Regulations to Track and Mitigate Emissions from Petroleum Refineries

Regulation 12, Rules 15 and 16

Public Workshop
March 2015
The Bay Area Air Quality Management District (Air District)

- Established in 1955
- 100+ cities
- 7 million people
- 5 million vehicles
- Mission: To protect and improve public health, air quality, and the global climate
Resolution 2014-07 directed staff to reduce emissions from refineries -

- Develop Regulation 12, Rule 15 to track refinery emissions
- Develop Regulation 12, Rule 16 to require mitigation of emission increases at refineries
- Develop new rules and amend existing rules to achieve 20% reductions in emissions and associated health risks within five years
Refinery Emission Trends 1980-2015 and Main Causes of Reductions

- **ROG (tpd)**
  - Reg. 8-18: Equipment Leaks
  - Reg. 8-5: Storage Tanks
  - Reg. 12-11: Flare Monitoring
  - Reg. 12-12: Refinery Flares

- **SO₂ (tpd)**
  - Reg. 12-11: Flare Monitoring
  - Reg. 12-12: Refinery Flares
  - Scrubber at Valero per consent decree

- **PM₂.₅ (tpd)**

- **NOₓ (tpd)**
  - Reg. 9-10: NOₓ at Refinery Heaters

Graphs show emission trends and causes of reductions from 1980 to 2015.
Air District Refinery Regulations

REGULATION 1 - GENERAL PROVISIONS
REGULATION 2 - PERMITS
REGULATION 6 - PARTICULATE MATTER AND VISIBLE EMISSIONS
REGULATION 7 - ODOROUS SUBSTANCES
REGULATION 8 - ORGANIC COMPOUNDS:
  Rule 1 - General Provisions
  Rule 2 - Miscellaneous Operations
  Rule 5 - Storage of Organic Liquids
  Rule 6 - Terminals and Bulk Plants
  Rule 8 - Wastewater (Oil-Water) Separators
  Rule 10 - Process Vessel Depressurization
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  Rule 37 - Natural Gas and Crude Oil Production Facilities
  Rule 43 - Surface Coating of Marine Vessels
  Rule 44 - Marine Vessel Loading Terminals
  Rule 46 - Marine Tank Vessel to Marine Tank Vessel Loading
REGULATION 9 - INORGANIC GASEOUS POLLUTANTS:
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  Rule 3 - Nitrogen Oxides from Heat Transfer Operations
  Rule 7 - Nitrogen Oxides And Carbon Monoxide from Industrial, Institutional, and Commercial Boilers, Steam Generators, And Process Heaters
Rule 8 - Nitrogen Oxides And Carbon Monoxide from Stationary Internal Combustion Engines
Rule 10 - Nitrogen oxides And Carbon Monoxide From Boilers, Steam Generators And Process Heaters in Petroleum Refineries

REGULATION 10 - STANDARDS OF PERFORMANCE FOR NEW STATIONARY SOURCES: This Regulation establishes emission and/or performance standards for new plants and other sources by reference to the provisions of Part 60, Chapter 1, Title 40, of the Code of Federal Regulations.

REGULATION 11 - HAZARDOUS POLLUTANTS
  Rule 1 - Lead
  Rule 2 - Asbestos Demolition, Renovation and Manufacturing
  Rule 7 - Benzene
  Rule 10 - Hexavalent Chromium Emissions From Cooling Towers
  Rule 11 - National Emission Standard For Benzene Emissions From Coke By-Product Recovery Plants and Benzene Storage Vessels
  Rule 12 - National Emission Standard For Benzene Emissions From Benzene Transfer Operations and Benzene Waste Operations

REGULATION 12 - MISCELLANEOUS STANDARDS OF PERFORMANCE:
  Rule 11 – Flare Monitoring
  Rule 12 – Flare Control
# Board Actions Requiring Emissions Reductions at Refineries 1992-2013

<table>
<thead>
<tr>
<th>Date</th>
<th>Reg.-Rule</th>
<th>Description</th>
<th>Pollutant</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/92, 1/98, 11/02, 1/04</td>
<td>8-18</td>
<td>Equipment leaks at refineries</td>
<td>ROG</td>
</tr>
<tr>
<td>3/92</td>
<td>8-22, 8-25</td>
<td>Leaks from valves and flanges</td>
<td>ROG</td>
</tr>
<tr>
<td>1/93, 12/99, 10/06</td>
<td>8-5</td>
<td>Storage tanks</td>
<td>ROG</td>
</tr>
<tr>
<td>1/94, 12/10, 10/13</td>
<td>9-10</td>
<td>Boilers, steam generators, process heaters</td>
<td>NO\textsubscript{X}</td>
</tr>
<tr>
<td>12/97, 3/98, 12/05</td>
<td>8-28</td>
<td>Leaks from pressure relief valves</td>
<td>ROG</td>
</tr>
<tr>
<td>6/03</td>
<td>12-11</td>
<td>Refinery flare monitoring</td>
<td>All</td>
</tr>
<tr>
<td>1/04</td>
<td>8-10</td>
<td>Process vessel depressurization</td>
<td>ROG</td>
</tr>
<tr>
<td>9/04</td>
<td>8-8</td>
<td>Refinery wastewater separators</td>
<td>ROG</td>
</tr>
<tr>
<td>7/05, 4/06</td>
<td>12-12</td>
<td>Refinery flares</td>
<td>All</td>
</tr>
<tr>
<td>12/05</td>
<td>8-44</td>
<td>Marine loading operations</td>
<td>ROG</td>
</tr>
<tr>
<td>7/07</td>
<td>9-8</td>
<td>Stationary internal combustion engines</td>
<td>NO\textsubscript{X}, PM</td>
</tr>
<tr>
<td>4/09</td>
<td>8-33, 8-39</td>
<td>Gasoline bulk terminals</td>
<td>ROG</td>
</tr>
<tr>
<td>4/12</td>
<td>8-53</td>
<td>Vacuum trucks</td>
<td>ROG</td>
</tr>
</tbody>
</table>
### Additional Rule Development to Reduce Refinery Emissions

<table>
<thead>
<tr>
<th>Project</th>
<th>Expected Benefits</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tracking and monitoring refinery emissions</td>
<td>Improved protection of public health, identification of control opportunities</td>
<td>Workshops scheduled for March</td>
</tr>
<tr>
<td>Mitigating emissions increases at refineries</td>
<td>Ensure refinery emissions continue to decrease</td>
<td>Workshops scheduled for March</td>
</tr>
<tr>
<td>Reduce SO₂ from coke calcining</td>
<td>Reduce SO₂ emissions</td>
<td>Workshop planned for April or May</td>
</tr>
<tr>
<td>Reduce ammonia from Fluid Catalytic Cracking Units</td>
<td>Reduce ammonia emissions in order to minimize PM formation</td>
<td>Concept paper to be published in April</td>
</tr>
<tr>
<td>Further reduce equipment leaks (pumps, valves, other)</td>
<td>Reduce ROG and toxic emissions</td>
<td>Concept paper to be published in April</td>
</tr>
<tr>
<td>Limit sulfur content of refinery fuel gas</td>
<td>Reduce SO₂ emissions at some refineries</td>
<td>Concept paper to be published in April</td>
</tr>
<tr>
<td>Reduce SO₂ from acid plants associated with refineries</td>
<td>Reduce SO₂ emissions</td>
<td>Concept paper to be published in April</td>
</tr>
<tr>
<td>Cooling tower monitoring and repair</td>
<td>Reduce ROG and toxic emissions due to leaking heat exchangers</td>
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</tr>
</tbody>
</table>

- **SO₂**: Sulfur Dioxide
- **ROG**: Reactive Organic Gases
- **PM**: Particulate Matter
Other Rules Affecting Refineries

- Regulation 2, Rule 5 – New Source Review of Toxic Air Contaminants
- Regulation 6, Rule 1 – General Particulate Matter
- Regulation 9, Rule 9 – Stationary Gas Turbines
Regulatory Approach

• Regulation 12, Rule 15 (12-15) – Petroleum Refining Emissions Tracking Rule

• Regulation 12, Rule 16 (12-16) – Petroleum Refining Emissions Analysis, Thresholds and Mitigation Rule
• **Annual emissions inventories** of all regulated air pollutants based on upgraded methods, including emissions from cargo carriers

• **Petroleum Refinery Emissions Profile (PREP)**; require that on-going inventories include comparisons with PREP

• **Crude oil composition characteristics** with annual emissions inventories (e.g. sulfur, nitrogen content, API gravity, Total Acid Number)

• **Health Risk Assessments (HRA)** with enhanced emissions inventories and revised OEHHA HRA guidelines

• **Enhance fence line monitoring systems and establish community air quality monitoring systems**
Air Monitoring Systems

2 UV Monitors
4 compounds each

2 TDLAS Monitors
1 compound each

1 FTIR Monitor
30 chemical compounds
Goals of 12-16

• Identify emissions increases of criteria pollutants, Toxic Air Contaminants (TAC) and greenhouse gases (GHG) based on PREP
  • Determine cause/source of emissions increases
  • Identify ways to mitigate TAC and criteria pollutants increases
  • Ensure public participation

• This will help ensure that crude oil composition changes do not increase emissions

• This will help identify processes that contribute to emissions increases
Elements of 12-16

- **Causal Analysis** of criteria pollutants, GHG and TACs if trigger levels are exceeded

- **Mitigation plan** to bring criteria pollutants and TACs below trigger levels within two years (plan available for public review)

- **Identification of Control Technology (Audit)** of all sources if reductions not achievable within two years to identify potential to further reduce emissions

- **Updates to mitigation plan** if proposed progress is not made within two year window

- **Health Risk Assessments (HRA)** updates if risk increases above trigger levels
Issues Raised

• Community stakeholders have made comments on Regulation 12-16 regarding the following areas:
  • GHG emissions
  • Permitting moratorium
  • Crude oil throughput
Next Steps

• Hold public workshops for 12-15 and 12-16
  • Benicia, Martinez, Richmond and San Francisco during the week of March 16th
  • San Francisco workshop will be webcast
• Consider comments and make changes to draft rule
• Complete staff report, including responses to comments and analysis of socioeconomic and environmental impacts
• Present 12-15 and 12-16 to Board for consideration and potential adoption in the 2nd quarter of 2015
Refinery Overview
Air District

Refinery Regulations

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Fugitive Emissions:

- 100 parts per million leak standard
- First regulation to control Greenhouse Gases (methane)
- South Coast AQMD and EPA at 500 ppm
- Collaboration between Communities, Environmental Groups and Industry

Other Regulation Examples

- Tanks, Marine Loading and Flares
Air District Compliance & Enforcement Efforts - 2014

- Compliance Verification Inspections
  • 12,132

- Complaint Investigations
  • 5448

- Violations
  • 648

- Incident Investigations
  • 404

- Compliance Audits & Refinery Program Review
  • Tank Degas Audit
  • Regulation 8-18 Audit
  • Marine Terminals Audit
Questions/Comments

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