Methane to Markets

# Efficient Pigging of Gathering Lines

Energy Management Workshop for Upstream and Midstream Operations

January 17, 2007

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# Agenda

- Methane Losses from Pipeline Pigging
- Methane Recovery
- Industry Experience
- Is Recovery Profitable?
- Discussion Topics

# Methane Losses from Pipeline Pigging

- Pipeline pigging contributes to
  - the 4,060 Mcf methane per year vented by an average processing plant
  - the 2,886 Mcf methane per year of fugitive methane emissions at an average processing plant

Mcf = thousand cubic feet

# Pigging Gathering Lines

- Hydrocarbons and water condense inside wet gas gathering lines, causing pressure drop and reducing gas flow
- Periodic line pigging removes liquids and debris to improve gas flow
- Efficient pigging:
  - Keeps pipeline running continuously
  - Keeps pipeline near maximum throughput by removing debris
  - Minimizes product losses during launch/capture

www.girardind.com/

# Pigging Applications

- Pipeline pigs come in a variety of shapes and sizes for different applications
  - Cleaning pigs
    - Have brushes or blades to help remove debris
  - Sealing pigs
    - Make tight seal for removing liquids from the pipe
  - Inspection pigs
    - Specialized pigs outfitted with instruments to monitor the pipeline integrity

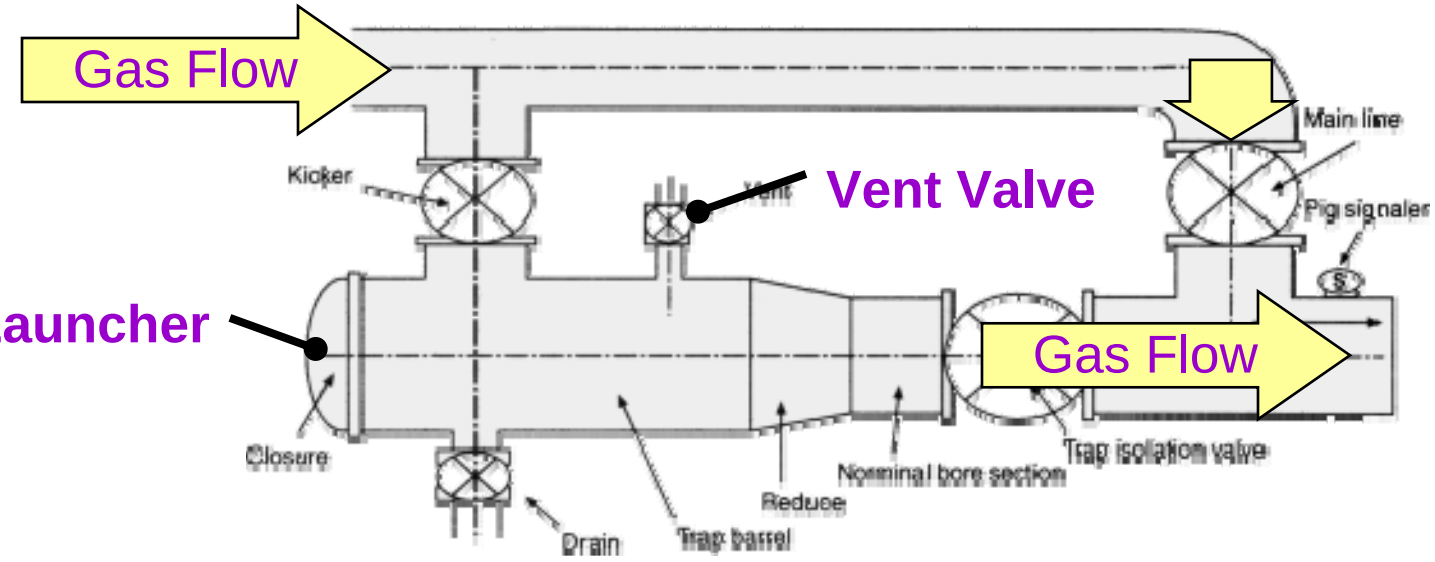
www.westernfilterco.com

# Pigging and Methane Losses

- Gas lost when launching and receiving a pig
- Fugitive emissions from pig launcher/receiver valves
- Gas lost from storage tanks receiving condensate removed by pigging
- Gas vented from pipeline blowdowns

# How Does Pigging Vent Methane?

- Gathering lines have built-in pig launchers
- Pig launchers have isolation valves for loading pigs, pressurizing pigs, and launching pigs with gas bypassed from the pipeline
- Launcher pressuring/depressuring loses methane out the vent valve

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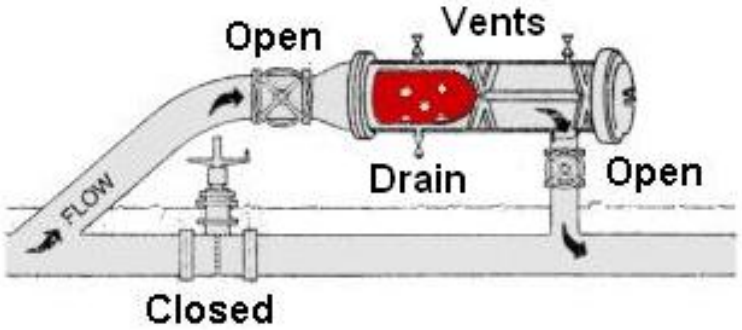
# Pigging Vents Methane Twice!

- Methane lost through vent valve on the launcher and again through vent valve on the receiver
  - Once receiver is isolated from the line, it must be depressured to remove the pig
  - Liquids ahead of the pig drain to a vessel or tank
- Isolation valve leaks cause excessive venting to depressure

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# Estimating Pigging Vents

- E = P * V / 14.7 * n * f

  where:

  E = methane emissions (cf)

  P = Gathering line pressure (psia)

  V = Launcher and receiver volume (cf)

  n = % methane

  f = number of piggings

- Pig trap isolation valve leakage greatly increases this minimum amount of gas venting

cf = cubic feet
psia = pounds per square inch absolute

# Estimating Emissions from Pigging

- Estimating V

| Line Diameter (inches) | V (cf) |
|---|---|
| 6 | 0.9 |
| 12 | 4.6 |
| 18 | 11.5 |
| 26 | 27.7 |
| 34 | 65.2 |
| 48 | 170.7 |

Adapted from www.pigsunlimited.com

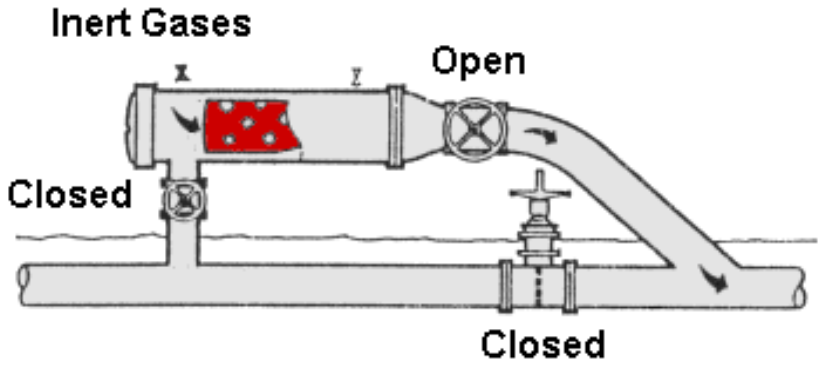
- Estimating P
  - **Default: 315 psia**
- Estimating n
  - **Default: 78.8 % methane**

# Methane Recovery: Use Inert Gases

- Pipeline maintenance requires pipe section blowdown before work can begin
- Gas in pipeline is usually vented to the atmosphere
- Inert gas can be used to drive a pig down the section of pipe to be serviced, displacing the natural gas to a product line rather than venting
- Inert gas is then blown down to the atmosphere, avoiding methane loss

# Inert Gas Setup

- Existing pig launcher can be used, set up to work with inert gases
- Portable nitrogen supply connected to the pig launcher vent
- Close valve on the main pipeline, pressurize launcher with inert gas, open launcher to main pipeline
- Supply nitrogen until pig reaches receiver

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# Industry Experience

- One partner reported using inert gas to purge six pipelines for maintenance
- Gas savings from these applications was 538 Mcf
- These savings correspond to a typical application of:
  - 2 miles of 10 inch diameter pipeline
  - Nitrogen at 280 psia

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# Is Recovery Profitable?

- No capital costs with existing pigging facilities
- Labor costs are estimated at eight hours for two operators
- Nitrogen costs are roughly $8/Mcf
- Increased safety is the primary benefit of this project
- Gas savings are a secondary benefit, as the labor and nitrogen costs outweigh the gas value

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# Discussion Topics

- Identify other opportunities to reduce methane emissions from pigging
- Discuss further information required to identify and evaluate opportunities
- Any barriers to implementing the technologies and practices in this presentation

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