### Guidelines for Calculating and Reporting Emissions from Bulk Loading Operations May 2015

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)

$$E_1 = Q * L_L \qquad \qquad Eq. 1$$

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.

$$E_2 = E_{uncollected} + E_{stack} = E_{uncollected} + E_{collected} * (1 - Eff_{VR})$$
$$E_2 = Q * L_L * (1 - Eff_{VC}) + Q * L_L * Eff_{VC} * (1 - Eff_{VR})$$

$$E_2 = Q * L_L - Q * L_L * Eff_{VC} * Eff_{VR} \qquad Eq. 2$$

Where,

 $E_2$  = VOC Emission from Loading Losses

 $Eff_{VC}$  = Vapor Collection Efficiency (fraction) as defined in US EPA AP-42, Section 5.2 as follows:

 $Eff_{VC} = 0.992$  for tanker trucks passing MACT-level annual leak test; or

 $Eff_{VC} = 0.987$  for tanker trucks passing the NSPS-level annual leak test; or

 $Eff_{VC} = 0.70$  for tanker trucks not passing either of the above leak tests.

 $Eff_{VR}$  = Vapor Recovery Efficiency (fraction).

Without specific tests, Vapor Recovery Efficiency ( $Eff_{VR}$ ) is assumed to be 0.95 and equation 2 becomes:

$$E_2 = Q * L_L * (1 - 0.95 * Eff_{VC}) \qquad Eq. 3$$

## 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.

$$E_{3} = E_{uncollected} + E_{stack} = E_{uncollected} + E_{collected} * (1 - Eff_{VB}) * (1 - Eff_{VD})$$
$$E_{3} = Q * L_{L} * (1 - Eff_{VC}) + Q * L_{L} * Eff_{VC} * (1 - Eff_{VB}) * (1 - Eff_{VD})$$

$$E_{3} = Q * L_{L} * [1 - Eff_{VC} (Eff_{VB} + Eff_{VD} - (Eff_{VB} * Eff_{VD}))] \qquad Eq. 4$$

Where,

 $E_3$  = VOC Emission from Loading Losses

 $Eff_{VC}$  = Vapor Collection Efficiency (fraction) as defined in US EPA AP-42, Section 5.2

 $Eff_{VB}$  = Vapor Balance Efficiency (fraction)

 $Eff_{VD}$  = Vapor Destruction Efficiency (fraction)

A typical system is operating with Vapor Balance Efficiency (Eff<sub>VB</sub>) of 50% (or 0.50). Without specific tests, Vapor Destruction Efficiency (Eff<sub>VD</sub>) is assumed to be 99% (or 0.99) and equation 4 becomes:

$$E_3 = Q * L_L * (1 - 0.995 * Eff_{VC})$$
 Eq. 5

#### THERMAL OXIDATION

If the operation is equipped with a VOC destruction system by means of thermal oxidation, other contaminants (NOx, SOx, 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).

$$TO_{Throughput} = \frac{E_{collected}}{1,000 * d_l} * (1 - Eff_{VB})$$

$$TO_{Throughput} = \frac{Q * L_L * Eff_{VC}}{1,000 * d_l} * (1 - Eff_{VB}) \qquad Eq. 6$$

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

$$TO_{Throughput} = 0.0005 * Eff_{VC} * \frac{Q * L_L}{d_l} \qquad Eq. 7$$

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:

Bulk Loading Guidelines – May 2015

S = 1.45 (Saturation Factor from AP-42)

 $T = 70^{\circ}F = 530^{\circ}R$  (Temperature of Gasoline)

P = 6.2 psia (True Vapor Pressure)

M = 66 lb/lb-mole (Vapor Molecular Weight)

$$L_{L} = \frac{12.46 \times S \times P \times M}{T} = \frac{12.46 \times 1.45 \times 6.2 \times 66}{530} = 13.95 \ lbs \ VOC/Mgal$$

Equation 1 yields the VOC emissions as follows:

$$E_1 = 120 Mgals * 13.95 \frac{lbs VOC}{Mgal} = 1,674 lbs VOC$$

| Γ | Edit Emission I | Process            | - Other   | Proc                             | esses              |       |      |             |           |           |                      | ×     |
|---|-----------------|--------------------|-----------|----------------------------------|--------------------|-------|------|-------------|-----------|-----------|----------------------|-------|
|   | AER Device ID   | Permit D           | evice ID  | A/N                              | Process ID         | Rule  | #    |             | I         | Activity  |                      |       |
|   | ES37            |                    |           |                                  | P1                 | 462   |      | Petroleum : | Bulk Plai | nts and M | MarineTermi          | inals |
|   | AER Device ID   |                    | ES37      | AEF                              | R Device Name      |       |      |             |           |           |                      |       |
| L | NON-PERMITTE    | D                  |           | Per                              | mit Device ID      |       |      |             |           |           |                      |       |
|   | Process ID      |                    | P1        | Process Name Bulk Splash Loading |                    |       |      |             |           |           |                      |       |
|   | Process Comme   | ent                | Case 1 -  | Simp                             | ole Operation      | no Co | ntro | ol          |           |           |                      |       |
|   | Activity Code * | Operatio           | lants and |                                  | eTerminals<br>Cars |       |      |             |           |           | <ul> <li></li> </ul> |       |
|   |                 | Process<br>Gasolin |           |                                  |                    |       |      |             |           |           | •                    |       |
|   | Rule #          | 462                |           | <b>•</b>                         | * Add Rule         |       |      |             |           |           |                      |       |
|   |                 |                    |           |                                  |                    |       |      |             |           | Save      | Canc                 | el    |

| Edit Throughpu    | t Information - Othe | r Proc  | esses      |        | ×   |  |  |  |  |  |  |
|-------------------|----------------------|---------|------------|--------|---|--|--|--|--|--|--|
| AER Device ID     | Permit Device ID     | A/N     | Process ID | Rule # | Activity                                    |  |  |  |  |  |  |
| ES37              |                      |         | P1         | 462    | Petroleum : Bulk Plants and MarineTerminals |  |  |  |  |  |  |
| Annual Throughput |                      |         |            |        |   |  |  |  |  |  |  |
|                   |                      |         | 120.0      | M gal  |   |  |  |  |  |  |  |
| Annual Throughp   | ut 120               | ).0     | -          | * M ga | al 💌 *                                      |  |  |  |  |  |  |
| Throughput Type   | Ing                  | out 🔄 💌 | *          |        |   |  |  |  |  |  |  |
| Throughput Com    | ment                 |         |            |        |   |  |  |  |  |  |  |
|                   |                      |         |            |        | Save Cancel                                 |  |  |  |  |  |  |

| Open Criteria Emission Info  | rmation - Othe                 | r Processes   |           | ×   |  |  |  |  |  |  |  |
|--|--------------------------------|---------------|-----------|---|--|--|--|--|--|--|--|
| AER Device ID Permit Dev   | vice ID A/N                    | Process ID    | Rule #    | Activity                                    |  |  |  |  |  |  |  |
| ES37   |                                | P1            | 462       | Petroleum : Bulk Plants and MarineTerminals |  |  |  |  |  |  |  |
|  |                                | Annual Thr    | oughput   |   |  |  |  |  |  |  |  |
| 120.0 M gal  |                                |               |           |   |  |  |  |  |  |  |  |
| Pollutant  | VOC - Volatile                 | Organic Compo | ounds     |   |  |  |  |  |  |  |  |
| Emission Factor (EF)   | 13.9500                        | *             | lbs/M gal |   |  |  |  |  |  |  |  |
| Controlled EF value<br>(mark checkbox if EF listed represents EF determined after control) |                                |               |           |   |  |  |  |  |  |  |  |
| Overall Control Efficiency   | 0.00000                        |               |           |   |  |  |  |  |  |  |  |
| Emission Factor Comment  | Splash Loaded with No Controls |               |           |   |  |  |  |  |  |  |  |
| Emission Factor Data Source  | AP-42                          |               |           | *   |  |  |  |  |  |  |  |
| Emissions  | 1,674.00 lbs                   |               |           |   |  |  |  |  |  |  |  |
| Click here to <u>delete</u> this Emission  |                                |               |           |   |  |  |  |  |  |  |  |
|  |                                |               |           | Save Cancel                                 |  |  |  |  |  |  |  |

| Open Toxic (TAC/ODC) Emi       | ssion Information - Other I                        | Processes         |   | × |  |  |  |
|--------------------------------|--|-------------------|---|---|--|--|--|
| AER Device ID Permit De        |  |                   | Activity                                    |   |  |  |  |
| ES37                           | P1<br>Annual                                       | 462<br>Throughput | Petroleum : Bulk Plants and MarineTerminals |   |  |  |  |
|                                |  | .0 M gal          |   |   |  |  |  |
| TAC/ODC Toxic Pollutants / Ozo | one Depleting Compounds                            |                   |   |   |  |  |  |
| TAC Group                      | 2 - Benzene  |                   |   |   |  |  |  |
| CAS # (Pollutant)              | 71432 - Benzene                                    |                   |   |   |  |  |  |
| Emission Factor (EF)           | 1.39500e-1   | * lbs/M gal       |   |   |  |  |  |
|                                | Controlled EF value<br>(mark checkbox if EF listed | represents EF     | F determined after control)                 |   |  |  |  |
| Overall Control Efficiency     |  |                   |   |   |  |  |  |
| Emission Factor Comment        | Bezene is 1% of Total VOC Emissions                |                   |   |   |  |  |  |
| Emission Factor Data Source    | Back-calculation                                   |                   | *   |   |  |  |  |
| Emissions                      | 1.674e+1 lbs                                       |                   |   |   |  |  |  |
|                                |  |                   | Click here to <u>delete</u> this Emission.  |   |  |  |  |
|                                |  |                   | Save Cancel                                 |   |  |  |  |

## 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°R (Temperature of Gasoline)
- P = 6.2 psia (True Vapor Pressure)

M = 66 lb/lb-mole (Vapor Molecular Weight)

 $Eff_{VR} = 0.95$  (Vapor Recovery Efficiency)

 $Eff_{VC} = 0.992$  (Vapor Collection Efficiency)

$$L_{L} = \frac{12.46 \times S \times P \times M}{T} = \frac{12.46 \times 1 \times 6.2 \times 66}{530} = 9.62 \ lb \ VOC/Mgal$$

Equation 3 yields the VOC emissions as follows:

$$E_2 = 1,000 Mgals * 9.62 \frac{lbs VOC}{Mgal} * (1 - 0.95 * 0.992) = 554 lbs VOC$$

| Edit Emission      | Process                                     | - Othe                     | er Process             | es        |  | × |
|--------------------|---|----------------------------|------------------------|-----------|--|---|
| AER Device<br>ID D | Permit<br>Device ID                         | A/N                        | Process<br>ID          | Rule<br># | Activity   |   |
| ES37               |   |                            | P1                     | 462       | Petroleum : Bulk Plants and MarineTerminals : Loading - Tank Trucks : Gasoline |   |
| AER Device ID      | AER Device ID                               |                            | AER De                 | vice Nan  | ne   |   |
| NON-PERMITT        | NON-PERMITTED<br>Process ID                 |                            | Permit [               | Device ID |  |   |
| Process ID         |   |                            | Process                | Name      | Bulk Loading   |   |
| Process Comm       | nent  | Case 2                     | 2 - Vapor C            | ollectio  | n and Recovery Systems   |   |
| Activity Code *    | Petrole<br>Industry:<br>Bulk Pl<br>Operatio | lants an<br>on:<br>g - Tan | d MarineTe<br>k Trucks | erminals  | ▼<br>▼<br>▼  |   |
| Rule #             | 462   |                            | ▼ * Ac                 | ld Rule   |  |   |
|                    |   |                            |                        |           | Save Cancel  |   |

|   | Edit Throug      | hput Informatio     | n - O | ther Proces   | sses      |   | × |
|---|------------------|---------------------|-------|---------------|-----------|---|---|
|   | AER Device<br>ID | Permit Device<br>ID | A/N   | Process<br>ID | Rule<br># | Activity  |   |
|   | ES37             |                     |       | P1            | 462       | Petroleum : Bulk Plants and MarineTerminals : Loading - Tank Trucks :<br>Gasoline |   |
|   |                  |                     |       |               | Ann       | ual Throughput  |   |
| 1 |                  |                     |       |               |           | 120.0 M gal   |   |
| 9 | Annual Thro      | ughput              |       | 1000          |           | * M gal • *   |   |
|   | Throughput       | Туре                |       | Input 💌       | *         |   |   |
| ł | Throughput       | Comment             |       |               |           |   |   |
| ł |                  |                     |       |               |           |   |   |
|   |                  |                     |       |               |           | Save Cancel   |   |

| - (                                     | Open Criter                                | ia Emission Info    | ormati | ion - Other                  | Proces    | ses   | × |  |  |  |  |
|---|--|---------------------|--------|------------------------------|-----------|---|---|--|--|--|--|
| A                                       | ER Device<br>ID                            | Permit Device<br>ID | A/N    | Process<br>ID                | Rule<br># | Activity  |   |  |  |  |  |
|   | ES37                                       |                     |        | P1                           | 462       | Petroleum : Bulk Plants and MarineTerminals : Loading - Tank Trucks :<br>Gasoline |   |  |  |  |  |
|   |  |                     |        |                              | Ann       | ual Throughput  |   |  |  |  |  |
|   |  |                     |        |                              |           | 1,000.0 M gal   |   |  |  |  |  |
|   | Pollutant VOC - Volatile Organic Compounds |                     |        |                              |           |   |   |  |  |  |  |
| Emission Factor (EF) 9.6200 * Ibs/M gal |  |                     |        |                              |           |   |   |  |  |  |  |
|   |  |                     |        | Controlled E<br>(mark checkb |           | isted represents EF determined after control)                                     |   |  |  |  |  |
|   | Overall Cont                               | rol Efficiency      | 0.94   | 1240                         |           |   |   |  |  |  |  |
|   | Emission Fa                                | ctor Comment        |        | or Collection                | n Syster  | m 99.2% Effective and Vapor Recovery System is                                    |   |  |  |  |  |
|   | Emission Fa                                | ctor Data Source    | AP     | -42                          |           | *   |   |  |  |  |  |
|   | Emissions                                  |                     | 554.   | 11 lbs                       |           |   |   |  |  |  |  |
|   | Click here to <u>delete</u> this Emission. |                     |        |                              |           |   |   |  |  |  |  |
|   |  |                     |        |                              |           | Save Cancel   |   |  |  |  |  |

| Open Toxic   | (TAC/ODC) Em          | ission | Informatio    | on - Oth  | er Processes   | ×  |  |  |  |
|--|-----------------------|--------|---------------|-----------|--|----|--|--|--|
| AER Device<br>ID   | Permit Device<br>ID   | A/N    | Process<br>ID | Rule<br># | Activity   |    |  |  |  |
| ES37   |                       |        | P1            | 462       | Petroleum : Bulk Plants and MarineTerminals : Loading - Tank Trucks : Gasoline |    |  |  |  |
|  |                       |        |               |           | ual Throughput   |    |  |  |  |
|  |                       |        |               |           | 1,000.0 M gal  |    |  |  |  |
| TAC/ODC T  | oxic Pollutants / Ozo | one De | pleting Comp  | ounds     |  |    |  |  |  |
| TAC Group  |                       | 2 - E  | Benzene       |           |  |    |  |  |  |
| CAS # (Pollutant) 71432 - Benzene  |                       |        |               |           |  |    |  |  |  |
| Emission Factor (EF) 5.54000e-3 * Ibs/M gal  |                       |        |               |           |  |    |  |  |  |
| Controlled EF value<br>(mark checkbox if EF listed represents EF determined after control) |                       |        |               |           |  |    |  |  |  |
| Overall Cont   | rol Efficiency        |        |               |           |  |    |  |  |  |
| Emission Fa  | ctor Comment          | Bez    | ene is 1% o   | f Total \ | /OC Emissions  |    |  |  |  |
| Emission Fa  | ctor Data Source      | Bac    | k-calculatio  | n         | *  |    |  |  |  |
| Emissions  |                       | 5.54   | 0e+0 lbs      |           |  |    |  |  |  |
|  |                       |        |               |           | Click here to <u>delete</u> this Emission                                      | I_ |  |  |  |
|  |                       |        |               |           | Save Cancel  |    |  |  |  |

# 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 *lb VOC/Mgal* (see Case 2 studies for loading loss factor calculation)

Q = 125,000 Mgals

 $Eff_{VC} = 0.992$  (Vapor Collection Efficiency)

 $Eff_{VB} = 0.49$  (Vapor Balance Efficiency)

 $Eff_{VD} = 0.994$  (Vapor Destruction Efficiency)

Equation 4 yields the VOC emissions as follows:

 $E_{3} = 125,000 Mgals * 9.62 \frac{lbs VOC}{Mgal} * [1 - 0.992 * (0.49 + 0.994 - (0.49 * 0.994))] = 13,276 lbs VOC$ 

### 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:

 $TO_{Throughput} = \frac{125,000 * 9.62 * 0.992}{1,000 * 5.6} * (1 - 0.49) = 108.64 Mgals of gasoline$ 

| Edit Emiss       | ion Pr                  | ocess -        | Othe                       | r Process     | es        |   | × |  |  |  |  |
|------------------|-------------------------|----------------|----------------------------|---------------|-----------|---|---|--|--|--|--|
| AER Device<br>ID |                         | rmit<br>ice ID | A/N                        | Process<br>ID | Rule<br># | Activity  |   |  |  |  |  |
| ES37             |                         |                |                            | P1            | 462       | Petroleum : Bulk Plants and MarineTerminals : Loading -<br>Tank Trucks : Gasoline |   |  |  |  |  |
| AER Devic        | e ID                    | E              | S37                        | AER De        | vice Nan  | ne  |   |  |  |  |  |
| NON-PERM         | NITTED                  |                |                            | Permit [      | Device ID |   |   |  |  |  |  |
| Process ID       | )                       | F              | P1                         | Process       | Name      | Bulk Loading  |   |  |  |  |  |
| Process Co       | omment                  | C              | Case 3                     | 3 - Vapor B   | alance    | and Destruction System  |   |  |  |  |  |
| Activity Co      | Activity Code * Sector: |                |                            |               |           |   |   |  |  |  |  |
|                  | Petrole                 |                |                            | etroleum 🗨    |           |   |   |  |  |  |  |
|                  |                         | dustry:        |                            |               |           |   |   |  |  |  |  |
|                  |                         |                | Plants and MarineTerminals |               |           |   |   |  |  |  |  |
|                  |                         | peration       |                            |               |           |   |   |  |  |  |  |
|                  |                         | -              | ading - Tank Trucks        |               |           |   |   |  |  |  |  |
|                  |                         | rocess:        |                            |               |           |   |   |  |  |  |  |
|                  | 0                       | Gasoline       | )                          |               |           | <b>_</b>  |   |  |  |  |  |
| Rule #           | 4                       | 62             |                            | ▼ * Ac        | ld Rule   |   |   |  |  |  |  |
|                  |                         |                |                            |               |           |   |   |  |  |  |  |
|                  | Save Cancel             |                |                            |               |           |   |   |  |  |  |  |
|                  |                         |                |                            |               |           |   |   |  |  |  |  |

|   | Edit Throug      | hput Informatio     | n - O | ther Proce    | sses      |  | × |
|---|------------------|---------------------|-------|---------------|-----------|--|---|
| - | AER Device<br>ID | Permit Device<br>ID | A/N   | Process<br>ID | Rule<br># | Activity   |   |
|   | ES37             |                     |       | P1            | 462       | Petroleum : Bulk Plants and MarineTerminals : Loading - Tank Trucks : Gasoline |   |
|   |                  |                     |       |               | Ann       | ual Throughput   |   |
| 1 |                  |                     |       |               |           | 1,000.0 M gal  |   |
| ę | Annual Thro      | ughput              |       | 125000        |           | * M gal <b>*</b>   |   |
| ł | Throughput       | Туре                |       | Input 💌       | *         |  |   |
|   | Throughput       | Comment             |       |               |           |  |   |
|   |                  |                     |       |               |           | Save Cancel  |   |

| Open Criter                                | ia Emission Info                           | ormati  | ion - Other   | Proces    | sses ×  |  |  |  |  |  |  |  |
|--|--|---|---------------|-----------|---|--|--|--|--|--|--|--|
| AER Device<br>ID                           | Permit Device<br>ID                        | A/N   | Process<br>ID | Rule<br># | Activity  |  |  |  |  |  |  |  |
| ES37                                       |  |   | P1            | 462       | Petroleum : Bulk Plants and MarineTerminals : Loading - Tank Trucks :<br>Gasoline |  |  |  |  |  |  |  |
|  |  |   |               | Ann       | ual Throughput  |  |  |  |  |  |  |  |
|  |  |   |               | 15        | 25,000.0 M gal  |  |  |  |  |  |  |  |
| Pollutant VOC - Volatile Organic Compounds |  |   |               |           |   |  |  |  |  |  |  |  |
| Emission Factor (EF) 9.6200 * Ibs/M gal    |  |   |               |           |   |  |  |  |  |  |  |  |
|  |  | isted represents EF determined after control) |               |           |   |  |  |  |  |  |  |  |
| Overall Cont                               | rol Efficiency                             | 0.98  | 896           |           |   |  |  |  |  |  |  |  |
| Emission Fa                                | ctor Comment                               |   |               |           | 2% Effective, Vapor Balance Efficiency is 49.0%, iciciency is 99.4%               |  |  |  |  |  |  |  |
| Emission Fa                                | ctor Data Source                           | Sou   | irce Test     |           | *   |  |  |  |  |  |  |  |
| Emissions                                  |  | 13,2  | 75.60 lbs     |           |   |  |  |  |  |  |  |  |
|  | Click here to <u>delete</u> this Emission. |   |               |           |   |  |  |  |  |  |  |  |
|  |  |   |               |           | Save Cancel   |  |  |  |  |  |  |  |

| Open Criteria Emission     | information - E     | xternal                                     | Compustion        |        |                         | >        |  |  |  |  |  |
|----------------------------|---------------------|---|-------------------|--------|-------------------------|----------|--|--|--|--|--|
| AER Device ID Pe           | rmit Device ID      | A/N   | Process ID        | Rule # | Equipment               | Fuel     |  |  |  |  |  |
| ES37                       |                     |   | P2                | 480    | Other process equipment | Gasoline |  |  |  |  |  |
| Annual Throughpu           | ut                  |   | Criteria/Toxic Th |        | GHG Throug              |          |  |  |  |  |  |
| 108.64 M gal               |                     |   | 108.64 M g        | jal    | 108,640.0               | gal      |  |  |  |  |  |
| Throughput used to calcula | ate emissions: 108. | 64M gal                                     |                   |        |                         |          |  |  |  |  |  |
| Pollutant                  | VOC - Vola          | OC - Volatile Organic Compounds             |                   |        |                         |          |  |  |  |  |  |
| Emission Factor (EF)       | 0.00                | 0.00 * Ibs/M gal                            |                   |        |                         |          |  |  |  |  |  |
| Emission Factor Comment    | Emissions           | Emissions Already Included in Process ID P1 |                   |        |                         |          |  |  |  |  |  |
|                            |                     | V   |                   |        |                         |          |  |  |  |  |  |
| Emission Factor Data Sour  | ce Other            | Other *                                     |                   |        |                         |          |  |  |  |  |  |
| Emissions                  | 0.00 lbs            |   |                   |        |                         |          |  |  |  |  |  |
|                            |                     |   |                   |        |                         |          |  |  |  |  |  |
|                            |                     |   |                   |        | Save                    | Cancel   |  |  |  |  |  |
|                            |                     |   |                   |        |                         |          |  |  |  |  |  |

| ( | Open Toxic      | (TAC/ODC) Emi         | issior | n Informatio                 | n - Oth   | er Processes  | × |
|---|-----------------|-----------------------|--------|------------------------------|-----------|---|---|
| Þ | ER Device<br>ID | Permit Device<br>ID   | A/N    | Process<br>ID                | Rule<br># | Activity  |   |
|   | ES37            |                       |        | P1                           | 462       | Petroleum : Bulk Plants and MarineTerminals : Loading - Tank Trucks :<br>Gasoline |   |
|   |                 |                       |        |                              |           | ual Throughput  |   |
|   |                 |                       |        |                              | 12        | 25,000.0 M gal  | _ |
|   | TAC/ODC T       | oxic Pollutants / Ozo | one De | pleting Comp                 | ounds     |   |   |
|   | TAC Group       |                       | 2 - E  | Benzene                      |           |   |   |
|   | CAS # (Pollu    | itant)                | 714    | 32 - Benzen                  | е         |   |   |
|   | Emission Fa     | ctor (EF)             | 1.06   | 6200e-3                      |           | * lbs/M gal   |   |
|   |                 |                       |        | Controlled E<br>(mark checkb |           | sted represents EF determined after control)                                      |   |
|   | Overall Cont    | trol Efficiency       |        |                              |           |   |   |
|   | Emission Fa     | ctor Comment          | Bez    | ene is 1% o                  | f Total \ | /OC Emissions   |   |
|   | Emission Fa     | ctor Data Source      | Bad    | ck-calculatio                | n         | *   |   |
|   | Emissions       |                       | 1.32   | 8e+2 lbs                     |           |   |   |
|   |                 |                       |        |                              |           | Click here to delete this Emission.   |   |
|   |                 |                       |        |                              |           | Save Cancel   |   |

| Edit Emission Proce | ess - Extern | al Com | bustion    |      |         |                      |      | ×           |
|---------------------|--------------|--------|------------|------|---------|----------------------|------|-------------|
| AER Device ID Perm  | it Device ID | A/N P  | rocess ID  | Rule | #       | Equipment            |      | Fuel        |
| ES39                |              |        | P1         | 480  | Afte    | rburner 10-100 MMBTU | J/HR | Natural Gas |
| AER Device ID       | ES39         | AER D  | evice Name |      |         |                      |      |             |
| NON-PERMITTED       |              | Permit | Device ID  |      |         |                      |      |             |
| Process ID          | P1           | Proces | ss Name    |      | Loading | g Rack Afterburner   |      |             |
| Process Comment     |              |        |            |      |         |                      |      |             |
| Fuel Natura         | Gas          | •      | *          |      |         |                      |      |             |
| Rule # 480          |              | * Add  | Rule       |      |         |                      |      |             |
| Equipment Afterbu   | irner 10-100 | MMBTU  | J/HR       |      |         |                      |      | ·           |
|                     |              |        |            |      |         |                      |      |             |
|                     |              |        |            |      |         | Save                 |      | Cancel      |

| Edit Throughpu                                       | t Information - Exte | rnal Co | mbustion         |             |             |                 | ×           |
|--|----------------------|---------|------------------|-------------|-------------|-----------------|-------------|
| AER Device ID  | Permit Device ID     | A/N     | Process ID       | Rule #      | Ec          | quipment        | Fuel        |
| ES39   |                      |         | P1               | 480         | Afterburner | 10-100 MMBTU/HR | Natural Gas |
| Annual Th  | nroughput            |         | Criteria/To:     | xic Through | nput        | GHG Thro        | ughput      |
| Fuel Usage (Ann<br>Throughput Type<br>Fuel Usage Com |                      |         | l.2<br>Input ▼ * |             | * mmscf     | *               |             |
|  |                      |         |                  |             |             | Save            | Cancel      |

Report Criteria and toxic compounds using default factors as below:

#### Criteria Emissions (lbs)

|             | Pollutant | EF     | Unit        | EF Data Source | Overall CE | Emissions |
|-------------|-----------|--------|-------------|----------------|------------|-----------|
| <u>Open</u> | VOC       | 7.00   | lbs / mmscf | AQMD default   |            | 29.40     |
| <u>Open</u> | NOx       | 130.00 | lbs / mmscf | AQMD default   |            | 546.00    |
| <u>Open</u> | SOx       | 0.60   | lbs / mmscf | AQMD default   |            | 2.52      |
| <u>Open</u> | CO        | 35.00  | lbs / mmscf | AQMD default   |            | 147.00    |
| <u>Open</u> | PM        | 7.50   | lbs / mmscf | AQMD default   |            | 31.50     |

#### Toxic (TAC/ODC) Emissions (lbs)

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

| F | Edit Emissio | n Process | - Externa   | l Comb         | oustion         |          |                    |        | ×        |
|---|--------------|-----------|-------------|----------------|-----------------|----------|--------------------|--------|----------|
| Å | ER Device I  | D Permi   | t Device ID | A/N            | Process ID      | Rule #   | Equipment          |        | Fuel     |
|   | ES37         |           |             |                | P2              | 480      | Other process equ  | ipment | Gasoline |
|   | AER Device   | ID        | ES37        | AER De         | evice Name      |          |                    |        |          |
|   | NON-PERMIT   | TTED      |             | Permit         | Device ID       |          |                    |        |          |
|   | Process ID   |           | P2          | Proces         | s Name          | Loadin   | g Rack Afterburner |        |          |
|   | Process Con  | nment     | Emissions   | from E         | Burning Gasolir | ne Vapor |                    |        |          |
|   | Fuel         | Gasoline  |             | *              |                 |          |                    |        |          |
|   | Rule #       | 480       | •           | * <u>Add I</u> | Rule            |          |                    |        |          |
|   | Equipment    | Other pro | cess equip  | ment           |                 |          |                    | -      |          |
|   |              |           |             |                |                 |          |                    |        |          |
|   |              |           |             |                |                 |          | Save               | e C    | ancel    |

| E | Edit Throughput                      | Information - Externa | l Comb       | ustion            |          |                         | ×        |
|---|--------------------------------------|-----------------------|--------------|-------------------|----------|-------------------------|----------|
|   | AER Device ID                        | Permit Device ID      | A/N          | Process ID        | Rule #   | Equipment               | Fuel     |
|   | ES37                                 |                       |              | P2                | 480      | Other process equipment | Gasoline |
|   | Annual Thr                           | oughput               |              | Criteria/Toxic Th | roughput | GHG Throug              | hput     |
|   | 108.64 1                             | Vi gal                |              | 108.64 M g        | jal      | 108,640.0 g             | gal      |
|   | Fuel Usage (Annua<br>Throughput Type | ll Throughput)        | 108.<br>Inpu | 64<br>.t 💌 *      | * M      | I gal 💌 *               |          |
|   | Fuel Usage Comme                     | ent                   |              |                   |          |                         |          |
|   |                                      |                       |              |                   |          | Save                    | Cancel   |

| AER Device ID         | Permit I    | Device ID        | A/N      | Process ID        | Rule #     | Equipment               | Fue      |  |  |
|-----------------------|-------------|------------------|----------|-------------------|------------|-------------------------|----------|--|--|
| ES37                  |             |                  |          | P2                | 480        | Other process equipment | Gasoline |  |  |
| Annual Throu          | ghput       |                  |          | Criteria/Toxic Th | roughput   | GHG Throug              | Jhput    |  |  |
| 108.64 M g            | jal         |                  |          | 108.64 M g        | jal        | 108,640.0               | gal      |  |  |
| Throughput used to ca | alculate en | nissions: 108.6  | 64M gal  |                   |            |                         |          |  |  |
| Pollutant             |             | VOC - Vola       | tile Org | anic Compounds    | 6          |                         |          |  |  |
| Emission Factor (EF)  |             | 0.00 * lbs/M gal |          |                   |            |                         |          |  |  |
| Emission Factor Comr  | nent        | Emissions        | Already  | Included in Pro   | cess ID P1 | <u>^</u>                |          |  |  |
|                       |             |                  |          |                   |            |                         | 1        |  |  |
| Emission Factor Data  | Source      | Other            |          |                   |            |                         | *        |  |  |
| Emissions             |             | 0.00 lbs         |          |                   |            |                         |          |  |  |
|                       |             |                  |          |                   |            |                         |          |  |  |

|                       | -           |                 |         |                   |          | _         |                 | _        |
|-----------------------|-------------|-----------------|---------|-------------------|----------|-----------|-----------------|----------|
| AER Device ID         | Permit      | Device ID       | A/N     | Process ID        | Rule #   | Eq        | uipment         | Fuel     |
| ES37                  |             |                 |         | P2                | 480      | Other pro | ocess equipment | Gasoline |
| Annual Throu          | ghput       |                 |         | Criteria/Toxic Th | roughput |           | GHG Throug      | Jhput    |
| 108.64 M g            | jal         |                 |         | 108.64 M g        | jal      |           | 108,640.0       | gal      |
| Throughput used to ca | alculate er | nissions: 108.6 | 64M gal |                   |          |           |                 |          |
| Pollutant             |             | NOx - Nitrog    | gen Oxi | ides              |          |           |                 |          |
| Emission Factor (EF)  |             | 22.87           |         | * Ibs/N           | l gal    |           |                 |          |
|                       |             | RECLA           | IM      |                   |          |           |                 | _        |
| Emission Factor Comr  | nent        |                 |         |                   |          |           |                 |          |
|                       |             |                 |         |                   |          |           | -               | ·        |
| Emission Factor Data  | Source      | Source Te       | st      |                   |          |           |                 | *        |
| Emissions             |             | 2,484.60 lbs    | 5       |                   |          |           |                 |          |
|                       |             |                 |         |                   |          |           |                 |          |
|                       |             |                 |         |                   |          |           | Save            | Cancel   |

| AER Device ID Permi            | t Device ID     | A/N         | Process ID        | Rule #   | Equipment               | Fue        |
|--------------------------------|-----------------|-------------|-------------------|----------|-------------------------|------------|
| ES37                           |                 |             | P2                | 480      | Other process equipment | Gasoline   |
| Annual Throughput              |                 |             | Criteria/Toxic Th | roughput | GHG Throug              | Jhput      |
| 108.64 M gal                   |                 |             | 108.64 M (        | gal      | 108,640.0               | gal        |
| Throughput used to calculate e | emissions: 108. | 64M gal     |                   |          |                         |            |
| Pollutant                      | SOx - Sulfu     | ur Oxides   | 3                 |          |                         |            |
| Emission Factor (EF)           | 0.13            |             | * lbs/N           | 1 gal    |                         |            |
| Emission Factor Comment        | SOx Propo       | ortional to | Sulfur Content    | t        |                         |            |
|                                |                 |             |                   |          |                         | <b>↓</b> ★ |
| Emission Factor Data Source    | Manufactu       | irer Spe    | cification        |          |                         | <b>▼</b>   |
| Emissions                      | 14.12 lbs       |             |                   |          |                         |            |
|                                |                 |             |                   |          |                         |            |

| Open Criteria Emission Info     | rmation - Ext    | ternal  | Combustion         |        |                         | 3        |
|---------------------------------|------------------|---------|--------------------|--------|-------------------------|----------|
| AER Device ID Permit            | Device ID        | A/N     | Process ID         | Rule # | Equipment               | Fuel     |
| ES37                            |                  |         | P2                 | 480    | Other process equipment | Gasoline |
| Annual Throughput               |                  |         | Criteria/Toxic Thi |        | GHG Throug              |          |
| 108.64 M gal                    |                  |         | 108.64 M g         | al     | 108,640.0               | gal      |
| Throughput used to calculate er | nissions: 108.64 | IM gal  |                    |        |                         |          |
| Pollutant                       | SOx - Sulfur     | Oxides  | 5                  |        |                         |          |
| Emission Factor (EF)            | 0.13             |         | * Ibs/M            | gal    |                         |          |
| Emission Factor Comment         | SOx Propora      | ational | to Sulfur Conter   | t      | <u> </u>                | 1        |
|                                 |                  |         |                    |        | ~                       | 1        |
| Emission Factor Data Source     | Manufacture      | er Spe  | cification         |        |                         | *        |
| Emissions                       | 14.12 lbs        |         |                    |        |                         |          |
|                                 |                  |         |                    |        |                         |          |
|                                 |                  |         |                    |        | Save                    | Cancel   |

| AER Device ID Permit           | Device ID       | A/N     | Process ID        | Rule #   | Equipment               | Fue      |
|--------------------------------|-----------------|---------|-------------------|----------|-------------------------|----------|
| ES37                           |                 |         | P2                | 480      | Other process equipment | Gasoline |
| Annual Throughput              |                 |         | Criteria/Toxic Th | roughput | GHG Throug              | ghput    |
| 108.64 M gal                   |                 |         | 108.64 M g        | jal      | 108,640.0               | gal      |
| Throughput used to calculate e | missions: 108.0 | 64M gal |                   |          |                         |          |
| Pollutant                      | CO - Carbo      | on Mono | xide              |          |                         |          |
| Emission Factor (EF)           | 2.53            |         | * lbs/N           | l gal    |                         |          |
| Emission Factor Comment        |                 |         |                   |          |                         |          |
|                                |                 |         |                   |          |                         | -        |
| Emission Factor Data Source    | Source Te       | st      |                   |          |                         | *        |
| Emissions                      | 274.86 lbs      |         |                   |          |                         |          |
|                                |                 |         |                   |          |                         |          |

| AER Device ID                               | Permit       | Device ID  | A/N                       | Process ID | Rule #        | Equipment               | Fue            |  |
|---|--------------|--|---------------------------|------------|---------------|-------------------------|----------------|--|
| ES37  |              |  |                           | P2         | 480           | Other process equipment | Gasoline       |  |
| Annual Throughput                           |              |  | Criteria/Toxic Throughput |            |               | GHG Throu               | GHG Throughput |  |
| 108.64 M gal                                |              | 108.64 M gal   |                           | 108,640.   | 108,640.0 gal |                         |                |  |
| Throughput used to e                        | calculate er | missions: 108.6  | 64M gal                   |            |               |                         |                |  |
| Pollutant                                   |              | PM - Particulate Matter  |                           |            |               |                         |                |  |
| Emission Factor (EF)                        |              | 1.14 * lbs/M gal   |                           |            |               |                         |                |  |
|   |              | Assumed the average point between light fuel (propane) and heavy fuel (diesel), using Appendix A default factors from AP-42) |                           |            |               |                         |                |  |
| Emission Factor Com                         | nment        |  |                           | <b>U</b>   | <u> </u>      |                         | ▲<br>▼         |  |
| Emission Factor Com<br>Emission Factor Data |              |  |                           | <b>U</b>   | <u> </u>      |                         | ×<br>•         |  |
|   |              | (diesel), us   |                           | <b>U</b>   | <u> </u>      |                         | ▲<br>▼<br>▼ *  |  |

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.

| POLLUTANT     | CAS NO. | EMISSION FACTOR |  |
|---------------|---------|-----------------|--|
| Benzene       | 71432   | 3.8061          |  |
| 1,3-Butadiene | 106990  | 0.9183          |  |
| Formaldehyde  | 50000   | 3.4520          |  |
| Nickel        | 7440020 | 0.0033          |  |
| PAHs          | 1151    | 0.1438          |  |

Note that facilities that are subject to AB2588 Quadrennial reporting requirements must report emissions for toxic species listed in Table B-4 in the <u>Supplemental Instructions for AB2588 Facilities</u> – May 2015.