
* Project Setup Information *

Project File : E:\APEN -- Emissions Tracking - CO\ef Modeling.Analyticals\Model files\2022 Files\Bra
Flowsheet Selection : Oil Tank with Separator
Calculation Method : AP42
Control Efficiency : 95.00%
Known Separator Stream : Low Pressure Oil
Entering Air Composition : No
Component Group : C10+

Filed Name : Mull Drilling Company
Well Name : Braukmann Farms
Date : 2014.09.09

* Data Input *

Separator Pressure (psia) : 56.00
Separator Temperature (F) : 140.0
C10+ SG : 0.78
C10+ MW(lb/lbmol) : 162.17

-- Low Pressure Oil -----

| No. | Component | Mole% | Wt% |
|-----|---------------|---------|---------|
| 1 | H2S | 0.0000 | 0.0000 |
| 2 | O2 | 0.0000 | 0.0000 |
| 3 | CO2 | 0.1060 | 0.0399 |
| 4 | N2 | 0.0080 | 0.0019 |
| 5 | C1 | 0.3290 | 0.0452 |
| 6 | C2 | 0.4680 | 0.1205 |
| 7 | C3 | 1.0791 | 0.4074 |
| 8 | i-C4 | 0.2960 | 0.1473 |
| 9 | n-C4 | 1.2401 | 0.6171 |
| 10 | i-C5 | 0.5306 | 0.3278 |
| 11 | n-C5 | 1.5226 | 0.9405 |
| 12 | C6 | 11.8341 | 8.7296 |
| 13 | C7 | 19.2181 | 16.4866 |
| 14 | C8 | 13.1629 | 12.8732 |
| 15 | C9 | 12.0204 | 13.2018 |
| 16 | C10+ | 26.6338 | 36.9794 |
| 17 | Benzene | 0.8167 | 0.5461 |
| 18 | Toluene | 1.1180 | 0.8818 |
| 19 | E-Benzene | 0.3566 | 0.3242 |
| 20 | Xylenes | 1.5975 | 1.4521 |
| 21 | n-C6 | 6.7311 | 4.9665 |
| 22 | 224Trimethylp | 0.9315 | 0.9110 |

-- Sales Oil -----

Production Rate (bbl/day) : 11.97
Days of Annual Operation : 365
API Gravity : 31.50
Reid Vapor Pressure (psia) : 2.80
Bulk Temperature : 109.0

-- Tank and Shell Data -----

Diameter (ft) : 12.00
Shell Height (ft) : 20.00
Cone Roof Slope : 0.06
Average Liquid Height (ft) : 10.00
Vent Pressure Range (psia) : 0.25
Solar Absorbance : 0.68

-- Meteorological Data -----

City : Denver, CO
 Min Ambient Temperature (F) : 37.2
 Max Ambient Temperature (F) : 64.5
 Total Solar Insolation (F) : 1501.00
 Ambient Pressure (psia) : 12.63
 Ambient Temperature (F) : 140.0

 * Calculation Results *

 -- Emission Summary -----

| | Uncontrolled ton | Controlled ton |
|------------|---------------------|-------------------|
| Total HAPs | 0.6040 | 0.0302 |
| Total HC | 4.5250 | 0.2262 |
| VOCs, C2+ | 4.2950 | 0.2148 |
| VOCs, C3+ | 3.8940 | 0.1947 |
| CO2 | 0.1740 | |
| CH4 | 0.2300 | |

Uncontrolled Recovery Information:

Vapor (mscfd) : 0.1826
 HC Vapor (mscfd) : 0.1736
 CO2 (mscfd) : 0.0100
 CH4 (mscfd) : 0.0300
 GOR (SCF/STB) : 15.2565

 -- Emission Composition -----

| NoComponent | Uncontrolled ton | Controlled ton |
|------------------|---------------------|-------------------|
| 1 H2S | 0.0000 | 0.0000 |
| 2 O2 | 0.0000 | 0.0000 |
| 3 CO2 | 0.1740 | 0.1740 |
| 4 N2 | 0.0120 | 0.0120 |
| 5 C1 | 0.2300 | 0.0115 |
| 6 C2 | 0.4010 | 0.0201 |
| 7 C3 | 0.7220 | 0.0361 |
| 8 i-C4 | 0.1400 | 0.0070 |
| 9 n-C4 | 0.4430 | 0.0222 |
| 10 i-C5 | 0.1090 | 0.0055 |
| 11 n-C5 | 0.2480 | 0.0124 |
| 12 C6 | 0.8310 | 0.0415 |
| 13 Benzene | 0.0460 | 0.0023 |
| 14 Toluene | 0.0250 | 0.0012 |
| 15 E-Benzene | 0.0040 | 0.0002 |
| 16 Xylenes | 0.0140 | 0.0007 |
| 17 n-C6 | 0.4810 | 0.0240 |
| 18 224Trimethylp | 0.0350 | 0.0018 |
| 19 Pseudo Comp1 | 0.5060 | 0.0253 |
| 20 Pseudo Comp2 | 0.2460 | 0.0123 |
| 21 Pseudo Comp3 | 0.0310 | 0.0016 |
| 22 Pseudo Comp4 | 0.0140 | 0.0007 |
| 23 Pseudo Comp5 | 0.0010 | 0.0000 |
| 24 Total | 4.7130 | 0.2357 |

 -- Stream Data -----

| NoComponent | MW lb/lbmol | LP Oil mole % | Flash Oil mole % | Sales Oil mole % | Flash Gas mole % | W&S Gas mole % | Total Emission mole % |
|-------------|----------------|------------------|---------------------|---------------------|---------------------|-------------------|--------------------------|
| 1 H2S | 34.80 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 2 O2 | 32.00 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 3 CO2 | 44.01 | 0.1060 | 0.0403 | 0.0046 | 5.2516 | 1.1735 | 4.4872 |
| 4 N2 | 28.01 | 0.0080 | 0.0007 | 0.0000 | 0.5786 | 0.0003 | 0.4702 |
| 5 C1 | 16.04 | 0.3290 | 0.0774 | 0.0000 | 20.0475 | 0.0002 | 16.2899 |
| 6 C2 | 30.07 | 0.4680 | 0.2723 | 0.1053 | 15.8010 | 12.4706 | 15.1768 |
| 7 C3 | 44.10 | 1.0791 | 0.8732 | 0.6439 | 17.2167 | 24.7440 | 18.6277 |

| | | | | | | | |
|--------------------------|--------|---------|-----------|-----------|-----------|---------|----------------|
| 8 i-C4 | 58.12 | 0.2960 | 0.2685 | 0.2359 | 2.4532 | 3.9973 | 2.7426 |
| 9 n-C4 | 58.12 | 1.2401 | 1.1573 | 1.0589 | 7.7274 | 12.7136 | 8.6620 |
| 10 i-C5 | 72.15 | 0.5306 | 0.5178 | 0.5020 | 1.5326 | 2.5052 | 1.7149 |
| 11 n-C5 | 72.15 | 1.5226 | 1.4973 | 1.4654 | 3.5022 | 5.6327 | 3.9015 |
| 12 C6 | 84.00 | 11.8341 | 11.8540 | 11.8487 | 10.2726 | 15.4547 | 11.2440 |
| 13 Benzene | 78.11 | 0.8167 | 0.8194 | 0.8203 | 0.6072 | 0.9088 | 0.6637 |
| 14 Toluene | 92.14 | 1.1180 | 1.1286 | 1.1371 | 0.2893 | 0.3960 | 0.3093 |
| 15 E-Benzene | 106.17 | 0.3566 | 0.3607 | 0.3641 | 0.0367 | 0.0464 | 0.0385 |
| 16 Xylenes | 106.17 | 1.5975 | 1.6160 | 1.6314 | 0.1465 | 0.1826 | 0.1532 |
| 17 n-C6 | 86.18 | 6.7311 | 6.7430 | 6.7407 | 5.7951 | 8.7070 | 6.3409 |
| 18 224Trimethylp | 114.23 | 0.9315 | 0.9393 | 0.9453 | 0.3215 | 0.4580 | 0.3471 |
| 19 Pseudo Comp1 | 96.00 | 19.2181 | 19.3910 | 19.5318 | 5.6710 | 7.4207 | 5.9990 |
| 20 Pseudo Comp2 | 113.68 | 25.1833 | 25.4743 | 25.7171 | 2.3830 | 2.8114 | 2.4633 |
| 21 Pseudo Comp3 | 134.00 | 8.8691 | 8.9790 | 9.0705 | 0.2592 | 0.2748 | 0.2621 |
| 22 Pseudo Comp4 | 152.60 | 9.8614 | 9.9860 | 10.0895 | 0.1027 | 0.0991 | 0.1020 |
| 23 Pseudo Comp5 | 205.15 | 7.9032 | 8.0040 | 8.0877 | 0.0042 | 0.0031 | 0.0040 |
| | | LP Oil | Flash Oil | Sales Oil | Flash Gas | W&S Gas | Total Emission |
| MW (lb/lbmol): | | 113.87 | 114.67 | 115.12 | 51.17 | 63.93 | 53.57 |
| Stream Mole Ratio: | | 1.0000 | 0.9874 | 0.9845 | 0.0126 | 0.0029 | 0.0155 |
| Stream Weight Ratio: | | 113.87 | 113.22 | 113.33 | 0.64 | 0.19 | 0.83 |
| Total Emission (ton): | | | | | 3.657 | 1.054 | 4.710 |
| Heating Value (BTU/scf): | | | | | 2718.18 | 3493.65 | 2863.54 |
| Gas Gravity (Gas/Air): | | | | | 1.77 | 2.21 | 1.85 |
| Bubble Pt. @100F (psia): | | 19.13 | 8.40 | 4.12 | | | |
| RVP @100F (psia): | | 51.36 | 33.59 | 24.73 | | | |
| Spec. Gravity @100F: | | 0.70 | 0.70 | 0.70 | | | |

Crude Oil Storage Tank(s) Emissions Inventory



Section 01 - Administrative Information

| | | | |
|-------------------|-----------|----------|-------|
| Facility AIRs ID: | 730077001 | 09L11365 | |
| | Cheyenne | Plant | Point |

Section 02 - Equipment Description Details

Detailed Emissions Unit Description: **Crude Oil Storage**

Emission Control Device Description: **Cimmaron Combustor**

Requested Overall VOC & HAP Control Efficiency %: **95.0**

Section 03 - Processing Rate Information for Emissions Estimates

Primary Emissions - Storage Tank(s)

| | | | | | |
|---------------------|-------------------------------|-------------------------------------|-------------------------------|--------------------------------|-------------------------------|
| Actual Throughput = | 4269.0 Barrels (bbl) per year | Requested Permit Limit Throughput = | 4800.0 Barrels (bbl) per year | Requested Monthly Throughput = | 407.7 Barrels (bbl) per month |
|---------------------|-------------------------------|-------------------------------------|-------------------------------|--------------------------------|-------------------------------|

Potential to Emit (PTE) Throughput = 5000.0 Barrels (bbl) per year

Secondary Emissions - Combustion Device(s)

| | | | |
|---|--|---------|--------------------|
| Heat content of waste gas = | | Btu/scf | |
| Volume of waste gas emitted per BBL of liquids produced = | | scf/bbl | |
| Actual heat content of waste gas routed to combustion device = | | | 0.0 MMBTU per year |
| Requested heat content of waste gas routed to combustion device = | | | 0.0 MMBTU per year |
| Potential to Emit (PTE) heat content of waste gas routed to combustion device = | | | 0.0 MMBTU per year |

Control Device

| | | | |
|-------------------------------|--|---------|--------------|
| Pilot Fuel Use Rate: | | scfh | 0.0 MMscf/yr |
| Pilot Fuel Gas Heating Value: | | Btu/scf | 0.0 MMBTU/yr |

Section 04 - Emissions Factors & Methodologies

Will this storage tank emit flash emissions? **Yes**

| Emission Factors | Crude Oil Tank | | Emission Factor Source |
|------------------|--------------------------------------|--------------------------------------|--|
| | Uncontrolled | Controlled | |
| | (lb/bbl) (Crude Oil Throughput) | (lb/bbl) (Crude Oil Throughput) | |
| VOC | 1.9737 | 0.0987 | Site Specific E.F. (includes flash) |
| Benzene | 0.0210 | 0.0011 | Site Specific E.F. (includes flash) |
| Toluene | 0.0117 | 0.0006 | Site Specific E.F. (includes flash) |
| Ethylbenzene | 0.0019 | 0.0001 | Site Specific E.F. (includes flash) |
| Xylene | 0.0066 | 0.0003 | Site Specific E.F. (includes flash) |
| n-Hexane | 0.2211 | 0.0111 | Site Specific E.F. (includes flash) |
| 224 TMP | 0.0159 | 0.0008 | Site Specific E.F. (includes flash) |
| Pollutant | Control Device | | Emission Factor Source |
| | Uncontrolled | Uncontrolled | |
| | (lb/MMBtu) (Waste Heat Combusted) | (lb/bbl) (Crude Oil Throughput) | |
| PM10 | 0.0075 | 0.0000 | AP-42 Table 1.4-2 (PM10/PM2.5) |
| PM2.5 | 0.0075 | 0.0000 | AP-42 Table 1.4-2 (PM10/PM2.5) |
| NOx | 0.0680 | 0.0000 | AP-42 Chapter 13.5 Industrial Flares (NOx) |
| CO | 0.3100 | 0.0000 | AP-42 Chapter 13.5 Industrial Flares (CO) |
| Pollutant | Pilot Light Emissions | | Emission Factor Source |
| | Uncontrolled | Uncontrolled | |
| | (lb/MMBtu) (Waste Heat Combusted) | (lb/MMscf) (Pilot Gas Throughput) | |
| PM10 | 0.0075 | 0.0000 | AP-42 Table 1.4-2 (PM10/PM2.5) |
| PM2.5 | 0.0075 | 0.0000 | AP-42 Table 1.4-2 (PM10/PM2.5) |
| NOx | 0.0680 | 0.0000 | AP-42 Chapter 13.5 Industrial Flares (NOx) |
| CO | 0.3100 | 0.0000 | AP-42 Chapter 13.5 Industrial Flares (CO) |

Crude Oil Storage Tank(s) Emissions Inventory



Section 05 - Emissions Inventory

| Criteria Pollutants | Potential to Emit Uncontrolled (tons/year) | Actual Emissions | | Requested Permit Limits | | Requested Monthly Limits Controlled (lbs/month) |
|--------------------------|--|-----------------------------|---------------------------|-----------------------------|---------------------------|---|
| | | Uncontrolled (tons/year) | Controlled (tons/year) | Uncontrolled (tons/year) | Controlled (tons/year) | |
| VOC | 4.9 | 4.2 | 0.2 | 4.7 | 0.2 | 40.2 |
| PM10 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| PM2.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| NOx | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| CO | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Hazardous Air Pollutants | Potential to Emit Uncontrolled (lbs/year) | Actual Emissions | | Requested Permit Limits | | |
| | | Uncontrolled (lbs/year) | Controlled (lbs/year) | Uncontrolled (lbs/year) | Controlled (lbs/year) | |
| Benzene | 105.0 | 89.6 | 4.5 | 100.8 | 5.0 | |
| Toluene | 58.5 | 49.9 | 2.5 | 56.2 | 2.8 | |
| Ethylbenzene | 9.4 | 8.0 | 0.4 | 9.0 | 0.4 | |
| Xylene | 33.0 | 28.2 | 1.4 | 31.7 | 1.6 | |
| n-Hexane | 1105.5 | 943.9 | 47.2 | 1061.3 | 53.1 | |
| 224 TMP | 79.5 | 67.9 | 3.4 | 76.3 | 3.8 | |

Section 06 - Regulatory Summary Analysis

| | |
|---|---|
| Regulation 3, Parts A,B | Not enough information |
| Regulation 7, Section XVII.B, C.1, C.3 | Storage Tank is not subject to Regulation 7, Section XVII |
| Regulation 7, Section XVII.C.2 | Storage Tank is not subject to Regulation 7, Section XVII.C.2 |
| Regulation 6, Part A, NSPS Subpart Kb | Not enough information |
| Regulation 6, Part A, NSPS Subpart OOOO | Not enough information |
| NSPS Subpart OOOOa | Not enough information |
| Regulation 8, Part E, MACT Subpart HH | Not enough information |

(See regulatory applicability worksheet for detailed analysis)

Section 07 - Initial and Periodic Sampling and Testing Requirements

Does the company use the state default emissions factors to estimate emissions? **Yes**

If yes, are the uncontrolled actual or requested emissions estimated to be greater than or equal to 20 tons VOC per year? **No**

If yes, the permit will contain an "Initial Compliance" testing requirement to develop a site specific emissions factor based on guidelines in PS Memo 14-03

Does the company use a site specific emissions factor to estimate emissions? **Yes**

If yes and if there are flash emissions, are the emissions factors based on a pressurized liquid sample of crude oil drawn at the facility being permitted? **Yes**

If no, the permit will contain an "Initial Compliance" testing requirement to develop a site specific emissions factor based on guidelines in PS Memo 14-03.

Does the company request a control device efficiency greater than 95% for a flare or combustion device? **No**

If yes, the permit will contain an initial compliance test condition to demonstrate the destruction efficiency of the combustion device based on inlet and outlet concentration sampling

Section 08 - Technical Analysis Notes

[Empty box for technical analysis notes]

Section 09 - Inventory SCC Coding and Emissions Factors

| AIRS Point # | Process # | SCC Code | Pollutant | Uncontrolled Emissions Factor | Control % | Units |
|--------------|-----------|----------|--------------|-------------------------------|-----------|---------------------------------------|
| 0 | 01 | | PM10 | 0.00 | 0 | lb/1,000 gallons crude oil throughput |
| | | | PM2.5 | 0.00 | 0 | lb/1,000 gallons crude oil throughput |
| | | | NOx | 0.00 | 0 | lb/1,000 gallons crude oil throughput |
| | | | VOC | 47.0 | 95 | lb/1,000 gallons crude oil throughput |
| | | | CO | 0.00 | 0 | lb/1,000 gallons crude oil throughput |
| | | | Benzene | 0.50 | 95 | lb/1,000 gallons crude oil throughput |
| | | | Toluene | 0.28 | 95 | lb/1,000 gallons crude oil throughput |
| | | | Ethylbenzene | 0.04 | 95 | lb/1,000 gallons crude oil throughput |
| | | | Xylene | 0.16 | 95 | lb/1,000 gallons crude oil throughput |
| | | | n-Hexane | 5.26 | 95 | lb/1,000 gallons crude oil throughput |
| | | | 224 TMP | 0.38 | 95 | lb/1,000 gallons crude oil throughput |