ REQUIREMENTS | TEST METHOD/ COMPLIANCE MONITORING |
|---|---|---|---|---|
| 1-05-LH-BS<br>*Line Heater*<br>2-05-HT-BS<br>*Heater Treater*<br>3-05-LH-BS<br>*Line Heater*<br>30-10-LH-BS<br>*Line Heater*<br>32-10-H-BS<br>*Heater Treater*<br>33-17-LH-BS<br>*Line Heater* | 11 Miss. Admin. Code Pt. 2, R. 1.3. D(1)(a). | PM | 0.6 lb/MMBTU | N/A |
| 1-05-LH-BS<br>*Line Heater*<br>2-05-HT-BS<br>*Heater Treater*<br>3-05-LH-BS<br>*Line Heater*<br>30-10-LH-BS<br>*Line Heater*<br>32-10-H-BS<br>*Heater Treater*<br>33-17-LH-BS<br>*Line Heater* | 11 Miss. Admin. Code Pt. 2, R. 1.3. D(1)(b). | PM | $E = 0.8808*I^{-0.1667}$ | N/A |

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Compliance Plan — Section OPGP-G

## Part 2. Applicable Requirements

List all applicable state and federal requirements, including emission limits, operating restrictions, etc., and the applicable test methods or monitoring used to demonstrate compliance with each applicable requirement. Clearly identify federal regulations from state requirements. Provide the compliance status as of the day the application is signed.

| EMISSION UNIT (Ref No.) | APPLICABLE REQUIREMENT (Specific Regulatory citation) | POLLUTANT | LIMITS/ REQUIREMENTS | TEST METHOD/ COMPLIANCE MONITORING |
|---|---|---|---|---|
| 1-05-LH-BS<br>*Line Heater*<br>2-05-HT-BS<br>*Heater Treater*<br>3-05-LH-BS<br>*Line Heater*<br>30-10-LH-BS<br>*Line Heater*<br>32-10-H-BS<br>*Heater Treater*<br>33-17-LH-BS<br>*Line Heater* | 11 Miss. Admin. Code Pt. 2, R.1.4.A(1). | $SO_2$ | 4.8 lbs/MMBTU | N/A |
| 4-05-SBP<br>*Sand Blowdown Pit* | 11 Miss. Admin. Code Pt. 2, R.2.2.B(10). | VOC | Sand Blowdown Operating Limits | The sand blowdown pit will operate no more than 730 hours during a 12-month period. |
| 25-05-F<br>*Control Flare*<br>31-05-F<br>*Control Flare* | 11 Miss. Admin. Code Pt. 2, R.1.4.B(2) | $H_2S$ | 1 grain $H_2S$ per 100 standard cubic feet (1 gr/100 scf) | Recordkeeping of $H_2S$ composition of gas by gas analysis; Maintenance of continuous flame for gas combustion. |

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Compliance Plan — Section OPGP-G

## Part 2. Applicable Requirements

List all applicable state and federal requirements, including emission limits, operating restrictions, etc., and the applicable test methods or monitoring used to demonstrate compliance with each applicable requirement. Clearly identify federal regulations from state requirements. Provide the compliance status as of the day the application is signed.

| EMISSION UNIT (Ref No.) | APPLICABLE REQUIREMENT (Specific Regulatory citation) | POLLUTANT | LIMITS/ REQUIREMENTS | TEST METHOD/ COMPLIANCE MONITORING |
|---|---|---|---|---|
| 25-05-F<br>*Control Flare*<br>31-05-F<br>*Control Flare* | 11 Miss. Admin. Code Pt. 2, R.2.2.B(10). | VOC, HAPs | Flare Operating Requirements | The flare shall be operated at all times when emissions may be vented to it. The flare is anticipated to provide a significant reduction in hydrocarbon emissions. Based on manufacturer's data, a minimum of 98% reduction can be expected.<br><br>It should also be noted that the facility will operate the flare such that criteria pollutant emissions will not exceed emission rates restricted in the Oil Production General Permit, nor will hazardous air pollutant (HAP) emissions exceed any HAP emission rates restricted in the Oil Production General Permit. |

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Compliance Plan — Section OPGP-G

## Part 2. Applicable Requirements

List all applicable state and federal requirements, including emission limits, operating restrictions, etc., and the applicable test methods or monitoring used to demonstrate compliance with each applicable requirement. Clearly identify federal regulations from state requirements. Provide the compliance status as of the day the application is signed.

| EMISSION UNIT (Ref No.) | APPLICABLE REQUIREMENT (Specific Regulatory citation) | POLLUTANT | LIMITS/ REQUIREMENTS | TEST METHOD/ COMPLIANCE MONITORING |
|---|---|---|---|---|
| 25-05-F<br>*Control Flare*<br>31-05-F<br>*Control Flare* | 11 Miss. Admin. Code Pt. 2, R.2.2.B(11). | VOC, HAPs | Monitoring and recordkeeping | Denbury shall maintain a flare pilot flame or auto-igniter system at all times when emissions may be vented to the flare. Denbury will either continuously monitor & record the presence of the flare pilot flame by use of a thermocouple OR maintain & operate an auto-igniter system on the flare to ensure a flame is immediately restored when emissions are being sent to the flare.<br><br>The flare shall be operated with no visible emissions as determined by EPA Method 22, except for periods not to exceed a total of five (5) minutes during any two (2) consecutive hours.<br><br>Records of all visual observations/tests and corrective action shall be maintained. |

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Compliance Plan — Section OPGP-G

## Part 2. Applicable Requirements

List all applicable state and federal requirements, including emission limits, operating restrictions, etc., and the applicable test methods or monitoring used to demonstrate compliance with each applicable requirement. Clearly identify federal regulations from state requirements. Provide the compliance status as of the day the application is signed.

| EMISSION UNIT (Ref No.) | APPLICABLE REQUIREMENT (Specific Regulatory citation) | POLLUTANT | LIMITS/ REQUIREMENTS | TEST METHOD/ COMPLIANCE MONITORING |
|---|---|---|---|---|
| 24-05-FE<br>*Fugitive Emissions* | Standards of Performance for Crude Oil and Natural Gas Facilities<br>(40 CFR 60-Subpart OOOOa)<br><br>40 CFR 60.5365a(i)<br>40 CFR 60.5397a<br>40 CFR 60.5397a(a) | VOC | Owners and operators of an affected facility, which is the collection of fugitive emission components at a well site that commenced construction or modification after 9/18/2015 and on or before 12/6/2022, must reduce GHG & VOC emissions by complying with paragraphs (a) through (j) of this section.<br><br>Owners and operators must:<br>1) Monitor all fugitive emission components, as defined in §60.5430a, in accordance with §60.5397a(b)-(g);<br>2) Repair all sources of fugitive emissions (defined as any visible emission from a fugitive emissions component observed using optical gas imaging or an instrument reading of 500 parts per million (ppm) or greater using Method 21 of appendix A-7 to this part) in accordance with §60.5397a(h); and<br>3) Keep records in accordance with §60.5397a(i) and report in accordance with §60.5397a(j). | N/A |

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Compliance Plan — Section OPGP-G

## Part 2. Applicable Requirements

List all applicable state and federal requirements, including emission limits, operating restrictions, etc., and the applicable test methods or monitoring used to demonstrate compliance with each applicable requirement. Clearly identify federal regulations from state requirements. Provide the compliance status as of the day the application is signed.

| EMISSION UNIT (Ref No.) | APPLICABLE REQUIREMENT (Specific Regulatory citation) | POLLUTANT | LIMITS/ REQUIREMENTS | TEST METHOD/ COMPLIANCE MONITORING |
|---|---|---|---|---|
| 24-05-FE<br>*Fugitive Emissions* | Standards of Performance for Crude Oil and Natural Gas Facilities<br>(40 CFR 60-Subpart OOOOa)<br><br>40 CFR 60.5397a(b)<br>40 CFR 60.5397a(c)<br>40 CFR 60.5397a(d)<br>40 CFR 60.5397a(e)<br>40 CFR 60.5397a(f)(1)<br>40 CFR 60.5397a(g)(1) | VOC | **Requirements that specify monitoring:**<br>Develop an emissions monitoring plan that covers the collection of fugitive emissions components at the affected well site(s) and compressor station(s) within each company-defined area in accordance with paragraphs (c) & (d).<br><br>Fugitive emissions monitoring plans must include the elements specified in paragraphs (c)(1) through (8), at a minimum.<br><br>Each fugitive emissions monitoring plan must include the elements specified in paragraphs (d)(1) through (3), at a minimum, as applicable.<br><br>Each monitoring survey shall observe each fugitive emissions component, as defined in §60.5430a, for fugitive emissions.<br><br>Conduct an initial monitoring survey within 90 days of the startup of production, as defined in §60.5430a, for each collection of fugitive emissions components at a new well site or by June 3, 2017, whichever is later. For a modified well site, conduct an initial monitoring survey within 90 days of the first day of production after the modification, or by June 3, 2017, whichever is later.<br><br>Subsequent monitoring surveys must be conducted at least semiannually after the initial survey. Consecutive semiannual monitoring surveys must be conducted at least 4 months apart and no more than 7 months apart. | N/A |

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Compliance Plan — Section OPGP-G

## Part 2. Applicable Requirements

List all applicable state and federal requirements, including emission limits, operating restrictions, etc., and the applicable test methods or monitoring used to demonstrate compliance with each applicable requirement. Clearly identify federal regulations from state requirements. Provide the compliance status as of the day the application is signed.

| EMISSION UNIT (Ref No.) | APPLICABLE REQUIREMENT (Specific Regulatory citation) | POLLUTANT | LIMITS/ REQUIREMENTS | TEST METHOD/ COMPLIANCE MONITORING |
|---|---|---|---|---|
| 24-05-FE<br>*Fugitive Emissions* | Standards of Performance for Crude Oil and Natural Gas Facilities<br>(40 CFR 60-Subpart OOOOa)<br><br>40 CFR 60.5397a(g)(3)<br>40 CFR 60.5397a(g)(4)<br>40 CFR 60.5397a(g)(5)<br>40 CFR 60.5397a(h) | VOC | Fugitive emissions components that cannot be monitored without elevating the monitoring personnel more than 2 meters above the surface may be designated as difficult-to-monitor and must meet the specifications of §60.5397a(g)(3)(i) through (iv).<br><br>Fugitive emissions components that cannot be monitored because monitoring personnel would be exposed to immediate danger while conducted a monitoring survey may be designated as unsafe-to-monitor and must meet the specifications of §60.5397a(g)(4)(i) through (iv).<br><br>An affected facility is no longer required to comply with the requirements of paragraph (g)(1) of this section when the owner or operator removes all major production and processing equipment, as defined in §60.5430a, such that the well site becomes a wellhead only well site. If any major production and processing equipment is subsequently added to the well site, then the owner or operator must comply with the requirements in paragraphs (f)(1) and (g)(1) of this section.<br><br>Each identified source of fugitive emissions shall be repaired, as defined in §60.5430a, in accordance with paragraphs (h)(1) & (2) of this section. | N/A |

## Part 2. Applicable Requirements

List all applicable state and federal requirements, including emission limits, operating restrictions, etc., and the applicable test methods or monitoring used to demonstrate compliance with each applicable requirement. Clearly identify federal regulations from state requirements. Provide the compliance status as of the day the application is signed.

| EMISSION UNIT (Ref No.) | APPLICABLE REQUIREMENT (Specific Regulatory citation) | POLLUTANT | LIMITS/ REQUIREMENTS | TEST METHOD/ COMPLIANCE MONITORING |
|---|---|---|---|---|
| 24-05-FE<br>*Fugitive Emissions* | Standards of Performance for Crude Oil and Natural Gas Facilities<br>(40 CFR 60-Subpart OOOOa)<br><br>40 CFR 60.5397a(h)(3)<br>40 CFR 60.5397a(h)(3)(i)<br>40 CFR 60.5397a(h)(3)(ii) | VOC | Delay of repair will be allowed if the conditions in paragraphs (h)(3)(i) or (ii) of this section are met.<br><br>If the repair is technically infeasible, would require a vent blowdown, a compressor station shutdown, a well shutdown or well shut-in, or would be unsafe to repair during operation of the unit, the repair must be completed during the next scheduled compressor station shutdown for maintenance, scheduled well shutdown, scheduled well shut-in, after a scheduled vent blowdown, or within 2 years of detecting the fugitive emissions, whichever is earliest. For purposes of this paragraph (h)(3), a vent blowdown is the opening of one or more blowdown valves to depressurize major production and processing equipment, other than a storage vessel.<br><br>If the repair requires replacement of a fugitive emissions component or a part thereof, but the replacement cannot be acquired and installed within the repair timelines specified in paragraphs (h)(1) and (2) of this section due to either of the conditions specified in paragraphs (h)(3)(ii)(A) or (B) of this section, the repair must be completed in accordance with paragraph (h)(3)(ii)(C) of this section and documented in accordance with § 60.5420a(c)(15)(vii)(I).<br>(A) Valve assembly supplies had been sufficiently stocked but are depleted at the time of the required repair;<br>(B) A replacement fugitive emissions component or a part thereof requires custom fabrication.<br>(C) The required replacement must be ordered no later than 10 calendar days after the first attempt at repair. The repair must be completed as soon as practicable, but no later than 30 calendar days after receipt of the replacement component, unless the repair requires a compressor station or well shutdown. If the repair requires a compressor station or well shutdown, the repair must be completed in accordance with the timeframe specified in paragraph (h)(3)(i) of this section. | N/A |

**MDEQ NOTICE OF INTENT FOR COVERAGE UNDER THE OIL PRODUCTION GENERAL PERMIT TO CONSTRUCT/OPERATE AIR EMISSIONS EQUIPMENT AT A SYNTHETIC MINOR SOURCE**

# Compliance Plan — Section OPGP-G

## Part 2. Applicable Requirements

List all applicable state and federal requirements, including emission limits, operating restrictions, etc., and the applicable test methods or monitoring used to demonstrate compliance with each applicable requirement. Clearly identify federal regulations from state requirements. Provide the compliance status as of the day the application is signed.

| EMISSION UNIT (Ref No.) | APPLICABLE REQUIREMENT (Specific Regulatory citation) | POLLUTANT | LIMITS/ REQUIREMENTS | TEST METHOD/ COMPLIANCE MONITORING |
|---|---|---|---|---|
| 24-05-FE<br>*Fugitive Emissions* | Standards of Performance for Crude Oil and Natural Gas Facilities<br>(40 CFR 60-Subpart OOOOa)<br><br>40 CFR 60.5397a(h)(4)<br>40 CFR 60.5397a(i)<br>40 CFR 60.5420a(c)(15)<br>40 CFR 60.5420a(c) | VOC | Each identified source of fugitive emissions must be resurveyed to complete repair according to the requirements in paragraphs (h)(4)(i) through (iv) of this section, to ensure that there are no fugitive emissions.<br><br>**Requirements that specify records to be kept and record retention time:**<br>Records for each monitoring survey shall be maintained as specified §60.5420a(c)(15).<br><br>For each collection of fugitive emissions components at a well site and each collection of fugitive emissions components at a compressor station, maintain the records identified in paragraphs (c)(15)(i) through (ix) of this section, as applicable.<br><br>Records must be maintained either onsite or at the nearest local field office for at least 5 years. | N/A |

# Compliance Plan — Section OPGP-G

## Part 2. Applicable Requirements

List all applicable state and federal requirements, including emission limits, operating restrictions, etc., and the applicable test methods or monitoring used to demonstrate compliance with each applicable requirement. Clearly identify federal regulations from state requirements. Provide the compliance status as of the day the application is signed.

| EMISSION UNIT (Ref No.) | APPLICABLE REQUIREMENT (Specific Regulatory citation) | POLLUTANT | LIMITS/ REQUIREMENTS | TEST METHOD/ COMPLIANCE MONITORING |
|---|---|---|---|---|
| 24-05-FE<br>*Fugitive Emissions* | Standards of Performance for Crude Oil and Natural Gas Facilities<br>(40 CFR 60-Subpart OOOOa)<br><br>40 CFR 60.5397a(j)<br>40 CFR 60.5420a(b)<br>40 CFR 60.5420a(b)(11)<br>40 CFR 60.5410a | VOC | **Requirements that specify reports to be submitted:**<br>Annual reports shall be submitted for each collection of fugitive emissions components at a well site and each collection of fugitive emissions components at a compressor station that include the information specified in §60.5420a(b)(7). Multiple collection of fugitive emissions components at a well site or at a compressor station may be included in a single annual report.<br><br>Submit an annual report containing the information specified in §60.5420a(b)(1)(i)-(iv)&(b)(7)(i)-(iv), as applicable.<br><br>The initial annual report is due no later than 90 days after the end of the initial compliance period as determined according to §60.5410a. Subsequent annual reports are due no later than the same date each year as the initial annual report.<br><br>Submit reports to the EPA via CEDRI, except as outlined in this paragraph (b)(11). (CEDRI can be accessed through the EPA's CDX (https://cdx.epa.gov/).)<br><br>The initial compliance period begins on August 2, 2016, or upon initial startup, whichever is later, and ends no later than 1 year after the initial startup date for the affected facility or no later than 1 year after August 2, 2016. The initial compliance period may be less than one full year. | N/A |
| | Standards of Performance for Crude Oil and Natural Gas Facilities<br>(40 CFR 60-Subpart OOOOa)<br><br>40 CFR 60.5410a(j)<br>40 CFR 60.5415a(h) | VOC | To achieve initial compliance with the fugitive emission standards for each collection of fugitive emissions components at a well site and each collection of fugitive emissions components at a compressor station, comply with paragraphs (j)(1) through (5) of this section.<br><br>Demonstrate continuous compliance with the fugitive emission standards specified in §60.5397a(a)(1) according to paragraphs (h)(1) through (4) of this section. | N/A |

# *Emission Calculations*

**POINT SOURCE I.D. NUMBER:** ***1-05-LH-BS***

**EMISSION SOURCE DESCRIPTION:** ***30 MMBTU/Hr Line Heater-Burner Stack (H-106)***

DATA:

| | |
|---|---|
| **Emission Source:** | ***External Combustion Burner*** |
| **Annual Hours of Operation:** | ***8760*** |
| **Maximum Burner Rating (MMBTU/Hr):** | ***30*** |
| **Fuel Gas Heat of Combustion (BTU/scf):** *(based on an actual fuel gas analysis)* | ***1044*** |
| **Sulfur Concentration of Fuel Gas (ppmv):** *(conservative estimate)* | ***7*** |
| **Fuel Source:** | ***Field Gas*** |

Max. Hourly Fuel Consumption (SCFH): = burner rating/fuel gas heat of combustion/80% efficiency = ***35,919.54***

Max. Annual Fuel Consumption (MSCF/Yr): = hourly fuel consumption x annual hours = ***314,655.17***

**EMISSION FACTORS:**

*Unless otherwise noted, emission factors taken from EPA Publication AP-42, "Compilation of Air Pollution Emission Factors" - Natural Gas Combustion (Small Boilers), refer to supporting documentation.*

*$SO_2$ emission factor based on 100% conversion of sulfur compounds in fuel gas, using $H_2S$ fuel composition noted above.*

**EMISSION CALCULATIONS:**

| POLLUTANT: | EMISSION FACTOR ($LBS/10^6$ SCF) | CALCULATED EMISSION RATES: | |
|---|---|---|---|
| | | Hourly (lb/hr) | Annual (TPY) |
| Particulate Matter (filterable + condensable) | 7.6 | 0.2730 | 1.1957 |
| Sulfur Dioxide | 1.182 | 0.0424 | 0.1859 |
| Nitrogen Oxides | 100 | 3.5920 | 15.7328 |
| Carbon Monoxide | 84 | 3.0172 | 13.2155 |
| Methane (excluded from VOC total) | 2.3 | 0.0826 | 0.3619 |
| VOC | 5.5 | 0.1976 | 0.8653 |
| TOC | 11 | 0.3951 | 1.7306 |
| 2-Methylnaphthalene (TAP) | 0.0000240 | 0.0000 | 0.0000 |
| 3-Methylchloranthrene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| 7,12-Dimethylbenz(a)anthrancene (TAP) | 0.0000160 | 0.0000 | 0.0000 |
| Acenaphthene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| Acenaphthylene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| Anthracene (TAP) | 0.0000024 | 0.0000 | 0.0000 |

| POLLUTANT: | EMISSION FACTOR (LBS/$10^6$ SCF) | CALCULATED EMISSION RATES: | |
|---|---|---|---|
| | | Hourly (lb/hr) | Annual (TPY) |
| Benz(a)anthracene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| Benzene (TAP) | 0.0021000 | 0.0001 | 0.0003 |
| Benzo(a)pyrene (TAP) | 0.0000012 | 0.0000 | 0.0000 |
| Benzo(b)fluoranthene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| Benzo(g,h,I)perylene (TAP) | 0.0000012 | 0.0000 | 0.0000 |
| Benzo(k)fluoranthene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| Chrysene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| Dibenzo(a,h)anthrancene (TAP) | 0.0000012 | 0.0000 | 0.0000 |
| Dichlorobenzene (TAP) | 0.0012000 | 0.0000 | 0.0002 |
| Fluorathene (TAP) | 0.0000030 | 0.0000 | 0.0000 |
| Fluorene (TAP) | 0.0000028 | 0.0000 | 0.0000 |
| Formaldehyde (TAP) | 0.0750000 | 0.0027 | 0.0118 |
| Hexane (TAP) | 1.8000000 | 0.0647 | 0.2832 |
| Indeno(1,2,3-cd)pyrene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| Naphthalene (TAP) | 0.0006100 | 0.0000 | 0.0001 |
| Phenanathrene (TAP) | 0.0000170 | 0.0000 | 0.0000 |
| Pyrene (TAP) | 0.0000050 | 0.0000 | 0.0000 |
| Toluene (TAP) | 0.0034000 | 0.0001 | 0.0005 |
| Arsenic (TAP) | 0.0002000 | 0.0000 | 0.0000 |
| Beryllium (TAP) | 0.0000120 | 0.0000 | 0.0000 |
| Cadmium (TAP) | 0.0011000 | 0.0000 | 0.0002 |
| Chromium (TAP) | 0.0014000 | 0.0001 | 0.0002 |
| Cobalt (TAP) | 0.0000840 | 0.0000 | 0.0000 |
| Manganese (TAP) | 0.0003800 | 0.0000 | 0.0001 |
| Mercury (TAP) | 0.0002600 | 0.0000 | 0.0000 |
| Nickel (TAP) | 0.0021000 | 0.0001 | 0.0003 |
| Selenium (TAP) | 0.0000240 | 0.0000 | 0.0000 |
| **Total TAPs** | | 0.07 | 0.30 |
| **Total VOC-TAPs** | | 0.07 | 0.30 |
| **Total Non VOC & Non TAP-HC** | | 0.08 | 0.36 |
| **Total VOC** | | **0.20** | **0.87** |

# *Emission Calculations*

**POINT SOURCE I.D. NUMBER:** ***2-05-HT-BS***

**EMISSION SOURCE DESCRIPTION:** ***5.0 MMBTU/Hr Heater Treater-Burner Stack (V-22A)***

DATA:

| | |
|---|---|
| **Emission Source:** | ***External Combustion Burner*** |
| **Annual Hours of Operation:** | ***8760*** |
| **Maximum Burner Rating (MMBTU/Hr):** | ***5.0*** |
| **Fuel Gas Heat of Combustion (BTU/scf):** *(based on an actual fuel gas analysis)* | ***1044*** |
| **Sulfur Concentration of Fuel Gas (ppmv):** *(conservative estimate)* | ***7*** |
| **Fuel Source:** | ***Field Gas*** |

Max. Hourly Fuel Consumption (SCFH): = burner rating/fuel gas heat of combustion/80% efficiency = ***5,986.59***

Max. Annual Fuel Consumption (MSCF/Yr): = hourly fuel consumption x annual hours = ***52,442.53***

**EMISSION FACTORS:**

*Unless otherwise noted, emission factors taken from EPA Publication AP-42, "Compilation of Air Pollution Emission Factors" - Natural Gas Combustion (Small Boilers), refer to supporting documentation.*

*$SO_2$ emission factor based on 100% conversion of sulfur compounds in fuel gas, using $H_2S$ fuel composition noted above.*

**EMISSION CALCULATIONS:**

| POLLUTANT: | EMISSION FACTOR ($LBS/10^6$ SCF) | CALCULATED EMISSION RATES: | |
|---|---|---|---|
| | | Hourly (lb/hr) | Annual (TPY) |
| Particulate Matter (filterable + condensable) | 7.6 | 0.0455 | 0.1993 |
| Sulfur Dioxide | 1.182 | 0.0071 | 0.0310 |
| Nitrogen Oxides | 100 | 0.5987 | 2.6221 |
| Carbon Monoxide | 84 | 0.5029 | 2.2026 |
| Methane (excluded from VOC total) | 2.3 | 0.0138 | 0.0603 |
| VOC | 5.5 | 0.0329 | 0.1442 |
| TOC | 11 | 0.0659 | 0.2884 |
| 2-Methylnaphthalene (TAP) | 0.0000240 | 0.0000 | 0.0000 |
| 3-Methylchloranthrene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| 7,12-Dimethylbenz(a)anthrancene (TAP) | 0.0000160 | 0.0000 | 0.0000 |
| Acenaphthene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| Acenaphthylene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| Anthracene (TAP) | 0.0000024 | 0.0000 | 0.0000 |

| POLLUTANT: | EMISSION FACTOR (LBS/$10^6$ SCF) | CALCULATED EMISSION RATES: | |
|---|---|---|---|
| | | Hourly (lb/hr) | Annual (TPY) |
| Benz(a)anthracene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| Benzene (TAP) | 0.0021000 | 0.0000 | 0.0001 |
| Benzo(a)pyrene (TAP) | 0.0000012 | 0.0000 | 0.0000 |
| Benzo(b)fluoranthene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| Benzo(g,h,I)perylene (TAP) | 0.0000012 | 0.0000 | 0.0000 |
| Benzo(k)fluoranthene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| Chrysene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| Dibenzo(a,h)anthrancene (TAP) | 0.0000012 | 0.0000 | 0.0000 |
| Dichlorobenzene (TAP) | 0.0012000 | 0.0000 | 0.0000 |
| Fluorathene (TAP) | 0.0000030 | 0.0000 | 0.0000 |
| Fluorene (TAP) | 0.0000028 | 0.0000 | 0.0000 |
| Formaldehyde (TAP) | 0.0750000 | 0.0004 | 0.0020 |
| Hexane (TAP) | 1.8000000 | 0.0108 | 0.0472 |
| Indeno(1,2,3-cd)pyrene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| Naphthalene (TAP) | 0.0006100 | 0.0000 | 0.0000 |
| Phenanathrene (TAP) | 0.0000170 | 0.0000 | 0.0000 |
| Pyrene (TAP) | 0.0000050 | 0.0000 | 0.0000 |
| Toluene (TAP) | 0.0034000 | 0.0000 | 0.0001 |
| Arsenic (TAP) | 0.0002000 | 0.0000 | 0.0000 |
| Beryllium (TAP) | 0.0000120 | 0.0000 | 0.0000 |
| Cadmium (TAP) | 0.0011000 | 0.0000 | 0.0000 |
| Chromium (TAP) | 0.0014000 | 0.0000 | 0.0000 |
| Cobalt (TAP) | 0.0000840 | 0.0000 | 0.0000 |
| Manganese (TAP) | 0.0003800 | 0.0000 | 0.0000 |
| Mercury (TAP) | 0.0002600 | 0.0000 | 0.0000 |
| Nickel (TAP) | 0.0021000 | 0.0000 | 0.0001 |
| Selenium (TAP) | 0.0000240 | 0.0000 | 0.0000 |
| **Total TAPs** | | 0.01 | 0.05 |
| **Total VOC-TAPs** | | 0.01 | 0.05 |
| **Total Non VOC & Non TAP-HC** | | 0.01 | 0.06 |
| **Total VOC** | | **0.03** | **0.14** |

# *Emission Calculations*

**POINT SOURCE I.D. NUMBER:** ***3-05-LH-BS***

**EMISSION SOURCE DESCRIPTION:** ***2.5 MMBTU/Hr Inhibitor Oil Line Heater-Burner Stack (H-129)***

DATA:

| | |
|---|---|
| **Emission Source:** | ***External Combustion Burner*** |
| **Annual Hours of Operation:** | ***8760*** |
| **Maximum Burner Rating (MMBTU/Hr):** | ***2.5*** |
| **Fuel Gas Heat of Combustion (BTU/scf):** ***(based on an actual fuel gas analysis)*** | ***1044*** |
| **Sulfur Concentration of Fuel Gas (ppmv):** ***(conservative estimate)*** | ***7*** |
| **Fuel Source:** | ***Field Gas*** |

Max. Hourly Fuel Consumption (SCFH): = burner rating/fuel gas heat of combustion/80% efficiency = ***2,993.30***

Max. Annual Fuel Consumption (MSCF/Yr): = hourly fuel consumption x annual hours = ***26,221.31***

**EMISSION FACTORS:**

*Unless otherwise noted, emission factors taken from EPA Publication AP-42, "Compilation of Air Pollution Emission Factors" - Natural Gas Combustion (Small Boilers), refer to supporting documentation.*

*$SO_2$ emission factor based on 100% conversion of sulfur compounds in fuel gas, using $H_2S$ fuel composition noted above.*

**EMISSION CALCULATIONS:**

| POLLUTANT: | EMISSION FACTOR ($LBS/10^6$ SCF) | CALCULATED EMISSION RATES: | |
|---|---|---|---|
| | | Hourly (lb/hr) | Annual (TPY) |
| Particulate Matter (filterable + condensable) | 7.6 | 0.0227 | 0.0996 |
| Sulfur Dioxide | 1.182 | 0.0035 | 0.0155 |
| Nitrogen Oxides | 100 | 0.2993 | 1.3111 |
| Carbon Monoxide | 84 | 0.2514 | 1.1013 |
| Methane (excluded from VOC total) | 2.3 | 0.0069 | 0.0302 |
| VOC | 5.5 | 0.0165 | 0.0721 |
| TOC | 11 | 0.0329 | 0.1442 |
| 2-Methylnaphthalene (TAP) | 0.0000240 | 0.0000 | 0.0000 |
| 3-Methylchloranthrene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| 7,12-Dimethylbenz(a)anthrancene (TAP) | 0.0000160 | 0.0000 | 0.0000 |
| Acenaphthene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| Acenaphthylene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| Anthracene (TAP) | 0.0000024 | 0.0000 | 0.0000 |

| POLLUTANT: | EMISSION FACTOR ($LBS/10^6$ SCF) | CALCULATED EMISSION RATES: | |
|---|---|---|---|
| | | Hourly (lb/hr) | Annual (TPY) |
| Benz(a)anthracene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| Benzene (TAP) | 0.0021000 | 0.0000 | 0.0000 |
| Benzo(a)pyrene (TAP) | 0.0000012 | 0.0000 | 0.0000 |
| Benzo(b)fluoranthene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| Benzo(g,h,I)perylene (TAP) | 0.0000012 | 0.0000 | 0.0000 |
| Benzo(k)fluoranthene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| Chrysene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| Dibenzo(a,h)anthrancene (TAP) | 0.0000012 | 0.0000 | 0.0000 |
| Dichlorobenzene (TAP) | 0.0012000 | 0.0000 | 0.0000 |
| Fluorathene (TAP) | 0.0000030 | 0.0000 | 0.0000 |
| Fluorene (TAP) | 0.0000028 | 0.0000 | 0.0000 |
| Formaldehyde (TAP) | 0.0750000 | 0.0002 | 0.0010 |
| Hexane (TAP) | 1.8000000 | 0.0054 | 0.0236 |
| Indeno(1,2,3-cd)pyrene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| Naphthalene (TAP) | 0.0006100 | 0.0000 | 0.0000 |
| Phenanathrene (TAP) | 0.0000170 | 0.0000 | 0.0000 |
| Pyrene (TAP) | 0.0000050 | 0.0000 | 0.0000 |
| Toluene (TAP) | 0.0034000 | 0.0000 | 0.0000 |
| Arsenic (TAP) | 0.0002000 | 0.0000 | 0.0000 |
| Beryllium (TAP) | 0.0000120 | 0.0000 | 0.0000 |
| Cadmium (TAP) | 0.0011000 | 0.0000 | 0.0000 |
| Chromium (TAP) | 0.0014000 | 0.0000 | 0.0000 |
| Cobalt (TAP) | 0.0000840 | 0.0000 | 0.0000 |
| Manganese (TAP) | 0.0003800 | 0.0000 | 0.0000 |
| Mercury (TAP) | 0.0002600 | 0.0000 | 0.0000 |
| Nickel (TAP) | 0.0021000 | 0.0000 | 0.0000 |
| Selenium (TAP) | 0.0000240 | 0.0000 | 0.0000 |
| **Total TAPs** | | 0.01 | 0.02 |
| **Total VOC-TAPs** | | 0.01 | 0.02 |
| **Total Non VOC & Non TAP-HC** | | 0.01 | 0.03 |
| **Total VOC** | | **0.02** | **0.07** |

# *Emission Calculations*

**POINT SOURCE I.D. NUMBER:** ***4-05-SBP***

**EMISSION SOURCE DESCRIPTION:** ***Sand Blowdown Pit (SP-130)***

DATA:

| | |
|---|---|
| **Emission Source:** | ***Flash Gas from Brine Solution**** |
| **Approx. Pressure Drop of Brine Solution: (psig)** | ***850*** |
| **Approx. Temperature of Brine Solution: (ºF)** | ***80*** |
| **Flash Gas Specific Gravity:** | ***1.4418*** |
| **Avg. Water Throughput: (BBL/Hr)** | ***50*** |
| **Max. Water Throughput: (BBL/Hr)** | ***50*** |
| **Blowdown Hours per Year:** | ***730*** |
| **Gas to Water Ratio: (SCF/BBL of Brine; GWR)** | ***8.5*** |
| **Basis of Emission Estimates:** | ***API Documentation & Actual Inlet Gas Analysis (Refer to supporting documentation)*** |
| **Flash Gas Analysis Report Number:** | ***Southern Petroleum Laboratories Report No.: 172-23080191-003A*** |

**Associated with vessel blowdowns.*

| | | | | |
|---|---|---|---|---|
| Avg. Hourly Uncontrolled Flash Rate (SCF/Hr) | = | Brine Rate * GWR | = | **425.00** |
| Avg. Hourly Uncontrolled Total Flash Emissions (lb/hr) | = | Flash Gas Gravity * Density of Air * Flash Rate | = | **46.82** |
| Max. Hourly Uncontrolled Total Flash Emissions (lb/hr) | = | Avg. Emissions * Ratio of Max. Water Rate to Avg. Water Rate | = | **46.82** |
| Annual Potential Uncontrolled Flash Emissions (TPY) | = | Hourly * Blowdown Hours/2000 | = | **17.09** |

**EMISSION ESTIMATES:**

*The magnitude of the solubility of natural gas in the interstitial water present in oil sands was studied by The American Petroleum Institute (API) and presented in a 1944 document entitled, "P-V-T and Solubility Relations". Results of these studies have been projected to provide estimates of gas volumes present in the brine solution handled at this site within the specific pressure and temperature ranges expected. The composition of this gas is based on the referenced analysis.*

**EMISSIONS SUMMARY:**

| POLLUTANT: | Weight Percent | CALCULATED EMISSION RATES | | |
|---|---|---|---|---|
| | | Average Hourly (lb/hr) | Maximum Hourly (lb/hr) | Annual (TPY) |
| Nitrogen (excluded from VOC total) | 0.3299 | 0.1544 | 0.1544 | 0.0564 |
| Carbon Dioxide (excluded from VOC total) | 94.5515 | 44.2645 | 44.2645 | 16.1582 |
| Methane (excluded from VOC total) | 3.4498 | 1.6150 | 1.6150 | 0.5895 |
| Ethane (excluded from VOC total) | 0.3596 | 0.1683 | 0.1683 | 0.0615 |
| Hydrogen Sulfide (excluded from VOC total) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Propane | 0.2902 | 0.1359 | 0.1359 | 0.0496 |
| Iso-Butane | 0.0904 | 0.0423 | 0.0423 | 0.0154 |
| N-Butane | 0.1919 | 0.0898 | 0.0898 | 0.0328 |
| Iso-Pentane | 0.1130 | 0.0529 | 0.0529 | 0.0193 |
| N-Pentane | 0.0925 | 0.0433 | 0.0433 | 0.0158 |
| Iso-Hexane | 0.0834 | 0.0390 | 0.0390 | 0.0143 |
| N-Hexane (TAP) | 0.0427 | 0.0200 | 0.0200 | 0.0073 |

| | | | | |
|---|---|---|---|---|
| Methylcyclopentane | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Benzene (TAP) | 0.0124 | 0.0058 | 0.0058 | 0.0021 |
| Cyclohexane | 0.0296 | 0.0139 | 0.0139 | 0.0051 |
| Heptanes | 0.0844 | 0.0395 | 0.0395 | 0.0144 |
| Methylcyclohexane | 0.0442 | 0.0207 | 0.0207 | 0.0076 |
| Toluene (TAP) | 0.0080 | 0.0037 | 0.0037 | 0.0014 |
| 2,2,4-Trimethylpentane (TAP) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Octanes | 0.0602 | 0.0282 | 0.0282 | 0.0103 |
| Ethylbenzene (TAP) | 0.0015 | 0.0007 | 0.0007 | 0.0003 |
| Xylenes (TAP) | 0.0212 | 0.0099 | 0.0099 | 0.0036 |
| Nonanes | 0.0799 | 0.0374 | 0.0374 | 0.0137 |
| Decanes Plus | 0.0637 | 0.0298 | 0.0298 | 0.0109 |
| **Total Weight Percent:** | 100.0000 | | | |
| **Total TAP Emissions** | | 0.04 | 0.04 | 0.01 |
| **Total VOC Emissions** | | **0.61** | **0.61** | **0.22** |
| **Total Non VOC & Non TAP-HC** | | 1.78 | 1.78 | 0.65 |
| **Total Emissions** | | 46.82 | 46.82 | 17.09 |

| | | | |
|---|---|---|---|
| Uncontrolled VOC Emission Total (TPY) | Brine Flash Gas | = | **0.22** |

# *Emission Calculations*

*Emission calculations shown below are presented for informational purposes only as vapors from the wet oil tank are routed to the atmospheric control flare (EPN: 25-05-F) for combustion, except during brief intervals when thief hatches are opened for purposes of sampling, gauging, etc.*

**POINT SOURCE I.D. NUMBER:** ***5-05-OST-V***

**EMISSION SOURCE DESCRIPTION:** ***1500 BBL Wet Oil Tank-Common Vent (V-118)***

DATA:

| | |
|---|---|
| **Emission Source:** | ***Crude Oil Storage Vapors ('Working' & 'Standing')*** |
| **Average Daily Oil Throughput:** **(Annual Average; BBLD - $Q_{avg}$)** | ***2000*** |
| **Maximum Daily Oil Throughput:** **(BBLD - $Q_{max}$)** | ***2000*** |
| **Average VOC Working Losses - $L_W$ (lb/yr):** | ***23,514.261*** |
| **Average VOC Standing Losses - $L_S$ (lb/yr):** | ***2,794.343*** |
| **Basis of Estimates:** | ***AP-42, Chapter 7 (June 2020, Section 7.1.3.1); Refer to supporting documentation for summary*** |

| | | | |
|---|---|---|---|
| Avg. Hourly Uncontrolled THC Losses (lb/hr) | = (Lw + Ls) * 14.5612/8760 | = | **43.73** |
| Max. Hourly Uncontrolled THC Losses (lb/hr) | = (Ls + (Lw * QMax ÷ Qavg)) * 14.5612/8760 | = | **43.73** |
| Annual Potential Uncontrolled THC Losses (TPY) | = Hourly * 8760/2000 | = | **191.54** |

**SPECIATION FACTORS:**

*The composition of this gas is based on an actual analysis of the vapors routed to the control flare and normalized to account for the removal of Nitrogen; refer to Southern Petroleum Laboratories Report No.: 172-24050252-001A in supporting documentation.*

**UNCONTROLLED EMISSIONS SUMMARY:**

| POLLUTANT: | Weight Percent | CALCULATED EMISSION RATES | | |
|---|---|---|---|---|
| | | Average Hourly (lb/hr) | Maximum Hourly (lb/hr) | Annual (TPY) |
| Nitrogen (excluded from VOC total) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Carbon Dioxide (excluded from VOC total) | 92.2057 | 40.3225 | 40.3225 | 176.6128 |
| Methane (excluded from VOC total) | 0.4437 | 0.1940 | 0.1940 | 0.8499 |
| Ethane (excluded from VOC total) | 0.4830 | 0.2112 | 0.2112 | 0.9252 |
| Hydrogen Sulfide (excluded from VOC total) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Propane | 1.2192 | 0.5332 | 0.5332 | 2.3353 |
| Iso-Butane | 0.7063 | 0.3089 | 0.3089 | 1.3529 |
| N-Butane | 1.4841 | 0.6490 | 0.6490 | 2.8426 |
| Iso-Pentane | 0.9366 | 0.4096 | 0.4096 | 1.7939 |
| N-Pentane | 0.7358 | 0.3218 | 0.3218 | 1.4093 |
| Iso-Hexane | 0.6181 | 0.2703 | 0.2703 | 1.1840 |
| N-Hexane (TAP) | 0.2797 | 0.1223 | 0.1223 | 0.5358 |
| Methylcyclopentane | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Benzene (TAP) | 0.0595 | 0.0260 | 0.0260 | 0.1139 |
| Cyclohexane | 0.1597 | 0.0698 | 0.0698 | 0.3058 |

| | | | | |
|---|---|---|---|---|
| Heptanes | 0.3974 | 0.1738 | 0.1738 | 0.7612 |
| Methylcyclohexane | 0.1143 | 0.0500 | 0.0500 | 0.2190 |
| Toluene (TAP) | 0.0110 | 0.0048 | 0.0048 | 0.0211 |
| 2,2,4-Trimethylpentane (TAP) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Octanes | 0.0828 | 0.0362 | 0.0362 | 0.1586 |
| Ethylbenzene (TAP) | 0.0011 | 0.0005 | 0.0005 | 0.0021 |
| Xylenes (TAP) | 0.0088 | 0.0039 | 0.0039 | 0.0169 |
| Nonanes | 0.0480 | 0.0210 | 0.0210 | 0.0919 |
| Decanes Plus | 0.0052 | 0.0023 | 0.0023 | 0.0099 |
| **Total Weight Percent:** | 100.0000 | | | |
| **Total TAP Emissions** | | 0.16 | 0.16 | 0.69 |
| **Total VOC Emissions** | | **3.00** | **3.00** | **13.15** |
| **Total Non VOC & Non TAP-HC** | | 0.41 | 0.41 | 1.78 |
| **Total Hydrocarbon Emissions** | | 43.73 | 43.73 | 191.54 |

| | | | |
|---|---|---|---|
| Uncontrolled VOC Emission Total (TPY) | Storage Vapors | = | **13.15** |

DATA:

| | |
|---|---|
| **Emission Source:** | ***Losses When Opening Thief Hatches*** |
| **Specific Gravity of Gas:** | ***1.5347*** |
| **Maximum Thief Hatch Venting (Hrs/Yr)** **(Under Normal/Routine Operating Conditions)** | ***30*** |
| **Max. Minutes a Hatch is Opened in a Single Hour:** | ***5*** |
| **Maximum Hourly Emission Rate (lb/hr):** **(from preceding tank emission estimates)** | ***3.64*** |

| | | | | |
|---|---|---|---|---|
| Avg. Hourly Emissions (lb/hr) | = | Annual Total/8760 (hrs/yr) | = | **0.15** |
| Maximum Hourly Emissions (lb/hr) | = | Max. Emission Rate * Max. Minutes/Hr Hatch is Open | = | **3.64** |
| Maximum Annual Emissions (TPY) | = | Max. Hourly THC Rate * Hours/Yr Hatch is Open | = | **0.66** |

**EMISSION SUMMARY (based on the above referenced flare gas analysis):**

| POLLUTANT: | Weight Percent | CALCULATED EMISSION RATES | | |
|---|---|---|---|---|
| | | Average Hourly (lb/hr) | Maximum Hourly (lb/hr) | Annual (TPY) |
| Water Vapor (excluded from VOC total) | 0.0000 | 0.000 | 0.000 | 0.000 |
| Nitrogen (excluded from VOC total) | 0.0000 | 0.000 | 0.000 | 0.000 |
| Carbon Dioxide (excluded from VOC total) | 92.2057 | 0.139 | 3.356 | 0.605 |
| Methane (excluded from VOC total) | 0.4437 | 0.001 | 0.016 | 0.003 |
| Ethane (excluded from VOC total) | 0.4830 | 0.001 | 0.018 | 0.003 |
| Hydrogen Sulfide (excluded from VOC total) | 0.0000 | 0.000 | 0.000 | 0.000 |
| Propane | 1.2192 | 0.002 | 0.044 | 0.008 |
| Iso-Butane | 0.7063 | 0.001 | 0.026 | 0.005 |
| N-Butane | 1.4841 | 0.002 | 0.054 | 0.010 |
| Iso-Pentane | 0.9366 | 0.001 | 0.034 | 0.006 |
| N-Pentane | 0.7358 | 0.001 | 0.027 | 0.005 |
| Iso-Hexane | 0.6181 | 0.001 | 0.022 | 0.004 |

| | | | | |
|---|---|---|---|---|
| N-Hexane (TAP) | 0.2797 | 0.000 | 0.010 | 0.002 |
| Methylcyclopentane | 0.0000 | 0.000 | 0.000 | 0.000 |
| Benzene (TAP) | 0.0595 | 0.000 | 0.002 | 0.000 |
| Cyclohexane | 0.1597 | 0.000 | 0.006 | 0.001 |
| Heptanes | 0.3974 | 0.001 | 0.014 | 0.003 |
| Methylcyclohexane | 0.1143 | 0.000 | 0.004 | 0.001 |
| Toluene (TAP) | 0.0110 | 0.000 | 0.000 | 0.000 |
| 2,2,4-Trimethylpentane (TAP) | 0.0000 | 0.000 | 0.000 | 0.000 |
| Octanes | 0.0828 | 0.000 | 0.003 | 0.001 |
| Ethylbenzene (TAP) | 0.0011 | 0.000 | 0.000 | 0.000 |
| Xylenes (TAP) | 0.0088 | 0.000 | 0.000 | 0.000 |
| Nonanes | 0.0480 | 0.000 | 0.002 | 0.000 |
| Decanes Plus | 0.0052 | 0.000 | 0.000 | 0.000 |
| Other NM/NE HC | 0.0000 | 0.000 | 0.000 | 0.000 |
| **Total Weight Percent:** | 100.0000 | | | |
| **Total TAP Emissions** | | 0.00 | 0.01 | 0.00 |
| **Total VOC Emissions** | | **0.01** | **0.25** | **0.05** |
| **Total Non VOC & Non TAP-HC** | | 0.00 | 0.03 | 0.01 |
| **Total Emissions** | | 0.15 | 3.64 | 0.66 |

# *Emission Calculations*

*Emission calculations shown below are presented for informational purposes only as vapors from the dry oil tank are routed to the atmospheric control flare (EPN: 25-05-F) for combustion, except during brief intervals when thief hatches are opened for purposes of sampling, gauging, etc.*

**POINT SOURCE I.D. NUMBER:** ***6a-05-OST-CV***

**EMISSION SOURCE DESCRIPTION:** ***5000 BBL Dry Oil Tank-Common Vent (V-119A)***

DATA:

| | |
|---|---|
| **Emission Source:** | ***Crude Oil Storage Vapors ('Working' & 'Standing')*** |
| **Average Daily Oil Throughput:** **(Annual Average; BBLD - $Q_{avg}$)** | ***1000*** |
| **Maximum Daily Oil Throughput:** **(BBLD - $Q_{max}$)** | ***2000*** |
| **Average VOC Working Losses - $L_W$ (lb/yr):** | ***52,637.127*** |
| **Average VOC Standing Losses - $L_S$ (lb/yr):** | ***9,578.530*** |
| **Basis of Estimates:** | ***AP-42, Chapter 7 (June 2020, Section 7.1.3.1); Refer to supporting documentation for summary*** |

| | | | |
|---|---|---|---|
| Avg. Hourly Uncontrolled THC Losses (lb/hr) | = (Lw + Ls) * 14.5612/8760 | = | **103.42** |
| Max. Hourly Uncontrolled THC Losses (lb/hr) | = (Ls + (Lw * QMax ÷ Qavg)) * 14.5612/8760 | = | **190.91** |
| Annual Potential Uncontrolled THC Losses (TPY) | = Hourly * 8760/2000 | = | **452.97** |

**SPECIATION FACTORS:**

*The composition of this gas is based on an actual analysis of the vapors routed to the control flare and normalized to account for the removal of Nitrogen; refer to Southern Petroleum Laboratories Report No.: 172-24050252-001A in supporting documentation.*

**UNCONTROLLED EMISSIONS SUMMARY:**

| POLLUTANT: | Weight Percent | CALCULATED EMISSION RATES | | |
|---|---|---|---|---|
| | | Average Hourly (lb/hr) | Maximum Hourly (lb/hr) | Annual (TPY) |
| Nitrogen (excluded from VOC total) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Carbon Dioxide (excluded from VOC total) | 92.2057 | 95.3564 | 176.0321 | 417.6611 |
| Methane (excluded from VOC total) | 0.4437 | 0.4589 | 0.8471 | 2.0100 |
| Ethane (excluded from VOC total) | 0.4830 | 0.4995 | 0.9221 | 2.1879 |
| Hydrogen Sulfide (excluded from VOC total) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Propane | 1.2192 | 1.2609 | 2.3276 | 5.5227 |
| Iso-Butane | 0.7063 | 0.7304 | 1.3484 | 3.1993 |
| N-Butane | 1.4841 | 1.5348 | 2.8333 | 6.7223 |
| Iso-Pentane | 0.9366 | 0.9686 | 1.7880 | 4.2424 |
| N-Pentane | 0.7358 | 0.7609 | 1.4047 | 3.3328 |
| Iso-Hexane | 0.6181 | 0.6392 | 1.1801 | 2.7999 |
| N-Hexane (TAP) | 0.2797 | 0.2893 | 0.5340 | 1.2670 |
| Methylcyclopentane | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Benzene (TAP) | 0.0595 | 0.0615 | 0.1136 | 0.2694 |
| Cyclohexane | 0.1597 | 0.1651 | 0.3048 | 0.7232 |

| | | | | |
|---|---|---|---|---|
| Heptanes | 0.3974 | 0.4110 | 0.7587 | 1.8000 |
| Methylcyclohexane | 0.1143 | 0.1182 | 0.2182 | 0.5178 |
| Toluene (TAP) | 0.0110 | 0.0114 | 0.0210 | 0.0499 |
| 2,2,4-Trimethylpentane (TAP) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Octanes | 0.0828 | 0.0857 | 0.1581 | 0.3752 |
| Ethylbenzene (TAP) | 0.0011 | 0.0011 | 0.0021 | 0.0050 |
| Xylenes (TAP) | 0.0088 | 0.0091 | 0.0169 | 0.0400 |
| Nonanes | 0.0480 | 0.0496 | 0.0916 | 0.2174 |
| Decanes Plus | 0.0052 | 0.0054 | 0.0099 | 0.0234 |
| **Total Weight Percent:** | 100.0000 | | | |
| **Total TAP Emissions** | | 0.37 | 0.69 | 1.63 |
| **Total VOC Emissions** | | **7.10** | **13.11** | **31.11** |
| **Total Non VOC & Non TAP-HC** | | 0.96 | 1.77 | 4.20 |
| **Total Hydrocarbon Emissions** | | 103.42 | 190.91 | 452.97 |

DATA:

| | |
|---|---|
| **Emission Source:** | ***Flash Gas from Oil*** |
| **Flash Gas Specific Gravity:** | ***1.5347*** |
| **Average Oil Throughput:** **(BBLD)** | ***1000*** |
| **Maximum Oil Throughput:** **(BBLD)** | ***2000*** |
| **Basis of Emission Estimates:** | ***Actual GOR & Actual Flare Gas Analysis*** |
| **Flash Gas Analysis Report Number:** | ***Southern Petroleum Laboratories Report No.: 172-24050252-001A*** |

*Estimates for gas volumes and composition associated with this stage of the process were derived from a laboratory test of an oil sample collected at this facility, refer to Southern Petroleum Laboratories Report No.: 23120295-001A in supporting documentation. The following table shows the actual field and laboratory conditions.*

| **API Oil Gravity @ 60°F** | **Process Conditions** | | **Gas/Oil Ratio** |
|---|---|---|---|
| | **Pressure (PSIG)** | **Temperature (°F)** | **(SCF/BBL)** |
| **Actual Facility & Laboratory Conditions:** | | | |
| 36.71 | 44 | 73 | |
| | 0 | 60 | 5.74 |
| | | GOR Estimate: | **5.74** |

| | | | | |
|---|---|---|---|---|
| Avg. Hourly Uncontrolled Flash Rate (SCF/Hr) | = | Oil Rate * GOR | = | **239.17** |
| Avg. Hourly Uncontrolled Total Flash Emissions (lb/hr) | = | Flash Gas Gravity * Density of Air * Flash Rate | = | **28.04** |
| Max. Hourly Uncontrolled Total Flash Emissions (lb/hr) | = | Avg. Emissions * Ratio of Max. Oil Rate to Avg. Oil Rate | = | **56.09** |
| Annual Potential Uncontrolled Flash Emissions (TPY) | = | Hourly * 8760/2000 | = | **122.82** |

**SPECIATION FACTORS:**

*Speciation of the flash gas mixture taken from the referenced laboratory results and normalized to account for the removal of Nitrogen; refer to supporting documentation*

**UNCONTROLLED EMISSIONS SUMMARY:**

| POLLUTANT: | Weight Percent | CALCULATED EMISSION RATES | | |
|---|---|---|---|---|
| | | Average Hourly (lb/hr) | Maximum Hourly (lb/hr) | Annual (TPY) |
| Nitrogen (excluded from VOC total) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Carbon Dioxide (excluded from VOC total) | 92.2057 | 25.8572 | 51.7144 | 113.2426 |
| Methane (excluded from VOC total) | 0.4437 | 0.1244 | 0.2489 | 0.5450 |
| Ethane (excluded from VOC total) | 0.4830 | 0.1355 | 0.2709 | 0.5932 |
| Hydrogen Sulfide (excluded from VOC total) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Propane | 1.2192 | 0.3419 | 0.6838 | 1.4974 |
| Iso-Butane | 0.7063 | 0.1981 | 0.3961 | 0.8675 |
| N-Butane | 1.4841 | 0.4162 | 0.8324 | 1.8227 |
| Iso-Pentane | 0.9366 | 0.2626 | 0.5253 | 1.1503 |
| N-Pentane | 0.7358 | 0.2063 | 0.4127 | 0.9036 |
| Iso-Hexane | 0.6181 | 0.1733 | 0.3467 | 0.7591 |
| N-Hexane (TAP) | 0.2797 | 0.0784 | 0.1569 | 0.3435 |
| Methylcyclopentane | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Benzene (TAP) | 0.0595 | 0.0167 | 0.0334 | 0.0731 |
| Cyclohexane | 0.1597 | 0.0448 | 0.0895 | 0.1961 |
| Heptanes | 0.3974 | 0.1114 | 0.2229 | 0.4881 |
| Methylcyclohexane | 0.1143 | 0.0321 | 0.0641 | 0.1404 |
| Toluene (TAP) | 0.0110 | 0.0031 | 0.0062 | 0.0135 |
| 2,2,4-Trimethylpentane (TAP) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Octanes | 0.0828 | 0.0232 | 0.0465 | 0.1017 |
| Ethylbenzene (TAP) | 0.0011 | 0.0003 | 0.0006 | 0.0014 |
| Xylenes (TAP) | 0.0088 | 0.0025 | 0.0050 | 0.0108 |
| Nonanes | 0.0480 | 0.0135 | 0.0269 | 0.0589 |
| Decanes Plus | 0.0052 | 0.0015 | 0.0029 | 0.0064 |
| **Total Weight Percent:** | 100.0000 | | | |
| **Total TAP Emissions** | | 0.10 | 0.20 | 0.44 |
| **Total VOC Emissions** | | **1.93** | **3.85** | **8.43** |
| **Total Non VOC & Non TAP-HC** | | 0.26 | 0.52 | 1.14 |
| **Total Emissions** | | 28.04 | 56.09 | 122.82 |

| Uncontrolled VOC Emission Total (TPY) | Storage Vapors + Oil Flash | = | **39.54** |
|---|---|---|---|

DATA:

| | |
|---|---|
| **Emission Source:** | ***Losses When Opening Thief Hatches*** |
| **Specific Gravity of Gas:** | ***1.5347*** |
| **Maximum Thief Hatch Venting (Hrs/Yr)** **(Under Normal/Routine Operating Conditions)** | ***30*** |
| **Max. Minutes a Hatch is Opened in a Single Hour:** | ***5*** |
| **Maximum Hourly Emission Rate (lb/hr):** **(from preceding tank emission estimates)** | ***20.58*** |

| | | | | |
|---|---|---|---|---|
| Avg. Hourly Emissions (lb/hr) | = | Annual Total/8760 (hrs/yr) | = | **0.85** |
| Maximum Hourly Emissions (lb/hr) | = | Max. Emission Rate * Max. Minutes/Hr Hatch is Open | = | **20.58** |
| Maximum Annual Emissions (TPY) | = | Max. Hourly THC Rate * Hours/Yr Hatch is Open | = | **3.71** |

**EMISSION SUMMARY (based on the above referenced flare gas analysis):**

| POLLUTANT: | Weight Percent | CALCULATED EMISSION RATES | | |
|---|---|---|---|---|
| | | Average Hourly (lb/hr) | Maximum Hourly (lb/hr) | Annual (TPY) |
| Water Vapor (excluded from VOC total) | 0.0000 | 0.000 | 0.000 | 0.000 |
| Nitrogen (excluded from VOC total) | 0.0000 | 0.000 | 0.000 | 0.000 |
| Carbon Dioxide (excluded from VOC total) | 92.2057 | 0.781 | 18.976 | 3.416 |
| Methane (excluded from VOC total) | 0.4437 | 0.004 | 0.091 | 0.016 |
| Ethane (excluded from VOC total) | 0.4830 | 0.004 | 0.099 | 0.018 |
| Hydrogen Sulfide (excluded from VOC total) | 0.0000 | 0.000 | 0.000 | 0.000 |
| Propane | 1.2192 | 0.010 | 0.251 | 0.045 |
| Iso-Butane | 0.7063 | 0.006 | 0.145 | 0.026 |
| N-Butane | 1.4841 | 0.013 | 0.305 | 0.055 |
| Iso-Pentane | 0.9366 | 0.008 | 0.193 | 0.035 |
| N-Pentane | 0.7358 | 0.006 | 0.151 | 0.027 |
| Iso-Hexane | 0.6181 | 0.005 | 0.127 | 0.023 |
| N-Hexane (TAP) | 0.2797 | 0.002 | 0.058 | 0.010 |
| Methylcyclopentane | 0.0000 | 0.000 | 0.000 | 0.000 |
| Benzene (TAP) | 0.0595 | 0.001 | 0.012 | 0.002 |
| Cyclohexane | 0.1597 | 0.001 | 0.033 | 0.006 |
| Heptanes | 0.3974 | 0.003 | 0.082 | 0.015 |
| Methylcyclohexane | 0.1143 | 0.001 | 0.024 | 0.004 |
| Toluene (TAP) | 0.0110 | 0.000 | 0.002 | 0.000 |
| 2,2,4-Trimethylpentane (TAP) | 0.0000 | 0.000 | 0.000 | 0.000 |
| Octanes | 0.0828 | 0.001 | 0.017 | 0.003 |
| Ethylbenzene (TAP) | 0.0011 | 0.000 | 0.000 | 0.000 |
| Xylenes (TAP) | 0.0088 | 0.000 | 0.002 | 0.000 |
| Nonanes | 0.0480 | 0.000 | 0.010 | 0.002 |

| | | | | |
|---|---|---|---|---|
| Decanes Plus | 0.0052 | 0.000 | 0.001 | 0.000 |
| Other NM/NE HC | 0.0000 | 0.000 | 0.000 | 0.000 |
| **Total Weight Percent:** | 100.0000 | | | |
| **Total TAP Emissions** | | 0.00 | 0.07 | 0.01 |
| **Total VOC Emissions** | | **0.06** | **1.41** | **0.25** |
| **Total Non VOC & Non TAP-HC** | | 0.01 | 0.19 | 0.03 |
| **Total Emissions** | | 0.85 | 20.58 | 3.71 |

# *Emission Calculations*

*Emission calculations shown below are presented for informational purposes only as vapors from the dry oil tank are routed to the atmospheric control flare (EPN: 25-05-F) for combustion, except during brief intervals when thief hatches are opened for purposes of sampling, gauging, etc.*

**POINT SOURCE I.D. NUMBER:** ***6b-05-OST-CV***

**EMISSION SOURCE DESCRIPTION:** ***5000 BBL Dry Oil Tank-Common Vent (V-119B)***

DATA:

| | |
|---|---|
| **Emission Source:** | ***Crude Oil Storage Vapors ('Working' & 'Standing')*** |
| **Average Daily Oil Throughput:** **(Annual Average; BBLD - $Q_{avg}$)** | ***1000*** |
| **Maximum Daily Oil Throughput:** **(BBLD - $Q_{max}$)** | ***2000*** |
| **Average VOC Working Losses - $L_W$ (lb/yr):** | ***52,637.127*** |
| **Average VOC Standing Losses - $L_S$ (lb/yr):** | ***9,578.530*** |
| **Basis of Estimates:** | ***AP-42, Chapter 7 (June 2020, Section 7.1.3.1); Refer to supporting documentation for summary*** |

| | | | |
|---|---|---|---|
| Avg. Hourly Uncontrolled THC Losses (lb/hr) | = (Lw + Ls) * 14.5612/8760 | = | **103.42** |
| Max. Hourly Uncontrolled THC Losses (lb/hr) | = (Ls + (Lw * QMax ÷ Qavg)) * 14.5612/8760 | = | **190.91** |
| Annual Potential Uncontrolled THC Losses (TPY) | = Hourly * 8760/2000 | = | **452.97** |

**SPECIATION FACTORS:**

*The composition of this gas is based on an actual analysis of the vapors routed to the control flare and normalized to account for the removal of Nitrogen; refer to Southern Petroleum Laboratories Report No.: 172-24050252-001A in supporting documentation.*

**UNCONTROLLED EMISSIONS SUMMARY:**

| POLLUTANT: | Weight Percent | CALCULATED EMISSION RATES | | |
|---|---|---|---|---|
| | | Average Hourly (lb/hr) | Maximum Hourly (lb/hr) | Annual (TPY) |
| Nitrogen (excluded from VOC total) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Carbon Dioxide (excluded from VOC total) | 92.2057 | 95.3564 | 176.0321 | 417.6611 |
| Methane (excluded from VOC total) | 0.4437 | 0.4589 | 0.8471 | 2.0100 |
| Ethane (excluded from VOC total) | 0.4830 | 0.4995 | 0.9221 | 2.1879 |
| Hydrogen Sulfide (excluded from VOC total) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Propane | 1.2192 | 1.2609 | 2.3276 | 5.5227 |
| Iso-Butane | 0.7063 | 0.7304 | 1.3484 | 3.1993 |
| N-Butane | 1.4841 | 1.5348 | 2.8333 | 6.7223 |
| Iso-Pentane | 0.9366 | 0.9686 | 1.7880 | 4.2424 |
| N-Pentane | 0.7358 | 0.7609 | 1.4047 | 3.3328 |
| Iso-Hexane | 0.6181 | 0.6392 | 1.1801 | 2.7999 |
| N-Hexane (TAP) | 0.2797 | 0.2893 | 0.5340 | 1.2670 |
| Methylcyclopentane | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Benzene (TAP) | 0.0595 | 0.0615 | 0.1136 | 0.2694 |
| Cyclohexane | 0.1597 | 0.1651 | 0.3048 | 0.7232 |

| | | | | |
|---|---|---|---|---|
| Heptanes | 0.3974 | 0.4110 | 0.7587 | 1.8000 |
| Methylcyclohexane | 0.1143 | 0.1182 | 0.2182 | 0.5178 |
| Toluene (TAP) | 0.0110 | 0.0114 | 0.0210 | 0.0499 |
| 2,2,4-Trimethylpentane (TAP) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Octanes | 0.0828 | 0.0857 | 0.1581 | 0.3752 |
| Ethylbenzene (TAP) | 0.0011 | 0.0011 | 0.0021 | 0.0050 |
| Xylenes (TAP) | 0.0088 | 0.0091 | 0.0169 | 0.0400 |
| Nonanes | 0.0480 | 0.0496 | 0.0916 | 0.2174 |
| Decanes Plus | 0.0052 | 0.0054 | 0.0099 | 0.0234 |
| **Total Weight Percent:** | 100.0000 | | | |
| **Total TAP Emissions** | | 0.37 | 0.69 | 1.63 |
| **Total VOC Emissions** | | **7.10** | **13.11** | **31.11** |
| **Total Non VOC & Non TAP-HC** | | 0.96 | 1.77 | 4.20 |
| **Total Hydrocarbon Emissions** | | 103.42 | 190.91 | 452.97 |

DATA:

| | |
|---|---|
| **Emission Source:** | ***Flash Gas from Oil*** |
| **Flash Gas Specific Gravity:** | ***1.5347*** |
| **Average Oil Throughput:** **(BBLD)** | ***1000*** |
| **Maximum Oil Throughput:** **(BBLD)** | ***2000*** |
| **Basis of Emission Estimates:** | ***Actual GOR & Actual Flare Gas Analysis*** |
| **Flash Gas Analysis Report Number:** | ***Southern Petroleum Laboratories Report No.: 172-24050252-001A*** |

*Estimates for gas volumes and composition associated with this stage of the process were derived from a laboratory test of an oil sample collected at this facility, refer to Southern Petroleum Laboratories Report No.: 23120295-001A in supporting documentation. The following table shows the actual field and laboratory conditions.*

| **API Oil Gravity @ 60°F** | **Process Conditions** | | **Gas/Oil Ratio** |
|---|---|---|---|
| | **Pressure (PSIG)** | **Temperature (°F)** | **(SCF/BBL)** |
| **Actual Facility & Laboratory Conditions:** | | | |
| 36.71 | 44 | 73 | |
| | 0 | 60 | 5.74 |
| | | GOR Estimate: | **5.74** |

| | | | | |
|---|---|---|---|---|
| Avg. Hourly Uncontrolled Flash Rate (SCF/Hr) | = | Oil Rate * GOR | = | **239.17** |
| Avg. Hourly Uncontrolled Total Flash Emissions (lb/hr) | = | Flash Gas Gravity * Density of Air * Flash Rate | = | **28.04** |
| Max. Hourly Uncontrolled Total Flash Emissions (lb/hr) | = | Avg. Emissions * Ratio of Max. Oil Rate to Avg. Oil Rate | = | **56.09** |
| Annual Potential Uncontrolled Flash Emissions (TPY) | = | Hourly * 8760/2000 | = | **122.82** |

**SPECIATION FACTORS:**

*Speciation of the flash gas mixture taken from the referenced laboratory results and normalized to account for the removal of Nitrogen; refer to supporting documentation*

**UNCONTROLLED EMISSIONS SUMMARY:**

| POLLUTANT: | Weight Percent | CALCULATED EMISSION RATES | | |
|---|---|---|---|---|
| | | Average Hourly (lb/hr) | Maximum Hourly (lb/hr) | Annual (TPY) |
| Nitrogen (excluded from VOC total) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Carbon Dioxide (excluded from VOC total) | 92.2057 | 25.8572 | 51.7144 | 113.2426 |
| Methane (excluded from VOC total) | 0.4437 | 0.1244 | 0.2489 | 0.5450 |
| Ethane (excluded from VOC total) | 0.4830 | 0.1355 | 0.2709 | 0.5932 |
| Hydrogen Sulfide (excluded from VOC total) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Propane | 1.2192 | 0.3419 | 0.6838 | 1.4974 |
| Iso-Butane | 0.7063 | 0.1981 | 0.3961 | 0.8675 |
| N-Butane | 1.4841 | 0.4162 | 0.8324 | 1.8227 |
| Iso-Pentane | 0.9366 | 0.2626 | 0.5253 | 1.1503 |
| N-Pentane | 0.7358 | 0.2063 | 0.4127 | 0.9036 |
| Iso-Hexane | 0.6181 | 0.1733 | 0.3467 | 0.7591 |
| N-Hexane (TAP) | 0.2797 | 0.0784 | 0.1569 | 0.3435 |
| Methylcyclopentane | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Benzene (TAP) | 0.0595 | 0.0167 | 0.0334 | 0.0731 |
| Cyclohexane | 0.1597 | 0.0448 | 0.0895 | 0.1961 |
| Heptanes | 0.3974 | 0.1114 | 0.2229 | 0.4881 |
| Methylcyclohexane | 0.1143 | 0.0321 | 0.0641 | 0.1404 |
| Toluene (TAP) | 0.0110 | 0.0031 | 0.0062 | 0.0135 |
| 2,2,4-Trimethylpentane (TAP) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Octanes | 0.0828 | 0.0232 | 0.0465 | 0.1017 |
| Ethylbenzene (TAP) | 0.0011 | 0.0003 | 0.0006 | 0.0014 |
| Xylenes (TAP) | 0.0088 | 0.0025 | 0.0050 | 0.0108 |
| Nonanes | 0.0480 | 0.0135 | 0.0269 | 0.0589 |
| Decanes Plus | 0.0052 | 0.0015 | 0.0029 | 0.0064 |
| **Total Weight Percent:** | 100.0000 | | | |
| **Total TAP Emissions** | | 0.10 | 0.20 | 0.44 |
| **Total VOC Emissions** | | **1.93** | **3.85** | **8.43** |
| **Total Non VOC & Non TAP-HC** | | 0.26 | 0.52 | 1.14 |
| **Total Emissions** | | 28.04 | 56.09 | 122.82 |

| Uncontrolled VOC Emission Total (TPY) | Storage Vapors + Oil Flash | = | **39.54** |
|---|---|---|---|

DATA:

| | |
|---|---|
| **Emission Source:** | ***Losses When Opening Thief Hatches*** |
| **Specific Gravity of Gas:** | ***1.5347*** |
| **Maximum Thief Hatch Venting (Hrs/Yr)** **(Under Normal/Routine Operating Conditions)** | ***30*** |
| **Max. Minutes a Hatch is Opened in a Single Hour:** | ***5*** |
| **Maximum Hourly Emission Rate (lb/hr):** **(from preceding tank emission estimates)** | ***20.58*** |

| | | | | |
|---|---|---|---|---|
| Avg. Hourly Emissions (lb/hr) | = | Annual Total/8760 (hrs/yr) | = | **0.85** |
| Maximum Hourly Emissions (lb/hr) | = | Max. Emission Rate * Max. Minutes/Hr Hatch is Open | = | **20.58** |
| Maximum Annual Emissions (TPY) | = | Max. Hourly THC Rate * Hours/Yr Hatch is Open | = | **3.71** |

**EMISSION SUMMARY (based on the above referenced flare gas analysis):**

| POLLUTANT: | Weight Percent | CALCULATED EMISSION RATES | | |
|---|---|---|---|---|
| | | Average Hourly (lb/hr) | Maximum Hourly (lb/hr) | Annual (TPY) |
| Water Vapor (excluded from VOC total) | 0.0000 | 0.000 | 0.000 | 0.000 |
| Nitrogen (excluded from VOC total) | 0.0000 | 0.000 | 0.000 | 0.000 |
| Carbon Dioxide (excluded from VOC total) | 92.2057 | 0.781 | 18.976 | 3.416 |
| Methane (excluded from VOC total) | 0.4437 | 0.004 | 0.091 | 0.016 |
| Ethane (excluded from VOC total) | 0.4830 | 0.004 | 0.099 | 0.018 |
| Hydrogen Sulfide (excluded from VOC total) | 0.0000 | 0.000 | 0.000 | 0.000 |
| Propane | 1.2192 | 0.010 | 0.251 | 0.045 |
| Iso-Butane | 0.7063 | 0.006 | 0.145 | 0.026 |
| N-Butane | 1.4841 | 0.013 | 0.305 | 0.055 |
| Iso-Pentane | 0.9366 | 0.008 | 0.193 | 0.035 |
| N-Pentane | 0.7358 | 0.006 | 0.151 | 0.027 |
| Iso-Hexane | 0.6181 | 0.005 | 0.127 | 0.023 |
| N-Hexane (TAP) | 0.2797 | 0.002 | 0.058 | 0.010 |
| Methylcyclopentane | 0.0000 | 0.000 | 0.000 | 0.000 |
| Benzene (TAP) | 0.0595 | 0.001 | 0.012 | 0.002 |
| Cyclohexane | 0.1597 | 0.001 | 0.033 | 0.006 |
| Heptanes | 0.3974 | 0.003 | 0.082 | 0.015 |
| Methylcyclohexane | 0.1143 | 0.001 | 0.024 | 0.004 |
| Toluene (TAP) | 0.0110 | 0.000 | 0.002 | 0.000 |
| 2,2,4-Trimethylpentane (TAP) | 0.0000 | 0.000 | 0.000 | 0.000 |
| Octanes | 0.0828 | 0.001 | 0.017 | 0.003 |
| Ethylbenzene (TAP) | 0.0011 | 0.000 | 0.000 | 0.000 |
| Xylenes (TAP) | 0.0088 | 0.000 | 0.002 | 0.000 |
| Nonanes | 0.0480 | 0.000 | 0.010 | 0.002 |

| | | | | |
|---|---|---|---|---|
| Decanes Plus | 0.0052 | 0.000 | 0.001 | 0.000 |
| Other NM/NE HC | 0.0000 | 0.000 | 0.000 | 0.000 |
| **Total Weight Percent:** | 100.0000 | | | |
| **Total TAP Emissions** | | 0.00 | 0.07 | 0.01 |
| **Total VOC Emissions** | | **0.06** | **1.41** | **0.25** |
| **Total Non VOC & Non TAP-HC** | | 0.01 | 0.19 | 0.03 |
| **Total Emissions** | | 0.85 | 20.58 | 3.71 |

# *Emission Calculations*

*Emission calculations shown below are presented for informational purposes only as vapors from the skimmer tank are routed to the atmospheric control flare (EPN: 25-05-F) for combustion, except during brief intervals when thief hatches are opened for purposes of sampling, gauging, etc.*

**POINT SOURCE I.D. NUMBER:** ***7a-05-ST-CV***

**EMISSION SOURCE DESCRIPTION:** ***2000 BBL Skimmer Tank-Common Vent (V-120A)***

DATA:

| | |
|---|---|
| **Emission Source:** | ***Crude Oil/Water Storage Vapors ('Working' & 'Standing')*** |
| **Average Daily Oil Throughput:** **(Annual Average; BBLD - $Q_{avg}$)** | ***6*** |
| **Maximum Daily Oil Throughput:** **(BBLD - $Q_{max}$)** | ***12*** |
| **Average Daily Water Throughput:** **(Annual Average; BBLD - $Q_{avg}$)** | ***6000*** |
| **Maximum Daily Water Throughput:** **(BBLD - $Q_{max}$)** | ***12000*** |
| **Average VOC Working Losses - $L_W$ (lb/yr):** | ***11,055.487*** |
| **Average VOC Standing Losses - $L_S$ (lb/yr):** | ***163.429*** |
| **Basis of Estimates:** | ***AP-42, Chapter 7 (June 2020, Section 7.1.3.1); Refer to supporting documentation for summary*** |

| | | | |
|---|---|---|---|
| Avg. Hourly Uncontrolled THC Losses (lb/hr) | = (Lw + Ls) * 21.9095/8760 | = | **28.06** |
| Max. Hourly Uncontrolled THC Losses (lb/hr) | = (Ls + (Lw * QMax ÷ Qavg)) * 21.9095/8760 | = | **55.71** |
| Annual Potential Uncontrolled THC Losses (TPY) | = Hourly * 8760/2000 | = | **122.90** |

**SPECIATION FACTORS:**

*The composition of this gas is based on an actual analysis of the vapors routed to the control flare and normalized to account for the removal of Nitrogen; refer to Southern Petroleum Laboratories Report No.: 172-24050252-002A in supporting documentation.*

**UNCONTROLLED EMISSIONS SUMMARY:**

| POLLUTANT: | Weight Percent | CALCULATED EMISSION RATES | | |
|---|---|---|---|---|
| | | Average Hourly (lb/hr) | Maximum Hourly (lb/hr) | Annual (TPY) |
| Nitrogen (excluded from VOC total) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Carbon Dioxide (excluded from VOC total) | 92.2057 | 25.8724 | 51.3679 | 113.3211 |
| Methane (excluded from VOC total) | 0.4437 | 0.1245 | 0.2472 | 0.5454 |
| Ethane (excluded from VOC total) | 0.4830 | 0.1355 | 0.2691 | 0.5936 |
| Hydrogen Sulfide (excluded from VOC total) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Propane | 1.2192 | 0.3421 | 0.6792 | 1.4984 |
| Iso-Butane | 0.7063 | 0.1982 | 0.3935 | 0.8681 |
| N-Butane | 1.4841 | 0.4164 | 0.8268 | 1.8239 |
| Iso-Pentane | 0.9366 | 0.2628 | 0.5218 | 1.1511 |
| N-Pentane | 0.7358 | 0.2065 | 0.4099 | 0.9043 |
| Iso-Hexane | 0.6181 | 0.1734 | 0.3444 | 0.7597 |
| N-Hexane (TAP) | 0.2797 | 0.0785 | 0.1558 | 0.3438 |

| | | | | |
|---|---|---|---|---|
| Methylcyclopentane | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Benzene (TAP) | 0.0595 | 0.0167 | 0.0331 | 0.0731 |
| Cyclohexane | 0.1597 | 0.0448 | 0.0889 | 0.1962 |
| Heptanes | 0.3974 | 0.1115 | 0.2214 | 0.4884 |
| Methylcyclohexane | 0.1143 | 0.0321 | 0.0637 | 0.1405 |
| Toluene (TAP) | 0.0110 | 0.0031 | 0.0061 | 0.0135 |
| 2,2,4-Trimethylpentane (TAP) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Octanes | 0.0828 | 0.0232 | 0.0461 | 0.1018 |
| Ethylbenzene (TAP) | 0.0011 | 0.0003 | 0.0006 | 0.0014 |
| Xylenes (TAP) | 0.0088 | 0.0025 | 0.0049 | 0.0109 |
| Nonanes | 0.0480 | 0.0135 | 0.0267 | 0.0590 |
| Decanes Plus | 0.0052 | 0.0015 | 0.0029 | 0.0064 |
| **Total Weight Percent:** | 100.0000 | | | |
| **Total TAP Emissions** | | 0.10 | 0.20 | 0.44 |
| **Total VOC Emissions** | | **1.93** | **3.83** | **8.44** |
| **Total Non VOC & Non TAP-HC** | | 0.26 | 0.52 | 1.14 |
| **Total Hydrocarbon Emissions** | | 28.06 | 55.71 | 122.90 |

DATA:

| | |
|---|---|
| **Emission Source:** | ***Flash Gas from Oil*** |
| **Flash Gas Specific Gravity:** | ***1.5347*** |
| **Average Oil Throughput:** **(BBLD)** | ***6.0*** |
| **Maximum Oil Throughput:** **(BBLD)** | ***12.0*** |
| **Basis of Emission Estimates:** | ***Actual GOR & Actual Flare Gas Analysis*** |
| **Flash Gas Analysis Report Number:** | ***Southern Petroleum Laboratories Report No.: 172-24050252-001A*** |

*Estimates for gas volumes and composition associated with this stage of the process were derived from a laboratory test of an oil sample collected at this facility, refer to Southern Petroleum Laboratories Report No.: 23120295-001A in supporting documentation. The following table shows the actual field and laboratory conditions.*

| **API Oil Gravity @ 60°F** | **Process Conditions** | | **Gas/Oil Ratio** |
|---|---|---|---|
| | **Pressure (PSIG)** | **Temperature (°F)** | **(SCF/BBL)** |
| **Actual Facility & Laboratory Conditions:** | | | |
| 36.71 | 44 | 73 | |
| | 0 | 60 | 5.74 |
| | | GOR Estimate: | **5.74** |

| | | | | |
|---|---|---|---|---|
| Avg. Hourly Uncontrolled Flash Rate (SCF/Hr) | = | Oil Rate * GOR | = | **1.44** |
| Avg. Hourly Uncontrolled Total Flash Emissions (lb/hr) | = | Flash Gas Gravity * Density of Air * Flash Rate | = | **0.17** |
| Max. Hourly Uncontrolled Total Flash Emissions (lb/hr) | = | Avg. Emissions * Ratio of Max. Oil Rate to Avg. Oil Rate | = | **0.34** |
| Annual Potential Uncontrolled Flash Emissions (TPY) | = | Hourly * 8760/2000 | = | **0.74** |

**SPECIATION FACTORS:**

*Speciation of the flash gas mixture taken from the referenced laboratory results and normalized to account for the removal of Nitrogen; refer to supporting documentation*

**UNCONTROLLED EMISSIONS SUMMARY:**

| POLLUTANT: | Weight Percent | CALCULATED EMISSION RATES | | |
|---|---|---|---|---|
| | | Average Hourly (lb/hr) | Maximum Hourly (lb/hr) | Annual (TPY) |
| Nitrogen (excluded from VOC total) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Carbon Dioxide (excluded from VOC total) | 92.2057 | 0.1557 | 0.3114 | 0.6866 |
| Methane (excluded from VOC total) | 0.4437 | 0.0007 | 0.0015 | 0.0033 |
| Ethane (excluded from VOC total) | 0.4830 | 0.0008 | 0.0016 | 0.0036 |
| Hydrogen Sulfide (excluded from VOC total) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Propane | 1.2192 | 0.0021 | 0.0041 | 0.0091 |
| Iso-Butane | 0.7063 | 0.0012 | 0.0024 | 0.0053 |
| N-Butane | 1.4841 | 0.0025 | 0.0050 | 0.0111 |
| Iso-Pentane | 0.9366 | 0.0016 | 0.0032 | 0.0070 |
| N-Pentane | 0.7358 | 0.0012 | 0.0025 | 0.0055 |
| Iso-Hexane | 0.6181 | 0.0010 | 0.0021 | 0.0046 |
| N-Hexane (TAP) | 0.2797 | 0.0005 | 0.0009 | 0.0021 |
| Methylcyclopentane | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Benzene (TAP) | 0.0595 | 0.0001 | 0.0002 | 0.0004 |
| Cyclohexane | 0.1597 | 0.0003 | 0.0005 | 0.0012 |
| Heptanes | 0.3974 | 0.0007 | 0.0013 | 0.0030 |
| Methylcyclohexane | 0.1143 | 0.0002 | 0.0004 | 0.0009 |
| Toluene (TAP) | 0.0110 | 0.0000 | 0.0000 | 0.0001 |
| 2,2,4-Trimethylpentane (TAP) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Octanes | 0.0828 | 0.0001 | 0.0003 | 0.0006 |
| Ethylbenzene (TAP) | 0.0011 | 0.0000 | 0.0000 | 0.0000 |
| Xylenes (TAP) | 0.0088 | 0.0000 | 0.0000 | 0.0001 |
| Nonanes | 0.0480 | 0.0001 | 0.0002 | 0.0004 |
| Decanes Plus | 0.0052 | 0.0000 | 0.0000 | 0.0000 |
| **Total Weight Percent:** | 100.0000 | | | |
| **Total TAP Emissions** | | 0.00 | 0.00 | 0.00 |
| **Total VOC Emissions** | | **0.01** | **0.02** | **0.05** |
| **Total Non VOC & Non TAP-HC** | | 0.00 | 0.00 | 0.01 |
| **Total Emissions** | | 0.17 | 0.34 | 0.74 |

DATA:

| | |
|---|---|
| **Emission Source:** | ***Flash Gas from Brine Solution*** |
| **Approx. Pressure Drop of Brine Solution: (psig)** | ***44*** |
| **Approx. Temperature of Brine Solution: (ºF)** | ***73*** |
| **Flash Gas Specific Gravity:** | ***1.5347*** |
| **Avg. Water Throughput: (BBLD)** | ***6000*** |
| **Max. Water Throughput: (BBLD)** | ***12000*** |
| **Gas to Water Ratio: (SCF/BBL of Brine; GWR)** | ***0.4*** |
| **Basis of Emission Estimates:** | ***API Documentation & Actual Flare Gas Analysis (Refer to supporting documentation)*** |
| **Flash Gas Analysis Report Number:** | ***Southern Petroleum Laboratories Report No.: 172-24050252-001A*** |

| | | | | |
|---|---|---|---|---|
| Avg. Hourly Uncontrolled Flash Rate (SCF/Hr) | = | Brine Rate * GWR | = | **100.00** |
| Avg. Hourly Uncontrolled Total Flash Emissions (lb/hr) | = | Flash Gas Gravity * Density of Air * Flash Rate | = | **11.73** |
| Max. Hourly Uncontrolled Total Flash Emissions (lb/hr) | = | Avg. Emissions * Ratio of Max. Water Rate to Avg. Water Rate | = | **23.45** |
| Annual Potential Uncontrolled Flash Emissions (TPY) | = | Hourly * 8760/2000 | = | **51.38** |

**EMISSION ESTIMATES:**

*The magnitude of the solubility of natural gas in the interstitial water present in oil sands was studied by The American Petroleum Institute (API) and presented in a 1944 document entitled, "P-V-T and Solubility Relations". Results of these studies have been projected to provide estimates of gas volumes present in the brine solution handled at this site within the specific pressure and temperature ranges expected. The composition of this gas is based on the referenced analysis and normalized to account for the removal of Nitrogen.*

**EMISSIONS SUMMARY:**

| POLLUTANT: | Weight Percent | CALCULATED EMISSION RATES | | |
|---|---|---|---|---|
| | | Average Hourly (lb/hr) | Maximum Hourly (lb/hr) | Annual (TPY) |
| Nitrogen (excluded from VOC total) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Carbon Dioxide (excluded from VOC total) | 92.2057 | 10.8112 | 21.6224 | 47.3729 |
| Methane (excluded from VOC total) | 0.4437 | 0.0520 | 0.1041 | 0.2280 |
| Ethane (excluded from VOC total) | 0.4830 | 0.0566 | 0.1133 | 0.2482 |
| Hydrogen Sulfide (excluded from VOC total) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Propane | 1.2192 | 0.1430 | 0.2859 | 0.6264 |
| Iso-Butane | 0.7063 | 0.0828 | 0.1656 | 0.3629 |
| N-Butane | 1.4841 | 0.1740 | 0.3480 | 0.7625 |
| Iso-Pentane | 0.9366 | 0.1098 | 0.2196 | 0.4812 |
| N-Pentane | 0.7358 | 0.0863 | 0.1725 | 0.3780 |
| Iso-Hexane | 0.6181 | 0.0725 | 0.1450 | 0.3176 |
| N-Hexane (TAP) | 0.2797 | 0.0328 | 0.0656 | 0.1437 |
| Methylcyclopentane | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Benzene (TAP) | 0.0595 | 0.0070 | 0.0139 | 0.0306 |
| Cyclohexane | 0.1597 | 0.0187 | 0.0374 | 0.0820 |
| Heptanes | 0.3974 | 0.0466 | 0.0932 | 0.2042 |
| Methylcyclohexane | 0.1143 | 0.0134 | 0.0268 | 0.0587 |
| Toluene (TAP) | 0.0110 | 0.0013 | 0.0026 | 0.0057 |
| 2,2,4-Trimethylpentane (TAP) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

| | | | | |
|---|---|---|---|---|
| Octanes | 0.0828 | 0.0097 | 0.0194 | 0.0426 |
| Ethylbenzene (TAP) | 0.0011 | 0.0001 | 0.0003 | 0.0006 |
| Xylenes (TAP) | 0.0088 | 0.0010 | 0.0021 | 0.0045 |
| Nonanes | 0.0480 | 0.0056 | 0.0113 | 0.0247 |
| Decanes Plus | 0.0052 | 0.0006 | 0.0012 | 0.0027 |
| **Total Weight Percent:** | 100.0000 | | | |
| **Total TAP Emissions** | | 0.04 | 0.08 | 0.19 |
| **Total VOC Emissions** | | **0.81** | **1.61** | **3.53** |
| **Total Non VOC & Non TAP-HC** | | 0.11 | 0.22 | 0.48 |
| **Total Emissions** | | 11.73 | 23.45 | 51.38 |

DATA:

| | |
|---|---|
| **Emission Source:** | ***Blanket Gas*** |
| **Average Annual Tank Throughput (BBLs/Yr):** | ***2,192,190*** |
| **Gross Blanket Gas Required (MSCF/Yr):** | ***12,309*** |
| **Gas from Process to Tank(s) (MSCF/Yr):** | ***889*** |
| **Calculated Volume Requirement (MSCF/Yr):** | ***11,421*** |
| **Net Blanket Gas Supplied (MSCF/Yr):** | ***11,421*** |
| **Maximum Hourly Fill Rate (BBLs/Hr):** | ***500*** |
| **Blanket Gas Specific Gravity:** | ***1.5347*** |
| **Basis of Emission Estimates:** | ***Manufacturers Gas Consumption Data & Actual Flare Gas Analysis (Refer to supporting documentation)*** |
| **Fuel Gas Analysis Report Number:** | ***Southern Petroleum Laboratories Report No.: 172-24050252-001A*** |

| | | | | |
|---|---|---|---|---|
| Avg. Hourly Uncontrolled Emissions (lb/hr) | = | Annual Gas Rate/ 8760 Hrs/Yr * 0.0764 * SG | = | **152.87** |
| Max. Hourly Uncontrolled Emissions (lb/hr) | = | Max. Fill Rate * 42/7.48 * 0.0764 * SG | = | **329.18** |
| Annual Potential Uncontrolled Emissions (TPY) | = | Annual Gas Rate * 0.0764 * SG/2000 | = | **669.56** |

**SPECIATION FACTORS:**

*Speciation of the blanket gas is based on the referenced analysis and normalized to account for the removal of Nitrogen.*

**UNCONTROLLED EMISSIONS SUMMARY:**

| POLLUTANT: | Weight Percent | CALCULATED EMISSION RATES | | |
|---|---|---|---|---|
| | | Average Hourly (lb/hr) | Maximum Hourly (lb/hr) | Annual (TPY) |
| Nitrogen (excluded from VOC total) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Carbon Dioxide (excluded from VOC total) | 92.2057 | 140.9531 | 303.5234 | 617.3744 |
| Methane (excluded from VOC total) | 0.4437 | 0.6783 | 1.4607 | 2.9711 |
| Ethane (excluded from VOC total) | 0.4830 | 0.7384 | 1.5900 | 3.2341 |
| Hydrogen Sulfide (excluded from VOC total) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Propane | 1.2192 | 1.8638 | 4.0134 | 8.1634 |
| Iso-Butane | 0.7063 | 1.0797 | 2.3250 | 4.7292 |
| N-Butane | 1.4841 | 2.2687 | 4.8853 | 9.9367 |
| Iso-Pentane | 0.9366 | 1.4317 | 3.0830 | 6.2710 |
| N-Pentane | 0.7358 | 1.1247 | 2.4220 | 4.9264 |
| Iso-Hexane | 0.6181 | 0.9449 | 2.0347 | 4.1387 |
| N-Hexane (TAP) | 0.2797 | 0.4276 | 0.9208 | 1.8729 |

| | | | | |
|---|---|---|---|---|
| Methylcyclopentane | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Benzene (TAP) | 0.0595 | 0.0909 | 0.1958 | 0.3983 |
| Cyclohexane | 0.1597 | 0.2441 | 0.5256 | 1.0690 |
| Heptanes | 0.3974 | 0.6075 | 1.3081 | 2.6607 |
| Methylcyclohexane | 0.1143 | 0.1748 | 0.3763 | 0.7654 |
| Toluene (TAP) | 0.0110 | 0.0168 | 0.0363 | 0.0738 |
| 2,2,4-Trimethylpentane (TAP) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Octanes | 0.0828 | 0.1266 | 0.2726 | 0.5546 |
| Ethylbenzene (TAP) | 0.0011 | 0.0017 | 0.0036 | 0.0074 |
| Xylenes (TAP) | 0.0088 | 0.0135 | 0.0291 | 0.0591 |
| Nonanes | 0.0480 | 0.0734 | 0.1580 | 0.3214 |
| Decanes Plus | 0.0052 | 0.0079 | 0.0170 | 0.0347 |
| **Total Weight Percent:** | 100.0000 | | | |
| **Total TAP Emissions** | | 0.55 | 1.19 | 2.41 |
| **Total VOC Emissions** | | **10.50** | **22.61** | **45.98** |
| **Total Non VOC & Non TAP-HC** | | 1.42 | 3.05 | 6.21 |
| **Total Emissions** | | 152.87 | 329.18 | 669.56 |

| | | | |
|---|---|---|---|
| Uncontrolled VOC Emission Total (TPY) | Storage Vapors + Oil Flash Gas + Brine Flash Gas + Blanket Gas | = | **58.00** |

DATA:

| | |
|---|---|
| **Emission Source:** | ***Losses When Opening Thief Hatches*** |
| **Specific Gravity of Gas:** | ***1.5347*** |
| **Maximum Thief Hatch Venting (Hrs/Yr)** **(Under Normal/Routine Operating Conditions)** | ***30*** |
| **Max. Minutes a Hatch is Opened in a Single Hour:** | ***5*** |
| **Maximum Hourly Emission Rate (lb/hr):** **(from preceding tank emission estimates)** | ***34.06*** |

| | | | | |
|---|---|---|---|---|
| Avg. Hourly Emissions (lb/hr) | = | Annual Total/8760 (hrs/yr) | = | **1.40** |
| Maximum Hourly Emissions (lb/hr) | = | Max. Emission Rate * Max. Minutes/Hr Hatch is Open | = | **34.06** |
| Maximum Annual Emissions (TPY) | = | Max. Hourly THC Rate * Hours/Yr Hatch is Open | = | **6.13** |

**EMISSION SUMMARY (based on the above referenced flare gas analysis):**

| POLLUTANT: | Weight Percent | CALCULATED EMISSION RATES | | |
|---|---|---|---|---|
| | | Average Hourly (lb/hr) | Maximum Hourly (lb/hr) | Annual (TPY) |
| Water Vapor (excluded from VOC total) | 0.0000 | 0.000 | 0.000 | 0.000 |
| Nitrogen (excluded from VOC total) | 0.0000 | 0.000 | 0.000 | 0.000 |
| Carbon Dioxide (excluded from VOC total) | 92.2057 | 1.290 | 31.405 | 5.652 |
| Methane (excluded from VOC total) | 0.4437 | 0.006 | 0.151 | 0.027 |
| Ethane (excluded from VOC total) | 0.4830 | 0.007 | 0.165 | 0.030 |
| Hydrogen Sulfide (excluded from VOC total) | 0.0000 | 0.000 | 0.000 | 0.000 |
| Propane | 1.2192 | 0.017 | 0.415 | 0.075 |
| Iso-Butane | 0.7063 | 0.010 | 0.241 | 0.043 |
| N-Butane | 1.4841 | 0.021 | 0.505 | 0.091 |

| | | | | |
|---|---|---|---|---|
| Iso-Pentane | 0.9366 | 0.013 | 0.319 | 0.057 |
| N-Pentane | 0.7358 | 0.010 | 0.251 | 0.045 |
| Iso-Hexane | 0.6181 | 0.009 | 0.211 | 0.038 |
| N-Hexane (TAP) | 0.2797 | 0.004 | 0.095 | 0.017 |
| Methylcyclopentane | 0.0000 | 0.000 | 0.000 | 0.000 |
| Benzene (TAP) | 0.0595 | 0.001 | 0.020 | 0.004 |
| Cyclohexane | 0.1597 | 0.002 | 0.054 | 0.010 |
| Heptanes | 0.3974 | 0.006 | 0.135 | 0.024 |
| Methylcyclohexane | 0.1143 | 0.002 | 0.039 | 0.007 |
| Toluene (TAP) | 0.0110 | 0.000 | 0.004 | 0.001 |
| 2,2,4-Trimethylpentane (TAP) | 0.0000 | 0.000 | 0.000 | 0.000 |
| Octanes | 0.0828 | 0.001 | 0.028 | 0.005 |
| Ethylbenzene (TAP) | 0.0011 | 0.000 | 0.000 | 0.000 |
| Xylenes (TAP) | 0.0088 | 0.000 | 0.003 | 0.001 |
| Nonanes | 0.0480 | 0.001 | 0.016 | 0.003 |
| Decanes Plus | 0.0052 | 0.000 | 0.002 | 0.000 |
| Other NM/NE HC | 0.0000 | 0.000 | 0.000 | 0.000 |
| **Total Weight Percent:** | 100.0000 | | | |
| **Total TAP Emissions** | | 0.01 | 0.12 | 0.02 |
| **Total VOC Emissions** | | **0.10** | **2.34** | **0.42** |
| **Total Non VOC & Non TAP-HC** | | 0.01 | 0.32 | 0.06 |
| **Total Emissions** | | 1.40 | 34.06 | 6.13 |

# *Emission Calculations*

*Emission calculations shown below are presented for informational purposes only as vapors from the skimmer tank are routed to the atmospheric control flare (EPN: 25-05-F) for combustion, except during brief intervals when thief hatches are opened for purposes of sampling, gauging, etc.*

**POINT SOURCE I.D. NUMBER:** ***7b-05-ST-CV***

**EMISSION SOURCE DESCRIPTION:** ***2000 BBL Skimmer Tank-Common Vent (V-120B)***

DATA:

| | |
|---|---|
| **Emission Source:** | ***Crude Oil/Water Storage Vapors ('Working' & 'Standing')*** |
| **Average Daily Oil Throughput:** **(Annual Average; BBLD - $Q_{avg}$)** | ***6*** |
| **Maximum Daily Oil Throughput:** **(BBLD - $Q_{max}$)** | ***12*** |
| **Average Daily Water Throughput:** **(Annual Average; BBLD - $Q_{avg}$)** | ***6000*** |
| **Maximum Daily Water Throughput:** **(BBLD - $Q_{max}$)** | ***12000*** |
| **Average VOC Working Losses - $L_W$ (lb/yr):** | ***11,055.487*** |
| **Average VOC Standing Losses - $L_S$ (lb/yr):** | ***163.429*** |
| **Basis of Estimates:** | ***AP-42, Chapter 7 (June 2020, Section 7.1.3.1); Refer to supporting documentation for summary*** |

| | | | |
|---|---|---|---|
| Avg. Hourly Uncontrolled THC Losses (lb/hr) | = (Lw + Ls) * 21.9095/8760 | = | **28.06** |
| Max. Hourly Uncontrolled THC Losses (lb/hr) | = (Ls + (Lw * QMax ÷ Qavg)) * 21.9095/8760 | = | **55.71** |
| Annual Potential Uncontrolled THC Losses (TPY) | = Hourly * 8760/2000 | = | **122.90** |

**SPECIATION FACTORS:**

*The composition of this gas is based on an actual analysis of the vapors routed to the control flare and normalized to account for the removal of Nitrogen; refer to Southern Petroleum Laboratories Report No.: 172-24050252-002A in supporting documentation.*

**UNCONTROLLED EMISSIONS SUMMARY:**

| POLLUTANT: | Weight Percent | CALCULATED EMISSION RATES | | |
|---|---|---|---|---|
| | | Average Hourly (lb/hr) | Maximum Hourly (lb/hr) | Annual (TPY) |
| Nitrogen (excluded from VOC total) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Carbon Dioxide (excluded from VOC total) | 92.2057 | 25.8724 | 51.3679 | 113.3211 |
| Methane (excluded from VOC total) | 0.4437 | 0.1245 | 0.2472 | 0.5454 |
| Ethane (excluded from VOC total) | 0.4830 | 0.1355 | 0.2691 | 0.5936 |
| Hydrogen Sulfide (excluded from VOC total) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Propane | 1.2192 | 0.3421 | 0.6792 | 1.4984 |
| Iso-Butane | 0.7063 | 0.1982 | 0.3935 | 0.8681 |
| N-Butane | 1.4841 | 0.4164 | 0.8268 | 1.8239 |
| Iso-Pentane | 0.9366 | 0.2628 | 0.5218 | 1.1511 |
| N-Pentane | 0.7358 | 0.2065 | 0.4099 | 0.9043 |
| Iso-Hexane | 0.6181 | 0.1734 | 0.3444 | 0.7597 |
| N-Hexane (TAP) | 0.2797 | 0.0785 | 0.1558 | 0.3438 |

| | | | | |
|---|---|---|---|---|
| Methylcyclopentane | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Benzene (TAP) | 0.0595 | 0.0167 | 0.0331 | 0.0731 |
| Cyclohexane | 0.1597 | 0.0448 | 0.0889 | 0.1962 |
| Heptanes | 0.3974 | 0.1115 | 0.2214 | 0.4884 |
| Methylcyclohexane | 0.1143 | 0.0321 | 0.0637 | 0.1405 |
| Toluene (TAP) | 0.0110 | 0.0031 | 0.0061 | 0.0135 |
| 2,2,4-Trimethylpentane (TAP) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Octanes | 0.0828 | 0.0232 | 0.0461 | 0.1018 |
| Ethylbenzene (TAP) | 0.0011 | 0.0003 | 0.0006 | 0.0014 |
| Xylenes (TAP) | 0.0088 | 0.0025 | 0.0049 | 0.0109 |
| Nonanes | 0.0480 | 0.0135 | 0.0267 | 0.0590 |
| Decanes Plus | 0.0052 | 0.0015 | 0.0029 | 0.0064 |
| **Total Weight Percent:** | 100.0000 | | | |
| **Total TAP Emissions** | | 0.10 | 0.20 | 0.44 |
| **Total VOC Emissions** | | **1.93** | **3.83** | **8.44** |
| **Total Non VOC & Non TAP-HC** | | 0.26 | 0.52 | 1.14 |
| **Total Hydrocarbon Emissions** | | 28.06 | 55.71 | 122.90 |

DATA:

| | |
|---|---|
| **Emission Source:** | ***Flash Gas from Oil*** |
| **Flash Gas Specific Gravity:** | ***1.5347*** |
| **Average Oil Throughput:** **(BBLD)** | ***6.0*** |
| **Maximum Oil Throughput:** **(BBLD)** | ***12.0*** |
| **Basis of Emission Estimates:** | ***Actual GOR & Actual Flare Gas Analysis*** |
| **Flash Gas Analysis Report Number:** | ***Southern Petroleum Laboratories Report No.: 172-24050252-001A*** |

*Estimates for gas volumes and composition associated with this stage of the process were derived from a laboratory test of an oil sample collected at this facility, refer to Southern Petroleum Laboratories Report No.: 23120295-001A in supporting documentation. The following table shows the actual field and laboratory conditions.*

| **API Oil Gravity @ 60°F** | **Process Conditions** | | **Gas/Oil Ratio** |
|---|---|---|---|
| | **Pressure (PSIG)** | **Temperature (°F)** | **(SCF/BBL)** |
| **Actual Facility & Laboratory Conditions:** | | | |
| 36.71 | 44 | 73 | |
| | 0 | 60 | 5.74 |
| | | GOR Estimate: | **5.74** |

| | | | | |
|---|---|---|---|---|
| Avg. Hourly Uncontrolled Flash Rate (SCF/Hr) | = | Oil Rate * GOR | = | **1.44** |
| Avg. Hourly Uncontrolled Total Flash Emissions (lb/hr) | = | Flash Gas Gravity * Density of Air * Flash Rate | = | **0.17** |
| Max. Hourly Uncontrolled Total Flash Emissions (lb/hr) | = | Avg. Emissions * Ratio of Max. Oil Rate to Avg. Oil Rate | = | **0.34** |
| Annual Potential Uncontrolled Flash Emissions (TPY) | = | Hourly * 8760/2000 | = | **0.74** |

**SPECIATION FACTORS:**

*Speciation of the flash gas mixture taken from the referenced laboratory results and normalized to account for the removal of Nitrogen; refer to supporting documentation*

**UNCONTROLLED EMISSIONS SUMMARY:**

| POLLUTANT: | Weight Percent | CALCULATED EMISSION RATES | | |
|---|---|---|---|---|
| | | Average Hourly (lb/hr) | Maximum Hourly (lb/hr) | Annual (TPY) |
| Nitrogen (excluded from VOC total) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Carbon Dioxide (excluded from VOC total) | 92.2057 | 0.1557 | 0.3114 | 0.6866 |
| Methane (excluded from VOC total) | 0.4437 | 0.0007 | 0.0015 | 0.0033 |
| Ethane (excluded from VOC total) | 0.4830 | 0.0008 | 0.0016 | 0.0036 |
| Hydrogen Sulfide (excluded from VOC total) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Propane | 1.2192 | 0.0021 | 0.0041 | 0.0091 |
| Iso-Butane | 0.7063 | 0.0012 | 0.0024 | 0.0053 |
| N-Butane | 1.4841 | 0.0025 | 0.0050 | 0.0111 |
| Iso-Pentane | 0.9366 | 0.0016 | 0.0032 | 0.0070 |
| N-Pentane | 0.7358 | 0.0012 | 0.0025 | 0.0055 |
| Iso-Hexane | 0.6181 | 0.0010 | 0.0021 | 0.0046 |
| N-Hexane (TAP) | 0.2797 | 0.0005 | 0.0009 | 0.0021 |
| Methylcyclopentane | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Benzene (TAP) | 0.0595 | 0.0001 | 0.0002 | 0.0004 |
| Cyclohexane | 0.1597 | 0.0003 | 0.0005 | 0.0012 |
| Heptanes | 0.3974 | 0.0007 | 0.0013 | 0.0030 |
| Methylcyclohexane | 0.1143 | 0.0002 | 0.0004 | 0.0009 |
| Toluene (TAP) | 0.0110 | 0.0000 | 0.0000 | 0.0001 |
| 2,2,4-Trimethylpentane (TAP) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Octanes | 0.0828 | 0.0001 | 0.0003 | 0.0006 |
| Ethylbenzene (TAP) | 0.0011 | 0.0000 | 0.0000 | 0.0000 |
| Xylenes (TAP) | 0.0088 | 0.0000 | 0.0000 | 0.0001 |
| Nonanes | 0.0480 | 0.0001 | 0.0002 | 0.0004 |
| Decanes Plus | 0.0052 | 0.0000 | 0.0000 | 0.0000 |
| **Total Weight Percent:** | 100.0000 | | | |
| **Total TAP Emissions** | | 0.00 | 0.00 | 0.00 |
| **Total VOC Emissions** | | **0.01** | **0.02** | **0.05** |
| **Total Non VOC & Non TAP-HC** | | 0.00 | 0.00 | 0.01 |
| **Total Emissions** | | 0.17 | 0.34 | 0.74 |

DATA:

| | |
|---|---|
| **Emission Source:** | ***Flash Gas from Brine Solution*** |
| **Approx. Pressure Drop of Brine Solution: (psig)** | ***44*** |
| **Approx. Temperature of Brine Solution: (ºF)** | ***73*** |
| **Flash Gas Specific Gravity:** | ***1.5347*** |
| **Avg. Water Throughput: (BBLD)** | ***6000*** |
| **Max. Water Throughput: (BBLD)** | ***12000*** |
| **Gas to Water Ratio: (SCF/BBL of Brine; GWR)** | ***0.4*** |
| **Basis of Emission Estimates:** | ***API Documentation & Actual Flare Gas Analysis (Refer to supporting documentation)*** |
| **Flash Gas Analysis Report Number:** | ***Southern Petroleum Laboratories Report No.: 172-24050252-001A*** |

| | | | | |
|---|---|---|---|---|
| Avg. Hourly Uncontrolled Flash Rate (SCF/Hr) | = | Brine Rate * GWR | = | **100.00** |
| Avg. Hourly Uncontrolled Total Flash Emissions (lb/hr) | = | Flash Gas Gravity * Density of Air * Flash Rate | = | **11.73** |
| Max. Hourly Uncontrolled Total Flash Emissions (lb/hr) | = | Avg. Emissions * Ratio of Max. Water Rate to Avg. Water Rate | = | **23.45** |
| Annual Potential Uncontrolled Flash Emissions (TPY) | = | Hourly * 8760/2000 | = | **51.38** |

**EMISSION ESTIMATES:**

*The magnitude of the solubility of natural gas in the interstitial water present in oil sands was studied by The American Petroleum Institute (API) and presented in a 1944 document entitled, "P-V-T and Solubility Relations". Results of these studies have been projected to provide estimates of gas volumes present in the brine solution handled at this site within the specific pressure and temperature ranges expected. The composition of this gas is based on the referenced analysis and normalized to account for the removal of Nitrogen.*

**EMISSIONS SUMMARY:**

| POLLUTANT: | Weight Percent | CALCULATED EMISSION RATES | | |
|---|---|---|---|---|
| | | Average Hourly (lb/hr) | Maximum Hourly (lb/hr) | Annual (TPY) |
| Nitrogen (excluded from VOC total) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Carbon Dioxide (excluded from VOC total) | 92.2057 | 10.8112 | 21.6224 | 47.3729 |
| Methane (excluded from VOC total) | 0.4437 | 0.0520 | 0.1041 | 0.2280 |
| Ethane (excluded from VOC total) | 0.4830 | 0.0566 | 0.1133 | 0.2482 |
| Hydrogen Sulfide (excluded from VOC total) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Propane | 1.2192 | 0.1430 | 0.2859 | 0.6264 |
| Iso-Butane | 0.7063 | 0.0828 | 0.1656 | 0.3629 |
| N-Butane | 1.4841 | 0.1740 | 0.3480 | 0.7625 |
| Iso-Pentane | 0.9366 | 0.1098 | 0.2196 | 0.4812 |
| N-Pentane | 0.7358 | 0.0863 | 0.1725 | 0.3780 |
| Iso-Hexane | 0.6181 | 0.0725 | 0.1450 | 0.3176 |
| N-Hexane (TAP) | 0.2797 | 0.0328 | 0.0656 | 0.1437 |
| Methylcyclopentane | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Benzene (TAP) | 0.0595 | 0.0070 | 0.0139 | 0.0306 |
| Cyclohexane | 0.1597 | 0.0187 | 0.0374 | 0.0820 |
| Heptanes | 0.3974 | 0.0466 | 0.0932 | 0.2042 |
| Methylcyclohexane | 0.1143 | 0.0134 | 0.0268 | 0.0587 |
| Toluene (TAP) | 0.0110 | 0.0013 | 0.0026 | 0.0057 |
| 2,2,4-Trimethylpentane (TAP) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

| | | | | |
|---|---|---|---|---|
| Octanes | 0.0828 | 0.0097 | 0.0194 | 0.0426 |
| Ethylbenzene (TAP) | 0.0011 | 0.0001 | 0.0003 | 0.0006 |
| Xylenes (TAP) | 0.0088 | 0.0010 | 0.0021 | 0.0045 |
| Nonanes | 0.0480 | 0.0056 | 0.0113 | 0.0247 |
| Decanes Plus | 0.0052 | 0.0006 | 0.0012 | 0.0027 |
| **Total Weight Percent:** | 100.0000 | | | |
| **Total TAP Emissions** | | 0.04 | 0.08 | 0.19 |
| **Total VOC Emissions** | | **0.81** | **1.61** | **3.53** |
| **Total Non VOC & Non TAP-HC** | | 0.11 | 0.22 | 0.48 |
| **Total Emissions** | | 11.73 | 23.45 | 51.38 |

DATA:

| | |
|---|---|
| **Emission Source:** | ***Blanket Gas*** |
| **Average Annual Tank Throughput (BBLs/Yr):** | ***2,192,190*** |
| **Gross Blanket Gas Required (MSCF/Yr):** | ***12,309*** |
| **Gas from Process to Tank(s) (MSCF/Yr):** | ***889*** |
| **Calculated Volume Requirement (MSCF/Yr):** | ***11,421*** |
| **Net Blanket Gas Supplied (MSCF/Yr):** | ***11,421*** |
| **Maximum Hourly Fill Rate (BBLs/Hr):** | ***500*** |
| **Blanket Gas Specific Gravity:** | ***1.5347*** |
| **Basis of Emission Estimates:** | ***Manufacturers Gas Consumption Data & Actual Flare Gas Analysis (Refer to supporting documentation)*** |
| **Fuel Gas Analysis Report Number:** | ***Southern Petroleum Laboratories Report No.: 172-24050252-001A*** |

| | | | | |
|---|---|---|---|---|
| Avg. Hourly Uncontrolled Emissions (lb/hr) | = | Annual Gas Rate/ 8760 Hrs/Yr * 0.0764 * SG | = | **152.87** |
| Max. Hourly Uncontrolled Emissions (lb/hr) | = | Max. Fill Rate * 42/7.48 * 0.0764 * SG | = | **329.18** |
| Annual Potential Uncontrolled Emissions (TPY) | = | Annual Gas Rate * 0.0764 * SG/2000 | = | **669.56** |

**SPECIATION FACTORS:**

*Speciation of the blanket gas is based on the referenced analysis and normalized to account for the removal of Nitrogen.*

**UNCONTROLLED EMISSIONS SUMMARY:**

| POLLUTANT: | Weight Percent | CALCULATED EMISSION RATES | | |
|---|---|---|---|---|
| | | Average Hourly (lb/hr) | Maximum Hourly (lb/hr) | Annual (TPY) |
| Nitrogen (excluded from VOC total) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Carbon Dioxide (excluded from VOC total) | 92.2057 | 140.9531 | 303.5234 | 617.3744 |
| Methane (excluded from VOC total) | 0.4437 | 0.6783 | 1.4607 | 2.9711 |
| Ethane (excluded from VOC total) | 0.4830 | 0.7384 | 1.5900 | 3.2341 |
| Hydrogen Sulfide (excluded from VOC total) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Propane | 1.2192 | 1.8638 | 4.0134 | 8.1634 |
| Iso-Butane | 0.7063 | 1.0797 | 2.3250 | 4.7292 |
| N-Butane | 1.4841 | 2.2687 | 4.8853 | 9.9367 |
| Iso-Pentane | 0.9366 | 1.4317 | 3.0830 | 6.2710 |
| N-Pentane | 0.7358 | 1.1247 | 2.4220 | 4.9264 |
| Iso-Hexane | 0.6181 | 0.9449 | 2.0347 | 4.1387 |
| N-Hexane (TAP) | 0.2797 | 0.4276 | 0.9208 | 1.8729 |

| | | | | |
|---|---|---|---|---|
| Methylcyclopentane | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Benzene (TAP) | 0.0595 | 0.0909 | 0.1958 | 0.3983 |
| Cyclohexane | 0.1597 | 0.2441 | 0.5256 | 1.0690 |
| Heptanes | 0.3974 | 0.6075 | 1.3081 | 2.6607 |
| Methylcyclohexane | 0.1143 | 0.1748 | 0.3763 | 0.7654 |
| Toluene (TAP) | 0.0110 | 0.0168 | 0.0363 | 0.0738 |
| 2,2,4-Trimethylpentane (TAP) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Octanes | 0.0828 | 0.1266 | 0.2726 | 0.5546 |
| Ethylbenzene (TAP) | 0.0011 | 0.0017 | 0.0036 | 0.0074 |
| Xylenes (TAP) | 0.0088 | 0.0135 | 0.0291 | 0.0591 |
| Nonanes | 0.0480 | 0.0734 | 0.1580 | 0.3214 |
| Decanes Plus | 0.0052 | 0.0079 | 0.0170 | 0.0347 |
| **Total Weight Percent:** | 100.0000 | | | |
| **Total TAP Emissions** | | 0.55 | 1.19 | 2.41 |
| **Total VOC Emissions** | | **10.50** | **22.61** | **45.98** |
| **Total Non VOC & Non TAP-HC** | | 1.42 | 3.05 | 6.21 |
| **Total Emissions** | | 152.87 | 329.18 | 669.56 |

| | | | |
|---|---|---|---|
| Uncontrolled VOC Emission Total (TPY) | Storage Vapors + Oil Flash Gas + Brine Flash Gas + Blanket Gas | = | **58.00** |

DATA:

| | |
|---|---|
| **Emission Source:** | ***Losses When Opening Thief Hatches*** |
| **Specific Gravity of Gas:** | ***1.5347*** |
| **Maximum Thief Hatch Venting (Hrs/Yr)** **(Under Normal/Routine Operating Conditions)** | ***30*** |
| **Max. Minutes a Hatch is Opened in a Single Hour:** | ***5*** |
| **Maximum Hourly Emission Rate (lb/hr):** **(from preceding tank emission estimates)** | ***34.06*** |

| | | | | |
|---|---|---|---|---|
| Avg. Hourly Emissions (lb/hr) | = | Annual Total/8760 (hrs/yr) | = | **1.40** |
| Maximum Hourly Emissions (lb/hr) | = | Max. Emission Rate * Max. Minutes/Hr Hatch is Open | = | **34.06** |
| Maximum Annual Emissions (TPY) | = | Max. Hourly THC Rate * Hours/Yr Hatch is Open | = | **6.13** |

**EMISSION SUMMARY (based on the above referenced flare gas analysis):**

| POLLUTANT: | Weight Percent | CALCULATED EMISSION RATES | | |
|---|---|---|---|---|
| | | Average Hourly (lb/hr) | Maximum Hourly (lb/hr) | Annual (TPY) |
| Water Vapor (excluded from VOC total) | 0.0000 | 0.000 | 0.000 | 0.000 |
| Nitrogen (excluded from VOC total) | 0.0000 | 0.000 | 0.000 | 0.000 |
| Carbon Dioxide (excluded from VOC total) | 92.2057 | 1.290 | 31.405 | 5.652 |
| Methane (excluded from VOC total) | 0.4437 | 0.006 | 0.151 | 0.027 |
| Ethane (excluded from VOC total) | 0.4830 | 0.007 | 0.165 | 0.030 |
| Hydrogen Sulfide (excluded from VOC total) | 0.0000 | 0.000 | 0.000 | 0.000 |
| Propane | 1.2192 | 0.017 | 0.415 | 0.075 |
| Iso-Butane | 0.7063 | 0.010 | 0.241 | 0.043 |
| N-Butane | 1.4841 | 0.021 | 0.505 | 0.091 |

| | | | | |
|---|---|---|---|---|
| Iso-Pentane | 0.9366 | 0.013 | 0.319 | 0.057 |
| N-Pentane | 0.7358 | 0.010 | 0.251 | 0.045 |
| Iso-Hexane | 0.6181 | 0.009 | 0.211 | 0.038 |
| N-Hexane (TAP) | 0.2797 | 0.004 | 0.095 | 0.017 |
| Methylcyclopentane | 0.0000 | 0.000 | 0.000 | 0.000 |
| Benzene (TAP) | 0.0595 | 0.001 | 0.020 | 0.004 |
| Cyclohexane | 0.1597 | 0.002 | 0.054 | 0.010 |
| Heptanes | 0.3974 | 0.006 | 0.135 | 0.024 |
| Methylcyclohexane | 0.1143 | 0.002 | 0.039 | 0.007 |
| Toluene (TAP) | 0.0110 | 0.000 | 0.004 | 0.001 |
| 2,2,4-Trimethylpentane (TAP) | 0.0000 | 0.000 | 0.000 | 0.000 |
| Octanes | 0.0828 | 0.001 | 0.028 | 0.005 |
| Ethylbenzene (TAP) | 0.0011 | 0.000 | 0.000 | 0.000 |
| Xylenes (TAP) | 0.0088 | 0.000 | 0.003 | 0.001 |
| Nonanes | 0.0480 | 0.001 | 0.016 | 0.003 |
| Decanes Plus | 0.0052 | 0.000 | 0.002 | 0.000 |
| Other NM/NE HC | 0.0000 | 0.000 | 0.000 | 0.000 |
| **Total Weight Percent:** | 100.0000 | | | |
| **Total TAP Emissions** | | 0.01 | 0.12 | 0.02 |
| **Total VOC Emissions** | | **0.10** | **2.34** | **0.42** |
| **Total Non VOC & Non TAP-HC** | | 0.01 | 0.32 | 0.06 |
| **Total Emissions** | | 1.40 | 34.06 | 6.13 |

# *Emission Calculations*

**POINT SOURCE I.D. NUMBER:** *8a-05-WST-CV*

**EMISSION SOURCE DESCRIPTION:** *5000 BBL Water Storage Tank-Common Vent (V-129A)*

DATA:

| | |
|---|---|
| **Emission Source:** | ***Water Storage Vapors ('Working' & 'Standing')*** |
| **Average Daily Water Throughput:** **(Annual Average; BBLD - $Q_{avg}$)** | ***6000*** |
| **Maximum Daily Water Throughput:** **(BBLD - $Q_{max}$)** | ***12000*** |
| **Average VOC Working Losses - $L_W$ (lb/yr):** | ***2,554.652*** |
| **Average VOC Standing Losses - $L_S$ (lb/yr):** | ***430.290*** |
| **Basis of Estimates:** | ***AP-42, Chapter 7 (June 2020, Section 7.1.3.1); Refer to supporting documentation for summary*** |

| | | | |
|---|---|---|---|
| Avg. Hourly Uncontrolled THC Losses (lb/hr) | = (Lw + Ls) * 1.134/8760 | = | **0.39** |
| Max. Hourly Uncontrolled THC Losses (lb/hr) | = (Ls + (Lw * QMax ÷ Qavg)) * 1.134/8760 | = | **0.72** |
| Annual Potential Uncontrolled THC Losses (TPY) | = Hourly * 8760/2000 | = | **1.69** |

**SPECIATION FACTORS:**

*Speciation factors were taken from "Air Emissions Species Manual - Volume I: Volatile Organic Compound Species Profiles", 2nd edition; Report No.: EPA-450/2-90-001a; page 258; reference supporting documentation.*

**UNCONTROLLED EMISSIONS SUMMARY:**

| POLLUTANT: | Weight Percent | CALCULATED EMISSION RATES | | |
|---|---|---|---|---|
| | | Average Hourly (lb/hr) | Maximum Hourly (lb/hr) | Annual (TPY) |
| Methane (excluded from VOC total) | 6.20 | 0.0240 | 0.0445 | 0.1049 |
| Ethane (excluded from VOC total) | 5.60 | 0.0216 | 0.0402 | 0.0948 |
| Hydrogen Sulfide (excluded from VOC total) | 0.00 | 0.0000 | 0.0000 | 0.0000 |
| Propane | 17.60 | 0.0680 | 0.1262 | 0.2979 |
| Iso-Butane | 1.50 | 0.0058 | 0.0108 | 0.0254 |
| N-Butane | 27.10 | 0.1047 | 0.1943 | 0.4587 |
| Iso-Pentane | 1.50 | 0.0058 | 0.0108 | 0.0254 |
| N-Pentane | 14.60 | 0.0564 | 0.1047 | 0.2471 |
| N-Hexane (TAP) | 7.90 | 0.0305 | 0.0567 | 0.1337 |
| Benzene (TAP) | 0.10 | 0.0004 | 0.0007 | 0.0017 |
| Heptanes | 9.20 | 0.0355 | 0.0660 | 0.1557 |

| | | | | |
|---|---|---|---|---|
| Octanes | 6.90 | 0.0267 | 0.0495 | 0.1168 |
| Other NM/NE Hydrocarbons | 1.80 | 0.0070 | 0.0129 | 0.0305 |
| **Total Weight Percent:** | 100.00 | | | |
| **Total TAP Emissions** | | 0.03 | 0.06 | 0.14 |
| **Total VOC Emissions** | | **0.34** | **0.63** | **1.49** |
| **Total Non VOC & Non TAP-HC** | | 0.05 | 0.08 | 0.20 |
| **Total Hydrocarbon Emissions** | | 0.39 | 0.72 | 1.69 |

DATA:

| | |
|---|---|
| **Emission Source:** | ***Blanket Gas*** |
| **Average Annual Tank Throughput (BBLs/Yr):** | ***2,190,000*** |
| **Gross Blanket Gas Required (MSCF/Yr):** | ***12,297*** |
| **Maximum Hourly Fill Rate (BBLs/Hr):** | ***250*** |
| **Blanket Gas Specific Gravity:** | ***1.4418*** |
| **Basis of Emission Estimates:** | ***Manufacturers Gas Consumption Data & Actual Inlet Gas Analysis (Refer to supporting documentation)*** |
| **Fuel Gas Analysis Report Number:** | ***Southern Petroleum Laboratories Report No.: 172-23080191-003A*** |

| | | | | |
|---|---|---|---|---|
| Avg. Hourly Uncontrolled Emissions (lb/hr) | = | Annual Gas Rate/ 8760 Hrs/Yr * 0.0764 * SG | = | **154.63** |
| Max. Hourly Uncontrolled Emissions (lb/hr) | = | Max. Fill Rate * 42/7.48 * 0.0764 * SG | = | **154.63** |
| Annual Potential Uncontrolled Emissions (TPY) | = | Annual Gas Rate * 0.0764 * SG/2000 | = | **677.28** |

**SPECIATION FACTORS:**

*Speciation of the blanket gas is based on the referenced analysis.*

**UNCONTROLLED EMISSIONS SUMMARY:**

| POLLUTANT: | Weight Percent | CALCULATED EMISSION RATES | | |
|---|---|---|---|---|
| | | Average Hourly (lb/hr) | Maximum Hourly (lb/hr) | Annual (TPY) |
| Nitrogen (excluded from VOC total) | 0.3299 | 0.5101 | 0.5101 | 2.2343 |
| Carbon Dioxide (excluded from VOC total) | 94.5515 | 146.2049 | 146.2024 | 640.3774 |
| Methane (excluded from VOC total) | 3.4498 | 5.3344 | 5.3343 | 23.3648 |
| Ethane (excluded from VOC total) | 0.3596 | 0.5560 | 0.5560 | 2.4355 |
| Hydrogen Sulfide (excluded from VOC total) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Propane | 0.2902 | 0.4487 | 0.4487 | 1.9655 |
| Iso-Butane | 0.0904 | 0.1398 | 0.1398 | 0.6123 |
| N-Butane | 0.1919 | 0.2967 | 0.2967 | 1.2997 |
| Iso-Pentane | 0.1130 | 0.1747 | 0.1747 | 0.7653 |
| N-Pentane | 0.0925 | 0.1430 | 0.1430 | 0.6265 |
| Iso-Hexane | 0.0834 | 0.1290 | 0.1290 | 0.5649 |
| N-Hexane (TAP) | 0.0427 | 0.0660 | 0.0660 | 0.2892 |
| Methylcyclopentane | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Benzene (TAP) | 0.0124 | 0.0192 | 0.0192 | 0.0840 |
| Cyclohexane | 0.0296 | 0.0458 | 0.0458 | 0.2005 |
| Heptanes | 0.0844 | 0.1305 | 0.1305 | 0.5716 |
| Methylcyclohexane | 0.0442 | 0.0683 | 0.0683 | 0.2994 |

| | | | | |
|---|---|---|---|---|
| Toluene (TAP) | 0.0080 | 0.0124 | 0.0124 | 0.0542 |
| 2,2,4-Trimethylpentane (TAP) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Octanes | 0.0602 | 0.0931 | 0.0931 | 0.4077 |
| Ethylbenzene (TAP) | 0.0015 | 0.0023 | 0.0023 | 0.0102 |
| Xylenes (TAP) | 0.0212 | 0.0328 | 0.0328 | 0.1436 |
| Nonanes | 0.0799 | 0.1235 | 0.1235 | 0.5411 |
| Decanes Plus | 0.0637 | 0.0985 | 0.0985 | 0.4314 |
| **Total Weight Percent:** | 100.0000 | | | |
| **Total TAP Emissions** | | 0.13 | 0.13 | 0.58 |
| **Total VOC Emissions** | | **2.02** | **2.02** | **8.87** |
| **Total Non VOC & Non TAP-HC** | | 5.89 | 5.89 | 25.80 |
| **Total Emissions** | | 154.63 | 154.63 | 677.28 |

| | | | |
|---|---|---|---|
| Uncontrolled VOC Emission Total (TPY) | Storage Vapors + Blanket Gas | = | **10.36** |

# *Emission Calculations*

**POINT SOURCE I.D. NUMBER:** ***8b-05-WST-CV***

**EMISSION SOURCE DESCRIPTION:** ***5000 BBL Water Storage Tank-Common Vent (V-129B)***

DATA:

| | |
|---|---|
| **Emission Source:** | ***Water Storage Vapors ('Working' & 'Standing')*** |
| **Average Daily Water Throughput:** **(Annual Average; BBLD - $Q_{avg}$)** | ***6000*** |
| **Maximum Daily Water Throughput:** **(BBLD - $Q_{max}$)** | ***12000*** |
| **Average VOC Working Losses - $L_W$ (lb/yr):** | ***2,554.652*** |
| **Average VOC Standing Losses - $L_S$ (lb/yr):** | ***430.290*** |
| **Basis of Estimates:** | ***AP-42, Chapter 7 (June 2020, Section 7.1.3.1); Refer to supporting documentation for summary*** |

| | | | |
|---|---|---|---|
| Avg. Hourly Uncontrolled THC Losses (lb/hr) | = (Lw + Ls) * 1.134/8760 | = | **0.39** |
| Max. Hourly Uncontrolled THC Losses (lb/hr) | = (Ls + (Lw * QMax ÷ Qavg)) * 1.134/8760 | = | **0.72** |
| Annual Potential Uncontrolled THC Losses (TPY) | = Hourly * 8760/2000 | = | **1.69** |

**SPECIATION FACTORS:**

*Speciation factors were taken from "Air Emissions Species Manual - Volume I: Volatile Organic Compound Species Profiles", 2nd edition; Report No.: EPA-450/2-90-001a; page 258; reference supporting documentation.*

**UNCONTROLLED EMISSIONS SUMMARY:**

| POLLUTANT: | Weight Percent | CALCULATED EMISSION RATES | | |
|---|---|---|---|---|
| | | Average Hourly (lb/hr) | Maximum Hourly (lb/hr) | Annual (TPY) |
| Methane (excluded from VOC total) | 6.20 | 0.0240 | 0.0445 | 0.1049 |
| Ethane (excluded from VOC total) | 5.60 | 0.0216 | 0.0402 | 0.0948 |
| Hydrogen Sulfide (excluded from VOC total) | 0.00 | 0.0000 | 0.0000 | 0.0000 |
| Propane | 17.60 | 0.0680 | 0.1262 | 0.2979 |
| Iso-Butane | 1.50 | 0.0058 | 0.0108 | 0.0254 |
| N-Butane | 27.10 | 0.1047 | 0.1943 | 0.4587 |
| Iso-Pentane | 1.50 | 0.0058 | 0.0108 | 0.0254 |
| N-Pentane | 14.60 | 0.0564 | 0.1047 | 0.2471 |
| N-Hexane (TAP) | 7.90 | 0.0305 | 0.0567 | 0.1337 |
| Benzene (TAP) | 0.10 | 0.0004 | 0.0007 | 0.0017 |
| Heptanes | 9.20 | 0.0355 | 0.0660 | 0.1557 |

| | | | | |
|---|---|---|---|---|
| Octanes | 6.90 | 0.0267 | 0.0495 | 0.1168 |
| Other NM/NE Hydrocarbons | 1.80 | 0.0070 | 0.0129 | 0.0305 |
| **Total Weight Percent:** | 100.00 | | | |
| **Total TAP Emissions** | | 0.03 | 0.06 | 0.14 |
| **Total VOC Emissions** | | **0.34** | **0.63** | **1.49** |
| **Total Non VOC & Non TAP-HC** | | 0.05 | 0.08 | 0.20 |
| **Total Hydrocarbon Emissions** | | 0.39 | 0.72 | 1.69 |

DATA:

| | |
|---|---|
| **Emission Source:** | ***Blanket Gas*** |
| **Average Annual Tank Throughput (BBLs/Yr):** | ***2,190,000*** |
| **Gross Blanket Gas Required (MSCF/Yr):** | ***12,297*** |
| **Maximum Hourly Fill Rate (BBLs/Hr):** | ***250*** |
| **Blanket Gas Specific Gravity:** | ***1.4418*** |
| **Basis of Emission Estimates:** | ***Manufacturers Gas Consumption Data & Actual Inlet Gas Analysis (Refer to supporting documentation)*** |
| **Fuel Gas Analysis Report Number:** | ***Southern Petroleum Laboratories Report No.: 172-23080191-003A*** |

| | | | | |
|---|---|---|---|---|
| Avg. Hourly Uncontrolled Emissions (lb/hr) | = | Annual Gas Rate/ 8760 Hrs/Yr * 0.0764 * SG | = | **154.63** |
| Max. Hourly Uncontrolled Emissions (lb/hr) | = | Max. Fill Rate * 42/7.48 * 0.0764 * SG | = | **154.63** |
| Annual Potential Uncontrolled Emissions (TPY) | = | Annual Gas Rate * 0.0764 * SG/2000 | = | **677.28** |

**SPECIATION FACTORS:**

*Speciation of the blanket gas is based on the referenced analysis.*

**UNCONTROLLED EMISSIONS SUMMARY:**

| POLLUTANT: | Weight Percent | CALCULATED EMISSION RATES | | |
|---|---|---|---|---|
| | | Average Hourly (lb/hr) | Maximum Hourly (lb/hr) | Annual (TPY) |
| Nitrogen (excluded from VOC total) | 0.3299 | 0.5101 | 0.5101 | 2.2343 |
| Carbon Dioxide (excluded from VOC total) | 94.5515 | 146.2049 | 146.2024 | 640.3774 |
| Methane (excluded from VOC total) | 3.4498 | 5.3344 | 5.3343 | 23.3648 |
| Ethane (excluded from VOC total) | 0.3596 | 0.5560 | 0.5560 | 2.4355 |
| Hydrogen Sulfide (excluded from VOC total) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Propane | 0.2902 | 0.4487 | 0.4487 | 1.9655 |
| Iso-Butane | 0.0904 | 0.1398 | 0.1398 | 0.6123 |
| N-Butane | 0.1919 | 0.2967 | 0.2967 | 1.2997 |
| Iso-Pentane | 0.1130 | 0.1747 | 0.1747 | 0.7653 |
| N-Pentane | 0.0925 | 0.1430 | 0.1430 | 0.6265 |
| Iso-Hexane | 0.0834 | 0.1290 | 0.1290 | 0.5649 |
| N-Hexane (TAP) | 0.0427 | 0.0660 | 0.0660 | 0.2892 |
| Methylcyclopentane | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Benzene (TAP) | 0.0124 | 0.0192 | 0.0192 | 0.0840 |
| Cyclohexane | 0.0296 | 0.0458 | 0.0458 | 0.2005 |
| Heptanes | 0.0844 | 0.1305 | 0.1305 | 0.5716 |
| Methylcyclohexane | 0.0442 | 0.0683 | 0.0683 | 0.2994 |

| | | | | |
|---|---|---|---|---|
| Toluene (TAP) | 0.0080 | 0.0124 | 0.0124 | 0.0542 |
| 2,2,4-Trimethylpentane (TAP) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Octanes | 0.0602 | 0.0931 | 0.0931 | 0.4077 |
| Ethylbenzene (TAP) | 0.0015 | 0.0023 | 0.0023 | 0.0102 |
| Xylenes (TAP) | 0.0212 | 0.0328 | 0.0328 | 0.1436 |
| Nonanes | 0.0799 | 0.1235 | 0.1235 | 0.5411 |
| Decanes Plus | 0.0637 | 0.0985 | 0.0985 | 0.4314 |
| **Total Weight Percent:** | 100.0000 | | | |
| **Total TAP Emissions** | | 0.13 | 0.13 | 0.58 |
| **Total VOC Emissions** | | **2.02** | **2.02** | **8.87** |
| **Total Non VOC & Non TAP-HC** | | 5.89 | 5.89 | 25.80 |
| **Total Emissions** | | 154.63 | 154.63 | 677.28 |

| | | | |
|---|---|---|---|
| Uncontrolled VOC Emission Total (TPY) | Storage Vapors + Blanket Gas | = | **10.36** |

# *Emission Calculations*

**POINT SOURCE I.D. NUMBER:** ***9-05-SOT-V***

**EMISSION SOURCE DESCRIPTION:** ***1500 BBL Slop Oil Tank-Vent (V-132)***

DATA:

| | |
|---|---|
| **Emission Source:** | ***Crude Oil Storage Vapors ('Working' & 'Standing')*** |
| **Average Daily Oil Throughput:** **(Annual Average; BBLD - $Q_{avg}$)** | ***30*** |
| **Maximum Daily Oil Throughput:** **(BBLD - $Q_{max}$)** | ***30*** |
| **Average VOC Working Losses - $L_W$ (lb/yr):** | ***1,567.743*** |
| **Average VOC Standing Losses - $L_S$ (lb/yr):** | ***2,794.343*** |
| **Basis of Estimates:** | ***AP-42, Chapter 7 (June 2020, Section 7.1.3.1); Refer to supporting documentation for summary*** |

| | | | |
|---|---|---|---|
| Avg. Hourly Uncontrolled THC Losses (lb/hr) | = (Lw + Ls) * 1.134/8760 | = | **0.56** |
| Max. Hourly Uncontrolled THC Losses (lb/hr) | = (Ls + (Lw * QMax ÷ Qavg)) * 1.134/8760 | = | **0.56** |
| Annual Potential Uncontrolled THC Losses (TPY) | = Hourly * 8760/2000 | = | **2.47** |

**SPECIATION FACTORS:**

*Speciation factors were taken from "Air Emissions Species Manual - Volume I: Volatile Organic Compound Species Profiles", 2nd edition; Report No.: EPA-450/2-90-001a; page 258; reference supporting documentation.*

**UNCONTROLLED EMISSIONS SUMMARY:**

| POLLUTANT: | Weight Percent | CALCULATED EMISSION RATES | | |
|---|---|---|---|---|
| | | Average Hourly (lb/hr) | Maximum Hourly (lb/hr) | Annual (TPY) |
| Methane (excluded from VOC total) | 6.20 | 0.0350 | 0.0350 | 0.1533 |
| Ethane (excluded from VOC total) | 5.60 | 0.0316 | 0.0316 | 0.1385 |
| Hydrogen Sulfide (excluded from VOC total) | 0.00 | 0.0000 | 0.0000 | 0.0000 |
| Propane | 17.60 | 0.0994 | 0.0994 | 0.4353 |
| Iso-Butane | 1.50 | 0.0085 | 0.0085 | 0.0371 |
| N-Butane | 27.10 | 0.1530 | 0.1530 | 0.6703 |
| Iso-Pentane | 1.50 | 0.0085 | 0.0085 | 0.0371 |
| N-Pentane | 14.60 | 0.0824 | 0.0824 | 0.3611 |
| N-Hexane (TAP) | 7.90 | 0.0446 | 0.0446 | 0.1954 |
| Benzene (TAP) | 0.10 | 0.0006 | 0.0006 | 0.0025 |
| Heptanes | 9.20 | 0.0520 | 0.0520 | 0.2275 |

| | | | | |
|---|---|---|---|---|
| Octanes | 6.90 | 0.0390 | 0.0390 | 0.1707 |
| Other NM/NE Hydrocarbons | 1.80 | 0.0102 | 0.0102 | 0.0445 |
| **Total Weight Percent:** | 100.00 | | | |
| **Total TAP Emissions** | | 0.05 | 0.05 | 0.20 |
| **Total VOC Emissions** | | **0.50** | **0.50** | **2.18** |
| **Total Non VOC & Non TAP-HC** | | 0.07 | 0.07 | 0.29 |
| **Total Hydrocarbon Emissions** | | 0.56 | 0.56 | 2.47 |

| | | | |
|---|---|---|---|
| Uncontrolled VOC Emission Total (TPY) | Storage Vapors | = | **2.18** |

# *Emission Calculations*

*Emission calculations shown below are presented for informational purposes only as vapors from the inhibitor oil tank are routed to the atmospheric control flare (EPN: 25-05-F) for combustion, except during brief intervals when thief hatches are opened for purposes of sampling, gauging, etc.*

**POINT SOURCE I.D. NUMBER:** ***10-05-IOT-V***

**EMISSION SOURCE DESCRIPTION:** ***1500 BBL Inhibitor Oil Tank-Vent (V-133A)***

DATA:

| | |
|---|---|
| **Emission Source:** | ***Crude Oil Storage Vapors ('Working' & 'Standing')*** |
| **Average Daily Oil Throughput:** **(Annual Average; BBLD - $Q_{avg}$)** | ***100*** |
| **Maximum Daily Oil Throughput:** **(BBLD - $Q_{max}$)** | ***300*** |
| **Average VOC Working Losses - $L_w$ (lb/yr):** | ***5,227.298*** |
| **Average VOC Standing Losses - $L_S$ (lb/yr):** | ***2,960.725*** |
| **Basis of Estimates:** | ***AP-42, Chapter 7 (June 2020, Section 7.1.3.1); Refer to supporting documentation for summary*** |

| | | | |
|---|---|---|---|
| Avg. Hourly Uncontrolled THC Losses (lb/hr) | = (Lw + Ls) * 14.5612/8760 | = | **13.61** |
| Max. Hourly Uncontrolled THC Losses (lb/hr) | = (Ls + (Lw * QMax ÷ Qavg)) * 14.5612/8760 | = | **30.99** |
| Annual Potential Uncontrolled THC Losses (TPY) | = Hourly * 8760/2000 | = | **59.61** |

**SPECIATION FACTORS:**

*The composition of this gas is based on an actual analysis of the vapors routed to the control flare and normalized to account for the removal of Nitrogen; refer to Southern Petroleum Laboratories Report No.: 172-24050252-001A in supporting documentation.*

**UNCONTROLLED EMISSIONS SUMMARY:**

| POLLUTANT: | Weight Percent | CALCULATED EMISSION RATES | | |
|---|---|---|---|---|
| | | Average Hourly (lb/hr) | Maximum Hourly (lb/hr) | Annual (TPY) |
| Nitrogen | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Carbon Dioxide | 92.2057 | 12.5496 | 28.5731 | 54.9672 |
| Methane (excluded from VOC total) | 0.4437 | 0.0604 | 0.1375 | 0.2645 |
| Ethane (excluded from VOC total) | 0.4830 | 0.0657 | 0.1497 | 0.2879 |
| Hydrogen Sulfide (excluded from VOC total) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Propane | 1.2192 | 0.1659 | 0.3778 | 0.7268 |
| Iso-Butane | 0.7063 | 0.0961 | 0.2189 | 0.4211 |
| N-Butane | 1.4841 | 0.2020 | 0.4599 | 0.8847 |
| Iso-Pentane | 0.9366 | 0.1275 | 0.2902 | 0.5583 |
| N-Pentane | 0.7358 | 0.1001 | 0.2280 | 0.4386 |

| | | | | |
|---|---|---|---|---|
| Iso-Hexane | 0.6181 | 0.0841 | 0.1915 | 0.3685 |
| N-Hexane (TAP) | 0.2797 | 0.0381 | 0.0867 | 0.1668 |
| Methylcyclopentane | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Benzene (TAP) | 0.0595 | 0.0081 | 0.0184 | 0.0355 |
| Cyclohexane | 0.1597 | 0.0217 | 0.0495 | 0.0952 |
| Heptanes | 0.3974 | 0.0541 | 0.1231 | 0.2369 |
| Methylcyclohexane | 0.1143 | 0.0156 | 0.0354 | 0.0681 |
| Toluene (TAP) | 0.0110 | 0.0015 | 0.0034 | 0.0066 |
| 2,2,4-Trimethylpentane (TAP) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Octanes | 0.0828 | 0.0113 | 0.0257 | 0.0494 |
| Ethylbenzene (TAP) | 0.0011 | 0.0002 | 0.0003 | 0.0007 |
| Xylenes (TAP) | 0.0088 | 0.0012 | 0.0027 | 0.0053 |
| Nonanes | 0.0480 | 0.0065 | 0.0149 | 0.0286 |
| Decanes Plus | 0.0052 | 0.0007 | 0.0016 | 0.0031 |
| **Total Weight Percent:** | 100.000 | | | |
| **Total TAP Emissions** | | 0.05 | 0.11 | 0.21 |
| **Total VOC Emissions** | | **0.93** | **2.13** | **4.09** |
| **Total Non VOC & Non TAP-HC** | | 0.13 | 0.29 | 0.55 |
| **Total Hydrocarbon Emissions** | | 13.61 | 30.99 | 59.61 |

| | |
|---|---|
| *Calculated Avg. Gas Flowrate (SCFH) =* | *12.23* |

The mixing station blends chemicals in various combinations. When the word "solution" is used it is intended to indicate a mixture of various chemicals. Total material use indicated below:

| Chemical Material | Specific Gravity | True Vapor Pressure (psia) | Throughput (gallons/year) |
|---|---|---|---|
| Corrosion Inhibitor | 0.936 | N/A | 18,250.00 |
| Paraffin Inhibitor | 1.48 | N/A | 3,650.00 |
| Asphaltine Inhibitor | 0.93 | N/A | 3,650.00 |
| Produced Oil | 1.529 | 5.37 | 1,533,000 |
| **Total Throughput (gallons/year) =** | | | 1,558,550.00 |

*EPA document 745-R-99-005 entitled "Look-up Tables for Estimating Toxic Release Inventory Air Emissions from Chemical Distribution Facilities" was used for determining the emissions during the mixing process and the emissions from the transfer of product to the final transport container; refer to ensuing pages for copy.*

| Chemical Material #1: | | Corrosion Inhibitor | | | |
|---|---|---|---|---|---|
| CHEMICAL USAGE | | | | CHEMICAL THROUGHPUT | |
| Gallons/Year | | Hour/Year | Specific Gravity | Hourly (lb/hr) | Annual (TPY) |
| 18,250.00 | | 8,760 | 0.936 | 16.26 | 71.23 |
| ***Emission Factors**** | | | | | |
| $A_1$ | $A_2$ | $A_5$ | $A_6$ | *Throughput Factor (lb)* | *City Factor* |
| *170* | *3* | *169* | *3* | *250,000* | *1.40* |
| $A_1$ (lb/yr) = 135.63 | | $A_2$ (lb/yr) = 2.39 | | $A_5$ (lb/yr) = 134.83 | $A_6$ (lb/yr) = 2.39 |
| | | | | **Total ΣTPY=** | 0.14 |

| POLLUTANT:** | Weight Percent | CALCULATED EMISSION RATES | |
|---|---|---|---|
| | | Hourly (lb/hr) | Annual (TPY) |
| 1,2,4-Trimethylbenzene | 10.00 | 0.0031 | 0.0138 |
| 1,2,3-Trimethylbenzene | 5.00 | 0.0016 | 0.0069 |
| 1,3,5-Trimethylbenzene | 5.00 | 0.0016 | 0.0069 |
| Light Aromatic Naphtha | 30.00 | 0.0094 | 0.0413 |
| Methanol (TAP) | 30.00 | 0.0094 | 0.0413 |
| Other VOCs | 20.00 | 0.0063 | 0.0275 |
| **Total Weight Percent:** | 100.00 | | |
| **Total TAP Emissions** | | 0.01 | 0.04 |
| **Total VOC Emissions** | | **0.03** | **0.14** |
| **Total Non VOC & Non TAP-HC** | | 0.00 | 0.00 |
| **Total Emissions** | | 0.03 | 0.14 |

**EPA document 745-R-99-005 entitled "Look-up Tables for Estimating Toxic Release Inventory Air Emissions from Chemical Distribution Facilities" was used for determining the emissions; refer to ensuing pages for copy.*

***HAP-Hazardous/Toxic Air Pollutant (listing taken from LAC 33:III.5112)*

*NOTE: Emission factors for n-Hexane were used since the above solution is not listed in the EPA document and both are believed to have similar evaporation rates.*

| Chemical Material #2: | | Paraffin Inhibitor | | | |
|---|---|---|---|---|---|
| CHEMICAL USAGE | | | | CHEMICAL THROUGHPUT | |
| Gallons/Year | | Hour/Year | Specific Gravity | Hourly (lb/hr) | Annual (TPY) |
| 3,650.00 | | 8,760 | 1.48 | 5.14 | 22.53 |
| ***Emission Factors**** | | | | | |
| $A_1$ | $A_2$ | $A_5$ | $A_6$ | *Throughput (lb)* | *City Factor* |
| *34* | *1* | *34* | *1* | *50,000* | *1.40* |
| $A_1$ (lb/yr) = 42.89 | | $A_2$ (lb/yr) = 1.26 | | $A_5$ (lb/yr) = 42.89 | $A_6$ (lb/yr) = 1.26 |
| | | | | **Total ΣTPY=** | 0.04 |

| POLLUTANT:** | Weight Percent | CALCULATED EMISSION RATES | |
|---|---|---|---|
| | | Hourly (lb/hr) | Annual (TPY) |
| 1,2,4-Trimethylbenzene | 10.00 | 0.0010 | 0.0044 |
| 1,2,3-Trimethylbenzene | 5.00 | 0.0005 | 0.0022 |
| 1,3,5-Trimethylbenzene | 5.00 | 0.0005 | 0.0022 |
| Light Aromatic Naphtha | 20.00 | 0.0020 | 0.0088 |
| Xylenes (TAP) | 50.00 | 0.0050 | 0.0221 |
| Ethylbenzene (TAP) | 10.00 | 0.0010 | 0.0044 |
| **Total Weight Percent:** | 100.00 | | |
| **Total TAP Emissions** | | 0.01 | 0.03 |
| **Total VOC Emissions** | | **0.01** | **0.04** |
| **Total Non VOC & Non TAP-HC** | | 0.00 | 0.00 |
| **Total Emissions** | | 0.01 | 0.04 |

**EPA document 745-R-99-005 entitled "Look-up Tables for Estimating Toxic Release Inventory Air Emissions from Chemical Distribution Facilities" was used for determining the emissions; refer to ensuing pages for copy.*

***HAP-Hazardous/Toxic Air Pollutant (listing taken from LAC 33:III.5112)*

*NOTE: Emission factors for n-Hexane were used since the above solution is not listed in the EPA document and both are believed to have similar evaporation rates.*

| Chemical Material #3: | Asphaltine Inhibitor | | | |
|---|---|---|---|---|
| **CHEMICAL USAGE** | | | **CHEMICAL THROUGHPUT** | |
| **Gallons/Year** | **Hour/Year** | **Specific Gravity** | **Hourly (lb/hr)** | **Annual (TPY)** |
| 3,650.00 | 8,760 | 0.930 | 3.23 | 14.16 |

| ***Emission Factors**** | | | | | |
|---|---|---|---|---|---|
| $A_1$ | $A_2$ | $A_5$ | $A_6$ | *Throughput (lb)* | *City Factor* |
| *34* | *1* | *34* | *1* | *50,000* | *1.40* |

$A_1$ (lb/yr) = 26.95 $A_2$ (lb/yr) = 0.79 $A_5$ (lb/yr) = 26.95 $A_6$ (lb/yr) = 0.79

| | |
|---|---|
| **Total ΣTPY=** | 0.03 |

| **POLLUTANT:**** | **Weight Percent** | **CALCULATED EMISSION RATES** | |
|---|---|---|---|
| | | **Hourly (lb/hr)** | **Annual (TPY)** |
| 1,2,4-Trimethylbenzene | 10.00 | 0.0006 | 0.0028 |
| 1,2,3-Trimethylbenzene | 5.00 | 0.0003 | 0.0014 |
| 1,3,5-Trimethylbenzene | 5.00 | 0.0003 | 0.0014 |
| Light Aromatic Naphtha | 20.00 | 0.0013 | 0.0055 |
| Xylenes (TAP) | 50.00 | 0.0032 | 0.0139 |
| Ethylbenzene (TAP) | 10.00 | 0.0006 | 0.0028 |
| **Total Weight Percent:** | 100.00 | | |
| **Total TAP Emissions** | | 0.00 | 0.00 |
| **Total VOC Emissions** | | **0.01** | **0.03** |
| **Total Non VOC & Non TAP-HC** | | 0.00 | 0.00 |
| **Total Emissions** | | 0.01 | 0.03 |

**EPA document 745-R-99-005 entitled "Look-up Tables for Estimating Toxic Release Inventory Air Emissions from Chemical Distribution Facilities" was used for determining the emissions; refer to ensuing pages for copy.*

***HAP-Hazardous/Toxic Air Pollutant (listing taken from LAC 33:III.5112)*

*NOTE: Emission factors for n-Hexane were used since the above solution is not listed in the EPA document and both are believed to have similar evaporation rates.*

| Chemical Material #4: | Produced Oil | | | |
|---|---|---|---|---|
| **CHEMICAL USAGE** | | | **CHEMICAL THROUGHPUT** | |
| **Gallons/Year** | **Hour/Year** | **Specific Gravity** | **Hourly (lb/hr)** | **Annual (TPY)** |
| 1,533,000 | 8,760 | 1.529 | 2231.58 | 9774.30 |

| ***Emission Factors**** | | | | | |
|---|---|---|---|---|---|
| $A_1$ | $A_2$ | $A_5$ | $A_6$ | *Throughput (lb)* | *City Factor* |
| *6794* | *112* | *2253* | *111* | *10,000,000* | *1.40* |

$A_1$ (lb/yr) = 18593.85 $A_2$ (lb/yr) = 306.52 $A_5$ (lb/yr) = 6,166.02 $A_6$ (lb/yr) = 303.79

| | |
|---|---|
| **Total ΣTPY=** | 12.69 |

| **POLLUTANT:**** | **Weight Percent** | **CALCULATED EMISSION RATES** | |
|---|---|---|---|
| | | **Hourly (lb/hr)** | **Annual (TPY)** |
| Nitrogen | 0.0000 | 0.0000 | 0.0000 |
| Carbon Dioxide | 92.2057 | 2.6704 | 11.6964 |
| Methane (excluded from VOC total) | 0.4437 | 0.0129 | 0.0563 |
| Ethane (excluded from VOC total) | 0.4830 | 0.0140 | 0.0613 |
| Hydrogen Sulfide (excluded from VOC total) | 0.0000 | 0.0000 | 0.0000 |
| Propane | 1.2192 | 0.0353 | 0.1547 |
| Iso-Butane | 0.7063 | 0.0205 | 0.0896 |

| | | | |
|---|---|---|---|
| N-Butane | 1.4841 | 0.0430 | 0.1883 |
| Iso-Pentane | 0.9366 | 0.0271 | 0.1188 |
| N-Pentane | 0.7358 | 0.0213 | 0.0933 |
| Iso-Hexane | 0.6181 | 0.0179 | 0.0784 |
| N-Hexane (TAP) | 0.2797 | 0.0081 | 0.0355 |
| Methylcyclopentane | 0.0000 | 0.0000 | 0.0000 |
| Benzene (TAP) | 0.0595 | 0.0017 | 0.0075 |
| Cyclohexane | 0.1597 | 0.0046 | 0.0203 |
| Heptanes | 0.3974 | 0.0115 | 0.0504 |
| Methylcyclohexane | 0.1143 | 0.0033 | 0.0145 |
| Toluene (TAP) | 0.0110 | 0.0003 | 0.0014 |
| 2,2,4-Trimethylpentane (TAP) | 0.0000 | 0.0000 | 0.0000 |
| Octanes | 0.0828 | 0.0024 | 0.0105 |
| Ethylbenzene (TAP) | 0.0011 | 0.0000 | 0.0001 |
| Xylenes (TAP) | 0.0088 | 0.0003 | 0.0011 |
| Nonanes | 0.0480 | 0.0014 | 0.0061 |
| Decanes Plus | 0.0052 | 0.0001 | 0.0007 |
| **Total Weight Percent:** | 100.000 | | |
| **Total TAP Emissions** | | 0.01 | 0.05 |
| **Total VOC Emissions** | | **0.20** | **0.87** |
| **Total Non VOC & Non TAP-HC** | | 0.03 | 0.12 |
| **Total Emissions** | | 2.90 | 12.69 |

**EPA document 745-R-99-005 entitled "Look-up Tables for Estimating Toxic Release Inventory Air Emissions from Chemical Distribution Facilities" was used for determining the emissions; refer to ensuing pages for copy.*

***HAP-Hazardous/Toxic Air Pollutant (listing taken from LAC 33:III.5112)*

*NOTE: Emission factors for n-Hexane were used since the above solution is not listed in the EPA document and both are believed to have similar evaporation rates.*

| | | | |
|---|---|---|---|
| Uncontrolled VOC Emission Total (TPY) | Storage Vapors + Blending Emissions | = | **5.17** |

DATA:

| | |
|---|---|
| **Emission Source:** | ***Losses When Opening Thief Hatches*** |
| **Specific Gravity of Gas:** | ***1.5347*** |
| **Maximum Thief Hatch Venting (Hrs)** **(Under Normal/Routine Operating Conditions)** | ***30*** |
| **Max. Minutes a Hatch is Opened in a Single Hr:** | ***5*** |
| **Maximum Hourly Emission Rate (lb/hr):** **(from preceding tank emission estimates)** | ***31.92*** |

| | | | | |
|---|---|---|---|---|
| Avg. Hourly Emissions (lb/hr) | = | Total/8760 (hrs) | = | **1.31** |
| Maximum Hourly Emissions (lb/hr) | = | Max. Emission Rate * Max. Minutes/Hr Hatch is Open | = | **31.92** |
| Maximum Total Emissions (Tons) | = | Max. Hourly THC Rate * Hours Hatch is Open | = | **5.74** |

| EMISSION SUMMARY (based on the above referenced flare gas analysis): | | | | |
|---|---|---|---|---|
| **POLLUTANT:** | **Weight Percent** | **CALCULATED EMISSION RATES** | | |
| | | **Average Hourly (lb/hr)** | **Maximum Hourly (lb/hr)** | **Total (Tons)** |
| Nitrogen (excluded from VOC total) | 0.0000 | 0.000 | 0.000 | 0.000 |
| Carbon Dioxide (excluded from VOC total) | 92.2057 | 1.208 | 29.432 | 5.297 |
| Methane (excluded from VOC total) | 0.4437 | 0.006 | 0.142 | 0.025 |
| Ethane (excluded from VOC total) | 0.4830 | 0.006 | 0.154 | 0.028 |
| Hydrogen Sulfide (excluded from VOC total) | 0.0000 | 0.000 | 0.000 | 0.000 |
| Propane | 1.2192 | 0.016 | 0.389 | 0.070 |
| Iso-Butane | 0.7063 | 0.009 | 0.225 | 0.041 |
| N-Butane | 1.4841 | 0.019 | 0.474 | 0.085 |
| Iso-Pentane | 0.9366 | 0.012 | 0.299 | 0.054 |
| N-Pentane | 0.7358 | 0.010 | 0.235 | 0.042 |
| Iso-Hexane | 0.6181 | 0.008 | 0.197 | 0.036 |
| N-Hexane (TAP) | 0.2797 | 0.004 | 0.089 | 0.016 |
| Methylcyclopentane | 0.0000 | 0.000 | 0.000 | 0.000 |
| Benzene (TAP) | 0.0595 | 0.001 | 0.019 | 0.003 |
| Cyclohexane | 0.1597 | 0.002 | 0.051 | 0.009 |
| Heptanes | 0.3974 | 0.005 | 0.127 | 0.023 |
| Methylcyclohexane | 0.1143 | 0.001 | 0.036 | 0.007 |
| Toluene (TAP) | 0.0110 | 0.000 | 0.004 | 0.001 |
| 2,2,4-Trimethylpentane (TAP) | 0.0000 | 0.000 | 0.000 | 0.000 |
| Octanes | 0.0828 | 0.001 | 0.026 | 0.005 |
| Ethylbenzene (TAP) | 0.0011 | 0.000 | 0.000 | 0.000 |
| Xylenes (TAP) | 0.0088 | 0.000 | 0.003 | 0.001 |
| Nonanes | 0.0480 | 0.001 | 0.015 | 0.003 |
| Decanes Plus | 0.0052 | 0.000 | 0.002 | 0.000 |
| Other NM/NE HC | 0.0000 | 0.000 | 0.000 | 0.000 |
| **Total Weight Percent:** | 100.0000 | | | |
| **Total TAP Emissions** | | 0.00 | 0.11 | 0.02 |
| **Total VOC Emissions** | | **0.09** | **2.19** | **0.39** |
| **Total Non VOC & Non TAP-HC** | | 0.01 | 0.30 | 0.05 |
| **Total Emissions** | | 1.31 | 31.92 | 5.74 |

# *Emission Calculations*

*Emission calculations shown below are presented for informational purposes only as vapors from the inhibitor oil tank are routed to the atmospheric control flare (EPN: 25-05-F) for combustion, except during brief intervals when thief hatches are opened for purposes of sampling, gauging, etc.*

**POINT SOURCE I.D. NUMBER:** ***11-05-IOT-V***

**EMISSION SOURCE DESCRIPTION:** ***1500 BBL Inhibitor Oil Tank-Vent (V-133B)***

DATA:

| | |
|---|---|
| **Emission Source:** | ***Crude Oil Storage Vapors ('Working' & 'Standing')*** |
| **Average Daily Oil Throughput:** **(Annual Average; BBLD - $Q_{avg}$)** | ***100*** |
| **Maximum Daily Oil Throughput:** **(BBLD - $Q_{max}$)** | ***300*** |
| **Average VOC Working Losses - $L_w$ (lb/yr):** | ***5,227.298*** |
| **Average VOC Standing Losses - $L_S$ (lb/yr):** | ***2,960.725*** |
| **Basis of Estimates:** | ***AP-42, Chapter 7 (June 2020, Section 7.1.3.1); Refer to supporting documentation for summary*** |

| | | | |
|---|---|---|---|
| Avg. Hourly Uncontrolled THC Losses (lb/hr) | = (Lw + Ls) * 14.5612/8760 | = | **13.61** |
| Max. Hourly Uncontrolled THC Losses (lb/hr) | = (Ls + (Lw * QMax ÷ Qavg)) * 14.5612/8760 | = | **30.99** |
| Annual Potential Uncontrolled THC Losses (TPY) | = Hourly * 8760/2000 | = | **59.61** |

**SPECIATION FACTORS:**

*The composition of this gas is based on an actual analysis of the vapors routed to the control flare and normalized to account for the removal of Nitrogen; refer to Southern Petroleum Laboratories Report No.: 172-24050252-001A in supporting documentation.*

**UNCONTROLLED EMISSIONS SUMMARY:**

| POLLUTANT: | Weight Percent | CALCULATED EMISSION RATES | | |
|---|---|---|---|---|
| | | Average Hourly (lb/hr) | Maximum Hourly (lb/hr) | Annual (TPY) |
| Nitrogen | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Carbon Dioxide | 92.2057 | 12.5496 | 28.5731 | 54.9672 |
| Methane (excluded from VOC total) | 0.4437 | 0.0604 | 0.1375 | 0.2645 |
| Ethane (excluded from VOC total) | 0.4830 | 0.0657 | 0.1497 | 0.2879 |
| Hydrogen Sulfide (excluded from VOC total) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Propane | 1.2192 | 0.1659 | 0.3778 | 0.7268 |
| Iso-Butane | 0.7063 | 0.0961 | 0.2189 | 0.4211 |
| N-Butane | 1.4841 | 0.2020 | 0.4599 | 0.8847 |
| Iso-Pentane | 0.9366 | 0.1275 | 0.2902 | 0.5583 |
| N-Pentane | 0.7358 | 0.1001 | 0.2280 | 0.4386 |

| | | | | |
|---|---|---|---|---|
| Iso-Hexane | 0.6181 | 0.0841 | 0.1915 | 0.3685 |
| N-Hexane (TAP) | 0.2797 | 0.0381 | 0.0867 | 0.1668 |
| Methylcyclopentane | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Benzene (TAP) | 0.0595 | 0.0081 | 0.0184 | 0.0355 |
| Cyclohexane | 0.1597 | 0.0217 | 0.0495 | 0.0952 |
| Heptanes | 0.3974 | 0.0541 | 0.1231 | 0.2369 |
| Methylcyclohexane | 0.1143 | 0.0156 | 0.0354 | 0.0681 |
| Toluene (TAP) | 0.0110 | 0.0015 | 0.0034 | 0.0066 |
| 2,2,4-Trimethylpentane (TAP) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Octanes | 0.0828 | 0.0113 | 0.0257 | 0.0494 |
| Ethylbenzene (TAP) | 0.0011 | 0.0002 | 0.0003 | 0.0007 |
| Xylenes (TAP) | 0.0088 | 0.0012 | 0.0027 | 0.0053 |
| Nonanes | 0.0480 | 0.0065 | 0.0149 | 0.0286 |
| Decanes Plus | 0.0052 | 0.0007 | 0.0016 | 0.0031 |
| **Total Weight Percent:** | 100.000 | | | |
| **Total TAP Emissions** | | 0.05 | 0.11 | 0.21 |
| **Total VOC Emissions** | | **0.93** | **2.13** | **4.09** |
| **Total Non VOC & Non TAP-HC** | | 0.13 | 0.29 | 0.55 |
| **Total Hydrocarbon Emissions** | | 13.61 | 30.99 | 59.61 |

| | |
|---|---|
| *Calculated Avg. Gas Flowrate (SCFH) =* | *12.23* |

The mixing station blends chemicals in various combinations. When the word "solution" is used it is intended to indicate a mixture of various chemicals. Total material use indicated below:

| Chemical Material | Specific Gravity | True Vapor Pressure (psia) | Throughput (gallons/year) |
|---|---|---|---|
| Corrosion Inhibitor | 0.936 | N/A | 18,250.00 |
| Paraffin Inhibitor | 1.48 | N/A | 3,650.00 |
| Asphaltine Inhibitor | 0.93 | N/A | 3,650.00 |
| Produced Oil | 1.529 | 5.37 | 1,533,000 |
| **Total Throughput (gallons/year) =** | | | 1,558,550.00 |

*EPA document 745-R-99-005 entitled "Look-up Tables for Estimating Toxic Release Inventory Air Emissions from Chemical Distribution Facilities" was used for determining the emissions during the mixing process and the emissions from the transfer of product to the final transport container; refer to ensuing pages for copy.*

| Chemical Material #1: | | Corrosion Inhibitor | | | |
|---|---|---|---|---|---|
| CHEMICAL USAGE | | | | CHEMICAL THROUGHPUT | |
| Gallons/Year | | Hour/Year | Specific Gravity | Hourly (lb/hr) | Annual (TPY) |
| 18,250.00 | | 8,760 | 0.936 | 16.26 | 71.23 |
| ***Emission Factors**** | | | | | |
| $A_1$ | $A_2$ | $A_5$ | $A_6$ | *Throughput Factor (lb)* | *City Factor* |
| *170* | *3* | *169* | *3* | *250,000* | *1.40* |
| $A_1$ (lb/yr) = 135.63 | | $A_2$ (lb/yr) = 2.39 | | $A_5$ (lb/yr) = 134.83 | $A_6$ (lb/yr) = 2.39 |
| | | | | **Total ΣTPY=** | 0.14 |

| POLLUTANT:** | Weight Percent | CALCULATED EMISSION RATES | |
|---|---|---|---|
| | | Hourly (lb/hr) | Annual (TPY) |
| 1,2,4-Trimethylbenzene | 10.00 | 0.0031 | 0.0138 |
| 1,2,3-Trimethylbenzene | 5.00 | 0.0016 | 0.0069 |
| 1,3,5-Trimethylbenzene | 5.00 | 0.0016 | 0.0069 |
| Light Aromatic Naphtha | 30.00 | 0.0094 | 0.0413 |
| Methanol (TAP) | 30.00 | 0.0094 | 0.0413 |
| Other VOCs | 20.00 | 0.0063 | 0.0275 |
| **Total Weight Percent:** | 100.00 | | |
| **Total TAP Emissions** | | 0.01 | 0.04 |
| **Total VOC Emissions** | | **0.03** | **0.14** |
| **Total Non VOC & Non TAP-HC** | | 0.00 | 0.00 |
| **Total Emissions** | | 0.03 | 0.14 |

**EPA document 745-R-99-005 entitled "Look-up Tables for Estimating Toxic Release Inventory Air Emissions from Chemical Distribution Facilities" was used for determining the emissions; refer to ensuing pages for copy.*

***HAP-Hazardous/Toxic Air Pollutant (listing taken from LAC 33:III.5112)*

*NOTE: Emission factors for n-Hexane were used since the above solution is not listed in the EPA document and both are believed to have similar evaporation rates.*

| Chemical Material #2: | Paraffin Inhibitor | | | |
|---|---|---|---|---|
| **CHEMICAL USAGE** | | | **CHEMICAL THROUGHPUT** | |
| **Gallons/Year** | **Hour/Year** | **Specific Gravity** | **Hourly (lb/hr)** | **Annual (TPY)** |
| 3,650.00 | 8,760 | 1.48 | 5.14 | 22.53 |

| ***Emission Factors**** | | | | | |
|---|---|---|---|---|---|
| $A_1$ | $A_2$ | $A_5$ | $A_6$ | *Throughput (lb)* | *City Factor* |
| *34* | *1* | *34* | *1* | *50,000* | *1.40* |

| | | | |
|---|---|---|---|
| $A_1$ (lb/yr) = 42.89 | $A_2$ (lb/yr) = 1.26 | $A_5$ (lb/yr) = 42.89 | $A_6$ (lb/yr) = 1.26 |
| | | **Total ΣTPY=** | 0.04 |

| **POLLUTANT:**** | **Weight Percent** | **CALCULATED EMISSION RATES** | |
|---|---|---|---|
| | | **Hourly (lb/hr)** | **Annual (TPY)** |
| 1,2,4-Trimethylbenzene | 10.00 | 0.0010 | 0.0044 |
| 1,2,3-Trimethylbenzene | 5.00 | 0.0005 | 0.0022 |
| 1,3,5-Trimethylbenzene | 5.00 | 0.0005 | 0.0022 |
| Light Aromatic Naphtha | 20.00 | 0.0020 | 0.0088 |
| Xylenes (TAP) | 50.00 | 0.0050 | 0.0221 |
| Ethylbenzene (TAP) | 10.00 | 0.0010 | 0.0044 |
| **Total Weight Percent:** | 100.00 | | |
| **Total TAP Emissions** | | 0.01 | 0.03 |
| **Total VOC Emissions** | | **0.01** | **0.04** |
| **Total Non VOC & Non TAP-HC** | | 0.00 | 0.00 |
| **Total Emissions** | | 0.01 | 0.04 |

**EPA document 745-R-99-005 entitled "Look-up Tables for Estimating Toxic Release Inventory Air Emissions from Chemical Distribution Facilities" was used for determining the emissions; refer to ensuing pages for copy.*

***HAP-Hazardous/Toxic Air Pollutant (listing taken from LAC 33:III.5112)*

*NOTE: Emission factors for n-Hexane were used since the above solution is not listed in the EPA document and both are believed to have similar evaporation rates.*

| Chemical Material #3: | Asphaltine Inhibitor | | | |
|---|---|---|---|---|
| **CHEMICAL USAGE** | | | **CHEMICAL THROUGHPUT** | |
| **Gallons/Year** | **Hour/Year** | **Specific Gravity** | **Hourly (lb/hr)** | **Annual (TPY)** |
| 3,650.00 | 8,760 | 0.930 | 3.23 | 14.16 |

| ***Emission Factors**** | | | | | |
|---|---|---|---|---|---|
| $A_1$ | $A_2$ | $A_5$ | $A_6$ | *Throughput (lb)* | *City Factor* |
| *34* | *1* | *34* | *1* | *50,000* | *1.40* |

$A_1$ (lb/yr) = 26.95 $A_2$ (lb/yr) = 0.79 $A_5$ (lb/yr) = 26.95 $A_6$ (lb/yr) = 0.79

| | |
|---|---|
| **Total ΣTPY=** | 0.03 |

| **POLLUTANT:**** | **Weight Percent** | **CALCULATED EMISSION RATES** | |
|---|---|---|---|
| | | **Hourly (lb/hr)** | **Annual (TPY)** |
| 1,2,4-Trimethylbenzene | 10.00 | 0.0006 | 0.0028 |
| 1,2,3-Trimethylbenzene | 5.00 | 0.0003 | 0.0014 |
| 1,3,5-Trimethylbenzene | 5.00 | 0.0003 | 0.0014 |
| Light Aromatic Naphtha | 20.00 | 0.0013 | 0.0055 |
| Xylenes (TAP) | 50.00 | 0.0032 | 0.0139 |
| Ethylbenzene (TAP) | 10.00 | 0.0006 | 0.0028 |
| **Total Weight Percent:** | 100.00 | | |
| **Total TAP Emissions** | | 0.00 | 0.00 |
| **Total VOC Emissions** | | **0.01** | **0.03** |
| **Total Non VOC & Non TAP-HC** | | 0.00 | 0.00 |
| **Total Emissions** | | 0.01 | 0.03 |

**EPA document 745-R-99-005 entitled "Look-up Tables for Estimating Toxic Release Inventory Air Emissions from Chemical Distribution Facilities" was used for determining the emissions; refer to ensuing pages for copy.*

***HAP-Hazardous/Toxic Air Pollutant (listing taken from LAC 33:III.5112)*

*NOTE: Emission factors for n-Hexane were used since the above solution is not listed in the EPA document and both are believed to have similar evaporation rates.*

| Chemical Material #4: | Produced Oil | | | |
|---|---|---|---|---|
| **CHEMICAL USAGE** | | | **CHEMICAL THROUGHPUT** | |
| **Gallons/Year** | **Hour/Year** | **Specific Gravity** | **Hourly (lb/hr)** | **Annual (TPY)** |
| 1,533,000 | 8,760 | 1.529 | 2231.58 | 9774.30 |

| ***Emission Factors**** | | | | | |
|---|---|---|---|---|---|
| $A_1$ | $A_2$ | $A_5$ | $A_6$ | *Throughput (lb)* | *City Factor* |
| *6794* | *112* | *2253* | *111* | *10,000,000* | *1.40* |

$A_1$ (lb/yr) = 18593.85 $A_2$ (lb/yr) = 306.52 $A_5$ (lb/yr) = 6,166.02 $A_6$ (lb/yr) = 303.79

| | |
|---|---|
| **Total ΣTPY=** | 12.69 |

| **POLLUTANT:**** | **Weight Percent** | **CALCULATED EMISSION RATES** | |
|---|---|---|---|
| | | **Hourly (lb/hr)** | **Annual (TPY)** |
| Nitrogen | 0.0000 | 0.0000 | 0.0000 |
| Carbon Dioxide | 92.2057 | 2.6704 | 11.6964 |
| Methane (excluded from VOC total) | 0.4437 | 0.0129 | 0.0563 |
| Ethane (excluded from VOC total) | 0.4830 | 0.0140 | 0.0613 |
| Hydrogen Sulfide (excluded from VOC total) | 0.0000 | 0.0000 | 0.0000 |
| Propane | 1.2192 | 0.0353 | 0.1547 |
| Iso-Butane | 0.7063 | 0.0205 | 0.0896 |

| | | | |
|---|---|---|---|
| N-Butane | 1.4841 | 0.0430 | 0.1883 |
| Iso-Pentane | 0.9366 | 0.0271 | 0.1188 |
| N-Pentane | 0.7358 | 0.0213 | 0.0933 |
| Iso-Hexane | 0.6181 | 0.0179 | 0.0784 |
| N-Hexane (TAP) | 0.2797 | 0.0081 | 0.0355 |
| Methylcyclopentane | 0.0000 | 0.0000 | 0.0000 |
| Benzene (TAP) | 0.0595 | 0.0017 | 0.0075 |
| Cyclohexane | 0.1597 | 0.0046 | 0.0203 |
| Heptanes | 0.3974 | 0.0115 | 0.0504 |
| Methylcyclohexane | 0.1143 | 0.0033 | 0.0145 |
| Toluene (TAP) | 0.0110 | 0.0003 | 0.0014 |
| 2,2,4-Trimethylpentane (TAP) | 0.0000 | 0.0000 | 0.0000 |
| Octanes | 0.0828 | 0.0024 | 0.0105 |
| Ethylbenzene (TAP) | 0.0011 | 0.0000 | 0.0001 |
| Xylenes (TAP) | 0.0088 | 0.0003 | 0.0011 |
| Nonanes | 0.0480 | 0.0014 | 0.0061 |
| Decanes Plus | 0.0052 | 0.0001 | 0.0007 |
| **Total Weight Percent:** | 100.000 | | |
| **Total TAP Emissions** | | 0.01 | 0.05 |
| **Total VOC Emissions** | | **0.20** | **0.87** |
| **Total Non VOC & Non TAP-HC** | | 0.03 | 0.12 |
| **Total Emissions** | | 2.90 | 12.69 |

**EPA document 745-R-99-005 entitled "Look-up Tables for Estimating Toxic Release Inventory Air Emissions from Chemical Distribution Facilities" was used for determining the emissions; refer to ensuing pages for copy.*

***HAP-Hazardous/Toxic Air Pollutant (listing taken from LAC 33:III.5112)*

*NOTE: Emission factors for n-Hexane were used since the above solution is not listed in the EPA document and both are believed to have similar evaporation rates.*

| | | | |
|---|---|---|---|
| Uncontrolled VOC Emission Total (TPY) | Storage Vapors + Blending Emissions | = | **5.17** |

DATA:

| | |
|---|---|
| **Emission Source:** | ***Losses When Opening Thief Hatches*** |
| **Specific Gravity of Gas:** | ***1.5347*** |
| **Maximum Thief Hatch Venting (Hrs)** **(Under Normal/Routine Operating Conditions)** | ***30*** |
| **Max. Minutes a Hatch is Opened in a Single Hr:** | ***5*** |
| **Maximum Hourly Emission Rate (lb/hr):** **(from preceding tank emission estimates)** | ***31.92*** |

| | | | | |
|---|---|---|---|---|
| Avg. Hourly Emissions (lb/hr) | = | Total/8760 (hrs) | = | **1.31** |
| Maximum Hourly Emissions (lb/hr) | = | Max. Emission Rate * Max. Minutes/Hr Hatch is Open | = | **31.92** |
| Maximum Total Emissions (Tons) | = | Max. Hourly THC Rate * Hours Hatch is Open | = | **5.74** |

| EMISSION SUMMARY (based on the above referenced flare gas analysis): | | | | |
|---|---|---|---|---|
| **POLLUTANT:** | **Weight Percent** | **CALCULATED EMISSION RATES** | | |
| | | **Average Hourly (lb/hr)** | **Maximum Hourly (lb/hr)** | **Total (Tons)** |
| Nitrogen (excluded from VOC total) | 0.0000 | 0.000 | 0.000 | 0.000 |
| Carbon Dioxide (excluded from VOC total) | 92.2057 | 1.208 | 29.432 | 5.297 |
| Methane (excluded from VOC total) | 0.4437 | 0.006 | 0.142 | 0.025 |
| Ethane (excluded from VOC total) | 0.4830 | 0.006 | 0.154 | 0.028 |
| Hydrogen Sulfide (excluded from VOC total) | 0.0000 | 0.000 | 0.000 | 0.000 |
| Propane | 1.2192 | 0.016 | 0.389 | 0.070 |
| Iso-Butane | 0.7063 | 0.009 | 0.225 | 0.041 |
| N-Butane | 1.4841 | 0.019 | 0.474 | 0.085 |
| Iso-Pentane | 0.9366 | 0.012 | 0.299 | 0.054 |
| N-Pentane | 0.7358 | 0.010 | 0.235 | 0.042 |
| Iso-Hexane | 0.6181 | 0.008 | 0.197 | 0.036 |
| N-Hexane (TAP) | 0.2797 | 0.004 | 0.089 | 0.016 |
| Methylcyclopentane | 0.0000 | 0.000 | 0.000 | 0.000 |
| Benzene (TAP) | 0.0595 | 0.001 | 0.019 | 0.003 |
| Cyclohexane | 0.1597 | 0.002 | 0.051 | 0.009 |
| Heptanes | 0.3974 | 0.005 | 0.127 | 0.023 |
| Methylcyclohexane | 0.1143 | 0.001 | 0.036 | 0.007 |
| Toluene (TAP) | 0.0110 | 0.000 | 0.004 | 0.001 |
| 2,2,4-Trimethylpentane (TAP) | 0.0000 | 0.000 | 0.000 | 0.000 |
| Octanes | 0.0828 | 0.001 | 0.026 | 0.005 |
| Ethylbenzene (TAP) | 0.0011 | 0.000 | 0.000 | 0.000 |
| Xylenes (TAP) | 0.0088 | 0.000 | 0.003 | 0.001 |
| Nonanes | 0.0480 | 0.001 | 0.015 | 0.003 |
| Decanes Plus | 0.0052 | 0.000 | 0.002 | 0.000 |
| Other NM/NE HC | 0.0000 | 0.000 | 0.000 | 0.000 |
| **Total Weight Percent:** | 100.0000 | | | |
| **Total TAP Emissions** | | 0.00 | 0.11 | 0.02 |
| **Total VOC Emissions** | | **0.09** | **2.19** | **0.39** |
| **Total Non VOC & Non TAP-HC** | | 0.01 | 0.30 | 0.05 |
| **Total Emissions** | | 1.31 | 31.92 | 5.74 |

# *Emission Calculations*

*Emission calculations shown below are presented for informational purposes only as vapors from the inhibitor oil tank are routed to the atmospheric control flare (EPN: 25-05-F) for combustion, except during brief intervals when thief hatches are opened for purposes of sampling, gauging, etc.*

**POINT SOURCE I.D. NUMBER:** ***12-05-IOT-V***

**EMISSION SOURCE DESCRIPTION:** ***1500 BBL Inhibitor Oil Tank-Vent (V-133C)***

DATA:

| | |
|---|---|
| **Emission Source:** | ***Crude Oil Storage Vapors ('Working' & 'Standing')*** |
| **Average Daily Oil Throughput:** **(Annual Average; BBLD - $Q_{avg}$)** | ***100*** |
| **Maximum Daily Oil Throughput:** **(BBLD - $Q_{max}$)** | ***300*** |
| **Average VOC Working Losses - $L_w$ (lb/yr):** | ***5,227.298*** |
| **Average VOC Standing Losses - $L_S$ (lb/yr):** | ***2,960.725*** |
| **Basis of Estimates:** | ***AP-42, Chapter 7 (June 2020, Section 7.1.3.1); Refer to supporting documentation for summary*** |

| | | | |
|---|---|---|---|
| Avg. Hourly Uncontrolled THC Losses (lb/hr) | = (Lw + Ls) * 14.5612/8760 | = | **13.61** |
| Max. Hourly Uncontrolled THC Losses (lb/hr) | = (Ls + (Lw * QMax ÷ Qavg)) * 14.5612/8760 | = | **30.99** |
| Annual Potential Uncontrolled THC Losses (TPY) | = Hourly * 8760/2000 | = | **59.61** |

**SPECIATION FACTORS:**

*The composition of this gas is based on an actual analysis of the vapors routed to the control flare and normalized to account for the removal of Nitrogen; refer to Southern Petroleum Laboratories Report No.: 172-24050252-001A in supporting documentation.*

**UNCONTROLLED EMISSIONS SUMMARY:**

| POLLUTANT: | Weight Percent | CALCULATED EMISSION RATES | | |
|---|---|---|---|---|
| | | Average Hourly (lb/hr) | Maximum Hourly (lb/hr) | Annual (TPY) |
| Nitrogen | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Carbon Dioxide | 92.2057 | 12.5496 | 28.5731 | 54.9672 |
| Methane (excluded from VOC total) | 0.4437 | 0.0604 | 0.1375 | 0.2645 |
| Ethane (excluded from VOC total) | 0.4830 | 0.0657 | 0.1497 | 0.2879 |
| Hydrogen Sulfide (excluded from VOC total) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Propane | 1.2192 | 0.1659 | 0.3778 | 0.7268 |
| Iso-Butane | 0.7063 | 0.0961 | 0.2189 | 0.4211 |
| N-Butane | 1.4841 | 0.2020 | 0.4599 | 0.8847 |
| Iso-Pentane | 0.9366 | 0.1275 | 0.2902 | 0.5583 |
| N-Pentane | 0.7358 | 0.1001 | 0.2280 | 0.4386 |

| | | | | |
|---|---|---|---|---|
| Iso-Hexane | 0.6181 | 0.0841 | 0.1915 | 0.3685 |
| N-Hexane (TAP) | 0.2797 | 0.0381 | 0.0867 | 0.1668 |
| Methylcyclopentane | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Benzene (TAP) | 0.0595 | 0.0081 | 0.0184 | 0.0355 |
| Cyclohexane | 0.1597 | 0.0217 | 0.0495 | 0.0952 |
| Heptanes | 0.3974 | 0.0541 | 0.1231 | 0.2369 |
| Methylcyclohexane | 0.1143 | 0.0156 | 0.0354 | 0.0681 |
| Toluene (TAP) | 0.0110 | 0.0015 | 0.0034 | 0.0066 |
| 2,2,4-Trimethylpentane (TAP) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Octanes | 0.0828 | 0.0113 | 0.0257 | 0.0494 |
| Ethylbenzene (TAP) | 0.0011 | 0.0002 | 0.0003 | 0.0007 |
| Xylenes (TAP) | 0.0088 | 0.0012 | 0.0027 | 0.0053 |
| Nonanes | 0.0480 | 0.0065 | 0.0149 | 0.0286 |
| Decanes Plus | 0.0052 | 0.0007 | 0.0016 | 0.0031 |
| **Total Weight Percent:** | 100.000 | | | |
| **Total TAP Emissions** | | 0.05 | 0.11 | 0.21 |
| **Total VOC Emissions** | | **0.93** | **2.13** | **4.09** |
| **Total Non VOC & Non TAP-HC** | | 0.13 | 0.29 | 0.55 |
| **Total Hydrocarbon Emissions** | | 13.61 | 30.99 | 59.61 |

| | |
|---|---|
| *Calculated Avg. Gas Flowrate (SCFH) =* | *12.23* |

The mixing station blends chemicals in various combinations. When the word "solution" is used it is intended to indicate a mixture of various chemicals. Total material use indicated below:

| Chemical Material | Specific Gravity | True Vapor Pressure (psia) | Throughput (gallons/year) |
|---|---|---|---|
| Corrosion Inhibitor | 0.936 | N/A | 18,250.00 |
| Paraffin Inhibitor | 1.48 | N/A | 3,650.00 |
| Asphaltine Inhibitor | 0.93 | N/A | 3,650.00 |
| Produced Oil | 1.529 | 5.37 | 1,533,000 |
| **Total Throughput (gallons/year) =** | | | 1,558,550.00 |

*EPA document 745-R-99-005 entitled "Look-up Tables for Estimating Toxic Release Inventory Air Emissions from Chemical Distribution Facilities" was used for determining the emissions during the mixing process and the emissions from the transfer of product to the final transport container; refer to ensuing pages for copy.*

| Chemical Material #1: | | Corrosion Inhibitor | | | |
|---|---|---|---|---|---|
| CHEMICAL USAGE | | | | CHEMICAL THROUGHPUT | |
| Gallons/Year | | Hour/Year | Specific Gravity | Hourly (lb/hr) | Annual (TPY) |
| 18,250.00 | | 8,760 | 0.936 | 16.26 | 71.23 |
| ***Emission Factors**** | | | | | |
| $A_1$ | $A_2$ | $A_5$ | $A_6$ | *Throughput Factor (lb)* | *City Factor* |
| *170* | *3* | *169* | *3* | *250,000* | *1.40* |
| $A_1$ (lb/yr) = 135.63 | | $A_2$ (lb/yr) = 2.39 | | $A_5$ (lb/yr) = 134.83 | $A_6$ (lb/yr) = 2.39 |
| | | | | **Total ΣTPY=** | 0.14 |

| POLLUTANT:** | Weight Percent | CALCULATED EMISSION RATES | |
|---|---|---|---|
| | | Hourly (lb/hr) | Annual (TPY) |
| 1,2,4-Trimethylbenzene | 10.00 | 0.0031 | 0.0138 |
| 1,2,3-Trimethylbenzene | 5.00 | 0.0016 | 0.0069 |
| 1,3,5-Trimethylbenzene | 5.00 | 0.0016 | 0.0069 |
| Light Aromatic Naphtha | 30.00 | 0.0094 | 0.0413 |
| Methanol (TAP) | 30.00 | 0.0094 | 0.0413 |
| Other VOCs | 20.00 | 0.0063 | 0.0275 |
| **Total Weight Percent:** | 100.00 | | |
| **Total TAP Emissions** | | 0.01 | 0.04 |
| **Total VOC Emissions** | | **0.03** | **0.14** |
| **Total Non VOC & Non TAP-HC** | | 0.00 | 0.00 |
| **Total Emissions** | | 0.03 | 0.14 |

**EPA document 745-R-99-005 entitled "Look-up Tables for Estimating Toxic Release Inventory Air Emissions from Chemical Distribution Facilities" was used for determining the emissions; refer to ensuing pages for copy.*

***HAP-Hazardous/Toxic Air Pollutant (listing taken from LAC 33:III.5112)*

*NOTE: Emission factors for n-Hexane were used since the above solution is not listed in the EPA document and both are believed to have similar evaporation rates.*

| Chemical Material #2: | Paraffin Inhibitor | | | |
|---|---|---|---|---|
| **CHEMICAL USAGE** | | | **CHEMICAL THROUGHPUT** | |
| **Gallons/Year** | **Hour/Year** | **Specific Gravity** | **Hourly (lb/hr)** | **Annual (TPY)** |
| 3,650.00 | 8,760 | 1.48 | 5.14 | 22.53 |

| ***Emission Factors**** | | | | | |
|---|---|---|---|---|---|
| $A_1$ | $A_2$ | $A_5$ | $A_6$ | *Throughput (lb)* | *City Factor* |
| *34* | *1* | *34* | *1* | *50,000* | *1.40* |

$A_1$ (lb/yr) = 42.89 $A_2$ (lb/yr) = 1.26 $A_5$ (lb/yr) = 42.89 $A_6$ (lb/yr) = 1.26

**Total ΣTPY=** 0.04

| **POLLUTANT:**** | **Weight Percent** | **CALCULATED EMISSION RATES** | |
|---|---|---|---|
| | | **Hourly (lb/hr)** | **Annual (TPY)** |
| 1,2,4-Trimethylbenzene | 10.00 | 0.0010 | 0.0044 |
| 1,2,3-Trimethylbenzene | 5.00 | 0.0005 | 0.0022 |
| 1,3,5-Trimethylbenzene | 5.00 | 0.0005 | 0.0022 |
| Light Aromatic Naphtha | 20.00 | 0.0020 | 0.0088 |
| Xylenes (TAP) | 50.00 | 0.0050 | 0.0221 |
| Ethylbenzene (TAP) | 10.00 | 0.0010 | 0.0044 |
| **Total Weight Percent:** | 100.00 | | |
| **Total TAP Emissions** | | 0.01 | 0.03 |
| **Total VOC Emissions** | | **0.01** | **0.04** |
| **Total Non VOC & Non TAP-HC** | | 0.00 | 0.00 |
| **Total Emissions** | | 0.01 | 0.04 |

**EPA document 745-R-99-005 entitled "Look-up Tables for Estimating Toxic Release Inventory Air Emissions from Chemical Distribution Facilities" was used for determining the emissions; refer to ensuing pages for copy.*

***HAP-Hazardous/Toxic Air Pollutant (listing taken from LAC 33:III.5112)*

*NOTE: Emission factors for n-Hexane were used since the above solution is not listed in the EPA document and both are believed to have similar evaporation rates.*

| Chemical Material #3: | Asphaltine Inhibitor | | | |
|---|---|---|---|---|
| **CHEMICAL USAGE** | | | **CHEMICAL THROUGHPUT** | |
| **Gallons/Year** | **Hour/Year** | **Specific Gravity** | **Hourly (lb/hr)** | **Annual (TPY)** |
| 3,650.00 | 8,760 | 0.930 | 3.23 | 14.16 |

| ***Emission Factors**** | | | | | |
|---|---|---|---|---|---|
| $A_1$ | $A_2$ | $A_5$ | $A_6$ | *Throughput (lb)* | *City Factor* |
| *34* | *1* | *34* | *1* | *50,000* | *1.40* |

$A_1$ (lb/yr) = 26.95 $A_2$ (lb/yr) = 0.79 $A_5$ (lb/yr) = 26.95 $A_6$ (lb/yr) = 0.79

**Total ΣTPY=** 0.03

| **POLLUTANT:**** | **Weight Percent** | **CALCULATED EMISSION RATES** | |
|---|---|---|---|
| | | **Hourly (lb/hr)** | **Annual (TPY)** |
| 1,2,4-Trimethylbenzene | 10.00 | 0.0006 | 0.0028 |
| 1,2,3-Trimethylbenzene | 5.00 | 0.0003 | 0.0014 |
| 1,3,5-Trimethylbenzene | 5.00 | 0.0003 | 0.0014 |
| Light Aromatic Naphtha | 20.00 | 0.0013 | 0.0055 |
| Xylenes (TAP) | 50.00 | 0.0032 | 0.0139 |
| Ethylbenzene (TAP) | 10.00 | 0.0006 | 0.0028 |
| **Total Weight Percent:** | 100.00 | | |
| **Total TAP Emissions** | | 0.00 | 0.00 |
| **Total VOC Emissions** | | **0.01** | **0.03** |
| **Total Non VOC & Non TAP-HC** | | 0.00 | 0.00 |
| **Total Emissions** | | 0.01 | 0.03 |

**EPA document 745-R-99-005 entitled "Look-up Tables for Estimating Toxic Release Inventory Air Emissions from Chemical Distribution Facilities" was used for determining the emissions; refer to ensuing pages for copy.*

***HAP-Hazardous/Toxic Air Pollutant (listing taken from LAC 33:III.5112)*

*NOTE: Emission factors for n-Hexane were used since the above solution is not listed in the EPA document and both are believed to have similar evaporation rates.*

| Chemical Material #4: | Produced Oil | | | |
|---|---|---|---|---|
| **CHEMICAL USAGE** | | | **CHEMICAL THROUGHPUT** | |
| **Gallons/Year** | **Hour/Year** | **Specific Gravity** | **Hourly (lb/hr)** | **Annual (TPY)** |
| 1,533,000 | 8,760 | 1.529 | 2231.58 | 9774.30 |

| ***Emission Factors**** | | | | | |
|---|---|---|---|---|---|
| $A_1$ | $A_2$ | $A_5$ | $A_6$ | *Throughput (lb)* | *City Factor* |
| *6794* | *112* | *2253* | *111* | *10,000,000* | *1.40* |

$A_1$ (lb/yr) = 18593.85 $A_2$ (lb/yr) = 306.52 $A_5$ (lb/yr) = 6,166.02 $A_6$ (lb/yr) = 303.79

**Total ΣTPY=** 12.69

| **POLLUTANT:**** | **Weight Percent** | **CALCULATED EMISSION RATES** | |
|---|---|---|---|
| | | **Hourly (lb/hr)** | **Annual (TPY)** |
| Nitrogen | 0.0000 | 0.0000 | 0.0000 |
| Carbon Dioxide | 92.2057 | 2.6704 | 11.6964 |
| Methane (excluded from VOC total) | 0.4437 | 0.0129 | 0.0563 |
| Ethane (excluded from VOC total) | 0.4830 | 0.0140 | 0.0613 |
| Hydrogen Sulfide (excluded from VOC total) | 0.0000 | 0.0000 | 0.0000 |
| Propane | 1.2192 | 0.0353 | 0.1547 |
| Iso-Butane | 0.7063 | 0.0205 | 0.0896 |

| | | | |
|---|---|---|---|
| N-Butane | 1.4841 | 0.0430 | 0.1883 |
| Iso-Pentane | 0.9366 | 0.0271 | 0.1188 |
| N-Pentane | 0.7358 | 0.0213 | 0.0933 |
| Iso-Hexane | 0.6181 | 0.0179 | 0.0784 |
| N-Hexane (TAP) | 0.2797 | 0.0081 | 0.0355 |
| Methylcyclopentane | 0.0000 | 0.0000 | 0.0000 |
| Benzene (TAP) | 0.0595 | 0.0017 | 0.0075 |
| Cyclohexane | 0.1597 | 0.0046 | 0.0203 |
| Heptanes | 0.3974 | 0.0115 | 0.0504 |
| Methylcyclohexane | 0.1143 | 0.0033 | 0.0145 |
| Toluene (TAP) | 0.0110 | 0.0003 | 0.0014 |
| 2,2,4-Trimethylpentane (TAP) | 0.0000 | 0.0000 | 0.0000 |
| Octanes | 0.0828 | 0.0024 | 0.0105 |
| Ethylbenzene (TAP) | 0.0011 | 0.0000 | 0.0001 |
| Xylenes (TAP) | 0.0088 | 0.0003 | 0.0011 |
| Nonanes | 0.0480 | 0.0014 | 0.0061 |
| Decanes Plus | 0.0052 | 0.0001 | 0.0007 |
| **Total Weight Percent:** | 100.000 | | |
| **Total TAP Emissions** | | 0.01 | 0.05 |
| **Total VOC Emissions** | | **0.20** | **0.87** |
| **Total Non VOC & Non TAP-HC** | | 0.03 | 0.12 |
| **Total Emissions** | | 2.90 | 12.69 |

**EPA document 745-R-99-005 entitled "Look-up Tables for Estimating Toxic Release Inventory Air Emissions from Chemical Distribution Facilities" was used for determining the emissions; refer to ensuing pages for copy.*

***HAP-Hazardous/Toxic Air Pollutant (listing taken from LAC 33:III.5112)*

*NOTE: Emission factors for n-Hexane were used since the above solution is not listed in the EPA document and both are believed to have similar evaporation rates.*

| | | | |
|---|---|---|---|
| Uncontrolled VOC Emission Total (TPY) | Storage Vapors + Blending Emissions | = | **5.17** |

DATA:

| | |
|---|---|
| **Emission Source:** | ***Losses When Opening Thief Hatches*** |
| **Specific Gravity of Gas:** | ***1.5347*** |
| **Maximum Thief Hatch Venting (Hrs)** **(Under Normal/Routine Operating Conditions)** | ***30*** |
| **Max. Minutes a Hatch is Opened in a Single Hr:** | ***5*** |
| **Maximum Hourly Emission Rate (lb/hr):** **(from preceding tank emission estimates)** | ***31.92*** |

| | | | | |
|---|---|---|---|---|
| Avg. Hourly Emissions (lb/hr) | = | Total/8760 (hrs) | = | **1.31** |
| Maximum Hourly Emissions (lb/hr) | = | Max. Emission Rate * Max. Minutes/Hr Hatch is Open | = | **31.92** |
| Maximum Total Emissions (Tons) | = | Max. Hourly THC Rate * Hours Hatch is Open | = | **5.74** |

| EMISSION SUMMARY (based on the above referenced flare gas analysis): | | | | |
|---|---|---|---|---|
| **POLLUTANT:** | **Weight Percent** | **CALCULATED EMISSION RATES** | | |
| | | **Average Hourly (lb/hr)** | **Maximum Hourly (lb/hr)** | **Total (Tons)** |
| Nitrogen (excluded from VOC total) | 0.0000 | 0.000 | 0.000 | 0.000 |
| Carbon Dioxide (excluded from VOC total) | 92.2057 | 1.208 | 29.432 | 5.297 |
| Methane (excluded from VOC total) | 0.4437 | 0.006 | 0.142 | 0.025 |
| Ethane (excluded from VOC total) | 0.4830 | 0.006 | 0.154 | 0.028 |
| Hydrogen Sulfide (excluded from VOC total) | 0.0000 | 0.000 | 0.000 | 0.000 |
| Propane | 1.2192 | 0.016 | 0.389 | 0.070 |
| Iso-Butane | 0.7063 | 0.009 | 0.225 | 0.041 |
| N-Butane | 1.4841 | 0.019 | 0.474 | 0.085 |
| Iso-Pentane | 0.9366 | 0.012 | 0.299 | 0.054 |
| N-Pentane | 0.7358 | 0.010 | 0.235 | 0.042 |
| Iso-Hexane | 0.6181 | 0.008 | 0.197 | 0.036 |
| N-Hexane (TAP) | 0.2797 | 0.004 | 0.089 | 0.016 |
| Methylcyclopentane | 0.0000 | 0.000 | 0.000 | 0.000 |
| Benzene (TAP) | 0.0595 | 0.001 | 0.019 | 0.003 |
| Cyclohexane | 0.1597 | 0.002 | 0.051 | 0.009 |
| Heptanes | 0.3974 | 0.005 | 0.127 | 0.023 |
| Methylcyclohexane | 0.1143 | 0.001 | 0.036 | 0.007 |
| Toluene (TAP) | 0.0110 | 0.000 | 0.004 | 0.001 |
| 2,2,4-Trimethylpentane (TAP) | 0.0000 | 0.000 | 0.000 | 0.000 |
| Octanes | 0.0828 | 0.001 | 0.026 | 0.005 |
| Ethylbenzene (TAP) | 0.0011 | 0.000 | 0.000 | 0.000 |
| Xylenes (TAP) | 0.0088 | 0.000 | 0.003 | 0.001 |
| Nonanes | 0.0480 | 0.001 | 0.015 | 0.003 |
| Decanes Plus | 0.0052 | 0.000 | 0.002 | 0.000 |
| Other NM/NE HC | 0.0000 | 0.000 | 0.000 | 0.000 |
| **Total Weight Percent:** | 100.0000 | | | |
| **Total TAP Emissions** | | 0.00 | 0.11 | 0.02 |
| **Total VOC Emissions** | | **0.09** | **2.19** | **0.39** |
| **Total Non VOC & Non TAP-HC** | | 0.01 | 0.30 | 0.05 |
| **Total Emissions** | | 1.31 | 31.92 | 5.74 |

# *Emission Calculations*

**POINT SOURCE I.D. NUMBER:** ***13-05-ITT-V***

**EMISSION SOURCE DESCRIPTION:** ***500 Gallon Inhibitor Transfer Tank (V-134A)***

DATA:

| | | | |
|---|---|---|---|
| **Emission Source:** | ***"Working" & "Standing" Losses*** | | |
| **Maximum Annual Throughput:** **(Gallons/Yr)** | ***5,000*** | | |
| **Average VOC Working Losses - $L_W$ (lb/yr):** | ***26.018*** | | |
| **Average VOC Standing Losses - $L_S$ (lb/yr):** | ***82.929*** | | |
| **Basis of Estimates:** | ***AP-42, Chapter 7 (June 2020, Section 7.1.3.1); Refer to supporting documentation for summary*** | | |
| Avg. Hourly Uncontrolled THC Losses (lb/hr) | = (Lw + Ls) / 8760 | = | **0.01** |
| Annual Potential Uncontrolled THC Losses (TPY) | = Hourly * 8760/2000 | = | **0.05** |

*For purposes of permitting and/or providing conservative emission estimates, emissions were calculated using N-Hexane as the stored material for this tank. A throughput of approximately 5,000 gallons/yr was used in the emissions model in an effort to demonstrate a conservative potential emissions estimate.*

# *Emission Calculations*

**POINT SOURCE I.D. NUMBER:** ***14-05-ITT-V***

**EMISSION SOURCE DESCRIPTION:** ***500 Gallon Inhibitor Transfer Tank (V-134B)***

DATA:

| | | | |
|---|---|---|---|
| **Emission Source:** | ***"Working" & "Standing" Losses*** | | |
| **Maximum Annual Throughput:** **(Gallons/Yr)** | ***5,000*** | | |
| **Average VOC Working Losses - $L_W$ (lb/yr):** | ***26.018*** | | |
| **Average VOC Standing Losses - $L_S$ (lb/yr):** | ***82.929*** | | |
| **Basis of Estimates:** | ***AP-42, Chapter 7 (June 2020, Section 7.1.3.1); Refer to supporting documentation for summary*** | | |
| Avg. Hourly Uncontrolled THC Losses (lb/hr) | = (Lw + Ls) / 8760 | = | **0.01** |
| Annual Potential Uncontrolled THC Losses (TPY) | = Hourly * 8760/2000 | = | **0.05** |

*For purposes of permitting and/or providing conservative emission estimates, emissions were calculated using N-Hexane as the stored material for this tank. A throughput of approximately 5,000 gallons/yr was used in the emissions model in an effort to demonstrate a conservative potential emissions estimate.*

# *Emission Calculations*

**POINT SOURCE I.D. NUMBER:** ***15-05-ITT-V***

**EMISSION SOURCE DESCRIPTION:** ***2000 Gallon Inhibitor Transfer Tank (V-134C)***

DATA:

| | | | |
|---|---|---|---|
| **Emission Source:** | ***"Working" & "Standing" Losses*** | | |
| **Maximum Annual Throughput:** **(Gallons/Yr)** | ***20,000*** | | |
| **Average VOC Working Losses - $L_W$ (lb/yr):** | ***105.148*** | | |
| **Average VOC Standing Losses - $L_S$ (lb/yr):** | ***307.674*** | | |
| **Basis of Estimates:** | ***AP-42, Chapter 7 (June 2020, Section 7.1.3.1); Refer to supporting documentation for summary*** | | |
| Avg. Hourly Uncontrolled THC Losses (lb/hr) | = (Lw + Ls) / 8760 | = | **0.05** |
| Annual Potential Uncontrolled THC Losses (TPY) | = Hourly * 8760/2000 | = | **0.21** |

*For purposes of permitting and/or providing conservative emission estimates, emissions were calculated using N-Hexane as the stored material for this tank. A throughput of approximately 20,000 gallons/yr was used in the emissions model in an effort to demonstrate a conservative potential emissions estimate.*

# *Emission Calculations*

**POINT SOURCE I.D. NUMBER:** ***17-05-GST***

**EMISSION SOURCE DESCRIPTION:** ***100 BBL Glycol Storage Tank (V-137)***

DATA:

| | | | |
|---|---|---|---|
| **Emission Source:** | ***"Working" & "Standing" Losses*** | | |
| **Maximum Annual Throughput:** **(BBL/Yr)** | ***1,000*** | | |
| **Average VOC Working Losses - $L_W$ (lb/yr):** | ***43.619*** | | |
| **Average VOC Standing Losses - $L_S$ (lb/yr):** | ***88.729*** | | |
| **Basis of Estimates:** | ***AP-42, Chapter 7 (June 2020, Section 7.1.3.1); Refer to supporting documentation for summary*** | | |
| Avg. Hourly Uncontrolled THC Losses (lb/hr) | = (Lw + Ls) / 8760 | = | **0.02** |
| Annual Potential Uncontrolled THC Losses (TPY) | = Hourly * 8760/2000 | = | **0.07** |

*For purposes of permitting and/or providing conservative emission estimates, emissions were calculated using Toluene as the stored material for this tank. A throughput of approximately 1,000 BBL/yr was used in the emissions model in an effort to demonstrate a conservative potential emissions estimate.*

# *Emission Calculations*

**POINT SOURCE I.D. NUMBER:** ***19-05-SUMP***

**EMISSION SOURCE DESCRIPTION:** ***Drainage Sump (SP-141)***

DATA:

| | | | |
|---|---|---|---|
| **Emission Source:** | ***"Working" & "Standing" Losses*** | | |
| **Maximum Annual Throughput:** **(BBL/Yr)** | ***20*** | | |
| **Average VOC Working Losses - $L_W$ (lb/yr):** | ***2.919*** | | |
| **Average VOC Standing Losses - $L_S$ (lb/yr):** | ***1,004.943*** | | |
| **Basis of Estimates:** | ***AP-42, Chapter 7 (June 2020, Section 7.1.3.1); Refer to supporting documentation for summary*** | | |
| Avg. Hourly Uncontrolled THC Losses (lb/hr) | = (Lw + Ls) / 8760 | = | **0.12** |
| Annual Potential Uncontrolled THC Losses (TPY) | = Hourly * 8760/2000 | = | **0.50** |

*For purposes of permitting and/or providing conservative emission estimates, emissions were calculated using Crude Oil as the stored material for this tank. A throughput of approximately 20 BBL/yr was used in the emissions model in an effort to demonstrate a conservative potential emissions estimate.*

# *Emission Calculations*

**POINT SOURCE I.D. NUMBER:** ***20-05-SUMP***

**EMISSION SOURCE DESCRIPTION:** ***Compressor Building Sump (SP-142)***

DATA:

| | | | |
|---|---|---|---|
| **Emission Source:** | ***"Working" & "Standing" Losses*** | | |
| **Maximum Annual Throughput:** **(BBL/Yr)** | ***20*** | | |
| **Average VOC Working Losses - $L_W$ (lb/yr):** | ***2.919*** | | |
| **Average VOC Standing Losses - $L_S$ (lb/yr):** | ***1,004.943*** | | |
| **Basis of Estimates:** | ***AP-42, Chapter 7 (June 2020, Section 7.1.3.1); Refer to supporting documentation for summary*** | | |
| Avg. Hourly Uncontrolled THC Losses (lb/hr) | = (Lw + Ls) / 8760 | = | **0.12** |
| Annual Potential Uncontrolled THC Losses (TPY) | = Hourly * 8760/2000 | = | **0.50** |

*For purposes of permitting and/or providing conservative emission estimates, emissions were calculated using Crude Oil as the stored material for this tank. A throughput of approximately 20 BBL/yr was used in the emissions model in an effort to demonstrate a conservative potential emissions estimate.*

# *Emission Calculations*

*This is a sample calculation for EPNs: 21-05-ST through 23-05-ST.*

**POINT SOURCE I.D. NUMBER:** ***"See Above"***

**EMISSION SOURCE DESCRIPTION:** ***Chemical Storage Tank***

DATA:

| | | | |
|---|---|---|---|
| **Emission Source:** | ***"Working" & "Standing" Losses*** | | |
| **Maximum Annual Throughput:** **(BBL/Yr/Tank)** | ***36*** | | |
| **Average VOC Working Losses - $L_W$ (lb/yr):** | ***7.854*** | | |
| **Average VOC Standing Losses - $L_S$ (lb/yr):** | ***39.906*** | | |
| **Basis of Estimates:** | ***AP-42, Chapter 7 (June 2020, Section 7.1.3.1); Refer to supporting documentation for summary*** | | |
| Avg. Hourly Uncontrolled THC Losses (lb/hr) | = (Lw + Ls) / 8760 | = | **0.01** |
| Annual Potential Uncontrolled THC Losses (TPY) | = Hourly * 8760/2000 | = | **0.02** |

*For purposes of permitting and/or providing conservative emission estimates, emissions were calculated using N-Hexane as the stored material for this tank. A throughput of approximately 36 BBL/yr was used in the emissions model in an effort to demonstrate a conservative potential emissions estimate.*

# *Emission Calculations*

**POINT SOURCE I.D. NUMBERS:** ***24-05-FE***

**EMISSION SOURCE DESCRIPTION:** ***Fugitive Emissions***

DATA:

| | |
|---|---|
| **Emission Source:** | ***Fugitive from Light Liquid & Gas-Service Components*** |
| **Basis of Emission Estimates:** | ***U.S. EPA*** |

**EMISSION CALCULATIONS:**

| | Count - by Service | | | THC Emission Factors [c] (kg/hr/source) | | Calculated THC Emissions | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Hourly Emissions (lb/hr) | | Annual Emissions (TPY) | |
| | Lt. Liquid | Gas | Total | Lt. Liquid Service | Gas Service | LL | Gas | LL | Gas |
| **Connectors** | 88 | 2,137 | 2225 | 2.1E-04 | 2.0E-04 | 0.041 | 0.942 | 0.18 | 4.13 |
| **Flanges** | 104 | 0 | 104 | 1.1E-04 | 3.9E-04 | 0.025 | 0.000 | 0.11 | 0.00 |
| **Open Ends** | 0 | 66 | 66 | 1.4E-03 | 2.0E-03 | 0.000 | 0.291 | 0.00 | 1.27 |
| **Pumps[a]** | 20 | | 20 | 1.3E-02 | 2.4E-03 | 0.573 | N/A | 2.51 | N/A |
| **Valves** | 54 | 740 | 794 | 2.5E-03 | 4.5E-03 | 0.298 | 7.341 | 1.30 | 32.16 |
| **"Others"[b]** | 0 | 43 | 43 | 7.5E-03 | 8.8E-03 | 0.000 | 0.834 | 0.00 | 3.65 |
| **TOTALS:** | **266** | **2,986** | **3,252** | | | **0.94** | **9.41** | **4.10** | **41.21** |

[a] Process Pumps Only

[b] "Others" equipment derived from compressors, diaphragms, drains, dump arms, hatches, instruments, meters, pressure relief valves, polished rods, relief valves, and vents

[c] Refer to EPA Publication No. 453/R-95-017, "Protocol for Equipment Leak Emission Estimates", copy included in supporting documentation

**LIGHT LIQUID-SERVICE SPECIATION FACTORS:**

*Speciation of the emission stream from components in light liquid service was taken from EPA Publication No.: 453/R-95-017; "Protocol for Equipment Leak Emission Estimates".*

**EMISSIONS SUMMARY:**

| Component | Weight Percent | Calculated Emission Rate | |
|---|---|---|---|
| | | Avg. Hourly (lb/hr) | Avg. Annual (TPY) |
| Hydrogen Sulfide (TAP; excluded from VOC total) | 0.0 | 0.0000 | 0.0000 |
| NMEHC (expressed as VOC) | 29.2 | 0.2735 | 1.1981 |
| Benzene (TAP) | 0.027 | 0.0003 | 0.0011 |
| Ethylbenzene (TAP) | 0.0170 | 0.0002 | 0.0007 |

| | | | |
|---|---|---|---|
| Toluene (TAP) | 0.075 | 0.0007 | 0.0031 |
| Xylenes (m,p,o) (TAP) | 0.036 | 0.0003 | 0.0015 |
| | **TOTAL TAP EMISSIONS:** | 0.00 | 0.01 |
| | **TOTAL VOC EMISSIONS:** | **0.27** | **1.20** |

**GAS SERVICE SPECIATION FACTORS:**

*Speciation of the emission stream from components in gas service is based on an actual inlet gas analysis; refer to Southern Petroleum Laboratories Report No.: 172-23080191-003A in supporting documentation.*

**EMISSIONS SUMMARY:**

| Component | Weight Percent | Calculated Emission Rate | |
|---|---|---|---|
| | | Avg. Hourly (lb/hr) | Avg. Annual (TPY) |
| Nitrogen (excluded from VOC total) | 0.3299 | 0.0310 | 0.1360 |
| Carbon Dioxide (excluded from VOC total) | 94.5515 | 8.8963 | 38.9658 |
| Methane (excluded from VOC total) | 3.4498 | 0.3246 | 1.4217 |
| Ethane (excluded from VOC total) | 0.3596 | 0.0338 | 0.1482 |
| Hydrogen Sulfide (TAP; excluded from VOC total) | 0.0000 | 0.0000 | 0.0000 |
| Propane | 0.2902 | 0.0273 | 0.1196 |
| Iso-Butane | 0.0904 | 0.0085 | 0.0373 |
| N-Butane | 0.1919 | 0.0181 | 0.0791 |
| Iso-Pentane | 0.1130 | 0.0106 | 0.0466 |
| N-Pentane | 0.0925 | 0.0087 | 0.0381 |
| Iso-Hexanes | 0.0834 | 0.0078 | 0.0344 |
| N-Hexane (TAP) | 0.0427 | 0.0040 | 0.0176 |
| Methylcyclopentane | 0.0000 | 0.0000 | 0.0000 |
| Benzene (TAP) | 0.0124 | 0.0012 | 0.0051 |
| Cyclohexane | 0.0296 | 0.0028 | 0.0122 |
| Heptanes | 0.0844 | 0.0079 | 0.0348 |
| Methylcyclohexane | 0.0442 | 0.0042 | 0.0182 |
| Toluene (TAP) | 0.0080 | 0.0008 | 0.0033 |
| 2,2,4-Trimethylpentane (TAP) | 0.0000 | 0.0000 | 0.0000 |
| Octanes | 0.0602 | 0.0057 | 0.0248 |
| Ethylbenzene (TAP) | 0.0015 | 0.0001 | 0.0006 |
| Xylenes (TAP) | 0.0212 | 0.0020 | 0.0087 |
| Nonanes | 0.0799 | 0.0075 | 0.0329 |
| Decanes Plus | 0.0637 | 0.0060 | 0.0263 |
| **TOTAL WEIGHT PERCENT:** | 100.0000 | | |
| | **TOTAL TAP EMISSIONS:** | 0.01 | 0.04 |
| | **TOTAL VOC EMISSIONS:** | **0.12** | **0.54** |
| | **TOTAL Non-VOC & Non-TAP HC:** | 0.36 | 1.57 |
| | **TOTAL Emissions:** | 9.41 | 41.21 |

| | | | |
|---|---|---|---|
| Facility-Wide VOC Fugitive Totals | = | **0.39 lb/hr** | **1.74 TPY** |

# *Emission Calculations*

**POINT SOURCE I.D. NUMBER:** ***25-05-F***

**EMISSION SOURCE DESCRIPTION:** ***Atmospheric Control Flare (ZZZ-180A)***

DATA:

| | |
|---|---|
| **Emission Source:** | ***Unburned Hydrocarbons and Products of Combustion*** |
| **Atmospheric Gas Streams:** | |
| **Gas Stream #1:** | ***Storage Tank Vapors*** |
| **Gas Heat of Combustion (BTU/Ft$^3$-actual flare gas analysis):** | ***195*** |
| **Assist Gas Feed:** | ***Yes*** |
| **Gas Heat of Combustion (BTU/Ft$^3$-actual fuel gas analysis):** | ***1044*** |
| **Purge Gas Feed:** | ***Yes*** |
| **Gas Heat of Combustion (BTU/Ft$^3$-actual fuel gas analysis):** | ***1044*** |
| **Pilot Gas Feed:** | ***Yes*** |
| **Gas Heat of Combustion (BTU/Ft$^3$-actual fuel gas analysis):** | ***1044*** |
| **Combustion Efficiency:** | ***98% for all other HC*** |

**Gas Stream #1 - Storage Tank Vapors**

*Gas volume estimates are supported by the calculations associated with EPNs: 5-05-OST-V through 7b-05-ST-CV & 10-05-IOT-V through 12-05-IOT-V and are outlined below:*

**INPUT**

| *Maximum Gas Flowrate (scf/hr)* | *Operating Time (hrs/year)* | *Burn Efficiency (%)* | *Gas Heat of Combustion (BTU/FT$^3$)* | *Specific Gravity of Gas* |
|---|---|---|---|---|
| *3,306.09* | *8760* | *98* | *195* | *1.5347* |

**CALCULATIONS**

| | | | | | | |
|---|---|---|---|---|---|---|
| *Gas Combusted (annual hourly average)* | = | *gas rate (scf/hr)* | *x* | *efficiency* | *x* | *usage (hrs/yr)* |
| | = | *3,306.09* | *x* | *0.98* | *x* | *8,760* |
| | = | ***28,382,121 scf/yr*** | | = | ***3,239.97 SCF/hr*** | |
| *Heat Content (annual hourly average)* | = | *gas rate (scf/yr)* | *x* | *gas heat of combustion (BTU/scf)* | | |
| | = | *28,382,121* | *x* | *195* | | |
| | = | | | ***0.6318 MMBTU/Hr*** | | |
| *Uncontrolled Max. Hourly Emissions (lbs/hr)* | = | *gas specific gravity* | *x* | *density of air (lb/SCF)* | *x* | *Maximum Gas Rate (SCF/Hr)* |
| | = | *1.5347* | *x* | *0.0764* | *x* | *3,306.09* |
| | = | ***387.64 lbs/hr*** | | | | |
| *Uncontrolled Annual Emissions (TPY)* | = | *gas specific gravity* | *x* | *density of air (tons/SCF)* | *x* | *Total Gas Rate (SCF/Yr)* |
| | = | *1.5347* | *x* | *0.0000382* | *x* | *28,961,348* |
| | = | ***1,697.87 TPY*** | | | | |

**SPECIATION FACTORS:**

*Speciation of the flash gas mixture is based on an actual analysis of the vapors routed to the control flare and normalized to account for the removal of Nitrogen; refer to Southern Petroleum Laboratories Report No.: 172-24050252-001A in supporting documentation.*

**EMISSIONS SUMMARY:**

| POLLUTANT: | Weight Percent | CALCULATED EMISSION RATES | | |
|---|---|---|---|---|
| | | Average Hourly (lb/hr) | Maximum Hourly (lb/hr) | Annual (TPY) |
| Nitrogen (excluded from VOC total) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Carbon Dioxide (excluded from VOC total) | 92.2057 | 357.4285 | 357.4285 | 1565.5368 |
| Methane (excluded from VOC total) | 0.4437 | 0.0344 | 0.0344 | 0.1507 |
| Ethane (excluded from VOC total) | 0.4830 | 0.0374 | 0.0374 | 0.1640 |
| Hydrogen Sulfide (TAP; excluded from VOC total) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Propane | 1.2192 | 0.0945 | 0.0945 | 0.4140 |
| Iso-Butane | 0.7063 | 0.0548 | 0.0548 | 0.2398 |
| N-Butane | 1.4841 | 0.1151 | 0.1151 | 0.5040 |
| Iso-Pentane | 0.9366 | 0.0726 | 0.0726 | 0.3180 |
| N-Pentane | 0.7358 | 0.0570 | 0.0570 | 0.2498 |
| Iso-Hexanes | 0.6181 | 0.0479 | 0.0479 | 0.2099 |
| N-Hexane (TAP) | 0.2797 | 0.0217 | 0.0217 | 0.0950 |
| Methylcyclopentane | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Benzene (TAP) | 0.0595 | 0.0046 | 0.0046 | 0.0202 |
| Cyclohexane | 0.1597 | 0.0124 | 0.0124 | 0.0542 |
| Heptanes | 0.3974 | 0.0308 | 0.0308 | 0.1349 |
| Methylcyclohexane | 0.1143 | 0.0089 | 0.0089 | 0.0388 |
| Toluene (TAP) | 0.0110 | 0.0009 | 0.0009 | 0.0037 |
| 2,2,4-Trimethylpentane (TAP) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Octanes | 0.0828 | 0.0064 | 0.0064 | 0.0281 |
| Ethylbenzene (TAP) | 0.0011 | 0.0001 | 0.0001 | 0.0004 |
| Xylenes (TAP) | 0.0088 | 0.0007 | 0.0007 | 0.0030 |
| Nonanes | 0.0480 | 0.0037 | 0.0037 | 0.0163 |
| Decanes Plus | 0.0052 | 0.0004 | 0.0004 | 0.0018 |
| Other NM/NE HC | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| **TOTAL WEIGHT PERCENT:** | 100.0000 | | | |
| **TOTAL TAP EMISSIONS:** | | 0.03 | 0.03 | 0.12 |
| **TOTAL VOC EMISSIONS:** | | **0.53** | **0.53** | **2.33** |
| **TOTAL Non-VOC & Non-TAP HC:** | | 0.07 | 0.07 | 0.31 |
| **TOTAL EMISSIONS:** | | 358.03 | 358.03 | 1568.18 |

**Assist Gas (maximum gas flowrate based on conservative estimate):**

| INPUT | | | | |
|---|---|---|---|---|
| *Maximum Gas Flowrate (scf/hr)* | *Operating Time (hrs/year)* | *Burn Efficiency (%)* | *Gas Heat of Combustion ($BTU/FT^3$)* | *Specific Gravity of Gas* |
| *150.00* | *8760* | *98* | *1044* | *0.5877* |

| CALCULATIONS | | | | | | |
|---|---|---|---|---|---|---|
| *Gas Combusted (annual hourly average)* | = | *gas rate (scf/hr)* | *x* | *efficiency* | *x* | *usage (hrs/yr)* |
| | = | *150.00* | *x* | *0.98* | *x* | *8,760* |
| | = | ***1,287,720*** | ***scf/yr*** | = | ***147.00*** | ***SCF/hr*** |
| *Heat Content (annual hourly average)* | = | *gas rate (scf/yr)* | *x* | *gas heat of combustion (BTU/scf)* | | |
| | = | *1,287,720* | *x* | *1044* | | |
| | = | | | | ***0.1535*** | ***MMBTU/Hr*** |
| *Uncontrolled Max. Hourly Emissions (lbs/hr)* | = | *gas specific gravity* | *x* | *density of air (lb/SCF)* | *x* | *Maximum Gas Rate (SCF/Hr)* |
| | = | *0.5877* | *x* | *0.0764* | *x* | *150.00* |
| | = | ***6.74*** | ***lbs/hr*** | | | |
| *Uncontrolled Annual Emissions (TPY)* | = | *gas specific gravity* | *x* | *density of air (tons/SCF)* | *x* | *Total Gas Rate (SCF/Yr)* |
| | = | *0.5877* | *x* | *0.0000382* | *x* | *1,314,000* |
| | = | ***29.50*** | ***TPY*** | | | |

**SPECIATION FACTORS:**

*Speciation of the assist gas is based on an actual fuel gas analysis; refer to Southern Petroleum Laboratories Report No.: 2030-16080189-001A in supporting documentation.*

**EMISSIONS SUMMARY:**

| POLLUTANT: | Weight Percent | CALCULATED EMISSION RATES | | |
|---|---|---|---|---|
| | | Average Hourly (lb/hr) | Maximum Hourly (lb/hr) | Annual (TPY) |
| Nitrogen (excluded from VOC total) | 2.501 | 0.1684 | 0.1684 | 0.7378 |
| Carbon Dioxide (excluded from VOC total) | 1.707 | 0.1150 | 0.1150 | 0.5036 |
| Methane (excluded from VOC total) | 91.034 | 0.1226 | 0.1226 | 0.5371 |
| Ethane (excluded from VOC total) | 0.887 | 0.0012 | 0.0012 | 0.0052 |
| Hydrogen Sulfide (TAP; excluded from VOC total) | 0.000 | 0.0000 | 0.0000 | 0.0000 |
| Propane | 0.529 | 0.0007 | 0.0007 | 0.0031 |
| Iso-Butane | 0.287 | 0.0004 | 0.0004 | 0.0017 |
| N-Butane | 0.390 | 0.0005 | 0.0005 | 0.0023 |
| Iso-Pentane | 0.365 | 0.0005 | 0.0005 | 0.0022 |
| N-Pentane | 0.344 | 0.0005 | 0.0005 | 0.0020 |
| Iso-Hexanes | 0.427 | 0.0006 | 0.0006 | 0.0025 |
| N-Hexane (TAP) | 0.297 | 0.0004 | 0.0004 | 0.0018 |
| Methylcyclopentane | 0.000 | 0.0000 | 0.0000 | 0.0000 |
| Benzene (TAP) | 0.056 | 0.0001 | 0.0001 | 0.0003 |
| Cyclohexane | 0.042 | 0.0001 | 0.0001 | 0.0002 |
| Heptanes | 0.598 | 0.0008 | 0.0008 | 0.0035 |
| Methylcyclohexane | 0.000 | 0.0000 | 0.0000 | 0.0000 |

| | | | | |
|---|---|---|---|---|
| Toluene (TAP) | 0.015 | 0.0000 | 0.0000 | 0.0001 |
| 2,2,4-Trimethylpentane (TAP) | 0.307 | 0.0004 | 0.0004 | 0.0018 |
| Octanes Plus | 0.089 | 0.0001 | 0.0001 | 0.0005 |
| Ethylbenzene (TAP) | 0.002 | 0.0000 | 0.0000 | 0.0000 |
| Xylenes (TAP) | 0.007 | 0.0000 | 0.0000 | 0.0000 |
| **TOTAL WEIGHT PERCENT:** | 100.000 | | | |
| **TOTAL TAP EMISSIONS:** | | 0.00 | 0.00 | 0.00 |
| **TOTAL VOC EMISSIONS:** | | **0.01** | **0.01** | **0.02** |
| **TOTAL Non-VOC & Non-TAP HC:** | | 0.12 | 0.12 | 0.54 |
| **TOTAL EMISSIONS:** | | 0.41 | 0.41 | 1.81 |

**Purge Gas (maximum gas flowrate based on conservative estimate):**

| INPUT | | | | |
|---|---|---|---|---|
| *Maximum Gas Flowrate (scf/hr)* | *Operating Time (hrs/year)* | *Burn Efficiency (%)* | *Gas Heat of Combustion ($BTU/FT^3$)* | *Specific Gravity of Gas* |
| *150.00* | *8760* | *98* | *1044* | *0.5877* |

| CALCULATIONS | | | | | | |
|---|---|---|---|---|---|---|
| *Gas Combusted (annual hourly average)* | = | *gas rate (scf/hr)* | *x* | *efficiency* | *x* | *usage (hrs/yr)* |
| | = | *150.00* | *x* | *0.98* | *x* | *8,760* |
| | = | ***1,287,720 scf/yr*** | | = | ***147.00 SCF/hr*** | |
| *Heat Content (annual hourly average)* | = | *gas rate (scf/yr)* | *x* | *gas heat of combustion (BTU/scf)* | | |
| | = | *1,287,720* | *x* | *1044* | | |
| | = | | | ***0.1535 MMBTU/Hr*** | | |
| *Uncontrolled Max. Hourly Emissions (lbs/hr)* | = | *gas specific gravity* | *x* | *density of air (lb/SCF)* | *x* | *Maximum Gas Rate (SCF/Hr)* |
| | = | *0.5877* | *x* | *0.0764* | *x* | *150.00* |
| | = | ***6.74 lbs/hr*** | | | | |
| *Uncontrolled Annual Emissions (TPY)* | = | *gas specific gravity* | *x* | *density of air (tons/SCF)* | *x* | *Total Gas Rate (SCF/Yr)* |
| | = | *0.5877* | *x* | *0.0000382* | *x* | *1,314,000* |
| | = | ***29.50 TPY*** | | | | |

**SPECIATION FACTORS:**

*Speciation of the purge gas is based on an actual fuel gas analysis; refer to Southern Petroleum Laboratories Report No.: 2030-16080189-001A in supporting documentation.*

**EMISSIONS SUMMARY:**

| POLLUTANT: | Weight Percent | CALCULATED EMISSION RATES | | |
|---|---|---|---|---|
| | | Average Hourly (lb/hr) | Maximum Hourly (lb/hr) | Annual (TPY) |
| Nitrogen (excluded from VOC total) | 2.501 | 0.1684 | 0.1684 | 0.7378 |
| Carbon Dioxide (excluded from VOC total) | 1.707 | 0.1150 | 0.1150 | 0.5036 |
| Methane (excluded from VOC total) | 91.034 | 0.0613 | 0.0613 | 0.2685 |
| Ethane (excluded from VOC total) | 0.887 | 0.0006 | 0.0006 | 0.0026 |
| Hydrogen Sulfide (TAP; excluded from VOC total) | 0.000 | 0.0000 | 0.0000 | 0.0000 |
| Propane | 0.529 | 0.0004 | 0.0004 | 0.0016 |

| | | | | |
|---|---|---|---|---|
| Iso-Butane | 0.287 | 0.0004 | 0.0004 | 0.0017 |
| N-Butane | 0.390 | 0.0005 | 0.0005 | 0.0023 |
| Iso-Pentane | 0.365 | 0.0005 | 0.0005 | 0.0022 |
| N-Pentane | 0.344 | 0.0005 | 0.0005 | 0.0020 |
| Iso-Hexanes | 0.427 | 0.0006 | 0.0006 | 0.0025 |
| N-Hexane (TAP) | 0.297 | 0.0004 | 0.0004 | 0.0018 |
| Methylcyclopentane | 0.000 | 0.0000 | 0.0000 | 0.0000 |
| Benzene (TAP) | 0.056 | 0.0001 | 0.0001 | 0.0003 |
| Cyclohexane | 0.042 | 0.0001 | 0.0001 | 0.0002 |
| Heptanes | 0.598 | 0.0008 | 0.0008 | 0.0035 |
| Methylcyclohexane | 0.000 | 0.0000 | 0.0000 | 0.0000 |
| Toluene (TAP) | 0.015 | 0.0000 | 0.0000 | 0.0001 |
| 2,2,4-Trimethylpentane (TAP) | 0.307 | 0.0004 | 0.0004 | 0.0018 |
| Octanes | 0.089 | 0.0001 | 0.0001 | 0.0005 |
| Ethylbenzene (TAP) | 0.002 | 0.0000 | 0.0000 | 0.0000 |
| Xylenes (TAP) | 0.007 | 0.0000 | 0.0000 | 0.0000 |
| Nonanes | 0.102 | 0.0001 | 0.0001 | 0.0006 |
| Decanes Plus | 0.014 | 0.0000 | 0.0000 | 0.0001 |
| **TOTAL WEIGHT PERCENT:** | 100.000 | | | |
| **TOTAL TAP EMISSIONS:** | | 0.00 | 0.00 | 0.00 |
| **TOTAL VOC EMISSIONS:** | | **0.00** | **0.00** | **0.02** |
| **TOTAL Non-VOC & Non-TAP HC:** | | 0.06 | 0.06 | 0.27 |
| **TOTAL EMISSIONS:** | | 0.35 | 0.35 | 1.53 |

**Pilot Gas (maximum gas flowrate based on conservative estimate):**

| **INPUT** | | | |
|---|---|---|---|
| *Maximum Gas Flowrate (scf/hr)* | *Operating Time (hrs/year)* | *Burn Efficiency (%)* | *Gas Heat of Combustion (BTU/FT$^3$)* | *Specific Gravity of Gas* |
| *150.00* | *8760* | *98* | *1044* | *0.5877* |

| **CALCULATIONS** | | | | | | | |
|---|---|---|---|---|---|---|---|
| *Gas Combusted (annual hourly average)* | = | *gas rate (scf/hr)* | *x* | *efficiency* | *x* | *usage (hrs/yr)* | |
| | = | *150.00* | *x* | *0.98* | *x* | *8,760* | |
| | = | ***1,287,720*** | ***scf/yr*** | = | ***147.00*** | ***SCF/hr*** | |
| *Heat Content (annual hourly average)* | = | *gas rate (scf/yr)* | *x* | *gas heat of combustion (BTU/scf)* | | | |
| | = | *1,287,720* | *x* | *1044* | | | |
| | = | | | ***0.1535*** | ***MMBTU/Hr*** | | |
| *Uncontrolled Max. Hourly Emissions (lbs/hr)* | = | *gas specific gravity* | *x* | *density of air (lb/SCF)* | *x* | *Maximum Gas Rate (SCF/Hr)* | |
| | = | *0.59* | *x* | *0.0764* | *x* | *150.00* | |
| | = | ***6.74*** | ***lbs/hr*** | | | | |
| *Uncontrolled Annual Emissions (TPY)* | = | *gas specific gravity* | *x* | *density of air (tons/SCF)* | *x* | *Total Gas Rate (SCF/Yr)* | |
| | = | *0.59* | *x* | *0.0000382* | *x* | *1,314,000* | |
| | = | ***29.50*** | ***TPY*** | | | | |

**SPECIATION FACTORS:**

*Speciation of the pilot gas is based on an actual fuel gas analysis; refer to Southern Petroleum Laboratories Report No.: 2030-16080189-001A in supporting documentation.*

**EMISSIONS SUMMARY:**

| POLLUTANT: | Weight Percent | CALCULATED EMISSION RATES | | |
|---|---|---|---|---|
| | | Average Hourly (lb/hr) | Maximum Hourly (lb/hr) | Annual (TPY) |
| Nitrogen (excluded from VOC total) | 2.501 | 0.1684 | 0.1684 | 0.7378 |
| Carbon Dioxide (excluded from VOC total) | 1.707 | 0.1150 | 0.1150 | 0.5036 |
| Methane (excluded from VOC total) | 91.034 | 0.1226 | 0.1226 | 0.5371 |
| Ethane (excluded from VOC total) | 0.887 | 0.0012 | 0.0012 | 0.0052 |
| Hydrogen Sulfide (TAP; excluded from VOC total) | 0.000 | 0.0000 | 0.0000 | 0.0000 |
| Propane | 0.529 | 0.0007 | 0.0007 | 0.0031 |
| Iso-Butane | 0.287 | 0.0004 | 0.0004 | 0.0017 |
| N-Butane | 0.390 | 0.0005 | 0.0005 | 0.0023 |
| Iso-Pentane | 0.365 | 0.0005 | 0.0005 | 0.0022 |
| N-Pentane | 0.344 | 0.0005 | 0.0005 | 0.0020 |
| Iso-Hexanes | 0.427 | 0.0006 | 0.0006 | 0.0025 |
| N-Hexane (TAP) | 0.297 | 0.0004 | 0.0004 | 0.0018 |
| Methylcyclopentane | 0.000 | 0.0000 | 0.0000 | 0.0000 |
| Benzene (TAP) | 0.056 | 0.0001 | 0.0001 | 0.0003 |
| Cyclohexane | 0.042 | 0.0001 | 0.0001 | 0.0002 |
| Heptanes | 0.598 | 0.0008 | 0.0008 | 0.0035 |
| Methylcyclohexane | 0.000 | 0.0000 | 0.0000 | 0.0000 |
| Toluene (TAP) | 0.015 | 0.0000 | 0.0000 | 0.0001 |
| 2,2,4-Trimethylpentane (TAP) | 0.307 | 0.0004 | 0.0004 | 0.0018 |
| Octanes Plus | 0.089 | 0.0001 | 0.0001 | 0.0005 |
| Ethylbenzene (TAP) | 0.002 | 0.0000 | 0.0000 | 0.0000 |
| Xylenes (TAP) | 0.007 | 0.0000 | 0.0000 | 0.0000 |
| Nonanes | 0.102 | 0.0001 | 0.0001 | 0.0006 |
| Decanes Plus | 0.014 | 0.0000 | 0.0000 | 0.0001 |
| Other Nm/NE HC | 0.000 | 0.0000 | 0.0000 | 0.0000 |
| **TOTAL WEIGHT PERCENT:** | 100.000 | | | |
| **TOTAL TAP EMISSIONS:** | | 0.00 | 0.00 | 0.00 |
| **TOTAL VOC EMISSIONS:** | | **0.01** | **0.01** | **0.02** |
| **TOTAL Non-VOC & Non-TAP HC:** | | 0.12 | 0.12 | 0.54 |
| **TOTAL EMISSIONS:** | | 0.41 | 0.41 | 1.81 |

| | |
|---|---|
| **Total of Average Hourly VOC emissions estimated for this source:** | **0.55 Lbs/Hr** |
| **Total of Maximum Hourly VOC emissions estimated for this source:** | **0.55 Lbs/Hr** |
| **Total of Maximum Annual VOC emissions estimated for this source:** | **2.39 TPY** |

## CALCULATIONS - Selected Combustion Products

**Summary of all routine streams combusted by this flare:**

| *Gas Stream* | *Annual Operating Hours* | *Average Flowrate (SCF/Hr)* | *Maximum Flowrate (SCF/Hr)* | *Average Heat Rate (MMBTU/Hr)* | *Maximum Heat Rate (MMBTU/Hr)* |
|---|---|---|---|---|---|
| 1. Storage Tank Vapors | 8760 | 3306.09 | 3306.09 | 0.6318 | 0.6318 |
| Assist Gas Feed | 8760 | 150.00 | 150.00 | 0.1535 | 0.1535 |
| Purge Gas Feed | 8760 | 150.00 | 150.00 | 0.1535 | 0.1535 |
| Pilot Feed | 8760 | 150.00 | 150.00 | 0.1535 | 0.1535 |
| | ***Totals:*** | ***3,756.09*** | ***3,756.09*** | ***1.09*** | ***1.09*** |

*Emission factor for soot is from AP-42 "Compilation of Air Pollution Emission Factors" for an industrial burn flare stack (refer to supporting documentation for copies).*
*$SO_2$ emissions based on the composite $H_2S$ composition of the flare gas streams assuming stoichiometric combustion.*

| **POLLUTANT:** | **Emission Factor (lb/SCF)** | **CALCULATED EMISSION RATES** | | |
|---|---|---|---|---|
| | | **Average Hourly (lb/hr)** | **Maximum Hourly (lb/hr)** | **Annual (TPY)** |
| Soot (expressed as $PM_{10}$) | 0.000011 | 0.04 | 0.04 | 0.18 |
| Soot (expressed as $PM_{2.5}$) | 0.000011 | 0.04 | 0.04 | 0.18 |
| $SO_2$ | N/A | 0.00 | 0.00 | 0.00 |

*Emission factors for nitrogen oxide and carbon monoxide are from a 1983 CMA document entitled "A Report on a Flare Efficiency Study", for a non-assisted industrial burn flares. (refer to supporting documentation for copies).*

| **POLLUTANT:** | **Emission Factor ($lb/10^6$ BTU)** | **CALCULATED EMISSION RATES** | | |
|---|---|---|---|---|
| | | **Average Hourly (lb/hr)** | **Maximum Hourly (lb/hr)** | **Annual (TPY)** |
| Nitrogen Oxides | 0.0641 | 0.07 | 0.07 | 0.31 |
| CO | 0.5496 | 0.60 | 0.60 | 2.62 |

# *Emission Calculations*

**POINT SOURCE I.D. NUMBER:** ***26-05-CB***

**EMISSION SOURCE DESCRIPTION:** ***Compressor Blowdowns***

DATA:

| | |
|---|---|
| **Emission Source:** | ***Compressor Blowdowns*** |
| **Gas Specific Gravity:** | ***1.4418*** |
| **Maximum Volume per Blowdown Rate (SCF):** *(conservative estimate provided by operator)* | ***57827*** |
| **Maximum Number of Blowdowns per Year:** | ***36*** |
| **Basis of Emission Estimates:** | ***Conservative Estimate Provided By Operator & Actual Inlet Gas Analysis (Refer to supporting documentation)*** |
| **Well Gas Analysis Report Number:** | ***Southern Petroleum Laboratories Report No.: 172-23080191-003A*** |

| | | | | |
|---|---|---|---|---|
| Total Blowdown Gas Volume (SCF/Yr) | = | Volume per Event * Number of Events | = | **2081772.00** |
| Avg. Hourly Uncontrolled Total Emissions (lb/hr) | = | Gas Gravity * Density of Air * Volume per Blowdown | = | **6369.85** |
| Max. Hourly Uncontrolled Total Emissions (lb/hr) | = | Gas Gravity * Density of Air * Volume per Blowdown | = | **6369.85** |
| Annual Potential Uncontrolled Total Emissions (TPY) | = | Hourly * Number of Events per Year/2000 | = | **114.66** |

**SPECIATION FACTORS:**

*Speciation of the compressor blowdowns is based on the referenced analysis.*

**EMISSIONS SUMMARY:**

| POLLUTANT: | Weight Percent | CALCULATED EMISSION RATES | | |
|---|---|---|---|---|
| | | Average Hourly (lb/hr) | Maximum Hourly (lb/hr) | Annual (TPY) |
| Nitrogen (excluded from VOC total) | 0.3299 | 21.0141 | 21.0141 | 0.3783 |
| Carbon Dioxide (excluded from VOC total) | 94.5515 | 6022.7865 | 6022.7865 | 108.4102 |
| Methane (excluded from VOC total) | 3.4498 | 219.7470 | 219.7470 | 3.9554 |
| Ethane (excluded from VOC total) | 0.3596 | 22.9060 | 22.9060 | 0.4123 |
| Hydrogen Sulfide (excluded from VOC total) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Propane | 0.2902 | 18.4853 | 18.4853 | 0.3327 |
| Iso-Butane | 0.0904 | 5.7583 | 5.7583 | 0.1037 |
| N-Butane | 0.1919 | 12.2237 | 12.2237 | 0.2200 |
| Iso-Pentane | 0.1130 | 7.1979 | 7.1979 | 0.1296 |
| N-Pentane | 0.0925 | 5.8921 | 5.8921 | 0.1061 |
| Iso-Hexane | 0.0834 | 5.3125 | 5.3125 | 0.0956 |
| N-Hexane (TAP) | 0.0427 | 2.7199 | 2.7199 | 0.0490 |
| Methylcyclopentane | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Benzene (TAP) | 0.0124 | 0.7899 | 0.7899 | 0.0142 |
| Cyclohexane | 0.0296 | 1.8855 | 1.8855 | 0.0339 |
| Heptanes | 0.0844 | 5.3762 | 5.3762 | 0.0968 |
| Methylcyclohexane | 0.0442 | 2.8155 | 2.8155 | 0.0507 |
| Toluene (TAP) | 0.0080 | 0.5096 | 0.5096 | 0.0092 |

| | | | | |
|---|---|---|---|---|
| 2,2,4-Trimethylpentane (TAP) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Octanes | 0.0602 | 3.8346 | 3.8346 | 0.0690 |
| Ethylbenzene (TAP) | 0.0015 | 0.0955 | 0.0955 | 0.0017 |
| Xylenes (TAP) | 0.0212 | 1.3504 | 1.3504 | 0.0243 |
| Nonanes | 0.0799 | 5.0895 | 5.0895 | 0.0916 |
| Decanes Plus | 0.0637 | 4.0576 | 4.0576 | 0.0730 |
| **Total Weight Percent:** | 100.0000 | | | |
| **Total TAP Emissions** | | 5.47 | 5.47 | 0.10 |
| **Total VOC Emissions** | | **83.39** | **83.39** | **1.50** |
| **Total Non VOC & Non TAP-HC** | | 242.65 | 242.65 | 4.37 |
| **Total Emissions** | | 6369.85 | 6369.85 | 114.66 |

| | | | |
|---|---|---|---|
| Uncontrolled VOC Emission Total (TPY) | Compressor Blowdowns | = | **1.50** |

# *Emission Calculations*

*Emission calculations shown below are presented for informational purposes only as off-gas from the heater treater is routed to the low pressure control flare (EPN: 31-05-F) for combustion.*

**POINT SOURCE I.D. NUMBER:** ***28-05-HT-WG***

**EMISSION SOURCE DESCRIPTION:** ***Heater Treater-Flash Gas***

DATA:

| | |
|---|---|
| **Emission Source:** | ***Heater Treater Flash Gas*** |
| **Flash Gas Specific Gravity:** | ***1.5176*** |
| **Maximum Oil Throughput:** **(BBLD)** | ***2000*** |
| **Basis of Emission Estimates:** | ***Representative GOR & Actual Flare Gas Analysis*** |
| **Flash Gas Analysis Report Number:** | ***Southern Petroleum Laboratories Report No.: 172-24050252-002A*** |

*Estimates for gas volumes and composition associated with this stage of the process were derived from a laboratory test of an oil sample collected at another site under similar conditions (pressure & temperature), refer to to PENCOR Report No.: 31554-5006038374 in supporting documentation. This representative analysis is expected to yield a comparable VOC total but individual component values may vary from site to site. The following table shows the field conditions compared to the results from the laboratory test:*

| **API Oil Gravity @ 60°F** | **Process Conditions** | | **Gas/Oil Ratio** |
|---|---|---|---|
| | **Pressure (PSIG)** | **Temperature (°F)** | **(SCF/BBL)** |
| **Actual Facility Conditions:** | | | |
| 36.71 | 210 | 85 | |
| | 44 | 73 | Unknown |
| **Laboratory Conditions:** | | | |
| 35.7 | 200 | 86 | |
| | 39 | 120 | 75 |
| | | Prorated GOR Estimate: | **73.21** |

| | | | | |
|---|---|---|---|---|
| Avg. Hourly Uncontrolled Flash Rate (SCF/Hr) | = | Oil Rate * GOR | = | **6100.62** |
| Avg. Hourly Uncontrolled Total Flash Emissions (lb/hr) | = | Flash Gas Gravity * Density of Air * Flash Rate | = | **707.33** |
| Max. Hourly Uncontrolled Total Flash Emissions (lb/hr) | = | Flash Gas Gravity * Density of Air * Flash Rate | = | **707.33** |
| Annual Potential Uncontrolled Flash Emissions (TPY) | = | Hourly * 8760/2000 | = | **3098.11** |

**SPECIATION FACTORS:**

*Speciation of the flash gas mixture taken from the referenced laboratory results and normalized to account for the removal of Nitrogen; refer to supporting documentation*

**EMISSIONS SUMMARY:**

| POLLUTANT: | Weight Percent | CALCULATED EMISSION RATES | | |
|---|---|---|---|---|
| | | Average Hourly (lb/hr) | Maximum Hourly (lb/hr) | Annual (TPY) |
| Nitrogen (excluded from VOC total) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Carbon Dioxide (excluded from VOC total) | 94.3448 | 667.3333 | 667.3333 | 2922.9025 |
| Methane (excluded from VOC total) | 0.7087 | 5.0131 | 5.0131 | 21.9572 |
| Ethane (excluded from VOC total) | 0.3822 | 2.7034 | 2.7034 | 11.8409 |
| Hydrogen Sulfide (excluded from VOC total) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Propane | 0.7961 | 5.6309 | 5.6309 | 24.6631 |
| Iso-Butane | 0.4705 | 3.3279 | 3.3279 | 14.5761 |
| N-Butane | 0.9718 | 6.8737 | 6.8737 | 30.1068 |
| Iso-Pentane | 0.6224 | 4.4027 | 4.4027 | 19.2839 |
| N-Pentane | 0.5035 | 3.5616 | 3.5616 | 15.5999 |
| Iso-Hexane | 0.4151 | 2.9362 | 2.9362 | 12.8606 |
| N-Hexane (TAP) | 0.1869 | 1.3221 | 1.3221 | 5.7907 |
| Methylcyclopentane | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Benzene (TAP) | 0.0410 | 0.2903 | 0.2903 | 1.2716 |
| Cyclohexane | 0.0960 | 0.6793 | 0.6793 | 2.9755 |
| Heptanes | 0.2551 | 1.8047 | 1.8047 | 7.9045 |
| Methylcyclohexane | 0.0782 | 0.5530 | 0.5530 | 2.4222 |
| Toluene (TAP) | 0.0096 | 0.0679 | 0.0679 | 0.2973 |
| 2,2,4-Trimethylpentane (TAP) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Octanes | 0.0711 | 0.5031 | 0.5031 | 2.2036 |
| Ethylbenzene (TAP) | 0.0002 | 0.0017 | 0.0017 | 0.0076 |
| Xylenes (TAP) | 0.0061 | 0.0435 | 0.0435 | 0.1903 |
| Nonanes | 0.0404 | 0.2856 | 0.2856 | 1.2509 |
| Decanes Plus | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| **Total Weight Percent:** | 100.0000 | | | |
| **Total TAP Emissions** | | 1.73 | 1.73 | 7.56 |
| **Total VOC Emissions** | | **32.28** | **32.28** | **141.40** |
| **Total Non VOC & Non TAP-HC** | | 7.72 | 7.72 | 33.80 |
| **Total Emissions** | | 707.33 | 707.33 | 3098.11 |

| Uncontrolled VOC Emission Total (TPY) | Heater Treater Flash Gas | = | **141.40** |
|---|---|---|---|

# *Emission Calculations*

*Emission calculations shown below are presented for informational purposes only as off-gas from the water flash vessel is routed to the low pressure control flare (EPN: 31-05-F) for combustion.*

**POINT SOURCE I.D. NUMBER:** ***29-05-WFV-WG***

**EMISSION SOURCE DESCRIPTION:** ***Water Flash Vessel-Flash Gas***

DATA:

| | |
|---|---|
| **Emission Source:** | ***Water Flash Vessel Flash Gas*** |
| **Approx. Pressure Drop of Brine Solution: (psig)** | ***190*** |
| **Approx. Temperature of Brine Solution: (ºF)** | ***85*** |
| **Flash Gas Specific Gravity:** | ***1.5176*** |
| **Maximum Water Throughput: (BBLD)** | ***12000*** |
| **Gas to Water Ratio: (SCF/BBL of Brine; GWR)** | ***1.9*** |
| **Basis of Emission Estimates:** | ***API Documentation & Actual Flare Gas Analysis (Refer to supporting documentation)*** |
| **Wet Gas Analysis Report Number:** | ***Southern Petroleum Laboratories Report No.: 172-24050252-002A*** |

| | | | | |
|---|---|---|---|---|
| Avg. Hourly Uncontrolled Flash Rate (SCF/Hr) | = | Brine Rate * GWR | = | **950.00** |
| Avg. Hourly Uncontrolled Total Flash Emissions (lb/hr) | = | Flash Gas Gravity * Density of Air * Flash Rate | = | **110.15** |
| Max. Hourly Uncontrolled Total Flash Emissions (lb/hr) | = | Flash Gas Gravity * Density of Air * Flash Rate | = | **110.15** |
| Annual Potential Uncontrolled Flash Emissions (TPY) | = | Hourly * 8760/2000 | = | **482.46** |

**EMISSION ESTIMATES:**

*The magnitude of the solubility of natural gas in the interstitial water present in oil sands was studied by The American Petroleum Institute (API) and presented in a 1944 document entitled, "P-V-T and Solubility Relations". Results of these studies have been projected to provide estimates of gas volumes present in the brine solution handled at this site within the specific pressure and temperature ranges expected. The composition of this gas is based on the referenced analysis and normalized to account for the removal of Nitrogen.*

**EMISSIONS SUMMARY:**

| POLLUTANT: | Weight Percent | CALCULATED EMISSION RATES | | |
|---|---|---|---|---|
| | | Average Hourly (lb/hr) | Maximum Hourly (lb/hr) | Annual (TPY) |
| Nitrogen (excluded from VOC total) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Carbon Dioxide (excluded from VOC total) | 94.3448 | 103.9184 | 103.9184 | 455.1733 |
| Methane (excluded from VOC total) | 0.7087 | 0.7806 | 0.7806 | 3.4193 |
| Ethane (excluded from VOC total) | 0.3822 | 0.4210 | 0.4210 | 1.8439 |
| Hydrogen Sulfide (excluded from VOC total) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Propane | 0.7961 | 0.8768 | 0.8768 | 3.8407 |
| Iso-Butane | 0.4705 | 0.5182 | 0.5182 | 2.2699 |
| N-Butane | 0.9718 | 1.0704 | 1.0704 | 4.6884 |
| Iso-Pentane | 0.6224 | 0.6856 | 0.6856 | 3.0030 |
| N-Pentane | 0.5035 | 0.5546 | 0.5546 | 2.4293 |
| Iso-Hexane | 0.4151 | 0.4572 | 0.4572 | 2.0027 |
| N-Hexane (TAP) | 0.1869 | 0.2059 | 0.2059 | 0.9018 |
| Methylcyclopentane | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

| | | | | |
|---|---|---|---|---|
| Benzene (TAP) | 0.0410 | 0.0452 | 0.0452 | 0.1980 |
| Cyclohexane | 0.0960 | 0.1058 | 0.1058 | 0.4634 |
| Heptanes | 0.2551 | 0.2810 | 0.2810 | 1.2309 |
| Methylcyclohexane | 0.0782 | 0.0861 | 0.0861 | 0.3772 |
| Toluene (TAP) | 0.0096 | 0.0106 | 0.0106 | 0.0463 |
| 2,2,4-Trimethylpentane (TAP) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Octanes | 0.0711 | 0.0783 | 0.0783 | 0.3432 |
| Ethylbenzene (TAP) | 0.0002 | 0.0003 | 0.0003 | 0.0012 |
| Xylenes (TAP) | 0.0061 | 0.0068 | 0.0068 | 0.0296 |
| Nonanes | 0.0404 | 0.0445 | 0.0445 | 0.1948 |
| Decanes Plus | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| **Total Weight Percent:** | 100.0000 | | | |
| **Total TAP Emissions** | | 0.27 | 0.27 | 1.18 |
| **Total VOC Emissions** | | **5.03** | **5.03** | **22.02** |
| **Total Non VOC & Non TAP-HC** | | 1.20 | 1.20 | 5.26 |
| **Total Emissions** | | 110.15 | 110.15 | 482.46 |

| | | | |
|---|---|---|---|
| Uncontrolled VOC Emission Total (TPY) | Water Flash Vessel Flash Gas | = | **22.02** |

# *Emission Calculations*

**POINT SOURCE I.D. NUMBER:** ***30-10-LH-BS***

**EMISSION SOURCE DESCRIPTION:** ***25 MMBTU/Hr Line Heater-Burner Stack (H-104)***

DATA:

| | |
|---|---|
| **Emission Source:** | ***External Combustion Burner*** |
| **Annual Hours of Operation:** | ***8760*** |
| **Maximum Burner Rating (MMBTU/Hr):** | ***25*** |
| **Fuel Gas Heat of Combustion (BTU/scf):** *(based on an actual fuel gas analysis)* | ***1044*** |
| **Sulfur Concentration of Fuel Gas (ppmv):** *(conservative estimate)* | ***7*** |
| **Fuel Source:** | ***Field Gas*** |

Max. Hourly Fuel Consumption (SCFH): = burner rating/fuel gas heat of combustion/80% efficiency = ***29,932.95***

Max. Annual Fuel Consumption (MSCF/Yr): = hourly fuel consumption x annual hours = ***262,212.64***

**EMISSION FACTORS:**

*Unless otherwise noted, emission factors taken from EPA Publication AP-42, "Compilation of Air Pollution Emission Factors" - Natural Gas Combustion (Small Boilers), refer to supporting documentation.*

*$SO_2$ emission factor based on 100% conversion of sulfur compounds in fuel gas, using $H_2S$ fuel composition noted above.*

**EMISSION CALCULATIONS:**

| POLLUTANT: | EMISSION FACTOR ($LBS/10^6$ SCF) | CALCULATED EMISSION RATES: | |
|---|---|---|---|
| | | Hourly (lb/hr) | Annual (TPY) |
| Particulate Matter (filterable + condensable) | 7.6 | 0.2275 | 0.9964 |
| Sulfur Dioxide | 1.182 | 0.0354 | 0.1549 |
| Nitrogen Oxides | 100 | 2.9933 | 13.1106 |
| Carbon Monoxide | 84 | 2.5144 | 11.0129 |
| Methane (excluded from VOC total) | 2.3 | 0.0688 | 0.3015 |
| VOC | 5.5 | 0.1646 | 0.7211 |
| TOC | 11 | 0.3293 | 1.4422 |
| 2-Methylnaphthalene (TAP) | 0.0000240 | 0.0000 | 0.0000 |
| 3-Methylchloranthrene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| 7,12-Dimethylbenz(a)anthrancene (TAP) | 0.0000160 | 0.0000 | 0.0000 |
| Acenaphthene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| Acenaphthylene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| Anthracene (TAP) | 0.0000024 | 0.0000 | 0.0000 |

| POLLUTANT: | EMISSION FACTOR (LBS/$10^6$ SCF) | CALCULATED EMISSION RATES: | |
|---|---|---|---|
| | | Hourly (lb/hr) | Annual (TPY) |
| Benz(a)anthracene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| Benzene (TAP) | 0.0021000 | 0.0001 | 0.0003 |
| Benzo(a)pyrene (TAP) | 0.0000012 | 0.0000 | 0.0000 |
| Benzo(b)fluoranthene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| Benzo(g,h,I)perylene (TAP) | 0.0000012 | 0.0000 | 0.0000 |
| Benzo(k)fluoranthene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| Chrysene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| Dibenzo(a,h)anthrancene (TAP) | 0.0000012 | 0.0000 | 0.0000 |
| Dichlorobenzene (TAP) | 0.0012000 | 0.0000 | 0.0002 |
| Fluorathene (TAP) | 0.0000030 | 0.0000 | 0.0000 |
| Fluorene (TAP) | 0.0000028 | 0.0000 | 0.0000 |
| Formaldehyde (TAP) | 0.0750000 | 0.0022 | 0.0098 |
| Hexane (TAP) | 1.8000000 | 0.0539 | 0.2360 |
| Indeno(1,2,3-cd)pyrene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| Naphthalene (TAP) | 0.0006100 | 0.0000 | 0.0001 |
| Phenanathrene (TAP) | 0.0000170 | 0.0000 | 0.0000 |
| Pyrene (TAP) | 0.0000050 | 0.0000 | 0.0000 |
| Toluene (TAP) | 0.0034000 | 0.0001 | 0.0004 |
| Arsenic (TAP) | 0.0002000 | 0.0000 | 0.0000 |
| Beryllium (TAP) | 0.0000120 | 0.0000 | 0.0000 |
| Cadmium (TAP) | 0.0011000 | 0.0000 | 0.0001 |
| Chromium (TAP) | 0.0014000 | 0.0000 | 0.0002 |
| Cobalt (TAP) | 0.0000840 | 0.0000 | 0.0000 |
| Manganese (TAP) | 0.0003800 | 0.0000 | 0.0000 |
| Mercury (TAP) | 0.0002600 | 0.0000 | 0.0000 |
| Nickel (TAP) | 0.0021000 | 0.0001 | 0.0003 |
| Selenium (TAP) | 0.0000240 | 0.0000 | 0.0000 |
| **Total TAPs** | | 0.06 | 0.25 |
| **Total VOC-TAPs** | | 0.06 | 0.25 |
| **Total Non VOC & Non TAP-HC** | | 0.07 | 0.30 |
| **Total VOC** | | **0.16** | **0.72** |

# *Emission Calculations*

**POINT SOURCE I.D. NUMBER:** ***31-05-F***

**EMISSION SOURCE DESCRIPTION:** ***Atmospheric Control Flare (ZZZ-180B)***

DATA:

| | |
|---|---|
| **Emission Source:** | ***Unburned Hydrocarbons and Products of Combustion*** |
| **Atmospheric Gas Streams:** | |
| **Gas Stream #1:** | ***Heater Treater Flash Gas & Water Flash Vessel Flash Gas*** |
| **Gas Heat of Combustion (BTU/Ft$^3$-actual flare gas analysis):** | ***141*** |
| **Assist Gas Feed:** | ***Yes*** |
| **Gas Heat of Combustion (BTU/Ft$^3$-actual fuel gas analysis):** | ***1044*** |
| **Purge Gas Feed:** | ***Yes*** |
| **Gas Heat of Combustion (BTU/Ft$^3$-actual fuel gas analysis):** | ***1044*** |
| **Pilot Gas Feed:** | ***Yes*** |
| **Gas Heat of Combustion (BTU/Ft$^3$-actual fuel gas analysis):** | ***1044*** |
| **Combustion Efficiency:** | ***98% for all other HC*** |

**Gas Stream #1 - Heater Treater Flash Gas & Water Flash Vessel Flash Gas**

*Gas volume estimates are supported by the calculations associated with EPNs: 28-05-HT-WG & 29-05-WFV-WG and are outlined below:*

**INPUT**

| *Maximum Gas Flowrate (scf/hr)* | *Operating Time (hrs/year)* | *Burn Efficiency (%)* | *Gas Heat of Combustion (BTU/FT$^3$)* | *Specific Gravity of Gas* |
|---|---|---|---|---|
| *7,050.62* | *8760* | *98* | *141* | *1.5176* |

**CALCULATIONS**

| | | | | | | |
|---|---|---|---|---|---|---|
| *Gas Combusted (annual hourly average)* | = | *gas rate (scf/hr)* | *x* | *efficiency* | *x* | *usage (hrs/yr)* |
| | = | *7,050.62* | *x* | *0.98* | *x* | *8,760* |
| | = | ***60,528,163*** | ***scf/yr*** | = | ***6,909.61*** | ***SCF/hr*** |
| *Heat Content (annual hourly average)* | = | *gas rate (scf/yr)* | *x* | *gas heat of combustion (BTU/scf)* | | |
| | = | *60,528,163* | *x* | *141* | | |
| | = | | | ***0.9743*** | ***MMBTU/Hr*** | |
| *Uncontrolled Max. Hourly Emissions (lbs/hr)* | = | *gas specific gravity* | *x* | *density of air (lb/SCF)* | *x* | *Maximum Gas Rate (SCF/Hr)* |
| | = | *1.5176* | *x* | *0.0764* | *x* | *7,050.62* |
| | = | ***817.48*** | ***lbs/hr*** | | | |
| *Uncontrolled Annual Emissions (TPY)* | = | *gas specific gravity* | *x* | *density of air (tons/SCF)* | *x* | *Total Gas Rate (SCF/Yr)* |
| | = | *1.5176* | *x* | *0.0000382* | *x* | *61,763,431* |
| | = | ***3,580.57*** | ***TPY*** | | | |

**SPECIATION FACTORS:**

*Speciation of the flash gas mixture is based on an actual analysis of the vapors routed to the control flare and normalized to account for the removal of Nitrogen; refer to Southern Petroleum Laboratories Report No.: 172-24050252-002A in supporting documentation.*

**EMISSIONS SUMMARY:**

| POLLUTANT: | Weight Percent | CALCULATED EMISSION RATES | | |
|---|---|---|---|---|
| | | Average Hourly (lb/hr) | Maximum Hourly (lb/hr) | Annual (TPY) |
| Nitrogen (excluded from VOC total) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Carbon Dioxide (excluded from VOC total) | 94.3448 | 771.2517 | 771.2517 | 3378.0824 |
| Methane (excluded from VOC total) | 0.7087 | 0.1159 | 0.1159 | 0.5075 |
| Ethane (excluded from VOC total) | 0.3822 | 0.0625 | 0.0625 | 0.2737 |
| Hydrogen Sulfide (TAP; excluded from VOC total) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Propane | 0.7961 | 0.1302 | 0.1302 | 0.5701 |
| Iso-Butane | 0.4705 | 0.0769 | 0.0769 | 0.3369 |
| N-Butane | 0.9718 | 0.1589 | 0.1589 | 0.6959 |
| Iso-Pentane | 0.6224 | 0.1018 | 0.1018 | 0.4457 |
| N-Pentane | 0.5035 | 0.0823 | 0.0823 | 0.3606 |
| Iso-Hexanes | 0.4151 | 0.0679 | 0.0679 | 0.2973 |
| N-Hexane (TAP) | 0.1869 | 0.0306 | 0.0306 | 0.1338 |
| Methylcyclopentane | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Benzene (TAP) | 0.0410 | 0.0067 | 0.0067 | 0.0294 |
| Cyclohexane | 0.0960 | 0.0157 | 0.0157 | 0.0688 |
| Heptanes | 0.2551 | 0.0417 | 0.0417 | 0.1827 |
| Methylcyclohexane | 0.0782 | 0.0128 | 0.0128 | 0.0560 |
| Toluene (TAP) | 0.0096 | 0.0016 | 0.0016 | 0.0069 |
| 2,2,4-Trimethylpentane (TAP) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Octanes | 0.0711 | 0.0116 | 0.0116 | 0.0509 |
| Ethylbenzene (TAP) | 0.0002 | 0.0000 | 0.0000 | 0.0002 |
| Xylenes (TAP) | 0.0061 | 0.0010 | 0.0010 | 0.0044 |
| Nonanes | 0.0404 | 0.0066 | 0.0066 | 0.0289 |
| Decanes Plus | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Other NM/NE HC | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| **TOTAL WEIGHT PERCENT:** | 100.0000 | | | |
| **TOTAL TAP EMISSIONS:** | | 0.04 | 0.04 | 0.17 |
| **TOTAL VOC EMISSIONS:** | | **0.75** | **0.75** | **3.27** |
| **TOTAL Non-VOC & Non-TAP HC:** | | 0.18 | 0.18 | 0.78 |
| **TOTAL EMISSIONS:** | | 772.18 | 772.18 | 3382.13 |

**Assist Gas (maximum gas flowrate based on conservative estimate):**

| INPUT | | | | | |
|---|---|---|---|---|---|
| *Maximum Gas Flowrate (scf/hr)* | *Operating Time (hrs/year)* | *Burn Efficiency (%)* | *Gas Heat of Combustion (BTU/FT$^3$)* | *Specific Gravity of Gas* | |
| *170.00* | *8760* | *98* | *1044* | *0.5877* | |

| CALCULATIONS | | | | | | |
|---|---|---|---|---|---|---|
| *Gas Combusted (annual hourly average)* | = | *gas rate (scf/hr)* | *x* | *efficiency* | *x* | *usage (hrs/yr)* |
| | = | *170.00* | *x* | *0.98* | *x* | *8,760* |
| | = | ***1,459,416*** | ***scf/yr*** | = | ***166.60*** | ***SCF/hr*** |
| *Heat Content (annual hourly average)* | = | *gas rate (scf/yr)* | *x* | *gas heat of combustion (BTU/scf)* | | |
| | = | *1,459,416* | *x* | *1044* | | |
| | = | | | | ***0.1739*** | ***MMBTU/Hr*** |
| *Uncontrolled Max. Hourly Emissions (lbs/hr)* | = | *gas specific gravity* | *x* | *density of air (lb/SCF)* | *x* | *Maximum Gas Rate (SCF/Hr)* |
| | = | *0.5877* | *x* | *0.0764* | *x* | *170.00* |
| | = | ***7.63*** | ***lbs/hr*** | | | |
| *Uncontrolled Annual Emissions (TPY)* | = | *gas specific gravity* | *x* | *density of air (tons/SCF)* | *x* | *Total Gas Rate (SCF/Yr)* |
| | = | *0.5877* | *x* | *0.0000382* | *x* | *1,489,200* |
| | = | ***33.43*** | ***TPY*** | | | |

**SPECIATION FACTORS:**

*Speciation of the supply gas is based on an actual fuel gas analysis; refer to Southern Petroleum Laboratories Report No.: 2030-16080189-001A in supporting documentation.*

**EMISSIONS SUMMARY:**

| POLLUTANT: | Weight Percent | CALCULATED EMISSION RATES | | |
|---|---|---|---|---|
| | | Average Hourly (lb/hr) | Maximum Hourly (lb/hr) | Annual (TPY) |
| Nitrogen (excluded from VOC total) | 2.501 | 0.1909 | 0.1909 | 0.8362 |
| Carbon Dioxide (excluded from VOC total) | 1.707 | 0.1303 | 0.1303 | 0.5707 |
| Methane (excluded from VOC total) | 91.034 | 0.1390 | 0.1390 | 0.6087 |
| Ethane (excluded from VOC total) | 0.887 | 0.0014 | 0.0014 | 0.0059 |
| Hydrogen Sulfide (TAP; excluded from VOC total) | 0.000 | 0.0000 | 0.0000 | 0.0000 |
| Propane | 0.529 | 0.0008 | 0.0008 | 0.0035 |
| Iso-Butane | 0.287 | 0.0004 | 0.0004 | 0.0019 |
| N-Butane | 0.390 | 0.0006 | 0.0006 | 0.0026 |
| Iso-Pentane | 0.365 | 0.0006 | 0.0006 | 0.0024 |
| N-Pentane | 0.344 | 0.0005 | 0.0005 | 0.0023 |
| Iso-Hexanes | 0.427 | 0.0007 | 0.0007 | 0.0029 |
| N-Hexane (TAP) | 0.297 | 0.0005 | 0.0005 | 0.0020 |
| Methylcyclopentane | 0.000 | 0.0000 | 0.0000 | 0.0000 |
| Benzene (TAP) | 0.056 | 0.0001 | 0.0001 | 0.0004 |
| Cyclohexane | 0.042 | 0.0001 | 0.0001 | 0.0003 |
| Heptanes | 0.598 | 0.0009 | 0.0009 | 0.0040 |
| Methylcyclohexane | 0.000 | 0.0000 | 0.0000 | 0.0000 |

| | | | | |
|---|---|---|---|---|
| Toluene (TAP) | 0.015 | 0.0000 | 0.0000 | 0.0001 |
| 2,2,4-Trimethylpentane (TAP) | 0.307 | 0.0005 | 0.0005 | 0.0021 |
| Octanes Plus | 0.089 | 0.0001 | 0.0001 | 0.0006 |
| Ethylbenzene (TAP) | 0.002 | 0.0000 | 0.0000 | 0.0000 |
| Xylenes (TAP) | 0.007 | 0.0000 | 0.0000 | 0.0000 |
| **TOTAL WEIGHT PERCENT:** | 100.000 | | | |
| **TOTAL TAP EMISSIONS:** | | 0.00 | 0.00 | 0.00 |
| **TOTAL VOC EMISSIONS:** | | **0.01** | **0.01** | **0.03** |
| **TOTAL Non-VOC & Non-TAP HC:** | | 0.14 | 0.14 | 0.61 |
| **TOTAL EMISSIONS:** | | 0.47 | 0.47 | 2.05 |

**Purge Gas (maximum gas flowrate based on conservative estimate):**

| **INPUT** | | | | |
|---|---|---|---|---|
| *Maximum Gas Flowrate (scf/hr)* | *Operating Time (hrs/year)* | *Burn Efficiency (%)* | *Gas Heat of Combustion (BTU/FT$^3$)* | *Specific Gravity of Gas* |
| *170.00* | *8760* | *98* | *1044* | *0.5877* |

| **CALCULATIONS** | | | | | | |
|---|---|---|---|---|---|---|
| *Gas Combusted (annual hourly average)* | = | *gas rate (scf/hr)* | *x* | *efficiency* | *x* | *usage (hrs/yr)* |
| | = | *170.00* | *x* | *0.98* | *x* | *8,760* |
| | = | ***1,459,416 scf/yr*** | | = | ***166.60 SCF/hr*** | |
| *Heat Content (annual hourly average)* | = | *gas rate (scf/yr)* | *x* | *gas heat of combustion (BTU/scf)* | | |
| | = | *1,459,416* | *x* | *1044* | | |
| | = | | | ***0.1739 MMBTU/Hr*** | | |
| *Uncontrolled Max. Hourly Emissions (lbs/hr)* | = | *gas specific gravity* | *x* | *density of air (lb/SCF)* | *x* | *Maximum Gas Rate (SCF/Hr)* |
| | = | *0.5877* | *x* | *0.0764* | *x* | *170.00* |
| | = | ***7.63 lbs/hr*** | | | | |
| *Uncontrolled Annual Emissions (TPY)* | = | *gas specific gravity* | *x* | *density of air (tons/SCF)* | *x* | *Total Gas Rate (SCF/Yr)* |
| | = | *0.5877* | *x* | *0.0000382* | *x* | *1,489,200* |
| | = | ***33.43 TPY*** | | | | |

**SPECIATION FACTORS:**

*Speciation of the purge gas is based on an actual fuel gas analysis; refer to Southern Petroleum Laboratories Report No.: 2030-16080189-001A in supporting documentation.*

**EMISSIONS SUMMARY:**

| **POLLUTANT:** | **Weight Percent** | **CALCULATED EMISSION RATES** | | |
|---|---|---|---|---|
| | | **Average Hourly (lb/hr)** | **Maximum Hourly (lb/hr)** | **Annual (TPY)** |
| Nitrogen (excluded from VOC total) | 2.501 | 0.1909 | 0.1909 | 0.8362 |
| Carbon Dioxide (excluded from VOC total) | 1.707 | 0.1303 | 0.1303 | 0.5707 |
| Methane (excluded from VOC total) | 91.034 | 0.0695 | 0.0695 | 0.3044 |
| Ethane (excluded from VOC total) | 0.887 | 0.0007 | 0.0007 | 0.0030 |
| Hydrogen Sulfide (TAP; excluded from VOC total) | 0.000 | 0.0000 | 0.0000 | 0.0000 |
| Propane | 0.529 | 0.0004 | 0.0004 | 0.0018 |

| | | | | |
|---|---|---|---|---|
| Iso-Butane | 0.287 | 0.0004 | 0.0004 | 0.0019 |
| N-Butane | 0.390 | 0.0006 | 0.0006 | 0.0026 |
| Iso-Pentane | 0.365 | 0.0006 | 0.0006 | 0.0024 |
| N-Pentane | 0.344 | 0.0005 | 0.0005 | 0.0023 |
| Iso-Hexanes | 0.427 | 0.0007 | 0.0007 | 0.0029 |
| N-Hexane (TAP) | 0.297 | 0.0005 | 0.0005 | 0.0020 |
| Methylcyclopentane | 0.000 | 0.0000 | 0.0000 | 0.0000 |
| Benzene (TAP) | 0.056 | 0.0001 | 0.0001 | 0.0004 |
| Cyclohexane | 0.042 | 0.0001 | 0.0001 | 0.0003 |
| Heptanes | 0.598 | 0.0009 | 0.0009 | 0.0040 |
| Methylcyclohexane | 0.000 | 0.0000 | 0.0000 | 0.0000 |
| Toluene (TAP) | 0.015 | 0.0000 | 0.0000 | 0.0001 |
| 2,2,4-Trimethylpentane (TAP) | 0.307 | 0.0005 | 0.0005 | 0.0021 |
| Octanes | 0.089 | 0.0001 | 0.0001 | 0.0006 |
| Ethylbenzene (TAP) | 0.002 | 0.0000 | 0.0000 | 0.0000 |
| Xylenes (TAP) | 0.007 | 0.0000 | 0.0000 | 0.0000 |
| Nonanes | 0.102 | 0.0002 | 0.0002 | 0.0007 |
| Decanes Plus | 0.014 | 0.0000 | 0.0000 | 0.0001 |
| **TOTAL WEIGHT PERCENT:** | 100.000 | | | |
| **TOTAL TAP EMISSIONS:** | | 0.00 | 0.00 | 0.00 |
| **TOTAL VOC EMISSIONS:** | | **0.01** | **0.01** | **0.02** |
| **TOTAL Non-VOC & Non-TAP HC:** | | 0.07 | 0.07 | 0.31 |
| **TOTAL EMISSIONS:** | | 0.40 | 0.40 | 1.74 |

**Pilot Gas (maximum gas flowrate based on conservative estimate):**

| **INPUT** | | | | | |
|---|---|---|---|---|---|
| *Maximum Gas Flowrate (scf/hr)* | *Operating Time (hrs/year)* | *Burn Efficiency (%)* | *Gas Heat of Combustion (BTU/FT$^3$)* | *Specific Gravity of Gas* | |
| *170.00* | *8760* | *98* | *1044* | *0.5877* | |

| **CALCULATIONS** | | | | | | |
|---|---|---|---|---|---|---|
| *Gas Combusted (annual hourly average)* | = | *gas rate (scf/hr)* | *x* | *efficiency* | *x* | *usage (hrs/yr)* |
| | = | *170.00* | *x* | *0.98* | *x* | *8,760* |
| | = | ***1,459,416 scf/yr*** | | = | ***166.60 SCF/hr*** | |
| *Heat Content (annual hourly average)* | = | *gas rate (scf/yr)* | *x* | *gas heat of combustion (BTU/scf)* | | |
| | = | *1,459,416* | *x* | *1044* | | |
| | = | | | ***0.1739 MMBTU/Hr*** | | |
| *Uncontrolled Max. Hourly Emissions (lbs/hr)* | = | *gas specific gravity* | *x* | *density of air (lb/SCF)* | *x* | *Maximum Gas Rate (SCF/Hr)* |
| | = | *0.59* | *x* | *0.0764* | *x* | *170.00* |
| | = | ***7.63 lbs/hr*** | | | | |
| *Uncontrolled Annual Emissions (TPY)* | = | *gas specific gravity* | *x* | *density of air (tons/SCF)* | *x* | *Total Gas Rate (SCF/Yr)* |
| | = | *0.59* | *x* | *0.0000382* | *x* | *1,489,200* |
| | = | ***33.43 TPY*** | | | | |

**SPECIATION FACTORS:**

*Speciation of the pilot gas is based on an actual fuel gas analysis; refer to Southern Petroleum Laboratories Report No.: 2030-16080189-001A in supporting documentation.*

**EMISSIONS SUMMARY:**

| POLLUTANT: | Weight Percent | CALCULATED EMISSION RATES | | |
|---|---|---|---|---|
| | | Average Hourly (lb/hr) | Maximum Hourly (lb/hr) | Annual (TPY) |
| Nitrogen (excluded from VOC total) | 2.501 | 0.1909 | 0.1909 | 0.8362 |
| Carbon Dioxide (excluded from VOC total) | 1.707 | 0.1303 | 0.1303 | 0.5707 |
| Methane (excluded from VOC total) | 91.034 | 0.1390 | 0.1390 | 0.6087 |
| Ethane (excluded from VOC total) | 0.887 | 0.0014 | 0.0014 | 0.0059 |
| Hydrogen Sulfide (TAP; excluded from VOC total) | 0.000 | 0.0000 | 0.0000 | 0.0000 |
| Propane | 0.529 | 0.0008 | 0.0008 | 0.0035 |
| Iso-Butane | 0.287 | 0.0004 | 0.0004 | 0.0019 |
| N-Butane | 0.390 | 0.0006 | 0.0006 | 0.0026 |
| Iso-Pentane | 0.365 | 0.0006 | 0.0006 | 0.0024 |
| N-Pentane | 0.344 | 0.0005 | 0.0005 | 0.0023 |
| Iso-Hexanes | 0.427 | 0.0007 | 0.0007 | 0.0029 |
| N-Hexane (TAP) | 0.297 | 0.0005 | 0.0005 | 0.0020 |
| Methylcyclopentane | 0.000 | 0.0000 | 0.0000 | 0.0000 |
| Benzene (TAP) | 0.056 | 0.0001 | 0.0001 | 0.0004 |
| Cyclohexane | 0.042 | 0.0001 | 0.0001 | 0.0003 |
| Heptanes | 0.598 | 0.0009 | 0.0009 | 0.0040 |
| Methylcyclohexane | 0.000 | 0.0000 | 0.0000 | 0.0000 |
| Toluene (TAP) | 0.015 | 0.0000 | 0.0000 | 0.0001 |
| 2,2,4-Trimethylpentane (TAP) | 0.307 | 0.0005 | 0.0005 | 0.0021 |
| Octanes Plus | 0.089 | 0.0001 | 0.0001 | 0.0006 |
| Ethylbenzene (TAP) | 0.002 | 0.0000 | 0.0000 | 0.0000 |
| Xylenes (TAP) | 0.007 | 0.0000 | 0.0000 | 0.0000 |
| Nonanes | 0.102 | 0.0002 | 0.0002 | 0.0007 |
| Decanes Plus | 0.014 | 0.0000 | 0.0000 | 0.0001 |
| Other Nm/NE HC | 0.000 | 0.0000 | 0.0000 | 0.0000 |
| **TOTAL WEIGHT PERCENT:** | 100.000 | | | |
| **TOTAL TAP EMISSIONS:** | | 0.00 | 0.00 | 0.00 |
| **TOTAL VOC EMISSIONS:** | | **0.01** | **0.01** | **0.03** |
| **TOTAL Non-VOC & Non-TAP HC:** | | 0.14 | 0.14 | 0.61 |
| **TOTAL EMISSIONS:** | | 0.47 | 0.47 | 2.05 |

| | |
|---|---|
| **Total of Average Hourly VOC emissions estimated for this source:** | **0.78 Lbs/Hr** |
| **Total of Maximum Hourly VOC emissions estimated for this source:** | **0.78 Lbs/Hr** |
| **Total of Maximum Annual VOC emissions estimated for this source:** | **3.35 TPY** |

| CALCULATIONS - Selected Combustion Products |
|---|

**Summary of all routine streams combusted by this flare:**

| *Gas Stream* | *Annual Operating Hours* | *Average Flowrate (SCF/Hr)* | *Maximum Flowrate (SCF/Hr)* | *Average Heat Rate (MMBTU/Hr)* | *Maximum Heat Rate (MMBTU/Hr)* |
|---|---|---|---|---|---|
| 1. Heater Treater Flash Gas & Water Flash Vessel Flash Gas | 8760 | 7050.62 | 7050.62 | 0.9743 | 0.9743 |
| Assist Gas Feed | 8760 | 170.00 | 170.00 | 0.1739 | 0.1739 |
| Purge Gas Feed | 8760 | 170.00 | 170.00 | 0.1739 | 0.1739 |
| Pilot Feed | 8760 | 170.00 | 170.00 | 0.1739 | 0.1739 |
| | ***Totals:*** | ***7,560.62*** | ***7,560.62*** | ***1.50*** | ***1.50*** |

*Emission factor for soot is from AP-42 "Compilation of Air Pollution Emission Factors" for an industrial burn flare stack (refer to supporting documentation for copies).*
*$SO_2$ emissions based on the composite $H_2S$ composition of the flare gas streams assuming stoichiometric combustion.*

| POLLUTANT: | Emission Factor (lb/SCF) | CALCULATED EMISSION RATES | | |
|---|---|---|---|---|
| | | Average Hourly (lb/hr) | Maximum Hourly (lb/hr) | Annual (TPY) |
| Soot (expressed as $PM_{10}$) | 0.000011 | 0.08 | 0.08 | 0.36 |
| Soot (expressed as $PM_{2.5}$) | 0.000011 | 0.08 | 0.08 | 0.36 |
| $SO_2$ | N/A | 0.00 | 0.00 | 0.00 |

*Emission factors for nitrogen oxide and carbon monoxide are from a 1983 CMA document entitled "A Report on a Flare Efficiency Study", for a non-assisted industrial burn flares. (refer to supporting documentation for copies).*

| POLLUTANT: | Emission Factor ($lb/10^6$ BTU) | CALCULATED EMISSION RATES | | |
|---|---|---|---|---|
| | | Average Hourly (lb/hr) | Maximum Hourly (lb/hr) | Annual (TPY) |
| Nitrogen Oxides | 0.0641 | 0.10 | 0.10 | 0.42 |
| CO | 0.5496 | 0.82 | 0.82 | 3.61 |

# *Emission Calculations*

**POINT SOURCE I.D. NUMBER:** ***32-10-H-BS***

**EMISSION SOURCE DESCRIPTION:** ***500 MBTU/Hr Heater Treater-Burner Stack (V-23)***

DATA:

| | |
|---|---|
| **Emission Source:** | ***External Combustion Burner*** |
| **Annual Hours of Operation:** | ***8760*** |
| **Maximum Burner Rating (MMBTU/Hr):** | ***0.500*** |
| **Fuel Gas Heat of Combustion (BTU/scf):** *(based on an actual fuel gas analysis)* | ***1044*** |
| **Sulfur Concentration of Fuel Gas (ppmv):** *(conservative estimate)* | ***7*** |
| **Fuel Source:** | ***Field Gas*** |

Max. Hourly Fuel Consumption (SCFH): = burner rating/fuel gas heat of combustion/80% efficiency = ***598.66***

Max. Annual Fuel Consumption (MSCF/Yr): = hourly fuel consumption x annual hours = ***5,244.26***

**EMISSION FACTORS:**

*Unless otherwise noted, emission factors taken from EPA Publication AP-42, "Compilation of Air Pollution Emission Factors" - Natural Gas Combustion (Small Boilers), refer to supporting documentation.*

*$SO_2$ emission factor based on 100% conversion of sulfur compounds in fuel gas, using $H_2S$ fuel composition noted above.*

**EMISSION CALCULATIONS:**

| POLLUTANT: | EMISSION FACTOR ($LBS/10^6$ SCF) | CALCULATED EMISSION RATES: | |
|---|---|---|---|
| | | Hourly (lb/hr) | Annual (TPY) |
| Particulate Matter (filterable + condensable) | 7.6 | 0.0045 | 0.0199 |
| Sulfur Dioxide | 1.182 | 0.0007 | 0.0031 |
| Nitrogen Oxides | 100 | 0.0599 | 0.2622 |
| Carbon Monoxide | 84 | 0.0503 | 0.2203 |
| Methane (excluded from VOC total) | 2.3 | 0.0014 | 0.0060 |
| VOC | 5.5 | 0.0033 | 0.0144 |
| TOC | 11 | 0.0066 | 0.0288 |
| 2-Methylnaphthalene (TAP) | 0.0000240 | 0.0000 | 0.0000 |
| 3-Methylchloranthrene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| 7,12-Dimethylbenz(a)anthrancene (TAP) | 0.0000160 | 0.0000 | 0.0000 |
| Acenaphthene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| Acenaphthylene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| Anthracene (TAP) | 0.0000024 | 0.0000 | 0.0000 |

| POLLUTANT: | EMISSION FACTOR (LBS/$10^6$ SCF) | CALCULATED EMISSION RATES: | |
|---|---|---|---|
| | | Hourly (lb/hr) | Annual (TPY) |
| Benz(a)anthracene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| Benzene (TAP) | 0.0021000 | 0.0000 | 0.0000 |
| Benzo(a)pyrene (TAP) | 0.0000012 | 0.0000 | 0.0000 |
| Benzo(b)fluoranthene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| Benzo(g,h,I)perylene (TAP) | 0.0000012 | 0.0000 | 0.0000 |
| Benzo(k)fluoranthene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| Chrysene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| Dibenzo(a,h)anthrancene (TAP) | 0.0000012 | 0.0000 | 0.0000 |
| Dichlorobenzene (TAP) | 0.0012000 | 0.0000 | 0.0000 |
| Fluorathene (TAP) | 0.0000030 | 0.0000 | 0.0000 |
| Fluorene (TAP) | 0.0000028 | 0.0000 | 0.0000 |
| Formaldehyde (TAP) | 0.0750000 | 0.0000 | 0.0002 |
| Hexane (TAP) | 1.8000000 | 0.0011 | 0.0047 |
| Indeno(1,2,3-cd)pyrene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| Naphthalene (TAP) | 0.0006100 | 0.0000 | 0.0000 |
| Phenanathrene (TAP) | 0.0000170 | 0.0000 | 0.0000 |
| Pyrene (TAP) | 0.0000050 | 0.0000 | 0.0000 |
| Toluene (TAP) | 0.0034000 | 0.0000 | 0.0000 |
| Arsenic (TAP) | 0.0002000 | 0.0000 | 0.0000 |
| Beryllium (TAP) | 0.0000120 | 0.0000 | 0.0000 |
| Cadmium (TAP) | 0.0011000 | 0.0000 | 0.0000 |
| Chromium (TAP) | 0.0014000 | 0.0000 | 0.0000 |
| Cobalt (TAP) | 0.0000840 | 0.0000 | 0.0000 |
| Manganese (TAP) | 0.0003800 | 0.0000 | 0.0000 |
| Mercury (TAP) | 0.0002600 | 0.0000 | 0.0000 |
| Nickel (TAP) | 0.0021000 | 0.0000 | 0.0000 |
| Selenium (TAP) | 0.0000240 | 0.0000 | 0.0000 |
| **Total TAPs** | | 0.00 | 0.00 |
| **Total VOC-TAPs** | | 0.00 | 0.00 |
| **Total Non VOC & Non TAP-HC** | | 0.00 | 0.01 |
| **Total VOC** | | **0.00** | **0.01** |

# *Emission Calculations*

**POINT SOURCE I.D. NUMBER:** ***33-17-LH-BS***

**EMISSION SOURCE DESCRIPTION:** ***3.5 MMBTU/Hr Line Heater-Burner Stack (H-108)***

DATA:

| | |
|---|---|
| **Emission Source:** | ***External Combustion Burner*** |
| **Annual Hours of Operation:** | ***8760*** |
| **Maximum Burner Rating (MMBTU/Hr):** | ***3.5*** |
| **Fuel Gas Heat of Combustion (BTU/scf):** *(based on an actual fuel gas analysis)* | ***1044*** |
| **Sulfur Concentration of Fuel Gas (ppmv):** *(conservative estimate)* | ***7*** |
| **Fuel Source:** | ***Field Gas*** |

Max. Hourly Fuel Consumption (SCFH): = burner rating/fuel gas heat of combustion/80% efficiency = ***4,190.61***

Max. Annual Fuel Consumption (MSCF/Yr): = hourly fuel consumption x annual hours = ***36,709.74***

**EMISSION FACTORS:**

*Unless otherwise noted, emission factors taken from EPA Publication AP-42, "Compilation of Air Pollution Emission Factors" - Natural Gas Combustion (Small Boilers), refer to supporting documentation.*

*$SO_2$ emission factor based on 100% conversion of sulfur compounds in fuel gas, using $H_2S$ fuel composition noted above.*

**EMISSION CALCULATIONS:**

| POLLUTANT: | EMISSION FACTOR ($LBS/10^6$ SCF) | CALCULATED EMISSION RATES: | |
|---|---|---|---|
| | | Hourly (lb/hr) | Annual (TPY) |
| Particulate Matter (filterable + condensable) | 7.6 | 0.0318 | 0.1395 |
| Sulfur Dioxide | 1.182 | 0.0050 | 0.0217 |
| Nitrogen Oxides | 100 | 0.4191 | 1.8355 |
| Carbon Monoxide | 84 | 0.3520 | 1.5418 |
| Methane (excluded from VOC total) | 2.3 | 0.0096 | 0.0422 |
| VOC | 5.5 | 0.0230 | 0.1010 |
| TOC | 11 | 0.0461 | 0.2019 |
| 2-Methylnaphthalene (TAP) | 0.0000240 | 0.0000 | 0.0000 |
| 3-Methylchloranthrene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| 7,12-Dimethylbenz(a)anthrancene (TAP) | 0.0000160 | 0.0000 | 0.0000 |
| Acenaphthene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| Acenaphthylene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| Anthracene (TAP) | 0.0000024 | 0.0000 | 0.0000 |

| POLLUTANT: | EMISSION FACTOR (LBS/$10^6$ SCF) | CALCULATED EMISSION RATES: | |
|---|---|---|---|
| | | Hourly (lb/hr) | Annual (TPY) |
| Benz(a)anthracene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| Benzene (TAP) | 0.0021000 | 0.0000 | 0.0000 |
| Benzo(a)pyrene (TAP) | 0.0000012 | 0.0000 | 0.0000 |
| Benzo(b)fluoranthene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| Benzo(g,h,I)perylene (TAP) | 0.0000012 | 0.0000 | 0.0000 |
| Benzo(k)fluoranthene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| Chrysene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| Dibenzo(a,h)anthrancene (TAP) | 0.0000012 | 0.0000 | 0.0000 |
| Dichlorobenzene (TAP) | 0.0012000 | 0.0000 | 0.0000 |
| Fluorathene (TAP) | 0.0000030 | 0.0000 | 0.0000 |
| Fluorene (TAP) | 0.0000028 | 0.0000 | 0.0000 |
| Formaldehyde (TAP) | 0.0750000 | 0.0003 | 0.0014 |
| Hexane (TAP) | 1.8000000 | 0.0075 | 0.0330 |
| Indeno(1,2,3-cd)pyrene (TAP) | 0.0000018 | 0.0000 | 0.0000 |
| Naphthalene (TAP) | 0.0006100 | 0.0000 | 0.0000 |
| Phenanathrene (TAP) | 0.0000170 | 0.0000 | 0.0000 |
| Pyrene (TAP) | 0.0000050 | 0.0000 | 0.0000 |
| Toluene (TAP) | 0.0034000 | 0.0000 | 0.0001 |
| Arsenic (TAP) | 0.0002000 | 0.0000 | 0.0000 |
| Beryllium (TAP) | 0.0000120 | 0.0000 | 0.0000 |
| Cadmium (TAP) | 0.0011000 | 0.0000 | 0.0000 |
| Chromium (TAP) | 0.0014000 | 0.0000 | 0.0000 |
| Cobalt (TAP) | 0.0000840 | 0.0000 | 0.0000 |
| Manganese (TAP) | 0.0003800 | 0.0000 | 0.0000 |
| Mercury (TAP) | 0.0002600 | 0.0000 | 0.0000 |
| Nickel (TAP) | 0.0021000 | 0.0000 | 0.0000 |
| Selenium (TAP) | 0.0000240 | 0.0000 | 0.0000 |
| **Total TAPs** | | 0.01 | 0.03 |
| **Total VOC-TAPs** | | 0.01 | 0.03 |
| **Total Non VOC & Non TAP-HC** | | 0.01 | 0.04 |
| **Total VOC** | | **0.02** | **0.10** |

# *Emission Calculations*

**POINT SOURCE I.D. NUMBER:** ***34-17-SEP***

**EMISSION SOURCE DESCRIPTION:** ***API Separator (SP-128)***

DATA:

| | |
|---|---|
| **Emission Source:** | ***"Working" & "Standing" Losses*** |
| **Maximum Annual Oil Throughput:** **(BBL/Yr)** | ***20*** |
| **Maximum Annual Water Throughput:** **(BBL/Yr)** | ***9,600*** |
| **Average VOC Working Losses - $L_W$ (lb/yr):** | ***47.355*** |
| **Average VOC Standing Losses - $L_S$ (lb/yr):** | ***27.654*** |
| **Basis of Estimates:** | ***AP-42, Chapter 7 (June 2020, Section 7.1.3.1); Refer to supporting documentation for summary*** |

| | | | |
|---|---|---|---|
| Avg. Hourly Uncontrolled THC Losses (lb/hr) | = (Lw + Ls) / 8760 | = | **0.01** |
| Annual Potential Uncontrolled THC Losses (TPY) | = Hourly * 8760/2000 | = | **0.04** |

*For purposes of permitting and/or providing conservative emission estimates, emissions were calculated using Crude Oil and Produced Water as the stored material for this tank. A throughput of approximately 9,620 BBL/yr was used in the emissions model in an effort to demonstrate a conservative potential emissions estimate.*

# *Emission Calculations*

**POINT SOURCE I.D. NUMBER:** ***35-17-IWT***

**EMISSION SOURCE DESCRIPTION:** ***480 BBL Injection Water Tank (V-181A)***

DATA:

| | | | |
|---|---|---|---|
| **Emission Source:** | ***"Working" & "Standing" Losses*** | | |
| **Maximum Annual Water Throughput: (BBL/Yr)** | ***9,600*** | | |
| **Average VOC Working Losses - $L_W$ (lb/yr):** | ***48.994*** | | |
| **Average VOC Standing Losses - $L_S$ (lb/yr):** | ***47.933*** | | |
| **Basis of Estimates:** | ***AP-42, Chapter 7 (June 2020, Section 7.1.3.1); Refer to supporting documentation for summary*** | | |
| Avg. Hourly Uncontrolled THC Losses (lb/hr) | = (Lw + Ls) / 8760 | = | **0.01** |
| Annual Potential Uncontrolled THC Losses (TPY) | = Hourly * 8760/2000 | = | **0.05** |

*For purposes of permitting and/or providing conservative emission estimates, emissions were calculated using Produced Water as the stored material for this tank. A throughput of approximately 9,600 BBL/yr was used in the emissions model in an effort to demonstrate a conservative potential emissions estimate.*

# *Emission Calculations*

**POINT SOURCE I.D. NUMBER:** ***36-17-IWT***

**EMISSION SOURCE DESCRIPTION:** ***480 BBL Injection Water Tank (V-181B)***

DATA:

| | | | |
|---|---|---|---|
| **Emission Source:** | ***"Working" & "Standing" Losses*** | | |
| **Maximum Annual Water Throughput: (BBL/Yr)** | ***9,600*** | | |
| **Average VOC Working Losses - $L_W$ (lb/yr):** | ***48.994*** | | |
| **Average VOC Standing Losses - $L_S$ (lb/yr):** | ***47.933*** | | |
| **Basis of Estimates:** | ***AP-42, Chapter 7 (June 2020, Section 7.1.3.1); Refer to supporting documentation for summary*** | | |
| Avg. Hourly Uncontrolled THC Losses (lb/hr) | = (Lw + Ls) / 8760 | = | **0.01** |
| Annual Potential Uncontrolled THC Losses (TPY) | = Hourly * 8760/2000 | = | **0.05** |

*For purposes of permitting and/or providing conservative emission estimates, emissions were calculated using Produced Water as the stored material for this tank. A throughput of approximately 9,600 BBL/yr was used in the emissions model in an effort to demonstrate a conservative potential emissions estimate.*

# *Emission Calculations*

**POINT SOURCE I.D. NUMBER:** ***37-17-TWP***

**EMISSION SOURCE DESCRIPTION:** ***Truck Washdown Pit (SP-183)***

DATA:

| | | | |
|---|---|---|---|
| **Emission Source:** | ***"Working" & "Standing" Losses*** | | |
| **Maximum Annual Oil Throughput:** **(BBL/Yr)** | ***20*** | | |
| **Average VOC Working Losses - $L_W$ (lb/yr):** | ***2.919*** | | |
| **Average VOC Standing Losses - $L_S$ (lb/yr):** | ***1,004.943*** | | |
| **Basis of Estimates:** | ***AP-42, Chapter 7 (June 2020, Section 7.1.3.1); Refer to supporting documentation for summary*** | | |
| Avg. Hourly Uncontrolled THC Losses (lb/hr) | = (Lw + Ls) / 8760 | = | **0.12** |
| Annual Potential Uncontrolled THC Losses (TPY) | = Hourly * 8760/2000 | = | **0.50** |

*For purposes of permitting and/or providing conservative emission estimates, emissions were calculated using Crude Oil as the stored material for this tank. A throughput of approximately 20 BBL/yr was used in the emissions model in an effort to demonstrate a conservative potential emissions estimate.*

# *Emission Calculations*

**POINT SOURCE I.D. NUMBER:** ***38-17-RWT***

**EMISSION SOURCE DESCRIPTION:** ***3000 BBL Raw Water Tank (V-121)***

DATA:

| | | | |
|---|---|---|---|
| **Emission Source:** | ***"Working" & "Standing" Losses*** | | |
| **Maximum Annual Water Throughput: (BBL/Yr)** | ***28,571*** | | |
| **Average VOC Working Losses - $L_W$ (lb/yr):** | ***149.652*** | | |
| **Average VOC Standing Losses - $L_S$ (lb/yr):** | ***303.697*** | | |
| **Basis of Estimates:** | ***AP-42, Chapter 7 (June 2020, Section 7.1.3.1); Refer to supporting documentation for summary*** | | |
| Avg. Hourly Uncontrolled THC Losses (lb/hr) | = (Lw + Ls) / 8760 | = | **0.05** |
| Annual Potential Uncontrolled THC Losses (TPY) | = Hourly * 8760/2000 | = | **0.23** |

*For purposes of permitting and/or providing conservative emission estimates, emissions were calculated using Produced Water as the stored material for this tank. A throughput of approximately 28,571 BBL/yr was used in the emissions model in an effort to demonstrate a conservative potential emissions estimate.*

# Michael Watson
SECRETARY OF STATE

This is not an official certificate of good standing.

## Name History

| Name | Name Type |
|---|---|
| DENBURY ONSHORE, LLC | Legal |

## Business Information

| | |
|---|---|
| **Business Type:** | Limited Liability Company |
| **Business ID:** | 743899 |
| **Status:** | Good Standing |
| **Effective Date:** | 12/31/2003 |
| **State of Incorporation:** | DE |
| **Principal Office Address:** | 5851 Legacy Circle, Suite 1200<br>Plano, TX 75024 |

## Registered Agent

**Name**

CORPORATION SERVICE COMPANY
109 Executive Drive, Suite 3
Madison, MS 39110

## Officers & Directors

| Name | Title |
|---|---|
| Alan Rhoades<br>5320 LEGACY DRIVE<br>PLANO, TX 75024 | Organizer |
| KATHLEEN D ASH<br>5851 LEGACY CIRCLE, SUITE 1200<br>PLANO, TX 75024 | Manager |
| KATHLEEN A BRACCI<br>5851 LEGACY CIRCLE, SUITE 1200<br>PLANO, TX 75024 | Manager |
| ROBERT D TRACY<br>5851 LEGACY CIRCLE, SUITE 1200<br>PLANO, TX 75024 | Manager |

Fuel Gas

# Certificate of Analysis

Number: 2030-16080189-001A

**Carencro Laboratory**
4790 NE Evangeline Thruway
Carencro, LA 70520
Phone 337-896-3055

Mark Garcia
Denbury Resources
5320 Legacy Drive
Plano, TX 75024

Aug. 25, 2016

| | | | |
|---|---|---|---|
| Field: | Brookhaven | Sampled By: | BV-FSC |
| Station Name: | EOR Fuel Gas | Sample Of: | Gas Spot |
| Station Number: | | Sample Date: | 08/09/2016 |
| Station Location: | | Sample Conditions: | 76 psig, @ 81 °F |
| Sample Point: | Fuel Gas Scrubber | Method: | GPA 2286 |
| Analyzed: | 08/18/2016 14:54:27 by CC123 | Cylinder No: | 30219 |

## Analytical Data

| Components | Mol. % | Wt. % | GPM at 15.025 psia | | |
|---|---|---|---|---|---|
| Nitrogen | 1.517 | 2.501 | | GPM TOTAL C2+ | 0.473 |
| Carbon Dioxide | 0.659 | 1.707 | | | |
| Methane | 96.405 | 91.034 | | | |
| Ethane | 0.501 | 0.887 | 0.137 | | |
| Propane | 0.204 | 0.529 | 0.057 | | |
| Iso-Butane | 0.084 | 0.287 | 0.028 | | |
| n-Butane | 0.114 | 0.390 | 0.037 | | |
| Iso-Pentane | 0.086 | 0.365 | 0.032 | | |
| n-Pentane | 0.081 | 0.344 | 0.030 | | |
| i-Hexanes | 0.087 | 0.427 | 0.036 | | |
| n-Hexane | 0.060 | 0.297 | 0.025 | | |
| Benzene | 0.012 | 0.056 | 0.003 | | |
| Cyclohexane | 0.009 | 0.042 | 0.003 | | |
| i-Heptanes | 0.066 | 0.379 | 0.030 | | |
| n-Heptane | 0.037 | 0.219 | 0.017 | | |
| Toluene | 0.003 | 0.015 | 0.001 | | |
| i-Octanes | 0.047 | 0.307 | 0.022 | | |
| n-Octane | 0.013 | 0.089 | 0.007 | | |
| Ethylbenzene | NIL | 0.002 | NIL | | |
| Xylenes | NIL | 0.007 | NIL | | |
| i-Nonanes | 0.011 | 0.082 | 0.006 | | |
| n-Nonane | 0.003 | 0.020 | 0.001 | | |
| Decane Plus | 0.001 | 0.014 | 0.001 | | |
| | 100.000 | 100.000 | 0.473 | | |

| Calculated Physical Properties | Total | C10+ |
|---|---|---|
| Calculated Molecular Weight | 16.99 | 135.87 |
| **GPA 2172-09 Calculation:** | | |
| **Calculated Gross BTU per ft³ @ 15.025 psia & 60°F** | | |
| Real Gas Dry BTU | 1044.0 | 7273.7 |
| Water Sat. Gas Base BTU | 1026.2 | 7149.6 |
| Relative Density Real Gas | 0.5877 | 4.6932 |
| Compressibility Factor | 0.9978 | |

**Comments:** LELAP Certificate 05023

Patti L. Petro

Hydrocarbon Laboratory Manager

Quality Assurance: The above analyses are performed in accordance with ASTM, UOP, GPA guidelines for quality assurance, unless otherwise stated.

Table 1.4-1. EMISSION FACTORS FOR NITROGEN OXIDES ($NO_x$) AND CARBON MONOXIDE (CO) FROM NATURAL GAS COMBUSTION[a]

| Combustor Type (MMBtu/hr Heat Input) [SCC] | $NO_x$[b] | | CO | |
|---|---|---|---|---|
| | Emission Factor ($lb/10^6$ scf) | Emission Factor Rating | Emission Factor ($lb/10^6$ scf) | Emission Factor Rating |
| Large Wall-Fired Boilers (>100) [1-01-006-01, 1-02-006-01, 1-03-006-01] | | | | |
| Uncontrolled (Pre-NSPS)[c] | 280 | A | 84 | B |
| Uncontrolled (Post-NSPS)[c] | 190 | A | 84 | B |
| Controlled - Low $NO_x$ burners | 140 | A | 84 | B |
| Controlled - Flue gas recirculation | 100 | D | 84 | B |
| Small Boilers (<100) [1-01-006-02, 1-02-006-02, 1-03-006-02, 1-03-006-03] | | | | |
| Uncontrolled | 100 | B | 84 | B |
| Controlled - Low $NO_x$ burners | 50 | D | 84 | B |
| Controlled - Low $NO_x$ burners/Flue gas recirculation | 32 | C | 84 | B |
| Tangential-Fired Boilers (All Sizes) [1-01-006-04] | | | | |
| Uncontrolled | 170 | A | 24 | C |
| Controlled - Flue gas recirculation | 76 | D | 98 | D |
| Residential Furnaces (<0.3) [No SCC] | | | | |
| Uncontrolled | 94 | B | 40 | B |

[a] Reference 11. Units are in pounds of pollutant per million standard cubic feet of natural gas fired. To convert from $lb/10^6$ scf to $kg/10^6$ $m^3$, multiply by 16. Emission factors are based on an average natural gas higher heating value of 1,020 Btu/scf. To convert from $1b/10^6$ scf to lb/MMBtu, divide by 1,020. The emission factors in this table may be converted to other natural gas heating values by multiplying the given emission factor by the ratio of the specified heating value to this average heating value. SCC = Source Classification Code. ND = no data. NA = not applicable.

[b] Expressed as $NO_2$. For large and small wall fired boilers with SNCR control, apply a 24 percent reduction to the appropriate $NO_X$ emission factor. For tangential-fired boilers with SNCR control, apply a 13 percent reduction to the appropriate $NO_X$ emission factor.

[c] NSPS=New Source Performance Standard as defined in 40 CFR 60 Subparts D and Db. Post-NSPS units are boilers with greater than 250 MMBtu/hr of heat input that commenced construction modification, or reconstruction after August 17, 1971, and units with heat input capacities between 100 and 250 MMBtu/hr that commenced construction modification, or reconstruction after June 19, 1984.

TABLE 1.4-2. EMISSION FACTORS FOR CRITERIA POLLUTANTS AND GREENHOUSE GASES FROM NATURAL GAS COMBUSTION[a]

| Pollutant | Emission Factor ($lb/10^6$ scf) | Emission Factor Rating |
|---|---|---|
| $CO_2$[b] | 120,000 | A |
| Lead | 0.0005 | D |
| $N_2O$ (Uncontrolled) | 2.2 | E |
| $N_2O$ (Controlled-low-$NO_X$ burner) | 0.64 | E |
| PM (Total)[c] | 7.6 | D |
| PM (Condensable)[c] | 5.7 | D |
| PM (Filterable)[c] | 1.9 | B |
| $SO_2$[d] | 0.6 | A |
| TOC | 11 | B |
| Methane | 2.3 | B |
| VOC | 5.5 | C |

[a] Reference 11. Units are in pounds of pollutant per million standard cubic feet of natural gas fired. Data are for all natural gas combustion sources. To convert from $lb/10^6$ scf to $kg/10^6$ $m^3$, multiply by 16. To convert from $lb/10^6$ scf to 1b/MMBtu, divide by 1,020. The emission factors in this table may be converted to other natural gas heating values by multiplying the given emission factor by the ratio of the specified heating value to this average heating value. TOC = Total Organic Compounds. VOC = Volatile Organic Compounds.

[b] Based on approximately 100% conversion of fuel carbon to $CO_2$. $CO_2[lb/10^6 \text{ scf}] = (3.67)(CON)(C)(D)$, where CON = fractional conversion of fuel carbon to $CO_2$, C = carbon content of fuel by weight (0.76), and D = density of fuel, $4.2 \times 10^4$ $lb/10^6$ scf.

[c] All PM (total, condensible, and filterable) is assumed to be less than 1.0 micrometer in diameter. Therefore, the PM emission factors presented here may be used to estimate $PM_{10}$, $PM_{2.5}$ or $PM_1$ emissions. Total PM is the sum of the filterable PM and condensible PM. Condensible PM is the particulate matter collected using EPA Method 202 (or equivalent). Filterable PM is the particulate matter collected on, or prior to, the filter of an EPA Method 5 (or equivalent) sampling train.

[d] Based on 100% conversion of fuel sulfur to $SO_2$. Assumes sulfur content is natural gas of 2,000 grains/$10^6$ scf. The $SO_2$ emission factor in this table can be converted to other natural gas sulfur contents by multiplying the $SO_2$ emission factor by the ratio of the site-specific sulfur content (grains/$10^6$ scf) to 2,000 grains/$10^6$ scf.

# TABLE 1.4-3. EMISSION FACTORS FOR SPECIATED ORGANIC COMPOUNDS FROM NATURAL GAS COMBUSTION[a]

| CAS No. | Pollutant | Emission Factor ($lb/10^6$ scf) | Emission Factor Rating |
|---|---|---|---|
| 91-57-6 | 2-Methylnaphthalene[b, c] | 2.4E-05 | D |
| 56-49-5 | 3-Methylchloranthrene[b, c] | <1.8E-06 | E |
| | 7,12-Dimethylbenz(a)anthracene[b,c] | <1.6E-05 | E |
| 83-32-9 | Acenaphthene[b,c] | <1.8E-06 | E |
| 203-96-8 | Acenaphthylene[b,c] | <1.8E-06 | E |
| 120-12-7 | Anthracene[b,c] | <2.4E-06 | E |
| 56-55-3 | Benz(a)anthracene[b,c] | <1.8E-06 | E |
| 71-43-2 | Benzene[b] | 2.1E-03 | B |
| 50-32-8 | Benzo(a)pyrene[b,c] | <1.2E-06 | E |
| 205-99-2 | Benzo(b)fluoranthene[b,c] | <1.8E-06 | E |
| 191-24-2 | Benzo(g,h,i)perylene[b,c] | <1.2E-06 | E |
| 207-08-9 | Benzo(k)fluoranthene[b,c] | <1.8E-06 | E |
| 106-97-8 | Butane | 2.1E+00 | E |
| 218-01-9 | Chrysene[b,c] | <1.8E-06 | E |
| 53-70-3 | Dibenzo(a,h)anthracene[b,c] | <1.2E-06 | E |
| 25321-22-6 | Dichlorobenzene[b] | 1.2E-03 | E |
| 74-84-0 | Ethane | 3.1E+00 | E |
| 206-44-0 | Fluoranthene[b,c] | 3.0E-06 | E |
| 86-73-7 | Fluorene[b,c] | 2.8E-06 | E |
| 50-00-0 | Formaldehyde[b] | 7.5E-02 | B |
| 110-54-3 | Hexane[b] | 1.8E+00 | E |
| 193-39-5 | Indeno(1,2,3-cd)pyrene[b,c] | <1.8E-06 | E |
| 91-20-3 | Naphthalene[b] | 6.1E-04 | E |
| 109-66-0 | Pentane | 2.6E+00 | E |
| 85-01-8 | Phenanathrene[b,c] | 1.7E-05 | D |
| 74-98-6 | Propane | 1.6E+00 | E |

TABLE 1.4-3. EMISSION FACTORS FOR SPECIATED ORGANIC COMPOUNDS FROM NATURAL GAS COMBUSTION (Continued)

| CAS No. | Pollutant | Emission Factor ($lb/10^6$ scf) | Emission Factor Rating |
|---|---|---|---|
| 129-00-0 | Pyrene[b, c] | 5.0E-06 | E |
| 108-88-3 | Toluene[b] | 3.4E-03 | C |

[a] Reference 11. Units are in pounds of pollutant per million standard cubic feet of natural gas fired. Data are for all natural gas combustion sources. To convert from $lb/10^6$ scf to $kg/10^6$ $m^3$, multiply by 16. To convert from $1b/10^6$ scf to lb/MMBtu, divide by 1,020. Emission Factors preceeded with a less-than symbol are based on method detection limits.

[b] Hazardous Air Pollutant (HAP) as defined by Section 112(b) of the Clean Air Act.

[c] HAP because it is Polycyclic Organic Matter (POM). POM is a HAP as defined by Section 112(b) of the Clean Air Act.

[d] The sum of individual organic compounds may exceed the VOC and TOC emission factors due to differences in test methods and the availability of test data for each pollutant.

TABLE 1.4-4. EMISSION FACTORS FOR METALS FROM NATURAL GAS COMBUSTION[a]

| CAS No. | Pollutant | Emission Factor ($lb/10^6$ scf) | Emission Factor Rating |
|---|---|---|---|
| 7440-38-2 | Arsenic[b] | 2.0E-04 | E |
| 7440-39-3 | Barium | 4.4E-03 | D |
| 7440-41-7 | Beryllium[b] | <1.2E-05 | E |
| 7440-43-9 | Cadmium[b] | 1.1E-03 | D |
| 7440-47-3 | Chromium[b] | 1.4E-03 | D |
| 7440-48-4 | Cobalt[b] | 8.4E-05 | D |
| 7440-50-8 | Copper | 8.5E-04 | C |
| 7439-96-5 | Manganese[b] | 3.8E-04 | D |
| 7439-97-6 | Mercury[b] | 2.6E-04 | D |
| 7439-98-7 | Molybdenum | 1.1E-03 | D |
| 7440-02-0 | Nickel[b] | 2.1E-03 | C |
| 7782-49-2 | Selenium[b] | <2.4E-05 | E |
| 7440-62-2 | Vanadium | 2.3E-03 | D |
| 7440-66-6 | Zinc | 2.9E-02 | E |

[a] Reference 11. Units are in pounds of pollutant per million standard cubic feet of natural gas fired. Data are for all natural gas combustion sources. Emission factors preceeded by a less-than symbol are based on method detection limits. To convert from $lb/10^6$ scf to $kg/10^6$ $m^3$, multiply by l6. To convert from $lb/10^6$ scf to 1b/MMBtu, divide by 1,020.

[b] Hazardous Air Pollutant as defined by Section 112(b) of the Clean Air Act.

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# DRILLING AND PRODUCTION PRACTICE

1944



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To calculate the properties of the interstitial water in the reservoir, it is observed from Table 4 that the change in formation volume of pure water at 3,000 psi, absolute, and 200 deg F (due to the solution of 15.4 cu ft per bbl of gas) is 1.0330 minus 1.0271, or 0.0059 bbl per bbl. As the solubility in the interstitial water is only 13.6 cu ft per bbl, the change in formation volume would be expected to be $\frac{13.6}{15.4}$ (0.0059), or 0.0052. Hence, the formation volume of the interstitial water is calculated to be 1.0271 plus 0.0052, or 1.0323 bbl per bbl. A similar calculation at a reservoir pressure of 2,000 psi, absolute, yields a formation volume of 1.0340 bbl per bbl—which indicates that, even though the interstitial water contains less dissolved gas at 2,000 psi, absolute, than it did at 3,000 psi, absolute, its volume is greater at the lower pressure. This result is interesting, because it is opposite to the behavior of natural-gas–crude-oil mixtures.

The compressibility of the saturated interstitial water is found from Fig. 2 by multiplying the correction factor for the gas solubility, 1.12 for a 13.6-cu-ft-per-bbl mixture, times the compressibility, 3.12 times $10^{-6}$, of pure water, which gives 3.50 times $10^{-6}$ bbl per bbl per lb per sq in.

The use of data on the formation volumes of the saturated interstitial water, together with the data on the compressibilities, permits accurate accounting of the interstitial-water behavior for material-balance calculations when the accuracy of the other data justifies the additional refinement.

TABLE 4

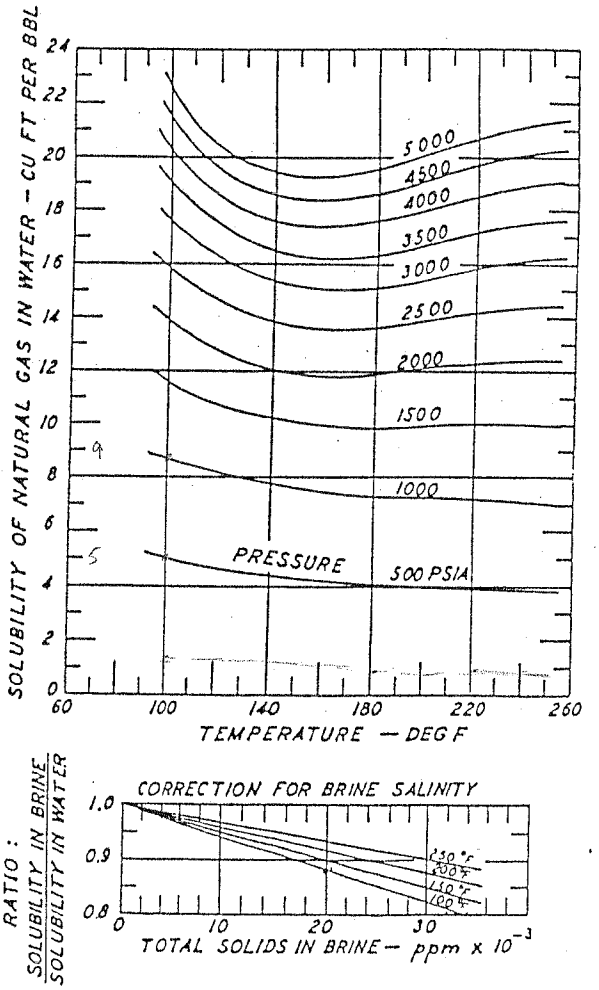
**Formation Volumes of Pure Water and Mixtures of Natural Gas and Water**

| Saturation Pressure (PSI, Absolute) | Formation Volumes—Barrel Per Barrel: 100 Deg F | 150 Deg F | 200 Deg F | 250 Deg F |
|---|---|---|---|---|
| | Natural Gas and Water | | | |
| 5,000 | 0.9989 | 1.0126 | 1.0301 | 1.0522 |
| 4,000 | 1.0003 | 1.0140 | 1.0316 | 1.0537 |
| 3,000 | 1.0017 | 1.0154 | 1.0330 | 1.0552 |
| 2,000 | 1.0031 | 1.0168 | 1.0345 | 1.0568 |
| 1,000 | 1.0045 | 1.0183 | 1.0361 | 1.0584 |
| Pressure (PSI, Absolute) | Pure Water * | | | |
| 5,000 | 0.9910 | 1.0039 | 1.0210 | 1.0418 |
| 4,000 | 0.9938 | 1.0067 | 1.0240 | 1.0452 |
| 3,000 | 0.9966 | 1.0095 | 1.0271 | 1.0487 |
| 2,000 | 0.9995 | 1.0125 | 1.0304 | 1.0523 |
| 1,000 | 1.0025 | 1.0153 | 1.0335 | 1.0560 |
| Vapor pressure of water | 1.0056 | 1.0187 | 1.0370 | 1.0598 |

* See reference No. 3.

Water production from so-called "clean" gas wells or high gas-oil-ratio (distillate) wells may be a combination of the water that exists as vapor in the reservoir gas and liquid water that is brought to the surface by mechanical entrainment in the gas. The water produced by condensation is free of salts, whereas the entrained water may contain a considerable amount of dissolved salts.

The amount of water that will be produced from a well as vapor can be determined from Table 5 and Fig. 3. For example, consider the case of a gas reservoir at 3,000 psi, absolute, and 200 deg F, in which the interstitial water has a salinity of 30,000 ppm. From Table 5 and Fig. 3, the amount of water vapor in the formation gas is shown to be 0.82 bbl per 1,000 MCF of dry gas when vaporized from pure water, or 0.82 times 0.93, which equals 0.76 bbl per 1,000 MCF for the gas in equilibrium with the saline interstitial water. If the foregoing reservoir gas is put through a trap operating at 500 psi, absolute, and 100 deg F, the amount of water which can remain as vapor in the gas at these conditions is shown in Table 5 to be 0.31 bbl per 1,000




Solubility of Natural Gas in Water.

FIG. 1

Inlet Gas

# Certificate of Analysis

Number: 172-23080191-003A

**Williston Laboratory**
3111 1st Ave W
Williston, ND 58801

Aug. 29, 2023

Kevin Hendricks
Denbury
202 S 4th Street West
Baker, MT 59313

Station Name: MS Brookhaven EPR Facility
Sample Point: HP Separator
Method: GPA 2286
Cylinder No: 007752
Analyzed: 08/18/2023 11:05:14

Sampled By: John Fielder
Sample Of: Gas Spot
Sample Date: 08/04/2023 09:00
Sample Conditions: 770 psig, @ 80 °F
PO/Ref. No: 4300204782

## Analytical Data

| Components | Mol. % | Wt. % | GPM at 14.696 psia |
|---|---|---|---|
| Nitrogen | 0.4893 | 0.3299 | |
| Methane | 8.9353 | 3.4498 | |
| Carbon Dioxide | 89.2702 | 94.5515 | |
| Ethane | 0.4969 | 0.3596 | 0.1333 |
| Propane | 0.2735 | 0.2902 | 0.0756 |
| Iso-Butane | 0.0646 | 0.0904 | 0.0212 |
| n-Butane | 0.1372 | 0.1919 | 0.0434 |
| Iso-Pentane | 0.0651 | 0.1130 | 0.0239 |
| n-Pentane | 0.0533 | 0.0925 | 0.0194 |
| Hexanes | 0.0402 | 0.0834 | 0.0166 |
| n-Hexane | 0.0206 | 0.0427 | 0.0085 |
| Benzene | 0.0066 | 0.0124 | 0.0019 |
| Cyclohexane | 0.0146 | 0.0296 | 0.0050 |
| Heptanes | 0.0350 | 0.0844 | 0.0162 |
| Methylcyclohexane | 0.0187 | 0.0442 | 0.0075 |
| Toluene | 0.0036 | 0.0080 | 0.0012 |
| Octanes | 0.0219 | 0.0602 | 0.0113 |
| Ethylbenzene | 0.0006 | 0.0015 | 0.0002 |
| Xylenes | 0.0083 | 0.0212 | 0.0032 |
| Nonanes | 0.0259 | 0.0799 | 0.0146 |
| Decanes Plus | 0.0186 | 0.0637 | 0.0114 |
| | 100.0000 | 100.0000 | 0.4144 |

GPM TOTAL C2+ 0.413

| Calculated Physical Properties | Total | C10+ |
|---|---|---|
| Calculated Molecular Weight | 41.55 | 142.28 |
| **GPA 2172 Calculation:** | | |
| **Calculated Gross BTU per ft³ @ 14.696 psia & 60°F** | | |
| Higher Heating Value, Real Gas Dry BTU | 129.9 | 7742.9 |
| Water Sat. Gas Base BTU | 127.7 | 7607.8 |
| Relative Density Real Gas | 1.4418 | 4.9126 |
| Compressibility Factor | 0.9947 | |

Data reviewed by: Ahsenur Kara, Lab Technician 1

Quality Assurance: The above analyses are performed in accordance with ASTM, UOP, GPA guidelines for quality assurance, unless otherwise stated.

## Tank Emission Calculations Based on AP 42 Chapter 7 (June 2020, Section 7.1.3.1), Fixed Roof

| | |
|---|---|
| *Tank ID* | **5-05-OST-V** |
| *Tank Description* | **1500 BBL Wet Oil Tank-Common Vent (V-118)** |
| *Company Name* | **Denbury Onshore, LLC** |

| | |
|---|---|
| *Tank Orientation* | **Vertical** |
| *Tank Diameter (D ft)* | **21.00** |
| *Vertical Height/Horizontal Length ($H_S$ ft)* | **24.00** |
| *Roof Height ($H_R$ ft)* | **0.66** |
| *Max Liquid Height ($H_{LX}$ ft)* | **23.00** |
| *Avg Liquid Height ($H_L$ ft)* | **11.50** |
| *Breather Vent Pressure Setting ($P_{BP}$ psig)* | |
| *Breather Vent Vacuum Setting ($P_{BV}$ psig)* | |
| *actual tank pressure ($P_I$ psig)* | **0.0** |
| *Shell Paint Solar Absorptance ($S_A$)* | **0.71** |
| *Roof Paint Solar Absorptance ($R_A$)* | **0.71** |
| *breather vent pressure range ($\Delta P_B$ psi)* | **0.00** |
| *roof outage ($H_{RO}$ ft)* | **0.2188** |

| | |
|---|---|
| *Tank Shell Color/Shade* | **Gray - Medium** |
| *Tank Shell Paint Condition* | **average** |
| *Tank Roof Color/Shade* | **Gray - Medium** |
| *Tank Roof Paint Condition* | **average** |
| *Roof Type* | **vertical tank with cone roof** |
| *Tank Insulation* | **no insulation** |
| *Tank Underground?* | **no** |
| *Annual Throughput (Q bbl/year)* | **730,000.00** |
| *Annual Turnovers, N* | **514.45** |
| *Annual Hours* | **8,760** |
| *tank max liquid volume ($V_{LX}$ $ft^3$)* | **7,966.29** |
| *vapor space outage ($H_{VO}$ ft)* | **12.719** |
| *vapor space volume ($V_V$ $ft^3$)* | **4,405.27** |

| | |
|---|---|
| *Major City for Meterological Data* | **Jackson, MS** |
| *Site Elevation (ft)* | **300** |
| *Atmospheric Pressure ($P_A$ psia)* | **14.537** |
| *Table 7.1-2 Liquid* | **crude oil** |
| *RVP** | **5.37** |
| *API gravity** | **36.7** |
| *°F basis for gv** | **60.0** |
| *bubble point psia* | |
| *API gravity at 60F* | **36.7** |
| *API gravity at 100F* | **39.5** |
| *Working Loss Product Factor ($K_P$)* | **0.75** |
| *working loss turnover factor $K_N$* | **0.225** |

*sales oil data determines RVP per API pub 4683

Tank contents (if not selected from Table 7.1-2):

| *component* | *mole%* | *MW* | *lb/mole* | *wt%* | *Antoine constants (log 10, mmHg, °C) A* | *B* | *C* |
|---|---|---|---|---|---|---|---|
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| | 0.000 | | 0.000 | 0.000 | | | |

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Avg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| hourly average maximum ambient temperature ($T_{AX}$ °F) | 56.50 | 60.80 | 68.10 | 75.70 | 83.00 | 89.00 | 91.10 | 91.20 | 86.50 | 77.10 | 66.30 | 58.10 | 75.30 |
| hourly average minimum ambient temperature ($T_{AN}$ °F) | 37.00 | 39.30 | 45.90 | 53.30 | 62.50 | 69.20 | 72.10 | 71.40 | 65.50 | 53.90 | 43.90 | 37.90 | 54.30 |
| daily total solar insolation factor (I btu/ft$^2$ day) | 783 | 1039 | 1369 | 1762 | 1929 | 2025 | 1969 | 1849 | 1576 | 1262 | 922 | 726 | 1434 |
| daily average ambient temperature ($T_{AA}$ °F) | 46.75 | 50.05 | 57.00 | 64.50 | 72.75 | 79.10 | 81.60 | 81.30 | 76.00 | 65.50 | 55.10 | 48.00 | 64.80 |
| liquid bulk temperature ($T_B$ °F) | 48.42 | 52.26 | 59.92 | 68.25 | 76.86 | 83.41 | 85.79 | 85.24 | 79.36 | 68.19 | 57.06 | 49.55 | 67.85 |
| average vapor temperature ($T_V$ °F) | 51.57 | 56.44 | 65.42 | 75.34 | 84.62 | 91.56 | 93.72 | 92.68 | 85.70 | 73.27 | 60.77 | 52.47 | 73.62 |
| daily ambient temperature range ($\Delta T_A$ °R) | 19.50 | 21.50 | 22.20 | 22.40 | 20.50 | 19.80 | 19.00 | 19.80 | 21.00 | 23.20 | 22.40 | 20.20 | 21.00 |
| daily vapor temperature range ($\Delta T_V$ °R) | 25.00 | 29.80 | 34.98 | 40.70 | 41.74 | 42.62 | 41.26 | 40.12 | 37.08 | 34.16 | 28.98 | 24.91 | 35.06 |
| daily average liquid surface temperature ($T_{LA}$ °F) | 49.99 | 54.35 | 62.67 | 71.80 | 80.74 | 87.49 | 89.75 | 88.96 | 82.53 | 70.73 | 58.92 | 51.01 | 70.74 |
| daily maximum liquid surface temperature ($T_{LX}$ °F) | 56.24 | 61.80 | 71.41 | 81.97 | 91.17 | 98.14 | 100.07 | 98.99 | 91.80 | 79.27 | 66.16 | 57.24 | 79.50 |
| daily minimum liquid surface temperature ($T_{LN}$ °F) | 43.74 | 46.90 | 53.92 | 61.62 | 70.30 | 76.83 | 79.44 | 78.93 | 73.26 | 62.19 | 51.67 | 44.78 | 61.97 |
| vapor pressure at daily avg liq surface temp $T_{LA}$ ($P_{VA}$ psia) | 2.608 | 2.844 | 3.343 | 3.969 | 4.669 | 5.259 | 5.470 | 5.395 | 4.820 | 3.891 | 3.110 | 2.661 | 3.892 |
| vapor pressure at daily max liq surface temp $T_{LX}$ ($P_{VX}$ psia) | 2.952 | 3.288 | 3.941 | 4.773 | 5.606 | 6.309 | 6.516 | 6.399 | 5.666 | 4.547 | 3.573 | 3.010 | 4.567 |
| vapor pressure at daily min liq surface temp $T_{LN}$ ($P_{VN}$ psia) | 2.297 | 2.450 | 2.821 | 3.277 | 3.861 | 4.352 | 4.561 | 4.520 | 4.077 | 3.313 | 2.697 | 2.346 | 3.299 |
| daily vapor pressure range ($\Delta P_V$) | 0.6554 | 0.8383 | 1.1204 | 1.4956 | 1.7450 | 1.9574 | 1.9546 | 1.8796 | 1.5888 | 1.2347 | 0.8754 | 0.6640 | 1.2677 |
| vapor space expansion factor ($K_E$) | 0.1040 | 0.1297 | 0.1671 | 0.2181 | 0.2541 | 0.2889 | 0.2907 | 0.2787 | 0.2319 | 0.1804 | 0.1325 | 0.1047 | 0.1852 |
| vapor molecular weight ($M_V$ lb/lbmole) | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 |
| monthly hours with avg = total annual | 744 | 672 | 744 | 720 | 744 | 720 | 744 | 744 | 720 | 744 | 720 | 744 | 8,760 |
| throughputs (ft$^3$/month) and avg = total annual | 348,068 | 314,384 | 348,068 | 336,840 | 348,068 | 336,840 | 348,068 | 348,068 | 336,840 | 348,068 | 336,840 | 348,068 | 4,098,220 |
| monthly turnovers (N/month) with avg = total annual | 43.69 | 39.46 | 43.69 | 42.28 | 43.69 | 42.28 | 43.69 | 43.69 | 42.28 | 43.69 | 42.28 | 43.69 | 514.45 |
| vented vapor saturation factor ($K_S$) | 0.3626 | 0.3428 | 0.3073 | 0.2721 | 0.2411 | 0.2200 | 0.2133 | 0.2157 | 0.2354 | 0.2760 | 0.3229 | 0.3579 | 0.2760 |
| vent setting correction factor ($K_B$) | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| vapor density ($W_V$ lb/ft$^3$) | 0.0238 | 0.0257 | 0.0297 | 0.0346 | 0.0400 | 0.0445 | 0.0461 | 0.0455 | 0.0412 | 0.0340 | 0.0278 | 0.0242 | 0.0340 |
| standing storage losses ($L_S$ lb/month & avg is lb/yr) | 165.89 | 161.89 | 207.06 | 233.46 | 278.95 | 300.25 | 321.45 | 317.65 | 278.13 | 237.43 | 188.08 | 169.00 | 2859.24 |
| working losses ($L_W$ lb/month & avg is lb/yr) | 1395.98 | 1362.26 | 1742.39 | 1964.58 | 2347.34 | 2526.57 | 2705.01 | 2672.97 | 2340.45 | 1997.99 | 1582.69 | 1422.13 | 24060.35 |
| total losses ($L_T$ lb/month & avg is lb/yr) | 1561.87 | 1524.14 | 1949.45 | 2198.04 | 2626.28 | 2826.81 | 3026.46 | 2990.62 | 2618.58 | 2235.42 | 1770.77 | 1591.14 | 26919.59 |
| max hourly Q in bbl/hour | 467.83 | 467.83 | 467.83 | 467.83 | 467.83 | 467.83 | 467.83 | 467.83 | 467.83 | 467.83 | 467.83 | 467.83 | |
| max hourly working loss at $P_{VX}$ & Q/hr & $K_N$=1 ($L_W$ lb/hr) | 8.340 | 9.010 | 10.409 | 12.128 | 14.023 | 15.597 | 16.160 | 15.969 | 14.448 | 11.936 | 9.770 | 8.496 | |
| breathing/standing loss ($L_S$ lb/hr) | 0.223 | 0.241 | 0.280 | 0.376 | 0.449 | 0.519 | 0.524 | 0.502 | 0.412 | 0.319 | 0.261 | 0.227 | |
| max hourly total loss ($L_T$ lb/hr) | 8.563 | 9.251 | 10.689 | 12.504 | 14.473 | 16.116 | 16.684 | 16.471 | 14.861 | 12.255 | 10.032 | 8.723 | |

| $L_S$ sum months | $L_W$ sum months | $L_T$ sum months |
|---|---|---|
| 2859.24 | 24060.35 | 26919.59 |

The monthly sums will be greater than the annual average since the monthly variables yield higher emissions

**Emissions Summary:**

| | avg lbs/hr | max lbs/hr | lbs/yr |
|---|---|---|---|
| **Standing/Breathing Loss $L_S$** | **0.319** | **0.524** | **2,794.343** |
| **Working Loss $L_W$** | **2.684** | **16.160** | **23,514.261** |
| **Total Loss $L_T$** | **3.003** | **16.684** | **26,308.605** |

max hourly total loss may not add up to $L_S$ + $L_W$ as their max values may be in different months

# Certificate of Analysis

Number: 172-24050252-001A

**Williston Laboratory**
3111 1st Ave W
Williston, ND 58801

May 28, 2024

Kevin Hendricks
Denbury
202 S 4th Street West
Baker, MT 59313

Station Name: Brookhaven EOR
Sample Point: FLARE INLET GAS 180A
Method: GPA 2286
Analyzed: 05/23/2024 10:53:32

Sampled By: John Fielder
Sample Of: Gas Spot
Sample Date: 05/06/2024 07:38
Sample Conditions: 70 °F
PO/Ref. No: 4300204782

## Analytical Data

| Components | Mol. % | Wt. % | GPM at 14.696 psia |
|---|---|---|---|
| Nitrogen | 13.5409 | 8.9734 | |
| Methane | 1.0643 | 0.4039 | |
| Carbon Dioxide | 80.6183 | 83.9319 | |
| Ethane | 0.6181 | 0.4397 | 0.1657 |
| Propane | 1.0639 | 1.1098 | 0.2939 |
| Iso-Butane | 0.4676 | 0.6429 | 0.1534 |
| n-Butane | 0.9825 | 1.3509 | 0.3106 |
| Iso-Pentane | 0.4995 | 0.8525 | 0.1832 |
| n-Pentane | 0.3924 | 0.6697 | 0.1426 |
| Hexanes | 0.2760 | 0.5626 | 0.1137 |
| n-Hexane | 0.1249 | 0.2546 | 0.0515 |
| Benzene | 0.0293 | 0.0541 | 0.0082 |
| Cyclohexane | 0.0730 | 0.1453 | 0.0249 |
| Heptanes | 0.1526 | 0.3617 | 0.0706 |
| Methylcyclohexane | 0.0448 | 0.1041 | 0.0181 |
| Toluene | 0.0046 | 0.0100 | 0.0015 |
| Octanes | 0.0279 | 0.0754 | 0.0143 |
| Ethylbenzene | 0.0004 | 0.0010 | 0.0002 |
| Xylenes | 0.0032 | 0.0081 | 0.0012 |
| Nonanes | 0.0144 | 0.0437 | 0.0081 |
| Decanes Plus | 0.0014 | 0.0047 | 0.0009 |
| | 100.0000 | 100.0000 | 1.5626 |

GPM TOTAL C2+ 1.563

| Calculated Physical Properties | Total | C10+ |
|---|---|---|
| Calculated Molecular Weight | 42.27 | 142.28 |
| **GPA 2172 Calculation:** | | |
| **Calculated Gross BTU per ft³ @ 14.696 psia & 60°F** | | |
| Higher Heating Value, Real Gas Dry BTU | 169.7 | 7742.9 |
| Water Sat. Gas Base BTU | 166.8 | 7607.8 |
| Relative Density Real Gas | 1.4666 | 4.9126 |
| Compressibility Factor | 0.9948 | |

Data reviewed by: Mo Milton, Laboratory Technician

Quality Assurance: The above analyses are performed in accordance with ASTM, UOP, GPA guidelines for quality assurance, unless otherwise stated.

**Normalized Component Calculation**

Atmospheric Control Flare Gas Analysis; Southern Petroleum Laboratories Report No.: 172-24050252-001A

| COMPONENT | mole % | Normalized mole % | COMPONENT MW | Fuel Weight | Normalized WT % | Component BTU/scf | Partial Heating Values |
|---|---|---|---|---|---|---|---|
| **Water** | 0.0000 | 0.0000 | 18 | 0.00 | 0.0000 | 0 | 0 |
| **Nitrogen** | 13.5409 | 0.0000 | 28.0134 | 0.00 | 0.0000 | 0 | 0 |
| **Carbon Dioxide** | 80.6183 | 93.2444 | 44.01 | 41.04 | 92.2057 | 0 | 0 |
| **Methane** | 1.0643 | 1.2310 | 16.043 | 0.20 | 0.4437 | 1010 | 12 |
| **Ethane** | 0.6181 | 0.7149 | 30.07 | 0.21 | 0.4830 | 1770 | 13 |
| **Hydrogen Sulfide** | 0.0000 | 0.0000 | 34.08 | 0.00 | 0.0000 | 637 | 0 |
| **Propane** | 1.0639 | 1.2305 | 44.097 | 0.54 | 1.2192 | 2516 | 31 |
| **I-Butane** | 0.4676 | 0.5408 | 58.123 | 0.31 | 0.7063 | 3252 | 18 |
| **N-Butane** | 0.9825 | 1.1364 | 58.123 | 0.66 | 1.4841 | 3262 | 37 |
| **I-Pentane** | 0.4995 | 0.5777 | 72.15 | 0.42 | 0.9366 | 4001 | 23 |
| **N-Pentane** | 0.3924 | 0.4539 | 72.15 | 0.33 | 0.7358 | 4009 | 18 |
| **Other/Iso Hexanes** | 0.2760 | 0.3192 | 86.177 | 0.28 | 0.6181 | 4750 | 15 |
| **N-Hexane** | 0.1249 | 0.1445 | 86.177 | 0.12 | 0.2797 | 4756 | 7 |
| **Methylcyclopentane** | 0.0000 | 0.0000 | 84.1608 | 0.00 | 0.0000 | 4501 | 0 |
| **Benzene** | 0.0293 | 0.0339 | 78.114 | 0.03 | 0.0595 | 3742 | 1 |
| **Cyclohexane** | 0.0730 | 0.0844 | 84.1608 | 0.07 | 0.1597 | 4482 | 4 |
| **Heptane** | 0.1526 | 0.1765 | 100.204 | 0.18 | 0.3974 | 5503 | 10 |
| **Methylcyclohexane** | 0.0448 | 0.0518 | 98.188 | 0.05 | 0.1143 | 5216 | 3 |
| **Toluene** | 0.0046 | 0.0053 | 92.141 | 0.00 | 0.0110 | 4475 | 0 |
| **Iso-Octane/224-Trimethylpentane** | 0.0000 | 0.0000 | 114.231 | 0.00 | 0.0000 | 6232 | 0 |
| **Octanes** | 0.0279 | 0.0323 | 114.231 | 0.04 | 0.0828 | 6249 | 2 |
| **Ethylbenzene** | 0.0004 | 0.0005 | 106.167 | 0.00 | 0.0011 | 5222 | 0 |
| **Xylenes** | 0.0032 | 0.0037 | 106.167 | 0.00 | 0.0088 | 5209 | 0 |
| **Nonanes** | 0.0144 | 0.0167 | 128.258 | 0.02 | 0.0480 | 6997 | 1 |
| **Decanes Plus** | 0.0014 | 0.0016 | 142.285 | 0.00 | 0.0052 | 7743 | 0 |
| **TOTALS** | **100.0000** | **100.0000** | **MW=** | **44.51** | **100.0000** | **btu/scf =** | **195.277374** |
| | | | | **sg** | **1.5347** | | |
| | | | | **VOC wt%** | **6.8676** | | |
| | | | | **Toxic wt%** | **0.3601** | | |

## Tank Emission Calculations Based on AP 42 Chapter 7 (June 2020, Section 7.1.3.1), Fixed Roof

| | |
|---|---|
| *Tank ID* | **6a-05-OST-CV** |
| *Tank Description* | **5000 BBL Dry Oil Tank-Common Vent (V-119A)** |
| *Company Name* | **Denbury Onshore, LLC** |

| | |
|---|---|
| *Tank Orientation* | **Vertical** |
| *Tank Diameter (D ft)* | **38.64** |
| *Vertical Height/Horizontal Length ($H_S$ ft)* | **24.13** |
| *Roof Height ($H_R$ ft)* | **1.21** |
| *Max Liquid Height ($H_{LX}$ ft)* | **23.13** |
| *Avg Liquid Height ($H_L$ ft)* | **11.57** |
| *Breather Vent Pressure Setting ($P_{BP}$ psig)* | |
| *Breather Vent Vacuum Setting ($P_{BV}$ psig)* | |
| *actual tank pressure ($P_I$ psig)* | **0.0** |
| *Shell Paint Solar Absorptance ($S_A$)* | **0.71** |
| *Roof Paint Solar Absorptance ($R_A$)* | **0.71** |
| *breather vent pressure range ($\Delta P_B$ psi)* | **0.00** |
| *roof outage ($H_{RO}$ ft)* | **0.4025** |

| | |
|---|---|
| *Tank Shell Color/Shade* | **Gray - Medium** |
| *Tank Shell Paint Condition* | **average** |
| *Tank Roof Color/Shade* | **Gray - Medium** |
| *Tank Roof Paint Condition* | **average** |
| *Roof Type* | **vertical tank with cone roof** |
| *Tank Insulation* | **no insulation** |
| *Tank Underground?* | **no** |
| *Annual Throughput (Q bbl/year)* | **365,000.00** |
| *Annual Turnovers, N* | **75.55** |
| *Annual Hours* | **8,760** |
| *tank max liquid volume ($V_{LX}$ $ft^3$)* | **27,123.13** |
| *vapor space outage ($H_{VO}$ ft)* | **12.968** |
| *vapor space volume ($V_V$ $ft^3$)* | **15,206.19** |

| | |
|---|---|
| *Major City for Meterological Data* | **Jackson, MS** |
| *Site Elevation (ft)* | **300** |
| *Atmospheric Pressure ($P_A$ psia)* | **14.537** |
| *Table 7.1-2 Liquid* | **crude oil** |
| *RVP** | **5.37** |
| *API gravity** | **36.7** |
| *°F basis for gv** | **60.0** |
| *bubble point psia* | |
| *API gravity at 60F* | **36.7** |
| *API gravity at 100F* | **39.5** |
| *Working Loss Product Factor ($K_P$)* | **0.75** |
| *working loss turnover factor $K_N$* | **1.000** |

*sales oil data determines RVP per API pub 4683

Tank contents (if not selected from Table 7.1-2):

| *component* | *mole%* | *MW* | *lb/mole* | *wt%* | *Antoine constants ($\log_{10}$, mmHg, °C) A* | *B* | *C* |
|---|---|---|---|---|---|---|---|
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| | 0.000 | | 0.000 | 0.000 | | | |

| | *Jan* | *Feb* | *Mar* | *Apr* | *May* | *Jun* | *Jul* | *Aug* | *Sep* | *Oct* | *Nov* | *Dec* | *Avg* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| hourly average maximum ambient temperature ($T_{AX}$ °F) | 56.50 | 60.80 | 68.10 | 75.70 | 83.00 | 89.00 | 91.10 | 91.20 | 86.50 | 77.10 | 66.30 | 58.10 | 75.30 |
| hourly average minimum ambient temperature ($T_{AN}$ °F) | 37.00 | 39.30 | 45.90 | 53.30 | 62.50 | 69.20 | 72.10 | 71.40 | 65.50 | 53.90 | 43.90 | 37.90 | 54.30 |
| daily total solar insolation factor (I btu/ft$^2$ day) | 783 | 1039 | 1369 | 1762 | 1929 | 2025 | 1969 | 1849 | 1576 | 1262 | 922 | 726 | 1434 |
| daily average ambient temperature ($T_{AA}$ °F) | 46.75 | 50.05 | 57.00 | 64.50 | 72.75 | 79.10 | 81.60 | 81.30 | 76.00 | 65.50 | 55.10 | 48.00 | 64.80 |
| liquid bulk temperature ($T_B$ °F) | 48.42 | 52.26 | 59.92 | 68.25 | 76.86 | 83.41 | 85.79 | 85.24 | 79.36 | 68.19 | 57.06 | 49.55 | 67.85 |
| average vapor temperature ($T_V$ °F) | 52.10 | 57.15 | 66.36 | 76.54 | 85.94 | 92.94 | 95.06 | 93.94 | 86.77 | 74.13 | 61.40 | 52.96 | 74.60 |
| daily ambient temperature range ($\Delta T_A$ °R) | 19.50 | 21.50 | 22.20 | 22.40 | 20.50 | 19.80 | 19.00 | 19.80 | 21.00 | 23.20 | 22.40 | 20.20 | 21.00 |
| daily vapor temperature range ($\Delta T_V$ °R) | 24.77 | 29.80 | 34.98 | 40.70 | 41.74 | 42.62 | 41.26 | 40.12 | 37.08 | 34.16 | 28.77 | 24.45 | 35.06 |
| daily average liquid surface temperature ($T_{LA}$ °F) | 50.26 | 54.71 | 63.14 | 72.40 | 81.40 | 88.18 | 90.43 | 89.59 | 83.06 | 71.16 | 59.23 | 51.25 | 71.23 |
| daily maximum liquid surface temperature ($T_{LX}$ °F) | 56.45 | 62.16 | 71.88 | 82.57 | 91.83 | 98.83 | 100.74 | 99.62 | 92.33 | 79.70 | 66.43 | 57.37 | 79.99 |
| daily minimum liquid surface temperature ($T_{LN}$ °F) | 44.07 | 47.26 | 54.39 | 62.22 | 70.96 | 77.52 | 80.11 | 79.56 | 73.79 | 62.62 | 52.04 | 45.14 | 62.46 |
| vapor pressure at daily avg liq surface temp $T_{LA}$ ($P_{VA}$ psia) | 2.622 | 2.864 | 3.373 | 4.013 | 4.724 | 5.323 | 5.534 | 5.454 | 4.866 | 3.922 | 3.129 | 2.675 | 3.927 |
| vapor pressure at daily max liq surface temp $T_{LX}$ ($P_{VX}$ psia) | 2.964 | 3.311 | 3.975 | 4.824 | 5.669 | 6.383 | 6.589 | 6.467 | 5.718 | 4.583 | 3.590 | 3.018 | 4.607 |
| vapor pressure at daily min liq surface temp $T_{LN}$ ($P_{VN}$ psia) | 2.312 | 2.468 | 2.847 | 3.315 | 3.908 | 4.407 | 4.617 | 4.571 | 4.117 | 3.340 | 2.717 | 2.364 | 3.330 |
| daily vapor pressure range ($\Delta P_V$) | 0.6522 | 0.8430 | 1.1284 | 1.5088 | 1.7613 | 1.9760 | 1.9725 | 1.8959 | 1.6008 | 1.2425 | 0.8735 | 0.6542 | 1.2768 |
| vapor space expansion factor ($K_E$) | 0.1033 | 0.1302 | 0.1680 | 0.2199 | 0.2566 | 0.2922 | 0.2941 | 0.2818 | 0.2338 | 0.1814 | 0.1320 | 0.1030 | 0.1864 |
| vapor molecular weight ($M_V$ lb/lbmole) | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 |
| monthly hours with avg = total annual | 744 | 672 | 744 | 720 | 744 | 720 | 744 | 744 | 720 | 744 | 720 | 744 | 8,760 |
| throughputs (ft$^3$/month) and avg = total annual | 174,034 | 157,192 | 174,034 | 168,420 | 174,034 | 168,420 | 174,034 | 174,034 | 168,420 | 174,034 | 168,420 | 174,034 | 2,049,110 |
| monthly turnovers (N/month) with avg = total annual | 6.42 | 5.80 | 6.42 | 6.21 | 6.42 | 6.21 | 6.42 | 6.42 | 6.21 | 6.42 | 6.21 | 6.42 | 75.55 |
| vented vapor saturation factor ($K_S$) | 0.3569 | 0.3369 | 0.3014 | 0.2661 | 0.2355 | 0.2147 | 0.2082 | 0.2106 | 0.2302 | 0.2706 | 0.3174 | 0.3523 | 0.2703 |
| vent setting correction factor ($K_B$) | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| vapor density ($W_V$ lb/ft$^3$) | 0.0239 | 0.0258 | 0.0299 | 0.0349 | 0.0403 | 0.0449 | 0.0465 | 0.0459 | 0.0415 | 0.0342 | 0.0280 | 0.0243 | 0.0343 |
| standing storage losses ($L_S$ lb/month & avg is lb/yr) | 567.00 | 554.02 | 709.70 | 801.56 | 958.19 | 1031.55 | 1104.02 | 1090.37 | 953.70 | 813.17 | 643.20 | 577.43 | 9803.93 |
| working losses ($L_W$ lb/month & avg is lb/yr) | 3115.84 | 3044.54 | 3900.05 | 4404.85 | 5265.57 | 5668.72 | 6066.96 | 5991.93 | 5240.89 | 4468.66 | 3534.60 | 3173.17 | 53875.78 |
| total losses ($L_T$ lb/month & avg is lb/yr) | 3682.84 | 3598.56 | 4609.75 | 5206.41 | 6223.77 | 6700.28 | 7170.99 | 7082.30 | 6194.59 | 5281.83 | 4177.80 | 3750.60 | 63679.71 |
| max hourly Q in bbl/hour | 233.92 | 233.92 | 233.92 | 233.92 | 233.92 | 233.92 | 233.92 | 233.92 | 233.92 | 233.92 | 233.92 | 233.92 | |
| max hourly working loss at $P_{VX}$ & Q/hr & $K_N$=1 ($L_W$ lb/hr) | 4.188 | 4.531 | 5.242 | 6.118 | 7.077 | 7.873 | 8.155 | 8.054 | 7.279 | 6.006 | 4.909 | 4.265 | |
| breathing/standing loss ($L_S$ lb/hr) | 0.762 | 0.824 | 0.958 | 1.293 | 1.545 | 1.784 | 1.803 | 1.726 | 1.415 | 1.093 | 0.893 | 0.776 | |
| max hourly total loss ($L_T$ lb/hr) | 4.950 | 5.355 | 6.200 | 7.410 | 8.622 | 9.657 | 9.958 | 9.780 | 8.694 | 7.099 | 5.802 | 5.041 | |

| $L_S$ sum months | $L_W$ sum months | $L_T$ sum months |
|---|---|---|
| 9803.93 | 53875.78 | 63679.71 |

The monthly sums will be greater than the annual average since the monthly variables yield higher emissions

**Emissions Summary:**

| | **avg lbs/hr** | **max lbs/hr** | **lbs/yr** |
|---|---|---|---|
| **Standing/Breathing Loss $L_S$** | **1.093** | **1.803** | **9,578.530** |
| **Working Loss $L_W$** | **6.009** | **8.155** | **52,637.127** |
| **Total Loss $L_T$** | **7.102** | **9.958** | **62,215.657** |

max hourly total loss may not add up to $L_S$ + $L_W$ as their max values may be in different months



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A Professional Environmental Firm

SPL, Inc.
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Williston, ND 58801
701-368-7183

# Flash Liberation of Hydrocarbon Liquid Study

| | | | |
|---|---|---|---|
| Client: | Denbury Resources | Sample Lab ID: | 23120295-001A |
| Facility: | Brookhaven EOR V-22A | Facility Well: | Not Indicated |
| Equipment: | Not Indicated | Sample Source: | Heater Treater |
| Unique Number: | Not Indicated | Analyst: | JMC |
| Date Sampled: | 12/13/23 | Date Analyzed: | 12/28/23 |
| State: | MS | Site Notes: | |
| County: | Not Indicated | | |

## Flash Liberation of Hydrocarbon Liquid Conditions

| | Pressure (psig) | Temperature (°F) |
|---|---|---|
| Separator Hydrocarbon Liquid | 44.0 | 73.0 |
| Stock Tank | 0.0 | 60.0 |

## Base Conditions

| | Condition | Units/Description |
|---|---|---|
| Base Conditions, Pressure | 14.73 | psi |

## Flash Liberation of Hydrocarbon Liquid Results

| | Result | Units/Description |
|---|---|---|
| Gas Oil Ratio | 5.74 | SCF flashed vapor/bbl stock tank oil |
| Gas Oil Ratio | 0.671 | lb flashed vapor/bbl stock tank oil |
| Gas Specific Gravity | 1.529 | Air = 1.000 |
| Separator Volume Factor | 1.016 | Separator Volume/Stock tank Volume |

## Stock Tank Fluid Properties

| | Result | Units/Description |
|---|---|---|
| Shrinkage Recovery Factor | 0.9844 | Fraction of first stage separator liquid |
| Oil API Gravity at 60 °F | 36.71 | |
| Specific Gravity at 60 °F | 0.8412 | ASTM D7777, Measured |
| Dry Vapor Pressure, psi | 3.37 | Absolute Pressure at 100°F by D5191 |

## Cylinder Pressure Check

| | Pressure (psi) | Temperature (°F) |
|---|---|---|
| Sample Conditions | 44.0 | 73.0 |
| Test Sample | 33.3 | 74.8 |

## Quality Control Summary

| Duplicate Results | | Acceptable Range |
|---|---|---|
| Gas Oil Ratio (% difference) | 0.2 | <5% |
| Separator Volume Factor (% difference) | 0.2 | <5% |
| Shrinkage Recovery Factor (% difference) | 0.2 | <5% |
| Cylinder Type | Piston | |
| Cylinder Size (cc) | 500 | |
| Cylinder Number | 444 | |
| Sample Collection Rate (mL/min) | 47 | <50 mL/min |

## Tank Emission Calculations Based on AP 42 Chapter 7 (June 2020, Section 7.1.3.1), Fixed Roof

| | |
|---|---|
| *Tank ID* | **6b-05-OST-CV** |
| *Tank Description* | **5000 BBL Dry Oil Tank-Common Vent (V-119B)** |
| *Company Name* | **Denbury Onshore, LLC** |

| | |
|---|---|
| *Tank Orientation* | **Vertical** |
| *Tank Diameter (D ft)* | **38.64** |
| *Vertical Height/Horizontal Length ($H_S$ ft)* | **24.13** |
| *Roof Height ($H_R$ ft)* | **1.21** |
| *Max Liquid Height ($H_{LX}$ ft)* | **23.13** |
| *Avg Liquid Height ($H_L$ ft)* | **11.57** |
| *Breather Vent Pressure Setting ($P_{BP}$ psig)* | |
| *Breather Vent Vacuum Setting ($P_{BV}$ psig)* | |
| *actual tank pressure ($P_I$ psig)* | **0.0** |
| *Shell Paint Solar Absorptance ($S_A$)* | **0.71** |
| *Roof Paint Solar Absorptance ($R_A$)* | **0.71** |
| *breather vent pressure range ($\Delta P_B$ psi)* | **0.00** |
| *roof outage ($H_{RO}$ ft)* | **0.4025** |

| | |
|---|---|
| *Tank Shell Color/Shade* | **Gray - Medium** |
| *Tank Shell Paint Condition* | **average** |
| *Tank Roof Color/Shade* | **Gray - Medium** |
| *Tank Roof Paint Condition* | **average** |
| *Roof Type* | **vertical tank with cone roof** |
| *Tank Insulation* | **no insulation** |
| *Tank Underground?* | **no** |
| *Annual Throughput (Q bbl/year)* | **365,000.00** |
| *Annual Turnovers, N* | **75.55** |
| *Annual Hours* | **8,760** |
| *tank max liquid volume ($V_{LX}$ $ft^3$)* | **27,123.13** |
| *vapor space outage ($H_{VO}$ ft)* | **12.968** |
| *vapor space volume ($V_V$ $ft^3$)* | **15,206.19** |

| | |
|---|---|
| *Major City for Meterological Data* | **Jackson, MS** |
| *Site Elevation (ft)* | **300** |
| *Atmospheric Pressure ($P_A$ psia)* | **14.537** |
| *Table 7.1-2 Liquid* | **crude oil** |
| *RVP** | **5.37** |
| *API gravity** | **36.7** |
| *°F basis for gv** | **60.0** |
| *bubble point psia* | |
| *API gravity at 60F* | **36.7** |
| *API gravity at 100F* | **39.5** |
| *Working Loss Product Factor ($K_P$)* | **0.75** |
| *working loss turnover factor $K_N$* | **1.000** |

*sales oil data determines RVP per API pub 4683

Tank contents (if not selected from Table 7.1-2):

| *component* | *mole%* | *MW* | *lb/mole* | *wt%* | *Antoine constants (log 10, mmHg, °C) A* | *B* | *C* |
|---|---|---|---|---|---|---|---|
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| | 0.000 | | 0.000 | 0.000 | | | |



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| | *Jan* | *Feb* | *Mar* | *Apr* | *May* | *Jun* | *Jul* | *Aug* | *Sep* | *Oct* | *Nov* | *Dec* | *Avg* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| hourly average maximum ambient temperature ($T_{AX}$ °F) | 56.50 | 60.80 | 68.10 | 75.70 | 83.00 | 89.00 | 91.10 | 91.20 | 86.50 | 77.10 | 66.30 | 58.10 | 75.30 |
| hourly average minimum ambient temperature ($T_{AN}$ °F) | 37.00 | 39.30 | 45.90 | 53.30 | 62.50 | 69.20 | 72.10 | 71.40 | 65.50 | 53.90 | 43.90 | 37.90 | 54.30 |
| daily total solar insolation factor (I btu/ft$^2$ day) | 783 | 1039 | 1369 | 1762 | 1929 | 2025 | 1969 | 1849 | 1576 | 1262 | 922 | 726 | 1434 |
| daily average ambient temperature ($T_{AA}$ °F) | 46.75 | 50.05 | 57.00 | 64.50 | 72.75 | 79.10 | 81.60 | 81.30 | 76.00 | 65.50 | 55.10 | 48.00 | 64.80 |
| liquid bulk temperature ($T_B$ °F) | 48.42 | 52.26 | 59.92 | 68.25 | 76.86 | 83.41 | 85.79 | 85.24 | 79.36 | 68.19 | 57.06 | 49.55 | 67.85 |
| average vapor temperature ($T_V$ °F) | 52.10 | 57.15 | 66.36 | 76.54 | 85.94 | 92.94 | 95.06 | 93.94 | 86.77 | 74.13 | 61.40 | 52.96 | 74.60 |
| daily ambient temperature range ($\Delta T_A$ °R) | 19.50 | 21.50 | 22.20 | 22.40 | 20.50 | 19.80 | 19.00 | 19.80 | 21.00 | 23.20 | 22.40 | 20.20 | 21.00 |
| daily vapor temperature range ($\Delta T_V$ °R) | 24.77 | 29.80 | 34.98 | 40.70 | 41.74 | 42.62 | 41.26 | 40.12 | 37.08 | 34.16 | 28.77 | 24.45 | 35.06 |
| daily average liquid surface temperature ($T_{LA}$ °F) | 50.26 | 54.71 | 63.14 | 72.40 | 81.40 | 88.18 | 90.43 | 89.59 | 83.06 | 71.16 | 59.23 | 51.25 | 71.23 |
| daily maximum liquid surface temperature ($T_{LX}$ °F) | 56.45 | 62.16 | 71.88 | 82.57 | 91.83 | 98.83 | 100.74 | 99.62 | 92.33 | 79.70 | 66.43 | 57.37 | 79.99 |
| daily minimum liquid surface temperature ($T_{LN}$ °F) | 44.07 | 47.26 | 54.39 | 62.22 | 70.96 | 77.52 | 80.11 | 79.56 | 73.79 | 62.62 | 52.04 | 45.14 | 62.46 |
| vapor pressure at daily avg liq surface temp $T_{LA}$ ($P_{VA}$ psia) | 2.622 | 2.864 | 3.373 | 4.013 | 4.724 | 5.323 | 5.534 | 5.454 | 4.866 | 3.922 | 3.129 | 2.675 | 3.927 |
| vapor pressure at daily max liq surface temp $T_{LX}$ ($P_{VX}$ psia) | 2.964 | 3.311 | 3.975 | 4.824 | 5.669 | 6.383 | 6.589 | 6.467 | 5.718 | 4.583 | 3.590 | 3.018 | 4.607 |
| vapor pressure at daily min liq surface temp $T_{LN}$ ($P_{VN}$ psia) | 2.312 | 2.468 | 2.847 | 3.315 | 3.908 | 4.407 | 4.617 | 4.571 | 4.117 | 3.340 | 2.717 | 2.364 | 3.330 |
| daily vapor pressure range ($\Delta P_V$) | 0.6522 | 0.8430 | 1.1284 | 1.5088 | 1.7613 | 1.9760 | 1.9725 | 1.8959 | 1.6008 | 1.2425 | 0.8735 | 0.6542 | 1.2768 |
| vapor space expansion factor ($K_E$) | 0.1033 | 0.1302 | 0.1680 | 0.2199 | 0.2566 | 0.2922 | 0.2941 | 0.2818 | 0.2338 | 0.1814 | 0.1320 | 0.1030 | 0.1864 |
| vapor molecular weight ($M_V$ lb/lbmole) | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 |
| monthly hours with avg = total annual | 744 | 672 | 744 | 720 | 744 | 720 | 744 | 744 | 720 | 744 | 720 | 744 | 8,760 |
| throughputs (ft$^3$/month) and avg = total annual | 174,034 | 157,192 | 174,034 | 168,420 | 174,034 | 168,420 | 174,034 | 174,034 | 168,420 | 174,034 | 168,420 | 174,034 | 2,049,110 |
| monthly turnovers (N/month) with avg = total annual | 6.42 | 5.80 | 6.42 | 6.21 | 6.42 | 6.21 | 6.42 | 6.42 | 6.21 | 6.42 | 6.21 | 6.42 | 75.55 |
| vented vapor saturation factor ($K_S$) | 0.3569 | 0.3369 | 0.3014 | 0.2661 | 0.2355 | 0.2147 | 0.2082 | 0.2106 | 0.2302 | 0.2706 | 0.3174 | 0.3523 | 0.2703 |
| vent setting correction factor ($K_B$) | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| vapor density ($W_V$ lb/ft$^3$) | 0.0239 | 0.0258 | 0.0299 | 0.0349 | 0.0403 | 0.0449 | 0.0465 | 0.0459 | 0.0415 | 0.0342 | 0.0280 | 0.0243 | 0.0343 |
| standing storage losses ($L_S$ lb/month & avg is lb/yr) | 567.00 | 554.02 | 709.70 | 801.56 | 958.19 | 1031.55 | 1104.02 | 1090.37 | 953.70 | 813.17 | 643.20 | 577.43 | 9803.93 |
| working losses ($L_W$ lb/month & avg is lb/yr) | 3115.84 | 3044.54 | 3900.05 | 4404.85 | 5265.57 | 5668.72 | 6066.96 | 5991.93 | 5240.89 | 4468.66 | 3534.60 | 3173.17 | 53875.78 |
| total losses ($L_T$ lb/month & avg is lb/yr) | 3682.84 | 3598.56 | 4609.75 | 5206.41 | 6223.77 | 6700.28 | 7170.99 | 7082.30 | 6194.59 | 5281.83 | 4177.80 | 3750.60 | 63679.71 |
| max hourly Q in bbl/hour | 233.92 | 233.92 | 233.92 | 233.92 | 233.92 | 233.92 | 233.92 | 233.92 | 233.92 | 233.92 | 233.92 | 233.92 | |
| max hourly working loss at $P_{VX}$ & Q/hr & $K_N$=1 ($L_W$ lb/hr) | 4.188 | 4.531 | 5.242 | 6.118 | 7.077 | 7.873 | 8.155 | 8.054 | 7.279 | 6.006 | 4.909 | 4.265 | |
| breathing/standing loss ($L_S$ lb/hr) | 0.762 | 0.824 | 0.958 | 1.293 | 1.545 | 1.784 | 1.803 | 1.726 | 1.415 | 1.093 | 0.893 | 0.776 | |
| max hourly total loss ($L_T$ lb/hr) | 4.950 | 5.355 | 6.200 | 7.410 | 8.622 | 9.657 | 9.958 | 9.780 | 8.694 | 7.099 | 5.802 | 5.041 | |

| $L_S$ sum months | $L_W$ sum months | $L_T$ sum months |
|---|---|---|
| 9803.93 | 53875.78 | 63679.71 |

The monthly sums will be greater than the annual average since the monthly variables yield higher emissions

**Emissions Summary:**

| | **avg lbs/hr** | **max lbs/hr** | **lbs/yr** |
|---|---|---|---|
| **Standing/Breathing Loss $L_S$** | **1.093** | **1.803** | **9,578.530** |
| **Working Loss $L_W$** | **6.009** | **8.155** | **52,637.127** |
| **Total Loss $L_T$** | **7.102** | **9.958** | **62,215.657** |

max hourly total loss may not add up to $L_S$ + $L_W$ as their max values may be in different months



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## Tank Emission Calculations Based on AP 42 Chapter 7 (June 2020, Section 7.1.3.1), Fixed Roof

| | |
|---|---|
| *Tank ID* | **7a-05-ST-CV** |
| *Tank Description* | **2000 BBL Skimmer Tank-**Common **Vent (V-120A)** |
| *Company Name* | **Denbury Onshore, LLC** |

| | |
|---|---|
| *Tank Orientation* | **Vertical** |
| *Tank Diameter (D ft)* | **21.50** |
| *Vertical Height/Horizontal Length ($H_S$ ft)* | **32.00** |
| *Roof Height ($H_R$ ft)* | **0.67** |
| *Max Liquid Height ($H_{LX}$ ft)* | **31.00** |
| *Avg Liquid Height ($H_L$ ft)* | **15.50** |
| *Breather Vent Pressure Setting ($P_{BP}$ psig)* | |
| *Breather Vent Vacuum Setting ($P_{BV}$ psig)* | |
| *actual tank pressure ($P_I$ psig)* | **0.0** |
| *Shell Paint Solar Absorptance ($S_A$)* | **0.71** |
| *Roof Paint Solar Absorptance ($R_A$)* | **0.71** |
| *breather vent pressure range ($\Delta P_B$ psi)* | **0.00** |
| *roof outage ($H_{RO}$ ft)* | **0.2240** |

| | |
|---|---|
| *Tank Shell Color/Shade* | **Gray - Medium** |
| *Tank Shell Paint Condition* | **average** |
| *Tank Roof Color/Shade* | **Gray - Medium** |
| *Tank Roof Paint Condition* | **average** |
| *Roof Type* | **vertical tank with cone roof** |
| *Tank Insulation* | **no insulation** |
| *Tank Underground?* | **no** |
| *Annual Throughput (Q bbl/year)* | **2,192,190.00** |
| *Annual Turnovers, N* | **1093.51** |
| *Annual Hours* | **8,760** |
| *tank max liquid volume ($V_{LX}$ $ft^3$)* | **11,254.56** |
| *vapor space outage ($H_{VO}$ ft)* | **16.724** |
| *vapor space volume ($V_V$ $ft^3$)* | **6,071.64** |

| | |
|---|---|
| *Major City for Meterological Data* | **Jackson, MS** |
| *Site Elevation (ft)* | **300** |
| *Atmospheric Pressure ($P_A$ psia)* | **14.537** |
| *Table 7.1-2 Liquid* | |
| *RVP** | **5.37** |
| *API gravity** | **36.7** |
| *°F basis for gv** | **60.0** |
| *bubble point psia* | |
| *API gravity at 60F* | **36.7** |
| *API gravity at 100F* | **39.5** |
| *Working Loss Product Factor ($K_P$)* | **0.75** |
| *working loss turnover factor $K_N$* | **1.000** |

*sales oil data determines RVP per API pub 4683

Tank contents (if not selected from Table 7.1-2):

| *component* | *mole%* | *MW* | *lb/mole* | *wt%* | *Antoine constants (log 10, mmHg, °C) A* | *B* | *C* |
|---|---|---|---|---|---|---|---|
| Crude Oil | 0.100 | 50.000 | 0.04995 | 0.27678 | 11.194 | 5216.548 | 0.000 |
| Water | 99.900 | 18.015 | 17.99700 | 99.72322 | 8.108 | 1750.300 | 235.000 |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| | 100.000 | | 18.047 | 100.000 | | | |



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| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Avg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| hourly average maximum ambient temperature ($T_{AX}$ °F) | 56.50 | 60.80 | 68.10 | 75.70 | 83.00 | 89.00 | 91.10 | 91.20 | 86.50 | 77.10 | 66.30 | 58.10 | 75.30 |
| hourly average minimum ambient temperature ($T_{AN}$ °F) | 37.00 | 39.30 | 45.90 | 53.30 | 62.50 | 69.20 | 72.10 | 71.40 | 65.50 | 53.90 | 43.90 | 37.90 | 54.30 |
| daily total solar insolation factor (I btu/ft$^2$ day) | 783 | 1039 | 1369 | 1762 | 1929 | 2025 | 1969 | 1849 | 1576 | 1262 | 922 | 726 | 1434 |
| daily average ambient temperature ($T_{AA}$ °F) | 46.75 | 50.05 | 57.00 | 64.50 | 72.75 | 79.10 | 81.60 | 81.30 | 76.00 | 65.50 | 55.10 | 48.00 | 64.80 |
| liquid bulk temperature ($T_B$ °F) | 48.42 | 52.26 | 59.92 | 68.25 | 76.86 | 83.41 | 85.79 | 85.24 | 79.36 | 68.19 | 57.06 | 49.55 | 67.85 |
| average vapor temperature ($T_V$ °F) | 51.34 | 56.14 | 65.03 | 74.84 | 84.06 | 90.98 | 93.15 | 92.15 | 85.24 | 72.90 | 60.51 | 52.26 | 73.21 |
| daily ambient temperature range ($\Delta T_A$ °R) | 19.50 | 21.50 | 22.20 | 22.40 | 20.50 | 19.80 | 19.00 | 19.80 | 21.00 | 23.20 | 22.40 | 20.20 | 21.00 |
| daily vapor temperature range ($\Delta T_V$ °R) | 25.16 | 29.80 | 34.98 | 40.70 | 41.74 | 42.62 | 41.26 | 40.12 | 37.08 | 34.16 | 29.15 | 25.12 | 35.06 |
| daily average liquid surface temperature ($T_{LA}$ °F) | 49.88 | 54.20 | 62.47 | 71.54 | 80.46 | 87.20 | 89.47 | 88.69 | 82.30 | 70.55 | 58.79 | 50.90 | 70.53 |
| daily maximum liquid surface temperature ($T_{LX}$ °F) | 56.17 | 61.65 | 71.22 | 81.72 | 90.90 | 97.85 | 99.79 | 98.72 | 91.57 | 79.09 | 66.07 | 57.18 | 79.30 |
| daily minimum liquid surface temperature ($T_{LN}$ °F) | 43.59 | 46.75 | 53.73 | 61.37 | 70.03 | 76.54 | 79.16 | 78.66 | 73.03 | 62.01 | 51.50 | 44.62 | 61.77 |
| vapor pressure at daily avg liq surface temp $T_{LA}$ ($P_{VA}$ psia) | 0.180 | 0.210 | 0.283 | 0.386 | 0.519 | 0.644 | 0.692 | 0.675 | 0.551 | 0.373 | 0.248 | 0.186 | 0.373 |
| vapor pressure at daily max liq surface temp $T_{LX}$ ($P_{VX}$ psia) | 0.226 | 0.275 | 0.382 | 0.541 | 0.723 | 0.895 | 0.949 | 0.919 | 0.739 | 0.496 | 0.320 | 0.234 | 0.500 |
| vapor pressure at daily min liq surface temp $T_{LN}$ ($P_{VN}$ psia) | 0.142 | 0.160 | 0.207 | 0.272 | 0.367 | 0.456 | 0.497 | 0.489 | 0.406 | 0.278 | 0.191 | 0.147 | 0.276 |
| daily vapor pressure range ($\Delta P_V$) | 0.0842 | 0.1150 | 0.1753 | 0.2687 | 0.3564 | 0.4390 | 0.4519 | 0.4299 | 0.3326 | 0.2182 | 0.1299 | 0.0869 | 0.2239 |
| vapor space expansion factor ($K_E$) | 0.0552 | 0.0660 | 0.0793 | 0.0956 | 0.1027 | 0.1095 | 0.1078 | 0.1042 | 0.0922 | 0.0798 | 0.0653 | 0.0552 | 0.0819 |
| vapor molecular weight ($M_V$ lb/lbmole) | 18.48 | 18.45 | 18.39 | 18.34 | 18.30 | 18.27 | 18.27 | 18.27 | 18.29 | 18.35 | 18.41 | 18.47 | 18.35 |
| monthly hours with avg = total annual | 744 | 672 | 744 | 720 | 744 | 720 | 744 | 744 | 720 | 744 | 720 | 744 | 8,760 |
| throughputs (ft$^3$/month) and avg = total annual | 1,045,248 | 944,095 | 1,045,248 | 1,011,531 | 1,045,248 | 1,011,531 | 1,045,248 | 1,045,248 | 1,011,531 | 1,045,248 | 1,011,531 | 1,045,248 | 12,306,955 |
| monthly turnovers (N/month) with avg = total annual | 92.87 | 83.89 | 92.87 | 89.88 | 92.87 | 89.88 | 92.87 | 92.87 | 89.88 | 92.87 | 89.88 | 92.87 | 1,093.51 |
| vented vapor saturation factor ($K_S$) | 0.8627 | 0.8428 | 0.7996 | 0.7449 | 0.6849 | 0.6366 | 0.6199 | 0.6256 | 0.6719 | 0.7513 | 0.8197 | 0.8582 | 0.7514 |
| vent setting correction factor ($K_B$) | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| vapor density ($W_V$ lb/ft$^3$) | 0.0006 | 0.0007 | 0.0009 | 0.0012 | 0.0016 | 0.0020 | 0.0021 | 0.0021 | 0.0017 | 0.0012 | 0.0008 | 0.0006 | 0.0012 |
| standing storage losses ($L_S$ lb/month & avg is lb/yr) | 7.01 | 7.34 | 10.70 | 13.85 | 18.87 | 22.34 | 24.69 | 24.14 | 19.33 | 13.89 | 9.18 | 7.26 | 178.61 |
| working losses ($L_W$ lb/month & avg is lb/yr) | 474.22 | 496.48 | 723.94 | 937.17 | 1276.25 | 1511.19 | 1670.14 | 1633.01 | 1307.47 | 939.89 | 621.06 | 491.40 | 12082.22 |
| total losses ($L_T$ lb/month & avg is lb/yr) | 481.23 | 503.82 | 734.65 | 951.03 | 1295.11 | 1533.53 | 1694.83 | 1657.15 | 1326.80 | 953.79 | 630.24 | 498.66 | 12260.83 |
| max hourly Q in bbl/hour | 1404.90 | 1404.90 | 1404.90 | 1404.90 | 1404.90 | 1404.90 | 1404.90 | 1404.90 | 1404.90 | 1404.90 | 1404.90 | 1404.90 | |
| max hourly working loss at $P_{VX}$ & Q/hr & $K_N$=1 ($L_W$ lb/hr) | 0.637 | 0.739 | 0.973 | 1.302 | 1.715 | 2.099 | 2.245 | 2.195 | 1.816 | 1.263 | 0.863 | 0.660 | |
| breathing/standing loss ($L_S$ lb/hr) | 0.009 | 0.011 | 0.015 | 0.022 | 0.029 | 0.035 | 0.036 | 0.034 | 0.027 | 0.019 | 0.013 | 0.010 | |
| max hourly total loss ($L_T$ lb/hr) | 0.647 | 0.750 | 0.988 | 1.324 | 1.744 | 2.134 | 2.281 | 2.229 | 1.843 | 1.282 | 0.875 | 0.670 | |

| $L_S$ sum months | $L_W$ sum months | $L_T$ sum months |
|---|---|---|
| 178.61 | 12082.22 | 12260.83 |

The monthly sums will be greater than the annual average since the monthly variables yield higher emissions

**Emissions Summary:**

| | avg lbs/hr | max lbs/hr | lbs/yr |
|---|---|---|---|
| **Standing/Breathing Loss $L_S$** | **0.019** | **0.036** | **163.429** |
| **Working Loss $L_W$** | **1.262** | **2.245** | **11,055.487** |
| **Total Loss $L_T$** | **1.281** | **2.281** | **11,218.916** |

max hourly total loss may not add up to $L_S$ + $L_W$ as their max values may be in different months

## Tank Emission Calculations Based on AP 42 Chapter 7 (June 2020, Section 7.1.3.1), Fixed Roof

| | |
|---|---|
| *Tank ID* | **7b-05-ST-CV** |
| *Tank Description* | **2000 BBL Skimmer Tank-**Common **Vent (V-120B)** |
| *Company Name* | **Denbury Onshore, LLC** |

| | |
|---|---|
| *Tank Orientation* | **Vertical** |
| *Tank Diameter (D ft)* | **21.50** |
| *Vertical Height/Horizontal Length ($H_S$ ft)* | **32.00** |
| *Roof Height ($H_R$ ft)* | **0.67** |
| *Max Liquid Height ($H_{LX}$ ft)* | **31.00** |
| *Avg Liquid Height ($H_L$ ft)* | **15.50** |
| *Breather Vent Pressure Setting ($P_{BP}$ psig)* | |
| *Breather Vent Vacuum Setting ($P_{BV}$ psig)* | |
| *actual tank pressure ($P_I$ psig)* | **0.0** |
| *Shell Paint Solar Absorptance ($S_A$)* | **0.71** |
| *Roof Paint Solar Absorptance ($R_A$)* | **0.71** |
| *breather vent pressure range ($\Delta P_B$ psi)* | **0.00** |
| *roof outage ($H_{RO}$ ft)* | **0.2240** |

| | |
|---|---|
| *Tank Shell Color/Shade* | **Gray - Medium** |
| *Tank Shell Paint Condition* | **average** |
| *Tank Roof Color/Shade* | **Gray - Medium** |
| *Tank Roof Paint Condition* | **average** |
| *Roof Type* | **vertical tank with cone roof** |
| *Tank Insulation* | **no insulation** |
| *Tank Underground?* | **no** |
| *Annual Throughput (Q bbl/year)* | **2,192,190.00** |
| *Annual Turnovers, N* | **1093.51** |
| *Annual Hours* | **8,760** |
| *tank max liquid volume ($V_{LX}$ $ft^3$)* | **11,254.56** |
| *vapor space outage ($H_{VO}$ ft)* | **16.724** |
| *vapor space volume ($V_V$ $ft^3$)* | **6,071.64** |

| | |
|---|---|
| *Major City for Meterological Data* | **Jackson, MS** |
| *Site Elevation (ft)* | **300** |
| *Atmospheric Pressure ($P_A$ psia)* | **14.537** |
| *Table 7.1-2 Liquid* | |
| *RVP** | **5.37** |
| *API gravity** | **36.7** |
| *°F basis for gv** | **60.0** |
| *bubble point psia* | |
| *API gravity at 60F* | **36.7** |
| *API gravity at 100F* | **39.5** |
| *Working Loss Product Factor ($K_P$)* | **0.75** |
| *working loss turnover factor $K_N$* | **1.000** |

*sales oil data determines RVP per API pub 4683

Tank contents (if not selected from Table 7.1-2):

| *component* | *mole%* | *MW* | *lb/mole* | *wt%* | *Antoine constants (log 10, mmHg, °C) A* | *B* | *C* |
|---|---|---|---|---|---|---|---|
| Crude Oil | 0.100 | 50.000 | 0.04995 | 0.27678 | 11.194 | 5216.548 | 0.000 |
| Water | 99.900 | 18.015 | 17.99700 | 99.72322 | 8.108 | 1750.300 | 235.000 |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| | 100.000 | | 18.047 | 100.000 | | | |

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Avg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| hourly average maximum ambient temperature ($T_{AX}$ °F) | 56.50 | 60.80 | 68.10 | 75.70 | 83.00 | 89.00 | 91.10 | 91.20 | 86.50 | 77.10 | 66.30 | 58.10 | 75.30 |
| hourly average minimum ambient temperature ($T_{AN}$ °F) | 37.00 | 39.30 | 45.90 | 53.30 | 62.50 | 69.20 | 72.10 | 71.40 | 65.50 | 53.90 | 43.90 | 37.90 | 54.30 |
| daily total solar insolation factor (I btu/ft$^2$ day) | 783 | 1039 | 1369 | 1762 | 1929 | 2025 | 1969 | 1849 | 1576 | 1262 | 922 | 726 | 1434 |
| daily average ambient temperature ($T_{AA}$ °F) | 46.75 | 50.05 | 57.00 | 64.50 | 72.75 | 79.10 | 81.60 | 81.30 | 76.00 | 65.50 | 55.10 | 48.00 | 64.80 |
| liquid bulk temperature ($T_B$ °F) | 48.42 | 52.26 | 59.92 | 68.25 | 76.86 | 83.41 | 85.79 | 85.24 | 79.36 | 68.19 | 57.06 | 49.55 | 67.85 |
| average vapor temperature ($T_V$ °F) | 51.34 | 56.14 | 65.03 | 74.84 | 84.06 | 90.98 | 93.15 | 92.15 | 85.24 | 72.90 | 60.51 | 52.26 | 73.21 |
| daily ambient temperature range ($\Delta T_A$ °R) | 19.50 | 21.50 | 22.20 | 22.40 | 20.50 | 19.80 | 19.00 | 19.80 | 21.00 | 23.20 | 22.40 | 20.20 | 21.00 |
| daily vapor temperature range ($\Delta T_V$ °R) | 25.16 | 29.80 | 34.98 | 40.70 | 41.74 | 42.62 | 41.26 | 40.12 | 37.08 | 34.16 | 29.15 | 25.12 | 35.06 |
| daily average liquid surface temperature ($T_{LA}$ °F) | 49.88 | 54.20 | 62.47 | 71.54 | 80.46 | 87.20 | 89.47 | 88.69 | 82.30 | 70.55 | 58.79 | 50.90 | 70.53 |
| daily maximum liquid surface temperature ($T_{LX}$ °F) | 56.17 | 61.65 | 71.22 | 81.72 | 90.90 | 97.85 | 99.79 | 98.72 | 91.57 | 79.09 | 66.07 | 57.18 | 79.30 |
| daily minimum liquid surface temperature ($T_{LN}$ °F) | 43.59 | 46.75 | 53.73 | 61.37 | 70.03 | 76.54 | 79.16 | 78.66 | 73.03 | 62.01 | 51.50 | 44.62 | 61.77 |
| vapor pressure at daily avg liq surface temp $T_{LA}$ ($P_{VA}$ psia) | 0.180 | 0.210 | 0.283 | 0.386 | 0.519 | 0.644 | 0.692 | 0.675 | 0.551 | 0.373 | 0.248 | 0.186 | 0.373 |
| vapor pressure at daily max liq surface temp $T_{LX}$ ($P_{VX}$ psia) | 0.226 | 0.275 | 0.382 | 0.541 | 0.723 | 0.895 | 0.949 | 0.919 | 0.739 | 0.496 | 0.320 | 0.234 | 0.500 |
| vapor pressure at daily min liq surface temp $T_{LN}$ ($P_{VN}$ psia) | 0.142 | 0.160 | 0.207 | 0.272 | 0.367 | 0.456 | 0.497 | 0.489 | 0.406 | 0.278 | 0.191 | 0.147 | 0.276 |
| daily vapor pressure range ($\Delta P_V$) | 0.0842 | 0.1150 | 0.1753 | 0.2687 | 0.3564 | 0.4390 | 0.4519 | 0.4299 | 0.3326 | 0.2182 | 0.1299 | 0.0869 | 0.2239 |
| vapor space expansion factor ($K_E$) | 0.0552 | 0.0660 | 0.0793 | 0.0956 | 0.1027 | 0.1095 | 0.1078 | 0.1042 | 0.0922 | 0.0798 | 0.0653 | 0.0552 | 0.0819 |
| vapor molecular weight ($M_V$ lb/lbmole) | 18.48 | 18.45 | 18.39 | 18.34 | 18.30 | 18.27 | 18.27 | 18.27 | 18.29 | 18.35 | 18.41 | 18.47 | 18.35 |
| monthly hours with avg = total annual | 744 | 672 | 744 | 720 | 744 | 720 | 744 | 744 | 720 | 744 | 720 | 744 | 8,760 |
| throughputs (ft$^3$/month) and avg = total annual | 1,045,248 | 944,095 | 1,045,248 | 1,011,531 | 1,045,248 | 1,011,531 | 1,045,248 | 1,045,248 | 1,011,531 | 1,045,248 | 1,011,531 | 1,045,248 | 12,306,955 |
| monthly turnovers (N/month) with avg = total annual | 92.87 | 83.89 | 92.87 | 89.88 | 92.87 | 89.88 | 92.87 | 92.87 | 89.88 | 92.87 | 89.88 | 92.87 | 1,093.51 |
| vented vapor saturation factor ($K_S$) | 0.8627 | 0.8428 | 0.7996 | 0.7449 | 0.6849 | 0.6366 | 0.6199 | 0.6256 | 0.6719 | 0.7513 | 0.8197 | 0.8582 | 0.7514 |
| vent setting correction factor ($K_B$) | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| vapor density ($W_V$ lb/ft$^3$) | 0.0006 | 0.0007 | 0.0009 | 0.0012 | 0.0016 | 0.0020 | 0.0021 | 0.0021 | 0.0017 | 0.0012 | 0.0008 | 0.0006 | 0.0012 |
| standing storage losses ($L_S$ lb/month & avg is lb/yr) | 7.01 | 7.34 | 10.70 | 13.85 | 18.87 | 22.34 | 24.69 | 24.14 | 19.33 | 13.89 | 9.18 | 7.26 | 178.61 |
| working losses ($L_W$ lb/month & avg is lb/yr) | 474.22 | 496.48 | 723.94 | 937.17 | 1276.25 | 1511.19 | 1670.14 | 1633.01 | 1307.47 | 939.89 | 621.06 | 491.40 | 12082.22 |
| total losses ($L_T$ lb/month & avg is lb/yr) | 481.23 | 503.82 | 734.65 | 951.03 | 1295.11 | 1533.53 | 1694.83 | 1657.15 | 1326.80 | 953.79 | 630.24 | 498.66 | 12260.83 |
| max hourly Q in bbl/hour | 1404.90 | 1404.90 | 1404.90 | 1404.90 | 1404.90 | 1404.90 | 1404.90 | 1404.90 | 1404.90 | 1404.90 | 1404.90 | 1404.90 | |
| max hourly working loss at $P_{VX}$ & Q/hr & $K_N$=1 ($L_W$ lb/hr) | 0.637 | 0.739 | 0.973 | 1.302 | 1.715 | 2.099 | 2.245 | 2.195 | 1.816 | 1.263 | 0.863 | 0.660 | |
| breathing/standing loss ($L_S$ lb/hr) | 0.009 | 0.011 | 0.015 | 0.022 | 0.029 | 0.035 | 0.036 | 0.034 | 0.027 | 0.019 | 0.013 | 0.010 | |
| max hourly total loss ($L_T$ lb/hr) | 0.647 | 0.750 | 0.988 | 1.324 | 1.744 | 2.134 | 2.281 | 2.229 | 1.843 | 1.282 | 0.875 | 0.670 | |

| $L_S$ sum months | $L_W$ sum months | $L_T$ sum months |
|---|---|---|
| 178.61 | 12082.22 | 12260.83 |

The monthly sums will be greater than the annual average since the monthly variables yield higher emissions

**Emissions Summary:**

| | avg lbs/hr | max lbs/hr | lbs/yr |
|---|---|---|---|
| **Standing/Breathing Loss $L_S$** | **0.019** | **0.036** | **163.429** |
| **Working Loss $L_W$** | **1.262** | **2.245** | **11,055.487** |
| **Total Loss $L_T$** | **1.281** | **2.281** | **11,218.916** |

max hourly total loss may not add up to $L_S$ + $L_W$ as their max values may be in different months

## Tank Emission Calculations Based on AP 42 Chapter 7 (June 2020, Section 7.1.3.1), Fixed Roof

| | |
|---|---|
| *Tank ID* | **8a-05-WST-CV** |
| *Tank Description* | **5000 BBL Water Storage Tank-Common Vent (V-129A)** |
| *Company Name* | **Denbury Onshore, LLC** |

| | |
|---|---|
| *Tank Orientation* | **Vertical** |
| *Tank Diameter (D ft)* | **38.64** |
| *Vertical Height/Horizontal Length ($H_S$ ft)* | **24.13** |
| *Roof Height ($H_R$ ft)* | **1.21** |
| *Max Liquid Height ($H_{LX}$ ft)* | **23.13** |
| *Avg Liquid Height ($H_L$ ft)* | **11.57** |
| *Breather Vent Pressure Setting ($P_{BP}$ psig)* | |
| *Breather Vent Vacuum Setting ($P_{BV}$ psig)* | |
| *actual tank pressure ($P_I$ psig)* | **0.0** |
| *Shell Paint Solar Absorptance ($S_A$)* | **0.71** |
| *Roof Paint Solar Absorptance ($R_A$)* | **0.71** |
| *breather vent pressure range ($\Delta P_B$ psi)* | **0.00** |
| *roof outage ($H_{RO}$ ft)* | **0.4025** |

| | |
|---|---|
| *Tank Shell Color/Shade* | **Gray - Medium** |
| *Tank Shell Paint Condition* | **average** |
| *Tank Roof Color/Shade* | **Gray - Medium** |
| *Tank Roof Paint Condition* | **average** |
| *Roof Type* | **vertical tank with cone roof** |
| *Tank Insulation* | **no insulation** |
| *Tank Underground?* | **no** |
| *Annual Throughput (Q bbl/year)* | **2,190,000.00** |
| *Annual Turnovers, N* | **453.29** |
| *Annual Hours* | **8,760** |
| *tank max liquid volume ($V_{LX}$ $ft^3$)* | **27,123.13** |
| *vapor space outage ($H_{VO}$ ft)* | **12.968** |
| *vapor space volume ($V_V$ $ft^3$)* | **15,206.19** |

| | |
|---|---|
| *Major City for Meterological Data* | **Jackson, MS** |
| *Site Elevation (ft)* | **300** |
| *Atmospheric Pressure ($P_A$ psia)* | **14.537** |
| *Table 7.1-2 Liquid* | |
| *RVP** | |
| *API gravity** | |
| *°F basis for gv** | |
| *bubble point psia* | |
| *API gravity at 60F* | |
| *API gravity at 100F* | |
| *Working Loss Product Factor ($K_P$)* | **0.75** |
| *working loss turnover factor $K_N$* | **0.233** |

*sales oil data determines RVP per API pub 4683

Tank contents (if not selected from Table 7.1-2):

| *component* | *mole%* | *MW* | *lb/mole* | *wt%* | *Antoine constants (log 10, mmHg, °C) A* | *B* | *C* |
|---|---|---|---|---|---|---|---|
| Water | 100.000 | 18.015 | 18.01500 | 100.00000 | 8.108 | 1750.300 | 235.000 |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| | 100.000 | | 18.015 | 100.000 | | | |

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Avg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| hourly average maximum ambient temperature ($T_{AX}$ °F) | 56.50 | 60.80 | 68.10 | 75.70 | 83.00 | 89.00 | 91.10 | 91.20 | 86.50 | 77.10 | 66.30 | 58.10 | 75.30 |
| hourly average minimum ambient temperature ($T_{AN}$ °F) | 37.00 | 39.30 | 45.90 | 53.30 | 62.50 | 69.20 | 72.10 | 71.40 | 65.50 | 53.90 | 43.90 | 37.90 | 54.30 |
| daily total solar insolation factor (I btu/ft$^2$ day) | 783 | 1039 | 1369 | 1762 | 1929 | 2025 | 1969 | 1849 | 1576 | 1262 | 922 | 726 | 1434 |
| daily average ambient temperature ($T_{AA}$ °F) | 46.75 | 50.05 | 57.00 | 64.50 | 72.75 | 79.10 | 81.60 | 81.30 | 76.00 | 65.50 | 55.10 | 48.00 | 64.80 |
| liquid bulk temperature ($T_B$ °F) | 48.42 | 52.26 | 59.92 | 68.25 | 76.86 | 83.41 | 85.79 | 85.24 | 79.36 | 68.19 | 57.06 | 49.55 | 67.85 |
| average vapor temperature ($T_V$ °F) | 52.10 | 57.15 | 66.36 | 76.54 | 85.94 | 92.94 | 95.06 | 93.94 | 86.77 | 74.13 | 61.40 | 52.96 | 74.60 |
| daily ambient temperature range ($\Delta T_A$ °R) | 19.50 | 21.50 | 22.20 | 22.40 | 20.50 | 19.80 | 19.00 | 19.80 | 21.00 | 23.20 | 22.40 | 20.20 | 21.00 |
| daily vapor temperature range ($\Delta T_V$ °R) | 24.77 | 29.80 | 34.98 | 40.70 | 41.74 | 42.62 | 41.26 | 40.12 | 37.08 | 34.16 | 28.77 | 24.45 | 35.06 |
| daily average liquid surface temperature ($T_{LA}$ °F) | 50.26 | 54.71 | 63.14 | 72.40 | 81.40 | 88.18 | 90.43 | 89.59 | 83.06 | 71.16 | 59.23 | 51.25 | 71.23 |
| daily maximum liquid surface temperature ($T_{LX}$ °F) | 56.45 | 62.16 | 71.88 | 82.57 | 91.83 | 98.83 | 100.74 | 99.62 | 92.33 | 79.70 | 66.43 | 57.37 | 79.99 |
| daily minimum liquid surface temperature ($T_{LN}$ °F) | 44.07 | 47.26 | 54.39 | 62.22 | 70.96 | 77.52 | 80.11 | 79.56 | 73.79 | 62.62 | 52.04 | 45.14 | 62.46 |
| vapor pressure at daily avg liq surface temp $T_{LA}$ ($P_{VA}$ psia) | 0.180 | 0.212 | 0.286 | 0.394 | 0.531 | 0.660 | 0.708 | 0.690 | 0.560 | 0.378 | 0.249 | 0.186 | 0.379 |
| vapor pressure at daily max liq surface temp $T_{LX}$ ($P_{VX}$ psia) | 0.226 | 0.277 | 0.387 | 0.551 | 0.740 | 0.917 | 0.971 | 0.939 | 0.751 | 0.502 | 0.321 | 0.233 | 0.507 |
| vapor pressure at daily min liq surface temp $T_{LN}$ ($P_{VN}$ psia) | 0.142 | 0.160 | 0.209 | 0.277 | 0.375 | 0.468 | 0.509 | 0.500 | 0.413 | 0.281 | 0.192 | 0.148 | 0.280 |
| daily vapor pressure range ($\Delta P_V$) | 0.0834 | 0.1161 | 0.1779 | 0.2743 | 0.3646 | 0.4494 | 0.4622 | 0.4390 | 0.3385 | 0.2211 | 0.1293 | 0.0850 | 0.2275 |
| vapor space expansion factor ($K_E$) | 0.0544 | 0.0660 | 0.0794 | 0.0959 | 0.1032 | 0.1102 | 0.1084 | 0.1047 | 0.0925 | 0.0800 | 0.0645 | 0.0538 | 0.0821 |
| vapor molecular weight ($M_V$ lb/lbmole) | 18.02 | 18.02 | 18.02 | 18.02 | 18.02 | 18.02 | 18.02 | 18.02 | 18.02 | 18.02 | 18.02 | 18.02 | 18.02 |
| monthly hours with avg = total annual | 744 | 672 | 744 | 720 | 744 | 720 | 744 | 744 | 720 | 744 | 720 | 744 | 8,760 |
| throughputs (ft$^3$/month) and avg = total annual | 1,044,204 | 943,152 | 1,044,204 | 1,010,520 | 1,044,204 | 1,010,520 | 1,044,204 | 1,044,204 | 1,010,520 | 1,044,204 | 1,010,520 | 1,044,204 | 12,294,660 |
| monthly turnovers (N/month) with avg = total annual | 38.50 | 34.77 | 38.50 | 37.26 | 38.50 | 37.26 | 38.50 | 38.50 | 37.26 | 38.50 | 37.26 | 38.50 | 453.29 |
| vented vapor saturation factor ($K_S$) | 0.8901 | 0.8730 | 0.8356 | 0.7869 | 0.7327 | 0.6880 | 0.6727 | 0.6784 | 0.7220 | 0.7939 | 0.8537 | 0.8864 | 0.7935 |
| vent setting correction factor ($K_B$) | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| vapor density ($W_V$ lb/ft$^3$) | 0.0006 | 0.0007 | 0.0009 | 0.0012 | 0.0016 | 0.0020 | 0.0021 | 0.0021 | 0.0017 | 0.0012 | 0.0008 | 0.0006 | 0.0012 |
| standing storage losses ($L_S$ lb/month & avg is lb/yr) | 18.10 | 19.07 | 28.06 | 36.66 | 50.17 | 59.57 | 65.81 | 64.24 | 51.17 | 36.49 | 23.87 | 18.75 | 471.96 |
| working losses ($L_W$ lb/month & avg is lb/yr) | 107.45 | 113.23 | 166.61 | 217.67 | 297.86 | 353.67 | 390.74 | 381.38 | 303.78 | 216.64 | 141.72 | 111.31 | 2802.06 |
| total losses ($L_T$ lb/month & avg is lb/yr) | 125.55 | 132.31 | 194.68 | 254.33 | 348.03 | 413.24 | 456.55 | 445.62 | 354.95 | 253.13 | 165.59 | 130.06 | 3274.02 |
| max hourly Q in bbl/hour | 1403.50 | 1403.50 | 1403.50 | 1403.50 | 1403.50 | 1403.50 | 1403.50 | 1403.50 | 1403.50 | 1403.50 | 1403.50 | 1403.50 | |
| max hourly working loss at $P_{VX}$ & Q/hr & $K_N$=1 ($L_W$ lb/hr) | 0.620 | 0.724 | 0.962 | 1.298 | 1.719 | 2.110 | 2.255 | 2.201 | 1.812 | 1.251 | 0.845 | 0.643 | |
| breathing/standing loss ($L_S$ lb/hr) | 0.024 | 0.028 | 0.038 | 0.059 | 0.078 | 0.096 | 0.099 | 0.094 | 0.073 | 0.049 | 0.033 | 0.025 | |
| max hourly total loss ($L_T$ lb/hr) | 0.645 | 0.752 | 1.000 | 1.357 | 1.798 | 2.206 | 2.355 | 2.296 | 1.885 | 1.300 | 0.878 | 0.668 | |

| $L_S$ sum months | $L_W$ sum months | $L_T$ sum months |
|---|---|---|
| 471.96 | 2802.06 | 3274.02 |

The monthly sums will be greater than the annual average since the monthly variables yield higher emissions

**Emissions Summary:**

| | avg lbs/hr | max lbs/hr | lbs/yr |
|---|---|---|---|
| **Standing/Breathing Loss $L_S$** | **0.049** | **0.099** | **430.290** |
| **Working Loss $L_W$** | **0.292** | **2.255** | **2,554.652** |
| **Total Loss $L_T$** | **0.341** | **2.355** | **2,984.943** |

max hourly total loss may not add up to $L_S$ + $L_W$ as their max values may be in different months



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VOC Profile Speciation Report

Profile Name : Fixed Roof Tank - Crude Oil Production
Profile Number : 0296
Data Quality : C

Control Device : Uncontrolled
Reference(s) : 59, 72
Data Source : Engineering evaluation of test data and literature data

SCC Assignments: 40301010, 40301011, 40301012, 40301109

| Saroad | CAS Number | Name | Spec_MW | Spec_WT | Peak |
|---|---|---|---|---|---|
| 43115 | | C-7 CYCLOPARAFFINS | 98.19 | 1.30 | |
| 43116 | | C-8 CYCLOPARAFFINS | 112.23 | 0.50 | |
| 43122 | | ISOMERS OF PENTANE | 72.15 | 1.50 | |
| 43201 | 74-82-8 | METHANE | 16.04 | 6.20 | |
| 43202 | 74-84-0 | ETHANE | 30.07 | 5.60 | |
| 43204 | 74-98-6 | PROPANE | 44.09 | 17.60 | |
| 43212 | 106-97-8 | N-BUTANE | 58.12 | 27.10 | |
| 43214 | 75-28-5 | ISO-BUTANE | 58.12 | 1.50 | |
| 43220 | 109-66-0 | N-PENTANE | 72.15 | 14.60 | |
| 43231 | 110-54-3 | HEXANE | 86.17 | 7.90 | |
| 43232 | 142-82-5 | HEPTANE | 100.20 | 9.20 | |
| 43233 | 111-65-9 | OCTANE | 114.23 | 6.90 | |
| 45201 | 71-43-2 | BENZENE | 78.11 | 0.10 | |
| TOTAL | | | | 100.00 | |

## Tank Emission Calculations Based on AP 42 Chapter 7 (June 2020, Section 7.1.3.1), Fixed Roof

| | |
|---|---|
| *Tank ID* | **8b-05-WST-CV** |
| *Tank Description* | **5000 BBL Water Storage Tank-Common Vent (V-129B)** |
| *Company Name* | **Denbury Onshore, LLC** |

| | |
|---|---|
| *Tank Orientation* | **Vertical** |
| *Tank Diameter (D ft)* | **38.64** |
| *Vertical Height/Horizontal Length ($H_S$ ft)* | **24.13** |
| *Roof Height ($H_R$ ft)* | **1.21** |
| *Max Liquid Height ($H_{LX}$ ft)* | **23.13** |
| *Avg Liquid Height ($H_L$ ft)* | **11.57** |
| *Breather Vent Pressure Setting ($P_{BP}$ psig)* | |
| *Breather Vent Vacuum Setting ($P_{BV}$ psig)* | |
| *actual tank pressure ($P_I$ psig)* | **0.0** |
| *Shell Paint Solar Absorptance ($S_A$)* | **0.71** |
| *Roof Paint Solar Absorptance ($R_A$)* | **0.71** |
| *breather vent pressure range ($\Delta P_B$ psi)* | **0.00** |
| *roof outage ($H_{RO}$ ft)* | **0.4025** |

| | |
|---|---|
| *Tank Shell Color/Shade* | **Gray - Medium** |
| *Tank Shell Paint Condition* | **average** |
| *Tank Roof Color/Shade* | **Gray - Medium** |
| *Tank Roof Paint Condition* | **average** |
| *Roof Type* | **vertical tank with cone roof** |
| *Tank Insulation* | **no insulation** |
| *Tank Underground?* | **no** |
| *Annual Throughput (Q bbl/year)* | **2,190,000.00** |
| *Annual Turnovers, N* | **453.29** |
| *Annual Hours* | **8,760** |
| *tank max liquid volume ($V_{LX}$ $ft^3$)* | **27,123.13** |
| *vapor space outage ($H_{VO}$ ft)* | **12.968** |
| *vapor space volume ($V_V$ $ft^3$)* | **15,206.19** |

| | |
|---|---|
| *Major City for Meterological Data* | **Jackson, MS** |
| *Site Elevation (ft)* | **300** |
| *Atmospheric Pressure ($P_A$ psia)* | **14.537** |
| *Table 7.1-2 Liquid* | |
| *RVP** | |
| *API gravity** | |
| *°F basis for gv** | |
| *bubble point psia* | |
| *API gravity at 60F* | |
| *API gravity at 100F* | |
| *Working Loss Product Factor ($K_P$)* | **0.75** |
| *working loss turnover factor $K_N$* | **0.233** |

*sales oil data determines RVP per API pub 4683

Tank contents (if not selected from Table 7.1-2):

| *component* | *mole%* | *MW* | *lb/mole* | *wt%* | *Antoine constants (log 10, mmHg, °C) A* | *B* | *C* |
|---|---|---|---|---|---|---|---|
| Water | 100.000 | 18.015 | 18.01500 | 100.00000 | 8.108 | 1750.300 | 235.000 |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| | 100.000 | | 18.015 | 100.000 | | | |



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| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Avg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| hourly average maximum ambient temperature ($T_{AX}$ °F) | 56.50 | 60.80 | 68.10 | 75.70 | 83.00 | 89.00 | 91.10 | 91.20 | 86.50 | 77.10 | 66.30 | 58.10 | 75.30 |
| hourly average minimum ambient temperature ($T_{AN}$ °F) | 37.00 | 39.30 | 45.90 | 53.30 | 62.50 | 69.20 | 72.10 | 71.40 | 65.50 | 53.90 | 43.90 | 37.90 | 54.30 |
| daily total solar insolation factor (I btu/ft$^2$ day) | 783 | 1039 | 1369 | 1762 | 1929 | 2025 | 1969 | 1849 | 1576 | 1262 | 922 | 726 | 1434 |
| daily average ambient temperature ($T_{AA}$ °F) | 46.75 | 50.05 | 57.00 | 64.50 | 72.75 | 79.10 | 81.60 | 81.30 | 76.00 | 65.50 | 55.10 | 48.00 | 64.80 |
| liquid bulk temperature ($T_B$ °F) | 48.42 | 52.26 | 59.92 | 68.25 | 76.86 | 83.41 | 85.79 | 85.24 | 79.36 | 68.19 | 57.06 | 49.55 | 67.85 |
| average vapor temperature ($T_V$ °F) | 52.10 | 57.15 | 66.36 | 76.54 | 85.94 | 92.94 | 95.06 | 93.94 | 86.77 | 74.13 | 61.40 | 52.96 | 74.60 |
| daily ambient temperature range ($\Delta T_A$ °R) | 19.50 | 21.50 | 22.20 | 22.40 | 20.50 | 19.80 | 19.00 | 19.80 | 21.00 | 23.20 | 22.40 | 20.20 | 21.00 |
| daily vapor temperature range ($\Delta T_V$ °R) | 24.77 | 29.80 | 34.98 | 40.70 | 41.74 | 42.62 | 41.26 | 40.12 | 37.08 | 34.16 | 28.77 | 24.45 | 35.06 |
| daily average liquid surface temperature ($T_{LA}$ °F) | 50.26 | 54.71 | 63.14 | 72.40 | 81.40 | 88.18 | 90.43 | 89.59 | 83.06 | 71.16 | 59.23 | 51.25 | 71.23 |
| daily maximum liquid surface temperature ($T_{LX}$ °F) | 56.45 | 62.16 | 71.88 | 82.57 | 91.83 | 98.83 | 100.74 | 99.62 | 92.33 | 79.70 | 66.43 | 57.37 | 79.99 |
| daily minimum liquid surface temperature ($T_{LN}$ °F) | 44.07 | 47.26 | 54.39 | 62.22 | 70.96 | 77.52 | 80.11 | 79.56 | 73.79 | 62.62 | 52.04 | 45.14 | 62.46 |
| vapor pressure at daily avg liq surface temp $T_{LA}$ ($P_{VA}$ psia) | 0.180 | 0.212 | 0.286 | 0.394 | 0.531 | 0.660 | 0.708 | 0.690 | 0.560 | 0.378 | 0.249 | 0.186 | 0.379 |
| vapor pressure at daily max liq surface temp $T_{LX}$ ($P_{VX}$ psia) | 0.226 | 0.277 | 0.387 | 0.551 | 0.740 | 0.917 | 0.971 | 0.939 | 0.751 | 0.502 | 0.321 | 0.233 | 0.507 |
| vapor pressure at daily min liq surface temp $T_{LN}$ ($P_{VN}$ psia) | 0.142 | 0.160 | 0.209 | 0.277 | 0.375 | 0.468 | 0.509 | 0.500 | 0.413 | 0.281 | 0.192 | 0.148 | 0.280 |
| daily vapor pressure range ($\Delta P_V$) | 0.0834 | 0.1161 | 0.1779 | 0.2743 | 0.3646 | 0.4494 | 0.4622 | 0.4390 | 0.3385 | 0.2211 | 0.1293 | 0.0850 | 0.2275 |
| vapor space expansion factor ($K_E$) | 0.0544 | 0.0660 | 0.0794 | 0.0959 | 0.1032 | 0.1102 | 0.1084 | 0.1047 | 0.0925 | 0.0800 | 0.0645 | 0.0538 | 0.0821 |
| vapor molecular weight ($M_V$ lb/lbmole) | 18.02 | 18.02 | 18.02 | 18.02 | 18.02 | 18.02 | 18.02 | 18.02 | 18.02 | 18.02 | 18.02 | 18.02 | 18.02 |
| monthly hours with avg = total annual | 744 | 672 | 744 | 720 | 744 | 720 | 744 | 744 | 720 | 744 | 720 | 744 | 8,760 |
| throughputs (ft$^3$/month) and avg = total annual | 1,044,204 | 943,152 | 1,044,204 | 1,010,520 | 1,044,204 | 1,010,520 | 1,044,204 | 1,044,204 | 1,010,520 | 1,044,204 | 1,010,520 | 1,044,204 | 12,294,660 |
| monthly turnovers (N/month) with avg = total annual | 38.50 | 34.77 | 38.50 | 37.26 | 38.50 | 37.26 | 38.50 | 38.50 | 37.26 | 38.50 | 37.26 | 38.50 | 453.29 |
| vented vapor saturation factor ($K_S$) | 0.8901 | 0.8730 | 0.8356 | 0.7869 | 0.7327 | 0.6880 | 0.6727 | 0.6784 | 0.7220 | 0.7939 | 0.8537 | 0.8864 | 0.7935 |
| vent setting correction factor ($K_B$) | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| vapor density ($W_V$ lb/ft$^3$) | 0.0006 | 0.0007 | 0.0009 | 0.0012 | 0.0016 | 0.0020 | 0.0021 | 0.0021 | 0.0017 | 0.0012 | 0.0008 | 0.0006 | 0.0012 |
| standing storage losses ($L_S$ lb/month & avg is lb/yr) | 18.10 | 19.07 | 28.06 | 36.66 | 50.17 | 59.57 | 65.81 | 64.24 | 51.17 | 36.49 | 23.87 | 18.75 | 471.96 |
| working losses ($L_W$ lb/month & avg is lb/yr) | 107.45 | 113.23 | 166.61 | 217.67 | 297.86 | 353.67 | 390.74 | 381.38 | 303.78 | 216.64 | 141.72 | 111.31 | 2802.06 |
| total losses ($L_T$ lb/month & avg is lb/yr) | 125.55 | 132.31 | 194.68 | 254.33 | 348.03 | 413.24 | 456.55 | 445.62 | 354.95 | 253.13 | 165.59 | 130.06 | 3274.02 |
| max hourly Q in bbl/hour | 1403.50 | 1403.50 | 1403.50 | 1403.50 | 1403.50 | 1403.50 | 1403.50 | 1403.50 | 1403.50 | 1403.50 | 1403.50 | 1403.50 | |
| max hourly working loss at $P_{VX}$ & Q/hr & $K_N$=1 ($L_W$ lb/hr) | 0.620 | 0.724 | 0.962 | 1.298 | 1.719 | 2.110 | 2.255 | 2.201 | 1.812 | 1.251 | 0.845 | 0.643 | |
| breathing/standing loss ($L_S$ lb/hr) | 0.024 | 0.028 | 0.038 | 0.059 | 0.078 | 0.096 | 0.099 | 0.094 | 0.073 | 0.049 | 0.033 | 0.025 | |
| max hourly total loss ($L_T$ lb/hr) | 0.645 | 0.752 | 1.000 | 1.357 | 1.798 | 2.206 | 2.355 | 2.296 | 1.885 | 1.300 | 0.878 | 0.668 | |

| $L_S$ sum months | $L_W$ sum months | $L_T$ sum months |
|---|---|---|
| 471.96 | 2802.06 | 3274.02 |

The monthly sums will be greater than the annual average since the monthly variables yield higher emissions

**Emissions Summary:**

| | avg lbs/hr | max lbs/hr | lbs/yr |
|---|---|---|---|
| **Standing/Breathing Loss $L_S$** | **0.049** | **0.099** | **430.290** |
| **Working Loss $L_W$** | **0.292** | **2.255** | **2,554.652** |
| **Total Loss $L_T$** | **0.341** | **2.355** | **2,984.943** |

max hourly total loss may not add up to $L_S$ + $L_W$ as their max values may be in different months



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## Tank Emission Calculations Based on AP 42 Chapter 7 (June 2020, Section 7.1.3.1), Fixed Roof

| | |
|---|---|
| *Tank ID* | **9-05-SOT-V** |
| *Tank Description* | **1500 BBL Slop Oil Tank-Vent (V-132)** |
| *Company Name* | **Denbury Onshore, LLC** |

| | |
|---|---|
| *Tank Orientation* | **Vertical** |
| *Tank Diameter (D ft)* | **21.00** |
| *Vertical Height/Horizontal Length ($H_S$ ft)* | **24.00** |
| *Roof Height ($H_R$ ft)* | **0.66** |
| *Max Liquid Height ($H_{LX}$ ft)* | **23.00** |
| *Avg Liquid Height ($H_L$ ft)* | **11.50** |
| *Breather Vent Pressure Setting ($P_{BP}$ psig)* | |
| *Breather Vent Vacuum Setting ($P_{BV}$ psig)* | |
| *actual tank pressure ($P_I$ psig)* | **0.0** |
| *Shell Paint Solar Absorptance ($S_A$)* | **0.71** |
| *Roof Paint Solar Absorptance ($R_A$)* | **0.71** |
| *breather vent pressure range ($\Delta P_B$ psi)* | **0.00** |
| *roof outage ($H_{RO}$ ft)* | **0.2188** |

| | |
|---|---|
| *Tank Shell Color/Shade* | **Gray - Medium** |
| *Tank Shell Paint Condition* | **average** |
| *Tank Roof Color/Shade* | **Gray - Medium** |
| *Tank Roof Paint Condition* | **average** |
| *Roof Type* | **vertical tank with cone roof** |
| *Tank Insulation* | **no insulation** |
| *Tank Underground?* | **no** |
| *Annual Throughput (Q bbl/year)* | **10,950.00** |
| *Annual Turnovers, N* | **7.72** |
| *Annual Hours* | **8,760** |
| *tank max liquid volume ($V_{LX}$ $ft^3$)* | **7,966.29** |
| *vapor space outage ($H_{VO}$ ft)* | **12.719** |
| *vapor space volume ($V_V$ $ft^3$)* | **4,405.27** |

| | |
|---|---|
| *Major City for Meterological Data* | **Jackson, MS** |
| *Site Elevation (ft)* | **300** |
| *Atmospheric Pressure ($P_A$ psia)* | **14.537** |
| *Table 7.1-2 Liquid* | **crude oil** |
| *RVP** | **5.37** |
| *API gravity** | **36.7** |
| *°F basis for gv** | **60.0** |
| *bubble point psia* | |
| *API gravity at 60F* | **36.7** |
| *API gravity at 100F* | **39.5** |
| *Working Loss Product Factor ($K_P$)* | **0.75** |
| *working loss turnover factor $K_N$* | **1.000** |

*sales oil data determines RVP per API pub 4683

Tank contents (if not selected from Table 7.1-2):

| *component* | *mole%* | *MW* | *lb/mole* | *wt%* | *Antoine constants (log 10, mmHg, °C) A* | *B* | *C* |
|---|---|---|---|---|---|---|---|
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| | 0.000 | | 0.000 | 0.000 | | | |



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| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Avg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| hourly average maximum ambient temperature ($T_{AX}$ °F) | 56.50 | 60.80 | 68.10 | 75.70 | 83.00 | 89.00 | 91.10 | 91.20 | 86.50 | 77.10 | 66.30 | 58.10 | 75.30 |
| hourly average minimum ambient temperature ($T_{AN}$ °F) | 37.00 | 39.30 | 45.90 | 53.30 | 62.50 | 69.20 | 72.10 | 71.40 | 65.50 | 53.90 | 43.90 | 37.90 | 54.30 |
| daily total solar insolation factor (I btu/ft$^2$ day) | 783 | 1039 | 1369 | 1762 | 1929 | 2025 | 1969 | 1849 | 1576 | 1262 | 922 | 726 | 1434 |
| daily average ambient temperature ($T_{AA}$ °F) | 46.75 | 50.05 | 57.00 | 64.50 | 72.75 | 79.10 | 81.60 | 81.30 | 76.00 | 65.50 | 55.10 | 48.00 | 64.80 |
| liquid bulk temperature ($T_B$ °F) | 48.42 | 52.26 | 59.92 | 68.25 | 76.86 | 83.41 | 85.79 | 85.24 | 79.36 | 68.19 | 57.06 | 49.55 | 67.85 |
| average vapor temperature ($T_V$ °F) | 51.57 | 56.44 | 65.42 | 75.34 | 84.62 | 91.56 | 93.72 | 92.68 | 85.70 | 73.27 | 60.77 | 52.47 | 73.62 |
| daily ambient temperature range ($\Delta T_A$ °R) | 19.50 | 21.50 | 22.20 | 22.40 | 20.50 | 19.80 | 19.00 | 19.80 | 21.00 | 23.20 | 22.40 | 20.20 | 21.00 |
| daily vapor temperature range ($\Delta T_V$ °R) | 25.00 | 29.80 | 34.98 | 40.70 | 41.74 | 42.62 | 41.26 | 40.12 | 37.08 | 34.16 | 28.98 | 24.91 | 35.06 |
| daily average liquid surface temperature ($T_{LA}$ °F) | 49.99 | 54.35 | 62.67 | 71.80 | 80.74 | 87.49 | 89.75 | 88.96 | 82.53 | 70.73 | 58.92 | 51.01 | 70.74 |
| daily maximum liquid surface temperature ($T_{LX}$ °F) | 56.24 | 61.80 | 71.41 | 81.97 | 91.17 | 98.14 | 100.07 | 98.99 | 91.80 | 79.27 | 66.16 | 57.24 | 79.50 |
| daily minimum liquid surface temperature ($T_{LN}$ °F) | 43.74 | 46.90 | 53.92 | 61.62 | 70.30 | 76.83 | 79.44 | 78.93 | 73.26 | 62.19 | 51.67 | 44.78 | 61.97 |
| vapor pressure at daily avg liq surface temp $T_{LA}$ ($P_{VA}$ psia) | 2.608 | 2.844 | 3.343 | 3.969 | 4.669 | 5.259 | 5.470 | 5.395 | 4.820 | 3.891 | 3.110 | 2.661 | 3.892 |
| vapor pressure at daily max liq surface temp $T_{LX}$ ($P_{VX}$ psia) | 2.952 | 3.288 | 3.941 | 4.773 | 5.606 | 6.309 | 6.516 | 6.399 | 5.666 | 4.547 | 3.573 | 3.010 | 4.567 |
| vapor pressure at daily min liq surface temp $T_{LN}$ ($P_{VN}$ psia) | 2.297 | 2.450 | 2.821 | 3.277 | 3.861 | 4.352 | 4.561 | 4.520 | 4.077 | 3.313 | 2.697 | 2.346 | 3.299 |
| daily vapor pressure range ($\Delta P_V$) | 0.6554 | 0.8383 | 1.1204 | 1.4956 | 1.7450 | 1.9574 | 1.9546 | 1.8796 | 1.5888 | 1.2347 | 0.8754 | 0.6640 | 1.2677 |
| vapor space expansion factor ($K_E$) | 0.1040 | 0.1297 | 0.1671 | 0.2181 | 0.2541 | 0.2889 | 0.2907 | 0.2787 | 0.2319 | 0.1804 | 0.1325 | 0.1047 | 0.1852 |
| vapor molecular weight ($M_V$ lb/lbmole) | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 |
| monthly hours with avg = total annual | 744 | 672 | 744 | 720 | 744 | 720 | 744 | 744 | 720 | 744 | 720 | 744 | 8,760 |
| throughputs (ft$^3$/month) and avg = total annual | 5,221 | 4,716 | 5,221 | 5,053 | 5,221 | 5,053 | 5,221 | 5,221 | 5,053 | 5,221 | 5,053 | 5,221 | 61,473 |
| monthly turnovers (N/month) with avg = total annual | 0.66 | 0.59 | 0.66 | 0.63 | 0.66 | 0.63 | 0.66 | 0.66 | 0.63 | 0.66 | 0.63 | 0.66 | 7.72 |
| vented vapor saturation factor ($K_S$) | 0.3626 | 0.3428 | 0.3073 | 0.2721 | 0.2411 | 0.2200 | 0.2133 | 0.2157 | 0.2354 | 0.2760 | 0.3229 | 0.3579 | 0.2760 |
| vent setting correction factor ($K_B$) | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| vapor density ($W_V$ lb/ft$^3$) | 0.0238 | 0.0257 | 0.0297 | 0.0346 | 0.0400 | 0.0445 | 0.0461 | 0.0455 | 0.0412 | 0.0340 | 0.0278 | 0.0242 | 0.0340 |
| standing storage losses ($L_S$ lb/month & avg is lb/yr) | 165.89 | 161.89 | 207.06 | 233.46 | 278.95 | 300.25 | 321.45 | 317.65 | 278.13 | 237.43 | 188.08 | 169.00 | 2859.24 |
| working losses ($L_W$ lb/month & avg is lb/yr) | 93.07 | 90.82 | 116.17 | 130.98 | 156.50 | 168.45 | 180.35 | 178.21 | 156.04 | 133.21 | 105.52 | 94.82 | 1604.15 |
| total losses ($L_T$ lb/month & avg is lb/yr) | 258.97 | 252.71 | 323.23 | 364.45 | 435.45 | 468.70 | 501.80 | 495.86 | 434.17 | 370.64 | 293.60 | 263.82 | 4463.39 |
| max hourly Q in bbl/hour | 7.02 | 7.02 | 7.02 | 7.02 | 7.02 | 7.02 | 7.02 | 7.02 | 7.02 | 7.02 | 7.02 | 7.02 | |
| max hourly working loss at $P_{VX}$ & Q/hr & $K_N$=1 ($L_W$ lb/hr) | 0.125 | 0.135 | 0.156 | 0.182 | 0.210 | 0.234 | 0.242 | 0.240 | 0.217 | 0.179 | 0.147 | 0.127 | |
| breathing/standing loss ($L_S$ lb/hr) | 0.223 | 0.241 | 0.280 | 0.376 | 0.449 | 0.519 | 0.524 | 0.502 | 0.412 | 0.319 | 0.261 | 0.227 | |
| max hourly total loss ($L_T$ lb/hr) | 0.348 | 0.376 | 0.436 | 0.558 | 0.660 | 0.753 | 0.767 | 0.742 | 0.629 | 0.498 | 0.408 | 0.355 | |

| $L_S$ sum months | $L_W$ sum months | $L_T$ sum months |
|---|---|---|
| 2859.24 | 1604.15 | 4463.39 |

The monthly sums will be greater than the annual average since the monthly variables yield higher emissions

**Emissions Summary:**

| | avg lbs/hr | max lbs/hr | lbs/yr |
|---|---|---|---|
| **Standing/Breathing Loss $L_S$** | **0.319** | **0.524** | **2,794.343** |
| **Working Loss $L_W$** | **0.179** | **0.242** | **1,567.743** |
| **Total Loss $L_T$** | **0.498** | **0.767** | **4,362.086** |

max hourly total loss may not add up to $L_S$ + $L_W$ as their max values may be in different months



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## Tank Emission Calculations Based on AP 42 Chapter 7 (June 2020, Section 7.1.3.1), Fixed Roof

| | |
|---|---|
| *Tank ID* | **10-05-IOT-V** |
| *Tank Description* | **1500 BBL Inhibitor Tank-Vent (V-133A)** |
| *Company Name* | **Denbury Onshore, LLC** |

| | |
|---|---|
| *Tank Orientation* | **Vertical** |
| *Tank Diameter (D ft)* | **21.60** |
| *Vertical Height/Horizontal Length ($H_S$ ft)* | **24.10** |
| *Roof Height ($H_R$ ft)* | **0.68** |
| *Max Liquid Height ($H_{LX}$ ft)* | **23.10** |
| *Avg Liquid Height ($H_L$ ft)* | **11.55** |
| *Breather Vent Pressure Setting ($P_{BP}$ psig)* | |
| *Breather Vent Vacuum Setting ($P_{BV}$ psig)* | |
| *actual tank pressure ($P_I$ psig)* | **0.0** |
| *Shell Paint Solar Absorptance ($S_A$)* | **0.71** |
| *Roof Paint Solar Absorptance ($R_A$)* | **0.71** |
| *breather vent pressure range ($\Delta P_B$ psi)* | **0.00** |
| *roof outage ($H_{RO}$ ft)* | **0.2250** |

| | |
|---|---|
| *Tank Shell Color/Shade* | **Gray - Medium** |
| *Tank Shell Paint Condition* | **average** |
| *Tank Roof Color/Shade* | **Gray - Medium** |
| *Tank Roof Paint Condition* | **average** |
| *Roof Type* | **vertical tank with cone roof** |
| *Tank Insulation* | **no insulation** |
| *Tank Underground?* | **no** |
| *Annual Throughput (Q bbl/year)* | **36,500.00** |
| *Annual Turnovers, N* | **24.21** |
| *Annual Hours* | **8,760** |
| *tank max liquid volume ($V_{LX}$ $ft^3$)* | **8,464.66** |
| *vapor space outage ($H_{VO}$ ft)* | **12.775** |
| *vapor space volume ($V_V$ $ft^3$)* | **4,681.21** |

| | |
|---|---|
| *Major City for Meterological Data* | **Jackson, MS** |
| *Site Elevation (ft)* | **300** |
| *Atmospheric Pressure ($P_A$ psia)* | **14.537** |
| *Table 7.1-2 Liquid* | **crude oil** |
| *RVP** | **5.37** |
| *API gravity** | **36.7** |
| *°F basis for gv** | **60.0** |
| *bubble point psia* | |
| *API gravity at 60F* | **36.7** |
| *API gravity at 100F* | **39.5** |
| *Working Loss Product Factor ($K_P$)* | **0.75** |
| *working loss turnover factor $K_N$* | **1.000** |

*sales oil data determines RVP per API pub 4683

Tank contents (if not selected from Table 7.1-2):

| *component* | *mole%* | *MW* | *lb/mole* | *wt%* | *Antoine constants (log 10, mmHg, °C) A* | *B* | *C* |
|---|---|---|---|---|---|---|---|
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| | 0.000 | | 0.000 | 0.000 | | | |



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| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Avg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| hourly average maximum ambient temperature ($T_{AX}$ °F) | 56.50 | 60.80 | 68.10 | 75.70 | 83.00 | 89.00 | 91.10 | 91.20 | 86.50 | 77.10 | 66.30 | 58.10 | 75.30 |
| hourly average minimum ambient temperature ($T_{AN}$ °F) | 37.00 | 39.30 | 45.90 | 53.30 | 62.50 | 69.20 | 72.10 | 71.40 | 65.50 | 53.90 | 43.90 | 37.90 | 54.30 |
| daily total solar insolation factor (I btu/ft$^2$ day) | 783 | 1039 | 1369 | 1762 | 1929 | 2025 | 1969 | 1849 | 1576 | 1262 | 922 | 726 | 1434 |
| daily average ambient temperature ($T_{AA}$ °F) | 46.75 | 50.05 | 57.00 | 64.50 | 72.75 | 79.10 | 81.60 | 81.30 | 76.00 | 65.50 | 55.10 | 48.00 | 64.80 |
| liquid bulk temperature ($T_B$ °F) | 48.42 | 52.26 | 59.92 | 68.25 | 76.86 | 83.41 | 85.79 | 85.24 | 79.36 | 68.19 | 57.06 | 49.55 | 67.85 |
| average vapor temperature ($T_V$ °F) | 51.59 | 56.47 | 65.46 | 75.39 | 84.67 | 91.61 | 93.77 | 92.73 | 85.74 | 73.30 | 60.80 | 52.49 | 73.66 |
| daily ambient temperature range ($\Delta T_A$ °R) | 19.50 | 21.50 | 22.20 | 22.40 | 20.50 | 19.80 | 19.00 | 19.80 | 21.00 | 23.20 | 22.40 | 20.20 | 21.00 |
| daily vapor temperature range ($\Delta T_V$ °R) | 24.98 | 29.80 | 34.98 | 40.70 | 41.74 | 42.62 | 41.26 | 40.12 | 37.08 | 34.16 | 28.96 | 24.89 | 35.06 |
| daily average liquid surface temperature ($T_{LA}$ °F) | 50.00 | 54.37 | 62.69 | 71.82 | 80.77 | 87.51 | 89.78 | 88.98 | 82.55 | 70.74 | 58.93 | 51.02 | 70.76 |
| daily maximum liquid surface temperature ($T_{LX}$ °F) | 56.25 | 61.82 | 71.43 | 82.00 | 91.20 | 98.17 | 100.10 | 99.01 | 91.82 | 79.28 | 66.17 | 57.24 | 79.52 |
| daily minimum liquid surface temperature ($T_{LN}$ °F) | 43.76 | 46.92 | 53.94 | 61.65 | 70.33 | 76.86 | 79.47 | 78.95 | 73.28 | 62.20 | 51.69 | 44.79 | 61.99 |
| vapor pressure at daily avg liq surface temp $T_{LA}$ ($P_{VA}$ psia) | 2.608 | 2.845 | 3.345 | 3.971 | 4.671 | 5.261 | 5.473 | 5.397 | 4.822 | 3.892 | 3.111 | 2.662 | 3.893 |
| vapor pressure at daily max liq surface temp $T_{LX}$ ($P_{VX}$ psia) | 2.953 | 3.289 | 3.942 | 4.775 | 5.608 | 6.312 | 6.519 | 6.402 | 5.668 | 4.549 | 3.573 | 3.010 | 4.568 |
| vapor pressure at daily min liq surface temp $T_{LN}$ ($P_{VN}$ psia) | 2.297 | 2.451 | 2.822 | 3.278 | 3.862 | 4.354 | 4.564 | 4.522 | 4.079 | 3.314 | 2.698 | 2.347 | 3.300 |
| daily vapor pressure range ($\Delta P_V$) | 0.6551 | 0.8385 | 1.1207 | 1.4961 | 1.7456 | 1.9581 | 1.9553 | 1.8802 | 1.5892 | 1.2350 | 0.8751 | 0.6636 | 1.2680 |
| vapor space expansion factor ($K_E$) | 0.1039 | 0.1297 | 0.1671 | 0.2182 | 0.2542 | 0.2890 | 0.2908 | 0.2788 | 0.2320 | 0.1804 | 0.1324 | 0.1046 | 0.1852 |
| vapor molecular weight ($M_V$ lb/lbmole) | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 |
| monthly hours with avg = total annual | 744 | 672 | 744 | 720 | 744 | 720 | 744 | 744 | 720 | 744 | 720 | 744 | 8,760 |
| throughputs (ft$^3$/month) and avg = total annual | 17,403 | 15,719 | 17,403 | 16,842 | 17,403 | 16,842 | 17,403 | 17,403 | 16,842 | 17,403 | 16,842 | 17,403 | 204,911 |
| monthly turnovers (N/month) with avg = total annual | 2.06 | 1.86 | 2.06 | 1.99 | 2.06 | 1.99 | 2.06 | 2.06 | 1.99 | 2.06 | 1.99 | 2.06 | 24.21 |
| vented vapor saturation factor ($K_S$) | 0.3615 | 0.3417 | 0.3063 | 0.2711 | 0.2402 | 0.2192 | 0.2125 | 0.2148 | 0.2345 | 0.2751 | 0.3219 | 0.3568 | 0.2750 |
| vent setting correction factor ($K_B$) | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| vapor density ($W_V$ lb/ft$^3$) | 0.0238 | 0.0257 | 0.0297 | 0.0346 | 0.0400 | 0.0445 | 0.0461 | 0.0455 | 0.0412 | 0.0340 | 0.0279 | 0.0242 | 0.0340 |
| standing storage losses ($L_S$ lb/month & avg is lb/yr) | 175.75 | 171.51 | 219.39 | 247.38 | 295.58 | 318.15 | 340.62 | 336.58 | 294.69 | 251.56 | 199.26 | 179.04 | 3029.52 |
| working losses ($L_W$ lb/month & avg is lb/yr) | 310.29 | 302.82 | 387.34 | 436.76 | 521.86 | 561.71 | 601.38 | 594.24 | 520.30 | 444.14 | 351.80 | 316.10 | 5348.76 |
| total losses ($L_T$ lb/month & avg is lb/yr) | 486.04 | 474.33 | 606.73 | 684.14 | 817.45 | 879.87 | 942.00 | 930.82 | 814.99 | 695.71 | 551.06 | 495.15 | 8378.28 |
| max hourly Q in bbl/hour | 23.39 | 23.39 | 23.39 | 23.39 | 23.39 | 23.39 | 23.39 | 23.39 | 23.39 | 23.39 | 23.39 | 23.39 | |
| max hourly working loss at $P_{VX}$ & Q/hr & $K_N$=1 ($L_W$ lb/hr) | 0.417 | 0.451 | 0.521 | 0.607 | 0.701 | 0.780 | 0.808 | 0.799 | 0.723 | 0.597 | 0.489 | 0.425 | |
| breathing/standing loss ($L_S$ lb/hr) | 0.236 | 0.255 | 0.296 | 0.399 | 0.476 | 0.549 | 0.555 | 0.532 | 0.437 | 0.338 | 0.277 | 0.241 | |
| max hourly total loss ($L_T$ lb/hr) | 0.653 | 0.706 | 0.817 | 1.006 | 1.178 | 1.330 | 1.364 | 1.331 | 1.160 | 0.935 | 0.765 | 0.666 | |

| $L_S$ sum months | $L_W$ sum months | $L_T$ sum months |
|---|---|---|
| 3029.52 | 5348.76 | 8378.28 |

The monthly sums will be greater than the annual average since the monthly variables yield higher emissions

**Emissions Summary:**

| | avg lbs/hr | max lbs/hr | lbs/yr |
|---|---|---|---|
| **Standing/Breathing Loss $L_S$** | **0.338** | **0.555** | **2,960.725** |
| **Working Loss $L_W$** | **0.597** | **0.808** | **5,227.298** |
| **Total Loss $L_T$** | **0.935** | **1.364** | **8,188.022** |

max hourly total loss may not add up to $L_S$ + $L_W$ as their max values may be in different months

United States Environmental Protection Agency

Office of Pollution Prevention and Toxics
Washington, DC 20460

March 1999
EPA 745-R-99-005

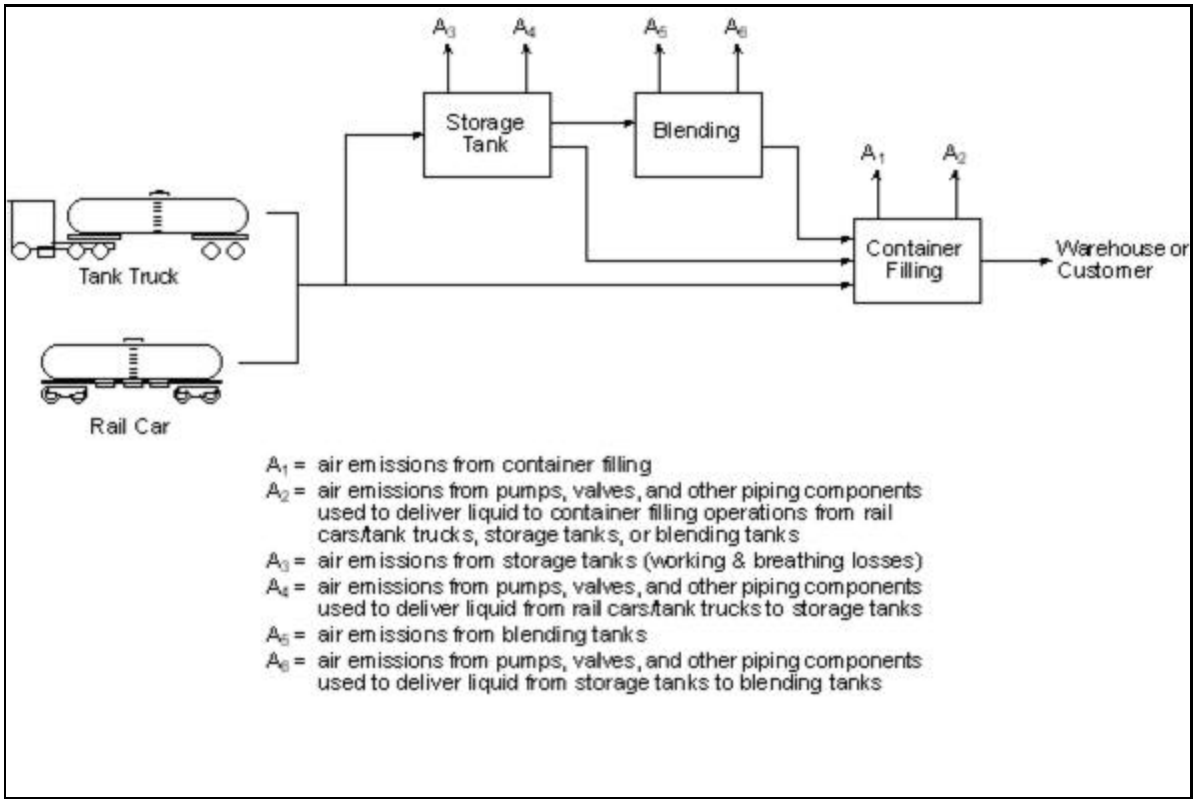
EPCRA Section 313

# Look-up Tables for Estimating Toxic Release Inventory Air Emissions from Chemical Distribution Facilities


**Section 313 of the Emergency Planning and Community Right-to-Know Act**

**Toxic Chemical Release Inventory**

*FIGURE 1: LIQUID BULK STORAGE AND CONTAINER FILLING PROCESS*



**n-Hexane Look-up Table**

**(CAS No. 110-54-3)**

**Air Emissions (in pounds) from bulk unloading, storage, blending and container filling operations at a typical chemical distribution facility in Louisville, KY**

| Type of Air Release (lb) | Throughput (1,000 lb/yr) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **50** | **100** | **250** | **500** | **750** | **1,000** | **2,000** | **3,000** | **5,000** | **10,000** |
| A1- Container filling emissions | 34 | 68 | 170 | 340 | 510 | 679 | 1,359 | 2,038 | 3,397 | 6,794 |
| A2 - Piping component leaks - delivery of liquid to container filling | 1 | 1 | 3 | 6 | 8 | 11 | 22 | 33 | 56 | 112 |
| A3 - Storage tank working + breathing losses (pick closest tank size) 5,000 gallon tank | 265 | 299 | 400 | 569 | 737 | 905 | 1,017 | 1,129 | 1,354 | 1,916 |
| 10,000 gallon tank | 429 | 463 | 564 | 732 | 901 | 1,069 | 1,743 | 1,862 | 2,087 | 2,649 |
| 25,000 gallon tank | 892 | 926 | 1,027 | 1,195 | 1,364 | 1,532 | 2,206 | 2,880 | 4,200 | 4,762 |
| A4 - Piping component leaks - delivery of liquid to storage tank | 1 | 1 | 1 | 1 | 2 | 3 | 6 | 9 | 14 | 28 |
| A5 - Blending/mixing tank emissions | 34 | 67 | 169 | 337 | 506 | 674 | 1,348 | 1,467 | 1,692 | 2,253 |
| A6 - Piping component leaks - delivery of liquid to blending/mixing tank | 1 | 2 | 3 | 6 | 9 | 11 | 22 | 33 | 56 | 111 |

| *City* | *State* | *City Factor* |
|---|---|---|
| Homer | AK | 0.52 |
| Birmingham | AL | 1.21 |
| Montgomery | AL | 1.31 |
| Little Rock | AR | 1.21 |
| Fort Smith | AR | 1.18 |
| Phoenix | AZ | 1.67 |
| Tucson | AZ | 1.53 |
| Bakersfield | CA | 1.38 |
| San Francisco | CA | 1.02 |
| Long Beach | CA | 1.29 |
| Los Angeles | CA | 1.2 |
| Sacramento | CA | 1.21 |
| Santa Maria | CA | 1.07 |
| Denver | CO | 0.91 |
| Grand Junction | CO | 0.97 |
| Wilmington | DE | 0.93 |
| Miami | FL | 1.69 |
| Atlanta | GA | 1.17 |
| Savannah | GA | 1.34 |
| Honolulu | HI | 1.79 |
| Des Moine | IA | 0.83 |
| Boise | ID | 0.9 |
| Chicago | IL | 0.81 |
| Springfield | IL | 0.91 |
| Indianapolis | IN | 0.88 |
| Wichita | KS | 1.04 |
| Louisville | KY | 1 |
| Baton Rouge | LA | 1.4 |
| Lake Charles | LA | 1.41 |
| New Orleans | LA | 1.42 |
| Boston | MA | 0.84 |
| Baltimore | MD | 0.97 |
| Portland | ME | 0.71 |
| Detroit | MI | 0.79 |
| Grand Rapids | MI | 0.77 |
| St. Paul | MN | 0.71 |
| St. Louis | MO | 0.99 |
| Jackson | MS | 1.31 |
| Billings | MT | 0.77 |

## Tank Emission Calculations Based on AP 42 Chapter 7 (June 2020, Section 7.1.3.1), Fixed Roof

| | |
|---|---|
| *Tank ID* | **11-05-IOT-V** |
| *Tank Description* | **1500 BBL Inhibitor Tank-Vent (V-133B)** |
| *Company Name* | **Denbury Onshore, LLC** |

| | |
|---|---|
| *Tank Orientation* | **Vertical** |
| *Tank Diameter (D ft)* | **21.60** |
| *Vertical Height/Horizontal Length ($H_S$ ft)* | **24.10** |
| *Roof Height ($H_R$ ft)* | **0.68** |
| *Max Liquid Height ($H_{LX}$ ft)* | **23.10** |
| *Avg Liquid Height ($H_L$ ft)* | **11.55** |
| *Breather Vent Pressure Setting ($P_{BP}$ psig)* | |
| *Breather Vent Vacuum Setting ($P_{BV}$ psig)* | |
| *actual tank pressure ($P_I$ psig)* | **0.0** |
| *Shell Paint Solar Absorptance ($S_A$)* | **0.71** |
| *Roof Paint Solar Absorptance ($R_A$)* | **0.71** |
| *breather vent pressure range ($\Delta P_B$ psi)* | **0.00** |
| *roof outage ($H_{RO}$ ft)* | **0.2250** |

| | |
|---|---|
| *Tank Shell Color/Shade* | **Gray - Medium** |
| *Tank Shell Paint Condition* | **average** |
| *Tank Roof Color/Shade* | **Gray - Medium** |
| *Tank Roof Paint Condition* | **average** |
| *Roof Type* | **vertical tank with cone roof** |
| *Tank Insulation* | **no insulation** |
| *Tank Underground?* | **no** |
| *Annual Throughput (Q bbl/year)* | **36,500.00** |
| *Annual Turnovers, N* | **24.21** |
| *Annual Hours* | **8,760** |
| *tank max liquid volume ($V_{LX}$ $ft^3$)* | **8,464.66** |
| *vapor space outage ($H_{VO}$ ft)* | **12.775** |
| *vapor space volume ($V_V$ $ft^3$)* | **4,681.21** |

| | |
|---|---|
| *Major City for Meterological Data* | **Jackson, MS** |
| *Site Elevation (ft)* | **300** |
| *Atmospheric Pressure ($P_A$ psia)* | **14.537** |
| *Table 7.1-2 Liquid* | **crude oil** |
| *RVP** | **5.37** |
| *API gravity** | **36.7** |
| *°F basis for gv** | **60.0** |
| *bubble point psia* | |
| *API gravity at 60F* | **36.7** |
| *API gravity at 100F* | **39.5** |
| *Working Loss Product Factor ($K_P$)* | **0.75** |
| *working loss turnover factor $K_N$* | **1.000** |

*sales oil data determines RVP per API pub 4683

Tank contents (if not selected from Table 7.1-2):

| *component* | *mole%* | *MW* | *lb/mole* | *wt%* | *Antoine constants (log 10, mmHg, °C) A* | *B* | *C* |
|---|---|---|---|---|---|---|---|
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| | 0.000 | | 0.000 | 0.000 | | | |



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| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Avg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| hourly average maximum ambient temperature ($T_{AX}$ °F) | 56.50 | 60.80 | 68.10 | 75.70 | 83.00 | 89.00 | 91.10 | 91.20 | 86.50 | 77.10 | 66.30 | 58.10 | 75.30 |
| hourly average minimum ambient temperature ($T_{AN}$ °F) | 37.00 | 39.30 | 45.90 | 53.30 | 62.50 | 69.20 | 72.10 | 71.40 | 65.50 | 53.90 | 43.90 | 37.90 | 54.30 |
| daily total solar insolation factor (I btu/ft$^2$ day) | 783 | 1039 | 1369 | 1762 | 1929 | 2025 | 1969 | 1849 | 1576 | 1262 | 922 | 726 | 1434 |
| daily average ambient temperature ($T_{AA}$ °F) | 46.75 | 50.05 | 57.00 | 64.50 | 72.75 | 79.10 | 81.60 | 81.30 | 76.00 | 65.50 | 55.10 | 48.00 | 64.80 |
| liquid bulk temperature ($T_B$ °F) | 48.42 | 52.26 | 59.92 | 68.25 | 76.86 | 83.41 | 85.79 | 85.24 | 79.36 | 68.19 | 57.06 | 49.55 | 67.85 |
| average vapor temperature ($T_V$ °F) | 51.59 | 56.47 | 65.46 | 75.39 | 84.67 | 91.61 | 93.77 | 92.73 | 85.74 | 73.30 | 60.80 | 52.49 | 73.66 |
| daily ambient temperature range ($\Delta T_A$ °R) | 19.50 | 21.50 | 22.20 | 22.40 | 20.50 | 19.80 | 19.00 | 19.80 | 21.00 | 23.20 | 22.40 | 20.20 | 21.00 |
| daily vapor temperature range ($\Delta T_V$ °R) | 24.98 | 29.80 | 34.98 | 40.70 | 41.74 | 42.62 | 41.26 | 40.12 | 37.08 | 34.16 | 28.96 | 24.89 | 35.06 |
| daily average liquid surface temperature ($T_{LA}$ °F) | 50.00 | 54.37 | 62.69 | 71.82 | 80.77 | 87.51 | 89.78 | 88.98 | 82.55 | 70.74 | 58.93 | 51.02 | 70.76 |
| daily maximum liquid surface temperature ($T_{LX}$ °F) | 56.25 | 61.82 | 71.43 | 82.00 | 91.20 | 98.17 | 100.10 | 99.01 | 91.82 | 79.28 | 66.17 | 57.24 | 79.52 |
| daily minimum liquid surface temperature ($T_{LN}$ °F) | 43.76 | 46.92 | 53.94 | 61.65 | 70.33 | 76.86 | 79.47 | 78.95 | 73.28 | 62.20 | 51.69 | 44.79 | 61.99 |
| vapor pressure at daily avg liq surface temp $T_{LA}$ ($P_{VA}$ psia) | 2.608 | 2.845 | 3.345 | 3.971 | 4.671 | 5.261 | 5.473 | 5.397 | 4.822 | 3.892 | 3.111 | 2.662 | 3.893 |
| vapor pressure at daily max liq surface temp $T_{LX}$ ($P_{VX}$ psia) | 2.953 | 3.289 | 3.942 | 4.775 | 5.608 | 6.312 | 6.519 | 6.402 | 5.668 | 4.549 | 3.573 | 3.010 | 4.568 |
| vapor pressure at daily min liq surface temp $T_{LN}$ ($P_{VN}$ psia) | 2.297 | 2.451 | 2.822 | 3.278 | 3.862 | 4.354 | 4.564 | 4.522 | 4.079 | 3.314 | 2.698 | 2.347 | 3.300 |
| daily vapor pressure range ($\Delta P_V$) | 0.6551 | 0.8385 | 1.1207 | 1.4961 | 1.7456 | 1.9581 | 1.9553 | 1.8802 | 1.5892 | 1.2350 | 0.8751 | 0.6636 | 1.2680 |
| vapor space expansion factor ($K_E$) | 0.1039 | 0.1297 | 0.1671 | 0.2182 | 0.2542 | 0.2890 | 0.2908 | 0.2788 | 0.2320 | 0.1804 | 0.1324 | 0.1046 | 0.1852 |
| vapor molecular weight ($M_V$ lb/lbmole) | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 |
| monthly hours with avg = total annual | 744 | 672 | 744 | 720 | 744 | 720 | 744 | 744 | 720 | 744 | 720 | 744 | 8,760 |
| throughputs (ft$^3$/month) and avg = total annual | 17,403 | 15,719 | 17,403 | 16,842 | 17,403 | 16,842 | 17,403 | 17,403 | 16,842 | 17,403 | 16,842 | 17,403 | 204,911 |
| monthly turnovers (N/month) with avg = total annual | 2.06 | 1.86 | 2.06 | 1.99 | 2.06 | 1.99 | 2.06 | 2.06 | 1.99 | 2.06 | 1.99 | 2.06 | 24.21 |
| vented vapor saturation factor ($K_S$) | 0.3615 | 0.3417 | 0.3063 | 0.2711 | 0.2402 | 0.2192 | 0.2125 | 0.2148 | 0.2345 | 0.2751 | 0.3219 | 0.3568 | 0.2750 |
| vent setting correction factor ($K_B$) | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| vapor density ($W_V$ lb/ft$^3$) | 0.0238 | 0.0257 | 0.0297 | 0.0346 | 0.0400 | 0.0445 | 0.0461 | 0.0455 | 0.0412 | 0.0340 | 0.0279 | 0.0242 | 0.0340 |
| standing storage losses ($L_S$ lb/month & avg is lb/yr) | 175.75 | 171.51 | 219.39 | 247.38 | 295.58 | 318.15 | 340.62 | 336.58 | 294.69 | 251.56 | 199.26 | 179.04 | 3029.52 |
| working losses ($L_W$ lb/month & avg is lb/yr) | 310.29 | 302.82 | 387.34 | 436.76 | 521.86 | 561.71 | 601.38 | 594.24 | 520.30 | 444.14 | 351.80 | 316.10 | 5348.76 |
| total losses ($L_T$ lb/month & avg is lb/yr) | 486.04 | 474.33 | 606.73 | 684.14 | 817.45 | 879.87 | 942.00 | 930.82 | 814.99 | 695.71 | 551.06 | 495.15 | 8378.28 |
| max hourly Q in bbl/hour | 23.39 | 23.39 | 23.39 | 23.39 | 23.39 | 23.39 | 23.39 | 23.39 | 23.39 | 23.39 | 23.39 | 23.39 | |
| max hourly working loss at $P_{VX}$ & Q/hr & $K_N$=1 ($L_W$ lb/hr) | 0.417 | 0.451 | 0.521 | 0.607 | 0.701 | 0.780 | 0.808 | 0.799 | 0.723 | 0.597 | 0.489 | 0.425 | |
| breathing/standing loss ($L_S$ lb/hr) | 0.236 | 0.255 | 0.296 | 0.399 | 0.476 | 0.549 | 0.555 | 0.532 | 0.437 | 0.338 | 0.277 | 0.241 | |
| max hourly total loss ($L_T$ lb/hr) | 0.653 | 0.706 | 0.817 | 1.006 | 1.178 | 1.330 | 1.364 | 1.331 | 1.160 | 0.935 | 0.765 | 0.666 | |

| $L_S$ sum months | $L_W$ sum months | $L_T$ sum months |
|---|---|---|
| 3029.52 | 5348.76 | 8378.28 |

The monthly sums will be greater than the annual average since the monthly variables yield higher emissions

**Emissions Summary:**

| | avg lbs/hr | max lbs/hr | lbs/yr |
|---|---|---|---|
| **Standing/Breathing Loss $L_S$** | **0.338** | **0.555** | **2,960.725** |
| **Working Loss $L_W$** | **0.597** | **0.808** | **5,227.298** |
| **Total Loss $L_T$** | **0.935** | **1.364** | **8,188.022** |

max hourly total loss may not add up to $L_S$ + $L_W$ as their max values may be in different months

## Tank Emission Calculations Based on AP 42 Chapter 7 (June 2020, Section 7.1.3.1), Fixed Roof

| | |
|---|---|
| *Tank ID* | **12-05-IOT-V** |
| *Tank Description* | **1500 BBL Inhibitor Tank-Vent (V-133C)** |
| *Company Name* | **Denbury Onshore, LLC** |

| | |
|---|---|
| *Tank Orientation* | **Vertical** |
| *Tank Diameter (D ft)* | **21.60** |
| *Vertical Height/Horizontal Length ($H_S$ ft)* | **24.10** |
| *Roof Height ($H_R$ ft)* | **0.68** |
| *Max Liquid Height ($H_{LX}$ ft)* | **23.10** |
| *Avg Liquid Height ($H_L$ ft)* | **11.55** |
| *Breather Vent Pressure Setting ($P_{BP}$ psig)* | |
| *Breather Vent Vacuum Setting ($P_{BV}$ psig)* | |
| *actual tank pressure ($P_I$ psig)* | **0.0** |
| *Shell Paint Solar Absorptance ($S_A$)* | **0.71** |
| *Roof Paint Solar Absorptance ($R_A$)* | **0.71** |
| *breather vent pressure range ($\Delta P_B$ psi)* | **0.00** |
| *roof outage ($H_{RO}$ ft)* | **0.2250** |

| | |
|---|---|
| *Tank Shell Color/Shade* | **Gray - Medium** |
| *Tank Shell Paint Condition* | **average** |
| *Tank Roof Color/Shade* | **Gray - Medium** |
| *Tank Roof Paint Condition* | **average** |
| *Roof Type* | **vertical tank with cone roof** |
| *Tank Insulation* | **no insulation** |
| *Tank Underground?* | **no** |
| *Annual Throughput (Q bbl/year)* | **36,500.00** |
| *Annual Turnovers, N* | **24.21** |
| *Annual Hours* | **8,760** |
| *tank max liquid volume ($V_{LX}$ $ft^3$)* | **8,464.66** |
| *vapor space outage ($H_{VO}$ ft)* | **12.775** |
| *vapor space volume ($V_V$ $ft^3$)* | **4,681.21** |

| | |
|---|---|
| *Major City for Meterological Data* | **Jackson, MS** |
| *Site Elevation (ft)* | **300** |
| *Atmospheric Pressure ($P_A$ psia)* | **14.537** |
| *Table 7.1-2 Liquid* | **crude oil** |
| *RVP** | **5.37** |
| *API gravity** | **36.7** |
| *°F basis for gv** | **60.0** |
| *bubble point psia* | |
| *API gravity at 60F* | **36.7** |
| *API gravity at 100F* | **39.5** |
| *Working Loss Product Factor ($K_P$)* | **0.75** |
| *working loss turnover factor $K_N$* | **1.000** |

*sales oil data determines RVP per API pub 4683

Tank contents (if not selected from Table 7.1-2):

| *component* | *mole%* | *MW* | *lb/mole* | *wt%* | *Antoine constants (log 10, mmHg, °C) A* | *B* | *C* |
|---|---|---|---|---|---|---|---|
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| | 0.000 | | 0.000 | 0.000 | | | |



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| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Avg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| hourly average maximum ambient temperature ($T_{AX}$ °F) | 56.50 | 60.80 | 68.10 | 75.70 | 83.00 | 89.00 | 91.10 | 91.20 | 86.50 | 77.10 | 66.30 | 58.10 | 75.30 |
| hourly average minimum ambient temperature ($T_{AN}$ °F) | 37.00 | 39.30 | 45.90 | 53.30 | 62.50 | 69.20 | 72.10 | 71.40 | 65.50 | 53.90 | 43.90 | 37.90 | 54.30 |
| daily total solar insolation factor (I btu/ft$^2$ day) | 783 | 1039 | 1369 | 1762 | 1929 | 2025 | 1969 | 1849 | 1576 | 1262 | 922 | 726 | 1434 |
| daily average ambient temperature ($T_{AA}$ °F) | 46.75 | 50.05 | 57.00 | 64.50 | 72.75 | 79.10 | 81.60 | 81.30 | 76.00 | 65.50 | 55.10 | 48.00 | 64.80 |
| liquid bulk temperature ($T_B$ °F) | 48.42 | 52.26 | 59.92 | 68.25 | 76.86 | 83.41 | 85.79 | 85.24 | 79.36 | 68.19 | 57.06 | 49.55 | 67.85 |
| average vapor temperature ($T_V$ °F) | 51.59 | 56.47 | 65.46 | 75.39 | 84.67 | 91.61 | 93.77 | 92.73 | 85.74 | 73.30 | 60.80 | 52.49 | 73.66 |
| daily ambient temperature range ($\Delta T_A$ °R) | 19.50 | 21.50 | 22.20 | 22.40 | 20.50 | 19.80 | 19.00 | 19.80 | 21.00 | 23.20 | 22.40 | 20.20 | 21.00 |
| daily vapor temperature range ($\Delta T_V$ °R) | 24.98 | 29.80 | 34.98 | 40.70 | 41.74 | 42.62 | 41.26 | 40.12 | 37.08 | 34.16 | 28.96 | 24.89 | 35.06 |
| daily average liquid surface temperature ($T_{LA}$ °F) | 50.00 | 54.37 | 62.69 | 71.82 | 80.77 | 87.51 | 89.78 | 88.98 | 82.55 | 70.74 | 58.93 | 51.02 | 70.76 |
| daily maximum liquid surface temperature ($T_{LX}$ °F) | 56.25 | 61.82 | 71.43 | 82.00 | 91.20 | 98.17 | 100.10 | 99.01 | 91.82 | 79.28 | 66.17 | 57.24 | 79.52 |
| daily minimum liquid surface temperature ($T_{LN}$ °F) | 43.76 | 46.92 | 53.94 | 61.65 | 70.33 | 76.86 | 79.47 | 78.95 | 73.28 | 62.20 | 51.69 | 44.79 | 61.99 |
| vapor pressure at daily avg liq surface temp $T_{LA}$ ($P_{VA}$ psia) | 2.608 | 2.845 | 3.345 | 3.971 | 4.671 | 5.261 | 5.473 | 5.397 | 4.822 | 3.892 | 3.111 | 2.662 | 3.893 |
| vapor pressure at daily max liq surface temp $T_{LX}$ ($P_{VX}$ psia) | 2.953 | 3.289 | 3.942 | 4.775 | 5.608 | 6.312 | 6.519 | 6.402 | 5.668 | 4.549 | 3.573 | 3.010 | 4.568 |
| vapor pressure at daily min liq surface temp $T_{LN}$ ($P_{VN}$ psia) | 2.297 | 2.451 | 2.822 | 3.278 | 3.862 | 4.354 | 4.564 | 4.522 | 4.079 | 3.314 | 2.698 | 2.347 | 3.300 |
| daily vapor pressure range ($\Delta P_V$) | 0.6551 | 0.8385 | 1.1207 | 1.4961 | 1.7456 | 1.9581 | 1.9553 | 1.8802 | 1.5892 | 1.2350 | 0.8751 | 0.6636 | 1.2680 |
| vapor space expansion factor ($K_E$) | 0.1039 | 0.1297 | 0.1671 | 0.2182 | 0.2542 | 0.2890 | 0.2908 | 0.2788 | 0.2320 | 0.1804 | 0.1324 | 0.1046 | 0.1852 |
| vapor molecular weight ($M_V$ lb/lbmole) | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 |
| monthly hours with avg = total annual | 744 | 672 | 744 | 720 | 744 | 720 | 744 | 744 | 720 | 744 | 720 | 744 | 8,760 |
| throughputs (ft$^3$/month) and avg = total annual | 17,403 | 15,719 | 17,403 | 16,842 | 17,403 | 16,842 | 17,403 | 17,403 | 16,842 | 17,403 | 16,842 | 17,403 | 204,911 |
| monthly turnovers (N/month) with avg = total annual | 2.06 | 1.86 | 2.06 | 1.99 | 2.06 | 1.99 | 2.06 | 2.06 | 1.99 | 2.06 | 1.99 | 2.06 | 24.21 |
| vented vapor saturation factor ($K_S$) | 0.3615 | 0.3417 | 0.3063 | 0.2711 | 0.2402 | 0.2192 | 0.2125 | 0.2148 | 0.2345 | 0.2751 | 0.3219 | 0.3568 | 0.2750 |
| vent setting correction factor ($K_B$) | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| vapor density ($W_V$ lb/ft$^3$) | 0.0238 | 0.0257 | 0.0297 | 0.0346 | 0.0400 | 0.0445 | 0.0461 | 0.0455 | 0.0412 | 0.0340 | 0.0279 | 0.0242 | 0.0340 |
| standing storage losses ($L_S$ lb/month & avg is lb/yr) | 175.75 | 171.51 | 219.39 | 247.38 | 295.58 | 318.15 | 340.62 | 336.58 | 294.69 | 251.56 | 199.26 | 179.04 | 3029.52 |
| working losses ($L_W$ lb/month & avg is lb/yr) | 310.29 | 302.82 | 387.34 | 436.76 | 521.86 | 561.71 | 601.38 | 594.24 | 520.30 | 444.14 | 351.80 | 316.10 | 5348.76 |
| total losses ($L_T$ lb/month & avg is lb/yr) | 486.04 | 474.33 | 606.73 | 684.14 | 817.45 | 879.87 | 942.00 | 930.82 | 814.99 | 695.71 | 551.06 | 495.15 | 8378.28 |
| max hourly Q in bbl/hour | 23.39 | 23.39 | 23.39 | 23.39 | 23.39 | 23.39 | 23.39 | 23.39 | 23.39 | 23.39 | 23.39 | 23.39 | |
| max hourly working loss at $P_{VX}$ & Q/hr & $K_N$=1 ($L_W$ lb/hr) | 0.417 | 0.451 | 0.521 | 0.607 | 0.701 | 0.780 | 0.808 | 0.799 | 0.723 | 0.597 | 0.489 | 0.425 | |
| breathing/standing loss ($L_S$ lb/hr) | 0.236 | 0.255 | 0.296 | 0.399 | 0.476 | 0.549 | 0.555 | 0.532 | 0.437 | 0.338 | 0.277 | 0.241 | |
| max hourly total loss ($L_T$ lb/hr) | 0.653 | 0.706 | 0.817 | 1.006 | 1.178 | 1.330 | 1.364 | 1.331 | 1.160 | 0.935 | 0.765 | 0.666 | |

| $L_S$ sum months | $L_W$ sum months | $L_T$ sum months |
|---|---|---|
| 3029.52 | 5348.76 | 8378.28 |

The monthly sums will be greater than the annual average since the monthly variables yield higher emissions

**Emissions Summary:**

| | avg lbs/hr | max lbs/hr | lbs/yr |
|---|---|---|---|
| **Standing/Breathing Loss $L_S$** | **0.338** | **0.555** | **2,960.725** |
| **Working Loss $L_W$** | **0.597** | **0.808** | **5,227.298** |
| **Total Loss $L_T$** | **0.935** | **1.364** | **8,188.022** |

max hourly total loss may not add up to $L_S$ + $L_W$ as their max values may be in different months

## Tank Emission Calculations Based on AP 42 Chapter 7 (June 2020, Section 7.1.3.1), Fixed Roof

| | |
|---|---|
| *Tank ID* | **13-05-ITT-V** |
| *Tank Description* | **500 Gallon Inhibitor Transfer Tank (V-134A)** |
| *Company Name* | **Denbury Onshore, LLC** |

| | |
|---|---|
| *Tank Orientation* | **Horizontal** |
| *Tank Diameter (D ft)* | **4.00** |
| *Vertical Height/Horizontal Length ($H_S$ ft)* | **6.10** |
| *Roof Height ($H_R$ ft)* | |
| *Max Liquid Height ($H_{LX}$ ft)* | **4.00** |
| *Avg Liquid Height ($H_L$ ft)* | **2.00** |
| *Breather Vent Pressure Setting ($P_{BP}$ psig)* | |
| *Breather Vent Vacuum Setting ($P_{BV}$ psig)* | |
| *actual tank pressure ($P_I$ psig)* | **0.0** |
| *Shell Paint Solar Absorptance ($S_A$)* | **0.90** |
| *Roof Paint Solar Absorptance ($R_A$)* | **0.9** |
| *breather vent pressure range ($\Delta P_B$ psi)* | **0.00** |
| *roof outage ($H_{RO}$ ft)* | |

| | |
|---|---|
| *Tank Shell Color/Shade* | **Red - Primer** |
| *Tank Shell Paint Condition* | **average** |
| *Tank Roof Color/Shade* | **Red - Primer** |
| *Tank Roof Paint Condition* | **average** |
| *Roof Type* | **horizontal tank** |
| *Tank Insulation* | **no insulation** |
| *Tank Underground?* | **no** |
| *Annual Throughput (Q bbl/year)* | **119.05** |
| *Annual Turnovers, N* | **8.72** |
| *Annual Hours* | **8,760** |
| *tank max liquid volume ($V_{LX}$ $ft^3$)* | **76.65** |
| *vapor space outage ($H_{VO}$ ft)* | **1.571** |
| *vapor space volume ($V_V$ $ft^3$)* | **38.33** |

| | |
|---|---|
| *Major City for Meterological Data* | **Jackson, MS** |
| *Site Elevation (ft)* | **300** |
| *Atmospheric Pressure ($P_A$ psia)* | **14.537** |
| *Table 7.1-2 Liquid* | |
| *RVP** | |
| *API gravity** | |
| *°F basis for gv** | |
| *bubble point psia* | |
| *API gravity at 60F* | |
| *API gravity at 100F* | |

| | |
|---|---|
| *Working Loss Product Factor ($K_P$)* | **1** |
| *working loss turnover factor $K_N$* | **1.000** |

*sales oil data determines RVP per API pub 4683

Tank contents (if not selected from Table 7.1-2):

| *component* | *mole%* | *MW* | *lb/mole* | *wt%* | *Antoine constants (log 10, mmHg, °C) A* | *B* | *C* |
|---|---|---|---|---|---|---|---|
| Hexane N- | 100.000 | 86.180 | 86.18000 | 100.00000 | 6.878 | 1171.500 | 224.370 |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| | 100.000 | | 86.180 | 100.000 | | | |

| | *Jan* | *Feb* | *Mar* | *Apr* | *May* | *Jun* | *Jul* | *Aug* | *Sep* | *Oct* | *Nov* | *Dec* | *Avg* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| hourly average maximum ambient temperature ($T_{AX}$ °F) | 56.50 | 60.80 | 68.10 | 75.70 | 83.00 | 89.00 | 91.10 | 91.20 | 86.50 | 77.10 | 66.30 | 58.10 | 75.30 |
| hourly average minimum ambient temperature ($T_{AN}$ °F) | 37.00 | 39.30 | 45.90 | 53.30 | 62.50 | 69.20 | 72.10 | 71.40 | 65.50 | 53.90 | 43.90 | 37.90 | 54.30 |
| daily total solar insolation factor (I btu/ft$^2$ day) | 783 | 1039 | 1369 | 1762 | 1929 | 2025 | 1969 | 1849 | 1576 | 1262 | 922 | 726 | 1434 |
| daily average ambient temperature ($T_{AA}$ °F) | 46.75 | 50.05 | 57.00 | 64.50 | 72.75 | 79.10 | 81.60 | 81.30 | 76.00 | 65.50 | 55.10 | 48.00 | 64.80 |
| liquid bulk temperature ($T_B$ °F) | 48.86 | 52.86 | 60.70 | 69.26 | 77.96 | 84.57 | 86.92 | 86.29 | 80.26 | 68.91 | 57.59 | 49.96 | 68.67 |
| average vapor temperature ($T_V$ °F) | 52.55 | 57.74 | 67.13 | 77.54 | 87.03 | 94.09 | 96.18 | 94.99 | 87.67 | 74.84 | 61.93 | 53.37 | 75.42 |
| daily ambient temperature range ($\Delta T_A$ °R) | 19.50 | 21.50 | 22.20 | 22.40 | 20.50 | 19.80 | 19.00 | 19.80 | 21.00 | 23.20 | 22.40 | 20.20 | 21.00 |
| daily vapor temperature range ($\Delta T_V$ °R) | 27.74 | 33.75 | 40.18 | 47.40 | 49.07 | 50.31 | 48.74 | 47.14 | 43.07 | 38.96 | 32.28 | 27.28 | 40.51 |
| daily average liquid surface temperature ($T_{LA}$ °F) | 50.71 | 55.30 | 63.92 | 73.40 | 82.49 | 89.33 | 91.55 | 90.64 | 83.96 | 71.87 | 59.76 | 51.67 | 72.04 |
| daily maximum liquid surface temperature ($T_{LX}$ °F) | 57.64 | 63.74 | 73.96 | 85.25 | 94.76 | 101.91 | 103.73 | 102.43 | 94.73 | 81.61 | 67.83 | 58.49 | 82.17 |
| daily minimum liquid surface temperature ($T_{LN}$ °F) | 43.77 | 46.86 | 53.87 | 61.55 | 70.23 | 76.75 | 79.36 | 78.85 | 73.19 | 62.14 | 51.69 | 44.85 | 61.92 |
| vapor pressure at daily avg liq surface temp $T_{LA}$ ($P_{VA}$ psia) | 1.493 | 1.689 | 2.115 | 2.682 | 3.336 | 3.908 | 4.110 | 4.027 | 3.453 | 2.583 | 1.900 | 1.533 | 2.594 |
| vapor pressure at daily max liq surface temp $T_{LX}$ ($P_{VX}$ psia) | 1.797 | 2.105 | 2.719 | 3.558 | 4.418 | 5.168 | 5.376 | 5.227 | 4.415 | 3.267 | 2.335 | 1.838 | 3.311 |
| vapor pressure at daily min liq surface temp $T_{LN}$ ($P_{VN}$ psia) | 1.233 | 1.344 | 1.626 | 1.990 | 2.480 | 2.909 | 3.097 | 3.060 | 2.668 | 2.021 | 1.533 | 1.270 | 2.009 |
| daily vapor pressure range ($\Delta P_V$) | 0.5649 | 0.7619 | 1.0926 | 1.5673 | 1.9381 | 2.2592 | 2.2786 | 2.1668 | 1.7463 | 1.2466 | 0.8021 | 0.5674 | 1.3013 |
| vapor space expansion factor ($K_E$) | 0.0977 | 0.1248 | 0.1647 | 0.2211 | 0.2635 | 0.3042 | 0.3070 | 0.2918 | 0.2368 | 0.1776 | 0.1256 | 0.0970 | 0.1852 |
| vapor molecular weight ($M_V$ lb/lbmole) | 86.18 | 86.18 | 86.18 | 86.18 | 86.18 | 86.18 | 86.18 | 86.18 | 86.18 | 86.18 | 86.18 | 86.18 | 86.18 |
| monthly hours with avg = total annual | 744 | 672 | 744 | 720 | 744 | 720 | 744 | 744 | 720 | 744 | 720 | 744 | 8,760 |
| throughputs (ft$^3$/month) and avg = total annual | 57 | 51 | 57 | 55 | 57 | 55 | 57 | 57 | 55 | 57 | 55 | 57 | 668 |
| monthly turnovers (N/month) with avg = total annual | 0.74 | 0.67 | 0.74 | 0.72 | 0.74 | 0.72 | 0.74 | 0.74 | 0.72 | 0.74 | 0.72 | 0.74 | 8.72 |
| vented vapor saturation factor ($K_S$) | 0.8894 | 0.8767 | 0.8503 | 0.8175 | 0.7826 | 0.7545 | 0.7451 | 0.7489 | 0.7767 | 0.8230 | 0.8634 | 0.8869 | 0.8224 |
| vent setting correction factor ($K_B$) | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| vapor density ($W_V$ lb/ft$^3$) | 0.0234 | 0.0262 | 0.0322 | 0.0401 | 0.0490 | 0.0567 | 0.0594 | 0.0583 | 0.0507 | 0.0388 | 0.0293 | 0.0240 | 0.0389 |
| standing storage losses ($L_S$ lb/month & avg is lb/yr) | 4.24 | 4.28 | 5.83 | 7.02 | 8.87 | 9.92 | 10.74 | 10.55 | 8.87 | 7.02 | 5.12 | 4.34 | 86.81 |
| working losses ($L_W$ lb/month & avg is lb/yr) | 1.33 | 1.34 | 1.83 | 2.20 | 2.78 | 3.11 | 3.37 | 3.31 | 2.78 | 2.20 | 1.61 | 1.36 | 27.23 |
| total losses ($L_T$ lb/month & avg is lb/yr) | 5.56 | 5.63 | 7.66 | 9.22 | 11.65 | 13.04 | 14.11 | 13.86 | 11.65 | 9.22 | 6.73 | 5.70 | 114.04 |
| max hourly Q in bbl/hour | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | |
| max hourly working loss at $P_{VX}$ & Q/hr & $K_N$=1 ($L_W$ lb/hr) | 0.002 | 0.002 | 0.002 | 0.003 | 0.004 | 0.004 | 0.005 | 0.004 | 0.004 | 0.003 | 0.002 | 0.002 | |
| breathing/standing loss ($L_S$ lb/hr) | 0.006 | 0.006 | 0.008 | 0.012 | 0.016 | 0.021 | 0.022 | 0.020 | 0.015 | 0.009 | 0.007 | 0.006 | |
| max hourly total loss ($L_T$ lb/hr) | 0.007 | 0.008 | 0.010 | 0.015 | 0.020 | 0.025 | 0.026 | 0.025 | 0.019 | 0.012 | 0.009 | 0.008 | |

| $L_S$ sum months | $L_W$ sum months | $L_T$ sum months |
|---|---|---|
| 86.81 | 27.23 | 114.04 |

The monthly sums will be greater than the annual average since the monthly variables yield higher emissions

**Emissions Summary:**

| | **avg lbs/hr** | **max lbs/hr** | **lbs/yr** |
|---|---|---|---|
| **Standing/Breathing Loss $L_S$** | **0.009** | **0.022** | **82.929** |
| **Working Loss $L_W$** | **0.003** | **0.005** | **26.018** |
| **Total Loss $L_T$** | **0.012** | **0.026** | **108.947** |

max hourly total loss may not add up to $L_S$ + $L_W$ as their max values may be in different months

## Tank Emission Calculations Based on AP 42 Chapter 7 (June 2020, Section 7.1.3.1), Fixed Roof

| | |
|---|---|
| *Tank ID* | **14-05-ITT-V** |
| *Tank Description* | **500 Gallon Inhibitor Transfer Tank (V-134B)** |
| *Company Name* | **Denbury Onshore, LLC** |

| | |
|---|---|
| *Tank Orientation* | **Horizontal** |
| *Tank Diameter (D ft)* | **4.00** |
| *Vertical Height/Horizontal Length ($H_S$ ft)* | **6.10** |
| *Roof Height ($H_R$ ft)* | |
| *Max Liquid Height ($H_{LX}$ ft)* | **4.00** |
| *Avg Liquid Height ($H_L$ ft)* | **2.00** |
| *Breather Vent Pressure Setting ($P_{BP}$ psig)* | |
| *Breather Vent Vacuum Setting ($P_{BV}$ psig)* | |
| *actual tank pressure ($P_I$ psig)* | **0.0** |
| *Shell Paint Solar Absorptance ($S_A$)* | **0.90** |
| *Roof Paint Solar Absorptance ($R_A$)* | **0.9** |
| *breather vent pressure range ($\Delta P_B$ psi)* | **0.00** |
| *roof outage ($H_{RO}$ ft)* | |

| | |
|---|---|
| *Tank Shell Color/Shade* | **Red - Primer** |
| *Tank Shell Paint Condition* | **average** |
| *Tank Roof Color/Shade* | **Red - Primer** |
| *Tank Roof Paint Condition* | **average** |
| *Roof Type* | **horizontal tank** |
| *Tank Insulation* | **no insulation** |
| *Tank Underground?* | **no** |
| *Annual Throughput (Q bbl/year)* | **119.05** |
| *Annual Turnovers, N* | **8.72** |
| *Annual Hours* | **8,760** |
| *tank max liquid volume ($V_{LX}$ $ft^3$)* | **76.65** |
| *vapor space outage ($H_{VO}$ ft)* | **1.571** |
| *vapor space volume ($V_V$ $ft^3$)* | **38.33** |

| | |
|---|---|
| *Major City for Meterological Data* | **Jackson, MS** |
| *Site Elevation (ft)* | **300** |
| *Atmospheric Pressure ($P_A$ psia)* | **14.537** |
| *Table 7.1-2 Liquid* | |
| *RVP** | |
| *API gravity** | |
| *°F basis for gv** | |
| *bubble point psia* | |
| *API gravity at 60F* | |
| *API gravity at 100F* | |
| *Working Loss Product Factor ($K_P$)* | **1** |
| *working loss turnover factor $K_N$* | **1.000** |

*sales oil data determines RVP per API pub 4683

Tank contents (if not selected from Table 7.1-2):

| *component* | *mole%* | *MW* | *lb/mole* | *wt%* | *Antoine constants (log 10, mmHg, °C) A* | *B* | *C* |
|---|---|---|---|---|---|---|---|
| Hexane N- | 100.000 | 86.180 | 86.18000 | 100.00000 | 6.878 | 1171.500 | 224.370 |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| | 100.000 | | 86.180 | 100.000 | | | |

| | *Jan* | *Feb* | *Mar* | *Apr* | *May* | *Jun* | *Jul* | *Aug* | *Sep* | *Oct* | *Nov* | *Dec* | *Avg* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| hourly average maximum ambient temperature ($T_{AX}$ °F) | 56.50 | 60.80 | 68.10 | 75.70 | 83.00 | 89.00 | 91.10 | 91.20 | 86.50 | 77.10 | 66.30 | 58.10 | 75.30 |
| hourly average minimum ambient temperature ($T_{AN}$ °F) | 37.00 | 39.30 | 45.90 | 53.30 | 62.50 | 69.20 | 72.10 | 71.40 | 65.50 | 53.90 | 43.90 | 37.90 | 54.30 |
| daily total solar insolation factor (I btu/ft$^2$ day) | 783 | 1039 | 1369 | 1762 | 1929 | 2025 | 1969 | 1849 | 1576 | 1262 | 922 | 726 | 1434 |
| daily average ambient temperature ($T_{AA}$ °F) | 46.75 | 50.05 | 57.00 | 64.50 | 72.75 | 79.10 | 81.60 | 81.30 | 76.00 | 65.50 | 55.10 | 48.00 | 64.80 |
| liquid bulk temperature ($T_B$ °F) | 48.86 | 52.86 | 60.70 | 69.26 | 77.96 | 84.57 | 86.92 | 86.29 | 80.26 | 68.91 | 57.59 | 49.96 | 68.67 |
| average vapor temperature ($T_V$ °F) | 52.55 | 57.74 | 67.13 | 77.54 | 87.03 | 94.09 | 96.18 | 94.99 | 87.67 | 74.84 | 61.93 | 53.37 | 75.42 |
| daily ambient temperature range ($\Delta T_A$ °R) | 19.50 | 21.50 | 22.20 | 22.40 | 20.50 | 19.80 | 19.00 | 19.80 | 21.00 | 23.20 | 22.40 | 20.20 | 21.00 |
| daily vapor temperature range ($\Delta T_V$ °R) | 27.74 | 33.75 | 40.18 | 47.40 | 49.07 | 50.31 | 48.74 | 47.14 | 43.07 | 38.96 | 32.28 | 27.28 | 40.51 |
| daily average liquid surface temperature ($T_{LA}$ °F) | 50.71 | 55.30 | 63.92 | 73.40 | 82.49 | 89.33 | 91.55 | 90.64 | 83.96 | 71.87 | 59.76 | 51.67 | 72.04 |
| daily maximum liquid surface temperature ($T_{LX}$ °F) | 57.64 | 63.74 | 73.96 | 85.25 | 94.76 | 101.91 | 103.73 | 102.43 | 94.73 | 81.61 | 67.83 | 58.49 | 82.17 |
| daily minimum liquid surface temperature ($T_{LN}$ °F) | 43.77 | 46.86 | 53.87 | 61.55 | 70.23 | 76.75 | 79.36 | 78.85 | 73.19 | 62.14 | 51.69 | 44.85 | 61.92 |
| vapor pressure at daily avg liq surface temp $T_{LA}$ ($P_{VA}$ psia) | 1.493 | 1.689 | 2.115 | 2.682 | 3.336 | 3.908 | 4.110 | 4.027 | 3.453 | 2.583 | 1.900 | 1.533 | 2.594 |
| vapor pressure at daily max liq surface temp $T_{LX}$ ($P_{VX}$ psia) | 1.797 | 2.105 | 2.719 | 3.558 | 4.418 | 5.168 | 5.376 | 5.227 | 4.415 | 3.267 | 2.335 | 1.838 | 3.311 |
| vapor pressure at daily min liq surface temp $T_{LN}$ ($P_{VN}$ psia) | 1.233 | 1.344 | 1.626 | 1.990 | 2.480 | 2.909 | 3.097 | 3.060 | 2.668 | 2.021 | 1.533 | 1.270 | 2.009 |
| daily vapor pressure range ($\Delta P_V$) | 0.5649 | 0.7619 | 1.0926 | 1.5673 | 1.9381 | 2.2592 | 2.2786 | 2.1668 | 1.7463 | 1.2466 | 0.8021 | 0.5674 | 1.3013 |
| vapor space expansion factor ($K_E$) | 0.0977 | 0.1248 | 0.1647 | 0.2211 | 0.2635 | 0.3042 | 0.3070 | 0.2918 | 0.2368 | 0.1776 | 0.1256 | 0.0970 | 0.1852 |
| vapor molecular weight ($M_V$ lb/lbmole) | 86.18 | 86.18 | 86.18 | 86.18 | 86.18 | 86.18 | 86.18 | 86.18 | 86.18 | 86.18 | 86.18 | 86.18 | 86.18 |
| monthly hours with avg = total annual | 744 | 672 | 744 | 720 | 744 | 720 | 744 | 744 | 720 | 744 | 720 | 744 | 8,760 |
| throughputs (ft$^3$/month) and avg = total annual | 57 | 51 | 57 | 55 | 57 | 55 | 57 | 57 | 55 | 57 | 55 | 57 | 668 |
| monthly turnovers (N/month) with avg = total annual | 0.74 | 0.67 | 0.74 | 0.72 | 0.74 | 0.72 | 0.74 | 0.74 | 0.72 | 0.74 | 0.72 | 0.74 | 8.72 |
| vented vapor saturation factor ($K_S$) | 0.8894 | 0.8767 | 0.8503 | 0.8175 | 0.7826 | 0.7545 | 0.7451 | 0.7489 | 0.7767 | 0.8230 | 0.8634 | 0.8869 | 0.8224 |
| vent setting correction factor ($K_B$) | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| vapor density ($W_V$ lb/ft$^3$) | 0.0234 | 0.0262 | 0.0322 | 0.0401 | 0.0490 | 0.0567 | 0.0594 | 0.0583 | 0.0507 | 0.0388 | 0.0293 | 0.0240 | 0.0389 |
| standing storage losses ($L_S$ lb/month & avg is lb/yr) | 4.24 | 4.28 | 5.83 | 7.02 | 8.87 | 9.92 | 10.74 | 10.55 | 8.87 | 7.02 | 5.12 | 4.34 | 86.81 |
| working losses ($L_W$ lb/month & avg is lb/yr) | 1.33 | 1.34 | 1.83 | 2.20 | 2.78 | 3.11 | 3.37 | 3.31 | 2.78 | 2.20 | 1.61 | 1.36 | 27.23 |
| total losses ($L_T$ lb/month & avg is lb/yr) | 5.56 | 5.63 | 7.66 | 9.22 | 11.65 | 13.04 | 14.11 | 13.86 | 11.65 | 9.22 | 6.73 | 5.70 | 114.04 |
| max hourly Q in bbl/hour | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | |
| max hourly working loss at $P_{VX}$ & Q/hr & $K_N$=1 ($L_W$ lb/hr) | 0.002 | 0.002 | 0.002 | 0.003 | 0.004 | 0.004 | 0.005 | 0.004 | 0.004 | 0.003 | 0.002 | 0.002 | |
| breathing/standing loss ($L_S$ lb/hr) | 0.006 | 0.006 | 0.008 | 0.012 | 0.016 | 0.021 | 0.022 | 0.020 | 0.015 | 0.009 | 0.007 | 0.006 | |
| max hourly total loss ($L_T$ lb/hr) | 0.007 | 0.008 | 0.010 | 0.015 | 0.020 | 0.025 | 0.026 | 0.025 | 0.019 | 0.012 | 0.009 | 0.008 | |

| $L_S$ sum months | $L_W$ sum months | $L_T$ sum months |
|---|---|---|
| 86.81 | 27.23 | 114.04 |

The monthly sums will be greater than the annual average since the monthly variables yield higher emissions

**Emissions Summary:**

| | **avg lbs/hr** | **max lbs/hr** | **lbs/yr** |
|---|---|---|---|
| **Standing/Breathing Loss $L_S$** | **0.009** | **0.022** | **82.929** |
| **Working Loss $L_W$** | **0.003** | **0.005** | **26.018** |
| **Total Loss $L_T$** | **0.012** | **0.026** | **108.947** |

max hourly total loss may not add up to $L_S$ + $L_W$ as their max values may be in different months

## Tank Emission Calculations Based on AP 42 Chapter 7 (June 2020, Section 7.1.3.1), Fixed Roof

| | |
|---|---|
| *Tank ID* | **15-05-ITT-V** |
| *Tank Description* | **2000 Gallon Inhibitor Transfer Tank (V-134C)** |
| *Company Name* | **Denbury Onshore, LLC** |

| | |
|---|---|
| *Tank Orientation* | **Vertical** |
| *Tank Diameter (D ft)* | **7.50** |
| *Vertical Height/Horizontal Length ($H_S$ ft)* | **7.00** |
| *Roof Height ($H_R$ ft)* | **0.23** |
| *Max Liquid Height ($H_{LX}$ ft)* | **6.00** |
| *Avg Liquid Height ($H_L$ ft)* | **3.00** |
| *Breather Vent Pressure Setting ($P_{BP}$ psig)* | |
| *Breather Vent Vacuum Setting ($P_{BV}$ psig)* | |
| *actual tank pressure ($P_I$ psig)* | **0.0** |
| *Shell Paint Solar Absorptance ($S_A$)* | **0.90** |
| *Roof Paint Solar Absorptance ($R_A$)* | **0.9** |
| *breather vent pressure range ($\Delta P_B$ psi)* | **0.00** |
| *roof outage ($H_{RO}$ ft)* | **0.0781** |

| | |
|---|---|
| *Tank Shell Color/Shade* | **Red - Primer** |
| *Tank Shell Paint Condition* | **average** |
| *Tank Roof Color/Shade* | **Red - Primer** |
| *Tank Roof Paint Condition* | **average** |
| *Roof Type* | **vertical tank with cone roof** |
| *Tank Insulation* | **no insulation** |
| *Tank Underground?* | **no** |
| *Annual Throughput (Q bbl/year)* | **476.19** |
| *Annual Turnovers, N* | **10.09** |
| *Annual Hours* | **8,760** |
| *tank max liquid volume ($V_{LX}$ $ft^3$)* | **265.07** |
| *vapor space outage ($H_{VO}$ ft)* | **4.078** |
| *vapor space volume ($V_V$ $ft^3$)* | **180.17** |

| | |
|---|---|
| *Major City for Meterological Data* | **Jackson, MS** |
| *Site Elevation (ft)* | **300** |
| *Atmospheric Pressure ($P_A$ psia)* | **14.537** |
| *Table 7.1-2 Liquid* | |
| *RVP** | |
| *API gravity** | |
| *°F basis for gv** | |
| *bubble point psia* | |
| *API gravity at 60F* | |
| *API gravity at 100F* | |
| *Working Loss Product Factor ($K_P$)* | **1** |
| *working loss turnover factor $K_N$* | **1.000** |

*sales oil data determines RVP per API pub 4683

Tank contents (if not selected from Table 7.1-2):

*Antoine constants ($log_{10}$, mmHg, °C)*

| *component* | *mole%* | *MW* | *lb/mole* | *wt%* | *A* | *B* | *C* |
|---|---|---|---|---|---|---|---|
| Hexane N- | 100.000 | 86.180 | 86.18000 | 100.00000 | 6.878 | 1171.500 | 224.370 |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| | 100.000 | | 86.180 | 100.000 | | | |



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| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Avg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| hourly average maximum ambient temperature ($T_{AX}$ °F) | 56.50 | 60.80 | 68.10 | 75.70 | 83.00 | 89.00 | 91.10 | 91.20 | 86.50 | 77.10 | 66.30 | 58.10 | 75.30 |
| hourly average minimum ambient temperature ($T_{AN}$ °F) | 37.00 | 39.30 | 45.90 | 53.30 | 62.50 | 69.20 | 72.10 | 71.40 | 65.50 | 53.90 | 43.90 | 37.90 | 54.30 |
| daily total solar insolation factor (I btu/ft$^2$ day) | 783 | 1039 | 1369 | 1762 | 1929 | 2025 | 1969 | 1849 | 1576 | 1262 | 922 | 726 | 1434 |
| daily average ambient temperature ($T_{AA}$ °F) | 46.75 | 50.05 | 57.00 | 64.50 | 72.75 | 79.10 | 81.60 | 81.30 | 76.00 | 65.50 | 55.10 | 48.00 | 64.80 |
| liquid bulk temperature ($T_B$ °F) | 48.86 | 52.86 | 60.70 | 69.26 | 77.96 | 84.57 | 86.92 | 86.29 | 80.26 | 68.91 | 57.59 | 49.96 | 68.67 |
| average vapor temperature ($T_V$ °F) | 53.08 | 58.45 | 68.07 | 78.75 | 88.35 | 95.48 | 97.53 | 96.26 | 88.75 | 75.71 | 62.56 | 53.87 | 76.40 |
| daily ambient temperature range ($\Delta T_A$ °R) | 19.50 | 21.50 | 22.20 | 22.40 | 20.50 | 19.80 | 19.00 | 19.80 | 21.00 | 23.20 | 22.40 | 20.20 | 21.00 |
| daily vapor temperature range ($\Delta T_V$ °R) | 27.74 | 33.75 | 40.18 | 47.40 | 49.07 | 50.31 | 48.74 | 47.14 | 43.07 | 38.96 | 32.28 | 27.21 | 40.51 |
| daily average liquid surface temperature ($T_{LA}$ °F) | 50.97 | 55.66 | 64.39 | 74.01 | 83.16 | 90.02 | 92.22 | 91.27 | 84.50 | 72.31 | 60.07 | 51.92 | 72.54 |
| daily maximum liquid surface temperature ($T_{LX}$ °F) | 57.91 | 64.09 | 74.43 | 85.85 | 95.42 | 102.60 | 104.41 | 103.06 | 95.27 | 82.05 | 68.14 | 58.72 | 82.66 |
| daily minimum liquid surface temperature ($T_{LN}$ °F) | 44.04 | 47.22 | 54.34 | 62.16 | 70.89 | 77.45 | 80.04 | 79.49 | 73.74 | 62.57 | 52.00 | 45.11 | 62.41 |
| vapor pressure at daily avg liq surface temp $T_{LA}$ ($P_{VA}$ psia) | 1.504 | 1.705 | 2.141 | 2.722 | 3.388 | 3.971 | 4.173 | 4.085 | 3.496 | 2.611 | 1.916 | 1.543 | 2.625 |
| vapor pressure at daily max liq surface temp $T_{LX}$ ($P_{VX}$ psia) | 1.810 | 2.125 | 2.750 | 3.608 | 4.484 | 5.247 | 5.454 | 5.299 | 4.468 | 3.301 | 2.354 | 1.849 | 3.349 |
| vapor pressure at daily min liq surface temp $T_{LN}$ ($P_{VN}$ psia) | 1.242 | 1.357 | 1.647 | 2.022 | 2.521 | 2.958 | 3.147 | 3.107 | 2.704 | 2.043 | 1.547 | 1.280 | 2.035 |
| daily vapor pressure range ($\Delta P_V$) | 0.5683 | 0.7679 | 1.1034 | 1.5863 | 1.9627 | 2.2882 | 2.3068 | 2.1920 | 1.7643 | 1.2575 | 0.8076 | 0.5691 | 1.3143 |
| vapor space expansion factor ($K_E$) | 0.0979 | 0.1253 | 0.1657 | 0.2231 | 0.2664 | 0.3081 | 0.3109 | 0.2953 | 0.2389 | 0.1787 | 0.1261 | 0.0970 | 0.1865 |
| vapor molecular weight ($M_V$ lb/lbmole) | 86.18 | 86.18 | 86.18 | 86.18 | 86.18 | 86.18 | 86.18 | 86.18 | 86.18 | 86.18 | 86.18 | 86.18 | 86.18 |
| monthly hours with avg = total annual | 744 | 672 | 744 | 720 | 744 | 720 | 744 | 744 | 720 | 744 | 720 | 744 | 8,760 |
| throughputs (ft$^3$/month) and avg = total annual | 227 | 205 | 227 | 220 | 227 | 220 | 227 | 227 | 220 | 227 | 220 | 227 | 2,673 |
| monthly turnovers (N/month) with avg = total annual | 0.86 | 0.77 | 0.86 | 0.83 | 0.86 | 0.83 | 0.86 | 0.86 | 0.83 | 0.86 | 0.83 | 0.86 | 10.09 |
| vented vapor saturation factor ($K_S$) | 0.7547 | 0.7307 | 0.6837 | 0.6296 | 0.5773 | 0.5381 | 0.5258 | 0.5311 | 0.5696 | 0.6393 | 0.7072 | 0.7499 | 0.6380 |
| vent setting correction factor ($K_B$) | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| vapor density ($W_V$ lb/ft$^3$) | 0.0236 | 0.0264 | 0.0326 | 0.0406 | 0.0497 | 0.0574 | 0.0602 | 0.0590 | 0.0512 | 0.0392 | 0.0295 | 0.0241 | 0.0393 |
| standing storage losses ($L_S$ lb/month & avg is lb/yr) | 15.65 | 15.86 | 21.64 | 26.10 | 32.99 | 36.93 | 39.96 | 39.21 | 32.92 | 26.02 | 18.94 | 16.03 | 322.25 |
| working losses ($L_W$ lb/month & avg is lb/yr) | 5.35 | 5.42 | 7.40 | 8.92 | 11.27 | 12.62 | 13.66 | 13.40 | 11.25 | 8.89 | 6.47 | 5.48 | 110.13 |
| total losses ($L_T$ lb/month & avg is lb/yr) | 21.00 | 21.28 | 29.04 | 35.02 | 44.26 | 49.55 | 53.62 | 52.60 | 44.17 | 34.91 | 25.41 | 21.51 | 432.38 |
| max hourly Q in bbl/hour | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 | |
| max hourly working loss at $P_{VX}$ & Q/hr & $K_N$=1 ($L_W$ lb/hr) | 0.007 | 0.008 | 0.010 | 0.012 | 0.015 | 0.018 | 0.018 | 0.018 | 0.016 | 0.012 | 0.009 | 0.007 | |
| breathing/standing loss ($L_S$ lb/hr) | 0.021 | 0.024 | 0.029 | 0.043 | 0.057 | 0.071 | 0.074 | 0.069 | 0.052 | 0.035 | 0.026 | 0.022 | |
| max hourly total loss ($L_T$ lb/hr) | 0.028 | 0.032 | 0.039 | 0.055 | 0.072 | 0.089 | 0.092 | 0.087 | 0.068 | 0.047 | 0.035 | 0.029 | |

| $L_S$ sum months | $L_W$ sum months | $L_T$ sum months |
|---|---|---|
| 322.25 | 110.13 | 432.38 |

The monthly sums will be greater than the annual average since the monthly variables yield higher emissions

**Emissions Summary:**

| | avg lbs/hr | max lbs/hr | lbs/yr |
|---|---|---|---|
| **Standing/Breathing Loss $L_S$** | **0.035** | **0.074** | **307.674** |
| **Working Loss $L_W$** | **0.012** | **0.018** | **105.148** |
| **Total Loss $L_T$** | **0.047** | **0.092** | **412.822** |

max hourly total loss may not add up to $L_S$ + $L_W$ as their max values may be in different months



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## Tank Emission Calculations Based on AP 42 Chapter 7 (June 2020, Section 7.1.3.1), Fixed Roof

| | |
|---|---|
| *Tank ID* | **17-05-GST** |
| *Tank Description* | **100 BBL Glycol Storage Tank (V-137)** |
| *Company Name* | **Denbury Onshore, LLC** |

| | |
|---|---|
| *Tank Orientation* | **Vertical** |
| *Tank Diameter (D ft)* | **10.00** |
| *Vertical Height/Horizontal Length ($H_S$ ft)* | **8.00** |
| *Roof Height ($H_R$ ft)* | **0.31** |
| *Max Liquid Height ($H_{LX}$ ft)* | **7.00** |
| *Avg Liquid Height ($H_L$ ft)* | **3.50** |
| *Breather Vent Pressure Setting ($P_{BP}$ psig)* | |
| *Breather Vent Vacuum Setting ($P_{BV}$ psig)* | |
| *actual tank pressure ($P_I$ psig)* | **0.0** |
| *Shell Paint Solar Absorptance ($S_A$)* | **0.90** |
| *Roof Paint Solar Absorptance ($R_A$)* | **0.9** |
| *breather vent pressure range ($\Delta P_B$ psi)* | **0.00** |
| *roof outage ($H_{RO}$ ft)* | **0.1042** |

| | |
|---|---|
| *Tank Shell Color/Shade* | **Red - Primer** |
| *Tank Shell Paint Condition* | **average** |
| *Tank Roof Color/Shade* | **Red - Primer** |
| *Tank Roof Paint Condition* | **average** |
| *Roof Type* | **vertical tank with cone roof** |
| *Tank Insulation* | **no insulation** |
| *Tank Underground?* | **no** |
| *Annual Throughput (Q bbl/year)* | **1,000.00** |
| *Annual Turnovers, N* | **10.21** |
| *Annual Hours* | **8,760** |
| *tank max liquid volume ($V_{LX}$ $ft^3$)* | **549.78** |
| *vapor space outage ($H_{VO}$ ft)* | **4.604** |
| *vapor space volume ($V_V$ $ft^3$)* | **361.61** |

| | |
|---|---|
| *Major City for Meterological Data* | **Jackson, MS** |
| *Site Elevation (ft)* | **300** |
| *Atmospheric Pressure ($P_A$ psia)* | **14.537** |
| *Table 7.1-2 Liquid* | |
| *RVP** | |
| *API gravity** | |
| *°F basis for gv** | |
| *bubble point psia* | |
| *API gravity at 60F* | |
| *API gravity at 100F* | |

| | |
|---|---|
| *Working Loss Product Factor ($K_P$)* | **1** |
| *working loss turnover factor $K_N$* | **1.000** |

*sales oil data determines RVP per API pub 4683

Tank contents (if not selected from Table 7.1-2):

| *component* | *mole%* | *MW* | *lb/mole* | *wt%* | *Antoine constants ($log_{10}$, mmHg, °C) A* | *B* | *C* |
|---|---|---|---|---|---|---|---|
| Toluene | 100.000 | 92.141 | 92.14100 | 100.00000 | 7.017 | 1377.600 | 222.640 |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| | 100.000 | | 92.141 | 100.000 | | | |

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Avg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| hourly average maximum ambient temperature ($T_{AX}$ °F) | 56.50 | 60.80 | 68.10 | 75.70 | 83.00 | 89.00 | 91.10 | 91.20 | 86.50 | 77.10 | 66.30 | 58.10 | 75.30 |
| hourly average minimum ambient temperature ($T_{AN}$ °F) | 37.00 | 39.30 | 45.90 | 53.30 | 62.50 | 69.20 | 72.10 | 71.40 | 65.50 | 53.90 | 43.90 | 37.90 | 54.30 |
| daily total solar insolation factor (I btu/ft$^2$ day) | 783 | 1039 | 1369 | 1762 | 1929 | 2025 | 1969 | 1849 | 1576 | 1262 | 922 | 726 | 1434 |
| daily average ambient temperature ($T_{AA}$ °F) | 46.75 | 50.05 | 57.00 | 64.50 | 72.75 | 79.10 | 81.60 | 81.30 | 76.00 | 65.50 | 55.10 | 48.00 | 64.80 |
| liquid bulk temperature ($T_B$ °F) | 48.86 | 52.86 | 60.70 | 69.26 | 77.96 | 84.57 | 86.92 | 86.29 | 80.26 | 68.91 | 57.59 | 49.96 | 68.67 |
| average vapor temperature ($T_V$ °F) | 53.26 | 58.69 | 68.38 | 79.14 | 88.78 | 95.93 | 97.97 | 96.67 | 89.10 | 75.99 | 62.76 | 54.03 | 76.72 |
| daily ambient temperature range ($\Delta T_A$ °R) | 19.50 | 21.50 | 22.20 | 22.40 | 20.50 | 19.80 | 19.00 | 19.80 | 21.00 | 23.20 | 22.40 | 20.20 | 21.00 |
| daily vapor temperature range ($\Delta T_V$ °R) | 27.74 | 33.75 | 40.18 | 47.40 | 49.07 | 50.31 | 48.74 | 47.14 | 43.07 | 38.96 | 32.28 | 27.21 | 40.51 |
| daily average liquid surface temperature ($T_{LA}$ °F) | 51.06 | 55.77 | 64.54 | 74.20 | 83.37 | 90.25 | 92.44 | 91.48 | 84.68 | 72.45 | 60.18 | 52.00 | 72.70 |
| daily maximum liquid surface temperature ($T_{LX}$ °F) | 58.00 | 64.21 | 74.58 | 86.05 | 95.64 | 102.83 | 104.63 | 103.27 | 95.44 | 82.19 | 68.25 | 58.80 | 82.82 |
| daily minimum liquid surface temperature ($T_{LN}$ °F) | 44.12 | 47.33 | 54.49 | 62.35 | 71.10 | 77.67 | 80.26 | 79.69 | 73.91 | 62.71 | 52.11 | 45.20 | 62.57 |
| vapor pressure at daily avg liq surface temp $T_{LA}$ ($P_{VA}$ psia) | 0.249 | 0.290 | 0.380 | 0.507 | 0.659 | 0.796 | 0.844 | 0.823 | 0.683 | 0.482 | 0.333 | 0.257 | 0.485 |
| vapor pressure at daily max liq surface temp $T_{LX}$ ($P_{VX}$ psia) | 0.311 | 0.377 | 0.513 | 0.710 | 0.920 | 1.109 | 1.161 | 1.122 | 0.915 | 0.637 | 0.425 | 0.319 | 0.649 |
| vapor pressure at daily min liq surface temp $T_{LN}$ ($P_{VN}$ psia) | 0.198 | 0.221 | 0.278 | 0.356 | 0.463 | 0.561 | 0.603 | 0.594 | 0.503 | 0.360 | 0.258 | 0.206 | 0.358 |
| daily vapor pressure range ($\Delta P_V$) | 0.1126 | 0.1560 | 0.2346 | 0.3537 | 0.4564 | 0.5485 | 0.5579 | 0.5277 | 0.4119 | 0.2774 | 0.1677 | 0.1132 | 0.2905 |
| vapor space expansion factor ($K_E$) | 0.0622 | 0.0764 | 0.0932 | 0.1140 | 0.1233 | 0.1314 | 0.1290 | 0.1240 | 0.1089 | 0.0929 | 0.0739 | 0.0611 | 0.0968 |
| vapor molecular weight ($M_V$ lb/lbmole) | 92.14 | 92.14 | 92.14 | 92.14 | 92.14 | 92.14 | 92.14 | 92.14 | 92.14 | 92.14 | 92.14 | 92.14 | 92.14 |
| monthly hours with avg = total annual | 744 | 672 | 744 | 720 | 744 | 720 | 744 | 744 | 720 | 744 | 720 | 744 | 8,760 |
| throughputs (ft$^3$/month) and avg = total annual | 477 | 431 | 477 | 461 | 477 | 461 | 477 | 477 | 461 | 477 | 461 | 477 | 5,614 |
| monthly turnovers (N/month) with avg = total annual | 0.87 | 0.78 | 0.87 | 0.84 | 0.87 | 0.84 | 0.87 | 0.87 | 0.84 | 0.87 | 0.84 | 0.87 | 10.21 |
| vented vapor saturation factor ($K_S$) | 0.9427 | 0.9339 | 0.9150 | 0.8899 | 0.8615 | 0.8374 | 0.8291 | 0.8328 | 0.8571 | 0.8948 | 0.9249 | 0.9410 | 0.8941 |
| vent setting correction factor ($K_B$) | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| vapor density ($W_V$ lb/ft$^3$) | 0.0042 | 0.0048 | 0.0062 | 0.0081 | 0.0103 | 0.0123 | 0.0130 | 0.0127 | 0.0107 | 0.0077 | 0.0055 | 0.0043 | 0.0078 |
| standing storage losses ($L_S$ lb/month & avg is lb/yr) | 4.05 | 4.21 | 6.00 | 7.59 | 10.00 | 11.55 | 12.61 | 12.32 | 10.03 | 7.49 | 5.13 | 4.16 | 95.14 |
| working losses ($L_W$ lb/month & avg is lb/yr) | 1.99 | 2.07 | 2.95 | 3.73 | 4.92 | 5.68 | 6.20 | 6.06 | 4.93 | 3.68 | 2.52 | 2.05 | 46.77 |
| total losses ($L_T$ lb/month & avg is lb/yr) | 6.04 | 6.27 | 8.95 | 11.32 | 14.92 | 17.22 | 18.81 | 18.37 | 14.96 | 11.17 | 7.66 | 6.21 | 141.91 |
| max hourly Q in bbl/hour | 0.64 | 0.64 | 0.64 | 0.64 | 0.64 | 0.64 | 0.64 | 0.64 | 0.64 | 0.64 | 0.64 | 0.64 | |
| max hourly working loss at $P_{VX}$ & Q/hr & $K_N$=1 ($L_W$ lb/hr) | 0.003 | 0.003 | 0.004 | 0.005 | 0.007 | 0.008 | 0.008 | 0.008 | 0.007 | 0.005 | 0.004 | 0.003 | |
| breathing/standing loss ($L_S$ lb/hr) | 0.005 | 0.006 | 0.008 | 0.012 | 0.016 | 0.020 | 0.021 | 0.020 | 0.015 | 0.010 | 0.007 | 0.006 | |
| max hourly total loss ($L_T$ lb/hr) | 0.008 | 0.009 | 0.012 | 0.018 | 0.023 | 0.028 | 0.029 | 0.028 | 0.022 | 0.015 | 0.011 | 0.008 | |

| $L_S$ sum months | $L_W$ sum months | $L_T$ sum months |
|---|---|---|
| 95.14 | 46.77 | 141.91 |

The monthly sums will be greater than the annual average since the monthly variables yield higher emissions

| **Emissions Summary:** | **avg lbs/hr** | **max lbs/hr** | **lbs/yr** |
|---|---|---|---|
| **Standing/Breathing Loss $L_S$** | **0.010** | **0.021** | **88.729** |
| **Working Loss $L_W$** | **0.005** | **0.008** | **43.619** |
| **Total Loss $L_T$** | **0.015** | **0.029** | **132.348** |

max hourly total loss may not add up to $L_S$ + $L_W$ as their max values may be in different months

## Tank Emission Calculations Based on AP 42 Chapter 7 (June 2020, Section 7.1.3.1), Fixed Roof

| | |
|---|---|
| *Tank ID* | **19-05-SUMP** |
| *Tank Description* | **Drainage Sump (SP-141)** |
| *Company Name* | **Denbury Onshore, LLC** |

| | |
|---|---|
| *Tank Orientation* | **Horizontal** |
| *Tank Diameter (D ft)* | **10.00** |
| *Vertical Height/Horizontal Length ($H_S$ ft)* | **17.00** |
| *Roof Height ($H_R$ ft)* | |
| *Max Liquid Height ($H_{LX}$ ft)* | **10.00** |
| *Avg Liquid Height ($H_L$ ft)* | **5.00** |
| *Breather Vent Pressure Setting ($P_{BP}$ psig)* | |
| *Breather Vent Vacuum Setting ($P_{BV}$ psig)* | |
| *actual tank pressure ($P_I$ psig)* | **0.0** |
| *Shell Paint Solar Absorptance ($S_A$)* | **0.90** |
| *Roof Paint Solar Absorptance ($R_A$)* | **0.9** |
| *breather vent pressure range ($\Delta P_B$ psi)* | **0.00** |
| *roof outage ($H_{RO}$ ft)* | |

| | |
|---|---|
| *Tank Shell Color/Shade* | **Red - Primer** |
| *Tank Shell Paint Condition* | **average** |
| *Tank Roof Color/Shade* | **Red - Primer** |
| *Tank Roof Paint Condition* | **average** |
| *Roof Type* | **horizontal tank** |
| *Tank Insulation* | **no insulation** |
| *Tank Underground?* | **no** |
| *Annual Throughput (Q bbl/year)* | **20.00** |
| *Annual Turnovers, N* | **0.08** |
| *Annual Hours* | **8,760** |
| *tank max liquid volume ($V_{LX}$ $ft^3$)* | **1,335.18** |
| *vapor space outage ($H_{VO}$ ft)* | **3.927** |
| *vapor space volume ($V_V$ $ft^3$)* | **667.59** |

| | |
|---|---|
| *Major City for Meterological Data* | **Jackson, MS** |
| *Site Elevation (ft)* | **300** |
| *Atmospheric Pressure ($P_A$ psia)* | **14.537** |
| *Table 7.1-2 Liquid* | **crude oil** |
| *RVP** | **5.37** |
| *API gravity** | **36.7** |
| *°F basis for gv** | **60.0** |
| *bubble point psia* | |
| *API gravity at 60F* | **36.7** |
| *API gravity at 100F* | **39.5** |
| *Working Loss Product Factor ($K_P$)* | **0.75** |
| *working loss turnover factor $K_N$* | **1.000** |

*sales oil data determines RVP per API pub 4683

Tank contents (if not selected from Table 7.1-2):

| *component* | *mole%* | *MW* | *lb/mole* | *wt%* | *Antoine constants (log 10, mmHg, °C) A* | *B* | *C* |
|---|---|---|---|---|---|---|---|
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| | 0.000 | | 0.000 | 0.000 | | | |

| | *Jan* | *Feb* | *Mar* | *Apr* | *May* | *Jun* | *Jul* | *Aug* | *Sep* | *Oct* | *Nov* | *Dec* | *Avg* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| hourly average maximum ambient temperature ($T_{AX}$ °F) | 56.50 | 60.80 | 68.10 | 75.70 | 83.00 | 89.00 | 91.10 | 91.20 | 86.50 | 77.10 | 66.30 | 58.10 | 75.30 |
| hourly average minimum ambient temperature ($T_{AN}$ °F) | 37.00 | 39.30 | 45.90 | 53.30 | 62.50 | 69.20 | 72.10 | 71.40 | 65.50 | 53.90 | 43.90 | 37.90 | 54.30 |
| daily total solar insolation factor (I btu/ft$^2$ day) | 783 | 1039 | 1369 | 1762 | 1929 | 2025 | 1969 | 1849 | 1576 | 1262 | 922 | 726 | 1434 |
| daily average ambient temperature ($T_{AA}$ °F) | 46.75 | 50.05 | 57.00 | 64.50 | 72.75 | 79.10 | 81.60 | 81.30 | 76.00 | 65.50 | 55.10 | 48.00 | 64.80 |
| liquid bulk temperature ($T_B$ °F) | 48.86 | 52.86 | 60.70 | 69.26 | 77.96 | 84.57 | 86.92 | 86.29 | 80.26 | 68.91 | 57.59 | 49.96 | 68.67 |
| average vapor temperature ($T_V$ °F) | 52.44 | 57.59 | 66.94 | 77.29 | 86.76 | 93.80 | 95.90 | 94.72 | 87.44 | 74.66 | 61.79 | 53.27 | 75.21 |
| daily ambient temperature range ($\Delta T_A$ °R) | 19.50 | 21.50 | 22.20 | 22.40 | 20.50 | 19.80 | 19.00 | 19.80 | 21.00 | 23.20 | 22.40 | 20.20 | 21.00 |
| daily vapor temperature range ($\Delta T_V$ °R) | 27.74 | 33.75 | 40.18 | 47.40 | 49.07 | 50.31 | 48.74 | 47.14 | 43.07 | 38.96 | 32.28 | 27.32 | 40.51 |
| daily average liquid surface temperature ($T_{LA}$ °F) | 50.65 | 55.22 | 63.82 | 73.28 | 82.36 | 89.19 | 91.41 | 90.51 | 83.85 | 71.79 | 59.69 | 51.62 | 71.94 |
| daily maximum liquid surface temperature ($T_{LX}$ °F) | 57.59 | 63.66 | 73.86 | 85.12 | 94.63 | 101.76 | 103.59 | 102.29 | 94.62 | 81.52 | 67.76 | 58.45 | 82.07 |
| daily minimum liquid surface temperature ($T_{LN}$ °F) | 43.71 | 46.79 | 53.77 | 61.43 | 70.09 | 76.61 | 79.22 | 78.72 | 73.08 | 62.05 | 51.62 | 44.79 | 61.81 |
| vapor pressure at daily avg liq surface temp $T_{LA}$ ($P_{VA}$ psia) | 2.643 | 2.894 | 3.417 | 4.078 | 4.805 | 5.416 | 5.628 | 5.542 | 4.934 | 3.968 | 3.157 | 2.694 | 3.979 |
| vapor pressure at daily max liq surface temp $T_{LX}$ ($P_{VX}$ psia) | 3.031 | 3.407 | 4.123 | 5.046 | 5.946 | 6.702 | 6.907 | 6.761 | 5.945 | 4.735 | 3.682 | 3.082 | 4.781 |
| vapor pressure at daily min liq surface temp $T_{LN}$ ($P_{VN}$ psia) | 2.295 | 2.444 | 2.812 | 3.265 | 3.845 | 4.334 | 4.543 | 4.503 | 4.064 | 3.304 | 2.694 | 2.346 | 3.289 |
| daily vapor pressure range ($\Delta P_V$) | 0.7354 | 0.9630 | 1.3106 | 1.7814 | 2.1007 | 2.3675 | 2.3635 | 2.2578 | 1.8811 | 1.4309 | 0.9872 | 0.7355 | 1.4918 |
| vapor space expansion factor ($K_E$) | 0.1162 | 0.1483 | 0.1946 | 0.2593 | 0.3064 | 0.3512 | 0.3537 | 0.3367 | 0.2751 | 0.2087 | 0.1489 | 0.1155 | 0.2175 |
| vapor molecular weight ($M_V$ lb/lbmole) | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 |
| monthly hours with avg = total annual | 744 | 672 | 744 | 720 | 744 | 720 | 744 | 744 | 720 | 744 | 720 | 744 | 8,760 |
| throughputs (ft$^3$/month) and avg = total annual | 10 | 9 | 10 | 9 | 10 | 9 | 10 | 10 | 9 | 10 | 9 | 10 | 112 |
| monthly turnovers (N/month) with avg = total annual | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.08 |
| vented vapor saturation factor ($K_S$) | 0.6452 | 0.6241 | 0.5844 | 0.5409 | 0.5000 | 0.4701 | 0.4605 | 0.4644 | 0.4934 | 0.5477 | 0.6035 | 0.6407 | 0.5470 |
| vent setting correction factor ($K_B$) | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| vapor density ($W_V$ lb/ft$^3$) | 0.0240 | 0.0261 | 0.0302 | 0.0354 | 0.0410 | 0.0456 | 0.0472 | 0.0466 | 0.0420 | 0.0346 | 0.0282 | 0.0245 | 0.0347 |
| standing storage losses ($L_S$ lb/month & avg is lb/yr) | 59.20 | 57.97 | 74.45 | 84.32 | 100.88 | 108.65 | 116.21 | 114.67 | 100.12 | 85.19 | 67.22 | 60.25 | 1029.14 |
| working losses ($L_W$ lb/month & avg is lb/yr) | 0.17 | 0.17 | 0.22 | 0.24 | 0.29 | 0.32 | 0.34 | 0.33 | 0.29 | 0.25 | 0.20 | 0.18 | 2.99 |
| total losses ($L_T$ lb/month & avg is lb/yr) | 59.37 | 58.14 | 74.66 | 84.57 | 101.18 | 108.96 | 116.55 | 115.01 | 100.41 | 85.44 | 67.41 | 60.43 | 1032.13 |
| max hourly Q in bbl/hour | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | |
| max hourly working loss at $P_{VX}$ & Q/hr & $K_N$=1 ($L_W$ lb/hr) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | |
| breathing/standing loss ($L_S$ lb/hr) | 0.080 | 0.086 | 0.100 | 0.138 | 0.175 | 0.209 | 0.214 | 0.203 | 0.159 | 0.115 | 0.093 | 0.081 | |
| max hourly total loss ($L_T$ lb/hr) | 0.080 | 0.087 | 0.100 | 0.138 | 0.175 | 0.210 | 0.214 | 0.203 | 0.159 | 0.115 | 0.094 | 0.081 | |

| $L_S$ sum months | $L_W$ sum months | $L_T$ sum months |
|---|---|---|
| 1029.14 | 2.99 | 1032.13 |

The monthly sums will be greater than the annual average since the monthly variables yield higher emissions

**Emissions Summary:**

| | **avg lbs/hr** | **max lbs/hr** | **lbs/yr** |
|---|---|---|---|
| **Standing/Breathing Loss $L_S$** | **0.115** | **0.214** | **1,004.943** |
| **Working Loss $L_W$** | **0.000** | **0.000** | **2.919** |
| **Total Loss $L_T$** | **0.115** | **0.214** | **1,007.862** |

max hourly total loss may not add up to $L_S$ + $L_W$ as their max values may be in different months



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## Tank Emission Calculations Based on AP 42 Chapter 7 (June 2020, Section 7.1.3.1), Fixed Roof

| | |
|---|---|
| *Tank ID* | **20-05-SUMP** |
| *Tank Description* | **Compressor Building Sump (SP-142)** |
| *Company Name* | **Denbury Onshore, LLC** |

| | |
|---|---|
| *Tank Orientation* | **Horizontal** |
| *Tank Diameter (D ft)* | **10.00** |
| *Vertical Height/Horizontal Length ($H_S$ ft)* | **17.00** |
| *Roof Height ($H_R$ ft)* | |
| *Max Liquid Height ($H_{LX}$ ft)* | **10.00** |
| *Avg Liquid Height ($H_L$ ft)* | **5.00** |
| *Breather Vent Pressure Setting ($P_{BP}$ psig)* | |
| *Breather Vent Vacuum Setting ($P_{BV}$ psig)* | |
| *actual tank pressure ($P_I$ psig)* | **0.0** |
| *Shell Paint Solar Absorptance ($S_A$)* | **0.90** |
| *Roof Paint Solar Absorptance ($R_A$)* | **0.9** |
| *breather vent pressure range ($\Delta P_B$ psi)* | **0.00** |
| *roof outage ($H_{RO}$ ft)* | |

| | |
|---|---|
| *Tank Shell Color/Shade* | **Red - Primer** |
| *Tank Shell Paint Condition* | **average** |
| *Tank Roof Color/Shade* | **Red - Primer** |
| *Tank Roof Paint Condition* | **average** |
| *Roof Type* | **horizontal tank** |
| *Tank Insulation* | **no insulation** |
| *Tank Underground?* | **no** |
| *Annual Throughput (Q bbl/year)* | **20.00** |
| *Annual Turnovers, N* | **0.08** |
| *Annual Hours* | **8,760** |
| *tank max liquid volume ($V_{LX}$ $ft^3$)* | **1,335.18** |
| *vapor space outage ($H_{VO}$ ft)* | **3.927** |
| *vapor space volume ($V_V$ $ft^3$)* | **667.59** |

| | |
|---|---|
| *Major City for Meterological Data* | **Jackson, MS** |
| *Site Elevation (ft)* | **300** |
| *Atmospheric Pressure ($P_A$ psia)* | **14.537** |
| *Table 7.1-2 Liquid* | **crude oil** |
| *RVP** | **5.37** |
| *API gravity** | **36.7** |
| *°F basis for gv** | **60.0** |
| *bubble point psia* | |
| *API gravity at 60F* | **36.7** |
| *API gravity at 100F* | **39.5** |
| *Working Loss Product Factor ($K_P$)* | **0.75** |
| *working loss turnover factor $K_N$* | **1.000** |

*sales oil data determines RVP per API pub 4683

Tank contents (if not selected from Table 7.1-2):

| *component* | *mole%* | *MW* | *lb/mole* | *wt%* | *Antoine constants (log 10, mmHg, °C) A* | *B* | *C* |
|---|---|---|---|---|---|---|---|
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| | 0.000 | | 0.000 | 0.000 | | | |



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| | *Jan* | *Feb* | *Mar* | *Apr* | *May* | *Jun* | *Jul* | *Aug* | *Sep* | *Oct* | *Nov* | *Dec* | *Avg* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| hourly average maximum ambient temperature ($T_{AX}$ °F) | 56.50 | 60.80 | 68.10 | 75.70 | 83.00 | 89.00 | 91.10 | 91.20 | 86.50 | 77.10 | 66.30 | 58.10 | 75.30 |
| hourly average minimum ambient temperature ($T_{AN}$ °F) | 37.00 | 39.30 | 45.90 | 53.30 | 62.50 | 69.20 | 72.10 | 71.40 | 65.50 | 53.90 | 43.90 | 37.90 | 54.30 |
| daily total solar insolation factor (I btu/ft$^2$ day) | 783 | 1039 | 1369 | 1762 | 1929 | 2025 | 1969 | 1849 | 1576 | 1262 | 922 | 726 | 1434 |
| daily average ambient temperature ($T_{AA}$ °F) | 46.75 | 50.05 | 57.00 | 64.50 | 72.75 | 79.10 | 81.60 | 81.30 | 76.00 | 65.50 | 55.10 | 48.00 | 64.80 |
| liquid bulk temperature ($T_B$ °F) | 48.86 | 52.86 | 60.70 | 69.26 | 77.96 | 84.57 | 86.92 | 86.29 | 80.26 | 68.91 | 57.59 | 49.96 | 68.67 |
| average vapor temperature ($T_V$ °F) | 52.44 | 57.59 | 66.94 | 77.29 | 86.76 | 93.80 | 95.90 | 94.72 | 87.44 | 74.66 | 61.79 | 53.27 | 75.21 |
| daily ambient temperature range ($\Delta T_A$ °R) | 19.50 | 21.50 | 22.20 | 22.40 | 20.50 | 19.80 | 19.00 | 19.80 | 21.00 | 23.20 | 22.40 | 20.20 | 21.00 |
| daily vapor temperature range ($\Delta T_V$ °R) | 27.74 | 33.75 | 40.18 | 47.40 | 49.07 | 50.31 | 48.74 | 47.14 | 43.07 | 38.96 | 32.28 | 27.32 | 40.51 |
| daily average liquid surface temperature ($T_{LA}$ °F) | 50.65 | 55.22 | 63.82 | 73.28 | 82.36 | 89.19 | 91.41 | 90.51 | 83.85 | 71.79 | 59.69 | 51.62 | 71.94 |
| daily maximum liquid surface temperature ($T_{LX}$ °F) | 57.59 | 63.66 | 73.86 | 85.12 | 94.63 | 101.76 | 103.59 | 102.29 | 94.62 | 81.52 | 67.76 | 58.45 | 82.07 |
| daily minimum liquid surface temperature ($T_{LN}$ °F) | 43.71 | 46.79 | 53.77 | 61.43 | 70.09 | 76.61 | 79.22 | 78.72 | 73.08 | 62.05 | 51.62 | 44.79 | 61.81 |
| vapor pressure at daily avg liq surface temp $T_{LA}$ ($P_{VA}$ psia) | 2.643 | 2.894 | 3.417 | 4.078 | 4.805 | 5.416 | 5.628 | 5.542 | 4.934 | 3.968 | 3.157 | 2.694 | 3.979 |
| vapor pressure at daily max liq surface temp $T_{LX}$ ($P_{VX}$ psia) | 3.031 | 3.407 | 4.123 | 5.046 | 5.946 | 6.702 | 6.907 | 6.761 | 5.945 | 4.735 | 3.682 | 3.082 | 4.781 |
| vapor pressure at daily min liq surface temp $T_{LN}$ ($P_{VN}$ psia) | 2.295 | 2.444 | 2.812 | 3.265 | 3.845 | 4.334 | 4.543 | 4.503 | 4.064 | 3.304 | 2.694 | 2.346 | 3.289 |
| daily vapor pressure range ($\Delta P_V$) | 0.7354 | 0.9630 | 1.3106 | 1.7814 | 2.1007 | 2.3675 | 2.3635 | 2.2578 | 1.8811 | 1.4309 | 0.9872 | 0.7355 | 1.4918 |
| vapor space expansion factor ($K_E$) | 0.1162 | 0.1483 | 0.1946 | 0.2593 | 0.3064 | 0.3512 | 0.3537 | 0.3367 | 0.2751 | 0.2087 | 0.1489 | 0.1155 | 0.2175 |
| vapor molecular weight ($M_V$ lb/lbmole) | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 |
| monthly hours with avg = total annual | 744 | 672 | 744 | 720 | 744 | 720 | 744 | 744 | 720 | 744 | 720 | 744 | 8,760 |
| throughputs (ft$^3$/month) and avg = total annual | 10 | 9 | 10 | 9 | 10 | 9 | 10 | 10 | 9 | 10 | 9 | 10 | 112 |
| monthly turnovers (N/month) with avg = total annual | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.08 |
| vented vapor saturation factor ($K_S$) | 0.6452 | 0.6241 | 0.5844 | 0.5409 | 0.5000 | 0.4701 | 0.4605 | 0.4644 | 0.4934 | 0.5477 | 0.6035 | 0.6407 | 0.5470 |
| vent setting correction factor ($K_B$) | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| vapor density ($W_V$ lb/ft$^3$) | 0.0240 | 0.0261 | 0.0302 | 0.0354 | 0.0410 | 0.0456 | 0.0472 | 0.0466 | 0.0420 | 0.0346 | 0.0282 | 0.0245 | 0.0347 |
| standing storage losses ($L_S$ lb/month & avg is lb/yr) | 59.20 | 57.97 | 74.45 | 84.32 | 100.88 | 108.65 | 116.21 | 114.67 | 100.12 | 85.19 | 67.22 | 60.25 | 1029.14 |
| working losses ($L_W$ lb/month & avg is lb/yr) | 0.17 | 0.17 | 0.22 | 0.24 | 0.29 | 0.32 | 0.34 | 0.33 | 0.29 | 0.25 | 0.20 | 0.18 | 2.99 |
| total losses ($L_T$ lb/month & avg is lb/yr) | 59.37 | 58.14 | 74.66 | 84.57 | 101.18 | 108.96 | 116.55 | 115.01 | 100.41 | 85.44 | 67.41 | 60.43 | 1032.13 |
| max hourly Q in bbl/hour | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | |
| max hourly working loss at $P_{VX}$ & Q/hr & $K_N$=1 ($L_W$ lb/hr) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | |
| breathing/standing loss ($L_S$ lb/hr) | 0.080 | 0.086 | 0.100 | 0.138 | 0.175 | 0.209 | 0.214 | 0.203 | 0.159 | 0.115 | 0.093 | 0.081 | |
| max hourly total loss ($L_T$ lb/hr) | 0.080 | 0.087 | 0.100 | 0.138 | 0.175 | 0.210 | 0.214 | 0.203 | 0.159 | 0.115 | 0.094 | 0.081 | |

| $L_S$ sum months | $L_W$ sum months | $L_T$ sum months |
|---|---|---|
| 1029.14 | 2.99 | 1032.13 |

The monthly sums will be greater than the annual average since the monthly variables yield higher emissions

**Emissions Summary:**

| | **avg lbs/hr** | **max lbs/hr** | **lbs/yr** |
|---|---|---|---|
| **Standing/Breathing Loss $L_S$** | **0.115** | **0.214** | **1,004.943** |
| **Working Loss $L_W$** | **0.000** | **0.000** | **2.919** |
| **Total Loss $L_T$** | **0.115** | **0.214** | **1,007.862** |

max hourly total loss may not add up to $L_S$ + $L_W$ as their max values may be in different months



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## Tank Emission Calculations Based on AP 42 Chapter 7 (June 2020, Section 7.1.3.1), Fixed Roof

| | |
|---|---|
| *Tank ID* | **21-05-ST through 23-05-ST** |
| *Tank Description* | **Chemical Storage Tank** |
| *Company Name* | **Denbury Onshore, LLC** |

| | |
|---|---|
| *Tank Orientation* | **Horizontal** |
| *Tank Diameter (D ft)* | **3.00** |
| *Vertical Height/Horizontal Length ($H_S$ ft)* | **5.00** |
| *Roof Height ($H_R$ ft)* | |
| *Max Liquid Height ($H_{LX}$ ft)* | **3.00** |
| *Avg Liquid Height ($H_L$ ft)* | **1.50** |
| *Breather Vent Pressure Setting ($P_{BP}$ psig)* | |
| *Breather Vent Vacuum Setting ($P_{BV}$ psig)* | |
| *actual tank pressure ($P_I$ psig)* | **0.0** |
| *Shell Paint Solar Absorptance ($S_A$)* | **0.90** |
| *Roof Paint Solar Absorptance ($R_A$)* | **0.9** |
| *breather vent pressure range ($\Delta P_B$ psi)* | **0.00** |
| *roof outage ($H_{RO}$ ft)* | |

| | |
|---|---|
| *Tank Shell Color/Shade* | **Red - Primer** |
| *Tank Shell Paint Condition* | **average** |
| *Tank Roof Color/Shade* | **Red - Primer** |
| *Tank Roof Paint Condition* | **average** |
| *Roof Type* | **horizontal tank** |
| *Tank Insulation* | **no insulation** |
| *Tank Underground?* | **no** |
| *Annual Throughput (Q bbl/year)* | **36.00** |
| *Annual Turnovers, N* | **5.72** |
| *Annual Hours* | **8,760** |
| *tank max liquid volume ($V_{LX}$ $ft^3$)* | **35.34** |
| *vapor space outage ($H_{VO}$ ft)* | **1.178** |
| *vapor space volume ($V_V$ $ft^3$)* | **17.67** |

| | |
|---|---|
| *Major City for Meterological Data* | **Jackson, MS** |
| *Site Elevation (ft)* | **300** |
| *Atmospheric Pressure ($P_A$ psia)* | **14.537** |
| *Table 7.1-2 Liquid* | |
| *RVP** | |
| *API gravity** | |
| *°F basis for gv** | |
| *bubble point psia* | |
| *API gravity at 60F* | |
| *API gravity at 100F* | |
| *Working Loss Product Factor ($K_P$)* | **1** |
| *working loss turnover factor $K_N$* | **1.000** |

*sales oil data determines RVP per API pub 4683

Tank contents (if not selected from Table 7.1-2):

| *component* | *mole%* | *MW* | *lb/mole* | *wt%* | *Antoine constants (log 10, mmHg, °C) A* | *B* | *C* |
|---|---|---|---|---|---|---|---|
| Hexane N- | 100.000 | 86.180 | 86.18000 | 100.00000 | 6.878 | 1171.500 | 224.370 |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| | 100.000 | | 86.180 | 100.000 | | | |

| | *Jan* | *Feb* | *Mar* | *Apr* | *May* | *Jun* | *Jul* | *Aug* | *Sep* | *Oct* | *Nov* | *Dec* | *Avg* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| hourly average maximum ambient temperature ($T_{AX}$ °F) | 56.50 | 60.80 | 68.10 | 75.70 | 83.00 | 89.00 | 91.10 | 91.20 | 86.50 | 77.10 | 66.30 | 58.10 | 75.30 |
| hourly average minimum ambient temperature ($T_{AN}$ °F) | 37.00 | 39.30 | 45.90 | 53.30 | 62.50 | 69.20 | 72.10 | 71.40 | 65.50 | 53.90 | 43.90 | 37.90 | 54.30 |
| daily total solar insolation factor (I btu/ft$^2$ day) | 783 | 1039 | 1369 | 1762 | 1929 | 2025 | 1969 | 1849 | 1576 | 1262 | 922 | 726 | 1434 |
| daily average ambient temperature ($T_{AA}$ °F) | 46.75 | 50.05 | 57.00 | 64.50 | 72.75 | 79.10 | 81.60 | 81.30 | 76.00 | 65.50 | 55.10 | 48.00 | 64.80 |
| liquid bulk temperature ($T_B$ °F) | 48.86 | 52.86 | 60.70 | 69.26 | 77.96 | 84.57 | 86.92 | 86.29 | 80.26 | 68.91 | 57.59 | 49.96 | 68.67 |
| average vapor temperature ($T_V$ °F) | 52.46 | 57.62 | 66.97 | 77.34 | 86.81 | 93.85 | 95.95 | 94.77 | 87.48 | 74.70 | 61.82 | 53.29 | 75.25 |
| daily ambient temperature range ($\Delta T_A$ °R) | 19.50 | 21.50 | 22.20 | 22.40 | 20.50 | 19.80 | 19.00 | 19.80 | 21.00 | 23.20 | 22.40 | 20.20 | 21.00 |
| daily vapor temperature range ($\Delta T_V$ °R) | 27.74 | 33.75 | 40.18 | 47.40 | 49.07 | 50.31 | 48.74 | 47.14 | 43.07 | 38.96 | 32.28 | 27.31 | 40.51 |
| daily average liquid surface temperature ($T_{LA}$ °F) | 50.66 | 55.24 | 63.84 | 73.30 | 82.38 | 89.21 | 91.43 | 90.53 | 83.87 | 71.80 | 59.70 | 51.63 | 71.96 |
| daily maximum liquid surface temperature ($T_{LX}$ °F) | 57.60 | 63.68 | 73.88 | 85.15 | 94.65 | 101.79 | 103.62 | 102.32 | 94.64 | 81.54 | 67.77 | 58.45 | 82.09 |
| daily minimum liquid surface temperature ($T_{LN}$ °F) | 43.72 | 46.80 | 53.79 | 61.45 | 70.11 | 76.63 | 79.25 | 78.75 | 73.10 | 62.06 | 51.63 | 44.80 | 61.83 |
| vapor pressure at daily avg liq surface temp $T_{LA}$ ($P_{VA}$ psia) | 1.491 | 1.687 | 2.111 | 2.675 | 3.327 | 3.898 | 4.099 | 4.017 | 3.445 | 2.578 | 1.897 | 1.531 | 2.588 |
| vapor pressure at daily max liq surface temp $T_{LX}$ ($P_{VX}$ psia) | 1.795 | 2.102 | 2.713 | 3.549 | 4.407 | 5.155 | 5.363 | 5.215 | 4.406 | 3.262 | 2.332 | 1.836 | 3.304 |
| vapor pressure at daily min liq surface temp $T_{LN}$ ($P_{VN}$ psia) | 1.231 | 1.341 | 1.623 | 1.985 | 2.473 | 2.901 | 3.089 | 3.052 | 2.662 | 2.017 | 1.531 | 1.269 | 2.005 |
| daily vapor pressure range ($\Delta P_V$) | 0.5643 | 0.7609 | 1.0908 | 1.5641 | 1.9340 | 2.2542 | 2.2738 | 2.1625 | 1.7433 | 1.2448 | 0.8012 | 0.5676 | 1.2992 |
| vapor space expansion factor ($K_E$) | 0.0976 | 0.1248 | 0.1645 | 0.2208 | 0.2631 | 0.3035 | 0.3063 | 0.2912 | 0.2364 | 0.1774 | 0.1255 | 0.0971 | 0.1849 |
| vapor molecular weight ($M_V$ lb/lbmole) | 86.18 | 86.18 | 86.18 | 86.18 | 86.18 | 86.18 | 86.18 | 86.18 | 86.18 | 86.18 | 86.18 | 86.18 | 86.18 |
| monthly hours with avg = total annual | 744 | 672 | 744 | 720 | 744 | 720 | 744 | 744 | 720 | 744 | 720 | 744 | 8,760 |
| throughputs (ft$^3$/month) and avg = total annual | 17 | 16 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 202 |
| monthly turnovers (N/month) with avg = total annual | 0.49 | 0.44 | 0.49 | 0.47 | 0.49 | 0.47 | 0.49 | 0.49 | 0.47 | 0.49 | 0.47 | 0.49 | 5.72 |
| vented vapor saturation factor ($K_S$) | 0.9148 | 0.9047 | 0.8836 | 0.8569 | 0.8280 | 0.8043 | 0.7962 | 0.7995 | 0.8230 | 0.8613 | 0.8941 | 0.9128 | 0.8609 |
| vent setting correction factor ($K_B$) | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| vapor density ($W_V$ lb/ft$^3$) | 0.0234 | 0.0262 | 0.0322 | 0.0400 | 0.0489 | 0.0566 | 0.0593 | 0.0582 | 0.0506 | 0.0388 | 0.0292 | 0.0240 | 0.0389 |
| standing storage losses ($L_S$ lb/month & avg is lb/yr) | 2.04 | 2.06 | 2.81 | 3.38 | 4.26 | 4.77 | 5.17 | 5.07 | 4.27 | 3.38 | 2.47 | 2.09 | 41.77 |
| working losses ($L_W$ lb/month & avg is lb/yr) | 0.40 | 0.41 | 0.55 | 0.66 | 0.84 | 0.94 | 1.02 | 1.00 | 0.84 | 0.67 | 0.49 | 0.41 | 8.22 |
| total losses ($L_T$ lb/month & avg is lb/yr) | 2.44 | 2.47 | 3.36 | 4.04 | 5.10 | 5.71 | 6.18 | 6.07 | 5.11 | 4.04 | 2.95 | 2.50 | 49.99 |
| max hourly Q in bbl/hour | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | |
| max hourly working loss at $P_{VX}$ & Q/hr & $K_N$=1 ($L_W$ lb/hr) | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | |
| breathing/standing loss ($L_S$ lb/hr) | 0.003 | 0.003 | 0.004 | 0.006 | 0.008 | 0.010 | 0.011 | 0.010 | 0.007 | 0.005 | 0.003 | 0.003 | |
| max hourly total loss ($L_T$ lb/hr) | 0.003 | 0.004 | 0.005 | 0.006 | 0.009 | 0.011 | 0.012 | 0.011 | 0.008 | 0.005 | 0.004 | 0.003 | |

| $L_S$ sum months | $L_W$ sum months | $L_T$ sum months |
|---|---|---|
| 41.77 | 8.22 | 49.99 |

The monthly sums will be greater than the annual average since the monthly variables yield higher emissions

**Emissions Summary:**

| | **avg lbs/hr** | **max lbs/hr** | **lbs/yr** |
|---|---|---|---|
| **Standing/Breathing Loss $L_S$** | **0.005** | **0.011** | **39.906** |
| **Working Loss $L_W$** | **0.001** | **0.001** | **7.854** |
| **Total Loss $L_T$** | **0.005** | **0.012** | **47.760** |

max hourly total loss may not add up to $L_S$ + $L_W$ as their max values may be in different months

United States Environmental Protection Agency
Office of Air Quality Planning and Standards Research Triangle Park NC 27711
EPA-453/R-95-017 November 1995
Air

EPA

# Protocol for Equipment Leak Emission Estimates

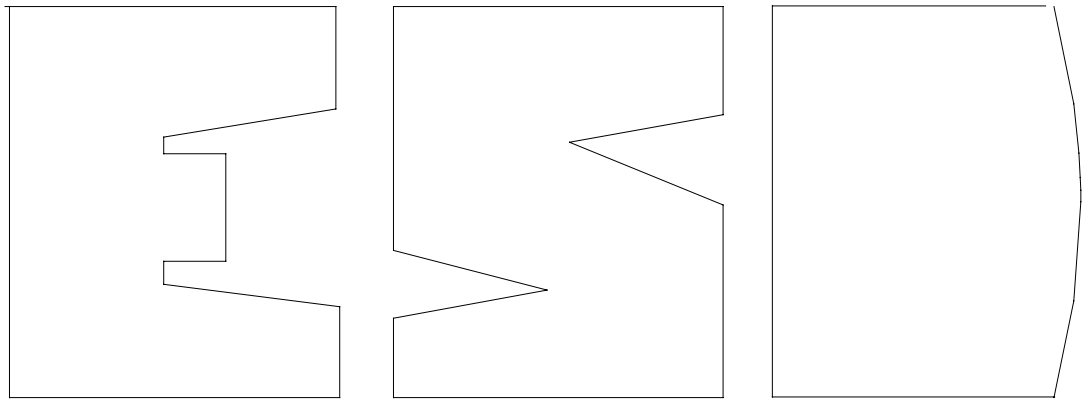

TABLE 2-4. OIL AND GAS PRODUCTION OPERATIONS AVERAGE EMISSION FACTORS (kg/hr/source)

| Equipment Type | Service[a] | Emission Factor (kg/hr/source)[b] |
|---|---|---|
| Valves | Gas | 4.5E-03 |
| | Heavy Oil | 8.4E-06 |
| | Light Oil | 2.5E-03 |
| | Water/Oil | 9.8E-05 |
| Pump seals | Gas | 2.4E-03 |
| | Heavy Oil | NA |
| | Light Oil | 1.3E-02 |
| | Water/Oil | 2.4E-05 |
| Others[c] | Gas | 8.8E-03 |
| | Heavy Oil | 3.2E-05 |
| | Light Oil | 7.5E-03 |
| | Water/Oil | 1.4E-02 |
| Connectors | Gas | 2.0E-04 |
| | Heavy Oil | 7.5E-06 |
| | Light Oil | 2.1E-04 |
| | Water/Oil | 1.1E-04 |
| Flanges | Gas | 3.9E-04 |
| | Heavy Oil | 3.9E-07 |
| | Light Oil | 1.1E-04 |
| | Water/Oil | 2.9E-06 |
| Open-ended lines | Gas | 2.0E-03 |
| | Heavy Oil | 1.4E-04 |
| | Light Oil | 1.4E-03 |
| | Water/Oil | 2.5E-04 |

[a]Water/Oil emission factors apply to water streams in oil service with a water content greater than 50%, from the point of origin to the point where the water content reaches 99%. For water streams with a water content greater than 99%, the emission rate is considered negligible.

[b]These factors are for total organic compound emission rates (including non-VOC's such as methane and ethane) and apply to light crude, heavy crude, gas plant, gas production, and off shore facilities. "NA" indicates that not enough data were available to develop the indicated emission factor.

[c]The "other" equipment type was derived from compressors, diaphrams, drains, dump arms, hatches, instruments, meters, pressure relief valves, polished rods, relief valves, and vents. This "other" equipment type should be applied for any equipment type other than connectors, flanges, open-ended lines, pumps, or valves.

# EPA Average Emission Factors

The EPA emission factors used by GRI-HAPCalc 3.01 to estimate fugitive emissions were developed from data obtained during a joint American Petroleum Institute (API)/GRI fugitive testing program at natural gas production and processing sites [U.S. Environmental Protection Agency, 1995; American Petroleum Institute, 1995]. Over 184,000 components at 20 sites were screened for total hydrocarbon (THC) emissions, and the results were averaged for each component type to develop THC emission factors. Furthermore, a statistical analysis conducted by the EPA found no difference in THC fugitive emissions by industry segment for oil and gas production operation. The average THC emission factors for equipment in gas and light liquid service are shown in Table 20.

**Table 20. EPA Average Emission Factors for THC**

| | Emission Factor, lb THC/yr | | |
|---|---|---|---|
| Component | Gas Service | Light Liquids Service | Heavy Liquids Service |
| Connections | 3.9 | 4.1 | 0.1 |
| Flanges | 7.5 | 2.1 | 0.0075 |
| Open-Ended Line | 39 | 27 | 2.7 |
| Pump Seals | 46 | 250 | NA |
| Valves | 87 | 48 | 0.16 |
| Other* | 170 | 140 | 0.62 |

** The "Other" category includes compressors, diaphragms, drains, dump arms, hatches, instruments, meters, pressure relief valves, polished rods, relief valves, and vents.*

To calculate speciated fugitive emissions for BTEX, methane, NMHC, and NMEHC, composition data obtained during a joint American Petroleum Institute (API)/GRI fugitive testing program are used with the THC emission factors above. The average compositions of fugitive leaks from production facilities and natural gas plants are shown in Table 21.

**Table 21. Fractional Composition of Fugitive Emissions**

| | Fractional Composition, lb/lb THC | | | |
|---|---|---|---|---|
| Compound | Gas Production/ Compressor Station | Gas Plant | Light Liquid Service | Heavy Liquid Service |
| Benzene | 0.00023 | 0.00123 | 0.00027 | 0.00935 |
| Toluene | 0.00039 | 0.00032 | 0.00075 | 0.00344 |
| Ethylbenzene | 0.000020 | 0.000010 | 0.000170 | 0.00051 |
| Xylenes (m,p,o) | 0.00010 | 0.000040 | 0.000360 | 0.00372 |
| Methane | 0.920 | 0.564 | 0.613 | 0.942 |
| NMHC | 0.080 | 0.436 | 0.387 | 0.058 |
| NMEHC | 0.0350 | 0.253 | 0.292 | 0.030 |

The following equation shows how annual emission rates are calculated from the above emission factors. The user-entered component count of each type of fugitive emission source is multiplied by the emission factor (lb THC/component/year) and the fractional composition (lb compound *i* / lb THC). This is then converted to an annual emission rate. Note that all calculations in GRI-HAPCalc 3.01 are done in U.S. Standard units and converted to metric units when necessary.

# Weighted Average for Tank Vapors to Atmospheric Control Flare (EPN: 25-05-F)

| | | |
|---|---|---|
| **Total Working & Standing Losses:** | **347.52** | **lb/hr** |
| **Total Oil Flash Vapors:** | **481.22** | **SCFH** |
| **Total Brine Flash Vapors:** | **200.00** | **SCFH** |
| **Total Blanket Gas:** | **305.74** | **lb/hr** |
| | | |
| **Total Stream Flowrate:** | **3306.09** | **SCFH** |


June 1998
RG-109

Air Permit Technical Guidance for Chemical Sources:

# Flares and Vapor Oxidizers

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New Source Review Permits Division

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

## Flare Emission Factors

The usual flare destruction efficiencies and emission factors are provided in Table 4. The high-Btu waste streams referred to in the table have a heating value greater than 1,000 Btu/scf.

## Flare Destruction Efficiencies

Claims for destruction efficiencies greater than those listed in Table 4 will be considered on a case-by-case basis. The applicant may make one of the three following demonstrations to justify the higher destruction efficiency: (1) general method, (2) 99.5 percent justification, or (3) flare stack sampling.

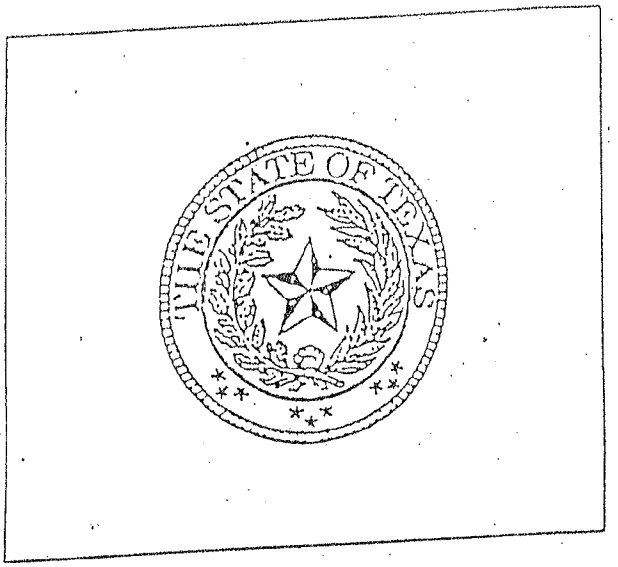
Table 4. Flare Factors

| Waste Stream | Destruction/Removal Efficiency (DRE) | | |
|---|---|---|---|
| VOC | 98 percent (generic) | | |
| | 99 percent for compounds containing no more than 3 carbons that contain no elements other than carbon and hydrogen in addition to the following compounds: methanol, ethanol, propanol, ethylene oxide and propylene oxide | | |
| $H_2S$ | 98 percent | | |
| $NH_3$ | case by case | | |
| CO | case by case | | |
| **Air Contaminants** | **Emission Factors** | | |
| thermal $NO_x$ | steam-assist: | high Btu | 0.0485 lb/MMBtu |
| | | low Btu | 0.068 lb/MMBtu |
| | other: | high Btu | 0.138 lb/MMBtu |
| | | low Btu | 0.0641 lb/MMBtu |
| fuel $NO_x$ | $NO_x$ is 0.5 wt percent of inlet $NH_3$, other fuels case by case | | |
| CO | steam-assist: | high Btu | 0.3503 lb/MMBtu |
| | | low Btu | 0.3465 lb/MMBtu |
| | other: | high Btu | 0.2755 lb/MMBtu |
| | | low Btu | 0.5496 lb/MMBtu |
| PM | none, required to be smokeless | | |
| $SO_2$ | 100 percent S in fuel to $SO_2$ | | |

Technical Guidance Package for
Chemical Sources

# Flare Sources

Texas Natural Resource Conservation Commission




John Hall, Chairman
Pam Reed, Commissioner
Peggy Garner, Commissioner
Dan Pearson, Executive Director

Compiled by TNRCC Chemical Section Engineers
November 1994

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(512) 239-1250

greater than standard destruction efficiencies (>SDE) are claimed. The determinations shall indicate the maximum or minimum values required for flare performance at the claimed efficiency. The determinations shall be made during the testing protocols used to demonstrate >SDE.

A. Tip Velocities and Flow rates (maximum)

B. Heating Values (minimum).

4. The applicant shall install, calibrate, operate and maintain a flow meter to monitor actual stream flow rates to, and calculate tip velocities of, flares for which >SDE are claimed.

5. Records shall be maintained which indicate on a continuous basis the flow rates and heating values of the streams directed to the flares for which >SDE are claimed.

6. Flow rates of streams to flares for which >SDE are claimed shall not exceed the lesser of the indicated maxima; (1) flow rates which produce the tip velocities specified in 40 CFR 60.18, or (2) flow rates demonstrated during testing to correspond to the demonstrated flare efficiency.

7. Tip velocities of flares for which >SDE are claimed shall not exceed the lesser of the indicated maxima; (1) tip velocities specified in 40 CFR 60.18, or (2) tip velocities demonstrated during testing to correspond to the demonstrated flare efficiency.

8. Heating values of streams directed to flares for which >SDE are claimed shall be no less than the greater of the indicated minima; (1) 300 BTU/scf for streams directed to non-assisted flares and 400 BTU/scf for streams directed to assisted flares, or (2) heating values demonstrated during testing to correspond to the demonstrated flare efficiency.

9. The applicant shall provide vendor data supportive of the claimed flare efficiency.

$NO_x$ and CO Emissions

The following $NO_x$ and CO factors were derived by the Chemical Section of the New Source Review Division based on data published in the 1983 CMA document entitled, *A Report on A Flare Efficiency Study*. These factors should be used in estimating $NO_x$ and CO emissions rather than the emission factors found in Section 11.5 of AP-42.

Table 3: Flare Factors.

| Type | Waste Gas | $NO_x$ lb/MM Btu | CO lb/MM Btu |
|---|---|---|---|
| Steam Assisted | High Btu (>1000/scf) | 0.0485 | 0.3503 |
| Steam Assisted | Low Btu (192-1000/scf) | 0.0680 | 0.3465 |
| Air & Nonassisted | High Btu (>1000/scf) | 0.1380 | 0.2755 |
| Air & Nonassisted | Low Btu (184-1000/scf) | 0.0641 | 0.5496 |

Example 2:

For the sample case, calculate the mole percent of each constituent in the waste stream for both the average and maximum scenarios by dividing the individual flow rates by the total flow rates and multiplying by 100 percent.

Table 4: Calculation of constituents in mole percent.

| | Average Case | | Maximum Case | |
|---|---|---|---|---|
| | scfm | mole % | scfm | mole % |
| Butane+ | 10.16 | 5.08 | 12.70 | 5.08 |
| Propylene | 5.94 | 2.97 | 7.43 | 2.97 |
| Propane | 5.08 | 2.54 | 6.35 | 2.54 |
| Ethylene | 84.74 | 42.37 | 105.93 | 42.37 |
| Ethane | 37.28 | 18.64 | 46.60 | 18.64 |
| Hydrogen | 22.04 | 11.02 | 27.55 | 11.02 |
| Ammonia | 4.24 | 2.12 | 5.30 | 2.12 |
| Inerts | 30.50 | 15.26 | 38.13 | 15.26 |
| Totals | 200.00 | 100.00 | 250.00 | 100.00 |

In this case, our calculations are simplified since the average and maximum case waste streams have the same compositions. If they were of different composition, the following heating value calculations would be required for both cases. Note that the maximum case shows the maximum vent stream to the flare under normal operating conditions for the purpose of calculating emissions from the flare (upset and maintenance conditions are not considered).

Next, estimate the net, or lower, heating value of the waste stream

Since flares do not lend themselves to conventional emission testing techniques, only a few attempts have been made to characterize flare emissions. Recent EPA tests using propylene as flare gas indicated that efficiencies of 98 percent can be achieved when burning an offgas with at least 11,200 kJ/m$^3$ (300 Btu/ft$^3$). The tests conducted on steam-assisted flares at velocities as low as 39.6 meters per minute (m/min) (130 ft/min) to 1140 m/min (3750 ft/min), and on air-assisted flares at velocities of 180 m/min (617 ft/min) to 3960 m/min (13,087 ft/min) indicated that variations in incoming gas flow rates have no effect on the combustion efficiency. Flare gases with less than 16,770 kJ/m$^3$ (450 Btu/ft$^3$) do not smoke.

Table 13.5-1 presents flare emission factors, and Table 13.5-2 presents emission composition data obtained from the EPA tests.[1] Crude propylene was used as flare gas during the tests. Methane was a major fraction of hydrocarbons in the flare emissions, and acetylene was the dominant intermediate hydrocarbon species. Many other reports on flares indicate that acetylene is always formed as a stable intermediate product. The acetylene formed in the combustion reactions may react further with hydrocarbon radicals to form polyacetylenes followed by polycyclic hydrocarbons.[2]

In flaring waste gases containing no nitrogen compounds, NO is formed either by the fixation of atmospheric nitrogen (N) with oxygen (O) or by the reaction between the hydrocarbon radicals present in the combustion products and atmospheric nitrogen, by way of the intermediate stages, HCN, CN, and OCN.[2] Sulfur compounds contained in a flare gas stream are converted to $SO_2$ when burned. The amount of $SO_2$ emitted depends directly on the quantity of sulfur in the flared gases.

Table 13.5-1 (English Units). EMISSION FACTORS FOR FLARE OPERATIONS[a]

EMISSION FACTOR RATING: B

| Component | Emission Factor (lb/10$^6$ Btu) |
|---|---|
| Total hydrocarbons[b] | 0.14 |
| Carbon monoxide | 0.37 |
| Nitrogen oxides | 0.068 |
| Soot[c] | 0 - 274 |

[a] Reference 1. Based on tests using crude propylene containing 80% propylene and 20% propane.
[b] Measured as methane equivalent.
[c] Soot in concentration values: nonsmoking flares, 0 micrograms per liter (μg/L); lightly smoking flares, 40 μg/L; average smoking flares, 177 μg/L; and heavily smoking flares, 274 μg/L.

Table 13.5-2. HYDROCARBON COMPOSITION OF FLARE EMISSION[a]

| Composition | Volume % | |
|---|---|---|
| | Average | Range |
| Methane | 55 | 14 - 83 |
| Ethane/Ethylene | 8 | 1 - 14 |
| Acetylene | 5 | 0.3 - 23 |
| Propane | 7 | 0 - 16 |
| Propylene | 25 | 1 - 65 |

[a] Reference 1. The composition presented is an average of a number of test results obtained under the following sets of test conditions: steam-assisted flare using high-Btu-content feed; steam-assisted using low-Btu-content feed; air-assisted flare using high-Btu-content feed; and air-assisted flare using low-Btu-content feed. In all tests, "waste" gas was a synthetic gas consisting of a mixture of propylene and propane.

References For Section 13.5


1. *Flare Efficiency Study*, EPA-600/2-83-052, U. S. Environmental Protection Agency, Cincinnati, OH, July 1983.

2. K. D. Siegel, *Degree Of Conversion Of Flare Gas In Refinery High Flares*, Dissertation, University of Karlsruhe, Karlsruhe, Germany, February 1980.

3. *Manual On Disposal Of Refinery Wastes, Volume On Atmospheric Emissions*, API Publication 931, American Petroleum Institute, Washington, DC, June 1977.

HT-FG

H.L.P. Engineering, Inc.
Engr: Mr. Thomas LaSalle

LA Environmental Laboratory Accreditation
Cert. No. 01995
Denbury Onshore, LLC
Brookhaven Field Central Facility
Lincoln County, Mississippi

# Multi-Stage Separator Test

| Separator Conditions Pressure (psig) | Temperature (°F) | Liquid Density ($g/cm^3$) | Gas Density ($g/cm^3$) | Gas Gravity | Solution GOR, Rs (scf/stb) | Solution GOR, Rs (scf/sep bbl) | Liberated GOR, RI (scf/stb) | Separator Shrinkage (stb / bbl @ P,T) |
|---|---|---|---|---|---|---|---|---|
| **200** | **86** | **0.820** | **N/A** | **N/A** | **90** | **85** | 0 | **0.948** |
| 39 | 120 | 0.826 | 0.0059 | 1.512 | 15 | 14 | 75 | 0.984 |
| 0 | 80 | 0.838 | 0.0020 | 1.635 | 0 | 0 | 15 | 1.000 |

***Summary Data***

| | | |
|---|---|---|
| Total Separator Gas-Oil Ratio | 90 | scf/stb |
| Stock Tank Oil Gravity | 37.2 | °API at 80 °F 35.7 @ 60°F |
| Separator Volume Factor | 1.055 | bbls@ Psat/stb |
| Color | Crude | |

***Notes:***

- stb: stock tank barrel @ 80 °F.
- sep bbl: volume of separator liquid at P,T.
- Solution GOR is given as the gas volume per stock tank barrel (stb) and per separator barrel (sep bbl).
- Separator Volume Factor is the inverse of the Separator Shrinkage Factor.
- Standard Conditions: 0 psig at 80 °F.

# Certificate of Analysis

Number: 172-24050252-002A

**Williston Laboratory**
3111 1st Ave W
Williston, ND 58801

May 28, 2024

Kevin Hendricks
Denbury
202 S 4th Street West
Baker, MT 59313

Station Name: Brookhaven EOR
Sample Point: FLARE INLET GAS 180B
Method: GPA 2286
Analyzed: 05/23/2024 11:05:17

Sampled By: John Fielder
Sample Of: Gas Spot
Sample Date: 05/06/2024 07:45
Sample Conditions: 70 °F
PO/Ref. No: 4300204782

## Analytical Data

| Components | Mol. % | Wt. % | GPM at 14.696 psia |
|---|---|---|---|
| Nitrogen | 1.8392 | 1.1786 | |
| Methane | 1.9085 | 0.7004 | |
| Carbon Dioxide | 92.6113 | 93.2329 | |
| Ethane | 0.5491 | 0.3777 | 0.1474 |
| Propane | 0.7799 | 0.7867 | 0.2156 |
| Iso-Butane | 0.3497 | 0.4649 | 0.1148 |
| n-Butane | 0.7223 | 0.9603 | 0.2285 |
| Iso-Pentane | 0.3727 | 0.6151 | 0.1368 |
| n-Pentane | 0.3015 | 0.4976 | 0.1097 |
| Hexanes | 0.2081 | 0.4102 | 0.0858 |
| n-Hexane | 0.0937 | 0.1847 | 0.0387 |
| Benzene | 0.0227 | 0.0406 | 0.0064 |
| Cyclohexane | 0.0493 | 0.0949 | 0.0168 |
| Heptanes | 0.1100 | 0.2521 | 0.0509 |
| Methylcyclohexane | 0.0344 | 0.0773 | 0.0139 |
| Toluene | 0.0045 | 0.0095 | 0.0015 |
| Octanes | 0.0269 | 0.0703 | 0.0138 |
| Ethylbenzene | 0.0001 | 0.0002 | 0.0000 |
| Xylenes | 0.0025 | 0.0061 | 0.0010 |
| Nonanes | 0.0136 | 0.0399 | 0.0077 |
| | 100.0000 | 100.0000 | 1.1893 |

GPM TOTAL C2+ 1.191

| Calculated Physical Properties | Total |
|---|---|
| Calculated Molecular Weight | 43.72 |
| **GPA 2172 Calculation:** | |
| **Calculated Gross BTU per ft³ @ 14.696 psia & 60°F** | |
| Higher Heating Value, Real Gas Dry BTU | 139.6 |
| Water Sat. Gas Base BTU | 137.2 |
| Relative Density Real Gas | 1.5178 |
| Compressibility Factor | 0.9941 |

Data reviewed by: Mo Milton, Laboratory Technician

Quality Assurance: The above analyses are performed in accordance with ASTM, UOP, GPA guidelines for quality assurance, unless otherwise stated.

**Normalized Component Calculation**

LP Flare Gas Analysis; Southern Petroleum Laboratories Report No.: 172-24050252-002A

| COMPONENT | mole % | Normalized mole % | COMPONENT MW | Fuel Weight | Normalized WT % | Component BTU/scf | Partial Heating Values |
|---|---|---|---|---|---|---|---|
| **Water** | 0.0000 | 0.0000 | 18 | 0.00 | 0.0000 | 0 | 0 |
| **Nitrogen** | 1.8392 | 0.0000 | 28.0134 | 0.00 | 0.0000 | 0 | 0 |
| **Carbon Dioxide** | 92.6113 | 94.3465 | 44.01 | 41.52 | 94.3448 | 0 | 0 |
| **Methane** | 1.9085 | 1.9443 | 16.043 | 0.31 | 0.7087 | 1010 | 20 |
| **Ethane** | 0.5491 | 0.5594 | 30.07 | 0.17 | 0.3822 | 1770 | 10 |
| **Hydrogen Sulfide** | 0.0000 | 0.0000 | 34.08 | 0.00 | 0.0000 | 637 | 0 |
| **Propane** | 0.7799 | 0.7945 | 44.097 | 0.35 | 0.7961 | 2516 | 20 |
| **I-Butane** | 0.3497 | 0.3563 | 58.123 | 0.21 | 0.4705 | 3252 | 12 |
| **N-Butane** | 0.7223 | 0.7358 | 58.123 | 0.43 | 0.9718 | 3262 | 24 |
| **I-Pentane** | 0.3727 | 0.3797 | 72.15 | 0.27 | 0.6224 | 4001 | 15 |
| **N-Pentane** | 0.3015 | 0.3071 | 72.15 | 0.22 | 0.5035 | 4009 | 12 |
| **Other/Iso Hexanes** | 0.2081 | 0.2120 | 86.177 | 0.18 | 0.4151 | 4750 | 10 |
| **N-Hexane** | 0.0937 | 0.0955 | 86.177 | 0.08 | 0.1869 | 4756 | 5 |
| **Methylcyclopentane** | 0.0000 | 0.0000 | 84.1608 | 0.00 | 0.0000 | 4501 | 0 |
| **Benzene** | 0.0227 | 0.0231 | 78.114 | 0.02 | 0.0410 | 3742 | 1 |
| **Cyclohexane** | 0.0493 | 0.0502 | 84.1608 | 0.04 | 0.0960 | 4482 | 2 |
| **Heptane** | 0.1100 | 0.1121 | 100.204 | 0.11 | 0.2551 | 5503 | 6 |
| **Methylcyclohexane** | 0.0344 | 0.0350 | 98.188 | 0.03 | 0.0782 | 5216 | 2 |
| **Toluene** | 0.0045 | 0.0046 | 92.141 | 0.00 | 0.0096 | 4475 | 0 |
| **Iso-Octane/224-Trimethylpentane** | 0.0000 | 0.0000 | 114.231 | 0.00 | 0.0000 | 6232 | 0 |
| **Octanes** | 0.0269 | 0.0274 | 114.231 | 0.03 | 0.0711 | 6249 | 2 |
| **Ethylbenzene** | 0.0001 | 0.0001 | 106.167 | 0.00 | 0.0002 | 5222 | 0 |
| **Xylenes** | 0.0025 | 0.0025 | 106.167 | 0.00 | 0.0061 | 5209 | 0 |
| **Nonanes** | 0.0136 | 0.0139 | 128.258 | 0.02 | 0.0404 | 6997 | 1 |
| **Decanes Plus** | 0.0000 | 0.0000 | 142.285 | 0.00 | 0.0000 | 7743 | 0 |
| **TOTALS** | **100.0000** | **100.0000** | **MW=** | **44.01** | **100.0000** | **btu/scf =** | **141.366938** |
| | | | | **sg** | **1.5176** | | |
| | | | | **VOC wt%** | **4.5642** | | |
| | | | | **Toxic wt%** | **0.2439** | | |

# Weighted Average for HT-WG & WFV-WG to LP Control Flare (EPN: 31-05-F)

| | | |
|---|---|---|
| **Total Heater Treater Flash Gas Vapors:** | **6100.62** | **SCFH** |
| **Total Water Flash Drum Flash Gas Vapors:** | **950.00** | **SCFH** |
| **Total Stream Flowrate:** | **7050.62** | **SCFH** |

## Tank Emission Calculations Based on AP 42 Chapter 7 (June 2020, Section 7.1.3.1), Fixed Roof

| | |
|---|---|
| *Tank ID* | **34-17-SEP** |
| *Tank Description* | **API Separator (SP-128)** |
| *Company Name* | **Denbury Onshore, LLC** |

| | |
|---|---|
| *Tank Orientation* | **Horizontal** |
| *Tank Diameter (D ft)* | **10.00** |
| *Vertical Height/Horizontal Length ($H_S$ ft)* | **17.00** |
| *Roof Height ($H_R$ ft)* | |
| *Max Liquid Height ($H_{LX}$ ft)* | **10.00** |
| *Avg Liquid Height ($H_L$ ft)* | **5.00** |
| *Breather Vent Pressure Setting ($P_{BP}$ psig)* | |
| *Breather Vent Vacuum Setting ($P_{BV}$ psig)* | |
| *actual tank pressure ($P_I$ psig)* | **0.0** |
| *Shell Paint Solar Absorptance ($S_A$)* | **0.90** |
| *Roof Paint Solar Absorptance ($R_A$)* | **0.9** |
| *breather vent pressure range ($\Delta P_B$ psi)* | **0.00** |
| *roof outage ($H_{RO}$ ft)* | |

| | |
|---|---|
| *Tank Shell Color/Shade* | **Red - Primer** |
| *Tank Shell Paint Condition* | **average** |
| *Tank Roof Color/Shade* | **Red - Primer** |
| *Tank Roof Paint Condition* | **average** |
| *Roof Type* | **horizontal tank** |
| *Tank Insulation* | **no insulation** |
| *Tank Underground?* | **no** |
| *Annual Throughput (Q bbl/year)* | **9,620.00** |
| *Annual Turnovers, N* | **40.45** |
| *Annual Hours* | **8,760** |
| *tank max liquid volume ($V_{LX}$ $ft^3$)* | **1,335.18** |
| *vapor space outage ($H_{VO}$ ft)* | **3.927** |
| *vapor space volume ($V_V$ $ft^3$)* | **667.59** |

| | |
|---|---|
| *Major City for Meterological Data* | **Jackson, MS** |
| *Site Elevation (ft)* | **300** |
| *Atmospheric Pressure ($P_A$ psia)* | **14.537** |
| *Table 7.1-2 Liquid* | |
| *RVP** | **5.37** |
| *API gravity** | **36.7** |
| *°F basis for gv** | **60.0** |
| *bubble point psia* | |
| *API gravity at 60F* | **36.7** |
| *API gravity at 100F* | **39.5** |
| *Working Loss Product Factor ($K_P$)* | **0.75** |
| *working loss turnover factor $K_N$* | **0.908** |

*sales oil data determines RVP per API pub 4683

Tank contents (if not selected from Table 7.1-2):

| *component* | *mole%* | *MW* | *lb/mole* | *wt%* | *Antoine constants (log 10, mmHg, °C) A* | *B* | *C* |
|---|---|---|---|---|---|---|---|
| Crude Oil | 0.208 | 50.000 | 0.10395 | 0.57490 | 11.194 | 5216.548 | 0.000 |
| Water | 99.792 | 18.015 | 17.97755 | 99.42510 | 8.108 | 1750.300 | 235.000 |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| | 100.000 | | 18.081 | 100.000 | | | |



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| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Avg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| hourly average maximum ambient temperature ($T_{AX}$ °F) | 56.50 | 60.80 | 68.10 | 75.70 | 83.00 | 89.00 | 91.10 | 91.20 | 86.50 | 77.10 | 66.30 | 58.10 | 75.30 |
| hourly average minimum ambient temperature ($T_{AN}$ °F) | 37.00 | 39.30 | 45.90 | 53.30 | 62.50 | 69.20 | 72.10 | 71.40 | 65.50 | 53.90 | 43.90 | 37.90 | 54.30 |
| daily total solar insolation factor (I btu/ft$^2$ day) | 783 | 1039 | 1369 | 1762 | 1929 | 2025 | 1969 | 1849 | 1576 | 1262 | 922 | 726 | 1434 |
| daily average ambient temperature ($T_{AA}$ °F) | 46.75 | 50.05 | 57.00 | 64.50 | 72.75 | 79.10 | 81.60 | 81.30 | 76.00 | 65.50 | 55.10 | 48.00 | 64.80 |
| liquid bulk temperature ($T_B$ °F) | 48.86 | 52.86 | 60.70 | 69.26 | 77.96 | 84.57 | 86.92 | 86.29 | 80.26 | 68.91 | 57.59 | 49.96 | 68.67 |
| average vapor temperature ($T_V$ °F) | 52.44 | 57.59 | 66.94 | 77.29 | 86.76 | 93.80 | 95.90 | 94.72 | 87.44 | 74.66 | 61.79 | 53.27 | 75.21 |
| daily ambient temperature range ($\Delta T_A$ °R) | 19.50 | 21.50 | 22.20 | 22.40 | 20.50 | 19.80 | 19.00 | 19.80 | 21.00 | 23.20 | 22.40 | 20.20 | 21.00 |
| daily vapor temperature range ($\Delta T_V$ °R) | 27.74 | 33.75 | 40.18 | 47.40 | 49.07 | 50.31 | 48.74 | 47.14 | 43.07 | 38.96 | 32.28 | 27.32 | 40.51 |
| daily average liquid surface temperature ($T_{LA}$ °F) | 50.65 | 55.22 | 63.82 | 73.28 | 82.36 | 89.19 | 91.41 | 90.51 | 83.85 | 71.79 | 59.69 | 51.62 | 71.94 |
| daily maximum liquid surface temperature ($T_{LX}$ °F) | 57.59 | 63.66 | 73.86 | 85.12 | 94.63 | 101.76 | 103.59 | 102.29 | 94.62 | 81.52 | 67.76 | 58.45 | 82.07 |
| daily minimum liquid surface temperature ($T_{LN}$ °F) | 43.71 | 46.79 | 53.77 | 61.43 | 70.09 | 76.61 | 79.22 | 78.72 | 73.08 | 62.05 | 51.62 | 44.79 | 61.81 |
| vapor pressure at daily avg liq surface temp $T_{LA}$ ($P_{VA}$ psia) | 0.187 | 0.221 | 0.300 | 0.413 | 0.556 | 0.691 | 0.740 | 0.720 | 0.584 | 0.393 | 0.259 | 0.194 | 0.395 |
| vapor pressure at daily max liq surface temp $T_{LX}$ ($P_{VX}$ psia) | 0.241 | 0.298 | 0.422 | 0.608 | 0.817 | 1.013 | 1.070 | 1.029 | 0.817 | 0.542 | 0.343 | 0.248 | 0.551 |
| vapor pressure at daily min liq surface temp $T_{LN}$ ($P_{VN}$ psia) | 0.145 | 0.162 | 0.210 | 0.276 | 0.371 | 0.462 | 0.503 | 0.495 | 0.411 | 0.282 | 0.194 | 0.151 | 0.280 |
| daily vapor pressure range ($\Delta P_V$) | 0.0960 | 0.1357 | 0.2117 | 0.3322 | 0.4457 | 0.5516 | 0.5667 | 0.5346 | 0.4062 | 0.2600 | 0.1491 | 0.0976 | 0.2719 |
| vapor space expansion factor ($K_E$) | 0.0611 | 0.0750 | 0.0916 | 0.1125 | 0.1224 | 0.1315 | 0.1295 | 0.1244 | 0.1084 | 0.0917 | 0.0726 | 0.0602 | 0.0954 |
| vapor molecular weight ($M_V$ lb/lbmole) | 18.95 | 18.88 | 18.77 | 18.67 | 18.59 | 18.54 | 18.52 | 18.53 | 18.58 | 18.69 | 18.82 | 18.94 | 18.68 |
| monthly hours with avg = total annual | 744 | 672 | 744 | 720 | 744 | 720 | 744 | 744 | 720 | 744 | 720 | 744 | 8,760 |
| throughputs (ft$^3$/month) and avg = total annual | 4,587 | 4,143 | 4,587 | 4,439 | 4,587 | 4,439 | 4,587 | 4,587 | 4,439 | 4,587 | 4,439 | 4,587 | 54,007 |
| monthly turnovers (N/month) with avg = total annual | 3.44 | 3.10 | 3.44 | 3.32 | 3.44 | 3.32 | 3.44 | 3.44 | 3.32 | 3.44 | 3.32 | 3.44 | 40.45 |
| vented vapor saturation factor ($K_S$) | 0.9625 | 0.9560 | 0.9413 | 0.9208 | 0.8962 | 0.8743 | 0.8665 | 0.8697 | 0.8917 | 0.9243 | 0.9488 | 0.9612 | 0.9240 |
| vent setting correction factor ($K_B$) | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| vapor density ($W_V$ lb/ft$^3$) | 0.0006 | 0.0008 | 0.0010 | 0.0013 | 0.0018 | 0.0022 | 0.0023 | 0.0022 | 0.0018 | 0.0013 | 0.0009 | 0.0007 | 0.0013 |
| standing storage losses ($L_S$ lb/month & avg is lb/yr) | 1.18 | 1.24 | 1.82 | 2.37 | 3.22 | 3.81 | 4.20 | 4.09 | 3.26 | 2.34 | 1.54 | 1.22 | 30.28 |
| working losses ($L_W$ lb/month & avg is lb/yr) | 2.02 | 2.12 | 3.11 | 4.05 | 5.51 | 6.52 | 7.19 | 7.01 | 5.59 | 4.01 | 2.64 | 2.09 | 51.85 |
| total losses ($L_T$ lb/month & avg is lb/yr) | 3.20 | 3.37 | 4.93 | 6.42 | 8.73 | 10.33 | 11.38 | 11.10 | 8.85 | 6.34 | 4.18 | 3.31 | 82.12 |
| max hourly Q in bbl/hour | 6.17 | 6.17 | 6.17 | 6.17 | 6.17 | 6.17 | 6.17 | 6.17 | 6.17 | 6.17 | 6.17 | 6.17 | |
| max hourly working loss at $P_{VX}$ & Q/hr & $K_N$=1 ($L_W$ lb/hr) | 0.003 | 0.003 | 0.005 | 0.006 | 0.008 | 0.010 | 0.011 | 0.010 | 0.009 | 0.006 | 0.004 | 0.003 | |
| breathing/standing loss ($L_S$ lb/hr) | 0.002 | 0.002 | 0.002 | 0.004 | 0.005 | 0.007 | 0.007 | 0.007 | 0.005 | 0.003 | 0.002 | 0.002 | |
| max hourly total loss ($L_T$ lb/hr) | 0.005 | 0.005 | 0.007 | 0.010 | 0.014 | 0.017 | 0.018 | 0.017 | 0.014 | 0.009 | 0.006 | 0.005 | |

| $L_S$ sum months | $L_W$ sum months | $L_T$ sum months |
|---|---|---|
| 30.28 | 51.85 | 82.12 |

The monthly sums will be greater than the annual average since the monthly variables yield higher emissions

**Emissions Summary:**

| | avg lbs/hr | max lbs/hr | lbs/yr |
|---|---|---|---|
| **Standing/Breathing Loss $L_S$** | **0.003** | **0.007** | **27.654** |
| **Working Loss $L_W$** | **0.005** | **0.011** | **47.355** |
| **Total Loss $L_T$** | **0.009** | **0.018** | **75.009** |

max hourly total loss may not add up to $L_S$ + $L_W$ as their max values may be in different months

## Tank Emission Calculations Based on AP 42 Chapter 7 (June 2020, Section 7.1.3.1), Fixed Roof

| | |
|---|---|
| *Tank ID* | **35-17-IWT** |
| *Tank Description* | **480 BBL Injection Water Tank (V-181A)** |
| *Company Name* | **Denbury Onshore, LLC** |

| | |
|---|---|
| *Tank Orientation* | **Vertical** |
| *Tank Diameter (D ft)* | **12.00** |
| *Vertical Height/Horizontal Length ($H_S$ ft)* | **24.10** |
| *Roof Height ($H_R$ ft)* | **0.38** |
| *Max Liquid Height ($H_{LX}$ ft)* | **23.10** |
| *Avg Liquid Height ($H_L$ ft)* | **11.55** |
| *Breather Vent Pressure Setting ($P_{BP}$ psig)* | |
| *Breather Vent Vacuum Setting ($P_{BV}$ psig)* | |
| *actual tank pressure ($P_I$ psig)* | **0.0** |
| *Shell Paint Solar Absorptance ($S_A$)* | **0.90** |
| *Roof Paint Solar Absorptance ($R_A$)* | **0.9** |
| *breather vent pressure range ($\Delta P_B$ psi)* | **0.00** |
| *roof outage ($H_{RO}$ ft)* | **0.1250** |

| | |
|---|---|
| *Tank Shell Color/Shade* | **Red - Primer** |
| *Tank Shell Paint Condition* | **average** |
| *Tank Roof Color/Shade* | **Red - Primer** |
| *Tank Roof Paint Condition* | **average** |
| *Roof Type* | **vertical tank with cone roof** |
| *Tank Insulation* | **no insulation** |
| *Tank Underground?* | **no** |
| *Annual Throughput (Q bbl/year)* | **9,600.00** |
| *Annual Turnovers, N* | **20.63** |
| *Annual Hours* | **8,760** |
| *tank max liquid volume ($V_{LX}$ $ft^3$)* | **2,612.55** |
| *vapor space outage ($H_{VO}$ ft)* | **12.675** |
| *vapor space volume ($V_V$ $ft^3$)* | **1,433.51** |

| | |
|---|---|
| *Major City for Meterological Data* | **Jackson, MS** |
| *Site Elevation (ft)* | **300** |
| *Atmospheric Pressure ($P_A$ psia)* | **14.537** |
| *Table 7.1-2 Liquid* | |
| *RVP** | |
| *API gravity** | |
| *°F basis for gv** | |
| *bubble point psia* | |
| *API gravity at 60F* | |
| *API gravity at 100F* | |
| *Working Loss Product Factor ($K_P$)* | **0.75** |
| *working loss turnover factor $K_N$* | **1.000** |

*sales oil data determines RVP per API pub 4683

Tank contents (if not selected from Table 7.1-2):

| *component* | *mole%* | *MW* | *lb/mole* | *wt%* | *Antoine constants (log 10, mmHg, °C) A* | *B* | *C* |
|---|---|---|---|---|---|---|---|
| Water | 100.000 | 18.015 | 18.01500 | 100.00000 | 8.108 | 1750.300 | 235.000 |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| | 100.000 | | 18.015 | 100.000 | | | |



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| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Avg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| hourly average maximum ambient temperature ($T_{AX}$ °F) | 56.50 | 60.80 | 68.10 | 75.70 | 83.00 | 89.00 | 91.10 | 91.20 | 86.50 | 77.10 | 66.30 | 58.10 | 75.30 |
| hourly average minimum ambient temperature ($T_{AN}$ °F) | 37.00 | 39.30 | 45.90 | 53.30 | 62.50 | 69.20 | 72.10 | 71.40 | 65.50 | 53.90 | 43.90 | 37.90 | 54.30 |
| daily total solar insolation factor (I btu/ft$^2$ day) | 783 | 1039 | 1369 | 1762 | 1929 | 2025 | 1969 | 1849 | 1576 | 1262 | 922 | 726 | 1434 |
| daily average ambient temperature ($T_{AA}$ °F) | 46.75 | 50.05 | 57.00 | 64.50 | 72.75 | 79.10 | 81.60 | 81.30 | 76.00 | 65.50 | 55.10 | 48.00 | 64.80 |
| liquid bulk temperature ($T_B$ °F) | 48.86 | 52.86 | 60.70 | 69.26 | 77.96 | 84.57 | 86.92 | 86.29 | 80.26 | 68.91 | 57.59 | 49.96 | 68.67 |
| average vapor temperature ($T_V$ °F) | 52.27 | 57.38 | 66.65 | 76.93 | 86.35 | 93.38 | 95.49 | 94.34 | 87.11 | 74.40 | 61.60 | 53.12 | 74.91 |
| daily ambient temperature range ($\Delta T_A$ °R) | 19.50 | 21.50 | 22.20 | 22.40 | 20.50 | 19.80 | 19.00 | 19.80 | 21.00 | 23.20 | 22.40 | 20.20 | 21.00 |
| daily vapor temperature range ($\Delta T_V$ °R) | 27.74 | 33.75 | 40.18 | 47.40 | 49.07 | 50.31 | 48.74 | 47.14 | 43.07 | 38.96 | 32.28 | 27.39 | 40.51 |
| daily average liquid surface temperature ($T_{LA}$ °F) | 50.57 | 55.12 | 63.68 | 73.09 | 82.16 | 88.97 | 91.20 | 90.32 | 83.68 | 71.65 | 59.60 | 51.54 | 71.79 |
| daily maximum liquid surface temperature ($T_{LX}$ °F) | 57.50 | 63.55 | 73.72 | 84.94 | 94.42 | 101.55 | 103.39 | 102.10 | 94.45 | 81.39 | 67.66 | 58.39 | 81.92 |
| daily minimum liquid surface temperature ($T_{LN}$ °F) | 43.63 | 46.68 | 53.63 | 61.24 | 69.89 | 76.40 | 79.02 | 78.53 | 72.92 | 61.91 | 51.53 | 44.69 | 61.66 |
| vapor pressure at daily avg liq surface temp $T_{LA}$ ($P_{VA}$ psia) | 0.182 | 0.215 | 0.292 | 0.403 | 0.544 | 0.676 | 0.725 | 0.706 | 0.572 | 0.384 | 0.253 | 0.188 | 0.386 |
| vapor pressure at daily max liq surface temp $T_{LX}$ ($P_{VX}$ psia) | 0.234 | 0.291 | 0.412 | 0.595 | 0.802 | 0.995 | 1.051 | 1.012 | 0.802 | 0.531 | 0.335 | 0.242 | 0.540 |
| vapor pressure at daily min liq surface temp $T_{LN}$ ($P_{VN}$ psia) | 0.140 | 0.157 | 0.203 | 0.268 | 0.362 | 0.450 | 0.491 | 0.483 | 0.401 | 0.274 | 0.188 | 0.146 | 0.272 |
| daily vapor pressure range ($\Delta P_V$) | 0.0945 | 0.1335 | 0.2085 | 0.3274 | 0.4398 | 0.5447 | 0.5599 | 0.5282 | 0.4013 | 0.2566 | 0.1469 | 0.0962 | 0.2681 |
| vapor space expansion factor ($K_E$) | 0.0610 | 0.0749 | 0.0914 | 0.1121 | 0.1220 | 0.1310 | 0.1290 | 0.1239 | 0.1080 | 0.0914 | 0.0724 | 0.0603 | 0.0952 |
| vapor molecular weight ($M_V$ lb/lbmole) | 18.02 | 18.02 | 18.02 | 18.02 | 18.02 | 18.02 | 18.02 | 18.02 | 18.02 | 18.02 | 18.02 | 18.02 | 18.02 |
| monthly hours with avg = total annual | 744 | 672 | 744 | 720 | 744 | 720 | 744 | 744 | 720 | 744 | 720 | 744 | 8,760 |
| throughputs (ft$^3$/month) and avg = total annual | 4,577 | 4,134 | 4,577 | 4,430 | 4,577 | 4,430 | 4,577 | 4,577 | 4,430 | 4,577 | 4,430 | 4,577 | 53,894 |
| monthly turnovers (N/month) with avg = total annual | 1.75 | 1.58 | 1.75 | 1.70 | 1.75 | 1.70 | 1.75 | 1.75 | 1.70 | 1.75 | 1.70 | 1.75 | 20.63 |
| vented vapor saturation factor ($K_S$) | 0.8912 | 0.8739 | 0.8361 | 0.7868 | 0.7323 | 0.6876 | 0.6724 | 0.6784 | 0.7225 | 0.7949 | 0.8550 | 0.8877 | 0.7941 |
| vent setting correction factor ($K_B$) | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| vapor density ($W_V$ lb/ft$^3$) | 0.0006 | 0.0007 | 0.0009 | 0.0013 | 0.0017 | 0.0021 | 0.0022 | 0.0021 | 0.0018 | 0.0012 | 0.0008 | 0.0006 | 0.0012 |
| standing storage losses ($L_S$ lb/month & avg is lb/yr) | 2.00 | 2.12 | 3.13 | 4.10 | 5.62 | 6.67 | 7.37 | 7.18 | 5.70 | 4.06 | 2.64 | 2.07 | 52.66 |
| working losses ($L_W$ lb/month & avg is lb/yr) | 2.05 | 2.16 | 3.19 | 4.19 | 5.74 | 6.82 | 7.53 | 7.34 | 5.83 | 4.15 | 2.70 | 2.12 | 53.83 |
| total losses ($L_T$ lb/month & avg is lb/yr) | 4.05 | 4.28 | 6.32 | 8.29 | 11.36 | 13.50 | 14.90 | 14.52 | 11.54 | 8.20 | 5.35 | 4.19 | 106.49 |
| max hourly Q in bbl/hour | 6.15 | 6.15 | 6.15 | 6.15 | 6.15 | 6.15 | 6.15 | 6.15 | 6.15 | 6.15 | 6.15 | 6.15 | |
| max hourly working loss at $P_{VX}$ & Q/hr & $K_N$=1 ($L_W$ lb/hr) | 0.003 | 0.003 | 0.004 | 0.006 | 0.008 | 0.009 | 0.010 | 0.010 | 0.008 | 0.006 | 0.004 | 0.003 | |
| breathing/standing loss ($L_S$ lb/hr) | 0.003 | 0.003 | 0.004 | 0.007 | 0.009 | 0.011 | 0.011 | 0.011 | 0.008 | 0.005 | 0.004 | 0.003 | |
| max hourly total loss ($L_T$ lb/hr) | 0.005 | 0.006 | 0.009 | 0.012 | 0.017 | 0.021 | 0.021 | 0.021 | 0.016 | 0.011 | 0.007 | 0.006 | |

| $L_S$ sum months | $L_W$ sum months | $L_T$ sum months |
|---|---|---|
| 52.66 | 53.83 | 106.49 |

The monthly sums will be greater than the annual average since the monthly variables yield higher emissions

**Emissions Summary:**

| | avg lbs/hr | max lbs/hr | lbs/yr |
|---|---|---|---|
| **Standing/Breathing Loss $L_S$** | **0.005** | **0.011** | **47.933** |
| **Working Loss $L_W$** | **0.006** | **0.010** | **48.994** |
| **Total Loss $L_T$** | **0.011** | **0.021** | **96.926** |

max hourly total loss may not add up to $L_S$ + $L_W$ as their max values may be in different months



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## Tank Emission Calculations Based on AP 42 Chapter 7 (June 2020, Section 7.1.3.1), Fixed Roof

| | |
|---|---|
| *Tank ID* | **36-17-IWT** |
| *Tank Description* | **480 BBL Injection Water Tank (V-181B)** |
| *Company Name* | **Denbury Onshore, LLC** |

| | |
|---|---|
| *Tank Orientation* | **Vertical** |
| *Tank Diameter (D ft)* | **12.00** |
| *Vertical Height/Horizontal Length ($H_S$ ft)* | **24.10** |
| *Roof Height ($H_R$ ft)* | **0.38** |
| *Max Liquid Height ($H_{LX}$ ft)* | **23.10** |
| *Avg Liquid Height ($H_L$ ft)* | **11.55** |
| *Breather Vent Pressure Setting ($P_{BP}$ psig)* | |
| *Breather Vent Vacuum Setting ($P_{BV}$ psig)* | |
| *actual tank pressure ($P_I$ psig)* | **0.0** |
| *Shell Paint Solar Absorptance ($S_A$)* | **0.90** |
| *Roof Paint Solar Absorptance ($R_A$)* | **0.9** |
| *breather vent pressure range ($\Delta P_B$ psi)* | **0.00** |
| *roof outage ($H_{RO}$ ft)* | **0.1250** |

| | |
|---|---|
| *Tank Shell Color/Shade* | **Red - Primer** |
| *Tank Shell Paint Condition* | **average** |
| *Tank Roof Color/Shade* | **Red - Primer** |
| *Tank Roof Paint Condition* | **average** |
| *Roof Type* | **vertical tank with cone roof** |
| *Tank Insulation* | **no insulation** |
| *Tank Underground?* | **no** |
| *Annual Throughput (Q bbl/year)* | **9,600.00** |
| *Annual Turnovers, N* | **20.63** |
| *Annual Hours* | **8,760** |
| *tank max liquid volume ($V_{LX}$ $ft^3$)* | **2,612.55** |
| *vapor space outage ($H_{VO}$ ft)* | **12.675** |
| *vapor space volume ($V_V$ $ft^3$)* | **1,433.51** |

| | |
|---|---|
| *Major City for Meterological Data* | **Jackson, MS** |
| *Site Elevation (ft)* | **300** |
| *Atmospheric Pressure ($P_A$ psia)* | **14.537** |
| *Table 7.1-2 Liquid* | |
| *RVP** | |
| *API gravity** | |
| *°F basis for gv** | |
| *bubble point psia* | |
| *API gravity at 60F* | |
| *API gravity at 100F* | |
| *Working Loss Product Factor ($K_P$)* | **0.75** |
| *working loss turnover factor $K_N$* | **1.000** |

*sales oil data determines RVP per API pub 4683

Tank contents (if not selected from Table 7.1-2):

| *component* | *mole%* | *MW* | *lb/mole* | *wt%* | *Antoine constants ($\log_{10}$, mmHg, °C) A* | *B* | *C* |
|---|---|---|---|---|---|---|---|
| Water | 100.000 | 18.015 | 18.01500 | 100.00000 | 8.108 | 1750.300 | 235.000 |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| | 100.000 | | 18.015 | 100.000 | | | |



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| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Avg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| hourly average maximum ambient temperature ($T_{AX}$ °F) | 56.50 | 60.80 | 68.10 | 75.70 | 83.00 | 89.00 | 91.10 | 91.20 | 86.50 | 77.10 | 66.30 | 58.10 | 75.30 |
| hourly average minimum ambient temperature ($T_{AN}$ °F) | 37.00 | 39.30 | 45.90 | 53.30 | 62.50 | 69.20 | 72.10 | 71.40 | 65.50 | 53.90 | 43.90 | 37.90 | 54.30 |
| daily total solar insolation factor (I btu/ft$^2$ day) | 783 | 1039 | 1369 | 1762 | 1929 | 2025 | 1969 | 1849 | 1576 | 1262 | 922 | 726 | 1434 |
| daily average ambient temperature ($T_{AA}$ °F) | 46.75 | 50.05 | 57.00 | 64.50 | 72.75 | 79.10 | 81.60 | 81.30 | 76.00 | 65.50 | 55.10 | 48.00 | 64.80 |
| liquid bulk temperature ($T_B$ °F) | 48.86 | 52.86 | 60.70 | 69.26 | 77.96 | 84.57 | 86.92 | 86.29 | 80.26 | 68.91 | 57.59 | 49.96 | 68.67 |
| average vapor temperature ($T_V$ °F) | 52.27 | 57.38 | 66.65 | 76.93 | 86.35 | 93.38 | 95.49 | 94.34 | 87.11 | 74.40 | 61.60 | 53.12 | 74.91 |
| daily ambient temperature range ($\Delta T_A$ °R) | 19.50 | 21.50 | 22.20 | 22.40 | 20.50 | 19.80 | 19.00 | 19.80 | 21.00 | 23.20 | 22.40 | 20.20 | 21.00 |
| daily vapor temperature range ($\Delta T_V$ °R) | 27.74 | 33.75 | 40.18 | 47.40 | 49.07 | 50.31 | 48.74 | 47.14 | 43.07 | 38.96 | 32.28 | 27.39 | 40.51 |
| daily average liquid surface temperature ($T_{LA}$ °F) | 50.57 | 55.12 | 63.68 | 73.09 | 82.16 | 88.97 | 91.20 | 90.32 | 83.68 | 71.65 | 59.60 | 51.54 | 71.79 |
| daily maximum liquid surface temperature ($T_{LX}$ °F) | 57.50 | 63.55 | 73.72 | 84.94 | 94.42 | 101.55 | 103.39 | 102.10 | 94.45 | 81.39 | 67.66 | 58.39 | 81.92 |
| daily minimum liquid surface temperature ($T_{LN}$ °F) | 43.63 | 46.68 | 53.63 | 61.24 | 69.89 | 76.40 | 79.02 | 78.53 | 72.92 | 61.91 | 51.53 | 44.69 | 61.66 |
| vapor pressure at daily avg liq surface temp $T_{LA}$ ($P_{VA}$ psia) | 0.182 | 0.215 | 0.292 | 0.403 | 0.544 | 0.676 | 0.725 | 0.706 | 0.572 | 0.384 | 0.253 | 0.188 | 0.386 |
| vapor pressure at daily max liq surface temp $T_{LX}$ ($P_{VX}$ psia) | 0.234 | 0.291 | 0.412 | 0.595 | 0.802 | 0.995 | 1.051 | 1.012 | 0.802 | 0.531 | 0.335 | 0.242 | 0.540 |
| vapor pressure at daily min liq surface temp $T_{LN}$ ($P_{VN}$ psia) | 0.140 | 0.157 | 0.203 | 0.268 | 0.362 | 0.450 | 0.491 | 0.483 | 0.401 | 0.274 | 0.188 | 0.146 | 0.272 |
| daily vapor pressure range ($\Delta P_V$) | 0.0945 | 0.1335 | 0.2085 | 0.3274 | 0.4398 | 0.5447 | 0.5599 | 0.5282 | 0.4013 | 0.2566 | 0.1469 | 0.0962 | 0.2681 |
| vapor space expansion factor ($K_E$) | 0.0610 | 0.0749 | 0.0914 | 0.1121 | 0.1220 | 0.1310 | 0.1290 | 0.1239 | 0.1080 | 0.0914 | 0.0724 | 0.0603 | 0.0952 |
| vapor molecular weight ($M_V$ lb/lbmole) | 18.02 | 18.02 | 18.02 | 18.02 | 18.02 | 18.02 | 18.02 | 18.02 | 18.02 | 18.02 | 18.02 | 18.02 | 18.02 |
| monthly hours with avg = total annual | 744 | 672 | 744 | 720 | 744 | 720 | 744 | 744 | 720 | 744 | 720 | 744 | 8,760 |
| throughputs (ft$^3$/month) and avg = total annual | 4,577 | 4,134 | 4,577 | 4,430 | 4,577 | 4,430 | 4,577 | 4,577 | 4,430 | 4,577 | 4,430 | 4,577 | 53,894 |
| monthly turnovers (N/month) with avg = total annual | 1.75 | 1.58 | 1.75 | 1.70 | 1.75 | 1.70 | 1.75 | 1.75 | 1.70 | 1.75 | 1.70 | 1.75 | 20.63 |
| vented vapor saturation factor ($K_S$) | 0.8912 | 0.8739 | 0.8361 | 0.7868 | 0.7323 | 0.6876 | 0.6724 | 0.6784 | 0.7225 | 0.7949 | 0.8550 | 0.8877 | 0.7941 |
| vent setting correction factor ($K_B$) | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| vapor density ($W_V$ lb/ft$^3$) | 0.0006 | 0.0007 | 0.0009 | 0.0013 | 0.0017 | 0.0021 | 0.0022 | 0.0021 | 0.0018 | 0.0012 | 0.0008 | 0.0006 | 0.0012 |
| standing storage losses ($L_S$ lb/month & avg is lb/yr) | 2.00 | 2.12 | 3.13 | 4.10 | 5.62 | 6.67 | 7.37 | 7.18 | 5.70 | 4.06 | 2.64 | 2.07 | 52.66 |
| working losses ($L_W$ lb/month & avg is lb/yr) | 2.05 | 2.16 | 3.19 | 4.19 | 5.74 | 6.82 | 7.53 | 7.34 | 5.83 | 4.15 | 2.70 | 2.12 | 53.83 |
| total losses ($L_T$ lb/month & avg is lb/yr) | 4.05 | 4.28 | 6.32 | 8.29 | 11.36 | 13.50 | 14.90 | 14.52 | 11.54 | 8.20 | 5.35 | 4.19 | 106.49 |
| max hourly Q in bbl/hour | 6.15 | 6.15 | 6.15 | 6.15 | 6.15 | 6.15 | 6.15 | 6.15 | 6.15 | 6.15 | 6.15 | 6.15 | |
| max hourly working loss at $P_{VX}$ & Q/hr & $K_N$=1 ($L_W$ lb/hr) | 0.003 | 0.003 | 0.004 | 0.006 | 0.008 | 0.009 | 0.010 | 0.010 | 0.008 | 0.006 | 0.004 | 0.003 | |
| breathing/standing loss ($L_S$ lb/hr) | 0.003 | 0.003 | 0.004 | 0.007 | 0.009 | 0.011 | 0.011 | 0.011 | 0.008 | 0.005 | 0.004 | 0.003 | |
| max hourly total loss ($L_T$ lb/hr) | 0.005 | 0.006 | 0.009 | 0.012 | 0.017 | 0.021 | 0.021 | 0.021 | 0.016 | 0.011 | 0.007 | 0.006 | |

| $L_S$ sum months | $L_W$ sum months | $L_T$ sum months |
|---|---|---|
| 52.66 | 53.83 | 106.49 |

The monthly sums will be greater than the annual average since the monthly variables yield higher emissions

**Emissions Summary:**

| | avg lbs/hr | max lbs/hr | lbs/yr |
|---|---|---|---|
| **Standing/Breathing Loss $L_S$** | **0.005** | **0.011** | **47.933** |
| **Working Loss $L_W$** | **0.006** | **0.010** | **48.994** |
| **Total Loss $L_T$** | **0.011** | **0.021** | **96.926** |

max hourly total loss may not add up to $L_S$ + $L_W$ as their max values may be in different months



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## Tank Emission Calculations Based on AP 42 Chapter 7 (June 2020, Section 7.1.3.1), Fixed Roof

| | |
|---|---|
| *Tank ID* | **37-17-TWP** |
| *Tank Description* | **Truck Washdown Pit (SP-183)** |
| *Company Name* | **Denbury Onshore, LLC** |

| | |
|---|---|
| *Tank Orientation* | **Horizontal** |
| *Tank Diameter (D ft)* | **10.00** |
| *Vertical Height/Horizontal Length ($H_S$ ft)* | **17.00** |
| *Roof Height ($H_R$ ft)* | |
| *Max Liquid Height ($H_{LX}$ ft)* | **10.00** |
| *Avg Liquid Height ($H_L$ ft)* | **5.00** |
| *Breather Vent Pressure Setting ($P_{BP}$ psig)* | |
| *Breather Vent Vacuum Setting ($P_{BV}$ psig)* | |
| *actual tank pressure ($P_I$ psig)* | **0.0** |
| *Shell Paint Solar Absorptance ($S_A$)* | **0.90** |
| *Roof Paint Solar Absorptance ($R_A$)* | **0.9** |
| *breather vent pressure range ($\Delta P_B$ psi)* | **0.00** |
| *roof outage ($H_{RO}$ ft)* | |

| | |
|---|---|
| *Tank Shell Color/Shade* | **Red - Primer** |
| *Tank Shell Paint Condition* | **average** |
| *Tank Roof Color/Shade* | **Red - Primer** |
| *Tank Roof Paint Condition* | **average** |
| *Roof Type* | **horizontal tank** |
| *Tank Insulation* | **no insulation** |
| *Tank Underground?* | **no** |
| *Annual Throughput (Q bbl/year)* | **20.00** |
| *Annual Turnovers, N* | **0.08** |
| *Annual Hours* | **8,760** |
| *tank max liquid volume ($V_{LX}$ $ft^3$)* | **1,335.18** |
| *vapor space outage ($H_{VO}$ ft)* | **3.927** |
| *vapor space volume ($V_V$ $ft^3$)* | **667.59** |

| | |
|---|---|
| *Major City for Meterological Data* | **Jackson, MS** |
| *Site Elevation (ft)* | **300** |
| *Atmospheric Pressure ($P_A$ psia)* | **14.537** |
| *Table 7.1-2 Liquid* | **crude oil** |
| *RVP** | **5.37** |
| *API gravity** | **36.7** |
| *°F basis for gv** | **60.0** |
| *bubble point psia* | |
| *API gravity at 60F* | **36.7** |
| *API gravity at 100F* | **39.5** |
| *Working Loss Product Factor ($K_P$)* | **0.75** |
| *working loss turnover factor $K_N$* | **1.000** |

*sales oil data determines RVP per API pub 4683

Tank contents (if not selected from Table 7.1-2):

| *component* | *mole%* | *MW* | *lb/mole* | *wt%* | *Antoine constants (log 10, mmHg, °C) A* | *B* | *C* |
|---|---|---|---|---|---|---|---|
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| | 0.000 | | 0.000 | 0.000 | | | |



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| | *Jan* | *Feb* | *Mar* | *Apr* | *May* | *Jun* | *Jul* | *Aug* | *Sep* | *Oct* | *Nov* | *Dec* | *Avg* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| hourly average maximum ambient temperature ($T_{AX}$ °F) | 56.50 | 60.80 | 68.10 | 75.70 | 83.00 | 89.00 | 91.10 | 91.20 | 86.50 | 77.10 | 66.30 | 58.10 | 75.30 |
| hourly average minimum ambient temperature ($T_{AN}$ °F) | 37.00 | 39.30 | 45.90 | 53.30 | 62.50 | 69.20 | 72.10 | 71.40 | 65.50 | 53.90 | 43.90 | 37.90 | 54.30 |
| daily total solar insolation factor (I btu/ft$^2$ day) | 783 | 1039 | 1369 | 1762 | 1929 | 2025 | 1969 | 1849 | 1576 | 1262 | 922 | 726 | 1434 |
| daily average ambient temperature ($T_{AA}$ °F) | 46.75 | 50.05 | 57.00 | 64.50 | 72.75 | 79.10 | 81.60 | 81.30 | 76.00 | 65.50 | 55.10 | 48.00 | 64.80 |
| liquid bulk temperature ($T_B$ °F) | 48.86 | 52.86 | 60.70 | 69.26 | 77.96 | 84.57 | 86.92 | 86.29 | 80.26 | 68.91 | 57.59 | 49.96 | 68.67 |
| average vapor temperature ($T_V$ °F) | 52.44 | 57.59 | 66.94 | 77.29 | 86.76 | 93.80 | 95.90 | 94.72 | 87.44 | 74.66 | 61.79 | 53.27 | 75.21 |
| daily ambient temperature range ($\Delta T_A$ °R) | 19.50 | 21.50 | 22.20 | 22.40 | 20.50 | 19.80 | 19.00 | 19.80 | 21.00 | 23.20 | 22.40 | 20.20 | 21.00 |
| daily vapor temperature range ($\Delta T_V$ °R) | 27.74 | 33.75 | 40.18 | 47.40 | 49.07 | 50.31 | 48.74 | 47.14 | 43.07 | 38.96 | 32.28 | 27.32 | 40.51 |
| daily average liquid surface temperature ($T_{LA}$ °F) | 50.65 | 55.22 | 63.82 | 73.28 | 82.36 | 89.19 | 91.41 | 90.51 | 83.85 | 71.79 | 59.69 | 51.62 | 71.94 |
| daily maximum liquid surface temperature ($T_{LX}$ °F) | 57.59 | 63.66 | 73.86 | 85.12 | 94.63 | 101.76 | 103.59 | 102.29 | 94.62 | 81.52 | 67.76 | 58.45 | 82.07 |
| daily minimum liquid surface temperature ($T_{LN}$ °F) | 43.71 | 46.79 | 53.77 | 61.43 | 70.09 | 76.61 | 79.22 | 78.72 | 73.08 | 62.05 | 51.62 | 44.79 | 61.81 |
| vapor pressure at daily avg liq surface temp $T_{LA}$ ($P_{VA}$ psia) | 2.643 | 2.894 | 3.417 | 4.078 | 4.805 | 5.416 | 5.628 | 5.542 | 4.934 | 3.968 | 3.157 | 2.694 | 3.979 |
| vapor pressure at daily max liq surface temp $T_{LX}$ ($P_{VX}$ psia) | 3.031 | 3.407 | 4.123 | 5.046 | 5.946 | 6.702 | 6.907 | 6.761 | 5.945 | 4.735 | 3.682 | 3.082 | 4.781 |
| vapor pressure at daily min liq surface temp $T_{LN}$ ($P_{VN}$ psia) | 2.295 | 2.444 | 2.812 | 3.265 | 3.845 | 4.334 | 4.543 | 4.503 | 4.064 | 3.304 | 2.694 | 2.346 | 3.289 |
| daily vapor pressure range ($\Delta P_V$) | 0.7354 | 0.9630 | 1.3106 | 1.7814 | 2.1007 | 2.3675 | 2.3635 | 2.2578 | 1.8811 | 1.4309 | 0.9872 | 0.7355 | 1.4918 |
| vapor space expansion factor ($K_E$) | 0.1162 | 0.1483 | 0.1946 | 0.2593 | 0.3064 | 0.3512 | 0.3537 | 0.3367 | 0.2751 | 0.2087 | 0.1489 | 0.1155 | 0.2175 |
| vapor molecular weight ($M_V$ lb/lbmole) | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 |
| monthly hours with avg = total annual | 744 | 672 | 744 | 720 | 744 | 720 | 744 | 744 | 720 | 744 | 720 | 744 | 8,760 |
| throughputs (ft$^3$/month) and avg = total annual | 10 | 9 | 10 | 9 | 10 | 9 | 10 | 10 | 9 | 10 | 9 | 10 | 112 |
| monthly turnovers (N/month) with avg = total annual | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.08 |
| vented vapor saturation factor ($K_S$) | 0.6452 | 0.6241 | 0.5844 | 0.5409 | 0.5000 | 0.4701 | 0.4605 | 0.4644 | 0.4934 | 0.5477 | 0.6035 | 0.6407 | 0.5470 |
| vent setting correction factor ($K_B$) | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| vapor density ($W_V$ lb/ft$^3$) | 0.0240 | 0.0261 | 0.0302 | 0.0354 | 0.0410 | 0.0456 | 0.0472 | 0.0466 | 0.0420 | 0.0346 | 0.0282 | 0.0245 | 0.0347 |
| standing storage losses ($L_S$ lb/month & avg is lb/yr) | 59.20 | 57.97 | 74.45 | 84.32 | 100.88 | 108.65 | 116.21 | 114.67 | 100.12 | 85.19 | 67.22 | 60.25 | 1029.14 |
| working losses ($L_W$ lb/month & avg is lb/yr) | 0.17 | 0.17 | 0.22 | 0.24 | 0.29 | 0.32 | 0.34 | 0.33 | 0.29 | 0.25 | 0.20 | 0.18 | 2.99 |
| total losses ($L_T$ lb/month & avg is lb/yr) | 59.37 | 58.14 | 74.66 | 84.57 | 101.18 | 108.96 | 116.55 | 115.01 | 100.41 | 85.44 | 67.41 | 60.43 | 1032.13 |
| max hourly Q in bbl/hour | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | |
| max hourly working loss at $P_{VX}$ & Q/hr & $K_N$=1 ($L_W$ lb/hr) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | |
| breathing/standing loss ($L_S$ lb/hr) | 0.080 | 0.086 | 0.100 | 0.138 | 0.175 | 0.209 | 0.214 | 0.203 | 0.159 | 0.115 | 0.093 | 0.081 | |
| max hourly total loss ($L_T$ lb/hr) | 0.080 | 0.087 | 0.100 | 0.138 | 0.175 | 0.210 | 0.214 | 0.203 | 0.159 | 0.115 | 0.094 | 0.081 | |

| $L_S$ sum months | $L_W$ sum months | $L_T$ sum months |
|---|---|---|
| 1029.14 | 2.99 | 1032.13 |

The monthly sums will be greater than the annual average since the monthly variables yield higher emissions

**Emissions Summary:**

| | **avg lbs/hr** | **max lbs/hr** | **lbs/yr** |
|---|---|---|---|
| **Standing/Breathing Loss $L_S$** | **0.115** | **0.214** | **1,004.943** |
| **Working Loss $L_W$** | **0.000** | **0.000** | **2.919** |
| **Total Loss $L_T$** | **0.115** | **0.214** | **1,007.862** |

max hourly total loss may not add up to $L_S$ + $L_W$ as their max values may be in different months



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## Tank Emission Calculations Based on AP 42 Chapter 7 (June 2020, Section 7.1.3.1), Fixed Roof

| | |
|---|---|
| *Tank ID* | **38-17-RWT** |
| *Tank Description* | **3000 BBL Raw Water Tank (V-121)** |
| *Company Name* | **Denbury Onshore, LLC** |

| | |
|---|---|
| *Tank Orientation* | **Vertical** |
| *Tank Diameter (D ft)* | **29.50** |
| *Vertical Height/Horizontal Length ($H_S$ ft)* | **24.50** |
| *Roof Height ($H_R$ ft)* | **0.92** |
| *Max Liquid Height ($H_{LX}$ ft)* | **23.50** |
| *Avg Liquid Height ($H_L$ ft)* | **11.75** |
| *Breather Vent Pressure Setting ($P_{BP}$ psig)* | |
| *Breather Vent Vacuum Setting ($P_{BV}$ psig)* | |
| *actual tank pressure ($P_I$ psig)* | **0.0** |
| *Shell Paint Solar Absorptance ($S_A$)* | **0.90** |
| *Roof Paint Solar Absorptance ($R_A$)* | **0.9** |
| *breather vent pressure range ($\Delta P_B$ psi)* | **0.00** |
| *roof outage ($H_{RO}$ ft)* | **0.3073** |

| | |
|---|---|
| *Tank Shell Color/Shade* | **Red - Primer** |
| *Tank Shell Paint Condition* | **average** |
| *Tank Roof Color/Shade* | **Red - Primer** |
| *Tank Roof Paint Condition* | **average** |
| *Roof Type* | **vertical tank with cone roof** |
| *Tank Insulation* | **no insulation** |
| *Tank Underground?* | **no** |
| *Annual Throughput (Q bbl/year)* | **28,571.00** |
| *Annual Turnovers, N* | **9.99** |
| *Annual Hours* | **8,760** |
| *tank max liquid volume ($V_{LX}$ $ft^3$)* | **16,062.08** |
| *vapor space outage ($H_{VO}$ ft)* | **13.057** |
| *vapor space volume ($V_V$ $ft^3$)* | **8,924.56** |

| | |
|---|---|
| *Major City for Meterological Data* | **Jackson, MS** |
| *Site Elevation (ft)* | **300** |
| *Atmospheric Pressure ($P_A$ psia)* | **14.537** |
| *Table 7.1-2 Liquid* | |
| *RVP** | |
| *API gravity** | |
| *°F basis for gv** | |
| *bubble point psia* | |
| *API gravity at 60F* | |
| *API gravity at 100F* | |
| *Working Loss Product Factor ($K_P$)* | **0.75** |
| *working loss turnover factor $K_N$* | **1.000** |

*sales oil data determines RVP per API pub 4683

Tank contents (if not selected from Table 7.1-2):

| *component* | *mole%* | *MW* | *lb/mole* | *wt%* | *Antoine constants (log 10, mmHg, °C) A* | *B* | *C* |
|---|---|---|---|---|---|---|---|
| Water | 100.000 | 18.015 | 18.01500 | 100.00000 | 8.108 | 1750.300 | 235.000 |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| 0 | 0.000 | | | | | | |
| | 100.000 | | 18.015 | 100.000 | | | |



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| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Avg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| hourly average maximum ambient temperature ($T_{AX}$ °F) | 56.50 | 60.80 | 68.10 | 75.70 | 83.00 | 89.00 | 91.10 | 91.20 | 86.50 | 77.10 | 66.30 | 58.10 | 75.30 |
| hourly average minimum ambient temperature ($T_{AN}$ °F) | 37.00 | 39.30 | 45.90 | 53.30 | 62.50 | 69.20 | 72.10 | 71.40 | 65.50 | 53.90 | 43.90 | 37.90 | 54.30 |
| daily total solar insolation factor (I btu/ft$^2$ day) | 783 | 1039 | 1369 | 1762 | 1929 | 2025 | 1969 | 1849 | 1576 | 1262 | 922 | 726 | 1434 |
| daily average ambient temperature ($T_{AA}$ °F) | 46.75 | 50.05 | 57.00 | 64.50 | 72.75 | 79.10 | 81.60 | 81.30 | 76.00 | 65.50 | 55.10 | 48.00 | 64.80 |
| liquid bulk temperature ($T_B$ °F) | 48.86 | 52.86 | 60.70 | 69.26 | 77.96 | 84.57 | 86.92 | 86.29 | 80.26 | 68.91 | 57.59 | 49.96 | 68.67 |
| average vapor temperature ($T_V$ °F) | 53.22 | 58.63 | 68.30 | 79.05 | 88.68 | 95.82 | 97.86 | 96.57 | 89.01 | 75.92 | 62.71 | 53.99 | 76.64 |
| daily ambient temperature range ($\Delta T_A$ °R) | 19.50 | 21.50 | 22.20 | 22.40 | 20.50 | 19.80 | 19.00 | 19.80 | 21.00 | 23.20 | 22.40 | 20.20 | 21.00 |
| daily vapor temperature range ($\Delta T_V$ °R) | 27.74 | 33.75 | 40.18 | 47.40 | 49.07 | 50.31 | 48.74 | 47.14 | 43.07 | 38.96 | 32.28 | 27.21 | 40.51 |
| daily average liquid surface temperature ($T_{LA}$ °F) | 51.04 | 55.74 | 64.50 | 74.15 | 83.32 | 90.19 | 92.39 | 91.43 | 84.63 | 72.41 | 60.15 | 51.98 | 72.66 |
| daily maximum liquid surface temperature ($T_{LX}$ °F) | 57.98 | 64.18 | 74.55 | 86.00 | 95.59 | 102.77 | 104.57 | 103.22 | 95.40 | 82.15 | 68.22 | 58.78 | 82.78 |
| daily minimum liquid surface temperature ($T_{LN}$ °F) | 44.10 | 47.30 | 54.45 | 62.30 | 71.05 | 77.62 | 80.20 | 79.64 | 73.87 | 62.68 | 52.08 | 45.18 | 62.53 |
| vapor pressure at daily avg liq surface temp $T_{LA}$ ($P_{VA}$ psia) | 0.185 | 0.220 | 0.300 | 0.418 | 0.565 | 0.703 | 0.753 | 0.731 | 0.589 | 0.394 | 0.258 | 0.191 | 0.397 |
| vapor pressure at daily max liq surface temp $T_{LX}$ ($P_{VX}$ psia) | 0.238 | 0.297 | 0.423 | 0.616 | 0.831 | 1.032 | 1.089 | 1.046 | 0.826 | 0.544 | 0.342 | 0.245 | 0.555 |
| vapor pressure at daily min liq surface temp $T_{LN}$ ($P_{VN}$ psia) | 0.142 | 0.161 | 0.210 | 0.278 | 0.376 | 0.469 | 0.511 | 0.501 | 0.414 | 0.282 | 0.192 | 0.148 | 0.280 |
| daily vapor pressure range ($\Delta P_V$) | 0.0959 | 0.1362 | 0.2138 | 0.3377 | 0.4543 | 0.5630 | 0.5780 | 0.5443 | 0.4121 | 0.2624 | 0.1495 | 0.0969 | 0.2750 |
| vapor space expansion factor ($K_E$) | 0.0610 | 0.0750 | 0.0917 | 0.1127 | 0.1229 | 0.1322 | 0.1302 | 0.1250 | 0.1087 | 0.0918 | 0.0726 | 0.0599 | 0.0956 |
| vapor molecular weight ($M_V$ lb/lbmole) | 18.02 | 18.02 | 18.02 | 18.02 | 18.02 | 18.02 | 18.02 | 18.02 | 18.02 | 18.02 | 18.02 | 18.02 | 18.02 |
| monthly hours with avg = total annual | 744 | 672 | 744 | 720 | 744 | 720 | 744 | 744 | 720 | 744 | 720 | 744 | 8,760 |
| throughputs (ft$^3$/month) and avg = total annual | 13,623 | 12,304 | 13,623 | 13,183 | 13,623 | 13,183 | 13,623 | 13,623 | 13,183 | 13,623 | 13,183 | 13,623 | 160,398 |
| monthly turnovers (N/month) with avg = total annual | 0.85 | 0.77 | 0.85 | 0.82 | 0.85 | 0.82 | 0.85 | 0.85 | 0.82 | 0.85 | 0.82 | 0.85 | 9.99 |
| vented vapor saturation factor ($K_S$) | 0.8866 | 0.8680 | 0.8279 | 0.7757 | 0.7189 | 0.6727 | 0.6575 | 0.6642 | 0.7103 | 0.7857 | 0.8487 | 0.8830 | 0.7843 |
| vent setting correction factor ($K_B$) | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| vapor density ($W_V$ lb/ft$^3$) | 0.0006 | 0.0007 | 0.0010 | 0.0013 | 0.0017 | 0.0021 | 0.0023 | 0.0022 | 0.0018 | 0.0012 | 0.0008 | 0.0006 | 0.0012 |
| standing storage losses ($L_S$ lb/month & avg is lb/yr) | 12.55 | 13.33 | 19.80 | 26.13 | 35.86 | 42.62 | 46.99 | 45.72 | 36.18 | 25.62 | 16.61 | 12.97 | 334.39 |
| working losses ($L_W$ lb/month & avg is lb/yr) | 6.18 | 6.57 | 9.76 | 12.88 | 17.67 | 21.00 | 23.16 | 22.53 | 17.83 | 12.62 | 8.18 | 6.39 | 164.78 |
| total losses ($L_T$ lb/month & avg is lb/yr) | 18.73 | 19.90 | 29.56 | 39.01 | 53.53 | 63.63 | 70.15 | 68.25 | 54.01 | 38.24 | 24.79 | 19.37 | 499.16 |
| max hourly Q in bbl/hour | 18.31 | 18.31 | 18.31 | 18.31 | 18.31 | 18.31 | 18.31 | 18.31 | 18.31 | 18.31 | 18.31 | 18.31 | |
| max hourly working loss at $P_{VX}$ & Q/hr & $K_N$=1 ($L_W$ lb/hr) | 0.008 | 0.010 | 0.013 | 0.018 | 0.024 | 0.029 | 0.031 | 0.030 | 0.025 | 0.017 | 0.011 | 0.009 | |
| breathing/standing loss ($L_S$ lb/hr) | 0.017 | 0.020 | 0.027 | 0.042 | 0.057 | 0.070 | 0.072 | 0.068 | 0.052 | 0.034 | 0.023 | 0.017 | |
| max hourly total loss ($L_T$ lb/hr) | 0.025 | 0.030 | 0.040 | 0.060 | 0.081 | 0.099 | 0.103 | 0.098 | 0.077 | 0.051 | 0.034 | 0.026 | |

| $L_S$ sum months | $L_W$ sum months | $L_T$ sum months |
|---|---|---|
| 334.39 | 164.78 | 499.16 |

The monthly sums will be greater than the annual average since the monthly variables yield higher emissions

**Emissions Summary:**

| | avg lbs/hr | max lbs/hr | lbs/yr |
|---|---|---|---|
| **Standing/Breathing Loss $L_S$** | **0.035** | **0.072** | **303.697** |
| **Working Loss $L_W$** | **0.017** | **0.031** | **149.652** |
| **Total Loss $L_T$** | **0.052** | **0.103** | **453.348** |

max hourly total loss may not add up to $L_S$ + $L_W$ as their max values may be in different months