



Mitigating Emissions from Pipeline Blowdowns



Ice Breaker (What is a Pig?)

- Non-O&G definition: adorable small pink creatures, farm animal that is good for ham, bacon, ribs etc.



- O&G definition:
 - Pipeline cleaning and measuring tool (also known as a pipeline inspection gauge or "PIG")

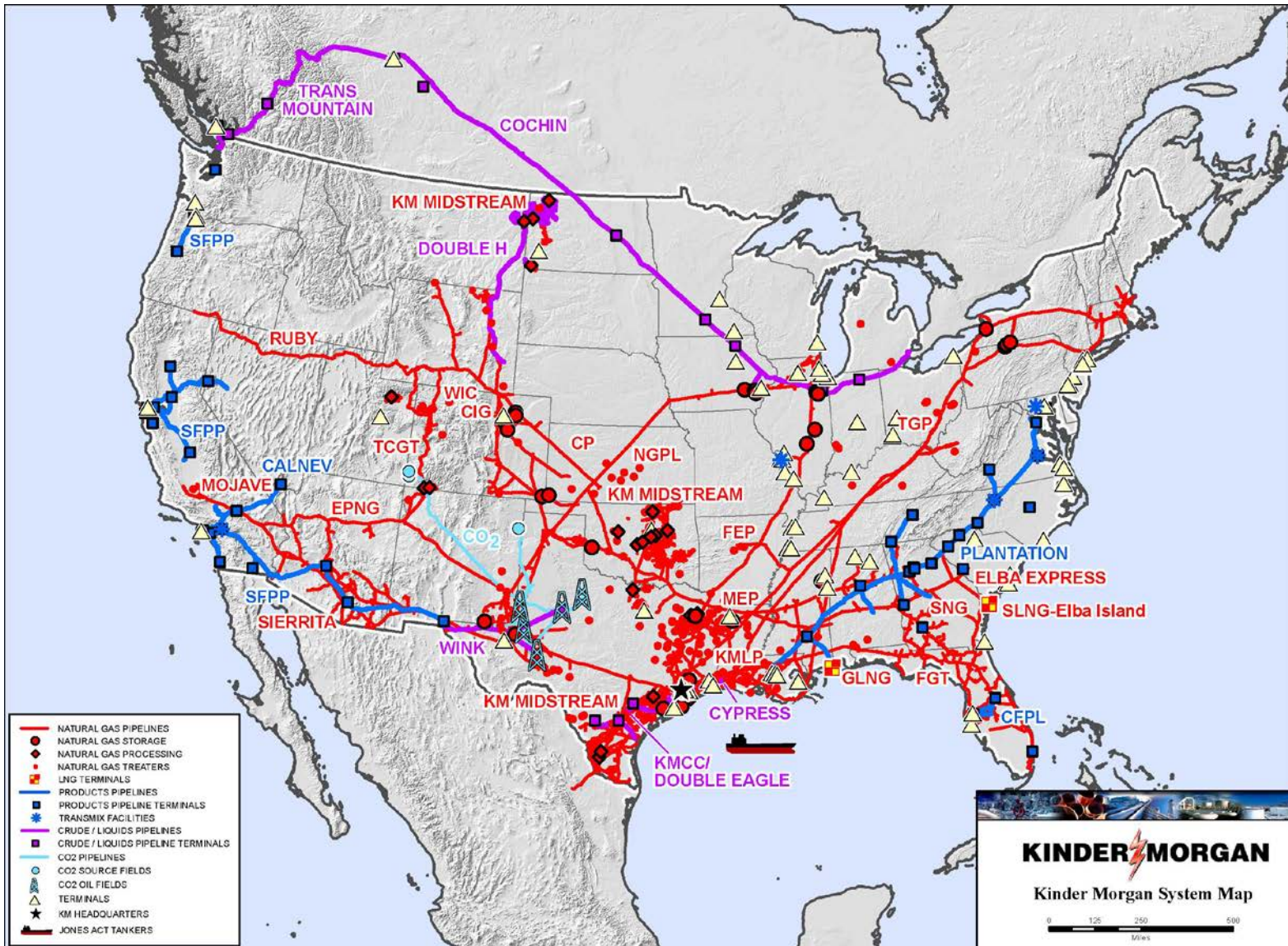
Agenda

- Kinder Morgan Overview
- Kinder Morgan Methane Emissions Management Program
- Kinder Morgan historical methane reductions
- Kinder Morgan Implementation Approach for Pipeline Blowdown Mitigation for Methane Challenge
- What is “Mitigating Pipeline Blowdowns”?
- Are these new technologies or work practices?
- Types of Pipeline Blowdown Mitigation Techniques

Kinder Morgan Overview

- Kinder Morgan is one of the largest energy infrastructure companies in North America.
 - **Over 84,000 miles** of pipelines and **155 terminals**.
 - **Over 12,000 employees** in U.S. and Canada.
- Kinder Morgan is the largest natural gas transporter and storage operator in North America.
 - **Approximately 70,000 miles** of pipelines.
 - We transport **approximately 38%** of the natural gas consumed in the U.S.
- Kinder Morgan is the largest independent transporter of petroleum products in the United States, transporting **approximately 2.1 million barrels** of product per day.
- Kinder Morgan is the largest transporter of carbon dioxide (CO₂), transporting **approximately 1.3 billion cubic feet** per day.
- Kinder Morgan is the largest independent Terminal operator in the U.S.
 - Our liquids terminals store refined petroleum products, chemicals, ethanol and more, and have the capacity of **152 million barrels**.
 - Our bulk terminals store and handle such materials as coal, petroleum coke and steel and we handle **over 53 million tons** per year.

Kinder Morgan Assets



Natural Gas Pipelines

- Largest natural gas network operator in North America with approximately 70,000 miles of pipelines. Our pipelines transport approximately 38% of the natural gas consumed in the U.S.
- We are also the largest supplier of contracted natural gas treating services and also the largest storage operator.
- Key assets in this business segment include:
 - **El Paso Natural Gas Pipeline (EPNG)** serving the entire southwest United States
 - **Tennessee Gas Pipeline (TGP)** that services New York City and Boston
 - **Natural Gas Pipeline Company of America (NGPL)** which serves the high-demand Chicago market.
 - **Texas Intrastate Pipeline Group-** Texas is the largest producer and consumer of natural gas in the United States
 - **Southern Natural Gas (SNG)** serving major metro areas in the Southeast United States



Kinder Morgan Methane Emission Management Program

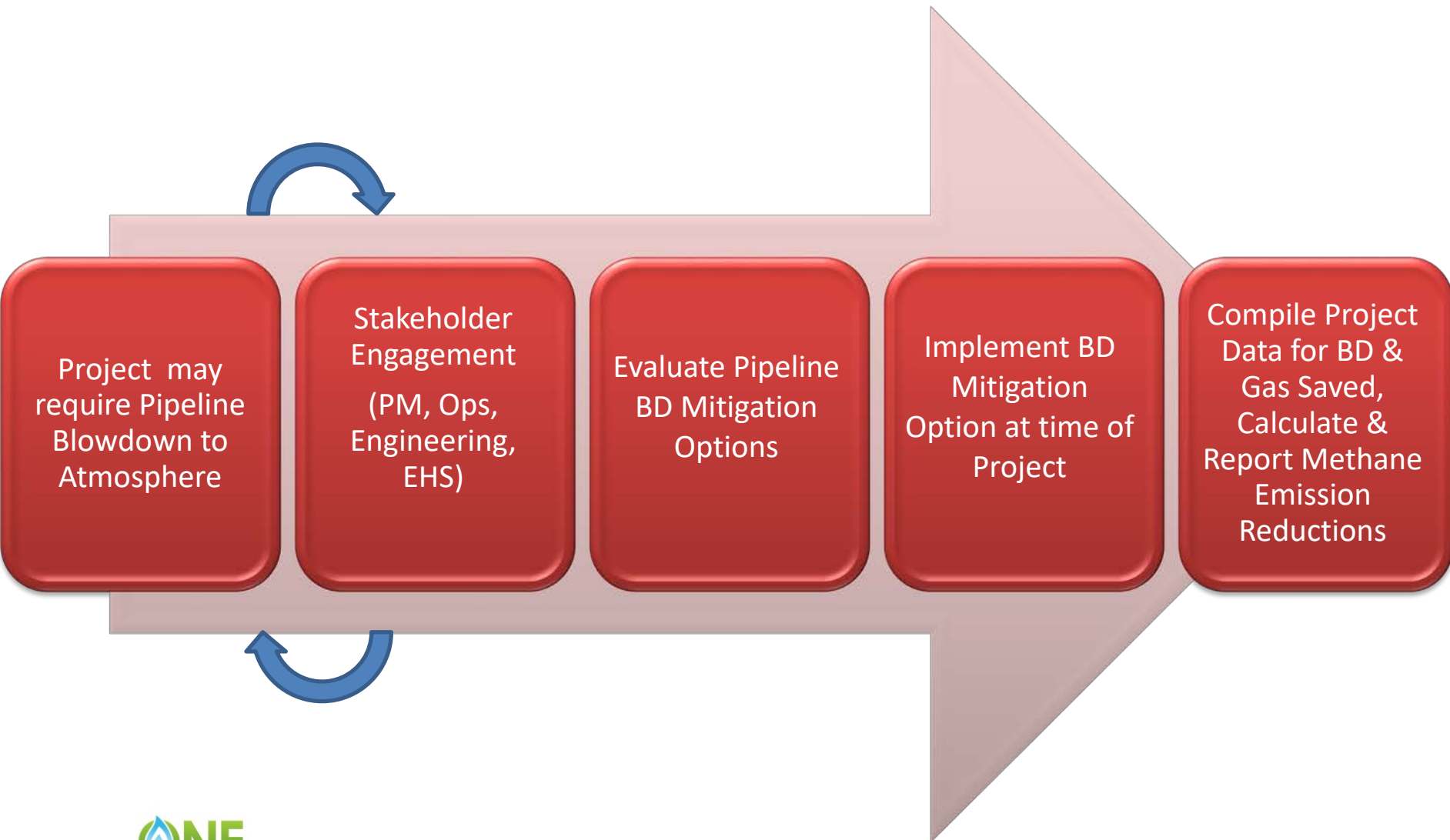
- Member of EPA's Natural Gas Star program
- Charter Member of EPA's Methane Challenge-ONE Future Option
 - **Methane Intensity Target: 0.31% by RY2025 for T&S assets**
 - **KM: 21 pipelines, 60,000 miles, and ~500 stations**
- Commitments include (chosen by KM):
 - **Leak Inspection & Maintenance at T&S facilities**
 - **Reduction of Transmission Pipeline Blowdown volumes**
 - **Other technologies & work practices on case-by-case basis**
- 1st Methane Challenge Report: June 31, 2018 for RY2017
- EPA's Mandatory Programs: Federal NSPS, State, and GHGRP

Kinder Morgan Historical Methane Reductions

KM Pipeline Drawdowns from Portable Compression
(Reported to EPA Natural Gas STAR Program)

Year	Number of Projects	Methane Reduction (Mcf)	Est. Value of Gas Saved	Est. Implementation Cost
2012	80	1,734,730	\$6,938,920	\$3,145,799
2013	80	1,644,730	\$4,976,840	\$2,857,805
2014	70	1,086,740	\$3,260,220	\$2,248,831
2015	94	2,027,890	\$6,083,670	\$3,656,025
2016	79	1,309,990	\$3,929,970	\$2,558,995
Totals	403	7,804,080	\$25,189,620	\$14,467,455

Kinder Morgan Implementation for Pipeline BD Mitigation



What is “Mitigating Pipeline Blowdowns”?

- **Mitigation:** *The elimination or reduction of the frequency, magnitude, or severity of exposure to risks, or minimization of the potential impact of a threat or warning.*
<http://www.businessdictionary.com/definition/mitigation.html>
- **Pipeline Blowdowns:** *The depressurizing of a natural gas pipeline to facilitate maintenance on the pipeline, accomplished by opening a valve and allowing the gas to escape to atmosphere, usually through a vertical pipe or "stack".*
<https://www.phmsa.dot.gov/staticfiles/PHMSA/Pipeline/TQGlossary/Glossary.html#Padding>
- **Mitigating Pipeline Blowdowns:** *Eliminating or Reducing the frequency, magnitude or severity of natural gas vented to atmosphere from pipeline blowdowns.*

Are these New Technologies or Techniques

- Not necessarily new technologies or techniques
 - 10 to 20+ years of use for some
 - Are becoming more widely accepted and used
- Goal: minimize gas loss to atmosphere
 - Economic benefits
 - Emission benefits
 - Other considerations
- Improvements in data systems to track and collect data associated with these projects
- Improvements in effectiveness

Portable Compression for Pumpdowns

- Portable compression is used to bring down gas pressure on an isolated pipeline segment and re-direct the gas downstream of the isolated segment
- Rent portable compression brought in on trailers
 - Effective for longer pipeline segments at higher pressures due to cost of rental compression
 - Capable of significant drawdown volumes
 - Requires advanced project planning and scheduling
 - Gas Saved: 16,582 Mcf per project (KM 2016 data)
 - Methane reduced for 2016 (in metric tons):
 - 302 MT per project (7,550 MT CO₂e)
 - 24,196 MT per year (605,000 MT CO₂e)

KM or Customer Compression for Pumpdowns

- Existing KM or customer compression is used to bring down gas pressure on an isolated pipeline segment and re-direct the gas downstream of the isolated segment
 - Use existing compression already in place; no additional cost for portable compression
 - Emergency & Non-emergency repairs
 - Short turn-around time to configure & implement
 - Limited length of pipeline segment
 - Limited pressure reduction based on availability of compressor assets & allowable pressures
 - Improving tracking of these projects

Repairs by Reinforcement: Composite Wrap or Compression Steel Sleeves

- Good for use on non-leaking defects such as pits, dents, gouges, and pipe corrosion
- Full-encirclement steel sleeves, laminate, epoxy or other type of composite wrap that seals and strengthens the pipe at the location of the defect
 - Pipe does not have to be taken out of service
 - Avoids blowing down long segments of pipeline
 - Emergency & Non-emergency repairs
 - Can normally be completed quickly from excavation to reburial (less than a day or two)
 - Not appropriate for significant pipe wall loss >80% or a leaking pipe
 - Composites: shielding of cathodic protection

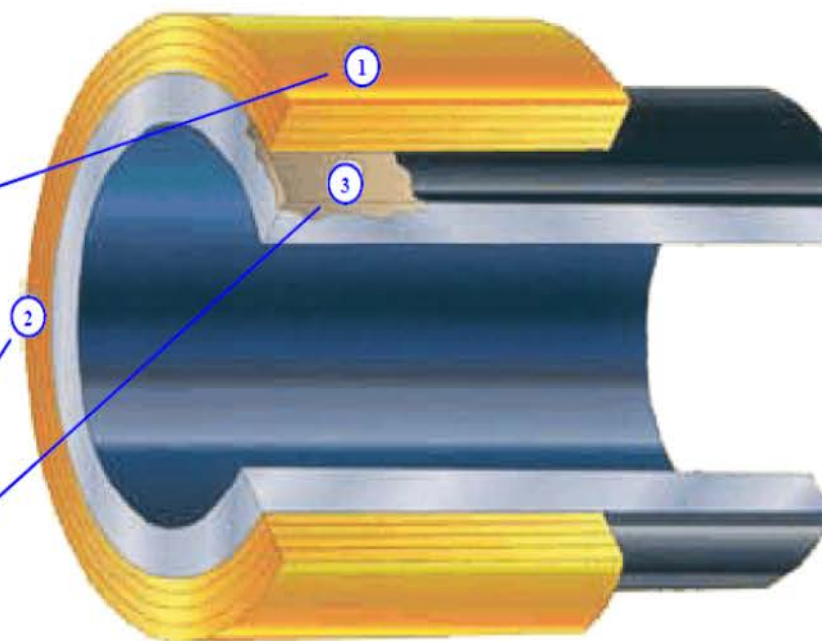
Clock Spring Composite Wrap (diagram)

https://www.epa.gov/sites/production/files/2016-06/documents/ll_compwrap.pdf

Exhibit 1: Clock Spring® Composite Wrap

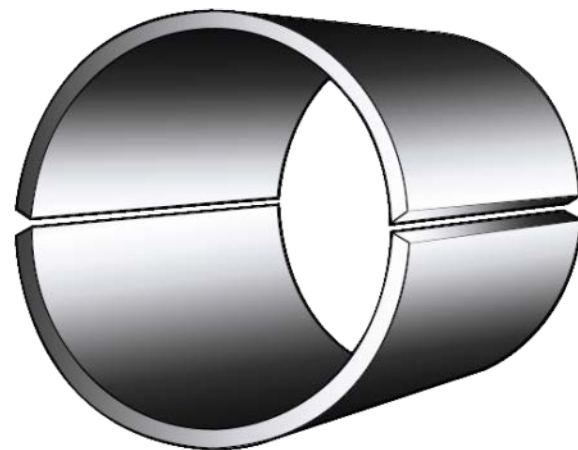
A Clock Spring® composite wrap consists of three parts:

1. A high-strength, unidirectional composite structure of glass fibers and a polymer base;
2. A fast curing, high-performance, two-part adhesive system; and
3. A high compressive-strength, load-transferring filler compound.



Clock Spring® Company L.P.

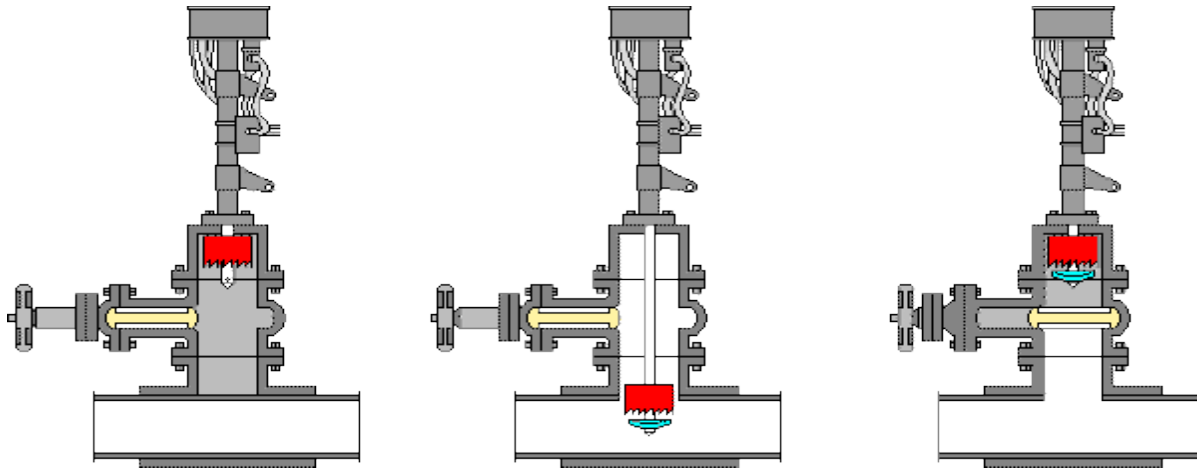
Steel Compression Sleeve (example)



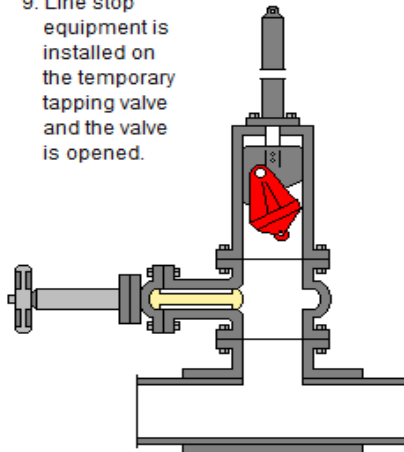
Other Techniques to Reduce or Eliminate Pipeline Blowdowns

- Hot taps
 - Attaching a connection and valve on the outside of an operating pipeline and cutting out the pipeline wall within the valve
- Stopples (valves, plugs, bypass)
 - Hot tapping and attaching a stopple valve on either side of pipeline section to be replaced and bypassing that pipeline section to keep line in service
 - Installing a stopple plug via hot tapping prior to installing a valve or connection on the line
- Other Less Common Techniques

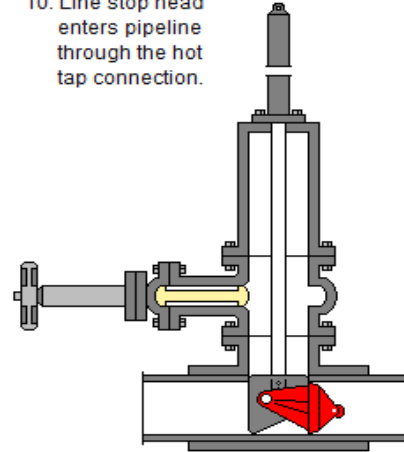
Hot Taps & Stopples (diagrams)



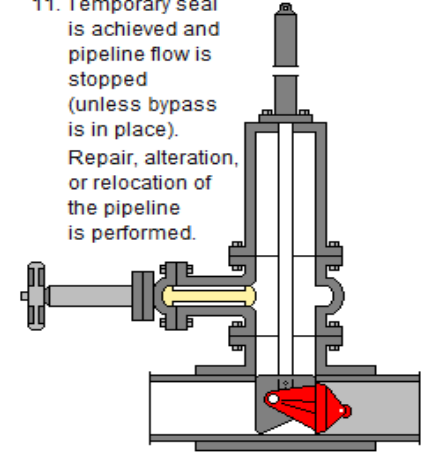
9. Line stop equipment is installed on the temporary tapping valve and the valve is opened.



10. Line stop head enters pipeline through the hot tap connection.



11. Temporary seal is achieved and pipeline flow is stopped (unless bypass is in place). Repair, alteration, or relocation of the pipeline is performed.



Q & A

Questions??

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