

PHMSA Mechanical Damage Technical Workshop
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Mechanical Damage: Detection and Characterization

Existing Technologies

Presented by:
Bryce Brown
ROSEN North America



Content



1. Introduction
2. ILI and Integrity Threats
3. Existing Technologies
4. Summary

Introduction



- ILI is a mature industry.
- Vast strides have been made in the past 15 years.
 - Development and Introduction of new and more advanced technologies/techniques.
- ILI development efforts continue based on input/needs of the Operator/Industry.

Introduction



ILI Methodologies are well –proven and
–established in helping Pipeline Operators ...

ensure Safe, Reliable and Economic operation
of their pipelines and pipeline systems.

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ILI and Integrity Threats



a) Time Dependent

- 1) External Corrosion.
- 2) Internal Corrosion.
- 3) Stress Corrosion Cracking.

b) Stable

- 4) Manufacturing Related Defects
Defective pipe seam.
Defective pipe.
- 5) Welding/Fabrication Related
Defective pipe girth weld.
Defective fabrication weld.
Wrinkle bend or buckle.
Stripped threads/broken pipe/coupling failure.
- 6) Equipment
Gasket O-ring failure.
Control/Relief equipment malfunction.
Seal/pump packing failure.
Miscellaneous.

c) Time Independent

- 7) Third Party/ Mechanical Damage:
Damage inflicted by first, second, or third parties (instantaneous/immediate failure).
Previously damaged pipe (delayed failure mode).
Vandalism.
- 8) Incorrect Operations
Incorrect operational procedure.
- 9) Weather Related and Outside Force
Cold weather.
Lightning.
Heavy rains or floods.
Earth Movements.

Reference:
ASME B31.8S

ILI and Integrity Threats



- What is the definition of mechanical damage?
- or, What are the definitions of mechanical damage?
 - Key physical parameters of defect.
 - Operational characteristics of pipeline.
 - Other characteristics, such as environment.
- Different categories of mechanical damage.

ILI and Integrity Threats



The New Regulations and Prescription (ref. 49 CFR 195)

Immediate repair conditions

- A dent located on the top of the pipeline (above the 4 and 8 o'clock positions) that has any indication of metal loss, cracking or a stress riser.
- A dent located on the top of the pipeline (above the 4 and 8 o'clock positions) with a depth greater than 6% of the nominal pipe diameter.

60 day repair conditions

- A dent located on the top of the pipeline (above the 4 and 8 o'clock positions) with a depth greater than 3% of the pipeline diameter (greater than 0.250 inches in depth for a pipeline diameter less than Nominal Pipe Size (NPS) 12).
- A dent located on the bottom of the pipeline that has any indication of metal loss, cracking or a stress riser.

180 day repair conditions

- A dent with a depth greater than 2% of the pipeline's diameter (0.250 inches in depth for a pipeline diameter less than NPS 12) that affects pipe curvature at a girth weld or a longitudinal seam weld.
 - A dent located on the top of the pipeline (above 4 and 8 o'clock position) with a depth greater than 2% of the pipeline's diameter (0.250 inches in depth for a pipeline diameter less than NPS 12).
 - A dent located on the bottom of the pipeline with a depth greater than 6% of the pipeline's diameter.
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- *Dents ≥ 0.250 " in depth*
 - *Dents containing a Stress Riser (corrosion, gouge, crack, etc.)*
 - *Critical Strain Analysis (ref. 49 CFR 192, B31.8S)*

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Existing Technologies



- How can mechanical damage be detected?
 - Physical characteristics of defect dictate what types of tools and technologies can be applied.
 - Understand the capabilities and limitations.
 - Understand susceptibility to mechanical damage, based on industry definition(s)
 - Choose tool(s) appropriately.

Existing Technologies



- Multi-Channel Geometry (or Caliper)
- High Resolution MFL
- High Resolution Circumferential MFL
- Ultrasonic: Metal Loss
- Ultrasonic: Crack Detection
- EMAT: Crack Detection
- Inertial Navigation
- Combination/Multi-Purpose Tools

Existing Technologies



- Data Integration and Analysis
- Introduction of new standards

New environment with IMP means New and Enhanced Standards;

- ILI Systems Qualification, API 1163
 - ILI Personnel Qualification, ASNT ILI-PQ
 - ILI Process, NACE RP0102
1. Improved Communication
 2. Improved Understanding
 3. Improved Transparency
 4. Improved Confidence
- R&D: ILI Service Provider and Industry Sponsored

Content



1. Introduction
2. Pre-Inspection
3. Applicability to Known Threats
4. Existing Technologies
5. **Summary**

Summary



- The New Regulations have changed the demand placed on ILI products and services.
- There are ILI tools and technologies available to address outlined threats to integrity.
- Combination/Multi-Purpose tools are becoming more common place.
- Continue working together to understand the requirements for Pipeline Integrity Management and the application of ILI;
 - Public Meetings, like this one.
 - R&D, internal to ILI and industry, e.g. PRCI and DOT funded
- Implement ILI Products and Services that are a direct result of the Pipeline Industry's requirements and commitment to meet their objectives.



Thank you.

www.ILIAssociation.org