

**Docket No. SA-534**  
**Exhibit No. 8-C**

**NATIONAL TRANSPORTATION SAFETY BOARD**

**Washington, D.C.**

Pipeline Integrity Management  
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(13 Pages)



# National Transportation Safety Board Investigative Hearing

*March 1 – 3, 2011*

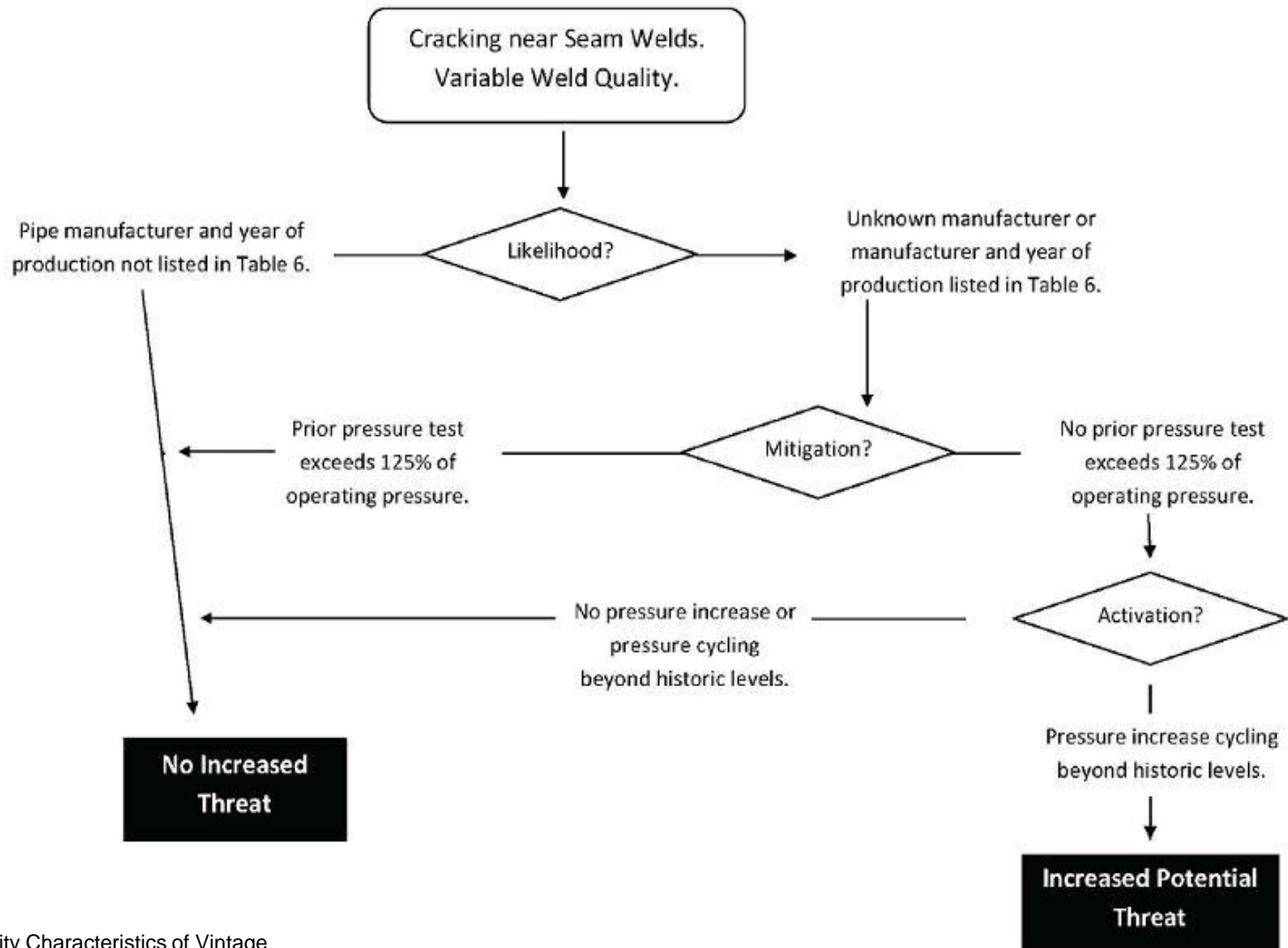
*Chuck Dipppo  
Operating Section Chairman  
American Gas Association*



# Addressing Gas Transmission Pipeline Threats

Threat Category	Time Based Behavior	Mitigation
<p><b>Corrosion:</b></p> <ul style="list-style-type: none"> <li>- External</li> <li>- Internal</li> <li>- Stress Corrosion Cracking</li> </ul>	<p><b>Time Dependent</b></p>	<p><b>Periodic Assessment</b></p>
<p><b>Defects:</b></p> <ul style="list-style-type: none"> <li>- Manufacturing Defects</li> <li>- Fabrication &amp; Construction Defects</li> <li>- Equipment Defects</li> </ul>	<p><b>Stable unless activated by a change in service conditions</b></p>	<p><b>One-Time Assessment</b></p>
<p><b>Excavation Damage</b></p> <p><b>Incorrect Operation</b></p> <p><b>Natural Force Damage</b></p> <p><b>Other Outside Force Damage</b></p> <p><b>All Other Causes</b></p>	<p><b>Time Independent or Random</b></p>	<p><b>Prevention &amp; Surveillance</b></p>
<p>References: ASME B31.8s Integrity Characteristics of Vintage Pipelines, INGAA, 2005</p>		

# Addressing Seam Weld & Variable Weld Quality



Source: Integrity Characteristics of Vintage Pipeline, INGAA, 2005

# Current ILI Technology

- **High-resolution MFL**
  - Axial field MFL
  - Extra High-res tri-axial sensor Axial Field MFL
  
- **Transverse field inspection MFL (“TFI”)**
  - Circumferential field MFL
  
- **Ultrasonic wall thickness**
  - Normal Beam UT
  - Smaller diameter pitting corrosion UT
  
- **Ultrasonic crack detection**
  - Angle Beam UT
  
- **EMAT crack detection**
  - Guided Wave UT
  
- **Standard & high-resolution deformation tools**
  
- **Inertial measurement geometry tools**
  
- **Combo defect and geometry tools**



# ILI Tools Suitability For Seam Defects

## ➤ **Angle Beam Shear Wave UT**

- Requires liquid couplant – difficult to use in gas pipelines

## ➤ **Circumferential MFL (TFI)**

- Not effective for tight defects – small gap must be present

## ➤ **EMAT CD tools**

- Does not require couplant – works in gas & liquid pipelines
- Least operator experience

# ILI Limitations & Benefits

## Limitations

- Many lines are not piggable. An estimated 61% of LDC transmission pipe is not piggable.
- Complex character of some seams or flaws makes accurate detecting, identifying, and sizing difficult
- Sometimes important flaws are missed
- Meticulous non-destructive evaluation in the field required to validate ILI – Difficult to consistently achieve.

## Benefits

- It is a non-destructive test
- It is more sensitive and efficient than a hydrotest
- Many operators have had good success finding significant flaws
- Periodic runs can compare defects for growth

# Hydrostatic Testing

Hydrotesting (and gas pressure tests) are conducted to:

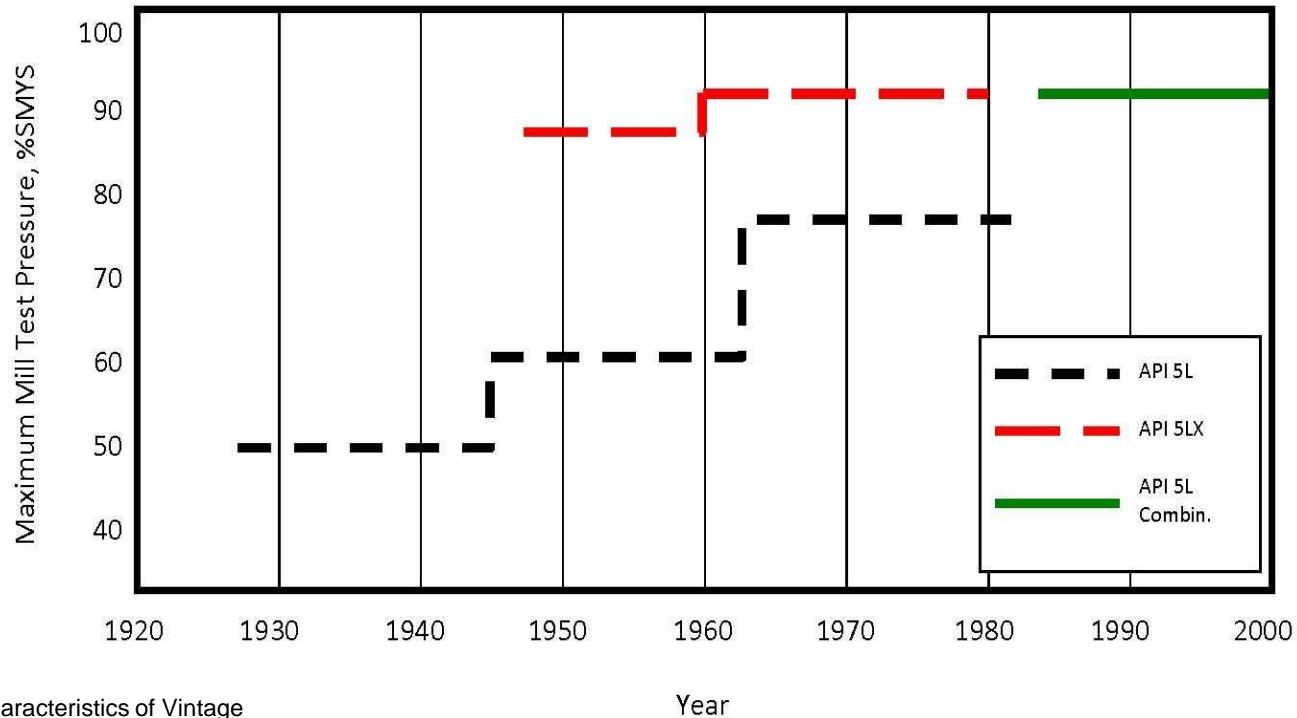
- Expose defective materials that have missed prior detection
- Ensure that any remaining defects are insignificant enough to allow operation at design pressures
- Expose possible leaks and
- Serve as a final validation of the integrity of the constructed system.



# Hydrostatic Testing

Pipe mills have tested pipe since the 1930s. The percent of SMYS mill test have increased over the years.

History API hydrotest requirements



Source: Integrity Characteristics of Vintage Pipeline, INGAA, 2005

# Hydrotest Limitations & Benefits

Limitations	Benefits
<ul style="list-style-type: none"><li>• In-service pipe difficult to shutdown for testing</li></ul>	<ul style="list-style-type: none"><li>• Applies to corrosion, SCC, fatigue, and seams</li></ul>
<ul style="list-style-type: none"><li>• Incomplete dewatering can cause severe corrosion problems</li></ul>	<ul style="list-style-type: none"><li>• Capability is generally predictable</li></ul>
<ul style="list-style-type: none"><li>• Effectiveness is reduced by variable pipe properties</li></ul>	<ul style="list-style-type: none"><li>• Proven success for managing progressive degradation conditions</li></ul>
<ul style="list-style-type: none"><li>• Not a mitigation of circumferential defects</li></ul>	
<ul style="list-style-type: none"><li>• Less sensitive than ILI for many defect types</li></ul>	
<ul style="list-style-type: none"><li>• Can grow subcritical defects to unknown size</li></ul>	

# Pressure Testing Vintage Pipe

- A significant portion of vintage pipe was field hydrotested
- Older pipe was mill tested, but not as high as today
  - Extremely difficult to set-up, test and dewater “in-service” gas transmission
  - High field test levels may exceed historically demonstrated capability of pipe and cause damage
- Repeated attempts to test too high can cause damage
- Operator and regulator need to decide whether to place pipe under the high stress of a pressure test or maintain the stability of historically low operating pressure.
- There are 187,837 miles of pre-1970

# Other Considerations: Low-Stress Pipelines

- Because pressure drives fracture initiation and propagation, low wall stress pipelines have different failure characteristics
- Lines below 30% SMYS tend to leak, not rupture, reducing the potential likelihood and consequence of an incident
- Pipelines below 30% SMYS are treated differently in:
  - ASME B31.8s
  - 49 CFR 192.507 *Test requirements for pipelines to operate at a hoop stress less than 30 percent of SMYS and above 100 psig*
  - 49 CFR 192.557 *Upgrading: Steel pipelines to a pressure that will produce a hoop stress less than 30 percent of SMYS; plastic, cast iron, and ductile iron pipelines*
  - 49 CFR 192.941 *What is a low stress reassessment?*

# Summary

- Operator need the flexibility to use all tools to address threats to pipeline safety.
- ILI and pressure tests have benefits and limitations
- Operators must weigh the benefits and risks to hydrotesting vintage pipe.
- Low stress pipelines have different leak versus rupture characteristic compared to higher stress pipelines.



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