Hydraulic Fracture Pollution Capture: Oil & Gas Production Air Regulations

Andrew D. Shroads, QEP
Regional Director
P.O. Box 1276 • Westerville, OH 43086
📞 (614) 887-7227 • 📧 ashroads @ scainc.com

While every effort has been made to ensure the accuracy of this information, SC&A is not responsible for any errors or omissions. This information is not a substitute for professional environmental consulting services. If legal services are required, consult with legal counsel.
**Sources of Air Pollution at Well Sites**

*Air pollution* includes fumes, dust, escaping gas, and equipment exhaust from drilling, fracturing, and treating oil and natural gas.
Air Pollution Regulations at Well Sites

- 40 CFR 98 W
  Ohio Air Permit

- 40 CFR 63 HH
- 40 CFR 63 DDDDD
- 40 CFR 63 JJJJJJ

- 40 CFR 60 Kb
- 40 CFR 60 OOOO
- 40 CFR 63 HH

- 40 CFR 60 IIII | 40 CFR 60 JJJJ
- 40 CFR 63 ZZZZ
Matching the Source to the Regulation

40 CFR 60, Subpart Kb
- Storage vessels (tanks) >13,333 barrels

40 CFR 60, Subpart IIII / JJJJ and 40 CFR 63, Subpart ZZZZ:
- Reciprocating internal combustion engines

40 CFR 60, Subpart OOOO
- Pneumatic controllers, hydraulic fracturing, storage vessels

40 CFR 63, Subpart HH
- Glycol dehydrator, some storage vessels

40 CFR 63, Subpart DDDDD and JJJJJJ
- Boilers

40 CFR 98, Subpart W (Greenhouse Gases Only)
- All onshore petroleum and natural gas production operations

Ohio Air Permit
- All installed equipment and flares
Well Drilling – Well Completions

40 CFR 60, Subpart OOOO: Applies to each single natural gas well that is hydraulically fractured after October 15, 2012

- Notify Ohio and U.S. EPA ≥2 days before scheduled well completion, (unless another agency requires more notice)
- Use **GREEN** completion practices through January 1, 2015:
  - Capture and flare flowback emissions
  - Maximize natural gas recovery and minimize air emissions
- On or after January 1, 2015, during flowback:
  - Recovered liquids must be reclaimed or re-injected
  - Recovered gas used on-site, routed to gas line, or re-injected
  - Route saleable gas to the gas line as soon as practicable
  - Flaring last resort
- Submit an annual report to EPA (due by November 14, 2013)
- Maintain required records and well log for 5 years
Well Drilling – Compressors & Generators

40 CFR 63, Subpart ZZZZ: Applicable to all reciprocating internal combustion engines (RICE)

40 CFR 60, Subpart IIII: Applicable to compression ignition (CI) RICE constructed or reconstructed after July 11, 2005

40 CFR 60, Subpart JJJJ: Applicable to all spark ignition (SI) RICE constructed or reconstructed after June 12, 2006

- The RICE regulations are some of the most complicated air regulations ever drafted (multiple releases and revisions)
  - Over 156 different possible compliance combinations
- Buying and installing manufacturer certified RICE is easiest compliance option
- Notifications, reports, and testing based on RICE size and location
Well Drilling – Air Permits

- Air permits required for all sources generating air pollution
- Ohio EPA has a general permit for oil and gas well site production operations (GP12) and unpaved roadways (GP5.1)
- Oil & Gas production general permit includes: (1) glycol dehydration; (2) flares; (3) leaks; (4) RICE; (5) storage vessels
- General permit subject to applicability criteria
  - Area sources for hazardous air pollutants (HAPs), or <10 tpy of any single HAP and <25 tpy for all HAPs
  - Each tank <950 barrels; all tanks <6,000 barrels
  - All natural gas engines total of ≤1,800 horsepower
  - All diesel engines total of ≤250 horsepower
  - Glycol dehy, RICE, and flare certification / testing restrictions
  - Minimum stack height and fence line requirements
Air Permit Considerations

**General Permit**
- Fast: most are issued within 45 days of application receipt
- Generic: limits and values are based on qualifying criteria: modeled values of tanks, compressors, dehy units
- May not include all onsite equipment
- Currently does not include 40 CFR 60, Subpart OOOO
- Modifications to general permit are pending

**Site-specific Permit**
- Slower: goal to issue within 180 days of application receipt
- Specific: limits and values are based on actual equipment intended for the site
- Flexible: not limited to general permit qualifying criteria or restrictions
40 CFR 98, Subpart W: Applicable to all wells under common ownership (name on the drilling permit) that emit a total of ≥25,000 metric tons (MT) of greenhouse gases (GHGs) per year

- All natural gas released through leaks or exhaust
- Stationary or portable fuel combustion equipment and flares
- Annual reports due on March 31 for previous calendar year
- Sites generally avoid this requirement by forming unique limited liability corporations for each well site
- Rented equipment included!!!
Case Study – Wells & Greenhouse Gases

National Gas and Oil Development Corporation (NGO) operates almost 600 wells in east-central Ohio, producing almost 3 million cubic feet per day of natural gas.

- Worked closely with NGO staff to expand their tracking spreadsheets to include necessary information for calculating GHGs, (e.g., added lift method, tanks, bleed vents)
- Merged NGO data into a proprietary SC&A spreadsheet to calculate GHG emissions
  - Added natural gas profile (CH₄ and CO₂ content)
  - Profiled gas/ liquid and oil-only wells separately
  - Estimated contractor diesel fuel consumption

Non-fractured well: ~10 MT CO₂e per completion
Fractured well: ~1000 MT CO₂e per completion (Other company)
### Case Study – GHG Calculations

**The Energy Cooperative | 1500 Granville Road • Newark, OH 43058**

**ADS - 6/14/2012**

#### GHG Emissions from Natural Gas Production (Wells)

<table>
<thead>
<tr>
<th>Calculation</th>
<th>Emissions Source</th>
<th>CO₂</th>
<th>CH₄</th>
<th>N₂O</th>
<th>CO₂e</th>
</tr>
</thead>
<tbody>
<tr>
<td>§98.233(a)</td>
<td>Natural gas pneumatic device venting</td>
<td>0.7</td>
<td>143.8</td>
<td>N/A</td>
<td>3,019.9</td>
</tr>
<tr>
<td>§98.233(c)</td>
<td>Natural gas driven pneumatic pump venting</td>
<td>0.0</td>
<td>0.0</td>
<td>N/A</td>
<td>0.0</td>
</tr>
<tr>
<td>§98.233(f)(1)</td>
<td>Well venting: liquids unloading (Method 1)</td>
<td>0.0</td>
<td>0.0</td>
<td>N/A</td>
<td>0.0</td>
</tr>
<tr>
<td>§98.233(h)</td>
<td>Gas well venting during well completions without hydraulic fracturing</td>
<td>0.0</td>
<td>3.8</td>
<td>N/A</td>
<td>80.7</td>
</tr>
<tr>
<td>§98.233(h)</td>
<td>Gas well venting during well workovers without hydraulic fracturing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>§98.233(g)</td>
<td>Gas well venting during well completions with hydraulic fracturing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>§98.233(g)</td>
<td>Gas well venting during well workovers with hydraulic fracturing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>§98.233(n)</td>
<td>Flare stack emissions</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>§98.233(j)</td>
<td>Storage tanks vented emissions from produced hydrocarbons</td>
<td>121.8</td>
<td>273.7</td>
<td>N/A</td>
<td>5,868.6</td>
</tr>
<tr>
<td>§98.233(p)</td>
<td>Reciprocating compressor rod packing venting</td>
<td>0.4</td>
<td>2.5</td>
<td>N/A</td>
<td>53.9</td>
</tr>
<tr>
<td>§98.233(l)</td>
<td>Well testing venting and flaring</td>
<td>0.0</td>
<td>0.0</td>
<td>N/A</td>
<td>0.0</td>
</tr>
<tr>
<td>§98.233(m)</td>
<td>Associated gas venting and flaring from produced hydrocarbons</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>§98.233(e)</td>
<td>Dehydrator vents</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>§98.233(w)</td>
<td>EOR injection pump blowdown</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>§98.233(d)</td>
<td>Acid gas removal vents</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>§98.233(x)</td>
<td>EOR hydrocarbon liquids dissolved CO₂</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>§98.233(o)(7)</td>
<td>Centrifugal compressor venting (wet seal degassing vents)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>§98.233(r)</td>
<td>Equipment leaks from valves, connectors, open ended lines, pressure relief valves, pumps, flanges, and other equipment leak sources (Gas)</td>
<td>1.6</td>
<td>356.1</td>
<td>N/A</td>
<td>7,480.1</td>
</tr>
<tr>
<td>§98.233(r)</td>
<td>Equipment leaks from valves, connectors, open ended lines, pressure relief valves, pumps, flanges, and other equipment leak sources (Oil)</td>
<td>0.0</td>
<td>0.9</td>
<td>N/A</td>
<td>20.0</td>
</tr>
<tr>
<td>§98.233(z)</td>
<td><strong>Onshore natural gas production combustion emissions from certain portable equipment</strong></td>
<td><strong>2,347.5</strong></td>
<td><strong>0.1</strong></td>
<td><strong>0.0</strong></td>
<td><strong>2,355.4</strong></td>
</tr>
</tbody>
</table>

**Total GHG Emissions:**

2,472.0 781.0 0.0 18,878.6

*Verified against EPA Subpart W Calculation Tool 9/26/12*
In late 1859, blacksmith William Jeffrey drilled the first well in Ohio specifically intended to produce petroleum.

Cygnet, Ohio 1885 ODNR via Toledo Blade