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Reducing Methane Emissions in Pipeline Maintenance and Repair

Oil & Gas Subcommittee Technology Transfer Workshop

January 28, 2009
Monterrey, Mexico

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Pipeline Maintenance and Repair: Agenda

- Methane Losses from Pipeline Maintenance
- Methane Recovery from Hot Taps
- Methane Losses from Major Pipeline Repairs
- Methane Recovery Using Pipeline Pumpdowns

Methane Losses from Current Pipeline Maintenance Practices

- Natural gas is often vented to the atmosphere when performing pipeline repairs and new connections
  - Up to 6,000 thousand cubic feet (Mcf)* natural gas vented when making a new connection or non-leaking repairs
  - Quantity depends on pipe diameter, length between isolation valves and operating pressure
- These practices have typically resulted in methane emissions
  - Loss of sales
  - Service disruption and customer inconvenience
  - Costs of gas-freeing the existing piping system

*Pipelines range from 4 to 18 inches diameter, 3 to 16 km between valves and operating pressure between 100 to 1,000 psig. Assumes 1 thousand cubic feet (Mcf) = 1 MMbtu

Methane Recovery: Hot Taps for New Connections

- Connecting pipelines without service disruption or methane emissions

Certified Williamson Industries Technician performing a hot tap with a 760 Tapping Machine as part of a 12-inches Stopple application.

Source: Williamson Industries Inc.

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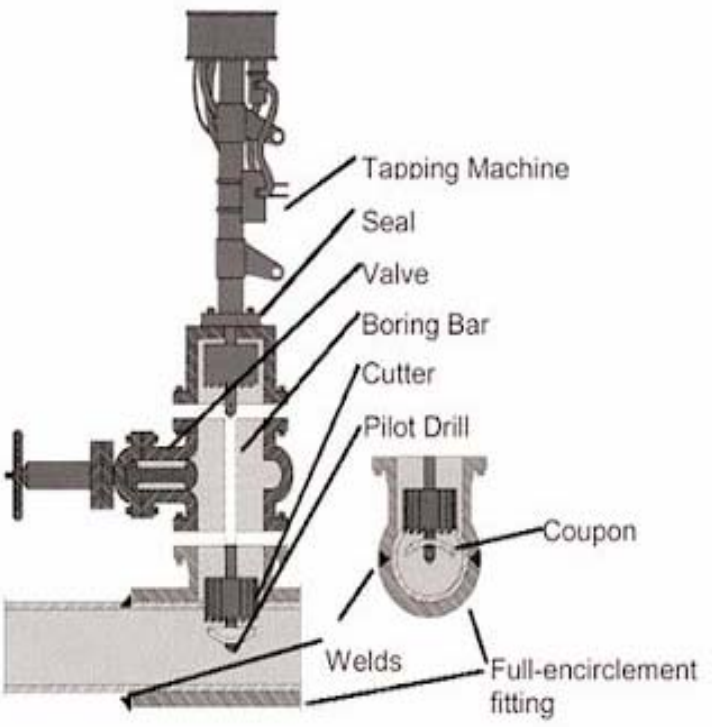
Hot Tapping Procedure

- Connect branch fitting and permanent valve on the existing pipeline while in service
- Install hot tapping machine on the valve
- Cut through pipeline wall and extract coupon through the valve
- Close valve and remove hot tapping machine
- Connect branch line



Schematic of Hot Tapping Machine

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Hot Tap Benefits

- Continuous system operation – shutdown and service interruptions are avoided
- No gas released to the atmosphere
- Avoided cutting, realignment and re-welding of pipeline sections
- Avoid inerting / gas-freeing pipeline section for hot work
- Reduced planning and coordination costs
- Increased worker safety

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Methane Losses from Major Repairs

- Not always possible to repair a pipeline without taking it out of service
- Major pipeline repairs often involve isolating the repair area and venting gas to the atmosphere
  - Major repairs
  - Internal defects
  - Leak repairs
  - Installing large connections
- 30 to 6,000 Mcf* natural gas vented to the atmosphere with each repair

*Pipelines range from 4 to 18 inches diameter, 3 to 16 km between isolation valves and operating pressure between 100 to 1,000 psig. Assumes 1 thousand cubic feet (Mcf) = 1 MMbtu

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Industry Experience

- One hot tap vendor reported helping a gas transmission client avoid a service outage
  - One day gas delivery in a 36-inch natural gas pipeline operating at 1,000 psig is worth US$608,000 in gross revenue
  - Performing a shutdown connection required 4 days
  - Revenue savings estimated at US$2,433,000*

*Gas valued at US$5/MMBtu

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Methane Recovery Using Pipeline Pumpdowns

- Minimizing emissions when you must cut out a section of pipeline

Source: Duke Energy

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Pipeline Pumpdown Procedure

- Use in-line compressors to “pull down” the pressure to minimum suction pressure
- Use portable compressor to “pull down” pressure even further
- Cost is justified by immediate payback in gas savings
- About 90% of gas usually vented is recoverable

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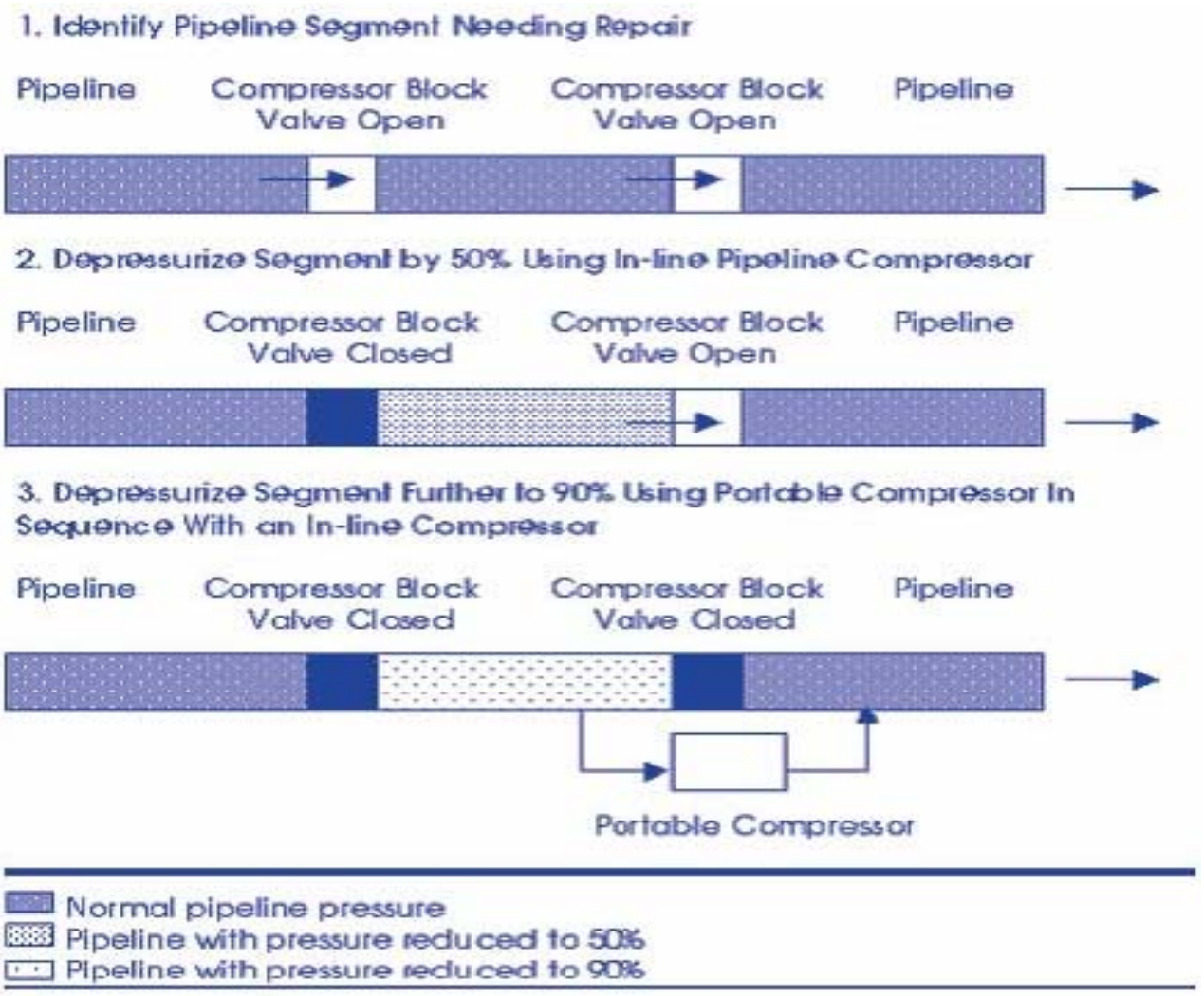
Sequence of Depressurization Events



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Pipeline Pumpdown Equipment

- In-line pipeline compressor
  - Typically has compression ratio of 2 to 1
  - Blocking upstream valve reduces pipeline pressure with no additional equipment costs
- Portable compressor
  - Typically has compression ratio of 5 to 1
  - Can be used in conjunction with in-line compressor to further reduce pressure in the pipeline section
  - Justifiable only when multiple sections of pipeline are to be serviced (i.e. long sections of maintenance or pipeline valve station maintenance where stopples are not feasible)

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Economics of Pipeline Pumpdown

- Calculate gas vented to atmosphere by depressuring pipeline
- Calculate gas saved with in-line compressors
- Calculate gas saved with portable compressor
  - Consider cost of a portable compressor
  - O&M costs of a portable compressor
  - Consider fuel costs for operating portable compressor
- Calculate the net gas savings

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Industry Experience

- U.S. Natural Gas STAR partner Southern Gas used compressors three times at one location
- Estimated total cost = US$52,600
- Gas saved from being vented = 32,560 Mcf (32,560 MMBtu*)
- Gross savings at Mexico price* = US$163,000
- Net savings = US$110,000
- At the Mexico gas price, this practice pays back immediately

*Mexico gas price assumed to be US$5 per thousand cubic feet = US$5/MMBtu. Assumes 1 Mcf = 1 MMbtu

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Discussion Questions

- To what extent are you implementing these practices?
- How could these practices be improved upon or altered for use in your operation(s)?
- What are the barriers (technological, economic, lack of information, regulatory, focus, manpower, etc.) that are preventing you from implementing these practices?