ONEOK
ROCKIES MIDSTREAM
A SUBSIDIARY OF ONEOK PARTNERS

*SUBMITTED VIA CERIS-ND*

September 24, 2024

Mr. Jim Semerad
North Dakota Department of Environmental Quality
Division of Air Quality
4201 Normandy Street, 2nd Floor
Bismarck, ND 58503-1324

**ONEOK ROCKIES MIDSTREAM, L.L.C.**
**LEWIS AND CLARK COMPRESSOR STATION**
**PERMIT TO CONSTRUCT APPLICATION**

Dear Mr. Semerad:

ONEOK Rockies Midstream, L.L.C. (ORM) operates the Lewis and Clark Compressor Station, located in Williams County. ORM submits this Permit to Construct application to authorize the addition of two (2) 1,680-hp Waukesha L7044 GSI compressor engines, one (1) 60 mmscf/d Glycol Dehydration Unit, one (1) 1.0 mmBtu/hr Glycol Reboiler, and one (1) BTEX Flare at the facility. Please note no other new equipment has been added or proposed.

Enclosed with this letter are required application forms, emissions calculations and supporting documents, as well as a check in the amount of $325.00 for the application fee. If you need additional information or have any questions, please contact me at 918-588-7862 or Joshua.Hills@oneok.com.

Sincerely,

Joshua Hills
Environmental Specialist

Enclosures
xc: K. Rudningen/V. Danzeisen/L. Weltikol/D. Vande Bossche/B. Haider/G. Roe/B. Beck/W. Phelps/K. Hanner/J. Chrobak (.pdf)
Tulsa Environmental Files – Lewis and Clark Compressor Station – Permit Actions - ACTs

# Permit to Construct Application

## Lewis and Clark Compressor Station

## ONEOK Rockies Midstream, L.L.C.

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**Submitted to NDDEQ Division of Air Quality**
**September 2024**

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## Introduction

ONEOK Rockies Midstream, L.L.C. (ORM) operates the Lewis and Clark Compressor Station, located in Williams County. ORM submits this Permit to Construct application to authorize the addition of two (2) 1,680-hp Waukesha L7044 GSI compressor engines, one (1) 60 mmscf/d Glycol Dehydration Unit, one (1) 1.0 mmBtu/hr Glycol Reboiler, and one (1) BTEX Flare at the facility.

## Facility Equipment

After construction, Lewis and Clark Compressor Station will consist of six (6) electrically driven compressors, two (2) 1,680-hp Waukesha L7044 GSI compressor engines, six (6) 400-bbl condensate tanks, one (1) 400-bbl LACT divert tank, one (1) 400-bbl methanol tank, one (1) 24-bbl methanol tank, one (1) 60 mmscf/d Glycol Dehydration Unit, one (1) 1.0 mmBtu/hr Glycol Reboiler, one (1) BTEX Flare, and one (1) emergency/process flare for controlling emergency relief from all equipment. Associated emission sources include condensate truck loading, fugitive emissions and miscellaneous vents and blowdowns. A vapor recovery unit (VRU) will control emissions from the condensate and water tanks.

## Process Description

A pipeline gathering system transports field natural gas from wells through an inlet separator where free liquids are removed and stored in the condensate tanks. Natural gas then passes through a suction header and is routed to the compressors, which boost gas pressure. After the gas passes through the compressors, it enters a TEG dehydration unit before exiting the facility. The dehydration unit is used to remove water from the gas. In the dehydration process, gas passes through a contactor vessel where water is absorbed by the glycol. The “rich” glycol containing water goes to the glycol dehydrator reboiler where heat is used to boil off the water. The heat is supplied by a natural gas-fired reboiler that exhausts to the atmosphere. Still vent vapors from the dehydration unit are controlled by an air-cooled condenser. Non-condensables from the condenser vent stream are routed to the combustor. A burner management system ensures that there is a constant flame present to destroy the vapors at the required destruction efficiency. Flash tank off-gases are directed to the reboiler to be used as fuel with excess routed to the facility fuel system to be used in the compressors. From the dehydration unit, natural gas enters a pipeline for transmission off-site, or is routed to a fuel scrubber and used as fuel for the compressor engines and the reboiler. Condensate is transported off-site via tank truck for sales. Emissions from fugitive components and miscellaneous vents and blowdowns also occur at the facility.

## Regulatory Applicability

The facility is a natural gas compressor station that falls under the North American Industrial Classification System (NAICS) code 211130 (formerly Standard Industrial Classification (SIC) 1311).

**New Source Performance Standards 40 CFR Part 60 Subpart JJJJ**, Stationary Spark Ignition Internal Combustion Engines (SI-ICE) promulgates emission standards for all new SI engines ordered after June 12, 2006, and all SI engines modified or reconstructed after June 12, 2006, regardless of size. The specific emission standards (either in g/hp-hr or as a concentration limit) vary based on engine class, engine power rating, lean-burn or rich-burn, fuel type, duty (emergency or non-emergency), and various manufacture dates. The compressor engines were manufactured after July 1, 2010; therefore, are subject to the Stage 2 emissions limitations of this subpart.

**New Source Performance Standards 40 CFR Part 60 Subpart OOOO**, Crude Oil and Natural Gas Production, Transmission and Distribution, establishes emission standards for the following equipment that

commences construction, modification, or reconstruction after August 23, 2011 and on or before September 18, 2015 at crude oil and natural gas production, transmission or distribution facilities:

1. Each single gas well;
2. Single centrifugal compressors using wet seals located between the wellhead and the point of custody transfer to the natural gas transmission and storage segment;
3. Single reciprocating compressors located between the wellhead and the point of custody transfer to the natural gas transmission and storage segment;
4. Single continuous bleed natural gas driven pneumatic controllers with a natural gas bleed rate greater than 6 SCFH, located between the wellhead and the point of custody transfer to the natural gas transmission and storage segment and not located at a natural gas processing plant;
5. Single continuous bleed natural gas driven pneumatic controllers located at a natural gas processing plant;
6. Single storage vessels located in the oil and natural gas production segment, natural gas processing segment, or natural gas transmission and storage segment with the potential for VOC emissions equal to or greater than 6 tons per year;
7. All equipment, except compressors, within a process unit at an onshore natural gas processing plant;
8. Sweetening units located at onshore natural gas processing plants.

All potentially affected equipment at East Fork Compressor Station was constructed after September 18, 2015 and is not subject to this subpart.

**New Source Performance Standards 40 CFR Part 60 Subpart OOOOa**, Crude Oil and Natural Gas Facilities, establishes emission standards for the following equipment that commences construction, modification or reconstruction after September 18, 2015 at crude oil and natural gas production, transmission or distribution facilities:

1. Each single oil or gas well that conducts a completion following hydraulic fracturing or refracturing;
2. Single centrifugal compressors using wet seals that are not located at a well site;
3. Single reciprocating compressors not located at a well site;
4. Single continuous bleed natural gas driven pneumatic controllers with a natural gas bleed rate greater than 6 SCFH, not located at a natural gas processing plant;
5. Single continuous bleed natural gas driven pneumatic controllers located at a natural gas processing plant;
6. Single storage vessels with the potential for VOC emissions equal to or greater than 6 tons per year;
7. The group of all equipment within a process unit;
8. The group of fugitive emissions equipment at a compressor station;
9. The group of fugitive emissions equipment at a well site;
10. Sweetening units located at onshore natural gas processing plants;
11. Pneumatic pumps at natural gas processing plants and well sites.

Facility is subject to OOOOa and this PTC adds two additional compressors to the rod packing requirements.

**National Emission Standards for Hazardous Air Pollutants 40 CFR Part 63 Subpart HH,** Oil and Natural Gas Production Facilities, applies to affected emission points that are located at facilities that are major and area sources of HAP, and either process, upgrade, or store natural gas prior to entering the natural gas transmission and storage source category. The only affected unit at an area source is a triethylene glycol (TEG) dehydration unit. Although the TEG dehydration unit at this facility is considered an affected area source, it is exempt from the requirements of § 63.764(d)(2) since the actual average emissions of benzene from the glycol dehydration unit process vent to the atmosphere are less than 0.90 Mg (1.0 TPY), as determined by the procedures specified in § 63.772(b)(2). However, the facility must maintain records of the de minimis determination as required in § 63.774(d)(1).

**National Emission Standards for Hazardous Air Pollutants 40 CFR Part 63 Subpart ZZZZ,** Reciprocating Internal Combustion Engines (RICE), affects any existing, new or reconstructed stationary RICE located at a major or area source of HAP emissions. Owners and operators of new or reconstructed engines at area sources must meet the requirements of Subpart ZZZZ by complying with either 40 CFR Part 60 Subpart IIII (for CI engines) or 40 CFR Part 60 Subpart JJJJ (for SI engines). Based on emission calculations, this facility is a minor source of HAP. Since the compressor engines are subject to 40 CFR Part 60 Subpart JJJJ, they automatically satisfy the requirements of Subpart ZZZZ by complying with NSPS Subpart JJJJ. There are no further requirements under Subpart ZZZZ for these engines.

## State Requirements

Applicability of regulations within Article 15 - Air Pollution Control Rules under the North Dakota Administrative Code were evaluated for the facility.

### 33.1-15-03 Restriction of Emission of Visible Air Contaminants

The facility will operate in a manner to not discharge into the ambient air from any single source of emission whatsoever any air contaminant which exhibits an opacity greater than twenty percent except that a maximum of forty percent opacity which is permissible for not more than one six-minute period per hour (33.1-15-03-02). Additionally, the facility will not discharge into the ambient air from any source of fugitive emissions any air contaminant which exhibits an opacity greater than forty percent for more than one six-minute period per hour (33.1-15-03-03).

### 33.1-15-05 Emissions of Particulate Matter Restricted

The facility is an insignificant source of particulate matter emissions and does not fall within the source categorizations listed in this subpart.

### 33.1-15-06 Emissions of Sulfur Compounds Restricted

The facility combusts pipeline quality natural gas and is therefore exempt from this subpart (33.1-15-06-01.1.e).

### 33.1-15-07 Control of Organic Compounds Emissions

Storage tanks at the facility will be equipped with submerged fill pipes or applicable control (33.1-15-07-01.3). Any loading of volatile organic compounds will not exceed 20,000 gallons per day (33.1-15-07-01.4). With the exception of emergency vapor blowdowns or safety relief valves, emissions of organic compounds will be routed to flare or an equally effective control device (33.1-15-07-02.1). Any flares located at the facility will be equipped with an automatic igniter or a continuous burning pilot (33.1-15-07-02.3). Any storage tanks in excess of 6 ton per year of VOC at the facility will be controlled and therefore meets the requirements of the May 27, 2015 NDDH guidance memorandum for storage vessels at oil and gas non-production facilities.

### 33.1-15-08 Control of Air Pollution From Vehicles and Other Internal Combustion Engines

Any internal combustion engines located at the facility will not emit any unreasonable and excessive smoke, obnoxious or noxious gases, fumes or vapor (33.1-15-08-01). The facility will not intentionally remove, alter, or otherwise render inoperative, exhaust emission control, crankcase ventilation, or any other air pollution control device which has been installed as a requirement of federal law or regulation (33.1-15-08-02.1).

### 33.1-15-11 Prevention of Air Pollution Emergency Episodes

The facility is not a source category listed in Table 7 of this subpart. The facility will comply with any requirements that are instituted during an air pollution emergency issued by the Department.

**33.1-15-12 Standards of Performance for New Stationary Sources**

**33.1-15-13 Emission Standards for Hazardous Air Pollutants**

**33.1-15-22 Emission Standards for Hazardous Air Pollutants for Source Categories**

NSPS and NESHAP applicability is addressed above in the Federal Requirements.

**33.1-15-14 Designated Air Contaminant Sources, Permit to Construct, Minor Source Permit to Operate, Title V Permit to Operate**

Through submittal of this application for a permit, the facility is complying with this subpart.

**33.1-15-15 Prevention of Significant Deterioration of Air Quality**

The facility is a minor source of emissions and is therefore not subject to this subpart.

**33.1-15-16 Restriction of Odorous Air Contaminants**

The facility will comply with the general provisions of the Department's odor restrictions (33.1.15-16-01) and will not exceed the maximum hydrogen sulfide concentrations to be considered a violation (33.1-15-16-02.1).

**33.1-15-17 Restriction of Fugitive Emissions**

The facility will take reasonable precautions to prevent fugitive emissions as defined under 33.1-15-17-04 in regards to ambient air quality standards and opacity limitations.

**33.1-15-18 Stack Heights**

Stack heights at the facility will not exceed good engineering practice (GEP) stack heights as defined under 33.1-15-18-01.2.d.

**33.1-15-19 Visibility Protection**

The visibility protection standards are only applicable to major sources and therefore not applicable to the facility.

**33.1-15-21 Acid Rain Program**

The acid rain provisions of the Air Pollution Control Rules are not applicable to the facility.

**33.1-15-24 Standards for Lead-Based Paint Activities**

There will be no lead-based paint utilized at the facility and therefore not applicable to the facility.

**33.1-15-25 Regional Haze Requirements**

The facility is currently not subject to regulation under a regional haze program. Therefore, this subpart is not applicable.

# PERMIT APPLICATION FOR AIR CONTAMINANT SOURCES

NORTH DAKOTA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR QUALITY
SFN 8516 (9-2021)

## SECTION A - FACILITY INFORMATION

| | | |
|---|---|---|
| Name of Firm or Organization<br>ONEOK Rockies Midstream, L.L.C. | | |
| Applicant's Name<br>Dick Vande Bossche | | |
| Title<br>Vice President - ONEOK Rockies Midstream Operations | Telephone Number<br>(406) 433-8710 | E-mail Address<br>dick.vandebossche@oneok.com |
| Contact Person for Air Pollution Matters<br>Joshua Hills | | |
| Title<br>Environmental Professional | Telephone Number<br>(918) 588-7862 | E-mail Address<br>Joshua.Hills@oneok.com |
| Mailing Address (Street & No.)<br>100 W Fifth St. | | |
| City<br>Tulsa | State<br>Oklahoma | ZIP Code<br>74102 |
| Facility Name<br>Lewis and Clark Compressor Station | | |
| Facility Address (Street & No.) | | |
| City<br>Williston | State<br>North Dakota | ZIP Code<br>58843 |

| | | |
|---|---|---|
| County<br>Williams | Coordinates NAD 83 in Decimal Degrees (to forth decimal degree) | |
| | Latitude<br>48.18312600 | Longitude<br>-103.32879700 |

Legal Description of Facility Site

| Quarter | Quarter | Section | Township | Range |
|---|---|---|---|---|
| NE | NE | 33 | 156N | 100W |

| | |
|---|---|
| Land Area at Facility Site<br>16.5 Acres (or) _____ Sq. Ft. | MSL Elevation at Facility<br>2405 |

## SECTION B – GENERAL NATURE OF BUSINESS

| Describe Nature of Business | North American Industry Classification System Number | Standard Industrial Classification Number (SIC) |
|---|---|---|
| Natural Gas Compression | 211130 | 1311 |
| | | |
| | | |
| | | |

## SECTION C – GENERAL PERMIT INFORMATION

Type of Permit? ☒ Permit to Construct (PTC) ☐ Permit to Operate (PTO)

If application is for a Permit to Construct, please provide the following data:

| Planned Start Construction Date | Planned End Construction Date |
|---|---|
| 12/2024 | 02/2025 |

## SECTION D – SOURCE IDENTIFICATION AND CATEGORY OF EACH SOURCE INCLUDED ON THIS PERMIT APPLICATION

| | | Permit to Construct | | | | Minor Source Permit to Operate | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Your Source ID Number | Source or Unit (Equipment, Machines, Devices, Boilers, Processes, Incinerators, Etc.) | New Source | Existing Source Modification | Existing Source Expansion | Existing Source Change of Location | New Source | Existing Source Initial Application | Existing Source After Modification | Existing Source After Expansion | Existing Source After Change of Location | Existing Source After Change of Ownership | Other |
| C-1 | 1,680-hp Waukesha L7044 GSI Engine | ☑ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| C-2 | 1,680-hp Waukesha L7044 GSI Engine | ☑ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| D-1 | Glycol Dehydration Unit | ☑ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| H-1 | Glycol Reboiler | ☑ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| FL-2 | BTEX Flare | ☑ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| | | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| | | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| | | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| | | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

Add additional pages if necessary

## SECTION D2 – APPLICABLE REGULATIONS

| Source ID No. | Applicable Regulations (NSPS/MACT/NESHAP/etc.) |
|---|---|
| Facility-wide | |
| C-1, C-2 | NSPS JJJJ, NESHAP ZZZZ |
| D-1 | MACT HH |
| FUG | NSPS OOOOb |
| | |

## SECTION E – TOTAL POTENTIAL EMISSIONS

| Pollutant | Amount (Tons Per Year) |
|---|---|
| $NO_x$ | 33.26 |
| CO | 66.66 |
| PM | 2.48 |

| Pollutant | Amount (Tons Per Year) |
|---|---|
| $PM_{10}$ (filterable and condensable) | 2.48 |
| $PM_{2.5}$ (filterable and condensable) | 2.48 |
| $SO_2$ | 0.08 |
| VOC | 72.88 |
| GHG (as $CO_2e$) | 16650.98 |
| Largest Single HAP | 1.29 |
| Total HAPS | 7.21 |

*If performance test results are available for the unit, submit a copy of test with this application. If manufacturer guarantee is used provide spec sheet.

## SECTION F1 – ADDITIONAL FORMS

Indicate which of the following forms are attached and made part of the application

| | |
|---|---|
| ■ Air Pollution Control Equipment (SFN 8532) | ■ Fuel Burning Equipment Used for Indirect Heating (SFN 8518) |
| ☐ Construct/Operate Incinerators (SFN 8522) | ☐ Hazardous Air Pollutant (HAP) Sources (SFN 8329) |
| ☐ Natural Gas Processing Plants (SFN 11408) | ☐ Manufacturing or Processing Equipment (SFN 8520) |
| ■ Glycol Dehydration Units (SFN 58923) | ☐ Volatile Organic Compounds Storage Tank (SFN 8535) |
| ■ Flares (SFN 59652) | ■ Internal Combustion Engines and Turbines (SFN 8891) |
| ☐ Grain, Feed, and Fertilizer Operations (SFN 8524) | ☐ Oil/Gas Production Facility Registration (SFN 14334) |

## SECTION F2 – OTHER ATTACHMENTS INCLUDED AS PART OF THIS APPLICATION

| | | | |
|---|---|---|---|
| 1. | Process Description and Regulatory Applicability | 4. | Emission Calculations |
| 2. | Area Map | 5. | Supporting Documentation |
| 3. | Process Flow Diagram | 6. | |

I, the undersigned applicant, am fully aware that statements made in this application and the attached exhibits and statements constitute the application for Permit(s) to Construct and/or Operate Air Contaminant sources from the North Dakota Department of Environmental Quality and certify that the information in this application is true, correct and complete to the best of my knowledge and belief. Further, I agree to comply with the provisions of Chapter 23.1-06 of the North Dakota Century Code and all rules and regulations of the Department, or revisions thereof. I also understand the permit is nontransferable and, if granted a permit, I will promptly notify the Department upon sale or legal transfer of this permitted establishment.

| Signature | Date |
|---|---|
| DocuSigned by: Dick Vande Bossche 67B797C4193640F... | 9/25/2024 |

# PERMIT APPLICATION FOR INTERNAL COMBUSTION ENGINES AND TURBINES

NORTH DAKOTA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR QUALITY
SFN 8891 (9-2021)

NOTE: READ INSTRUCTIONS BEFORE COMPLETING THIS FORM.
**- Must include SFN 8516 or SFN 52858**

## SECTION A – GENERAL INFORMATION

| Name of Firm or Organization | Facility Name |
|---|---|
| ONEOK Rockies Midstream, L.L.C. | Lewis and Clark Compressor Station |

## SECTION B – FACILITY AND UNIT INFORMATION

Source ID Number (From form SFN 8516): C-1 - C-2

Type of Unit (check all that apply):

- ☒ Stationary Natural Gas-Fired Engine
- ☐ Stationary Diesel and Dual Fuel Engine
- ☐ Stationary Gasoline Engine
- ☐ Stationary Natural Gas-Fired Turbine
- ☐ Emergency Use Only
- ☒ Non-Emergency Use
- ☐ Peaking
- ☐ Demand Response
- ☐ Other – Specify:

## SECTION C – MANUFACTURER DATA

| Make | Model | Date of Manufacture |
|---|---|---|
| Waukesha | L7044 GSI | 2013 |

Reciprocating Internal Combustion Engine

- ☒ Spark Ignition ☐ Compression Ignition ☐ Lean Burn
- ☒ 4 Stroke ☐ 2 Stroke ☒ Rich Burn

| Maximum Rating (BHP @ rpm) | Operating Capacity (BHP @ rpm) |
|---|---|
| 1,680-HP | 1,680-HP |

Engine Subject to:

- ☐ 40 CFR 60, Subpart IIII
- ☒ 40 CFR 60, Subpart JJJJ
- ☒ 40 CFR 63, Subpart ZZZZ
- ☐ 40 CFR 60, Subpart OOOO (for compressors)
- ☒ 40 CFR 60, Subpart OOOOa (for compressors)

Turbine
Dry Low Emissions? ☐ Yes ☐ No

| Heat Input (MMBtu/hr) | Maximum Rating (HP) | 75% Rating (HP) | Efficiency |
|---|---|---|---|
| | | | |

Turbine Subject to:
☐ 40 CFR 60, Subpart GG ☐ 40 CFR 60, Subpart KKKK

## SECTION D – FUELS USED

| | | |
|---|---|---|
| Natural Gas ($10^6$ cu ft/year)<br>122.3 | Percent Sulfur | Percent $H_2S$ |
| Oil (gal/year) | Percent Sulfur | Grade No. |
| LP Gas (gal/year) | Other – Specify: | |

## SECTION E – NORMAL OPERATING SCHEDULE

| Hours Per Day | Days Per Week | Weeks Per Year | Hours Per Year | Peak Production Season (if any) |
|---|---|---|---|---|
| 24 | 7 | 52 | 8760 | |

## SECTION F – STACK PARAMETERS

| Emission Point ID Number | | Stack Height Above Ground Level (feet)<br>30 | |
|---|---|---|---|
| Stack Diameter (feet at top)<br>1 | Gas Discharged (SCFM)<br>7,429 | Exit Temp (°F)<br>1201 | Gas Velocity (FPS)<br>157.65 |

## SECTION G – EMISSION CONTROL EQUIPMENT

Is any emission control equipment installed on this unit?

☐ No ■ Yes – Complete and attach form SFN 8532

## SECTION H – MAXIMUM AIR CONTAMINANTS EMITTED

| Pollutant | Maximum Pounds Per Hour | Amount (Tons Per Year) | Basis of Estimate* |
|---|---|---|---|
| $NO_x$ | 3.70 | 16.22 | NSPS JJJJ |
| CO | 7.41 | 32.44 | NSPS JJJJ |
| PM | 0.28 | 1.22 | AP-42 Table 3.2-2 (7/00) |
| $PM_{10}$ (filterable and condensable) | 0.28 | 1.22 | AP-42 Table 3.2-2 (7/00) |
| $PM_{2.5}$ (filterable and condensable) | 0.28 | 1.22 | AP-42 Table 3.2-2 (7/00) |
| $SO_2$ | 0.01 | 0.04 | AP-42 Table 3.2-2 (7/00) |
| VOC | 2.59 | 11.36 | NSPS JJJJ |
| GHG (as $CO_2e$) | 1677.27 | 7346.46 | 40 CFR Tables C-1 and C-2 |
| Largest Single HAP | 0.15 | 0.64 | AP-42 Table 3.2-2 (7/00) |
| Total HAPS | 0.23 | 1.02 | AP-42 Table 3.2-2 (7/00) |

* If performance test results are available for the unit, submit a copy of test with this application, if manufacture data used, submit manufacturers specification sheets.

IS THIS UNIT IN COMPLIANCE WITH ALL APPLICABLE AIR POLLUTION RULES AND REGULATIONS?

■ YES ☐ NO

If "NO" a Compliance Schedule (SFN 61008) must be completed and attached.

Attach and label separate sheet(s) if you need more space to explain any system or answers or to provide complete listings of Emissions, Contaminants, or other items.

SEND COMPLETED APPLICATION AND ALL ATTACHMENTS TO:

North Dakota Department of Environmental Quality
Division of Air Quality
4201 Normandy Street, 2nd Floor
Bismarck, ND 58503-1324
(701) 328-5188

# PERMIT APPLICATION FOR AIR POLLUTION CONTROL EQUIPMENT

NORTH DAKOTA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR QUALITY
SFN 8532 (9-2021)

NOTE: READ INSTRUCTIONS BEFORE COMPLETING THIS FORM.
**- Must also include forms SFN 8516 or SFN 52858**

## SECTION A – GENERAL INFORMATION

| Name of Firm or Organization | Facility Name |
|---|---|
| ONEOK Rockies Midstream, L.L.C. | Lewis and Clark Compressor Station |
| Source ID No. of Equipment being Controlled<br>C-1 - C-2 (Each) | |

## SECTION B – EQUIPMENT

Type: ☐ Cyclone ☐ Multiclone ☐ Baghouse ☐ Electrostatic Precipitator
☐ Wet Scrubber ☐ Spray Dryer ☐ Flare/Combustor
☒ Other – Specify: NSCR

| Name of Manufacturer | Model Number | Date to Be Installed |
|---|---|---|
| DCL | Quicklid w/2DC76-16 | TBD |

Application:
☐ Boiler ☐ Kiln ☒ Engine ☐ Other – Specify:

| Pollutants Removed | NOx | CO | VOC | |
|---|---|---|---|---|
| Design Efficiency (%) | | | | |
| Operating Efficiency (%) | | | | |

Describe method used to determine operating efficiency:
Data provided by manufacturer

## SECTION CD – GAS CONDITIONS

| Gas Conditions | | | Inlet | Outlet |
|---|---|---|---|---|
| Gas Volume (SCFM; 68°F; 14.7 psia) | | | | |
| Gas Temperature (°F) | | | | |
| Gas Pressure (in. $H_2O$) | | | | |
| Gas Velocity (ft/sec) | | | | |
| Pollutant Concentration (Specify Pollutant and Unit of Concentration) | Pollutant | Unit of Concentration | | |
| | NOx | g/hp-hr | | 1.00 |
| | CO | g/hp-hr | | 2.00 |
| | VOC | g/hp-hr | | 0.70 |
| | | | | |
| Pressure Drop Through Gas Cleaning Device (in. $H_2O$) | | | | |

# PERMIT APPLICATION FOR GLYCOL DEHYDRATION UNITS

NORTH DAKOTA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR QUALITY
SFN 58923 (9-2021)

NOTE: READ INSTRUCTIONS BEFORE COMPLETING THIS FORM.
**- Must include SFN 8516 or SFN 52858**

## SECTION A – GENERAL INFORMATION

| Name of Firm or Organization | Facility Name |
|---|---|
| ONEOK Rockies Midstream, L.L.C. | Lewis and Clark Compressor Station |

## SECTION B - 40 CFR 63, SUBPART HH APPLICABILITY DETERMINATION

The facility is a (check one): ☐ major, or ■ area source of hazardous air pollutants (HAP) as defined in §63.761. Attach calculations showing expected HAP emissions in accordance with §63.760(a)(1).

The facility (check all that apply):

☐ Processes, upgrades or stores hydrocarbon liquids prior to the point of custody transfer.

■ Processes, upgrades or stores natural gas prior to the point at which natural gas enters the transmission and storage source category or is delivered to a final end user.

Identify the 40 CFR 63 Subpart HH (MACT HH) affected source:

☐ Glycol (ethylene, diethylene, or triethylene) dehydration unit & associated equipment (located at a major source), or

■ Tryiethylene glycol (TEG) dehydration unit (located at an area source)

The facility is exempt from MACT HH because it:

☐ Is a qualifying black oil facility, or

☐ Is a major source facility, prior to the point of custody transfer, with a facility-wide actual annual average natural gas throughout less than 18.4 thousand standard cubic meters per day and a facility-wide actual annual average hydrocarbon liquid throughput less than 39,700 liters per day.

☐ The facility is not exempt from MACT HH.

## SECTION C – EMISSION UNIT INFORMATION

| Emission Unit Description | Emission Unit Identifier (EU) | Emission Point Number (EP) | Pollutant* | Emission Rate lb/hr | Emission Rate ton/yr | Air Pollution Control Equipment |
|---|---|---|---|---|---|---|
| Dehydration Unit | D-1 | FL-2 | VOC | 1.73 | 7.60 | Flash tank/reboiler, Condenser/Flare |
| Dehydration Unit | D-1 | FL-2 | Benzene | 0.16 | 0.69 | Flash tank/reboiler, Condenser/Flare |
| Dehydration Unit | D-1 | FL-2 | Total HAP | 0.40 | 1.74 | Flash tank/reboiler, Condenser/Flare |
| Dehydration Unit | D-1 | FL-2 | CO2e | 11.67 | 51.11 | Flash tank/reboiler, Condenser/Flare |
| | | | | | | |

* *Includes an estimate of greenhouse gas emissions (CO2e).*

# PERMIT APPLICATION FOR FUEL BURNING EQUIPMENT FOR INDIRECT HEATING

NORTH DAKOTA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR QUALITY
SFN 8518 (9-2021)

NOTE: READ INSTRUCTIONS BEFORE COMPLETING THIS FORM.
**- Must include SFN 8516 or SFN 52858**

## SECTION A - GENERAL INFORMATION

| Name of Firm or Organization | Facility Name |
|---|---|
| ONEOK Rockies Midstream, L.L.C. | Lewis and Clark Compressor Station |

## SECTION B – EQUIPMENT

| Source ID No. (From form SFN 8516) | Name of Manufacturer |
|---|---|
| H-1 | Glycol Reboiler |
| Rated Capacity/Maximum Input<br>1.0 mmBtu/hr | Model Number |

Purpose
Space Heat _____%
Process Heat _____%
Power Generation _____%
Other (Specify % if Multi-Purpose) _____%

## SECTION C – TYPE OF COMBUSTION UNIT AND FUEL FEEDING METHOD

Coal (If other solid fuel, specify here)
- ☐ Pulverized
- ☐ General
- ☐ Dry Bottom
- ☐ Wet Bottom with Fly Ash Reinjection
- ☐ Wet Bottom without Fly Ash Reinjection
- ☐ Other – Specify:
- ☐ Spreader Stoker with Fly Ash Reinjection
- ☐ Spreader Stoker without Fly Ash Reinjection
- ☐ Fluidized Bed
- ☐ Cyclone
- ☐ Hand-Fired

Fuel Oil
- ☐ Horizontally Fired
- ☐ Tangentially Fired
- ☐ Other – Specify:

Gas
- ☒ Horizontally Fired
- ☐ Tangentially Fired
- ☐ Other – Specify:

## SECTION D – NORMAL SCHEDULE OF OPERATION

| Hours Per Day | Days Per Week | Weeks Per Year | Hours Per Year Total | Peak Season (Specify Months) |
|---|---|---|---|---|
| 24 | 7 | 52 | 8760 | |

## SECTION E – FUEL USE EXPECTED IN A CALENDAR YEAR

Year 20

| Primary Fuels | | Standby Fuels | |
|---|---|---|---|
| Type<br>Natural Gas | | Type | |
| Quantity Per Year<br>8.54 | Units of Measure<br>mmscf/yr | Quantity Per Year | Units of Measure |

| Percent Ash (Solid Fuels Only) | | | | | |
|---|---|---|---|---|---|
| Minimum | Maximum | Average | Minimum | Maximum | Average |
| | | | | | |

| Percent Sulfur | | | | | |
|---|---|---|---|---|---|
| Minimum | Maximum | Average | Minimum | Maximum | Average |
| | | | | | |

| Btu Per Unit of Measure (e.g. lb, gal, etc. - Specify) | | | | | |
|---|---|---|---|---|---|
| Minimum | Maximum | Average | Minimum | Maximum | Average |
| | | 1026/scf | | | |

Describe Fuel Transport and Storage Methods:

**SECTION F – COMBUSTION AIR**

☐ Natural Draft ■ Induced ☐ Forced ☐ Other – Specify:

**SECTION G – STACK DATA**

| | |
|---|---|
| Inside Diameter (ft) | Height Above Grade (ft) |
| Gas Temperature at Exit (Avg. °F) | Gas Velocity at Exit (Avg. ft/sec) |
| Are Emission Control Devices in Place? If YES – Complete SFN 8532 ☐ Yes ☐ No | |
| Stack Exit Gas Flow Rate | |
| Average (ACFM) | Average (DSCFM) |
| Maximum (ACFM) | Maximum (DSCFM) |
| Are sampling ports available? ☐ No ☐ Yes – Describe: | |

**SECTION H – NEARBY BUILDINGS**

Attach drawings which show the plan and elevation views of any nearby buildings including the building that houses the fuel-fired equipment.

**SECTION I – AIR CONTAMINANTS EMITTED**

| Pollutant | Maximum Pounds Per Hour | Amount (Tons Per Year) | Basis of Estimate* |
|---|---|---|---|
| $NO_x$ | 0.10 | 0.43 | AP-42 Table 1.4-1 |
| CO | 0.08 | 0.36 | AP-42 Table 1.4-1 |
| PM | 0.01 | 0.03 | AP-42 Table 1.4-1 |
| $PM_{10}$ (filterable and condensable) | 0.01 | 0.03 | AP-42 Table 1.4-1 |
| $PM_{2.5}$ (filterable and condensable) | 0.01 | 0.03 | AP-42 Table 1.4-1 |
| $SO_2$ | 0.01 | 0.01 | AP-42 Table 1.4-1 |

| Pollutant | Maximum Pounds Per Hour | Amount (Tons Per Year) | Basis of Estimate* |
|---|---|---|---|
| VOC | 0.01 | 0.02 | AP-42 Table 1.4-1 |
| GHG (as $CO_2e$) | 117.10 | 512.89 | AP-42 Table 1.4-1 |
| Largest Single HAP | 0.01 | 0.01 | AP-42 Table 1.4-3 |
| Total HAPS | 0.01 | 0.01 | AP-42 Table 1.4-3 |

*If performance test results are available for the unit, submit a copy of test with this application. If manufacturer guarantees are used provide spec sheet.

# PERMIT APPLICATION FOR FLARES

NORTH DAKOTA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR QUALITY
SFN 59652 (9-2021)

NOTE: READ INSTRUCTIONS BEFORE COMPLETING THIS FORM.
**- Must include SFN 8516 or SFN 52858**

## SECTION A – GENERAL INFORMATION

| Name of Firm or Organization | Facility Name |
|---|---|
| ONEOK Rockies Midstream, L.L.C. | Lewis and Clark Compressor Station |

## SECTION B - FLARE INFORMATION

| | | |
|---|---|---|
| Use: ☐ Emergency ☒ Process ☐ Both | Subject to NSPS (40 CFR 60.18) ○ Yes ◉ No | |
| Emission Point ID<br>FL-2 | Height Above Ground Level (ft.) | Diameter at Top (ft.) |
| Flame Monitor: ☒ Thermocouple ☐ Infrared ☐ Ultraviolet ☐ Acoustic ☐ Other: | | |
| Ignition: ☒ Automatic ☒ Continuous Burning Pilot ☒ Other: | | |
| Average Btu/1000 scf<br>0.2004 | Percent $H_2S$ | Maximum Hourly Flow Rate to Flare<br>42.35 lb/hr |
| List source ID numbers controlled by this unit, if any:<br>D-1 | | |

## SECTION C – AIR CONTAMINANTS EMITTED

| Pollutant | Amount (Tons Per Year) | Basis of Estimate* |
|---|---|---|
| $NO_x$ | 0.28 | AP-42 Table 1.4-1 |
| CO | 1.23 | AP-42 Table 1.4-1 |
| PM | 0.01 | AP-42 Table 1.4-2 |
| $PM_{10}$ (filterable and condensable) | 0.01 | AP-42 Table 1.4-1 and Mass Balance |
| $PM_{2.5}$ (filterable and condensable) | 0.01 | AP-42 Table 1.4-2 |
| $SO_2$ | 0.01 | AP-42 Table 1.4-2 |
| VOC | 0.01 | AP-42 Table 1.4-1 and Mass Balance |
| GHG (as $CO_2e$) | 490.06 | 40 CFR 98 |
| Largest Single HAP | 0.01 | AP-42 Table 1.4-1 and Mass Balance |
| Total HAPS | 0.01 | AP-42 Table 1.4-1 and Mass Balance |

*If performance test results are available for the unit, submit a copy of test with this application. If manufacturer guarantee are used provide spec sheet.

Will flaring of gas comply with applicable Ambient Air Quality Standards? ☒ Yes ☐ No

IS THIS UNIT IN COMPLIANCE WITH ALL APPLICABLE AIR POLLUTION CONTROL RULES AND REGULATIONS?

☒ YES ☐ NO

If "NO" a Compliance Schedule (SFN 61008) must be completed and attached.

Attach and label separate sheet(s) if you need more space to explain any system or answers or to provide complete listings of Emissions, Contaminants or other items.

SEND COMPLETED APPLICATION AND ALL ATTACHMENTS TO:

North Dakota Department of Environmental Quality
Division of Air Quality
4201 Normandy Street, 2nd Floor
Bismarck, ND 58503-1324
(701)328-5188

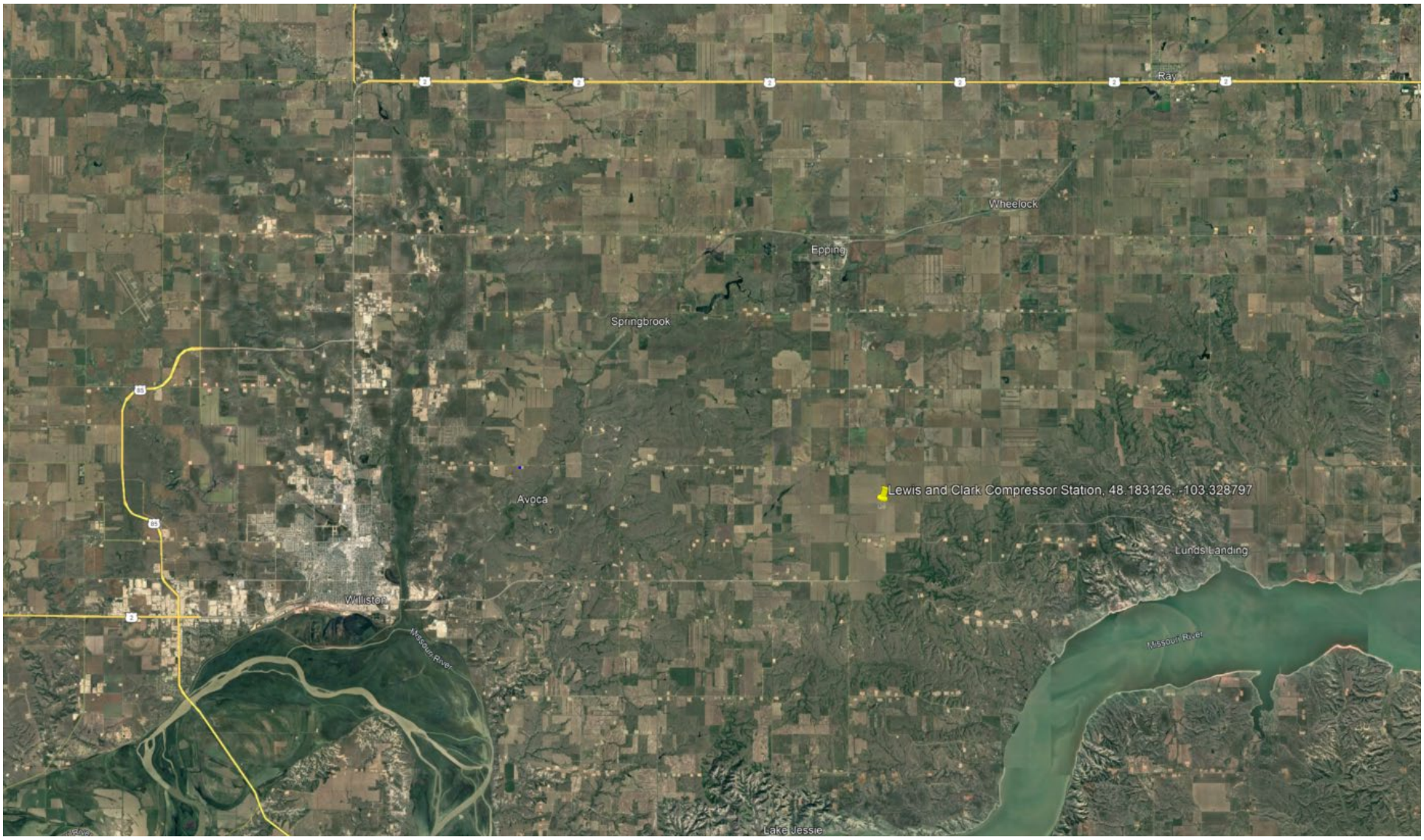
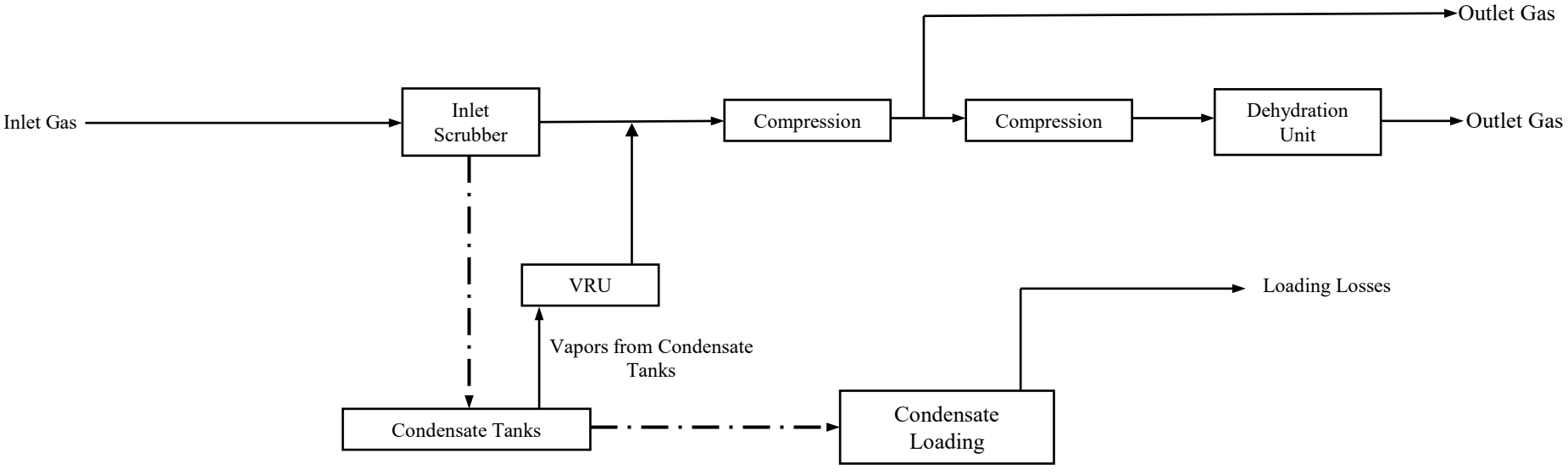



Figure Title: **Area Map**

ONEOK
ROCKIES MIDSTREAM
A SUBSIDIARY OF ONEOK PARTNERS

**Figure 1.**

ONEOK Rockies Midstream, L.L.C.
Lewis and Clark Compressor Station
Williams County, ND




Gas/Vapor

Condensate/Water

**ORM Lewis and Clark Compressor Station**

Figure 2: Process Flow Diagram

Williams County, North Dakota

# ONEOK Rockies Midstream, L.L.C.
# Lewis & Clark Compressor Station
# Facility Emissions Summary - Annual

| Unit ID | Description | NOx | CO | VOC | $SO_2$ | PM | HCHO | HAP | $CO_2e$ |
|---|---|---|---|---|---|---|---|---|---|
| | | TPY | TPY | TPY | TPY | TPY | TPY | TPY | TPY |
| C-1 | 1,680-hp Waukesha L7044 GSI | 16.22 | 32.44 | 11.36 | 0.04 | 1.22 | 0.64 | 1.02 | 7,346.46 |
| C-2 | 1,680-hp Waukesha L7044 GSI | 16.22 | 32.44 | 11.36 | 0.04 | 1.22 | 0.64 | 1.02 | 7,346.46 |
| D-1 | 60-mmscfd Glycol Dehydration Unit | -- | -- | 7.60 | -- | -- | -- | 1.74 | 51.11 |
| H-1 | 1-MMBtu/hr Glycol Reboiler | 0.43 | 0.36 | 0.02 | <0.01 | 0.03 | <0.01 | 0.01 | 512.89 |
| FL-2 | BTEX Flare | 0.28 | 1.23 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 492.63 |
| TK-1 | 400-bbl Condensate Tank | -- | -- | 1.36 | -- | -- | -- | 0.05 | 10.45 |
| TK-2 | 400-bbl Condensate Tank | -- | -- | 1.36 | -- | -- | -- | 0.05 | 10.45 |
| TK-3 | 400-bbl Condensate Tank | -- | -- | 0.48 | -- | -- | -- | 0.02 | 0.00 |
| TK-4 | 400-bbl Condensate Tank | -- | -- | 0.48 | -- | -- | -- | 0.02 | 0.00 |
| TK-5 | 400-bbl Condensate Tank | -- | -- | 0.48 | -- | -- | -- | 0.02 | 0.00 |
| TK-6 | 400-bbl Condensate Tank | -- | -- | 0.48 | -- | -- | -- | 0.02 | 0.00 |
| TL-1 | Condensate Truck Loading | -- | -- | 12.56 | -- | -- | -- | 1.94 | 0.08 |
| FL-1 | Emergency Flare | 0.11 | 0.19 | 0.13 | <0.01 | 0.01 | <0.01 | <0.01 | 152.66 |
| TK-7 | 400-bbl Methanol Tank | -- | -- | 0.17 | -- | -- | -- | 0.17 | -- |
| TK-8 | 24-bbl Methanol Tank | -- | -- | 0.02 | -- | -- | -- | 0.02 | -- |
| FUG | Fugitive Emissions | -- | -- | 14.11 | -- | -- | -- | 0.70 | 391.44 |
| BD | Miscellaneous Venting and Blowdowns to Atmosphere | -- | -- | 10.93 | -- | -- | -- | 0.42 | 336.35 |
| | **Total =** | **33.26** | **66.66** | **72.88** | **0.08** | **2.48** | **1.29** | **7.21** | **16,650.98** |

Notes:
1) Miscellaneous venting and blowdowns to atmosphere include, but are not limited to, miscellaneous planned and unplanned venting to atmosphere from pressure relief valves, startup, shut-down, maintenance, compressor blowdowns, pigging actions, and/or pneumatic controllers.

# ONEOK Rockies Midstream, L.L.C.
# Lewis & Clark Compressor Station
# Facility Emissions Summary - Hourly

| Unit ID | Description | NOx | CO | VOC | $SO_2$ | PM | HCHO | HAP | $CO_2e$ |
|---|---|---|---|---|---|---|---|---|---|
| | | lb/hr | lb/hr | lb/hr | lb/hr | lb/hr | lb/hr | lb/hr | lb/hr |
| C-1 | 1,680-hp Waukesha L7044 GSI | 3.70 | 7.41 | 2.59 | 0.01 | 0.28 | 0.15 | 0.23 | 1,677.27 |
| C-2 | 1,680-hp Waukesha L7044 GSI | 3.70 | 7.41 | 2.59 | 0.01 | 0.28 | 0.15 | 0.23 | 1,677.27 |
| D-1 | 60-mmscfd Glycol Dehydration Unit | -- | -- | 1.73 | -- | -- | -- | 0.40 | 11.67 |
| H-1 | 1-MMBtu/hr Glycol Reboiler | 0.10 | 0.08 | 0.01 | <0.01 | 0.01 | <0.01 | <0.01 | 117.10 |
| FL-2 | BTEX Flare | 0.06 | 0.28 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 112.47 |
| TK-1 | 400-bbl Condensate Tank | -- | -- | 0.31 | -- | -- | -- | 0.01 | 2.39 |
| TK-2 | 400-bbl Condensate Tank | -- | -- | 0.31 | -- | -- | -- | 0.01 | 2.39 |
| TK-3 | 400-bbl Condensate Tank | -- | -- | 0.11 | -- | -- | -- | <0.01 | 0.00 |
| TK-4 | 400-bbl Condensate Tank | -- | -- | 0.11 | -- | -- | -- | <0.01 | 0.00 |
| TK-5 | 400-bbl Condensate Tank | -- | -- | 0.11 | -- | -- | -- | <0.01 | 0.00 |
| TK-6 | 400-bbl Condensate Tank | -- | -- | 0.11 | -- | -- | -- | <0.01 | 0.00 |
| TL-1 | Condensate Truck Loading | -- | -- | 2.87 | -- | -- | -- | 0.44 | 0.02 |
| FL-1 | Emergency Flare | 0.19 | 0.78 | 0.83 | <0.01 | <0.01 | <0.01 | 0.01 | 340.16 |
| TK-7 | 400-bbl Methanol Tank | -- | -- | -- | -- | -- | -- | -- | -- |
| TK-8 | 24-bbl Methanol Tank | -- | -- | -- | -- | -- | -- | -- | -- |
| FUG | Fugitive Emissions | -- | -- | 3.22 | -- | -- | -- | 0.16 | 89.37 |
| BD | Miscellaneous Venting and Blowdowns to Atmosphere | -- | -- | -- | -- | -- | -- | -- | -- |
| | **Total =** | **7.76** | **15.96** | **14.90** | **0.02** | **0.57** | **0.29** | **1.52** | **4,030.10** |

# ONEOK Rockies Midstream, L.L.C.
## Lewis & Clark Compressor Station
## Facility Analyses

| Component | Molecular Weight | Stream 1 Inlet Gas | | | | Stream 2 Condensate | | | | Stream 3 Flash Gas | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Mole % | Equiv. Wt. Basis | Weight % | HC Weight % | Mole % | Equiv. Wt. Basis | Weight % | HC Weight % | Mole % | Equiv. Wt. Basis | Weight % | HC Weight % |
| **Hydrogen Sulfide** | 34.081 | 0.0000% | 0.00 | 0.00% | - | 0.0000% | 0.00 | 0.00% | - | 0.0000% | 0.00 | 0.00% | - |
| **Carbon Dioxide** | 44.010 | 1.1240% | 0.49 | 1.98% | - | 0.0132% | 0.01 | 0.01% | - | 0.8250% | 0.36 | 1.18% | - |
| **Nitrogen** | 28.013 | 1.8070% | 0.51 | 2.03% | - | 0.0020% | 0.00 | 0.00% | - | 1.4540% | 0.41 | 1.32% | - |
| **Helium** | 4.003 | 0.0000% | 0.00 | 0.00% | - | 0.0000% | 0.00 | 0.00% | - | 0.0000% | 0.00 | 0.00% | - |
| **Oxygen** | 31.999 | 0.0000% | 0.00 | 0.00% | - | 0.0000% | 0.00 | 0.00% | - | 0.0000% | 0.00 | 0.00% | - |
| **Methane** | 16.043 | 63.5130% | 10.19 | 40.81% | 42.51% | 0.2298% | 0.04 | 0.04% | 0.04% | 44.7510% | 7.18 | 23.34% | 23.94% |
| **Ethane** | 30.069 | 18.2430% | 5.49 | 21.97% | 22.89% | 0.9745% | 0.29 | 0.29% | 0.29% | 25.7070% | 7.73 | 25.13% | 25.77% |
| **Propane** | 44.096 | 8.5350% | 3.76 | 15.07% | 15.70% | 2.1298% | 0.94 | 0.93% | 0.93% | 14.4890% | 6.39 | 20.77% | 21.30% |
| **i-Butane** | 58.122 | 1.0290% | 0.60 | 2.40% | 2.50% | 0.7238% | 0.42 | 0.42% | 0.42% | 1.7774% | 1.03 | 3.36% | 3.44% |
| **n-Butane** | 58.122 | 3.0570% | 1.78 | 7.12% | 7.41% | 3.2759% | 1.90 | 1.89% | 1.89% | 5.3580% | 3.11 | 10.12% | 10.38% |
| **i-Pentane** | 72.149 | 0.6310% | 0.46 | 1.82% | 1.90% | 2.1122% | 1.52 | 1.51% | 1.51% | 1.2541% | 0.90 | 2.94% | 3.02% |
| **n-Pentane** | 72.149 | 0.9760% | 0.70 | 2.82% | 2.94% | 4.5843% | 3.31 | 3.28% | 3.28% | 1.9484% | 1.41 | 4.57% | 4.69% |
| **n-Hexane** | 86.175 | 0.2650% | 0.23 | 0.91% | 0.95% | 11.5520% | 9.95 | 9.87% | 9.87% | 1.2570% | 1.08 | 3.52% | 3.61% |
| **Other Hexanes** | 86.175 | 0.4600% | 0.40 | 1.59% | 1.65% | 0.0000% | 0.00 | 0.00% | 0.00% | 0.0000% | 0.00 | 0.00% | 0.00% |
| **Heptanes** | 100.202 | 0.2260% | 0.23 | 0.91% | 0.94% | 23.1120% | 23.16 | 22.96% | 22.96% | 0.7255% | 0.73 | 2.36% | 2.42% |
| **Benzene** | 78.114 | 0.0240% | 0.02 | 0.08% | 0.08% | 0.6092% | 0.48 | 0.47% | 0.47% | 0.0642% | 0.05 | 0.16% | 0.17% |
| **Toluene** | 92.141 | 0.0130% | 0.01 | 0.05% | 0.05% | 1.9250% | 1.77 | 1.76% | 1.76% | 0.0531% | 0.05 | 0.16% | 0.16% |
| **Ethylbenzene** | 106.167 | 0.0020% | 0.00 | 0.01% | 0.01% | 0.6199% | 0.66 | 0.65% | 0.65% | 0.0050% | 0.01 | 0.02% | 0.02% |
| **Xylenes** | 106.167 | 0.0120% | 0.01 | 0.05% | 0.05% | 2.5251% | 2.68 | 2.66% | 2.66% | 0.0157% | 0.02 | 0.05% | 0.06% |
| **Octanes** | 114.229 | 0.0360% | 0.04 | 0.16% | 0.17% | 26.7560% | 30.56 | 30.30% | 30.30% | 0.2322% | 0.27 | 0.86% | 0.88% |
| **2,2,4-Trimethylpentane** | 114.231 | 0.0390% | 0.04 | 0.18% | 0.19% | 0.0000% | 0.00 | 0.00% | 0.00% | 0.0000% | 0.00 | 0.00% | 0.00% |
| **Nonanes** | 128.255 | 0.0030% | 0.00 | 0.02% | 0.02% | 10.0720% | 12.92 | 12.81% | 12.81% | 0.0244% | 0.03 | 0.10% | 0.10% |
| **Decanes** | 142.282 | 0.0050% | 0.01 | 0.03% | 0.03% | 7.2043% | 10.25 | 10.16% | 10.16% | 0.0049% | 0.01 | 0.02% | 0.02% |
| **Totals =** | | 100.0000% | 24.97 | 100.00% | 100.00% | 98.4211% | 100.87 | 100.00% | 100.00% | 99.9459% | 30.76 | 100.00% | 100.00% |
| | | **Total HC =** | **23.97** | **Total VOC =** | **34.60%** | **Total HC =** | **100.86** | **Total VOC =** | **99.67%** | **Total HC =** | **29.99** | **Total VOC =** | **50.29%** |
| | | | | **Total HAP =** | **1.33%** | | | **Total HAP =** | **15.41%** | | | **Total HAP =** | **4.02%** |

Notes:
1) Representative gas analysis. Condensate composition calculated with site-specific ProMax process simulation.

# ONEOK Rockies Midstream, L.L.C.
# Lewis & Clark Compressor Station
# Engine Information and Manufacturer Emission Factors

| Equipment Information | | |
|---|---|---|
| | **C-1** | **C-2** |
| **Make** | Waukesha | Waukesha |
| **Model** | L7044 GSI | L7044 GSI |
| **Design Rating (hp)** | 1,680 | 1,680 |
| **Fuel Consumption (Btu/hp-hr)** | 8,526 | 8,526 |
| **Fuel Consumption (scfh)** | 13,961 | 13,961 |
| **Fuel Consumption (mmBtu/hr)** | 14.32 | 14.32 |
| **Fuel Consumption (scf/yr)** | 122,295,747 | 122,295,747 |
| **Fuel Heating Value (Btu/scf)** | 1,026 | 1,026 |
| **Design Class** | 4S-RB | 4S-RB |
| **Controls** | NSCR | NSCR |
| **Operating Hours** | 8,760 | 8,760 |
| **Stack Height (ft)** | 30.0 | 30.0 |
| **Stack Diameter (ft)** | 1.0 | 1.0 |
| **Exhaust Temperature (°F)** | 1201 | 1201 |
| **Exhaust Flow (acfm)** | 7,429 | 7,429 |
| **Exhaust Flow (scfh)** | 141,692 | 141,692 |
| **Exit Velocity (ft/s)** | 157.65 | 157.65 |

| Post-Control Emission Factors | | |
|---|---|---|
| | **C-1** | **C-2** |
| **NOx (g/hp-hr)** | 1.00 | 1.00 |
| **CO (g/hp-hr)** | 2.00 | 2.00 |
| **VOC (g/hp-hr)** | 0.70 | 0.70 |
| **Formaldehyde (g/hp-hr)** | NA | NA |
| **$CO_2$ (g/hp-hr)** | NA | NA |

Notes:

2) Emission Factor Source: NSPS JJJJ emissions limitations for modified engines.

## ONEOK Rockies Midstream, L.L.C.
## Lewis & Clark Compressor Station
## Engine AP-42/EPA Emission Factors

| Emission Factors | |
|---|---|
| | **4S-RB** |
| **NOx (lb/mmBtu)** | 2.21E+00 |
| **CO (lb/mmBtu)** | 3.72E+00 |
| **VOC (lb/mmBtu)** | 2.96E-02 |
| **$SO_2$ (lb/mmBtu)** | 5.88E-04 |
| **$PM_{10/2.5}$ (lb/mmBtu)** | 9.50E-03 |
| **$PM_{COND}$ (lb/mmBtu)** | 9.91E-03 |
| **$PM_{TOT}$ (lb/mmBtu)** | 1.94E-02 |
| **Acetaldehyde (lb/mmBtu)** | 2.79E-03 |
| **Acrolein (lb/mmBtu)** | 2.63E-03 |
| **Benzene (lb/mmBtu)** | 1.58E-03 |
| **Ethylbenzene (lb/mmBtu)** | 2.48E-05 |
| **Formaldehyde (lb/mmBtu)** | 2.05E-02 |
| **Methanol (lb/mmBtu)** | 3.06E-03 |
| **n-Hexane (lb/mmBtu)** | NA |
| **Toluene (lb/mmBtu)** | 5.58E-04 |
| **Xylenes (lb/mmBtu)** | 1.95E-04 |
| **Other HAP (lb/mmBtu)** | 1.08E-03 |
| **Carbon Dioxide ($CO_2$) (kg/mmBtu)** | 5.31E+01 |
| **Methane ($CH_4$) (kg/mmBtu)** | 1.00E-03 |
| **Nitrous Oxide ($N_2O$) (kg/mmBtu)** | 1.00E-04 |

| Control Efficiency | |
|---|---|
| | **4S-RB** |
| NOx | 0.00% |
| CO | 90.00% |
| VOC | 50.00% |
| Formaldehyde | 50.00% |
| HAP | 50.00% |

| Post-Control Emission Factors | |
|---|---|
| | **4S-RB** |
| **NOx (lb/mmBtu)** | 2.21E+00 |
| **CO (lb/mmBtu)** | 3.72E-01 |
| **VOC (lb/mmBtu)** | 1.48E-02 |
| **$SO_2$ (lb/mmBtu)** | 5.88E-04 |
| **$PM_{10/2.5}$ (lb/mmBtu)** | 9.50E-03 |
| **$PM_{COND}$ (lb/mmBtu)** | 9.91E-03 |
| **$PM_{TOT}$ (lb/mmBtu)** | 1.94E-02 |
| **Acetaldehyde (lb/mmBtu)** | 1.40E-03 |
| **Acrolein (lb/mmBtu)** | 1.32E-03 |
| **Benzene (lb/mmBtu)** | 7.90E-04 |
| **Ethylbenzene (lb/mmBtu)** | 1.24E-05 |
| **Formaldehyde (lb/mmBtu)** | 1.03E-02 |
| **Methanol (lb/mmBtu)** | 1.53E-03 |
| **n-Hexane (lb/mmBtu)** | NA |
| **Toluene (lb/mmBtu)** | 2.79E-04 |
| **Xylenes (lb/mmBtu)** | 9.75E-05 |
| **Other HAP (lb/mmBtu)** | 5.40E-04 |
| **Carbon Dioxide ($CO_2$) (kg/mmBtu)** | 5.31E+01 |
| **Methane ($CH_4$) (kg/mmBtu)** | 1.00E-03 |
| **Nitrous Oxide ($N_2O$) (kg/mmBtu)** | 1.00E-04 |

Notes:
1) Criteria pollutant and hazardous air pollutant emission factors are from AP-42 Table 3.2-2 (7/00). Greenhouse

**ONEOK Rockies Midstream, L.L.C.**
**Lewis & Clark Compressor Station**
**Engine Emissions Calculations**

**Unit ID:** **C-1**

| Pollutant | Emission Factor | | | Capacity | | | Conversion | | | Hourly Emissions | | Operating Hours | | Conversion | | | Annual Emissions | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **NOx** | 1.00E+00 | g/hp-hr | X | 1,680 | hp | X | 0.00220462 | lb/gr | = | **3.70** | **lb/hr** | X 8,760 | X | 0.0005 | ton/lb | = | **16.22** | **TPY** |
| **CO** | 2.00E+00 | g/hp-hr | X | 1,680 | hp | X | 0.00220462 | lb/gr | = | **7.41** | **lb/hr** | X 8,760 | X | 0.0005 | ton/lb | = | **32.44** | **TPY** |
| **VOC** | 7.00E-01 | g/hp-hr | X | 1,680 | hp | X | 0.00220462 | lb/gr | = | **2.59** | **lb/hr** | X 8,760 | X | 0.0005 | ton/lb | = | **11.36** | **TPY** |
| **$SO_2$** | 5.88E-04 | lb/mmBtu | X | 14.32 | mmBtu/hr | X | - | - | = | **0.01** | **lb/hr** | X 8,760 | X | 0.0005 | ton/lb | = | **0.04** | **TPY** |
| **$PM_{10/2.5}$** | 9.50E-03 | lb/mmBtu | X | 14.32 | mmBtu/hr | X | - | - | = | **0.14** | **lb/hr** | X 8,760 | X | 0.0005 | ton/lb | = | **0.60** | **TPY** |
| **$PM_{COND}$** | 9.91E-03 | lb/mmBtu | X | 14.32 | mmBtu/hr | X | - | - | = | **0.14** | **lb/hr** | X 8,760 | X | 0.0005 | ton/lb | = | **0.62** | **TPY** |
| **$PM_{TOT}$** | 1.94E-02 | lb/mmBtu | X | 14.32 | mmBtu/hr | X | - | - | = | **0.28** | **lb/hr** | X 8,760 | X | 0.0005 | ton/lb | = | **1.22** | **TPY** |
| **Acetaldehyde** | 1.40E-03 | lb/mmBtu | X | 14.32 | mmBtu/hr | X | - | - | = | **0.02** | **lb/hr** | X 8,760 | X | 0.0005 | ton/lb | = | **0.09** | **TPY** |
| **Acrolein** | 1.32E-03 | lb/mmBtu | X | 14.32 | mmBtu/hr | X | - | - | = | **0.02** | **lb/hr** | X 8,760 | X | 0.0005 | ton/lb | = | **0.08** | **TPY** |
| **Benzene** | 7.90E-04 | lb/mmBtu | X | 14.32 | mmBtu/hr | X | - | - | = | **0.01** | **lb/hr** | X 8,760 | X | 0.0005 | ton/lb | = | **0.05** | **TPY** |
| **Ethylbenzene** | 1.24E-05 | lb/mmBtu | X | 14.32 | mmBtu/hr | X | - | - | = | **<0.01** | **lb/hr** | X 8,760 | X | 0.0005 | ton/lb | = | **<0.01** | **TPY** |
| **Formaldehyde** | 1.03E-02 | lb/mmBtu | X | 14 | mmBtu/hr | X | - | - | = | **0.15** | **lb/hr** | X 8,760 | X | 0.0005 | ton/lb | = | **0.64** | **TPY** |
| **Methanol** | 1.53E-03 | lb/mmBtu | X | 14.32 | mmBtu/hr | X | - | - | = | **0.02** | **lb/hr** | X 8,760 | X | 0.0005 | ton/lb | = | **0.10** | **TPY** |
| **n-Hexane** | NA | lb/mmBtu | X | 14.32 | mmBtu/hr | X | - | - | = | **0.00** | **lb/hr** | X 8,760 | X | 0.0005 | ton/lb | = | **0.00** | **TPY** |
| **Toluene** | 2.79E-04 | lb/mmBtu | X | 14.32 | mmBtu/hr | X | - | - | = | **<0.01** | **lb/hr** | X 8,760 | X | 0.0005 | ton/lb | = | **0.02** | **TPY** |
| **Xylenes** | 9.75E-05 | lb/mmBtu | X | 14.32 | mmBtu/hr | X | - | - | = | **<0.01** | **lb/hr** | X 8,760 | X | 0.0005 | ton/lb | = | **0.01** | **TPY** |
| **Other HAP** | 5.40E-04 | lb/mmBtu | X | 14.32 | mmBtu/hr | X | - | - | = | **0.01** | **lb/hr** | X 8,760 | X | 0.0005 | ton/lb | = | **0.03** | **TPY** |
| **$CO_2$** | 5.31E+01 | lb/mmBtu | X | 14 | mmBtu/hr | X | 2.20462 | lb/kg | = | **1,675.54** | **lb/hr** | X 8,760 | X | 0.0005 | ton/lb | = | **7,338.88** | **TPY** |
| **$CH_4$** | 1.00E-03 | kg/mmBtu | X | 14.32 | mmBtu/hr | X | 2.20462 | lb/kg | = | **0.03** | **lb/hr** | X 8,760 | X | 0.0005 | ton/lb | = | **0.14** | **TPY** |
| **$N_2O$** | 1.00E-04 | kg/mmBtu | X | 14.32 | mmBtu/hr | X | 2.20462 | lb/kg | = | **<0.01** | **lb/hr** | X 8,760 | X | 0.0005 | ton/lb | = | **0.01** | **TPY** |

**ONEOK Rockies Midstream, L.L.C.**
**Lewis & Clark Compressor Station**
**Engine Emissions Calculations**

**Unit ID:** **C-2**

| Pollutant | Emission Factor | | | Capacity | | | Conversion | | | Hourly Emissions | | Operating Hours | | Conversion | | | Annual Emissions | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **NOx** | 1.00E+00 | g/hp-hr | X | 1,680 | hp | X | 0.00220462 | lb/gr | = | **3.70** | **lb/hr** | X 8,760 | X | 0.0005 | ton/lb | = | **16.22** | **TPY** |
| **CO** | 2.00E+00 | g/hp-hr | X | 1,680 | hp | X | 0.00220462 | lb/gr | = | **7.41** | **lb/hr** | X 8,760 | X | 0.0005 | ton/lb | = | **32.44** | **TPY** |
| **VOC** | 7.00E-01 | g/hp-hr | X | 1,680 | hp | X | 0.00220462 | lb/gr | = | **2.59** | **lb/hr** | X 8,760 | X | 0.0005 | ton/lb | = | **11.36** | **TPY** |
| **$SO_2$** | 5.88E-04 | lb/mmBtu | X | 14.32 | mmBtu/hr | X | - | - | = | **0.01** | **lb/hr** | X 8,760 | X | 0.0005 | ton/lb | = | **0.04** | **TPY** |
| **$PM_{10/2.5}$** | 9.50E-03 | lb/mmBtu | X | 14.32 | mmBtu/hr | X | - | - | = | **0.14** | **lb/hr** | X 8,760 | X | 0.0005 | ton/lb | = | **0.60** | **TPY** |
| **$PM_{COND}$** | 9.91E-03 | lb/mmBtu | X | 14.32 | mmBtu/hr | X | - | - | = | **0.14** | **lb/hr** | X 8,760 | X | 0.0005 | ton/lb | = | **0.62** | **TPY** |
| **$PM_{TOT}$** | 1.94E-02 | lb/mmBtu | X | 14.32 | mmBtu/hr | X | - | - | = | **0.28** | **lb/hr** | X 8,760 | X | 0.0005 | ton/lb | = | **1.22** | **TPY** |
| **Acetaldehyde** | 1.40E-03 | lb/mmBtu | X | 14.32 | mmBtu/hr | X | - | - | = | **0.02** | **lb/hr** | X 8,760 | X | 0.0005 | ton/lb | = | **0.09** | **TPY** |
| **Acrolein** | 1.32E-03 | lb/mmBtu | X | 14.32 | mmBtu/hr | X | - | - | = | **0.02** | **lb/hr** | X 8,760 | X | 0.0005 | ton/lb | = | **0.08** | **TPY** |
| **Benzene** | 7.90E-04 | lb/mmBtu | X | 14.32 | mmBtu/hr | X | - | - | = | **0.01** | **lb/hr** | X 8,760 | X | 0.0005 | ton/lb | = | **0.05** | **TPY** |
| **Ethylbenzene** | 1.24E-05 | lb/mmBtu | X | 14.32 | mmBtu/hr | X | - | - | = | **<0.01** | **lb/hr** | X 8,760 | X | 0.0005 | ton/lb | = | **<0.01** | **TPY** |
| **Formaldehyde** | 1.03E-02 | lb/mmBtu | X | 14 | mmBtu/hr | X | - | - | = | **0.15** | **lb/hr** | X 8,760 | X | 0.0005 | ton/lb | = | **0.64** | **TPY** |
| **Methanol** | 1.53E-03 | lb/mmBtu | X | 14.32 | mmBtu/hr | X | - | - | = | **0.02** | **lb/hr** | X 8,760 | X | 0.0005 | ton/lb | = | **0.10** | **TPY** |
| **n-Hexane** | NA | lb/mmBtu | X | 14.32 | mmBtu/hr | X | - | - | = | **0.00** | **lb/hr** | X 8,760 | X | 0.0005 | ton/lb | = | **0.00** | **TPY** |
| **Toluene** | 2.79E-04 | lb/mmBtu | X | 14.32 | mmBtu/hr | X | - | - | = | **<0.01** | **lb/hr** | X 8,760 | X | 0.0005 | ton/lb | = | **0.02** | **TPY** |
| **Xylenes** | 9.75E-05 | lb/mmBtu | X | 14.32 | mmBtu/hr | X | - | - | = | **<0.01** | **lb/hr** | X 8,760 | X | 0.0005 | ton/lb | = | **0.01** | **TPY** |
| **Other HAP** | 5.40E-04 | lb/mmBtu | X | 14.32 | mmBtu/hr | X | - | - | = | **0.01** | **lb/hr** | X 8,760 | X | 0.0005 | ton/lb | = | **0.03** | **TPY** |
| **$CO_2$** | 5.31E+01 | lb/mmBtu | X | 14 | mmBtu/hr | X | 2.20462 | lb/kg | = | **1,675.54** | **lb/hr** | X 8,760 | X | 0.0005 | ton/lb | = | **7,338.88** | **TPY** |
| **$CH_4$** | 1.00E-03 | kg/mmBtu | X | 14.32 | mmBtu/hr | X | 2.20462 | lb/kg | = | **0.03** | **lb/hr** | X 8,760 | X | 0.0005 | ton/lb | = | **0.14** | **TPY** |
| **$N_2O$** | 1.00E-04 | kg/mmBtu | X | 14.32 | mmBtu/hr | X | 2.20462 | lb/kg | = | **<0.01** | **lb/hr** | X 8,760 | X | 0.0005 | ton/lb | = | **0.01** | **TPY** |

# ONEOK Rockies Midstream, L.L.C.
# Lewis & Clark Compressor Station
# Dehydration Unit Information and Operating Parameters

| Equipment Information | |
|---|---|
| | **D-1** |
| **Maximum Throughput (MMSCFD)** | 60 |
| **Wet Gas Temperature (°F)** | 110 |
| **Wet Gas Pressure (psig)** | 1,125 |
| **Pump Type (Electric/Gas)** | Electric |
| **Gas Pump Make/Model** | NA |
| **Gas Pump Glycol Flow Rate (gpm)** | 14.00 |
| **Electric Pump Make and Model** | TechnipFMC |
| **Flash Tank Temperature (°F)** | 125 |
| **Flash Tank Pressure (psia)** | 60 |
| **Flash Tank Controls** | Recycled/Used as Fuel |
| **Regenerator Still Vent Controls** | Condenser/Combustor |
| **Condenser Temperature (°F)** | 150 |
| **Condenser Pressure (psig)** | 14.7 |
| **Combustion Device Efficiency (%)** | 98% |
| **Operating Hours** | 8,760 |
| **Safety Factor Added to GLYCalc Results** | 10% |

Notes:
1) The dehydration unit still vent will be controlled by a glycol-cooled condenser. Still vent non-condensables are sent ot the combustor 98% control efficiency. The reboiler will be equipped with a burner management system to ensure constant combustion. The flash tank off-gas will be recycled and used for fuel for 100%
2) 10% safety factor has been added to GLYCalcTM results for a conservative estimate of emissions, and to account for possible fluctuations in inlet gas

**ONEOK Rockies Midstream, L.L.C.**
**Lewis & Clark Compressor Station**
**Dehydration Unit Emissions**

**Unit ID:** **D-1**

**Proposed Emissions**

| Pollutant | GLYCalc Results Still Vent Hourly Emissions | | GLYCalc Results Still Vent Annual Emissions | | | GLYCalc Results Flash Tank Hourly Emissions | | GLYCalc Results Flash Tank Annual Emissions | | | Safety Factor | | Proposed Hourly Emissions | | Proposed Annual Emissions | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Total VOC** | 0.8491 | lb/hr | 3.7191 | TPY | + | 0.7281 | lb/hr | 3.1892 | TPY | + | 10% | = | **1.73** | **lb/hr** | **7.60** | **TPY** |
| **$H_2S$** | 0.0000 | lb/hr | 0.0000 | TPY | + | 0.0000 | lb/hr | 0.0000 | TPY | + | 10% | = | **0.00** | **lb/hr** | **0.00** | **TPY** |
| **2,2,4-Trimethylpentane** | <0.01 | lb/hr | 0.0137 | TPY | + | 0.0020 | lb/hr | 0.0089 | TPY | + | 10% | = | **0.01** | **lb/hr** | **0.02** | **TPY** |
| **n-Hexane** | 0.0296 | lb/hr | 0.1296 | TPY | + | 0.0175 | lb/hr | 0.0765 | TPY | + | 10% | = | **0.05** | **lb/hr** | **0.23** | **TPY** |
| **Benzene** | 0.1394 | lb/hr | 0.6104 | TPY | + | 0.0031 | lb/hr | 0.0134 | TPY | + | 10% | = | **0.16** | **lb/hr** | **0.69** | **TPY** |
| **Toluene** | 0.0795 | lb/hr | 0.3482 | TPY | + | 0.0014 | lb/hr | 0.0062 | TPY | + | 10% | = | **0.09** | **lb/hr** | **0.39** | **TPY** |
| **Ethylbenzene** | 0.0101 | lb/hr | 0.0444 | TPY | + | 0.0002 | lb/hr | 0.0007 | TPY | + | 10% | = | **0.01** | **lb/hr** | **0.05** | **TPY** |
| **Xylene** | 0.0747 | lb/hr | 0.3270 | TPY | + | 0.0009 | lb/hr | 0.0037 | TPY | + | 10% | = | **0.08** | **lb/hr** | **0.36** | **TPY** |
| **Total HAP** | 0.3364 | lb/hr | 1.4733 | TPY | + | 0.0251 | lb/hr | 0.1094 | TPY | + | 10% | = | **0.40** | **lb/hr** | **1.74** | **TPY** |
| **$CO_2$** | 0.0009 | lb/hr | <0.01 | TPY | + | 0.0197 | lb/hr | 0.0862 | TPY | + | 10% | = | **0.02** | **lb/hr** | **0.10** | **TPY** |
| **$CH_4$** | 0.0190 | lb/hr | 0.0833 | TPY | + | 0.4045 | lb/hr | 1.7716 | TPY | + | 10% | = | **0.47** | **lb/hr** | **2.04** | **TPY** |

**Uncontrolled Emissions - For Reference Only**

| Pollutant | GLYCalc Results Still Vent Hourly Emissions | | GLYCalc Results Still Vent Annual Emissions | | | GLYCalc Results Flash Tank Hourly Emissions | | GLYCalc Results Flash Tank Annual Emissions | | | Safety Factor | | Uncontrolled Hourly Emissions - For Reference Only | | Uncontrolled Annual Emissions - For Reference Only | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **VOC** | 55.1389 | lb/hr | 241.5085 | TPY | + | 36.4064 | lb/hr | 159.4601 | TPY | + | 10% | = | **100.70** | **lb/hr** | **441.07** | **TPY** |
| **$H_2S$** | 0.0000 | lb/hr | 0.0000 | TPY | + | 0.0000 | lb/hr | 0.0000 | TPY | + | 10% | = | **0.00** | **lb/hr** | **0.00** | **TPY** |
| **2,2,4-Trimethylpentane** | 0.1943 | lb/hr | 0.8512 | TPY | + | 0.1018 | lb/hr | 0.4459 | TPY | + | 10% | = | **0.33** | **lb/hr** | **1.43** | **TPY** |
| **n-Hexane** | 1.6233 | lb/hr | 7.1099 | TPY | + | 0.8730 | lb/hr | 3.8238 | TPY | + | 10% | = | **2.75** | **lb/hr** | **12.03** | **TPY** |
| **Benzene** | 8.2284 | lb/hr | 36.0406 | TPY | + | 0.1529 | lb/hr | 0.6695 | TPY | + | 10% | = | **9.22** | **lb/hr** | **40.38** | **TPY** |
| **Toluene** | 5.9219 | lb/hr | 25.9377 | TPY | + | 0.0706 | lb/hr | 0.3092 | TPY | + | 10% | = | **6.59** | **lb/hr** | **28.87** | **TPY** |
| **Ethylbenzene** | 1.1115 | lb/hr | 4.8682 | TPY | + | 0.0076 | lb/hr | 0.0334 | TPY | + | 10% | = | **1.23** | **lb/hr** | **5.39** | **TPY** |
| **Xylene** | 9.0547 | lb/hr | 39.6597 | TPY | + | 0.0427 | lb/hr | 0.1870 | TPY | + | 10% | = | **10.01** | **lb/hr** | **43.83** | **TPY** |
| **Total HAP** | 26.1341 | lb/hr | 114.4673 | TPY | + | 1.2486 | lb/hr | 5.4688 | TPY | + | 10% | = | **30.12** | **lb/hr** | **131.93** | **TPY** |
| **$CO_2$** | 0.0463 | lb/hr | 0.2027 | TPY | + | 0.9842 | lb/hr | 4.3109 | TPY | + | 10% | = | **1.13** | **lb/hr** | **4.96** | **TPY** |
| **$CH_4$** | 0.9507 | lb/hr | 4.1642 | TPY | + | 20.2234 | lb/hr | 88.5786 | TPY | + | 10% | = | **23.29** | **lb/hr** | **102.02** | **TPY** |

$CO_2$ emissions calculated using mass balance and inlet gas analysis
tons $CH_4$ * ton mole $CH_4$/16 ton $CH_4$ * ton mole gas/ton mole $CH_4$ * ton mole $CO_2$/ton mole gas * 44 ton $CO_2$/ton mole $CO_2$ = ton $CO_2$/yr

# ONEOK Rockies Midstream, L.L.C.
# Lewis & Clark Compressor Station
# Flare Information and Emission Factors

| Equipment Information | |
|---|---|
| | **FL-2** |
| **Description** | BTEX Flare |
| **VOC to Flare (lb/hr)** | 42.35 |
| **Stream Heat Content (Btu/scf)** | 2,004 |
| **Stream Net Btu Value (Btu/hr)** | 896,522 |
| **Operating Hours** | 8,760 |
| **Control Efficiency** | 98% |
| **Pilot Stream Heat Content (Btu/scf)** | 1,026 |
| **Pilot Gas Flow Rate (scfh)** | 25.34 |
| **Pilot Gas Capacity (mmBtu/hr)** | 0.026 |
| **Pilot Operating Hours** | 8,760 |

| AP-42/EPA Emission Factors | | | |
|---|---|---|---|
| | **Flare Stream** | | **Pilot Gas** |
| **NOx (lb/mmBtu)** | 0.068 | **NOx (lb/mmscf)** | 100.0 |
| **CO (lb/mmBtu)** | 0.31 | **CO (lb/mmscf)** | 84.0 |
| **VOC** | Mass Balance | **VOC (lb/mmscf)** | 5.5 |
| **$SO_2$** | Stoichiometric | **$SO_2$ (lb/mmscf)** | 0.6 |
| **$PM_{10/2.5}$** | -- | **$PM_{10/2.5}$ (lb/mmscf)** | 1.9 |
| **$PM_{COND}$** | -- | **$PM_{COND}$ (lb/mmscf)** | 5.7 |
| **$PM_{TOT}$** | -- | **$PM_{TOT}$ (lb/mmscf)** | 7.6 |
| **Formaldehyde** | -- | **Formaldehyde (lb/mmscf)** | 7.50E-02 |
| **n-Hexane** | Mass Balance | **n-Hexane (lb/mmscf)** | 1.80E+00 |
| **Benzene** | Mass Balance | **Benzene (lb/mmscf)** | 2.10E-03 |
| **Toluene** | Mass Balance | **Toluene (lb/mmscf)** | 3.40E-03 |
| **Ethylbenzene** | Mass Balance | **Ethylbenzene** | -- |
| **Xylenes** | Mass Balance | **Xylenes** | -- |
| **Other HAP** | Mass Balance | **Other HAP (lb/mmscf)** | 1.90E-03 |
| **Carbon Dioxide ($CO_2$) (kg/mmBtu)** | 53.06/Mass Balance | **Carbon Dioxide ($CO_2$) (kg/mmBtu)** | 53.06 |
| **Methane ($CH_4$) (kg/mmBtu)** | 0.001/Mass Balance | **Methane ($CH_4$) (kg/mmBtu)** | 1.00E-03 |
| **Nitrous Oxide ($N_2O$) (kg/mmBtu)** | 0.0001/Mass Balance | **Nitrous Oxide ($N_2O$) (kg/mmBtu)** | 1.00E-04 |

Notes:
1) NOx and CO emission factors (lb/mmBtu), flare stream: AP-42, Table 13.5-1 (4/2015). Pilot criteria and HAP emission factors (lb/mmscf): AP-42, Table 1.4-1, -2 (7/98). GHG emission factors (kg/mmBtu): 40 CFR 98.

**ONEOK Rockies Midstream, L.L.C.**
**Lewis & Clark Compressor Station**
**Flare Emissions Calculations**

**Unit ID:** **FL-2**

**Total: Stream + Pilot**

| Pollutant | Hourly Emissions | | Annual Emissions | |
|---|---|---|---|---|
| NOx | 0.06 | lb/hr | 0.28 | TPY |
| CO | 0.28 | lb/hr | 1.23 | TPY |
| VOC | <0.01 | lb/hr | <0.01 | TPY |
| $SO_2$ | <0.01 | lb/hr | <0.01 | TPY |
| $PM_{10/2.5}$ | <0.01 | lb/hr | <0.01 | TPY |
| $PM_{COND}$ | <0.01 | lb/hr | <0.01 | TPY |
| $PM_{TOT}$ | <0.01 | lb/hr | <0.01 | TPY |
| Formaldehyde | <0.01 | lb/hr | <0.01 | TPY |
| n-Hexane | <0.01 | lb/hr | <0.01 | TPY |
| Benzene | <0.01 | lb/hr | <0.01 | TPY |
| Toluene | <0.01 | lb/hr | <0.01 | TPY |
| Other HAP | <0.01 | lb/hr | <0.01 | TPY |
| $CO_2$ | 111.89 | lb/hr | 490.06 | TPY |
| $CH_4$ | 0.02 | lb/hr | 0.09 | TPY |
| $N_2O$ | <0.01 | lb/hr | <0.01 | TPY |

**Stream Emissions**

| Pollutant | Emission Factor | | | Capacity | | | Conversion | | | Hourly Emissions | | | Operating Hours | | | Conversion | | | Annual Emissions | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NOx | 6.80E-02 | lb/mmBtu | X | 8.97E-01 | mmBtu/hr | X | - | - | = | **0.06** | **lb/hr** | X | 8,760 | X | 0.0005 | ton/lb | = | **0.27** | **TPY** |
| CO | 3.10E-01 | lb/mmBtu | X | 8.97E-01 | mmBtu/hr | X | - | - | = | **0.28** | **lb/hr** | X | 8,760 | X | 0.0005 | ton/lb | = | **1.22** | **TPY** |
| $CO_2$ | 5.31E+01 | kg/mmBtu | X | 8.97E-01 | mmBtu/hr | X | 2.20462 | lb/kg | = | **104.87** | **lb/hr** | X | 8,760 | X | 0.0005 | ton/lb | = | **459.34** | **TPY** |
| $CO_2$ | - | - | - | - | - | - | - | - | = | **3.97** | **lb/hr** | X | 8,760 | X | 0.0005 | ton/lb | = | **17.40** | **TPY** |
| $CH_4$ | 1.00E-03 | kg/mmBtu | X | 8.97E-01 | mmBtu/hr | X | 2.20462 | lb/kg | = | **<0.01** | **lb/hr** | X | 8,760 | X | 0.0005 | ton/lb | = | **0.01** | **TPY** |
| $CH_4$ | - | - | - | - | - | - | - | - | = | **0.02** | **lb/hr** | X | 8,760 | X | 0.0005 | ton/lb | = | **0.08** | **TPY** |
| $N_2O$ | 1.00E-04 | kg/mmBtu | X | 8.97E-01 | mmBtu/hr | X | 2.20462 | lb/kg | = | **<0.01** | **lb/hr** | X | 8,760 | X | 0.0005 | ton/lb | = | **<0.01** | **TPY** |

**Pilot Emissions**

| Pollutant | Emission Factor | | | Capacity | | | Conversion | | | Hourly Emissions | | | Operating Hours | | | Conversion | | | Annual Emissions | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NOx | 1.00E+02 | lb/mmscf | X | 2.53E-05 | mmscf/hr | X | - | - | = | **<0.01** | **lb/hr** | X | 8,760 | X | 0.0005 | ton/lb | = | **0.01** | **TPY** |
| CO | 8.40E+01 | lb/mmscf | X | 2.53E-05 | mmscf/hr | X | - | - | = | **<0.01** | **lb/hr** | X | 8,760 | X | 0.0005 | ton/lb | = | **0.01** | **TPY** |
| VOC | 5.50E+00 | lb/mmscf | X | 2.53E-05 | mmscf/hr | X | - | - | = | **<0.01** | **lb/hr** | X | 8,760 | X | 0.0005 | ton/lb | = | **<0.01** | **TPY** |
| $SO_2$ | 6.00E-01 | lb/mmscf | X | 2.53E-05 | mmscf/hr | X | - | - | = | **<0.01** | **lb/hr** | X | 8,760 | X | 0.0005 | ton/lb | = | **<0.01** | **TPY** |
| $PM_{10/2.5}$ | 1.90E+00 | lb/mmscf | X | 2.53E-05 | mmscf/hr | X | - | - | = | **<0.01** | **lb/hr** | X | 8,760 | X | 0.0005 | ton/lb | = | **<0.01** | **TPY** |
| $PM_{COND}$ | 5.70E+00 | lb/mmscf | X | 2.53E-05 | mmscf/hr | X | - | - | = | **<0.01** | **lb/hr** | X | 8,760 | X | 0.0005 | ton/lb | = | **<0.01** | **TPY** |
| $PM_{TOT}$ | 7.60E+00 | lb/mmscf | X | 2.53E-05 | mmscf/hr | X | - | - | = | **<0.01** | **lb/hr** | X | 8,760 | X | 0.0005 | ton/lb | = | **<0.01** | **TPY** |
| Formaldehyde | 7.50E-02 | lb/mmscf | X | 2.53E-05 | mmscf/hr | X | - | - | = | **<0.01** | **lb/hr** | X | 8,760 | X | 0.0005 | ton/lb | = | **<0.01** | **TPY** |
| n-Hexane | 1.80E+00 | lb/mmscf | X | 2.53E-05 | mmscf/hr | X | - | - | = | **<0.01** | **lb/hr** | X | 8,760 | X | 0.0005 | ton/lb | = | **<0.01** | **TPY** |
| Benzene | 2.10E-03 | lb/mmscf | X | 2.53E-05 | mmscf/hr | X | - | - | = | **<0.01** | **lb/hr** | X | 8,760 | X | 0.0005 | ton/lb | = | **<0.01** | **TPY** |
| Toluene | 3.40E-03 | lb/mmscf | X | 2.53E-05 | mmscf/hr | X | - | - | = | **<0.01** | **lb/hr** | X | 8,760 | X | 0.0005 | ton/lb | = | **<0.01** | **TPY** |
| Other HAP | 1.90E-03 | lb/mmscf | X | 2.53E-05 | mmscf/hr | X | - | - | = | **<0.01** | **lb/hr** | X | 8,760 | X | 0.0005 | ton/lb | = | **<0.01** | **TPY** |
| $CO_2$ | 5.31E+01 | kg/mmBtu | X | 2.60E-02 | mmBtu/hr | X | 2.20462 | lb/kg | = | **3.04** | **lb/hr** | X | 8,760 | X | 0.0005 | ton/lb | = | **13.32** | **TPY** |
| $CH_4$ | 1.00E-03 | kg/mmBtu | X | 2.60E-02 | mmBtu/hr | X | 2.20462 | lb/kg | = | **<0.01** | **lb/hr** | X | 8,760 | X | 0.0005 | ton/lb | = | **<0.01** | **TPY** |
| $N_2O$ | 1.00E-04 | kg/mmBtu | X | 2.60E-02 | mmBtu/hr | X | 2.20462 | lb/kg | = | **<0.01** | **lb/hr** | X | 8,760 | X | 0.0005 | ton/lb | = | **<0.01** | **TPY** |

**ONEOK Rockies Midstream, L.L.C.**
**Lewis & Clark Compressor Station**
**Flare Emissions Calculations - Flare Stream Analysis**

**Unit ID:** **FL-2**

| Component | Molecular Weight | Stream 1 D-1 Still Vent Emissions | | Total Streams Burned in Flare | | | | | Net Heating Value | Net Btu Rate |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 4.47E+02 | scfh | Uncontrolled | | scfd | Controlled | | | |
| | | Mole % | lb/hr | lb/hr | TPY | | lb/hr | TPY | Btu/scf | Btu/hr |
| Water | 18.0153 | 25.400% | 5.39 | 5.39 | 23.61 | 2,725 | 5.39 | 23.61 | 0.00 | 0 |
| Hydrogen Sulfide | 34.081 | 0.000% | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 586.80 | 0 |
| Carbon Dioxide | 44.010 | 7.660% | 3.97 | 3.97 | 17.40 | 822 | 3.97 | 17.40 | 0.00 | 0 |
| Nitrogen | 28.013 | 0.176% | 0.06 | 0.06 | 0.25 | 19 | 0.06 | 0.25 | 0.00 | 0 |
| Helium | 4.003 | 0.000% | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 |
| Oxygen | 31.999 | 0.000% | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 |
| Methane | 16.043 | 5.030% | 0.95 | 0.95 | 4.16 | 540 | 0.02 | 0.08 | 909.40 | 20,447 |
| Ethane | 30.069 | 10.700% | 3.79 | 3.79 | 16.60 | 1,148 | 0.08 | 0.33 | 1,618.70 | 77,421 |
| Propane | 44.096 | 11.400% | 5.92 | 5.92 | 25.94 | 1,223 | 0.12 | 0.52 | 2,314.90 | 117,963 |
| i-Butane | 58.122 | 2.050% | 1.40 | 1.40 | 6.15 | 220 | 0.03 | 0.12 | 3,000.40 | 27,494 |
| n-Butane | 58.122 | 9.010% | 6.17 | 6.17 | 27.02 | 967 | 0.12 | 0.54 | 3,010.80 | 121,259 |
| i-Pentane | 72.149 | 1.650% | 1.40 | 1.40 | 6.14 | 177 | 0.03 | 0.12 | 3,699.00 | 27,282 |
| n-Pentane | 72.149 | 4.153% | 3.53 | 3.53 | 15.46 | 446 | 0.07 | 0.31 | 3,706.90 | 68,815 |
| n-Hexane | 86.175 | 1.460% | 1.48 | 1.48 | 6.49 | 157 | 0.03 | 0.13 | 4,403.80 | 28,740 |
| Other Hexanes | 86.175 | 4.710% | 4.78 | 4.78 | 20.95 | 505 | 0.10 | 0.42 | 4,403.80 | 92,716 |
| Heptanes | 100.202 | 1.950% | 2.30 | 2.30 | 10.08 | 209 | 0.05 | 0.20 | 5,100.00 | 44,454 |
| Benzene | 78.114 | 7.570% | 6.97 | 6.97 | 30.51 | 812 | 0.14 | 0.61 | 3,590.90 | 121,509 |
| Toluene | 92.141 | 3.660% | 3.97 | 3.97 | 17.40 | 393 | 0.08 | 0.35 | 4,273.60 | 69,917 |
| Ethylbenzene | 106.167 | 0.405% | 0.51 | 0.51 | 2.22 | 43 | 0.01 | 0.04 | 4,970.50 | 8,998 |
| Xylenes | 106.167 | 2.980% | 3.73 | 3.73 | 16.33 | 320 | 0.07 | 0.33 | 4,957.10 | 66,032 |
| Octanes | 114.229 | 0.019% | 0.02 | 0.02 | 0.11 | 2 | 0.00 | 0.00 | 5,796.00 | 479 |
| 2,2,4-Trimethylpentane | 114.231 | 0.116% | 0.16 | 0.16 | 0.68 | 12 | 0.00 | 0.01 | 5,778.80 | 2,996 |
| Nonanes | 128.255 | 0.000% | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 6,493.20 | 0 |
| Decanes | 142.282 | 0.000% | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 7,189.60 | 0 |
| **Totals =** | | **100.1%** | **56.51** | **56.51** | **247.53** | **10,739** | **--** | **--** | **--** | **896,522** |
| **Total VOC =** | | **51.133%** | **42.35** | **42.35** | **185.50** | **--** | **0.85** | **3.71** | **Heat Value (Btu/scf)** | **2,004** |
| | | | **Total HAP =** | **16.81** | **73.64** | **--** | **0.34** | **1.47** | | |
| | | | **Total $H_2S$=** | **0.00** | **0.00** | **--** | **0.00** | **0.00** | | |
| | | | | | **MW of Stream =** | **47.92** | | | | |

Notes:
1) Stream compositions and flow rates calculated by GLYCalc. 10% safety factor added to flow rates for a conservative estimate of emissions.

# ONEOK Rockies Midstream, L.L.C.
# Lewis & Clark Compressor Station
# Heater Information and Emission Factors

| Equipment Information | |
|---|---|
| | **H-1** |
| **Description** | Glycol Reboiler |
| **Combustor Type** | Uncontrolled |
| **Burner Design (mmBtu/hr)** | 1.00 |
| **Fuel Consumption (mmscf/hr)** | 9.75E-04 |
| **Fuel Consumption (mmscf/yr)** | 8.54 |
| **Fuel HHV (Btu/scf)** | 1,026 |
| **Operating Hours** | 8,760 |

| AP-42/EPA Emission Factors | |
|---|---|
| | **Uncontrolled** |
| **NOx (lb/mmscf)** | 100.0 |
| **CO (lb/mmscf)** | 84.0 |
| **VOC (lb/mmscf)** | 5.5 |
| **$SO_2$ (lb/mmscf)** | 0.6 |
| **$PM_{10/2.5}$ (lb/mmscf)** | 1.9 |
| **$PM_{COND}$ (lb/mmscf)** | 5.7 |
| **$PM_{TOT}$ (lb/mmscf)** | 7.6 |
| **Benzene (lb/mmscf)** | 2.10E-03 |
| **Formaldehyde (lb/mmscf)** | 7.50E-02 |
| **n-Hexane (lb/mmscf)** | 1.80E+00 |
| **Toluene (lb/mmscf)** | 3.40E-03 |
| **Other HAP (lb/mmscf)** | 1.90E-03 |
| **Carbon Dioxide ($CO_2$) (kg/mmBtu)** | 53.06 |
| **Methane ($CH_4$) (kg/mmBtu)** | 1.00E-03 |
| **Nitrous Oxide ($N_2O$) (kg/mmBtu)** | 1.00E-04 |

Notes:
1) Criteria pollutant emission factor source: AP-42 Tables 1.4-1, -

**ONEOK Rockies Midstream, L.L.C.**
**Lewis & Clark Compressor Station**
**Heater Emissions Calculations**

**Unit ID:** **H-1**

| Pollutant | Emission Factor | | | Capacity | | | Conversion | | | Hourly Emissions | | | Operating Hours | | | Conversion | | | Annual Emissions | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **NOx** | 1.00E+02 | lb/mmscf | X | 9.75E-04 | mmscf/hr | X | - | - | = | **0.10** | **lb/hr** | X | 8,760 | X | 0.0005 | ton/lb | = | **0.43** | **TPY** |
| **CO** | 8.40E+01 | lb/mmscf | X | 9.75E-04 | mmscf/hr | X | - | - | = | **0.08** | **lb/hr** | X | 8,760 | X | 0.0005 | ton/lb | = | **0.36** | **TPY** |
| **VOC** | 5.50E+00 | lb/mmscf | X | 9.75E-04 | mmscf/hr | X | - | - | = | **0.01** | **lb/hr** | X | 8,760 | X | 0.0005 | ton/lb | = | **0.02** | **TPY** |
| **$SO_2$** | 6.00E-01 | lb/mmscf | X | 9.75E-04 | mmscf/hr | X | - | - | = | **<0.01** | **lb/hr** | X | 8,760 | X | 0.0005 | ton/lb | = | **<0.01** | **TPY** |
| **$PM_{10/2.5}$** | 1.90E+00 | lb/mmscf | X | 9.75E-04 | mmscf/hr | X | - | - | = | **<0.01** | **lb/hr** | X | 8,760 | X | 0.0005 | ton/lb | = | **0.01** | **TPY** |
| **$PM_{COND}$** | 5.70E+00 | lb/mmscf | X | 9.75E-04 | mmscf/hr | X | - | - | = | **0.01** | **lb/hr** | X | 8,760 | X | 0.0005 | ton/lb | = | **0.02** | **TPY** |
| **$PM_{TOT}$** | 7.60E+00 | lb/mmscf | X | 9.75E-04 | mmscf/hr | X | - | - | = | **0.01** | **lb/hr** | X | 8,760 | X | 0.0005 | ton/lb | = | **0.03** | **TPY** |
| **Benzene** | 2.10E-03 | lb/mmscf | X | 9.75E-04 | mmscf/hr | X | - | - | = | **<0.01** | **lb/hr** | X | 8,760 | X | 0.0005 | ton/lb | = | **<0.01** | **TPY** |
| **Formaldehyde** | 7.50E-02 | lb/mmscf | X | 9.75E-04 | mmscf/hr | X | - | - | = | **<0.01** | **lb/hr** | X | 8,760 | X | 0.0005 | ton/lb | = | **<0.01** | **TPY** |
| **n-Hexane** | 1.80E+00 | lb/mmscf | X | 9.75E-04 | mmscf/hr | X | - | - | = | **<0.01** | **lb/hr** | X | 8,760 | X | 0.0005 | ton/lb | = | **0.01** | **TPY** |
| **Toluene** | 3.40E-03 | lb/mmscf | X | 9.75E-04 | mmscf/hr | X | - | - | = | **<0.01** | **lb/hr** | X | 8,760 | X | 0.0005 | ton/lb | = | **<0.01** | **TPY** |
| **Other HAP** | 1.90E-03 | lb/mmscf | X | 9.75E-04 | mmscf/hr | X | - | - | = | **<0.01** | **lb/hr** | X | 8,760 | X | 0.0005 | ton/lb | = | **<0.01** | **TPY** |
| **$CO_2$** | 5.31E+01 | kg/mmBtu | X | 1.00E+00 | mmBtu/hr | X | 2.20462 | lb/kg | = | **116.98** | **lb/hr** | X | 8,760 | X | 0.0005 | ton/lb | = | **512.36** | **TPY** |
| **$CH_4$** | 1.00E-03 | kg/mmBtu | X | 1.00E+00 | mmBtu/hr | X | 2.20462 | lb/kg | = | **<0.01** | **lb/hr** | X | 8,760 | X | 0.0005 | ton/lb | = | **0.01** | **TPY** |
| **$N_2O$** | 1.00E-04 | kg/mmBtu | X | 1.00E+00 | mmBtu/hr | X | 2.20462 | lb/kg | = | **<0.01** | **lb/hr** | X | 8,760 | X | 0.0005 | ton/lb | = | **<0.01** | **TPY** |

Notes:
1) All PM (total, condensable and filterable) is assumed to be <1 micrometer in diameter. Total PM is the sum of filterable PM and condensable PM.

# East Fork Offload - Williston, ND

ONEOK Josh Kreisler

# VHP - L7044GSI

Gas Compression

| | | | |
|---|---|---|---|
| ENGINE SPEED (rpm): | 1200 | NOx SELECTION (g/bhp-hr): | 0.15 NOx 0.30 CO |
| DISPLACEMENT (in3): | 7040 | COOLING SYSTEM: | JW, IC + OC |
| COMPRESSION RATIO: | 8:1 | INTERCOOLER WATER INLET (°F): | 130 |
| IGNITION SYSTEM: | ESM2 | JACKET WATER OUTLET (°F): | 180 |
| EXHAUST MANIFOLD: | Water Cooled | JACKET WATER CAPACITY (gal): | 100 |
| COMBUSTION: | Rich Burn, Turbocharged | AUXILIARY WATER CAPACITY (gal): | 11 |
| ENGINE DRY WEIGHT (lbs): | 24250 | LUBE OIL CAPACITY (gal): | 190 |
| AIR/FUEL RATIO SETTING: | 0.38% CO | MAX. EXHAUST BACKPRESSURE (in. H2O): | 18 |
| ENGINE SOUND LEVEL (dBA) | 104 | MAX. AIR INLET RESTRICTION (in. H2O): | 15 |
| IGNITION TIMING: | ESM2 Controlled | EXHAUST SOUND LEVEL (dBA) | 111 |

**SITE CONDITIONS:**

| | | | |
|---|---|---|---|
| FUEL: | Natural Gas | ALTITUDE (ft): | 1910 |
| FUEL PRESSURE RANGE (psig): | 30 - 60 | MAXIMUM INLET AIR TEMPERATURE (°F): | 100 |
| FUEL HHV (BTU/ft3): | 1,414.4 | FUEL WKI: | 51.8 |
| FUEL LHV (BTU/ft3): | 1,278.6 | | |

**SITE SPECIFIC TECHNICAL DATA**

| POWER RATING | UNITS | 110% OVERLOAD SITE DATA (See note 18) | MAX RATING AT 100 °F AIR TEMP | SITE RATING AT MAXIMUM INLET AIR TEMPERATURE OF 100 °F 86% | | 86% |
|---|---|---|---|---|---|---|
| CONTINUOUS ENGINE POWER | BHP | 1386 | 1474 | 1260 | | 1260 |
| OVERLOAD | % 2/24 hr | Note 18 | 0 | 10 | | - |
| MECHANICAL EFFICIENCY (LHV) | % | 29.9 | 30.3 | 29.2 | | 29.2 |
| CONTINUOUS POWER AT FLYWHEEL | BHP | 1386 | 1474 | 1260 | | 1260 |
| *based on no auxiliary engine driven equipment* | | | | | | |
| AVAILABLE TURNDOWN SPEED RANGE | RPM | 700 - 1200 | | | | |
| **FUEL CONSUMPTION** | | | | | | |
| FUEL CONSUMPTION (LHV) | BTU/BHP-hr | 8526 | 8411 | 8715 | | 8715 |
| FUEL CONSUMPTION (HHV) | BTU/BHP-hr | 9432 | 9304 | 9640 | | 9640 |
| FUEL FLOW *based on fuel analysis LHV* | SCFM | 154 | 162 | 143 | | 143 |
| **HEAT REJECTION** | | | | | | |
| JACKET WATER (JW) | BTU/hr x 1000 | 3614 | 3749 | 3423 | | 3422 |
| LUBE OIL (OC) | BTU/hr x 1000 | 535 | 545 | 520 | | 520 |
| INTERCOOLER (IC) | BTU/hr x 1000 | 213 | 230 | 189 | | 189 |
| EXHAUST | BTU/hr x 1000 | 3479 | 3679 | 3192 | | 3191 |
| RADIATION | BTU/hr x 1000 | 679 | 688 | 664 | | 664 |
| **EMISSIONS (CATALYST OUT):** | | | | | | |
| NOx (NO + NO2) | g/bhp-hr | 0.15 | 0.15 | 0.15 | | 0.15 |
| CO | g/bhp-hr | 0.30 | 0.30 | 0.30 | | 0.30 |
| THC | g/bhp-hr | 1.52 | 1.52 | 1.52 | | 1.52 |
| NMHC | g/bhp-hr | 0.444 | 0.445 | 0.444 | | 0.444 |
| NM,NEHC (VOC) | g/bhp-hr | 0.175 | 0.176 | 0.175 | | 0.175 |
| CO2 | g/bhp-hr | 582 | 574 | 594 | | 594 |
| CO2e (Methane GWP: 25) | g/bhp-hr | 597 | 590 | 610 | | 610 |
| CH2O | g/bhp-hr | 0.001 | 0.001 | 0.001 | | 0.001 |
| CH4 | g/bhp-hr | 0.63 | 0.63 | 0.63 | | 0.63 |
| **AIR INTAKE / EXHAUST GAS** | | | | | | |
| INDUCTION AIR FLOW | SCFM | 2164 | 2271 | 2011 | | 2010 |
| EXHAUST GAS MASS FLOW | lb/hr | 10063 | 10561 | 9351 | | 9349 |
| EXHAUST GAS FLOW *at exhaust temp, 14.5 psia* | ACFM | 7429 | 7834 | 6853 | | 6852 |
| EXHAUST TEMPERATURE | °F | 1201 | 1209 | 1189 | | 1189 |

| HEAT EXCHANGER SIZING[12] | | | |
|---|---|---|---|
| TOTAL JACKET WATER CIRCUIT (JW) | BTU/hr x 1000 | 4098 | 4251 |
| TOTAL AUXILIARY WATER CIRCUIT (IC + OC) | BTU/hr x 1000 | 848 | 878 |

| COOLING SYSTEM WITH ENGINE MOUNTED WATER PUMPS | | |
|---|---|---|
| JACKET WATER PUMP MIN. DESIGN FLOW | GPM | 450 |
| JACKET WATER PUMP MAX. EXTERNAL RESTRICTION | psig | 16 |
| AUX WATER PUMP MIN. DESIGN FLOW | GPM | 79 |
| AUX WATER PUMP MAX. EXTERNAL RESTRICTION | psig | 44 |

*All data provided per the condtions listed in the notes section on page three.*

Data Generated by EngCalc Program Version 4.3 INNIO Waukesha Gas Engines, Inc.

11/20/2023 18:58

## East Fork Offload - Williston, ND

ONEOK Josh Kreisler

## VHP - L7044GSI

Gas Compression

### FUEL COMPOSITION

| HYDROCARBONS: | | Mole or Volume % |
|---|---|---|
| Methane | CH4 | 60.31 |
| Ethane | C2H6 | 20.36 |
| Propane | C3H8 | 9.76 |
| Iso-Butane | I-C4H10 | 0.92 |
| Normal Butane | N-C4H10 | 2.86 |
| Iso-Pentane | I-C5H12 | 0.44 |
| Normal Pentane | N-C5H12 | 0.6 |
| Hexane | C6H14 | 0.32 |
| Heptane | C7H16 | 0.04 |
| Ethene | C2H4 | 0 |
| Propene | C3H6 | 0 |
| | SUM HYDROCARBONS | 95.61 |
| NON-HYDROCARBONS: | | |
| Nitrogen | N2 | 3.1 |
| Oxygen | O2 | 0 |
| Helium | He | 0 |
| Carbon Dioxide | CO2 | 1.26 |
| Carbon Monoxide | CO | 0 |
| Hydrogen | H2 | 0 |
| Water Vapor | H2O | 0.03 |
| | TOTAL FUEL | 100 |

| | |
|---|---|
| FUEL: | Natural Gas |
| FUEL PRESSURE RANGE (psig): | 30 - 60 |
| FUEL WKI: | 51.8 |
| FUEL SLHV (BTU/ft3): | 1256.76 |
| FUEL SLHV (MJ/Nm3): | 49.42 |
| FUEL LHV (BTU/ft3): | 1278.62 |
| FUEL LHV (MJ/Nm3): | 50.28 |
| FUEL HHV (BTU/ft3): | 1414.40 |
| FUEL HHV (MJ/Nm3): | 55.62 |
| FUEL DENSITY (SG): | 0.86 |

Standard Conditions per ASTM D3588-91 [60°F and 14.696psia] and ISO 6976:1996-02-01[25, V(0;101.325)].
Based on the fuel composition, supply pressure and temperature, liquid hydrocarbons may be present in the fuel. No liquid hydrocarbons are allowed in the fuel. The fuel must not contain any liquid water. Waukesha recommends both of the following:
1) Dew point of the fuel gas to be at least 20°F (11°C) below the measured temperature of the gas at the inlet of the engine fuel regulator.
2) A fuel filter separator to be used on all fuels except commercial quality natural gas.
Refer to the 'Fuel and Lubrication' section of 'Technical Data' or contact the Waukesha Application Engineering Department for additional information on fuels, or LHV and WKI* calculations.
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### FUEL CONTAMINANTS

| | | | | |
|---|---|---|---|---|
| Total Sulfur Compounds | 0 | % volume | Total Sulfur Compounds | 0 µg/BTU |
| Total Halogen as Chloride | 0 | % volume | Total Halogen as Chlorid | 0 µg/BTU |
| Total Ammonia | 0 | % volume | Total Ammonia | 0 µg/BTU |
| Siloxanes | | | Total Siloxanes (as Si) | 0 µg/BTU |
| Tetramethyl silane | 0 | % volume | | |
| Trimethyl silanol | 0 | % volume | | |
| Hexamethyldisiloxane (L2) | 0 | % volume | | |
| Hexamethylcyclotrisiloxane (D3) | 0 | % volume | | |
| Octamethyltrisiloxane (L3) | 0 | % volume | | |
| Octamethylcyclotetrasiloxane (D4) | 0 | % volume | | |
| Decamethyltetrasiloxane (L4) | 0 | % volume | | |
| Decamethylcyclopentasiloxane (D5) | 0 | % volume | | |
| Dodecamethylpentasiloxane (L5) | 0 | % volume | | |
| Dodecamethylcyclohexasiloxane (D6) | 0 | % volume | | |
| Others | 0 | % volume | | |

*Calculated fuel contaminant analysis will depend on the entered fuel composition and selected engine model.*

No water or hydrocarbon condensates are allowed in the engine. Requires liquids removal.

GRI-GLYCalc VERSION 4.0 - AGGREGATE CALCULATIONS REPORT

Case Name: Lewis and Clark CS Regen 1
File Name: \\Client\H$\ENV COMPLIANCE\NGGP\ORM\Lewis and Clark -ND\2.0 Air Files\2.1 Permit Actions\2024-09_Per
to Construct\Lewis&Clark_60MMCF_Regen 1_2024-09-17.ddf
Date: September 17, 2024

DESCRIPTION:

Description: REGEN-1 Condenser/Burner
60 MMCFD
Gas Analysis 9/5/2024
Wet Gas @ 1125 psig
Temp 110 Degrees F & Pump Rate @ 14 gpm

Annual Hours of Operation: 8760.0 hours/yr

EMISSIONS REPORTS:

CONTROLLED REGENERATOR EMISSIONS

| Component | lbs/hr | lbs/day | tons/yr |
|---|---|---|---|
| Methane | 0.0190 | 0.456 | 0.0833 |
| Ethane | 0.0759 | 1.822 | 0.3324 |
| Propane | 0.1181 | 2.834 | 0.5171 |
| Isobutane | 0.0280 | 0.673 | 0.1228 |
| n-Butane | 0.1234 | 2.961 | 0.5403 |
| Isopentane | 0.0280 | 0.673 | 0.1227 |
| n-Pentane | 0.0573 | 1.374 | 0.2508 |
| Cyclopentane | 0.0129 | 0.311 | 0.0567 |
| n-Hexane | 0.0296 | 0.710 | 0.1296 |
| Cyclohexane | 0.0390 | 0.936 | 0.1708 |
| Other Hexanes | 0.0296 | 0.711 | 0.1298 |
| Heptanes | 0.0460 | 1.103 | 0.2013 |
| Methylcyclohexane | 0.0297 | 0.713 | 0.1301 |
| 2,2,4-Trimethylpentane | 0.0031 | 0.075 | 0.0137 |
| Benzene | 0.1394 | 3.344 | 0.6104 |
| Toluene | 0.0795 | 1.908 | 0.3482 |
| Ethylbenzene | 0.0101 | 0.243 | 0.0444 |
| Xylenes | 0.0747 | 1.792 | 0.3270 |
| C8+ Heavies | 0.0007 | 0.018 | 0.0033 |
| Total Emissions | 0.9440 | 22.656 | 4.1348 |
| Total Hydrocarbon Emissions | 0.9440 | 22.656 | 4.1348 |
| Total VOC Emissions | 0.8491 | 20.379 | 3.7191 |
| Total HAP Emissions | 0.3364 | 8.073 | 1.4733 |
| Total BTEX Emissions | 0.3037 | 7.288 | 1.3300 |

UNCONTROLLED REGENERATOR EMISSIONS

| Component | lbs/hr | lbs/day | tons/yr |
|---|---|---|---|
| Methane | 0.9507 | 22.818 | 4.1642 |
| Ethane | 3.8004 | 91.210 | 16.6458 |
| Propane | 5.9411 | 142.586 | 26.0220 |
| Isobutane | 1.4177 | 34.025 | 6.2096 |
| n-Butane | 6.2618 | 150.283 | 27.4267 |
| Isopentane | 1.4503 | 34.807 | 6.3523 |
| n-Pentane | 3.0102 | 72.246 | 13.1849 |
| Cyclopentane | 0.6868 | 16.484 | 3.0083 |
| n-Hexane | 1.6233 | 38.958 | 7.1099 |
| Cyclohexane | 2.2132 | 53.116 | 9.6937 |
| Other Hexanes | 1.5879 | 38.109 | 6.9550 |
| Heptanes | 2.8689 | 68.854 | 12.5659 |
| Methylcyclohexane | 1.8821 | 45.171 | 8.2437 |
| 2,2,4-Trimethylpentane | 0.1943 | 4.664 | 0.8512 |
| Benzene | 8.2284 | 197.483 | 36.0406 |
| Toluene | 5.9219 | 142.124 | 25.9377 |
| Ethylbenzene | 1.1115 | 26.675 | 4.8682 |
| Xylenes | 9.0547 | 217.314 | 39.6597 |
| C8+ Heavies | 1.6847 | 40.434 | 7.3792 |
| Total Emissions | 59.8901 | 1437.362 | 262.3185 |

| | | | |
|---|---|---|---|
| Total Hydrocarbon Emissions | 59.8901 | 1437.362 | 262.3185 |
| Total VOC Emissions | 55.1389 | 1323.334 | 241.5085 |
| Total HAP Emissions | 26.1341 | 627.218 | 114.4673 |
| Total BTEX Emissions | 24.3165 | 583.596 | 106.5062 |

FLASH GAS EMISSIONS

| Component | lbs/hr | lbs/day | tons/yr |
|---|---|---|---|
| Methane | 0.4045 | 9.707 | 1.7716 |
| Ethane | 0.4593 | 11.024 | 2.0118 |
| Propane | 0.3305 | 7.932 | 1.4476 |
| Isobutane | 0.0521 | 1.251 | 0.2283 |
| n-Butane | 0.1750 | 4.199 | 0.7664 |
| Isopentane | 0.0353 | 0.847 | 0.1546 |
| n-Pentane | 0.0585 | 1.404 | 0.2562 |
| Cyclopentane | 0.0034 | 0.081 | 0.0149 |
| n-Hexane | 0.0175 | 0.419 | 0.0765 |
| Cyclohexane | 0.0060 | 0.143 | 0.0262 |
| Other Hexanes | 0.0226 | 0.542 | 0.0990 |
| Heptanes | 0.0150 | 0.360 | 0.0658 |

| | | | |
|---|---|---|---|
| Methylcyclohexane | 0.0040 | 0.095 | 0.0173 |
| 2,2,4-Trimethylpentane | 0.0020 | 0.049 | 0.0089 |
| Benzene | 0.0031 | 0.073 | 0.0134 |
| Toluene | 0.0014 | 0.034 | 0.0062 |
| Ethylbenzene | 0.0002 | 0.004 | 0.0007 |
| Xylenes | 0.0009 | 0.020 | 0.0037 |
| C8+ Heavies | 0.0008 | 0.019 | 0.0036 |
| Total Emissions | 1.5919 | 38.206 | 6.9726 |
| Total Hydrocarbon Emissions | 1.5919 | 38.206 | 6.9726 |
| Total VOC Emissions | 0.7281 | 17.475 | 3.1892 |
| Total HAP Emissions | 0.0250 | 0.599 | 0.1094 |
| Total BTEX Emissions | 0.0055 | 0.131 | 0.0240 |

FLASH TANK OFF GAS

| Component | lbs/hr | lbs/day | tons/yr |
|---|---|---|---|
| Methane | 20.2234 | 485.362 | 88.5786 |
| Ethane | 22.9661 | 551.187 | 100.5916 |
| Propane | 16.5249 | 396.599 | 72.3792 |
| Isobutane | 2.6065 | 62.555 | 11.4163 |
| n-Butane | 8.7487 | 209.968 | 38.3191 |
| Isopentane | 1.7654 | 42.369 | 7.7323 |
| n-Pentane | 2.9251 | 70.204 | 12.8121 |
| Cyclopentane | 0.1697 | 4.073 | 0.7434 |
| n-Hexane | 0.8730 | 20.952 | 3.8238 |
| Cyclohexane | 0.2989 | 7.173 | 1.3091 |
| Other Hexanes | 1.1297 | 27.112 | 4.9479 |
| Heptanes | 0.7507 | 18.016 | 3.2879 |
| Methylcyclohexane | 0.1978 | 4.748 | 0.8665 |
| 2,2,4-Trimethylpentane | 0.1018 | 2.443 | 0.4459 |
| Benzene | 0.1529 | 3.669 | 0.6695 |
| Toluene | 0.0706 | 1.694 | 0.3092 |
| Ethylbenzene | 0.0076 | 0.183 | 0.0334 |
| Xylenes | 0.0427 | 1.025 | 0.1870 |
| C8+ Heavies | 0.0406 | 0.974 | 0.1778 |
| Total Emissions | 79.5960 | 1910.303 | 348.6303 |
| Total Hydrocarbon Emissions | 79.5960 | 1910.303 | 348.6303 |
| Total VOC Emissions | 36.4064 | 873.754 | 159.4601 |
| Total HAP Emissions | 1.2486 | 29.965 | 5.4687 |
| Total BTEX Emissions | 0.2737 | 6.570 | 1.1990 |

COMBINED REGENERATOR VENT/FLASH GAS EMISSIONS

| Component | lbs/hr | lbs/day | tons/yr |
|---|---|---|---|

| | | | |
|---|---|---|---|
| Methane | 0.4235 | 10.163 | 1.8548 |
| Ethane | 0.5352 | 12.845 | 2.3443 |
| Propane | 0.4486 | 10.766 | 1.9647 |
| Isobutane | 0.0802 | 1.924 | 0.3511 |
| n-Butane | 0.2983 | 7.160 | 1.3067 |
| Isopentane | 0.0633 | 1.520 | 0.2774 |
| n-Pentane | 0.1158 | 2.778 | 0.5071 |
| Cyclopentane | 0.0163 | 0.392 | 0.0715 |
| n-Hexane | 0.0471 | 1.129 | 0.2061 |
| Cyclohexane | 0.0450 | 1.079 | 0.1970 |
| Other Hexanes | 0.0522 | 1.253 | 0.2287 |
| Heptanes | 0.0610 | 1.463 | 0.2670 |
| Methylcyclohexane | 0.0337 | 0.808 | 0.1475 |
| 2,2,4-Trimethylpentane | 0.0052 | 0.124 | 0.0226 |
| Benzene | 0.1424 | 3.418 | 0.6238 |
| Toluene | 0.0809 | 1.942 | 0.3544 |
| Ethylbenzene | 0.0103 | 0.247 | 0.0451 |
| Xylenes | 0.0755 | 1.812 | 0.3307 |
| C8+ Heavies | 0.0016 | 0.037 | 0.0068 |
| Total Emissions | 2.5359 | 60.862 | 11.1074 |
| Total Hydrocarbon Emissions | 2.5359 | 60.862 | 11.1074 |
| Total VOC Emissions | 1.5772 | 37.854 | 6.9083 |
| Total HAP Emissions | 0.3613 | 8.672 | 1.5827 |
| Total BTEX Emissions | 0.3091 | 7.419 | 1.3540 |

COMBINED REGENERATOR VENT/FLASH GAS EMISSION CONTROL REPORT:

| Component | Uncontrolled tons/yr | Controlled tons/yr | % Reduction |
|---|---|---|---|
| Methane | 92.7428 | 1.8548 | 98.00 |
| Ethane | 117.2374 | 2.3443 | 98.00 |
| Propane | 98.4013 | 1.9647 | 98.00 |
| Isobutane | 17.6258 | 0.3511 | 98.01 |
| n-Butane | 65.7459 | 1.3067 | 98.01 |
| Isopentane | 14.0845 | 0.2774 | 98.03 |
| n-Pentane | 25.9970 | 0.5071 | 98.05 |
| Cyclopentane | 3.7516 | 0.0715 | 98.09 |
| n-Hexane | 10.9337 | 0.2061 | 98.12 |
| Cyclohexane | 11.0028 | 0.1970 | 98.21 |
| Other Hexanes | 11.9029 | 0.2287 | 98.08 |
| Heptanes | 15.8538 | 0.2670 | 98.32 |
| Methylcyclohexane | 9.1102 | 0.1475 | 98.38 |
| 2,2,4-Trimethylpentane | 1.2970 | 0.0226 | 98.26 |
| Benzene | 36.7101 | 0.6238 | 98.30 |

| | | | |
|---|---|---|---|
| Toluene | 26.2469 | 0.3544 | 98.65 |
| Ethylbenzene | 4.9016 | 0.0451 | 99.08 |
| Xylenes | 39.8467 | 0.3307 | 99.17 |
| C8+ Heavies | 7.5569 | 0.0068 | 99.91 |
| Total Emissions | 610.9488 | 11.1074 | 98.18 |

| | | | |
|---|---|---|---|
| Total Hydrocarbon Emissions | 610.9488 | 11.1074 | 98.18 |
| Total VOC Emissions | 400.9686 | 6.9083 | 98.28 |
| Total HAP Emissions | 119.9360 | 1.5827 | 98.68 |
| Total BTEX Emissions | 107.7053 | 1.3540 | 98.74 |

EQUIPMENT REPORTS:

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CONDENSER AND COMBUSTION DEVICE

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Condenser Outlet Temperature: 150.00 deg. F
Condenser Pressure: 14.70 psia
Condenser Duty: 1.84e-001 MM BTU/hr
Hydrocarbon Recovery: 1.02 bbls/day
Produced Water: 11.26 bbls/day
Ambient Temperature: 80.00 deg. F
Excess Oxygen: 0.00 %
Combustion Efficiency: 98.00 %
Supplemental Fuel Requirement: 1.84e-001 MM BTU/hr

| Component | Emitted | Destroyed |
|---|---|---|
| Methane | 2.00% | 98.00% |
| Ethane | 2.00% | 98.00% |
| Propane | 1.99% | 98.01% |
| Isobutane | 1.98% | 98.02% |
| n-Butane | 1.97% | 98.03% |
| Isopentane | 1.93% | 98.07% |
| n-Pentane | 1.90% | 98.10% |
| Cyclopentane | 1.88% | 98.12% |
| n-Hexane | 1.82% | 98.18% |
| Cyclohexane | 1.76% | 98.24% |
| Other Hexanes | 1.87% | 98.13% |
| Heptanes | 1.60% | 98.40% |
| Methylcyclohexane | 1.58% | 98.42% |
| 2,2,4-Trimethylpentane | 1.61% | 98.39% |
| Benzene | 1.69% | 98.31% |
| Toluene | 1.34% | 98.66% |
| Ethylbenzene | 0.91% | 99.09% |
| Xylenes | 0.82% | 99.18% |

| | | |
|---|---|---|
| C8+ Heavies | 0.04% | 99.96% |

ABSORBER

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NOTE: Because the Calculated Absorber Stages was below the minimum allowed, GRI-GLYCalc has set the number of Absorber Stages to 1.25 and has calculated a revised Dry Gas Dew Point.

Calculated Absorber Stages: 1.25
Calculated Dry Gas Dew Point: 4.03 lbs. H2O/MMSCF

Temperature: 110.0 deg. F
Pressure: 1125.0 psig
Dry Gas Flow Rate: 60.0000 MMSCF/day
Glycol Losses with Dry Gas: 7.4543 lb/hr
Wet Gas Water Content: Saturated
Calculated Wet Gas Water Content: 71.77 lbs. H2O/MMSCF
Calculated Lean Glycol Recirc. Ratio: 4.96 gal/lb H2O

| Component | Remaining in Dry Gas | Absorbed in Glycol |
|---|---|---|
| Water | 5.60% | 94.40% |
| Carbon Dioxide | 99.66% | 0.34% |
| Nitrogen | 99.96% | 0.04% |
| Methane | 99.97% | 0.03% |
| Ethane | 99.93% | 0.07% |
| Propane | 99.91% | 0.09% |
| Isobutane | 99.90% | 0.10% |
| n-Butane | 99.87% | 0.13% |
| Isopentane | 99.89% | 0.11% |
| n-Pentane | 99.87% | 0.13% |
| Cyclopentane | 99.42% | 0.58% |
| n-Hexane | 99.83% | 0.17% |
| Cyclohexane | 99.22% | 0.78% |
| Other Hexanes | 99.87% | 0.13% |
| Heptanes | 99.76% | 0.24% |
| Methylcyclohexane | 99.30% | 0.70% |
| 2,2,4-Trimethylpentane | 99.90% | 0.10% |
| Benzene | 93.22% | 6.78% |
| Toluene | 92.41% | 7.59% |
| Ethylbenzene | 92.00% | 8.00% |
| Xylenes | 89.16% | 10.84% |
| C8+ Heavies | 99.65% | 0.35% |

FLASH TANK

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Flash Control: Combustion device
Flash Control Efficiency: 98.00 %
Flash Temperature: 125.0 deg. F
Flash Pressure: 60.0 psig

| Component | Left in Glycol | Removed in Flash Gas |
|---|---|---|
| Water | 99.96% | 0.04% |
| Carbon Dioxide | 36.06% | 63.94% |
| Nitrogen | 4.35% | 95.65% |
| Methane | 4.49% | 95.51% |
| Ethane | 14.20% | 85.80% |
| Propane | 26.44% | 73.56% |
| Isobutane | 35.23% | 64.77% |
| n-Butane | 41.71% | 58.29% |
| Isopentane | 45.37% | 54.63% |
| n-Pentane | 50.96% | 49.04% |
| Cyclopentane | 80.28% | 19.72% |
| n-Hexane | 65.20% | 34.80% |
| Cyclohexane | 88.48% | 11.52% |
| Other Hexanes | 58.85% | 41.15% |
| Heptanes | 79.36% | 20.64% |
| Methylcyclohexane | 90.87% | 9.13% |
| 2,2,4-Trimethylpentane | 66.14% | 33.86% |
| Benzene | 98.27% | 1.73% |
| Toluene | 98.92% | 1.08% |
| Ethylbenzene | 99.39% | 0.61% |
| Xylenes | 99.59% | 0.41% |
| C8+ Heavies | 97.93% | 2.07% |

REGENERATOR

No Stripping Gas used in regenerator.

| Component | Remaining in Glycol | Distilled Overhead |
|---|---|---|
| Water | 41.08% | 58.92% |
| Carbon Dioxide | 0.00% | 100.00% |
| Nitrogen | 0.00% | 100.00% |
| Methane | 0.00% | 100.00% |
| Ethane | 0.00% | 100.00% |
| Propane | 0.00% | 100.00% |
| Isobutane | 0.00% | 100.00% |
| n-Butane | 0.00% | 100.00% |
| Isopentane | 1.10% | 98.90% |
| n-Pentane | 0.98% | 99.02% |

| | | |
|---|---|---|
| Cyclopentane | 0.62% | 99.38% |
| n-Hexane | 0.77% | 99.23% |
| Cyclohexane | 3.62% | 96.38% |
| Other Hexanes | 1.70% | 98.30% |
| Heptanes | 0.63% | 99.37% |
| Methylcyclohexane | 4.40% | 95.60% |
| 2,2,4-Trimethylpentane | 2.27% | 97.73% |
| Benzene | 5.09% | 94.91% |
| Toluene | 7.99% | 92.01% |
| Ethylbenzene | 10.48% | 89.52% |
| Xylenes | 12.99% | 87.01% |
| C8+ Heavies | 12.28% | 87.72% |

STREAM REPORTS:

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WET GAS STREAM

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Temperature: 110.00 deg. F
Pressure: 1139.70 psia
Flow Rate: 2.51e+006 scfh

| Component | Conc. (vol%) | Loading (lb/hr) |
|---|---|---|
| Water | 1.51e-001 | 1.80e+002 |
| Carbon Dioxide | 1.12e+000 | 3.26e+003 |
| Nitrogen | 1.80e+000 | 3.34e+003 |
| Methane | 6.34e+001 | 6.72e+004 |
| Ethane | 1.82e+001 | 3.62e+004 |
| Propane | 8.52e+000 | 2.48e+004 |
| Isobutane | 1.03e+000 | 3.94e+003 |
| n-Butane | 3.05e+000 | 1.17e+004 |
| Isopentane | 6.30e-001 | 3.00e+003 |
| n-Pentane | 9.43e-001 | 4.49e+003 |
| Cyclopentane | 3.20e-002 | 1.48e+002 |
| n-Hexane | 2.65e-001 | 1.51e+003 |
| Cyclohexane | 5.79e-002 | 3.22e+002 |
| Other Hexanes | 3.55e-001 | 2.02e+003 |
| Heptanes | 2.26e-001 | 1.49e+003 |
| Methylcyclohexane | 4.59e-002 | 2.98e+002 |
| 2,2,4-Trimethylpentane | 3.89e-002 | 2.94e+002 |
| Benzene | 2.40e-002 | 1.24e+002 |
| Toluene | 1.30e-002 | 7.90e+001 |
| Ethylbenzene | 2.00e-003 | 1.40e+001 |

| | | |
|---|---|---|
| Xylenes | 1.20e-002 | 8.40e+001 |
| C8+ Heavies | 4.39e-002 | 4.94e+002 |
| Total Components | 100.00 | 1.65e+005 |

DRY GAS STREAM

Temperature: 110.00 deg. F
Pressure: 1139.70 psia
Flow Rate: 2.50e+006 scfh

| Component | Conc. (vol%) | Loading (lb/hr) |
|---|---|---|
| Water | 8.49e-003 | 1.01e+001 |
| Carbon Dioxide | 1.12e+000 | 3.25e+003 |
| Nitrogen | 1.81e+000 | 3.34e+003 |
| Methane | 6.35e+001 | 6.71e+004 |
| Ethane | 1.82e+001 | 3.61e+004 |
| Propane | 8.53e+000 | 2.48e+004 |
| Isobutane | 1.03e+000 | 3.94e+003 |
| n-Butane | 3.05e+000 | 1.17e+004 |
| Isopentane | 6.31e-001 | 3.00e+003 |
| n-Pentane | 9.43e-001 | 4.48e+003 |
| Cyclopentane | 3.18e-002 | 1.47e+002 |
| n-Hexane | 2.65e-001 | 1.50e+003 |
| Cyclohexane | 5.76e-002 | 3.19e+002 |
| Other Hexanes | 3.56e-001 | 2.02e+003 |
| Heptanes | 2.26e-001 | 1.49e+003 |
| Methylcyclohexane | 4.57e-002 | 2.96e+002 |
| 2,2,4-Trimethylpentane | 3.90e-002 | 2.93e+002 |
| Benzene | 2.24e-002 | 1.15e+002 |
| Toluene | 1.20e-002 | 7.30e+001 |
| Ethylbenzene | 1.84e-003 | 1.29e+001 |
| Xylenes | 1.07e-002 | 7.49e+001 |
| C8+ Heavies | 4.39e-002 | 4.92e+002 |
| Total Components | 100.00 | 1.65e+005 |

LEAN GLYCOL STREAM

Temperature: 110.00 deg. F
Flow Rate: 1.40e+001 gpm

| Component | Conc. (wt%) | Loading (lb/hr) |
|---|---|---|
| TEG | 9.85e+001 | 7.76e+003 |
| Water | 1.50e+000 | 1.18e+002 |

| | | |
|---|---|---|
| Carbon Dioxide | 1.40e-011 | 1.10e-009 |
| Nitrogen | 1.70e-012 | 1.34e-010 |
| Methane | 9.03e-018 | 7.11e-016 |
| Ethane | 1.60e-007 | 1.26e-005 |
| Propane | 1.16e-008 | 9.14e-007 |
| Isobutane | 1.53e-009 | 1.21e-007 |
| n-Butane | 4.72e-009 | 3.72e-007 |
| Isopentane | 2.05e-004 | 1.62e-002 |
| n-Pentane | 3.78e-004 | 2.98e-002 |
| Cyclopentane | 5.46e-005 | 4.30e-003 |
| n-Hexane | 1.59e-004 | 1.25e-002 |
| Cyclohexane | 1.05e-003 | 8.30e-002 |
| Other Hexanes | 3.48e-004 | 2.74e-002 |
| Heptanes | 2.31e-004 | 1.82e-002 |
| Methylcyclohexane | 1.10e-003 | 8.67e-002 |
| 2,2,4-Trimethylpentane | 5.72e-005 | 4.51e-003 |
| Benzene | 5.60e-003 | 4.41e-001 |
| Toluene | 6.53e-003 | 5.14e-001 |
| Ethylbenzene | 1.65e-003 | 1.30e-001 |
| Xylenes | 1.72e-002 | 1.35e+000 |
| C8+ Heavies | 2.99e-003 | 2.36e-001 |
| Total Components | 100.00 | 7.88e+003 |

RICH GLYCOL STREAM

Temperature: 110.00 deg. F
Pressure: 1139.70 psia
Flow Rate: 1.47e+001 gpm
NOTE: Stream has more than one phase.

| Component | Conc. (wt%) | Loading (lb/hr) |
|---|---|---|
| TEG | 9.46e+001 | 7.76e+003 |
| Water | 3.51e+000 | 2.88e+002 |
| Carbon Dioxide | 1.35e-001 | 1.10e+001 |
| Nitrogen | 1.63e-002 | 1.34e+000 |
| Methane | 2.58e-001 | 2.12e+001 |
| Ethane | 3.26e-001 | 2.68e+001 |
| Propane | 2.74e-001 | 2.25e+001 |
| Isobutane | 4.91e-002 | 4.02e+000 |
| n-Butane | 1.83e-001 | 1.50e+001 |
| Isopentane | 3.94e-002 | 3.23e+000 |
| n-Pentane | 7.27e-002 | 5.97e+000 |
| Cyclopentane | 1.05e-002 | 8.61e-001 |
| n-Hexane | 3.06e-002 | 2.51e+000 |
| Cyclohexane | 3.16e-002 | 2.60e+000 |
| Other Hexanes | 3.35e-002 | 2.75e+000 |

| | | |
|---|---|---|
| Heptanes | 4.44e-002 | 3.64e+000 |
| Methylcyclohexane | 2.64e-002 | 2.17e+000 |
| 2,2,4-Trimethylpentane | 3.67e-003 | 3.01e-001 |
| Benzene | 1.08e-001 | 8.82e+000 |
| Toluene | 7.93e-002 | 6.51e+000 |
| Ethylbenzene | 1.52e-002 | 1.25e+000 |
| Xylenes | 1.27e-001 | 1.04e+001 |
| C8+ Heavies | 2.39e-002 | 1.96e+000 |
| Total Components | 100.00 | 8.20e+003 |

FLASH TANK OFF GAS STREAM

Temperature: 125.00 deg. F
Pressure: 74.70 psia
Flow Rate: 1.11e+003 scfh

| Component | Conc. (vol%) | Loading (lb/hr) |
|---|---|---|
| Water | 2.24e-001 | 1.17e-001 |
| Carbon Dioxide | 5.51e+000 | 7.06e+000 |
| Nitrogen | 1.57e+000 | 1.28e+000 |
| Methane | 4.32e+001 | 2.02e+001 |
| Ethane | 2.62e+001 | 2.30e+001 |
| Propane | 1.29e+001 | 1.65e+001 |
| Isobutane | 1.54e+000 | 2.61e+000 |
| n-Butane | 5.16e+000 | 8.75e+000 |
| Isopentane | 8.39e-001 | 1.77e+000 |
| n-Pentane | 1.39e+000 | 2.93e+000 |
| Cyclopentane | 8.30e-002 | 1.70e-001 |
| n-Hexane | 3.47e-001 | 8.73e-001 |
| Cyclohexane | 1.22e-001 | 2.99e-001 |
| Other Hexanes | 4.50e-001 | 1.13e+000 |
| Heptanes | 2.57e-001 | 7.51e-001 |
| Methylcyclohexane | 6.91e-002 | 1.98e-001 |
| 2,2,4-Trimethylpentane | 3.06e-002 | 1.02e-001 |
| Benzene | 6.71e-002 | 1.53e-001 |
| Toluene | 2.63e-002 | 7.06e-002 |
| Ethylbenzene | 2.46e-003 | 7.62e-003 |
| Xylenes | 1.38e-002 | 4.27e-002 |
| C8+ Heavies | 8.17e-003 | 4.06e-002 |
| Total Components | 100.00 | 8.81e+001 |

FLASH TANK GLYCOL STREAM

Temperature: 125.00 deg. F
Flow Rate: 1.45e+001 gpm

| Component | Conc. (wt%) | Loading (lb/hr) |
|---|---|---|
| TEG | 9.56e+001 | 7.76e+003 |
| Water | 3.55e+000 | 2.88e+002 |
| Carbon Dioxide | 4.91e-002 | 3.98e+000 |
| Nitrogen | 7.17e-004 | 5.82e-002 |
| Methane | 1.17e-002 | 9.51e-001 |
| Ethane | 4.68e-002 | 3.80e+000 |
| Propane | 7.32e-002 | 5.94e+000 |
| Isobutane | 1.75e-002 | 1.42e+000 |
| n-Butane | 7.72e-002 | 6.26e+000 |
| Isopentane | 1.81e-002 | 1.47e+000 |
| n-Pentane | 3.75e-002 | 3.04e+000 |
| Cyclopentane | 8.52e-003 | 6.91e-001 |
| n-Hexane | 2.02e-002 | 1.64e+000 |
| Cyclohexane | 2.83e-002 | 2.30e+000 |
| Other Hexanes | 1.99e-002 | 1.62e+000 |
| Heptanes | 3.56e-002 | 2.89e+000 |
| Methylcyclohexane | 2.43e-002 | 1.97e+000 |
| 2,2,4-Trimethylpentane | 2.45e-003 | 1.99e-001 |
| Benzene | 1.07e-001 | 8.67e+000 |
| Toluene | 7.93e-002 | 6.44e+000 |
| Ethylbenzene | 1.53e-002 | 1.24e+000 |
| Xylenes | 1.28e-001 | 1.04e+001 |
| C8+ Heavies | 2.37e-002 | 1.92e+000 |
| Total Components | 100.00 | 8.11e+003 |

FLASH GAS EMISSIONS

Flow Rate: 5.03e+003 scfh
Control Method: Combustion Device
Control Efficiency: 98.00

| Component | Conc. (vol%) | Loading (lb/hr) |
|---|---|---|
| Water | 5.90e+001 | 1.41e+002 |
| Carbon Dioxide | 4.03e+001 | 2.35e+002 |
| Nitrogen | 3.44e-001 | 1.28e+000 |
| Methane | 1.90e-001 | 4.04e-001 |
| Ethane | 1.15e-001 | 4.59e-001 |
| Propane | 5.65e-002 | 3.30e-001 |
| Isobutane | 6.76e-003 | 5.21e-002 |
| n-Butane | 2.27e-002 | 1.75e-001 |
| Isopentane | 3.69e-003 | 3.53e-002 |

| | | |
|---|---|---|
| n-Pentane | 6.11e-003 | 5.85e-002 |
| Cyclopentane | 3.65e-004 | 3.39e-003 |
| n-Hexane | 1.53e-003 | 1.75e-002 |
| Cyclohexane | 5.36e-004 | 5.98e-003 |
| Other Hexanes | 1.98e-003 | 2.26e-002 |
| Heptanes | 1.13e-003 | 1.50e-002 |
| Methylcyclohexane | 3.04e-004 | 3.96e-003 |
| 2,2,4-Trimethylpentane | 1.34e-004 | 2.04e-003 |
| Benzene | 2.95e-004 | 3.06e-003 |
| Toluene | 1.16e-004 | 1.41e-003 |
| Ethylbenzene | 1.08e-005 | 1.52e-004 |
| Xylenes | 6.06e-005 | 8.54e-004 |
| C8+ Heavies | 3.59e-005 | 8.12e-004 |
| Total Components | 100.00 | 3.79e+002 |

REGENERATOR OVERHEADS STREAM

Temperature: 212.00 deg. F
Pressure: 14.70 psia
Flow Rate: 3.95e+003 scfh

| Component | Conc. (vol%) | Loading (lb/hr) |
|---|---|---|
| Water | 9.04e+001 | 1.70e+002 |
| Carbon Dioxide | 8.69e-001 | 3.98e+000 |
| Nitrogen | 1.99e-002 | 5.82e-002 |
| Methane | 5.69e-001 | 9.51e-001 |
| Ethane | 1.21e+000 | 3.80e+000 |
| Propane | 1.29e+000 | 5.94e+000 |
| Isobutane | 2.34e-001 | 1.42e+000 |
| n-Butane | 1.03e+000 | 6.26e+000 |
| Isopentane | 1.93e-001 | 1.45e+000 |
| n-Pentane | 4.00e-001 | 3.01e+000 |
| Cyclopentane | 9.40e-002 | 6.87e-001 |
| n-Hexane | 1.81e-001 | 1.62e+000 |
| Cyclohexane | 2.52e-001 | 2.21e+000 |
| Other Hexanes | 1.77e-001 | 1.59e+000 |
| Heptanes | 2.75e-001 | 2.87e+000 |
| Methylcyclohexane | 1.84e-001 | 1.88e+000 |
| 2,2,4-Trimethylpentane | 1.63e-002 | 1.94e-001 |
| Benzene | 1.01e+000 | 8.23e+000 |
| Toluene | 6.17e-001 | 5.92e+000 |
| Ethylbenzene | 1.00e-001 | 1.11e+000 |
| Xylenes | 8.18e-001 | 9.05e+000 |
| C8+ Heavies | 9.49e-002 | 1.68e+000 |

| Total Components | 100.00 | 2.34e+002 | |
|---|---|---|---|

CONDENSER PRODUCED WATER STREAM

Temperature: 150.00 deg. F
Flow Rate: 3.28e-001 gpm

| Component | Conc. (wt%) | Loading (lb/hr) | (ppm) |
|---|---|---|---|
| Water | 9.99e+001 | 1.64e+002 | 999313. |
| Carbon Dioxide | 5.19e-003 | 8.52e-003 | 52. |
| Nitrogen | 2.42e-006 | 3.98e-006 | 0. |
| Methane | 7.10e-005 | 1.17e-004 | 1. |
| Ethane | 3.05e-004 | 5.02e-004 | 3. |
| Propane | 5.78e-004 | 9.50e-004 | 6. |
| Isobutane | 7.23e-005 | 1.19e-004 | 1. |
| n-Butane | 4.09e-004 | 6.72e-004 | 4. |
| Isopentane | 6.27e-005 | 1.03e-004 | 1. |
| n-Pentane | 1.35e-004 | 2.22e-004 | 1. |
| Cyclopentane | 1.95e-004 | 3.20e-004 | 2. |
| n-Hexane | 5.47e-005 | 8.99e-005 | 1. |
| Cyclohexane | 3.70e-004 | 6.08e-004 | 4. |
| Other Hexanes | 4.51e-005 | 7.41e-005 | 0. |
| Heptanes | 4.53e-005 | 7.45e-005 | 0. |
| Methylcyclohexane | 1.31e-004 | 2.16e-004 | 1. |
| 2,2,4-Trimethylpentane | 2.11e-006 | 3.47e-006 | 0. |
| Benzene | 3.23e-002 | 5.30e-002 | 323. |
| Toluene | 1.44e-002 | 2.36e-002 | 144. |
| Ethylbenzene | 1.32e-003 | 2.17e-003 | 13. |
| Xylenes | 1.31e-002 | 2.15e-002 | 131. |
| C8+ Heavies | 2.87e-007 | 4.72e-007 | 0. |
| Total Components | 100.00 | 1.64e+002 | 1000000. |

CONDENSER RECOVERED OIL STREAM

Temperature: 150.00 deg. F
Flow Rate: 2.96e-002 gpm

| Component | Conc. (wt%) | Loading (lb/hr) |
|---|---|---|
| Water | 5.70e-002 | 7.18e-003 |
| Carbon Dioxide | 2.44e-002 | 3.08e-003 |
| Nitrogen | 2.04e-004 | 2.57e-005 |
| Methane | 2.08e-003 | 2.62e-004 |
| Ethane | 3.96e-002 | 4.99e-003 |

| | | |
|---|---|---|
| Propane | 2.91e-001 | 3.67e-002 |
| Isobutane | 1.29e-001 | 1.63e-002 |
| n-Butane | 7.38e-001 | 9.30e-002 |
| Isopentane | 3.89e-001 | 4.90e-002 |
| n-Pentane | 1.16e+000 | 1.47e-001 |
| Cyclopentane | 3.14e-001 | 3.96e-002 |
| n-Hexane | 1.14e+000 | 1.44e-001 |
| Cyclohexane | 2.09e+000 | 2.63e-001 |
| Other Hexanes | 8.43e-001 | 1.06e-001 |
| Heptanes | 4.53e+000 | 5.71e-001 |
| Methylcyclohexane | 3.15e+000 | 3.96e-001 |
| 2,2,4-Trimethylpentane | 3.00e-001 | 3.78e-002 |
| Benzene | 9.59e+000 | 1.21e+000 |
| Toluene | 1.53e+001 | 1.92e+000 |
| Ethylbenzene | 4.78e+000 | 6.02e-001 |
| Xylenes | 4.21e+001 | 5.30e+000 |
| C8+ Heavies | 1.31e+001 | 1.65e+000 |
| Total Components | 100.00 | 1.26e+001 |

CONDENSER VENT STREAM

Temperature: 150.00 deg. F
Pressure: 14.70 psia
Flow Rate: 4.47e+002 scfh

| Component | Conc. (vol%) | Loading (lb/hr) |
|---|---|---|
| Water | 2.54e+001 | 5.38e+000 |
| Carbon Dioxide | 7.66e+000 | 3.97e+000 |
| Nitrogen | 1.76e-001 | 5.81e-002 |
| Methane | 5.03e+000 | 9.50e-001 |
| Ethane | 1.07e+001 | 3.79e+000 |
| Propane | 1.14e+001 | 5.90e+000 |
| Isobutane | 2.05e+000 | 1.40e+000 |
| n-Butane | 9.01e+000 | 6.17e+000 |
| Isopentane | 1.65e+000 | 1.40e+000 |
| n-Pentane | 3.37e+000 | 2.86e+000 |
| Cyclopentane | 7.83e-001 | 6.47e-001 |
| n-Hexane | 1.46e+000 | 1.48e+000 |
| Cyclohexane | 1.97e+000 | 1.95e+000 |
| Other Hexanes | 1.46e+000 | 1.48e+000 |
| Heptanes | 1.95e+000 | 2.30e+000 |
| Methylcyclohexane | 1.28e+000 | 1.49e+000 |
| 2,2,4-Trimethylpentane | 1.16e-001 | 1.57e-001 |
| Benzene | 7.57e+000 | 6.97e+000 |
| Toluene | 3.66e+000 | 3.98e+000 |
| Ethylbenzene | 4.05e-001 | 5.07e-001 |

| | | |
|---|---|---|
| Xylenes | 2.98e+000 | 3.73e+000 |
| C8+ Heavies | 1.85e-002 | 3.71e-002 |
| Total Components | 100.00 | 5.66e+001 |

COMBUSTION DEVICE OFF GAS STREAM

Temperature: 1000.00 deg. F
Pressure: 14.70 psia
Flow Rate: 5.98e+000 scfh

| Component | Conc. (vol%) | Loading (lb/hr) |
|---|---|---|
| Methane | 7.53e+000 | 1.90e-002 |
| Ethane | 1.60e+001 | 7.59e-002 |
| Propane | 1.70e+001 | 1.18e-001 |
| Isobutane | 3.06e+000 | 2.80e-002 |
| n-Butane | 1.35e+001 | 1.23e-001 |
| Isopentane | 2.47e+000 | 2.80e-002 |
| n-Pentane | 5.04e+000 | 5.73e-002 |
| Cyclopentane | 1.17e+000 | 1.29e-002 |
| n-Hexane | 2.18e+000 | 2.96e-002 |
| Cyclohexane | 2.94e+000 | 3.90e-002 |
| Other Hexanes | 2.18e+000 | 2.96e-002 |
| Heptanes | 2.91e+000 | 4.60e-002 |
| Methylcyclohexane | 1.92e+000 | 2.97e-002 |
| 2,2,4-Trimethylpentane | 1.74e-001 | 3.13e-003 |
| Benzene | 1.13e+001 | 1.39e-001 |
| Toluene | 5.48e+000 | 7.95e-002 |
| Ethylbenzene | 6.06e-001 | 1.01e-002 |
| Xylenes | 4.47e+000 | 7.47e-002 |
| C8+ Heavies | 2.77e-002 | 7.42e-004 |
| Total Components | 100.00 | 9.44e-001 |

CONDENSER CONTROL CURVE DATA REPORT:

CONDENSER CONTROL EFFICIENCY CURVES

Note: Condenser curves computed for the range 40.0 F <= T <= 170.0 F. DO NOT EXTRAPOLATE BEYOND THIS RAN

| Temp(F) | BTEX | Total HAP | VOC |
|---|---|---|---|
| 40.0 | 98.14 | 97.83 | 79.89 |
| 45.0 | 97.74 | 97.36 | 78.55 |
| 50.0 | 97.26 | 96.81 | 77.15 |

| | | | |
|---|---|---|---|
| 55.0 | 96.70 | 96.17 | 75.70 |
| 60.0 | 96.03 | 95.41 | 74.18 |
| 65.0 | 95.26 | 94.53 | 72.60 |
| 70.0 | 94.35 | 93.50 | 70.94 |
| 75.0 | 93.29 | 92.31 | 69.18 |
| 80.0 | 92.07 | 90.95 | 67.34 |
| 85.0 | 90.67 | 89.39 | 65.39 |
| 90.0 | 88.91 | 87.45 | 63.14 |
| 95.0 | 87.00 | 85.38 | 60.90 |
| 100.0 | 84.81 | 83.02 | 58.49 |
| 105.0 | 82.30 | 80.34 | 55.92 |
| 110.0 | 79.43 | 77.31 | 53.16 |
| 115.0 | 76.16 | 73.90 | 50.19 |
| 120.0 | 72.44 | 70.06 | 47.00 |
| 125.0 | 68.22 | 65.75 | 43.59 |
| 130.0 | 63.43 | 60.94 | 39.94 |
| 135.0 | 58.02 | 55.55 | 36.05 |
| 140.0 | 51.91 | 49.54 | 31.91 |
| 145.0 | 45.03 | 42.85 | 27.52 |
| 150.0 | 37.37 | 35.46 | 22.89 |
| 155.0 | 29.70 | 28.12 | 18.47 |
| 160.0 | 21.12 | 19.96 | 13.68 |
| 165.0 | 12.99 | 12.26 | 9.12 |
| 170.0 | 6.05 | 5.70 | 4.86 |

Maximum temperature for 80% control (deg.F):

| | | |
|---|---|---|
| 109.0 | 105.6 | N/A |

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