Bay Area Refinery Update

Stationary Source and Climate Impacts Committee Meeting

December 20, 2021

Damian Breen
Sr. Deputy Executive Officer - Operations
dbreen@baaqmd.gov
Overview

- Introduction
- Review of Compliance History
- Summary of Flaring Events
- Public Nuisance Notices of Violation History
- Future Recommendations
# Bay Area Refinery Title V Deviations Filed 2016 - 2021

## Stationary Source and Climate Impacts Committee
December 20, 2021

<table>
<thead>
<tr>
<th>Year</th>
<th>Chevron</th>
<th>MRC (formerly Shell)</th>
<th>Phillips 66</th>
<th>Valero</th>
<th>Marathon (formerly Tesoro)</th>
<th>Annual Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>73</td>
<td>24</td>
<td>27</td>
<td>27</td>
<td>75</td>
<td>226</td>
</tr>
<tr>
<td>2017</td>
<td>62</td>
<td>47</td>
<td>18</td>
<td>30</td>
<td>51</td>
<td>208</td>
</tr>
<tr>
<td>2018</td>
<td>42</td>
<td>25</td>
<td>19</td>
<td>13</td>
<td>38</td>
<td>137</td>
</tr>
<tr>
<td>2019</td>
<td>168</td>
<td>23</td>
<td>24</td>
<td>34</td>
<td>31</td>
<td>280</td>
</tr>
<tr>
<td>2020</td>
<td>219</td>
<td>33</td>
<td>23</td>
<td>18</td>
<td>25</td>
<td>318</td>
</tr>
<tr>
<td>2021</td>
<td>201</td>
<td>14</td>
<td>14</td>
<td>8</td>
<td>13</td>
<td>250</td>
</tr>
<tr>
<td>Total</td>
<td>765</td>
<td>166</td>
<td>125</td>
<td>130</td>
<td>233</td>
<td></td>
</tr>
</tbody>
</table>
Bay Area Refinery
Notices of Violation 2016 - 2021

<table>
<thead>
<tr>
<th>Year</th>
<th>Chevron</th>
<th>MRC (formerly Shell)</th>
<th>Phillips 66</th>
<th>Valero</th>
<th>Marathon (formerly Tesoro)</th>
<th>Annual Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>60</td>
<td>12</td>
<td>26</td>
<td>14</td>
<td>41</td>
<td>153</td>
</tr>
<tr>
<td>2017</td>
<td>37</td>
<td>37</td>
<td>10</td>
<td>42</td>
<td>35</td>
<td>161</td>
</tr>
<tr>
<td>2018</td>
<td>26</td>
<td>15</td>
<td>13</td>
<td>18</td>
<td>30</td>
<td>102</td>
</tr>
<tr>
<td>2019</td>
<td>97</td>
<td>7</td>
<td>17</td>
<td>26</td>
<td>7</td>
<td>154</td>
</tr>
<tr>
<td>2020</td>
<td>64</td>
<td>6</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>80</td>
</tr>
<tr>
<td>2021*</td>
<td>200</td>
<td>12</td>
<td>12</td>
<td>7</td>
<td>12</td>
<td>243</td>
</tr>
<tr>
<td>Total</td>
<td>484</td>
<td>89</td>
<td>80</td>
<td>111</td>
<td>129</td>
<td>*Projected</td>
</tr>
</tbody>
</table>

*Projected
Bay Area Refinery Flaring Events 2016 through 2021

<table>
<thead>
<tr>
<th>Year</th>
<th>Chevron</th>
<th>MRC (formerly Shell)</th>
<th>Phillips 66</th>
<th>Valero</th>
<th>Marathon (formerly Tesoro)</th>
<th>Annual Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>5</td>
<td>7</td>
<td>12</td>
<td>6</td>
<td>4</td>
<td>34</td>
</tr>
<tr>
<td>2017</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>9</td>
<td>7</td>
<td>28</td>
</tr>
<tr>
<td>2018</td>
<td>9</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>5</td>
<td>23</td>
</tr>
<tr>
<td>2019</td>
<td>39</td>
<td>9</td>
<td>10</td>
<td>6</td>
<td>8</td>
<td>72</td>
</tr>
<tr>
<td>2020</td>
<td>11</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>28</td>
</tr>
<tr>
<td>2021</td>
<td>25</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>30</td>
</tr>
<tr>
<td>Total</td>
<td>93</td>
<td>29</td>
<td>33</td>
<td>30</td>
<td>30</td>
<td></td>
</tr>
</tbody>
</table>
Bay Area Refinery Flaring Data


Stationary Source and Climate Impacts Committee
December 20, 2021
Bay Area Refinery Public Nuisance Violations Issued 2016 - 2021

<table>
<thead>
<tr>
<th>Year</th>
<th>Chevron</th>
<th>MRC (formerly Shell)</th>
<th>Phillips 66</th>
<th>Valero</th>
<th>Marathon (formerly Tesoro)</th>
<th>Annual Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>2017</td>
<td>5</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>2018</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2019</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>2020</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>2021</td>
<td>5</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>13</td>
<td>0</td>
<td>2</td>
<td>9</td>
<td>0</td>
<td>23</td>
</tr>
</tbody>
</table>
Future Recommendations

- Consider Legislative Change for Penalties
- Review Effectiveness of Applicable Refinery Regulations
- Propose Changes to the Regulation 12 Rule 12 Refinery Flares
  - Critical review of each flaring event, causal analysis and proposed corrective actions
  - Provide more explicit rule language regarding Flare Minimization Plans
  - Require historic look-back for similar failures that may indicate a systemic root cause, or lack of management review and control. Then propose timeline for corrective measures that will be implemented.
  - Incorporate applicable Federal flare standards into the Air District Rule
Future Recommendations (cont.)

- Consider new program to improve monitoring and measurement during incidents
  - designed together with community members and partner agencies to ensure responsiveness to community objectives
  - adequately resourced for community engagement, planning, building capacity, and implementation
  - coordinated with enforcement actions and efforts to reduce incidents
Discussion
Regulation 8, Rule 18
Background

Stationary Source and Climate Impacts Committee Meeting

December 20, 2021

Nicholas Maiden, P.E.
Manager, Permitting and Refineries Section
nmaiden@baaqmd.gov
Presentation Outcome

• Provide a background on Regulation 8, Rule 18

• Overview of the Heavy Liquids Study

• Discuss Preliminary Study Results and Next Steps
Presentation Outline

- Regulation 8, Rule 18 Background
- Board Resolution
- Settlement Agreement
- Heavy Liquids Study Overview
- Heavy Liquids Study Preliminary Findings
- Next Steps
Requested Action

None – informational presentation
Regulation 8, Rule 18

- Rule limits emissions of total organic compounds from equipment leaks at petroleum refineries, chemical plants, bulk plants, and bulk terminals

- Establishes maximum allowable leak thresholds, repair provisions

- Requires certain component types be routinely monitored for leaks using portable emissions monitoring equipment
• Rule last revised in December 2015

• Prior to the revision, components that handled liquid materials with an initial boiling point greater than 302 degrees Fahrenheit were exempt from monitoring requirements

• Impacted approximately 370,000 components at the five petroleum refineries, required to be monitored either quarterly or annually
Estimated Emissions Reductions

• Baseline emissions estimated using average emission factors developed in 1980 and published by the Environmental Protection Agency and the California Air Pollution Control Officers Association

• Estimated a total emissions reduction of ~1,230 tons per year from equipment leaks at five refineries
Board Resolution Number 2015-12

• Directs staff to examine emission reduction and cost effectiveness issues related to the inclusion in Regulation 8, Rule 18 of requirements for monitoring of components in heavy liquid service

• Report the results of the examination

• Recommend modifying the rule (if appropriate) based on results
Settlement Agreement

• Conduct the heavy liquid component emissions study to assess air emissions that are directly related to refinery components in heavy liquid service

• Requires the Air District to analyze data and other findings of the study, in consultation with Petitioners

• Generate a written report documenting the results of the Heavy Liquids Study
Heavy Liquids Study Purpose

• Evaluate existing total organic compound emissions from equipment leaks from petroleum refinery components handling materials with an initial boiling point greater than 302 degrees Fahrenheit that are not currently monitored*

*Routinely monitored components are expected to have lower emissions as leaks are found and repaired
• Process units and process lines selected from drawings

• Selected components screened using a portable instrument to measure equipment leak concentrations of organic compounds

• Subset of screened components had mass emissions measured through physically enclosing the component and drawing a sample of the leak and sent offsite to a third-party laboratory

• Types: valves, pump seals, pressure relief devices, and connectors
Heavy Liquids Study Overview (Cont.)

• From estimated population:
  • Targeted 10,000 components to be screened
  • Targeted 100 components to be sampled, expanded to 165

• Screening by Air District (1.5 refineries) and refinery personnel with 3rd-party auditors (3.5 refineries)

• Sampling conducted by WSPA contractor with Air District oversight

• Air District reviewed and analyzed all results
### Heavy Liquids Study – Components

<table>
<thead>
<tr>
<th>Component Type</th>
<th>Screened</th>
<th>Sampled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump Seals</td>
<td>734</td>
<td>32</td>
</tr>
<tr>
<td>Connectors</td>
<td>4,710</td>
<td>61</td>
</tr>
<tr>
<td>Valves</td>
<td>5,349</td>
<td>72</td>
</tr>
<tr>
<td>Pressure Relief Devices</td>
<td>30</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>10,823</strong></td>
<td><strong>165</strong></td>
</tr>
</tbody>
</table>

**Temperature:**  
≤ 920° Fahrenheit

**Size:**  
≤ 100 inches

**Pressure:**  
≤ 3,900 pounds per square inch gage

**Location:**  
Ground Level to Top of Column

**Material:**  
Light (Diesel) to Heavy (Asphalt)
Heavy Liquids Study – Screening (cont.)
Heavy Liquids Study – Screening (cont.)
Heavy Liquids Study – Sampling
Heavy Liquids Study – Sampling (cont.)
Heavy Liquids Study – Sampling (cont.)
Heavy Liquids Study – Preliminary Findings

- Emissions lower than previously found
- Leaks can be anywhere, most emissions from small population
- Refineries agreed to monitor heavy liquid vapor components
- Some component categories not included in emissions inventory
- Not enough information for certain component types
Next Steps

• Address any technical comments submitted by the petroleum refineries on draft Heavy Liquids Study report and finalize report

• Evaluate potential emissions reductions

• Estimate cost effectiveness

• Recommend necessary revisions to the rule
Questions or Feedback