



# An Operator's Perspective of Pipeline Repair Methods

Government and Industry Pipeline R&D Forum  
Work Group 4 – Pipeline Repair and Remediation

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# Spectra Energy System Map – US Operations

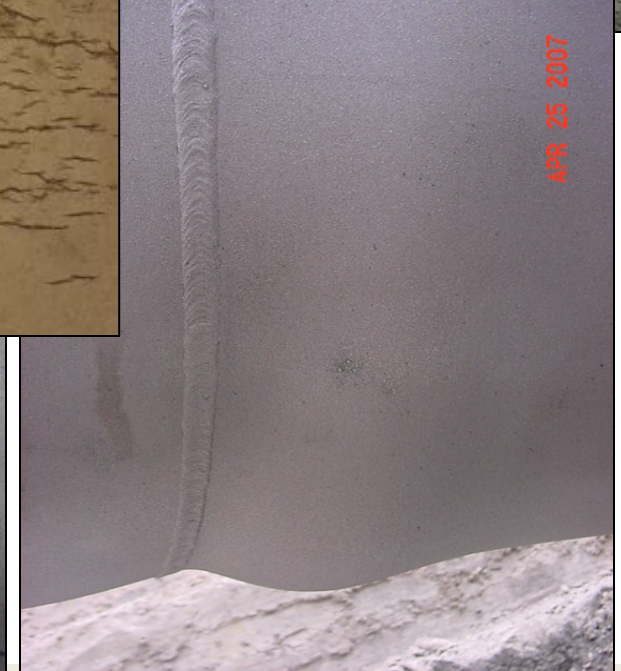
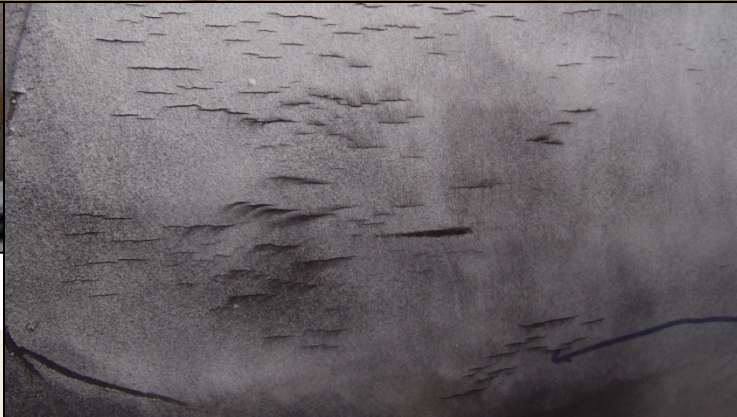
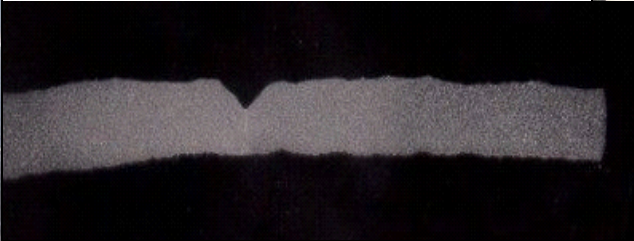


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# Defect Assessment and Repair – When Defects Don't Behave



# Defect Assessment – Establish Pass/Fail Condition

Damage Fitness for Service Assessment  
Corrosion damage (external, internal)  
Mechanical damage  
Environment cracking damage  
Manufacturing defect damage  
Construction defect damage



Sources of uncertainty into  
damage assessment:

- defect size, shape
- material properties
- loading conditions
- prior stress/strain history
- assessment method

Pass



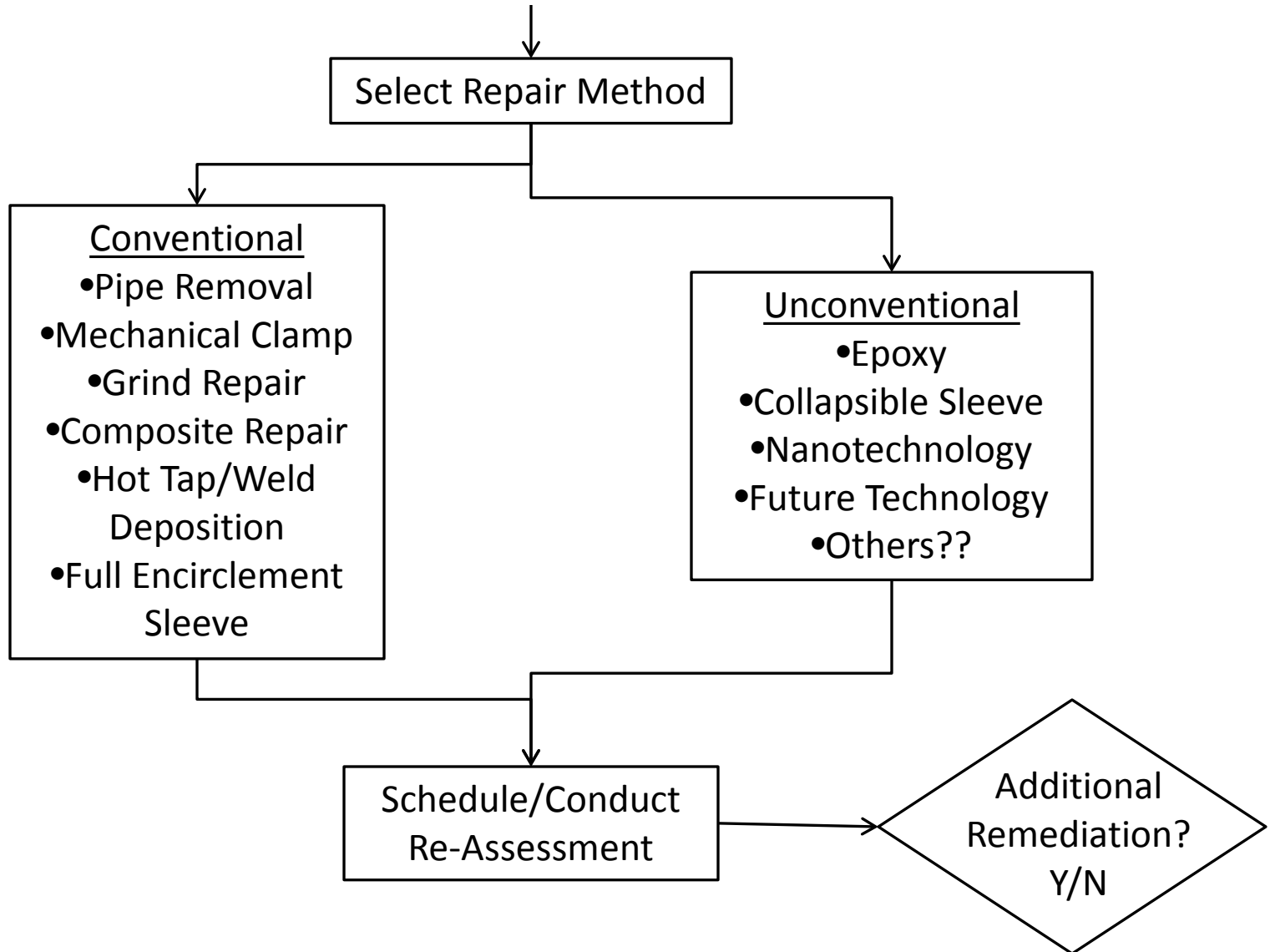
Recoat, backfill,  
monitor

Fail



- Apply pressure reduction (y/n)
- Select Repair Methods
- Conduct Repair
- Monitor


# Defect Repair



# Some thoughts on D & D Gaps

- Key capability for a pipeline operator is to make consistent methodical excavation decisions
  - Using ILI data
  - Non-piggable pipelines
- In-the-ditch assessment becomes somewhat routine as a suite of technologies exist to make repairs...however:
  - Is consistent guidance available with respect to the following?:
    - Understanding loading conditions on in-service pipelines
    - Scheduling excavations
    - Applying appropriate pressure reductions
    - Defect assessment for complex situations
      - environmental cracks, seam weld defects, interacting defects,
    - Further pipeline remediation measures

# Pipeline Repair vs Pipeline Remediation

- Pipeline Repair  Pig and Dig (repair)  
Direct assessment and repair  
Hydrotest and repair
- Pipeline Remediation – somewhat more subjective
  1. restore CP (anode, rectifier installation)
  2. restore coating (recoat)
  3. restore fitness integrity
    - hoop strength (hydrotest, external or internal reinforcement)
    - establish integrity “equivalence” for a vintage pipeline to current expectations

Are existing provisions adequate to allow operators to introduce and apply new technologies?

# Conclusions

- A suite of repair alternatives exist for most pipeline applications....probably not a huge R&D gap
- Key assessment gaps include the following
  - Assessment of seam weld defects, environmental crack colonies
  - Assessment of vintage girth welds, buckles and wrinkles
    - Uncertainty in existing and future stress and strain condition of the pipeline
    - Uncertainty in strain capacity of the pipeline
  - Management and remediation activities for vintage pipelines to meet the expectations of current integrity expectations

Uncertainty and reluctance to introduce/apply new technology for repair and remediation of pipelines restricts advancement of alternatives to address vintage pipeline issues



...thanks for your time

Questions???