Methane to Markets

Reducing Methane Emissions from Underground Natural Gas Storage Operations

Gazprom – EPA Technical Seminar on Methane Emission Mitigation

28 – 30 October, 2008

Methane to Markets

NaturalGas
EPA POLLUTION PREVENTER

Reducing Methane Emissions from Underground Storage: Agenda

- Methane Losses from Underground Storage
  - Fugitive Emissions
  - Vented Emissions
- Methane Emission Mitigation Options
- Discussion

Overview: Methane Emissions from Underground Storage

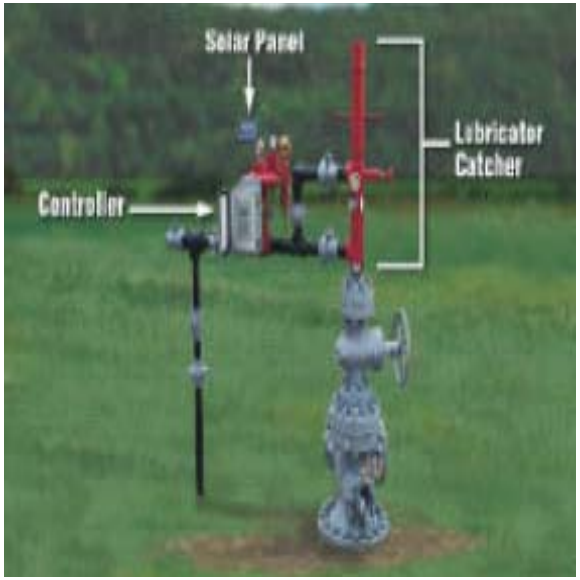
- Based on Natural Gas STAR experience, underground storage is not a major source of methane emissions compared to emissions from natural gas transmission pipelines and compressor stations.
  - Based on Partner experience, the majority of emissions from underground storage facilities are primarily from equipment leaks
- The information presented here is based on analogues and some company experiences

Natural Gas Storage Emissions and Reduction Opportunities

- 70% of methane emissions from U.S. underground natural gas storage operations are estimated to come from fugitives
  - Primarily from compressor related components
  - Few Natural Gas STAR Partners have reported comprehensive emission reduction projects at storage facilities alone
    - Storage facilities are sometimes screened under larger directed inspection and maintenance programs
- Operation of Russian underground storage facilities may favor different emission reduction opportunities than at U.S. facilities
  - Evaluate many opportunities to determine which are most cost-effective at your facility

Methane Emissions from Underground Storage: Fugitives

- Fugitive emissions sources include:
  - Unintentional leaks caused by mechanical and thermal stresses in piping, valves, compressor seals, flanges, fittings, and other components
  - Methane leakage from improperly plugged and abandoned wells (and to a lesser extent from the geologic formation due to over-pressurizing)



Source: Weatherford

Methane Emissions from Underground Storage: Venting

- Natural gas storage facilities have both continuous and intermittent venting sources.
  - Vents from pneumatic devices
  - compressor startup
  - compressor shutdown
  - gas dehydration
  - condensate storage tank venting
  - equipment depressurization

Underground Storage: Opportunities to Reduce Fugitives

- Increase deliveries and recover methane losses by
  - Performing periodic leak inspection and repair work
    - Compressor components and wellhead components
  - Reduce emissions from compressor seals
  - Selecting reservoirs best suited for natural gas storage and ensure proper well construction
  - Operate existing storage wells below fracture pressure; verify proper shutdown and abandonment of old wells

Source: Chevron

Underground Storage: Opportunities to Reduce Venting

- Using work practices and new equipment types to minimize venting
  - Low bleed pneumatic devices
  - Capture gas from offline compressors
- Replace bi-directional orifice meters with ultrasonic meters

Glycol Dehydrator Unit
Source: GasTech

Replace Bi-Directional Orifice Meters with Ultrasonic Flow Meters

- What is the problem?
  - Removing the orifice for inspection requires the meter run to be closed and vented to the atmosphere
- Partner solution
  - Replace orifice meters with ultrasonic meters to reduce methane emissions and operating and maintenance costs
- Methane savings
  - Based on reports from US transmission and storage companies
- Applicability
  - Applies to all flow measurements, but particularly for bi-direction flow metering

Methane Savings

570 m^3/year

Project Economics

Project Cost	> $10,000
Annual O&M Costs	< $100
Payback	1 – 3 years

Source: EPA Natural Gas STAR Partner Reported Opportunity "Replace Bi-Drectional Orifice Meters with Ultrasonic Flow Meters" Fact Sheet

Discussion

- Industry experience applying these technologies and practices
- Limitations on application of these technologies and practices
- Actual costs and benefits