

Pipeline Maintenance and Repair

Ministerio de Minas y Energia
Ministerio de Ambiente, Vivienda y Desarrollo Territorial
Occidental Oil & Gas Corporation and
Environmental Protection Agency, USA

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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



Methane Losses from Current Pipeline Maintenance Practice

- Methane is vented in preparation for external pipeline repairs or new connections
- Smallest possible linear section of pipeline is blocked in and depressured to the atmosphere
- “Hot work” may require purging pipeline with inert gas
- These practices results in methane emissions
 - **Loss of Sales**
 - **Service disruption and customer inconvenience**
 - **Costs of evacuating the existing piping system**



Hot Taps

Connecting
Pipelines without
Disruption



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

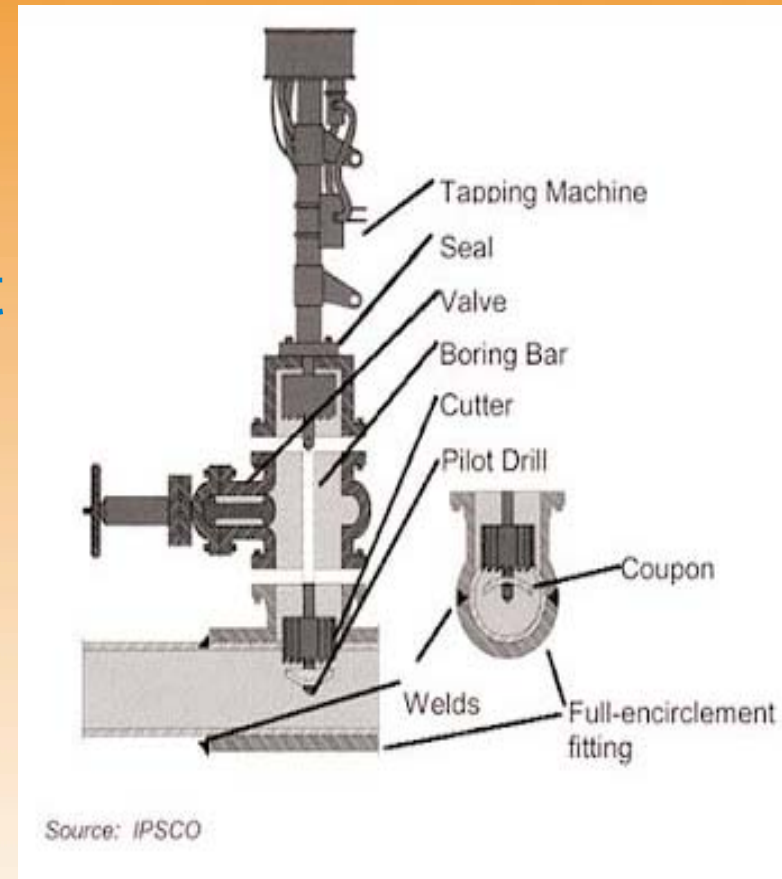


Methane to Markets

Source: Williamson Industries Inc.

Hot Tapping Procedure

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



Schematic of Hot Tapping Machine



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
- Reduced planning and coordination costs
- Increased worker safety



Composite Wrap

Permanent On-Line
Pipeline Repair
Technology



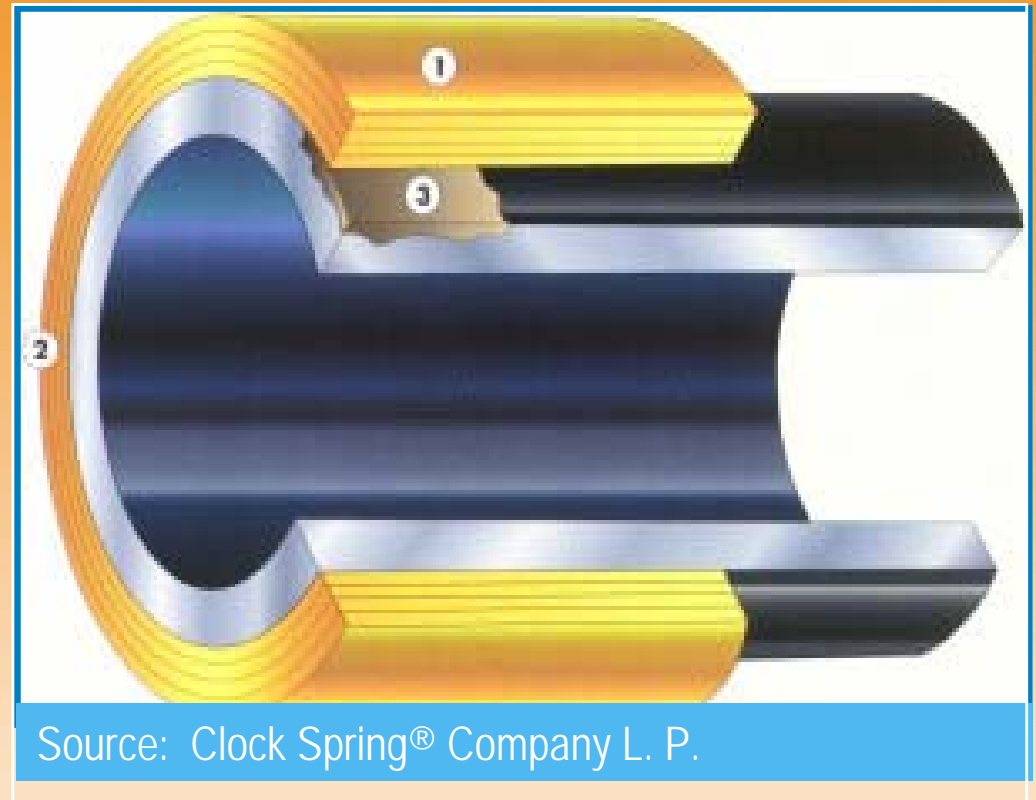
Source: Duke Energy



Methane to Markets

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



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” of wrap must extend beyond damage
 - Excavation site refilled after mandated curing time
- Reducing pressure improves quality of repair



Source: Armor Plate



Composite Wrap Lessons Learned

- 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
- 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



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 psig



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 cutting into the pipe
- Major pipeline repairs require sectioning off the repair area and blowing the gas down to the atmosphere
- Major repairs
 - **Internal defects**
 - **Leak repairs**
 - **Installing large connections**



Pipeline Pumpdown

Minimizing
Emissions when
Cutting into
Pipeline



Source: Duke Energy



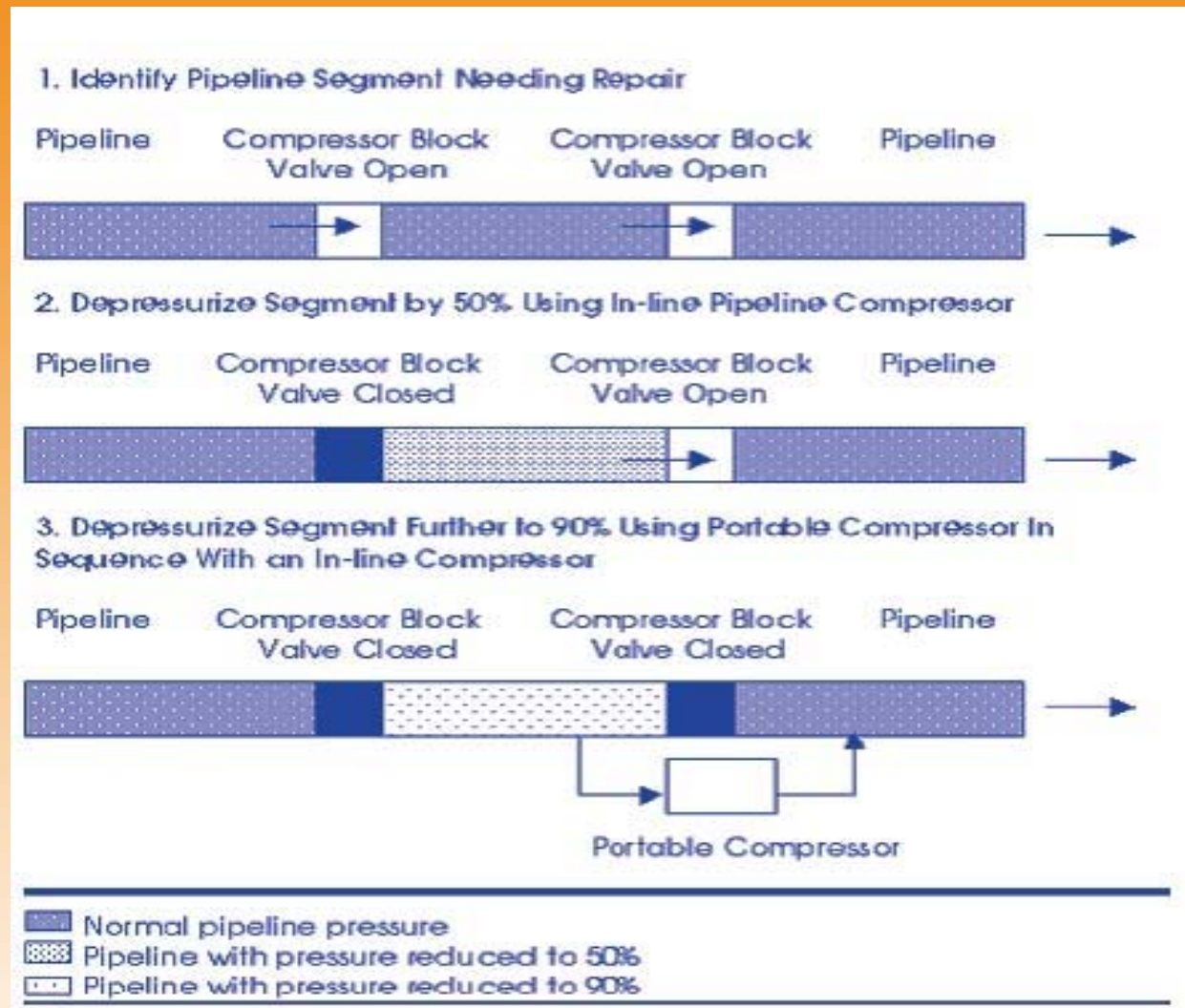
Methane to Markets

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



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 by depressurizing 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 annual savings



Contacts

- **Roger Fernandez, U.S. EPA**
(202) 343-9386
fernandez.roger@epa.gov
- **Don Robinson, ICF Consulting**
(703) 218-2512
drobinson@icfconsulting.com
- **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?

