Pipeline Maintenance and Repair

Technology Transfer Workshop
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Pipeline Maintenance and Repair: Agenda

- Methane Losses from Pipeline Maintenance
- Methane Recovery
  - Hot Taps
  - Composite Wrap
- Methane Losses from Major Pipeline Repairs
- Methane Recovery
  - Pipeline Pumpdowns
- Discussion Questions
Methane Losses from Current Pipeline Maintenance Practices

- Natural gas is often vented to the atmosphere when performing pipeline repairs and new connections
  - Up to 2,000 thousand cubic feet (Mcf) natural gas vented when making a new connection
  - Up to 6,000 Mcf natural gas vented when replacing pipe that has non-leaking damage
- These practices result in methane emissions
  - Loss of sales
  - Service disruption and customer inconvenience
  - Costs of evacuating the existing piping system

*pipelines ranging from 4 to 18 inches diameter operating at 100 to 1,000 pounds per square in gauge pressure

Hot Taps for New Connections

- Connecting pipelines without service disruption or methane emissions

Source: Williamson Industries Inc.
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

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
Composite Wrap for External Repair

- Permanent On-Line Pipeline Repair Technology

Source: Duke Energy

Composite Wrap: What Are They?

- 1) A high-strength glass fiber composite or laminate
- 2) An adhesive or resin bonding system
- 3) A high-compressive-strength load transfer filler compound

Source: Clock Spring® Company L. P.
Composite Wrap Installation

- After excavation and pipe preparation
  - External defects filled with filler
  - Composite wrap wound around pipe with adhesive or laminating agents
  - Typically 2 inches of wrap must extend beyond damage
  - Excavation site refilled after curing time
- Reducing pressure improves quality of repair

Source: Armor Plate

Composite Wrap Lessons Learned

- Trained but not skilled crafts persons required
- Specialized welding and lifting equipment not required
- Minimizes access concerns
- No delays awaiting metal sleeve
- Cathodic protection remains functional
- Proven permanent repair for external defects
- Temporary repair for internal faults
- In-service pipeline repair methodology
- Ideal for urgent and quick repair
- Avoid service disruptions
- Cost-effective
Clock Spring® Columbia Experience

- Clock Spring® was tested on a 24 inch diameter pipeline affected by external damage
- Pipeline had 75% diameter deflection and a defect length of 6 feet
- Clock Spring® used 87 four inch wide wrap kits and 150 filler kits to repair the damage
- Clocks Spring® wrap passed pressure cycles lasting 15 minutes at pressures up to 1800 pounds per square inch gauge

Composite Wrap Contacts

- epa.gov/gasstar
- Vendors of composite wrap kits
  - Armor Plate, Inc.
    - http://www.armorplateonline.com
  - The Clock Spring® Company L.P.
    - http://www.clockspring.com
  - The StrongBack Corporation
    - http://www.strongbackcorp.com
  - WrapMaster, Inc.
    - http://www.wrapm.com
Methane Losses from Major Repairs

- Not always possible to repair a pipeline without taking it out of service
- Major pipeline repairs often involve closing off 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

  *on pipelines ranging from 4 to 18 inches inside diameter and 100 to 1,000 pounds per square in gauge pressure

Pipeline Pumpdown

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

Source: Duke Energy
Methane Recovery by Pipeline Pumpdown

- 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

Sequence of Depressurization Events

1. Identify Pipeline Segment Needing Repair

2. Depressurize Segment by 50% Using In-line Pipeline Compressor

3. Depressurize Segment Further to 90% Using Portable Compressor in Sequence With In-line Compressor

- Normal pipeline pressure
- Pipeline with pressure reduced to 50%
- Pipeline with pressure reduced to 90%
Pipeline Pumpdown Equipment

- In-line pipeline compressor
  - Typically has compression ratio of 2 to 1
  - Blocking upstream valve reduces pipeline pressure to safe limits for maintenance

- 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)

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 difference in gas savings
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- Program website:
  www.methanetomarkets.org

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?