Natural Gas STAR’s 2009 Annual Implementation Workshop

Fugitive Emission Management in the Transmission Sector

Terence Trefiak, P.Eng.

Oct. 20, 2009
<table>
<thead>
<tr>
<th>OVERVIEW</th>
</tr>
</thead>
<tbody>
<tr>
<td>• BACKGROUND</td>
</tr>
<tr>
<td>• DETECTION &amp; MEASUREMENT TECHNOLOGY</td>
</tr>
<tr>
<td>• FUGITIVE EMISSION MANAGEMENT PROGRAM (FEMP) COMPONENTS</td>
</tr>
<tr>
<td>• FEMP CONSIDERATIONS</td>
</tr>
<tr>
<td>• REGULATIONS</td>
</tr>
<tr>
<td>• CASE STUDY DATA</td>
</tr>
</tbody>
</table>

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UNDERSTANDING THE ISSUE

Fugitive Emissions

• intentional
  ▪ intended/designed venting (i.e. venting from tanks, controllers, compressor seals, stacks, etc.)

• unintentional
  ▪ leaks due to normal wear and tear, improper or incomplete assembly of components, inadequate material specification, manufacturing defects, damage during installation or use, corrosion, fouling and environmental effects

• potentially cost industry hundreds of millions to billions of dollars in lost product and can pose safety risks to workers and the public

• account for a significant amount of the total inventory of greenhouse gases emitted by industry
DRIVERS

Improving Health & Safety
- Identify and eliminate hazards (Fire & Explosions and Exposure)
- Reduce LEL (lower explosive limit) levels within facilities

Maximizing Profits
- Recover lost product
- Increase production
- Reduce costs

Reducing Emissions
- Reduce GHG (methane) emissions
- Reduce BTEX and other VOC emissions
- Solve offsite odor problems

Maintaining Regulatory Compliance
- Meet or exceed requirements
- Arm company with new technologies used by regulators
CONVENTIONAL LEAK DETECTION

Gas Sniffer
- US EPA Method 21 using a hydrocarbon detection sensor to obtains ppm, or LEL.
- Ranging from a personal safety monitors to TVA VOC analyzer
- Each connection must be assessed separately

Bubble Test
- Using soap solution on a connection to detect leak

Ultrasonic Testing
- Detects frequency of turbulent flow from leaks
DETECTION TECHNOLOGIES

Primary:
Optical Infrared Detection
ThermaCAM® GasFindIR
- New leading FE technology
- Proven and reliable technology
- Significant increase in ability to find emissions
- Significant decrease in the time/money needed to assess facilities
- IR scanning now approved by EPA as alternative to conventional methods

Secondary:
Gas Detector (EC, PID/FID, IR, etc.)
- Provides ppm level detection of gas leaks
- Building entry, hazardous gas detection, etc.
- Supplementary confirmation of emission type, source, and size
DETECTION TECHNOLOGIES

Auxiliary / Specialized:

• **Laser Methane Gas Detector**
  - Long range & Remote detection
  - High sensitivity for Methane (100-10,000 ppm*m)
  - Ultra fast response
  - Use with mobile survey (pipeline)

• **Ultrasonic Internal Valve Leak Detection**
  - detects through-valve leakage based on ultrasonic frequency
  - Quantitative estimation of leak volume
Primary:
• Hi flow Sampler
  ▪ very high accuracy and efficiency
  ▪ allows an objective cost-benefit analysis
  ▪ always have at least one backup unit

Secondary:
• Vane Anemometer
• Calibrated volume bag
• Flow Meters
Let us help you “see” what you are missing!

What you see...  What we see...

www.targetemission.com
THREADED CONNECTION
0.45 ft³/min.
VALVE STEM
0.65 ft³/min.
DUMP VALVE LEAK (VENT STACK)
OVER 60.0 ft³/min.
HOLE IN BLOCK FLANGE
1.20 ft³/min.
COOLER PIPING LEAK
20.00 ft³/min.
FEMP

Roles and Responsibilities

Communication System

Data Collection Management

QA/QC

COMPREHENSIVE FACILITY ASSESSMENTS

• Baseline selection
• Technology & Resource selection
• Scheduling
• Communication & Follow-up

DIRECTED MONITORING AND PREVENTION

• Priority Monitoring
  • Component Specific
  • Routine
  • Installed
  • Post Modification
• Facility Design & Ops. Standards
COMPREHENSIVE FACILITY ASSESSMENTS

- Facility Baseline Selection (threshold)
- Perform Assessments
- Results Communication
- Set Ongoing Schedule
- Facility & Component Prioritization
- Repair Tracking
**FEMP COMPONENTS**

**FEMP TIMELINE**

- Emission Rates
- Baseline Rate
- Maintenance Rate
- Priority Ratings

**Assessment Cycles**
IMPORTANT CONSIDERATIONS

QA/QC - protocols for procedures, equipment maintenance, data collection and storage, and training

COMMUNICATION – effective reporting system to transfer data to individuals responsible for action

DATA CONSISTENCY - ensure that all source data is captured and consistently recorded

AUDITABILITY – consistent and repeatable results

VERIFIABLE - eligible to apply for GHG credits and/or offsets via independent verification (ISO 14064-1, 2, & 3)

EXPERIENCE – trained (certified), experienced and tested in the use of fugitive equipment and processes

HEALTH & SAFETY – work presents a set of hazards that must be controlled
IMPORTANT CONSIDERATIONS

RESOURCES
• external vs. internal (LODI)
• expertise in emission management
• a good tool is not a program

CORPORATE COMMITMENT
• bottom down approach will help ensure buy-in and follow through of implementation
• the program approach has large impact on success
• Imbed into corporate, facility and individual goal setting

REPAIR TRACKING
• develop a workable tracking system before program implementation
• incorporate existing data management systems
• effective feed-back system for repair tracking
FEMP APPROACHES

BASELINE
• threshold levels vary
• some starting at larger/older facilities only
• some companies doing wide cross section

FREQUENCY
• most companies are following a facility priority system, while other facility plans range from bi-annual to every 3 years

REPAIR TRACKING
• split between existing work order system and external tracking system

RESOURCES
• most companies are using third party, a few have started internal programs
• Operator involvement is low
EPA Proposed Mandatory Greenhouse Gas Reporting Rule (March 10, 2009)  
(http://www.epa.gov/climatechange/emissions/ghgrulemaking.html)

W. Oil and Natural Gas Systems

- facilities with emissions **greater than 25,000** metric tons CO2e per year be subject to reporting (**annual leak assessments**)
- identifies relevant facilities and outlines methods and procedures for calculating and reporting fugitive emissions
- fugitive emissions defined as unintentional equipment emissions and intentional or designed releases of **CH4 and CO2**
- propose that facilities would be required to **detect and then quantify** emissions
- Emission Source, Monitoring Method Type, Emissions Quantification Methods
Proposed Mandatory Greenhouse Gas Reporting Rule (cont.)

- lists advantages/disadvantages of specific technologies (cost-effective detection technologies such as infrared fugitive emissions detection instruments in conjunction with direct measurement methodologies)
- direct measurement using Method 21 was not found suitable for fugitive emissions measurement under this reporting rule
- engineering estimates only used of variable or unsafe to monitor sources
- the mass balance is often not recommended because of the uncertainties surrounding meter readings and the large volumes of throughput relative to fugitive emissions.
- emissions detected and measured would be assumed to continue throughout the reporting year, unless no emissions detection is recorded at an earlier and/or later point in the reporting period.
# CASE STUDY DATA

<table>
<thead>
<tr>
<th>FACILITY TYPE</th>
<th>#</th>
<th>Avg. Cumulative HP</th>
<th>Avg. Assessment Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMPRESSOR STATIONS</td>
<td>100</td>
<td>5000</td>
<td>8 hours (0.65 day)</td>
</tr>
</tbody>
</table>
### CASE STUDY DATA

<table>
<thead>
<tr>
<th>EMISSION TYPE</th>
<th>TOTAL # OF SOURCES</th>
<th>TOTAL ANNUAL RATE (mcf/yr)</th>
<th>TOTAL ANNUAL GAS VALUE ($)</th>
<th>TOTAL NET PRESENT VALUE OF LEAK REPAIRS</th>
<th>ANNUAL CO2E RATE (tonnes/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leaks</td>
<td>1300</td>
<td>180,000</td>
<td>$950,000</td>
<td>$2,200,000</td>
<td>66,000</td>
</tr>
<tr>
<td>Vents</td>
<td>2500</td>
<td>630,000</td>
<td>$3,370,000</td>
<td>$7,350,000</td>
<td>234,000</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>3800</td>
<td>810,000</td>
<td>$4,320,000</td>
<td>$9,550,000</td>
<td>300,000</td>
</tr>
<tr>
<td><strong>AVG/FACILITY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leaks</td>
<td>13</td>
<td>1,800</td>
<td>$9,500</td>
<td>$22,000</td>
<td>660</td>
</tr>
<tr>
<td>Vents</td>
<td>25</td>
<td>6,300</td>
<td>$33,700</td>
<td>$73,500</td>
<td>2,340</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>38</td>
<td>8,100</td>
<td>$43,200</td>
<td>$95,500</td>
<td>3,000</td>
</tr>
<tr>
<td><strong>AVG/DAY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leaks</td>
<td>20</td>
<td>2,800</td>
<td>$14,600</td>
<td>$33,800</td>
<td>1,000</td>
</tr>
<tr>
<td>Vents</td>
<td>38</td>
<td>9,700</td>
<td>$51,800</td>
<td>$113,000</td>
<td>3,600</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>58</td>
<td>12,500</td>
<td>$66,400</td>
<td>$146,800</td>
<td>4,600</td>
</tr>
</tbody>
</table>
STATISTICS

- % Economical Leaks (POP <1.5 years) = 92%
- % Economical Vents (POP <1.5 years) = 70%
- % of emissions that are Safety Concern = 4%
- Top 10% of leaks makes up 73% total volume
- Top 10% of vents makes up 62% total volume
CONTACT INFO
PHONE: (403) 225-8755
EMAIL: target@envirotecheng.com
WEBSITE: www.targetemission.com