The purpose of this document is to provide operators with guidelines in estimating emissions from loading of volatile organic containing liquid materials in bulk. Loading losses are the primary source of evaporative emissions that occur as organic vapors in "empty" cargo tanks are displaced to the atmosphere by the liquid being loaded into the tanks. These vapors are a composite of: (1) vapors formed in the empty tank by evaporation of residual product from previous loads, (2) vapors transferred to the tank in vapor balance systems as product is being unloaded, and (3) vapors generated in the tank as the new product is being loaded.

In addition to VOC emissions from evaporative losses, other emissions (NOx, SOx, CO, PM, and toxic air contaminants), from controlling VOC emissions by means of thermal destruction are also expected.

The following guidelines should be used to calculate annual emissions from bulk loading operations. The methodologies assume certain default parameters. Site-specific information should be used, if it is available. There are three emission scenarios for bulk loading operations:

1. Simple Operation (No Control)
2. Equipped with a Vapor Collection and Recovery System
3. Equipped with a Balance System and Vapor Control System

**CASE 1) SIMPLE OPERATION (NO VAPOR CONTROL)**

\[ E_1 = Q \times L_L \]  

*Eq. 1*

Where,

- \( E_1 \) = VOC Emission (un-captured vapor) from Loading Losses
- \( Q \) = Throughput in 1,000 gallons loaded
- \( L_L \) = Loading Loss Factor (lbs/1,000 Gallon Loaded) can be found in the Default Emission Factor tables or determined using information defined in US EPA AP-42, Section 5.2 as follows:

\[ L_L = \frac{12.46 \times S \times P \times M}{T} \]

Where,

- \( S \) = Saturation Factor (see AP-42, Table 5.2-1)
- \( P \) = True Vapor Pressure, psia
- \( M \) = Vapor Molecular Weight, lb/lb-mole
- \( T \) = Temperature of the Liquid being Loaded, °R (°F + 460)
**CASE 2) OPERATIONS EQUIPPED WITH VAPOR COLLECTION AND RECOVERY SYSTEMS**

Loading emissions from this configuration consist of two parts: 1) uncollected vapor during loading; and 2) collected vapor that was further recovered by the system before exiting the recovery stack.

\[
E_2 = E_{\text{uncollected}} + E_{\text{stack}} = E_{\text{uncollected}} + E_{\text{collected}} * (1 - \text{Eff}_{\text{VR}})
\]

\[
E_2 = Q * L_L * (1 - \text{Eff}_{\text{VC}}) + Q * L_L * \text{Eff}_{\text{VC}} * (1 - \text{Eff}_{\text{VR}})
\]

\[
E_2 = Q * L_L - Q * L_L * \text{Eff}_{\text{VC}} * \text{Eff}_{\text{VR}} \quad \text{Eq. 2}
\]

Where,

\[
E_2 = \text{VOC Emission from Loading Losses}
\]

\[
\text{Eff}_{\text{VC}} = \text{Vapor Collection Efficiency (fraction) as defined in US EPA AP-42, Section 5.2 as follows:}
\]

- \(\text{Eff}_{\text{VC}} = 0.992\) for tanker trucks passing MACT-level annual leak test; or
- \(\text{Eff}_{\text{VC}} = 0.987\) for tanker trucks passing the NSPS-level annual leak test; or
- \(\text{Eff}_{\text{VC}} = 0.70\) for tanker trucks not passing either of the above leak tests.

\[
\text{Eff}_{\text{VR}} = \text{Vapor Recovery Efficiency (fraction).}
\]

Without specific tests, Vapor Recovery Efficiency (\(\text{Eff}_{\text{VR}}\)) is assumed to be 0.95 and equation 2 becomes:

\[
E_2 = Q * L_L * (1 - 0.95 * \text{Eff}_{\text{VC}}) \quad \text{Eq. 3}
\]

**CASE 3) OPERATIONS EQUIPPED WITH A VAPOR BALANCE AND DESTRUCTION SYSTEM**

Loading emissions from this configuration consisted of two parts: 1) uncollected vapor during loading; and 2) collected vapor that was further recovered by the system before exiting the recovery stack.

\[
E_3 = E_{\text{uncollected}} + E_{\text{stack}} = E_{\text{uncollected}} + E_{\text{collected}} * (1 - \text{Eff}_{\text{VB}}) * (1 - \text{Eff}_{\text{VD}})
\]

\[
E_3 = Q * L_L * (1 - \text{Eff}_{\text{VC}}) + Q * L_L * \text{Eff}_{\text{VC}} * (1 - \text{Eff}_{\text{VB}}) * (1 - \text{Eff}_{\text{VD}})
\]

\[
E_3 = Q * L_L * [1 - \text{Eff}_{\text{VC}} (\text{Eff}_{\text{VB}} + \text{Eff}_{\text{VD}} - (\text{Eff}_{\text{VB}} * \text{Eff}_{\text{VD}}))] \quad \text{Eq. 4}
\]

Where,

\[
E_3 = \text{VOC Emission from Loading Losses}
\]
\( \text{Eff}_{VC} = \) Vapor Collection Efficiency (fraction) as defined in US EPA AP-42, Section 5.2  
\( \text{Eff}_{VB} = \) Vapor Balance Efficiency (fraction)  
\( \text{Eff}_{VD} = \) Vapor Destruction Efficiency (fraction)

A typical system is operating with Vapor Balance Efficiency (\( \text{Eff}_{VB} \)) of 50\% (or 0.50). Without specific tests, Vapor Destruction Efficiency (\( \text{Eff}_{VD} \)) is assumed to be 99\% (or 0.99) and equation 4 becomes:

\[
E_3 = Q \times L_L \times (1 - 0.995 \times \text{Eff}_{VC}) 
\]

**Eq. 5**

### THERMAL OXIDATION

If the operation is equipped with a VOC destruction system by means of thermal oxidation, other contaminants (NO\(_x\), SO\(_x\), CO, PM, and toxic air contaminants) resulted from burning off organic vapor are expected. AQMD encourages operators to use test results to calculate and report emissions. Since the organic vapor evaporates from loading of liquid organic materials, the captured for control vapor must be converted back into liquid form for consistency in emission calculations. The AQMD uses an equivalent method to determine the throughput of vapors directed to a thermal oxidizer (TO) as equivalent 1000 of gallons of liquid (Mgal).

\[
TO_{\text{Throughput}} = \frac{E_{\text{collected}}}{1,000 \times d_l} \times (1 - \text{Eff}_{VB}) 
\]

**Eq. 6**

A typical system is operating with Vapor Balance Efficiency (\( \text{Eff}_{VB} \)) of 50\% (or 0.50). Throughput for the TO become:

\[
TO_{\text{Throughput}} = 0.0005 \times \text{Eff}_{VC} \times \frac{Q \times L_L}{d_l} 
\]

**Eq. 7**

Where, \( d_l \) is the liquid density.

### EXAMPLES

The following examples will demonstrate how emissions are calculated for a typical bulk loading operation in all three cases. The examples also included images of screens for how to report emissions under the new reporting system.

### CASE 1 - SIMPLE OPERATION (NO VAPOR CONTROL)

Company XYZ splash loaded 120,000 gallons of gasoline RVP 10 at the following conditions:
S = 1.45 (Saturation Factor from AP-42)
T = 70°F = 530°F (Temperature of Gasoline)
P = 6.2 psia (True Vapor Pressure)
M = 66 lb/lb-mole (Vapor Molecular Weight)

\[ L_L = \frac{12.46 \times S \times P \times M}{T} = \frac{12.46 \times 1.45 \times 6.2 \times 66}{530} = 13.95 \text{ lbs VOC/Mgal} \]

Equation 1 yields the VOC emissions as follows:

\[ E_1 = 120 \text{ Mgals} \times \frac{13.95 \text{ lbs VOC}}{\text{Mgal}} = 1,674 \text{ lbs VOC} \]
### Open Criteria Emission Information - Other Processes

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>VOC - Volatile Organic Compounds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emission Factor (EF)</td>
<td>13.9500 lbs/M gal</td>
</tr>
<tr>
<td>Overall Control Efficiency</td>
<td>0.00000</td>
</tr>
<tr>
<td>Emission Factor Comment</td>
<td>Splash Loaded with No Controls</td>
</tr>
<tr>
<td>Emission Factor Data Source</td>
<td>AP-42</td>
</tr>
<tr>
<td>Emissions</td>
<td>1,674.00 lbs</td>
</tr>
</tbody>
</table>

Click here to delete this Emission.

### Open Toxic (TAC/ODC) Emission Information - Other Processes

<table>
<thead>
<tr>
<th>TAC/ODC Toxic Pollutants / Ozone Depleting Compounds</th>
<th>2 - Benzene</th>
</tr>
</thead>
<tbody>
<tr>
<td>TAC Group</td>
<td>71432 - Benzene</td>
</tr>
<tr>
<td>CAS # (Pollutant)</td>
<td>1.39500e-1 lbs/M gal</td>
</tr>
<tr>
<td>Emission Factor (EF)</td>
<td>Controlled EF value</td>
</tr>
<tr>
<td>Overall Control Efficiency</td>
<td>(mark checkbox if EF listed represents EF determined after control)</td>
</tr>
<tr>
<td>Emission Factor Comment</td>
<td>Benzene is 1% of Total VOC Emissions</td>
</tr>
<tr>
<td>Emission Factor Data Source</td>
<td>Back-calculation</td>
</tr>
<tr>
<td>Emissions</td>
<td>1.674e+1 lbs</td>
</tr>
</tbody>
</table>

Click here to delete this Emission.
CASE 2 - OPERATIONS EQUIPPED WITH VAPOR COLLECTION AND RECOVERY SYSTEMS

Company ABC operates a loading terminal with vapor balance service with submerged bottom filling technology into tanker trucks that have passed the MACT level leak test. The vapor vent line is connected to a refrigeration unit that recovers 95% of the vapor and returns it back as liquid to storage tank. ABC transferred 1,000,000 gallons of RVP 10 gasoline over the year at the following conditions:

- \( S = 1.0 \) (Saturation Factor from AP-42)
- \( T = 70^\circ F = 530^\circ R \) (Temperature of Gasoline)
- \( P = 6.2 \) psia (True Vapor Pressure)
- \( M = 66 \text{ lb/lb-mole} \) (Vapor Molecular Weight)
- \( Eff_{VR} = 0.95 \) (Vapor Recovery Efficiency)
- \( Eff_{VC} = 0.992 \) (Vapor Collection Efficiency)

\[
L_L = \frac{12.46 \times S \times P \times M}{T} = \frac{12.46 \times 1 \times 6.2 \times 66}{530} = 9.62 \text{ lb VOC/Mgal}
\]

Equation 3 yields the VOC emissions as follows:

\[
E_2 = 1,000 \text{ Mgals} \times 9.62 \frac{\text{lbs VOC}}{\text{Mgal}} \times (1 - 0.95 \times 0.992) = 554 \text{ lbs VOC}
\]
### Edit Throughput Information - Other Processes

<table>
<thead>
<tr>
<th>AER Device ID</th>
<th>Permit Device ID</th>
<th>A/N</th>
<th>Process ID</th>
<th>Rule #</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>ES37</td>
<td></td>
<td>P1</td>
<td>462</td>
<td></td>
<td>Petroleum: Bulk Plants and Marine Terminals: Loading - Tank Trucks: Gasoline</td>
</tr>
</tbody>
</table>

#### Annual Throughput

- **120.0 M gal**

#### Annual Throughput

- **1000** M gal

#### Throughput Type

- **Input**

#### Throughput Comment

- None

### Open Criteria Emission Information - Other Processes

<table>
<thead>
<tr>
<th>AER Device ID</th>
<th>Permit Device ID</th>
<th>A/N</th>
<th>Process ID</th>
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<th>Activity</th>
</tr>
</thead>
<tbody>
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<td>ES37</td>
<td></td>
<td>P1</td>
<td>462</td>
<td></td>
<td>Petroleum: Bulk Plants and Marine Terminals: Loading - Tank Trucks: Gasoline</td>
</tr>
</tbody>
</table>

#### Annual Throughput

- **1 000.0 M gal**

#### Pollutant

- **VOC - Volatile Organic Compounds**

#### Emission Factor (EF)

- **9.6200** lbs/M gal

#### Overall Control Efficiency

- **0.94240**

#### Emission Factor Comment

- Vapor Collection System 99.2% Effective and Vapor Recovery System is 95% Effective

#### Emission Factor Data Source

- **AP-42**

#### Emissions

- **554.11 lbs**

Click here to delete this Emission.
CASE 3 - OPERATIONS EQUIPPED WITH A VAPOR BALANCE AND DESTRUCTION SYSTEM

Over the year, company RST operates a loading terminal with submerged bottom filling 125,000,000 gallons of gasoline RVP 10 into tanker trucks that have passed the MACT level leak test at the same conditions as Case 2. The vapor vent line is connected to a system of vapor balance and then to an afterburner (thermal oxidizer -TO). The system of vapor balance achieves an overall efficiency of 49%. The oxidizer operates at 99.4% destruction efficiency.

\[
L_L = 9.62 \text{ lb } VOC/Mgal \text{ (see Case 2 studies for loading loss factor calculation)}
\]

\[
Q = 125,000 \text{ Mgals}
\]

\[
Eff_{VC} = 0.992 \text{ (Vapor Collection Efficiency)}
\]

\[
Eff_{VB} = 0.49 \text{ (Vapor Balance Efficiency)}
\]

\[
Eff_{VD} = 0.994 \text{ (Vapor Destruction Efficiency)}
\]

Equation 4 yields the VOC emissions as follows:

\[
E_3 = 125,000 \text{ Mgals} \times \frac{9.62 \text{ lb } VOC}{Mgal} \times \left[1 - 0.992 \times (0.49 + 0.994 - (0.49 \times 0.994))\right] = 13,276 \text{ lbs } VOC
\]
COMBUSTION EMISSIONS FROM THERMAL OXIDIZER (TO)

All thermal oxidizers used at bulk loading facilities are required to have a CARB Certification Test. In some cases, NOx, SOx, CO, and PM emission rates are tested and determined in terms of lbs of pollutant/Mgal material loaded. AQMD encourages operator to use the test results in calculating and reporting emissions.

In this example, other contaminants were not tested for the TO. Emissions for other air contaminants are calculated using the best available default factors published in AER Program Help & Support.

Throughput for the TO is determined using Equation 5 as follows for gasoline RVP 10 with liquid density of 5.6 lbs/gallon:

\[
TO_{\text{Throug}hput} = \frac{125,000 \times 9.62 \times 0.992}{1,000 \times 5.6} \times (1 - 0.49) = 108.64 \text{ Mgals of gasoline}
\]

*Formulas and calculations should be verified with appropriate documents and guidelines.*

---

Bulk Loading Guidelines – November 2017

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### Edit Throughput Information - Other Processes

<table>
<thead>
<tr>
<th>AER Device ID</th>
<th>Permit Device ID</th>
<th>A/N</th>
<th>Process ID</th>
<th>Rule #</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>ES37</td>
<td></td>
<td>P1</td>
<td></td>
<td>462</td>
<td>Petroleum : Bulk Plants and Marine Terminals : Loading - Tank Trucks : Gasoline</td>
</tr>
</tbody>
</table>

**Annual Throughput**

1,000,000 M gal

**Throughput Type**

- [ ] Input

**Throughput Comment**

### Open Criteria Emission Information - Other Processes

<table>
<thead>
<tr>
<th>AER Device ID</th>
<th>Permit Device ID</th>
<th>A/N</th>
<th>Process ID</th>
<th>Rule #</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>ES37</td>
<td></td>
<td>P1</td>
<td></td>
<td>462</td>
<td>Petroleum : Bulk Plants and Marine Terminals : Loading - Tank Trucks : Gasoline</td>
</tr>
</tbody>
</table>

**Annual Throughput**

125,000,000 M gal

**Pollutant**

VOC - Volatile Organic Compounds

**Emission Factor (EF)**

<table>
<thead>
<tr>
<th>EF Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.6200</td>
<td>9.6200 lbs/M gal</td>
</tr>
</tbody>
</table>

**Overall Control Efficiency**

0.98896

**Emission Factor Comment**

Vapor Collection is 99.2% Effective, Vapor Balance Efficiency is 49.0%, and the Destruction Efficiency is 99.4%

**Emission Factor Data Source**

Source Test

**Emissions**

13,275.60 lbs

Click here to delete this Emission.
Report Criteria and toxic compounds using default factors as below:
### Criteria Emissions (lbs)

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>EF</th>
<th>Unit</th>
<th>EF Data Source</th>
<th>Overall CE</th>
<th>Emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open VOC</td>
<td>7.00</td>
<td>lbs / mm/scf</td>
<td>AQMD default</td>
<td></td>
<td>29.40</td>
</tr>
<tr>
<td>Open NOx</td>
<td>130.00</td>
<td>lbs / mm/scf</td>
<td>AQMD default</td>
<td></td>
<td>546.00</td>
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<tr>
<td>Open SOx</td>
<td>0.60</td>
<td>lbs / mm/scf</td>
<td>AQMD default</td>
<td></td>
<td>2.52</td>
</tr>
<tr>
<td>Open CO</td>
<td>35.00</td>
<td>lbs / mm/scf</td>
<td>AQMD default</td>
<td></td>
<td>147.00</td>
</tr>
<tr>
<td>Open PM</td>
<td>7.50</td>
<td>lbs / mm/scf</td>
<td>AQMD default</td>
<td></td>
<td>31.50</td>
</tr>
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### Toxic (TAC/ODC) Emissions (lbs)

<table>
<thead>
<tr>
<th>TAC/ODC Group</th>
<th>CAS #</th>
<th>EF</th>
<th>Unit</th>
<th>EF Data Source</th>
<th>Overall CE</th>
<th>Emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open Benzene</td>
<td>71432</td>
<td>5.80000e-3</td>
<td>lbs / mm/scf</td>
<td>AQMD default</td>
<td></td>
<td>2.436e-2</td>
</tr>
<tr>
<td>Open Formaldehyde</td>
<td>50000</td>
<td>1.23000e-2</td>
<td>lbs / mm/scf</td>
<td>AQMD default</td>
<td></td>
<td>5.166e-2</td>
</tr>
<tr>
<td>Open PAHs [PAH, POM]</td>
<td>1151</td>
<td>1.00000e-4</td>
<td>lbs / mm/scf</td>
<td>AQMD default</td>
<td></td>
<td>4.200e-4</td>
</tr>
<tr>
<td>Open PAHs [PAH, POM]</td>
<td>91203</td>
<td>3.00000e-4</td>
<td>lbs / mm/scf</td>
<td>AQMD default</td>
<td></td>
<td>1.260e-3</td>
</tr>
<tr>
<td>Open Acetaldehyde</td>
<td>75070</td>
<td>3.10000e-3</td>
<td>lbs / mm/scf</td>
<td>AQMD default</td>
<td></td>
<td>1.302e-2</td>
</tr>
<tr>
<td>Open Acrolein</td>
<td>107028</td>
<td>2.70000e-3</td>
<td>lbs / mm/scf</td>
<td>AQMD default</td>
<td></td>
<td>1.134e-2</td>
</tr>
<tr>
<td>Open Ammonia</td>
<td>7664417</td>
<td>1.80000e+1</td>
<td>lbs / mm/scf</td>
<td>AQMD default</td>
<td></td>
<td>7.560e+1</td>
</tr>
<tr>
<td>Open Ethyl benzene</td>
<td>100414</td>
<td>6.90000e-3</td>
<td>lbs / mm/scf</td>
<td>AQMD default</td>
<td></td>
<td>2.898e-2</td>
</tr>
<tr>
<td>Open Hexane</td>
<td>110543</td>
<td>4.60000e-3</td>
<td>lbs / mm/scf</td>
<td>AQMD default</td>
<td></td>
<td>1.932e-2</td>
</tr>
<tr>
<td>Open Toluene</td>
<td>108883</td>
<td>2.65000e-2</td>
<td>lbs / mm/scf</td>
<td>AQMD default</td>
<td></td>
<td>1.113e-1</td>
</tr>
<tr>
<td>Open Xylenes</td>
<td>1330207</td>
<td>1.97000e-2</td>
<td>lbs / mm/scf</td>
<td>AQMD default</td>
<td></td>
<td>8.274e-2</td>
</tr>
</tbody>
</table>

Add New

---

### Edit Emission Process - External Combustion

<table>
<thead>
<tr>
<th>AER Device ID</th>
<th>Permit Device ID</th>
<th>A.N</th>
<th>Process ID</th>
<th>Rule #</th>
<th>Equipment</th>
<th>Fuel</th>
</tr>
</thead>
<tbody>
<tr>
<td>ES37</td>
<td></td>
<td>P2</td>
<td></td>
<td>480</td>
<td>Other process equipment</td>
<td>Gasoline</td>
</tr>
</tbody>
</table>

**Process ID**

<table>
<thead>
<tr>
<th>NON-PERMITTED</th>
<th>Permit Device Name</th>
<th>Process Name</th>
<th>Loading Rack Afterburner</th>
<th>Emissions from Burning Gasoline Vapor</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ES37</strong></td>
<td><strong>AER Device Name</strong></td>
<td><strong>Process Name</strong></td>
<td><strong>Loading Rack Afterburner</strong></td>
<td><strong>Emissions from Burning Gasoline Vapor</strong></td>
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</table>

**Fuel**

<table>
<thead>
<tr>
<th>Gasoline</th>
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</thead>
</table>

**Rule #**

| 480 |

**Equipment**

| Other process equipment |

Save | Cancel
### Edit Throughput Information - External Combustion

<table>
<thead>
<tr>
<th>AER Device ID</th>
<th>Permit Device ID</th>
<th>AN</th>
<th>Process ID</th>
<th>Rule #</th>
<th>Equipment</th>
<th>Fuel</th>
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<tbody>
<tr>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Annual Throughput</th>
<th>Criteria Toxic Throughput</th>
<th>GHG Throughput</th>
</tr>
</thead>
<tbody>
<tr>
<td>106.64 M gal</td>
<td>106.64 M gal</td>
<td>106,640.0 gal</td>
</tr>
</tbody>
</table>

**Fuel Usage (Annual Throughput)**: 106.64 M gal
**Throughput Type**: Input
**Fuel Usage Comment**: 

### Open Criteria Emission Information - External Combustion

<table>
<thead>
<tr>
<th>AER Device ID</th>
<th>Permit Device ID</th>
<th>AN</th>
<th>Process ID</th>
<th>Rule #</th>
<th>Equipment</th>
<th>Fuel</th>
</tr>
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<tr>
<td>ES37</td>
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<td></td>
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</tbody>
</table>

<table>
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<th>GHG Throughput</th>
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</thead>
<tbody>
<tr>
<td>106.64 M gal</td>
<td>106.64 M gal</td>
<td>106,640.0 gal</td>
</tr>
</tbody>
</table>

**Pollutant**: VOC - Volatile Organic Compounds
**Emission Factor (EF)**: 0.00 lbs/M gal
**Emission Factor Comment**: Emissions Already Included in Process ID P1
**Emission Factor Data Source**: Other
**Emissions**: 0.00 lbs

### Open Criteria Emission Information - External Combustion

<table>
<thead>
<tr>
<th>AER Device ID</th>
<th>Permit Device ID</th>
<th>AN</th>
<th>Process ID</th>
<th>Rule #</th>
<th>Equipment</th>
<th>Fuel</th>
</tr>
</thead>
<tbody>
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<td>ES37</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Annual Throughput</th>
<th>Criteria Toxic Throughput</th>
<th>GHG Throughput</th>
</tr>
</thead>
<tbody>
<tr>
<td>106.64 M gal</td>
<td>106.64 M gal</td>
<td>106,640.0 gal</td>
</tr>
</tbody>
</table>

**Pollutant**: NOx - Nitrogen Oxides
**Emission Factor (EF)**: 22.87 lbs/M gal
**Emission Factor Comment**: RECLAIM
**Emission Factor Data Source**: Source Test
**Emissions**: 2,484.60 lbs
### Open Criteria Emission Information - External Combustion

<table>
<thead>
<tr>
<th>AER Device ID</th>
<th>Permit Device ID</th>
<th>A/N</th>
<th>Process ID</th>
<th>Rule #</th>
<th>Equipment</th>
<th>Fuel</th>
</tr>
</thead>
<tbody>
<tr>
<td>ES37</td>
<td></td>
<td></td>
<td></td>
<td>P2</td>
<td>480</td>
<td>Other process equipment</td>
</tr>
</tbody>
</table>

#### Annual Throughput

<table>
<thead>
<tr>
<th>Throughput used to calculate emissions: 108.64 M gal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pollutant: S\text{O}_x - Sulfur Oxides</td>
</tr>
<tr>
<td>Emission Factor (EF): 0.13 * lbs/M gal</td>
</tr>
<tr>
<td>Emission Factor Comment: S\text{O}_x Proportional to Sulfur Content</td>
</tr>
<tr>
<td>Emission Factor Data Source: Manufacturer Specification</td>
</tr>
<tr>
<td>Emissions: 14.12 lbs</td>
</tr>
</tbody>
</table>

#### Criteria Toxic Throughput

<table>
<thead>
<tr>
<th>Throughput used to calculate emissions: 108.64 M gal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pollutant: S\text{O}_x - Sulfur Oxides</td>
</tr>
<tr>
<td>Emission Factor (EF): 0.13 * lbs/M gal</td>
</tr>
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<tr>
<td>Emission Factor Data Source: Manufacturer Specification</td>
</tr>
<tr>
<td>Emissions: 14.12 lbs</td>
</tr>
</tbody>
</table>

#### GHG Throughput

<table>
<thead>
<tr>
<th>Throughput used to calculate emissions: 108.64 M gal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pollutant: CO - Carbon Monoxide</td>
</tr>
<tr>
<td>Emission Factor (EF): 2.53 * lbs/M gal</td>
</tr>
<tr>
<td>Emission Factor Comment:</td>
</tr>
<tr>
<td>Emission Factor Data Source: Source Test</td>
</tr>
<tr>
<td>Emissions: 274.86 lbs</td>
</tr>
</tbody>
</table>

[Save] [Cancel]
Facilities must report toxic emission as well for this process. If default emission factors are needed, use the following, in pounds/1000 gallons of equivalent gasoline burned.

<table>
<thead>
<tr>
<th>POLLUTANT</th>
<th>CAS NO.</th>
<th>EMISSION FACTOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzene</td>
<td>71432</td>
<td>3.8061</td>
</tr>
<tr>
<td>1,3-Butadiene</td>
<td>106990</td>
<td>0.9183</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>50000</td>
<td>3.4520</td>
</tr>
<tr>
<td>Nickel</td>
<td>7440020</td>
<td>0.0033</td>
</tr>
<tr>
<td>Naphthalene</td>
<td>91203</td>
<td>0.1438</td>
</tr>
</tbody>
</table>

Note that facilities that are subject to AB2588 Quadrennial reporting requirements must report emissions for toxic species listed in Table B-4 of the Supplemental Instructions for AB2588 Facilities – December 2016, and select the default emission factors for Non-catalyst Internal Combustion Engine types.