Public Workshop

Revised Draft Regulation for Greenhouse Gas Emission Standards for Crude Oil and Natural Gas Facilities

California Air Resources Board
Sacramento, California

February 4, 2016
Agenda

- Background
- Gas Storage Facilities Update
- Revised Draft Regulation
- Emissions, Reductions, and Costs
- Next Steps
Background
• This draft regulation addresses fugitive and vented emissions from new and existing oil and gas facilities.

• ARB working with air districts to develop control strategies and to craft ways to implement and enforce the new standards.

• ARB also working with US EPA, industry, environmental groups, and other stakeholders to quantify emissions and evaluate different control strategies.
Background

- **August 2014 workshop**
  - Background and kick off

- **December 2014 workshop**
  - Source category proposals
  - Standardized Regulatory Impact Assessment (SRIA)
  - Environmental Analysis (EA)

- **April 2015 workshops (Sacramento & Bakersfield)**
  - Draft regulatory language
Gas Storage Facilities Update

- Aliso Canyon leak

- DOGGR emergency regulations
  - ARB working with DOGGR on evaluating monitoring plans

- This regulation will address early detection and emission reductions for future large leaks
Revised Draft
Regulation
Overview

- Staff received 13 feedback letters in response to the April 22, 2015 draft regulation.

- Staff has also been working with the local air districts on the requirements and on the implementation and enforcement provisions.

- Feedback submitted is reflected in this revised draft regulation.
• Separator and Tank Systems
• Flash Analysis Testing
• Vapor Collection Systems & Vapor Control Devices
• Circulation Tanks for Well Stimulation Treatments
• Reciprocating Compressors
• Centrifugal Compressors
• Pneumatic Devices and Pumps
• Liquids Unloading of Gas Wells
• Leak Detection and Repair
• New Requirements for Natural Gas Storage Facilities
• Implementation & Enforcement
Basic Requirements:

• Applies to separators and tank systems without a vapor collection system.

• Requires flash analysis testing to determine annual methane emissions.

• Systems tested above 10 MT CH4/Yr required to add a vapor collection system.
Separator and Tank Systems

Major Revisions:

• Clarified terms to better describe separators, tanks, and sumps subject to the vapor collection system requirements.

• Added exemption for systems already controlled using a vapor collection system or that do not contain oil, condensate, or produced water.
Major Revisions (continued):

• Clarified that separators, tanks, or covered sumps subject to these vapor collection requirements must comply with LDAR requirements.

• Clarified when flash testing is required.
Basic Requirements
• Requires crude oil, condensate, and produced water sampling to determine annual methane emissions.

Major Revisions:
• Clarified the two different sampling methods.
• New proposed quality control/assurance requirements for laboratories.
• New proposed equipment specifications and flash analysis procedure for laboratories.
Basic Requirements:

• Collected vapors required to go to one of the following:
  – Existing sales gas system
  – Existing fuel gas system
  – Existing underground injection well

• Facilities without one of the existing systems are required to install a new vapor control device.
Major Revisions:

• In non-attainment areas, new proposed NOx standard for any vapor control device receiving vapors related to requirements of this regulation
  – Proposed standard allows for the use of a microturbine or a low-NOx incinerator

• Proposal designed to control methane and lower overall NOx emissions while allowing facilities to operate normally.
Basic Requirements:
- Applies to tanks used for well stimulation treatments only.
- Requires tanks to be controlled for vapors.

Major Revisions:
- New proposed LDAR requirements to demonstrate that tanks comply with leak standards.
Basic Requirements:

- Production field units subject to LDAR testing and 1000 ppmv leak standard per US EPA Method 21 test method.

- All other units also subject to LDAR, but must also measure annual flow rate, and are subject to a 2 scfm replacement standard.
Major Revisions:

• Replaced horsepower rating with type of facility where compressor is used:
  – Production facilities
  – Gathering and boosting stations, underground storage facilities, processing plants, transmission compressor stations

• Rod packing/seal testing requirements clarified.

• Clarified that all components are subject to LDAR testing requirements.
Centrifugal Compressors

Basic Requirements:
• Compressors with wet seals required to collect vent gas or install a dry seal system.

Major Revisions:
• New proposed wet seal emissions standard and testing requirements.
• New proposed deadline to replace wet seals with dry seals if emissions are not controlled.
• Clarified that components are subject to LDAR.
Basic Requirements:
• No bleed or no vent devices required for continuous bleed devices, or required to use a vapor collection system.

Major Revisions:
• New proposal to allow for low-bleed devices installed before January 1, 2015.
  – Low-bleed devices must be tagged/identified
• All devices subject to testing requirements.
Basic Requirements:

• Applies to natural gas wells that are vented to remove accumulated liquids.
• Facilities must capture gas or report emissions.

Major Revisions:

• Added option to use ARB Mandatory Reporting calculation method to estimate emissions.
• New requirement to report equipment used to automatically perform liquids unloading.
Basic Requirements:

• Designed to integrate methane components into existing local district LDAR programs.
• Applies to all oil and gas facilities regardless of size or annual throughput:
  – Quarterly testing required
  – US EPA Method 21 test method required
• 1000 ppmv minor leak threshold.
Major Revisions:

- Modified testing frequency and test procedure requirements from:
  - Annual Method 21 testing; or,
  - Quarterly Optical Gas Imaging with Method 21 measurements.

- Clarified that requirements do not apply to components already subject to a local district LDAR program.

- Added new audio-visual inspection requirement.
Major Revisions (continued):

• New proposal to allow facilities that comply with standards to go to annual testing.
• New proposed phase-in standard provides time for facilities to comply with minimum standard.
• Critical component definition and requirements modified.
• Clarified that casing leaks are subject to LDAR.
New Proposed Natural Gas Storage Facility Requirements

• DOGGR emergency regulations require a monitoring plan. Need for permanent requirement for early detection of leaks both at wellhead and surface.

• Coordinating with DOGGR

• Requesting stakeholder feedback
New Leak Emission Reduction Concept

• Require emission reductions if there is a large methane leak at any facility covered by this regulation.

• Options include:
  – Specific emission reduction projects
  – Development of an emission reduction plan
  – Other ideas?

• Requesting feedback
Basic Requirements:

• All equipment subject to the proposed regulation must be registered or permitted to ensure compliance with the regulation.
• Only equipment types now under permit must amend their permits.
• All facilities must register with ARB, unless district permit or registration program collects and shares information with ARB.
• Each facility is subject to enforcement action.
Implementation and Enforcement

Major Revisions:

• Permit section modified to allow facilities and districts to update permits during next renewal cycle.

• Registration section modified to require registration by January 1, 2019.

• New proposed enforcement section that creates separate violation for each metric ton of methane emitted.
Emissions, Reductions, and Costs
## Summary

<table>
<thead>
<tr>
<th>Category</th>
<th>Methane Emission Reductions (MTCO2e, GWP=72)</th>
<th>Cost per Ton with Natural Gas Savings ($/MTCO2e)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Separator &amp; Tank Systems</td>
<td>538,000</td>
<td>$7</td>
</tr>
<tr>
<td>Circulation Tanks</td>
<td>5,000</td>
<td>$34</td>
</tr>
<tr>
<td>Reciprocating Compressors</td>
<td>67,000</td>
<td>($0)</td>
</tr>
<tr>
<td>Centrifugal Compressors</td>
<td>3,000</td>
<td>($2)</td>
</tr>
<tr>
<td>Pneumatic Devices and Pumps</td>
<td>319,000</td>
<td>$0</td>
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<tr>
<td>LDAR</td>
<td>220,000</td>
<td>$37</td>
</tr>
<tr>
<td>Total</td>
<td>1,152,000</td>
<td>$11</td>
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</table>
General Approach

- Used best available data for the source category.
- Costs from ICF’s report (Economic Analysis of Methane Emission Reduction Opportunities in the U.S. Onshore Oil and Natural Gas Industries), EPA, and industry.
- Annual costs include one-time costs annualized over lifetime of equipment and annual recurring costs (O&M, labor, etc.).
- Still finalizing.
Separator and Tank Systems

- Used ARB survey data and ARB and industry flash emission results
- Costs from ICF, EPA Natural Gas Star, and equipment manufacturers
- Vapor recovery added to over 300 uncontrolled tanks over 10 MT CH4/yr at about 20 facilities
- About 10 flares removed and replaced by low-NOx incinerators at about 10 facilities
## Separator and Tank Systems

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methane emissions (MTCO2e, GWP = 72)</td>
<td>566,000</td>
</tr>
<tr>
<td>Methane reductions (MTCO2e, GWP = 72)</td>
<td>538,000</td>
</tr>
<tr>
<td>Total annual costs</td>
<td>$4,674,000</td>
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<tr>
<td>Total annual savings</td>
<td>$653,000</td>
</tr>
<tr>
<td>Cost per Ton ($/MTCO2e reduced)</td>
<td>$9</td>
</tr>
<tr>
<td>Cost per Ton with natural gas savings ($/MTCO2e reduced)</td>
<td>$7</td>
</tr>
</tbody>
</table>
Circulation Tanks

- Used recent industry source testing data for emissions.
- Used DOGGR data for counts
- Used costs from ICF and equipment manufacturer
- Estimated would need eight control systems statewide
<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methane emissions (MTCO2e, GWP = 72)</td>
<td>5,200</td>
</tr>
<tr>
<td>Methane reductions (MTCO2e, GWP = 72)</td>
<td>4,900</td>
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<tr>
<td>Total annual costs</td>
<td>$186,000</td>
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<tr>
<td>Total annual savings</td>
<td>$17,000</td>
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<tr>
<td>Cost per Ton ($/MTCO2e reduced)</td>
<td>$38</td>
</tr>
<tr>
<td>Cost per Ton with natural gas savings ($/MTCO2e reduced)</td>
<td>$34</td>
</tr>
</tbody>
</table>
Reciprocating Compressors

• Used ARB survey data for counts, utility data reported to ARB for emissions, and ICF for costs

• Estimating replacement of about 90 rod packings per year for the over 1,000 cylinders on more than 300 non-production field compressors

• Production field compressors’ component counts added to LDAR
<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methane emissions (MTCO2e, GWP = 72)</td>
<td>426,000</td>
</tr>
<tr>
<td>Methane reductions (MTCO2e, GWP = 72)</td>
<td>67,000</td>
</tr>
<tr>
<td>Total annual costs</td>
<td>$203,000</td>
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<tr>
<td>Total annual savings</td>
<td>$230,000</td>
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<tr>
<td>Cost per Ton ($/MTCO2e reduced)</td>
<td>$3</td>
</tr>
<tr>
<td>Cost per Ton with natural gas savings ($/MTCO2e reduced)</td>
<td>($0)</td>
</tr>
</tbody>
</table>
• Follow up on ARB survey data showed only one remaining centrifugal compressor with wet seals
• Emissions estimated from operator data
• Costs come from ICF report, which matched operator estimates
### Centrifugal Compressors

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methane emissions (MTCO2e, GWP = 72)</td>
<td>3,600</td>
</tr>
<tr>
<td>Methane reductions (MTCO2e, GWP = 72)</td>
<td>3,450</td>
</tr>
<tr>
<td>Total annual costs</td>
<td>$4,000</td>
</tr>
<tr>
<td>Total annual savings</td>
<td>$12,000</td>
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<tr>
<td>Cost per Ton ($/MTCO2e reduced)</td>
<td>$1</td>
</tr>
<tr>
<td>Cost per Ton with natural gas savings ($/MTCO2e reduced)</td>
<td>($2)</td>
</tr>
</tbody>
</table>
Pneumatic Devices and Pumps

- ARB surveys for counts and API and EPA for emission factors
- ICF and Natural Gas Star for costs
- Estimate replacing about 1,300 pneumatic devices and pumps with no bleed
| **Methane emissions** (MTCO2e, GWP = 72) | 319,000 |
| **Methane reductions** (MTCO2e, GWP = 72) | 319,000 |
| **Total annual costs** | $1,153,000 |
| **Total annual savings** | $1,043,000 |
| **Cost per Ton ($/MTCO2e reduced)** | $4 |
| **Cost per Ton with natural gas savings ($/MTCO2e reduced)** | $0 |
Leak Detection and Repair

- Used ARB survey data for counts of components not already being inspected by districts
- Used API component emission factors and “high leaker” emission factors
- Used ICF report for costs and emission reductions, and LDAR contractors for labor hours
## Leak Detection and Repair

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methane emissions (MTCO2e, GWP = 72)</td>
<td>366,000</td>
</tr>
<tr>
<td>Methane reductions (MTCO2e, GWP = 72)</td>
<td>220,000</td>
</tr>
<tr>
<td>Total annual costs</td>
<td>$8,902,000</td>
</tr>
<tr>
<td>Total annual savings</td>
<td>$756,000</td>
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<tr>
<td>Cost per Ton ($/MTCO2e reduced)</td>
<td>$40</td>
</tr>
<tr>
<td>Cost per Ton with natural gas savings ($/MTCO2e reduced)</td>
<td>$37</td>
</tr>
</tbody>
</table>
Next Steps
Next Steps

• Requesting feedback on this revised draft regulation by **February 18, 2016.**

• 45-day comment period with Staff Report and Environmental Analysis begins **April 1, 2016.**

• Board Meeting **May 19, 2016.**

• Second Board Meeting tentatively scheduled for **September 2016.**
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