Methane to Markets

Pipeline Maintenance and Repair

Technology Transfer Workshop

PEMEX &
Environmental Protection Agency, USA

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Villahermosa, Mexico

Methane to Markets

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

2

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

3

Hot Taps for New Connections

- Connecting pipelines without service disruption or methane emissions

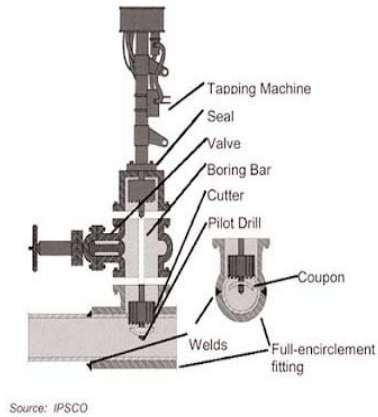
Certified Williamson Industries Technician performing a hot tap with a 760 Tapping Machine as part of a 12" Stopple application.

Source: Williamson Industries Inc.

4

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

5

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

6

Composite Wrap for External Repair

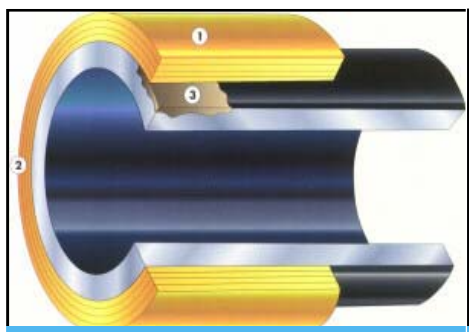
- Permanent On-Line Pipeline Repair Technology

Source: Duke Energy

7

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.

8

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

9

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

10

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

11

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

12

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

13

Pipeline Pumpdown

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

Source: Duke Energy

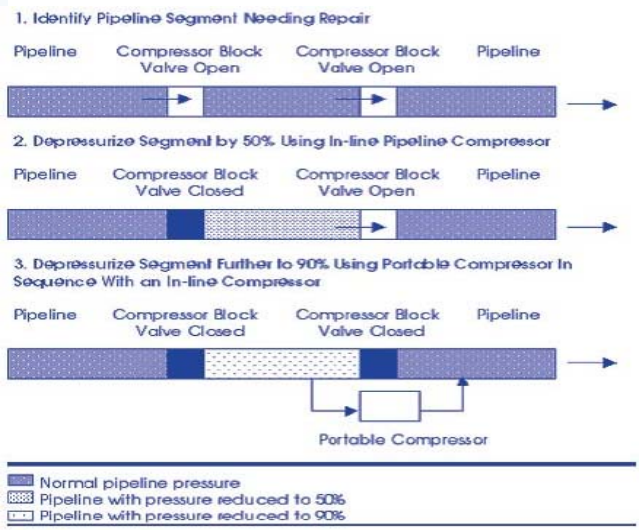
14

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

15

Sequence of Depressurization Events



16

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)

17

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

18

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- Program website:
  www.methanetomarkets.org

19

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?

20