Proposed BMP: Targeting Unit Isolation & Blowdown Valves

2020 EPA Webinar
April 8, 2020
Presented by Emily Nuding
Corporate Overview
NFG: A Diversified, Integrated Natural Gas Company

More than 100 years of Operating History, with Uniquely Integrated Assets Across the Natural Gas Value Chain

- Buffalo, New York headquartered company, incorporated in 1902
- Geographic and operational integration across Western New York and Pennsylvania
- Serving local communities – providing natural gas service to over 750,000 customers in New York and Pennsylvania
- Over 2,000 employees in New York, Pennsylvania, Texas, and California.
Corporate Overview

Upstream

Midstream

Downstream

Exploration & Production

Gathering

Pipeline & Storage

Utility

Energy Marketing

National Fuel Gas Midstream

National Fuel Gas Supply Corporation

Empire Pipeline

National Fuel Resources, Inc.

Deregulated Natural Gas Expertise

www.NFRInc.com
Proposed BMP – Equipment Leaks/Fugitive Emissions for Compressor Isolation and Blowdown Valve Leakage

Overview
## Methane Challenge Commitments – Supply, Empire, & Midstream

<table>
<thead>
<tr>
<th>Committed in 2018</th>
<th>Committed in 2018</th>
<th>Approval Pending</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pneumatic Controllers</strong></td>
<td><strong>Rod Packing</strong></td>
<td><strong>Equipment Leaks/Fugitives</strong>*</td>
</tr>
<tr>
<td>• Supply, Empire, &amp; Midstream</td>
<td>• Supply &amp; Midstream</td>
<td>• Supply</td>
</tr>
<tr>
<td>• Prioritize compressor stations</td>
<td>• Commit to maintenance schedule of 26,000 operating hours</td>
<td>• Commit to measuring leaks from Isolation &amp; Blowdown Valves</td>
</tr>
<tr>
<td>• Conduct inventories and replace high bleed pneumatic devices when practical</td>
<td>• Document results annually as they occur</td>
<td>• Develop a valve maintenance, repair, and replacement program</td>
</tr>
</tbody>
</table>

*Proposed BMP submitted on 3/21/2019
Background Information

- April 2018 Pipeline Research Council International (PRCI) report analyzed Subpart W data from natural gas T&S facilities.
  - Over 10,000 compressor-related measurements were analyzed from 2011 – 2016 GHGRP Subpart W data (14,000 Total - Acoustical Data Filtered Out)
  - Data confirms isolation valves, and, to a lesser extent, blowdown valves are key emissions source when leakage occurs

- EPA’s Annual GHG Inventory data indicates that about 90% of transmission and 80% of storage compressor stations GHG emissions from station leaks are from compressor components
Compressor components include:
- Compressor isolation valves,
- Blowdown valves, &
- Seals
  - Reciprocating compressor rod packing and
  - Centrifugal compressor wet or dry seals

Supply developed and submitted a proposed BMP under the Methane Challenge “Continuous Improvement Process”
- Addresses through-valve leakage from compressor isolation and blowdown valves
- Submitted: March 21, 2019
Schematics – Isolation and Blowdown Valves

- Facility Schematic
  - Suction & Discharge Isolation valves
  - Blowdown valves

- Two Primary Modes of Operation
  - Operating Pressurized Mode
  - Not Operating Depressurized Mode
Mode of Operation – Operating Pressurized Mode

- Isolation valves are **open** and the blowdown valve(s) is **closed** against both high-pressure suction and discharge compressor gas.

- Natural gas may leak to atmosphere via blowdown valve(s).

- Blowdown valve leakage is typically routed to the atmosphere via the blowdown valve vent line.

- Vent lines are considered “Elevated vent sources,” and visualized using optical gas imaging.

- 1” Ports on vent lines allow for leak measurement and quantification.

Potential Leak during Operating Pressurized Mode
Mode of Operation – Not Operating Depressurized Mode

- Isolation valves are **closed** against both high-pressure suction and discharge pipeline gas and the blowdown valve(s) is **open**

- Natural gas may leak to atmosphere via isolation valves

- Isolation valve leakage is typically routed to the atmosphere via the open blowdown valve vent line

- Vent lines are considered “Elevated vent sources,” and visualized using optical gas imaging

- 1” Ports on vent lines allow for leak measurement and quantification
Valve Replacement - Challenges

- Significant Cost - Example: 8” plug valve replacement \( \approx \$50k \)
- Replacement valve purchasing - long lead times \( \approx 6 \text{ months}+ \)
- Station downtime from valve repairs or replacement
- Need improved isolation valve technologies – 2019 PRCI Study
- Gas loss (and emissions) from station blowdowns
- New valves may have through-valve leaks when (re)commissioned
Proposed BMP Addresses

1) Methods to identify and measure through-valve leakage
2) Maintenance and repair practices for isolation and blowdown valves
3) Compressor station design considerations to facilitate improved access to isolation and blowdown valves for maintenance, repair, and replacement
4) Isolation and blowdown valves that are less prone to through-valve leakage
5) Leaking isolation and blowdown valve repair or replacement decision guidelines
Proposed BMP – Key Program Elements

- **Annual valve survey across all T&S compressor stations within 5 years**
  - Prioritize Stations - based on GHGRP data, age, utilization, etc.
  - Additional 20% of facilities incorporated each year
  - After end of 5 year period all stations have annual survey completed each year

- **Build a more detailed valve inventory for all T&S compressor stations**
  - Type, Manufacturer, Size, Model, etc.

- **Develop & Implement enhanced maintenance plan across all T&S compressor stations within 5 years**
  - Specific for Isolation & Blowdown Valves
    - Manufacturer’s recommendations
    - Data-driven “living document”
    - Documentation
Proposed BMP – Key Program Elements

- **Leak rate measurement will utilize Methodologies from Subpart W of the GHGRP**
  - Measurement data will be utilized for program applicability – maintenance, repair or replacement
  - Emission reductions will be based on leak rate *measurements*

- **Valve *repairs* and/or *replacement* will be completed when/where practical, and within 3 years**
  - Operational issues such as the need for system/facility blowdown, scheduled outages for maintenance, parts, availability of repair personnel, etc. will be considered when determining the valve repair or replacement schedule

- **Annual facility-level reporting will include:**
  - Program results, status, and future plans - survey, maintenance, repair, and replacement data
  - 5th year will include a discussion of “lessons learned” regarding leak counts, year-to-year leak changes, repair methods and practices, equipment / valve-specific recommendations, maintenance plan results and costs
NFG Case Study:
Iso Valve Enhanced Maintenance & Replacement
Summary of Measured and Estimated GHG Emissions from Case Study

Compressor Component Venting ≈ 75% of facility CO₂e emissions

2014 COMPRESSOR VENT EMISSIONS

- Rod Packing: 37%
- Isolation Valves: 62%
- Blowdown Valves: 1%

NFG Case Study: Pre 2015 Compressor Components
NFG Case Study: Enhanced Maintenance Program

- Enhanced program started 2015
- Expansion of standard valve maintenance
  - Prepopulated library of valve numbers, location description, size, type, sealant
  - Field operations indicates date, employee number, and % injected (i.e., 15%, 25%, 50%, and 100%)

Reference guide at the bottom of every field form
**Summary of Measured and Estimated GHG Emissions from Case Study**

- **Flares**
- **Leaks**
- **Pneumatics**
- **Slowdowns**
- **Tanks**
- **Compressor Vents**
- **Combustion**

**Enhanced Maintenance Program commenced in 2015**

- **2014 – 2018 Total Compressor Venting**
  
  \[ \approx 54\% \text{ decrease} \]
Replacement of the Suction Isolation Valves on Units 5, 6, & 7 occurred in late 2017 and resulted in further reductions.

In total - 9 Suction Isolation Valves were replaced.

<table>
<thead>
<tr>
<th>Reductions</th>
<th>Unit 5</th>
<th>Unit 6</th>
<th>Unit 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>'14/'15 – '16</td>
<td>74%</td>
<td>67%</td>
<td>55%</td>
</tr>
<tr>
<td>'14/'15 – '17</td>
<td>81%</td>
<td>N/A*</td>
<td>82%</td>
</tr>
<tr>
<td>'14/'15 – '18</td>
<td>95%</td>
<td>97%</td>
<td>90%</td>
</tr>
<tr>
<td>'14/'15 – '19</td>
<td>95%</td>
<td>99%</td>
<td>N/A*</td>
</tr>
</tbody>
</table>

*N/A = no measurement taken

*2019 Values are Projections Only for Remainder of Year
Current Status and Future Plans

- **NFG moving forward …**
  - Completed detailed valve inventory in Spring 2020
  - Developing enhanced valve maintenance program
  - Implementing enhanced valve maintenance program at additional 20% of facilities incorporated each year
  - Replacement of isolation valves at additional facility Fall 2019
    - Currently taking measurements to track progress

- **BMP out for public review and comment**
Thank you!