SLIDES: Technologies to Reduce Methane Emissions from Natural Gas Production Activities

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Technologies to Reduce Methane Emissions from Natural Gas Production Activities

epa.gov/gasstar
The Natural Gas STAR Program is a flexible, voluntary partnership between EPA and the oil and natural gas industry designed to cost-effectively reduce methane emissions from natural gas operations.
U.S. Industry Participation

**111 Program Partners:**
- 72% of transmission
  - 28 partners
- 59% of distribution
  - 49 partners
- 52% of production
  - 23 partners
- 75% of processing
  - 11 partners
Methane Emissions from the U.S. Gas Industry

- Production: 95 Bcf (31%)
- Processing: 36 Bcf (12%)
- Distribution: 73 Bcf (24%)
- Transmission & Storage: 98 Bcf (33%)
Program Accomplishments

★ 300 Billion cubic feet in reductions!

Methane Saved in Bcf/Year
Additional Reduction Opportunities

- Production
- Processing
- Transmission & Storage
- Distribution

2002 Emissions
2002 Reductions
Gas Production
Best Management Practices to Reduce Methane Emissions
PNEUMATIC DEVICES
About 35 Billion cubic feet of methane is vented each year from pneumatic devices in the USA, resulting in over $140 million dollars in losses at $3 per mcf.
Pneumatic Devices

- Gas loss can be minimized by retrofitting or replacing high-bleed with low-bleed models or air driven pneumatic systems.

- Cost of implementation varies with design, size, and operating conditions.

- Payback generally less than 1 year.
DEHYDRATORS
Dehydrators

★ 38,000 glycol dehydrator systems in the US natural gas production sector emitting approximately 25 billion cubic feet of methane per year.

★ Many ways to reduce methane emissions from these dehydrator systems.
Dehydrators - flash tanks

★ Installing flash tanks results in up to 90% recovery of methane emissions.

★ Flashed gas can be used to fuel on-site equipment or re-injected into pipeline for sale.

★ Flash tanks have low operating and maintenance costs.

★ Payback generally less than 2 years.
Dehydrators - reduced glycol circulation

- Common practice to set glycol circulation rates higher than is necessary or to neglect calibration as well production decreases. By optimizing the glycol circulation rate, methane emissions are lowered.

- Payback on investment is immediate.
Dehydrators - electric pumps

★ Gas-assisted pumps are the most common circulation pumps. Electric pumps, in contrast, eliminate methane emissions by using electricity as the power source.

★ Payback can be as short as two months.
Dehydrators - desiccant dehydrator

⭐ Installation of a desiccant dehydrator instead of a glycol dehydrator reduces methane emissions.

⭐ Wet gas passes through a drying bed of desiccant tablets. The tablets pull moisture from the gas and gradually dissolve in the process - the unit is fully enclosed, so the gas does not escape.

⭐ Payback is approximately 3 years.
PLUNGER LIFT SYSTEMS
Plunger Lifts

★ Accumulation of liquid hydrocarbons or water in the well bores of gas wells reduces and can halt production.

★ Common practice to temporarily restore production or “dewater a well” is to release significant quantities of methane by venting, or “blowing” the well to the atmosphere.

★ On average, 50 thousand cubic feet to 600 thousand cubic feet per well is emitted each year.
Plunger Lifts

- Plunger lifts automatically expel liquids without blowing the well to the atmosphere.
- Gas wells with properly adjusted plunger lift systems are kept productive without operator attention.
- Approximately 7 billion cubic feet per year of natural gas is saved with plunger lift installations.
VAPOR RECOVERY UNITS
Vapor Recovery Units

★ Methane and other light hydrocarbons often “flash out” of crude oil in storage tanks.

★ Installing vapor recovery units will reduce emissions from tanks by about 95%.
  - Natural gas can be sold or used on site.

★ On average, each unit serves four storage tanks
  - Recovers 5 to 100 million cubic feet / year.

★ Payback can occur in 6 months to 12 years depending on unit and tank battery design.
COMPRESSORS
Compressors -
Rod Packing Systems

★ Compressor rod packing systems contribute more than 9 billion cubic feet of methane emissions annually.

★ New packing systems may lose 60 standard cubic feet/hour; increasing to 900 cubic feet/hour over time as the rod packing ages.

★ Increases life for existing equipment, improves operating efficiencies, and generates long-term savings.

★ Payback occurs in less than 1 year.
Compressors - Replacing Wet Seals

- Centrifugal compressors normally use “wet” seals where high pressure oil forms a barrier against escaping gas.
- Little gas escapes through the barrier but significant gas is absorbed by the oil. Emissions occur when the gas is taken out of the circulating oil.
- Methane emissions from wet seal systems range from 40 to 200 standard cubic feet per minute.
Compressors - Replacing Wet Seals

- Replace an entire compressor with one using dry seals.
- Replace a worn out wet seal with a dry seal.
- Replace a fully functioning wet seal with a dry seal.
- Dry seal systems, which use high pressure gas to seal the compressor, emit less methane - only up to 5 standard cubic feet per minute.
Compressors - Off-line Techniques

★ When compressors are off-line, methane leaks from a number of sources such as rod packing and closed blowdown valves.

★ Depressurization through “blowdowns” also emits large amounts of methane.
Compressors - Off-line Techniques

- Keeping compressors pressurized when they are off-line avoids “blowdowns”.

- Connecting the blowdown vent lines to the fuel gas system allows normally vented gas to be used while the compressor is off-line.

- Installing a static seal on compressor rods can eliminate rod packing leaks during pressurized shut downs.
Other Practices to Reduce Methane Emissions
Production Sector PROs

- Connect Casing to Vapor Recovery Unit
- Consolidate Production and/or Tank Batteries
- Eliminate Unnecessary Equipment and/or Systems
- Install Downhole Separator Pumps
- Install Electric Compressors
- Replace Burst Plates with Secondary Relief Valves
- Install Electronic Flare Ignition Devices
- Lower Heater Treater Temperature
- Convert Water Tank Blanket to Produced CO₂ Gas
- Pipe Glycol Pump to Vapor Recovery Unit
- Reroute Glycol Skimmer Gas
- Install Pressurized Storage of Condensate
- Convert Gas-driven Chemical Pumps
- Convert Pneumatics to Alternative Controllers
- Install Compressors to Capture Casinghead Gas
- Install Velocity Tubing Strings
- Install Flares
- Recycle Line Recovers Gas During Condensate Loading
- Use Ultrasound to Identify Leaks
- Green Completions
- Use Foaming Agents
Workshops

Cost-effective Methods for Reducing Methane Emissions

Natural Gas STAR Production Workshop

June 29
Colorado Springs, CO
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