15th Annual Natural Gas STAR Implementation Workshop

Fugitive Emissions & Detection

By: Larry “Rick” Loveless

November 11-13, 2008
The Westin Riverwalk
San Antonio, Texas
Topics

- Northern Natural Gas Company?
- Greenhouse Gas (GHG) Fugitive Emissions
- Methane Detection and Quantification Technology
- Facility Leakage Audits (FLA)
- EPA STAR Program
- RESPECT
Northern Natural Gas Company?

- 13,000 miles of pipeline
- 60 Compressor Stations
- 1000 employees
- 2000 TBSs
Greenhouse Gas (GHG) Fugitive Emissions Component Mapping

- Component – size – pressure – activity
- Connections (flange, thread, weld, open end pipe)
- Valves (block, control, relief, etc)
- Valves (three different fugitives/ leaks)
- Scrubbers/ Vessels (0.5 inches)
- Compressor cylinders (HE, CE, suction, discharge, test port)
- Fugitive default value
# Greenhouse Gas Inventory Management System

**Region:** Amerillo  
**Team:** Andrews Team  
**Facility:** TX-089 - BROWNFIELD COMPRESSOR  
**Survey:** Initial mapping and survey  
**Unit Description:** Suction Piping - K-B Line Suction Piping

### Item List

<table>
<thead>
<tr>
<th>Seq #</th>
<th>Item Type</th>
<th>Connection Type</th>
<th>ID # 2</th>
<th>Nominal Size</th>
<th>liter/min</th>
<th>Connection liter/min</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select 11</td>
<td>Plug</td>
<td>Threaded</td>
<td>SP</td>
<td>2.00000</td>
<td>0.001</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>Select 12</td>
<td>Welded saddle</td>
<td>Welded</td>
<td>SP</td>
<td>8.00000</td>
<td>0.000</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>Select 13</td>
<td>Valve, block</td>
<td>Flange</td>
<td>BF101, ball valve</td>
<td>8.00000</td>
<td>0.001</td>
<td>0.001</td>
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<tr>
<td>Select 14</td>
<td>Valve, ESD</td>
<td>Flange</td>
<td>SP</td>
<td>8.00000</td>
<td>0.001</td>
<td>0.001</td>
<td>ESD valve, 8 inch Leak = 69.308 lpm</td>
</tr>
<tr>
<td>Select 15</td>
<td>Pipe</td>
<td>Open End Pipe</td>
<td>SP</td>
<td>8.00000</td>
<td>0.001</td>
<td>0.001</td>
<td>Ball valve, open ended pipe, 8 inch 28.510 lpm</td>
</tr>
<tr>
<td>Select 16</td>
<td>Welded saddle</td>
<td>Welded</td>
<td>SP</td>
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<td>0.000</td>
<td>0.000</td>
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<tr>
<td>Select 17</td>
<td>Valve, block</td>
<td>Flange</td>
<td>Ball Valve</td>
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<td>0.001</td>
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<tr>
<td>Select 18</td>
<td>Pipe</td>
<td>Open End Pipe</td>
<td>SP</td>
<td>8.00000</td>
<td>69.000</td>
<td>0.001</td>
<td>East station vent</td>
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<tr>
<td>Select 19</td>
<td>Tee</td>
<td>Welded</td>
<td>T-02</td>
<td>6.00000</td>
<td>0.000</td>
<td>0.000</td>
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<tr>
<td>Select 20</td>
<td>Welded saddle</td>
<td>Welded</td>
<td>SP</td>
<td>20.00000</td>
<td>0.000</td>
<td>0.000</td>
<td></td>
</tr>
</tbody>
</table>

[| Insert | 1 | 2 | 3 | 4 | 5 | 6 |]
# Amarillo

## Andrews Team

### Compressor Station

**TX-089 - BROWNFIELD COMPRESSOR**

**Survey Information**

- **Date:** 7/30/2000
- **Description:** Initial mapping and survey
- **Surveyor:** Rick Loseless
- **Verified By:**
- **Verified Date:**

## Unit Information

- **Pressure:** 600
- **Activity Factor:** 8.760

<table>
<thead>
<tr>
<th>Item Type</th>
<th>Item Count</th>
<th>Item LPM</th>
<th>Conn LPM</th>
<th>Total Item LPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blind</td>
<td>1</td>
<td>0.001</td>
<td>0.001</td>
<td>0.002</td>
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<tr>
<td>Elbow</td>
<td>1</td>
<td>0.000</td>
<td>0.001</td>
<td>0.001</td>
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<tr>
<td>Enhance</td>
<td>1</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
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<tr>
<td>Exit</td>
<td>2</td>
<td>0.000</td>
<td>0.001</td>
<td>0.001</td>
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<tr>
<td>Pipe</td>
<td>22</td>
<td>0.005</td>
<td>0.009</td>
<td>0.014</td>
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<td>Plug</td>
<td>5</td>
<td>0.005</td>
<td>0.005</td>
<td>0.010</td>
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<tr>
<td>Port</td>
<td>10</td>
<td>0.018</td>
<td>0.018</td>
<td>0.036</td>
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<tr>
<td>Reducer Dx</td>
<td>1</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
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<tr>
<td>Tee</td>
<td>3</td>
<td>0.000</td>
<td>0.001</td>
<td>0.002</td>
</tr>
<tr>
<td>Tee (cont) Section</td>
<td>2</td>
<td>0.001</td>
<td>0.002</td>
<td>0.003</td>
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<tr>
<td>Unloader</td>
<td>2</td>
<td>0.002</td>
<td>0.002</td>
<td>0.004</td>
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<tr>
<td>Valve, block</td>
<td>29</td>
<td>0.039</td>
<td>0.027</td>
<td>0.066</td>
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<tr>
<td>Valve, drip</td>
<td>2</td>
<td>0.001</td>
<td>0.002</td>
<td>0.003</td>
</tr>
<tr>
<td>Valve, ESD</td>
<td>1</td>
<td>0.002</td>
<td>0.002</td>
<td>0.004</td>
</tr>
<tr>
<td>Valve, flow control</td>
<td>2</td>
<td>0.002</td>
<td>0.002</td>
<td>0.004</td>
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<tr>
<td>Valve, relief</td>
<td>2</td>
<td>0.002</td>
<td>0.002</td>
<td>0.004</td>
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</table>
Methane Detection and Quantification Technology

★ GasFindIR – infrared camera

★ RMLD (remote methane leak detector)

★ HiFlow Analyzer

★ Aerial Infrared Methane Leak Detection
Scrubber Dump Valve Leak
Repaired Scrubber Dump Valve
RMLD (remote methane leak detector)
Aerial Leak Detection
Airborne Natural Gas Emission LIDAR (ANGEL)
Facility Leakage Audits

**Minneapolis**

**North Branch Pipeline Team**

**MN-079 - NORTH BRANCH COMPRESSOR**

<table>
<thead>
<tr>
<th>Item</th>
<th>LPM</th>
<th>Comm LPM</th>
<th>Activity Factor</th>
<th>Cu. Ft. Day</th>
<th>MCF Year</th>
<th>Repair Date</th>
<th>Repair Notes</th>
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<tr>
<td>20&quot; MNB SP - Valve, Schafer</td>
<td>5.000</td>
<td>0.000</td>
<td>600</td>
<td>254.42</td>
<td>02 882</td>
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<tr>
<td>20&quot; MNB SP - Valve, Schafer</td>
<td>2.500</td>
<td>0.001</td>
<td>600</td>
<td>127.26</td>
<td>16 450</td>
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<tr>
<td>20&quot; MNB SP - Plug</td>
<td>0.020</td>
<td>0.001</td>
<td>600</td>
<td>1.07</td>
<td>0.000</td>
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<tr>
<td>20&quot; MNB SP - Valve, Schafer</td>
<td>2.500</td>
<td>0.001</td>
<td>600</td>
<td>127.26</td>
<td>16 450</td>
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<tr>
<td>Engine #2 - Rod Packing</td>
<td>152.529</td>
<td>0.001</td>
<td>500</td>
<td>7,776.05</td>
<td>2,660.25</td>
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<tr>
<td>Engine #4 - Rod Packing</td>
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<td>0.001</td>
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<td>1,661.03</td>
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<tr>
<td>DF-Engine #1 - Valve, Schafer</td>
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<td>600</td>
<td>152.70</td>
<td>55 736</td>
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<td>DF-Engine #4 - Valve, Schafer</td>
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<td>0.001</td>
<td>500</td>
<td>2.44</td>
<td>0.001</td>
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</tbody>
</table>
EPA STAR Program

★ STAR I – The volume of methane from a Facility Leakage Audit (FLA) that was repaired. Un-repaired leaks go into our “unaccounted for” volumes.

★ STAR II – The volume of methane that was conserved during normal pipeline operations.

★ STAR III – Other methane conservation calculations.
STAR I

★ DI&M
- Dump valves
- Rodpacking
- Valves

★ Pipeline
- Pumpkins
- Patches
- Sleeves
STAR II

- Pressure reductions
- Blocked ESD
- Low bleed
- VRU
- Reroutes
- Electronic ignitions
- Temporary compression
- Dehy mods
STAR III

- Hot taps
- Clock springs/ composite wrap
- Stopples
- Pumpkins
- Patches
- Sleeves
MidAmerican Energy RESPECT Policy

- Respect
- Efficiency
- Stewardship
- Performance
- Evaluation
- Communication
- Training
Today’s Agenda

★ Northern Natural Gas Company?
★ Greenhouse Gas (GHG) Fugitive Emissions
★ Methane Detection and Quantification Technology
★ Facility Leakage Audits
★ EPA STAR Program
★ RESPECT
Question?
Contact Information

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- Please visit www.epa.gov/gasstar