Pipeline Research Council International, Inc.

Working Group #3: Anomaly Detection/ Characterization

Overview of PRCI Current Projects

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Overall Pipeline R&D Program

- **PRCI's Integrity and Inspection Committee research projects line up in three major categories:**
  - MOAP Reconfirmation
  - Anomaly Detection and Characterization (focus of this presentation)
  - Pipe Material Properties

PRCI Integrity & Inspection Program

- **The focus is to verify the capabilities of inspection technologies to detect various feature types:**
  - General corrosion & pitting corrosion
  - Crack colonies on pipe body
  - ERW long seam cracks
  - Mechanical damage
  - Weld defects

- **Evaluate the accuracy of inside the pipe (ILI), and over the pipe (NDE) technologies**

In-line Inspection (ILI)

- **ILI Projects & Program Overview**
  - Improve the performance of current tools and develop new tools for the key threats.
  - ILI technologies that can detect features that are not currently being characterized as effectively as they could be.
  - A suite of ILI technologies to identify all critical features in pipelines and methods for analysis of the data.

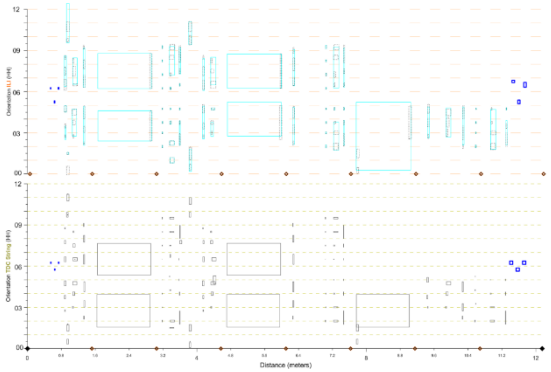
Ongoing Work (ILI)

- Develop a State of The Art Pull Test Facility (PHMSA-Cofund)

- Defining Close Metal Object (CMO) Detection Capabilities of MFL ILI Tools
- Development of a PRCI ILI Performance Test Loop for Liquid Coupled Technologies (6 inch and 12 inch)
- Evaluating the Effectiveness of Low Field MFL Technology or Other Electromagnetic Technologies in Measuring Loading Conditions at Branch Connections

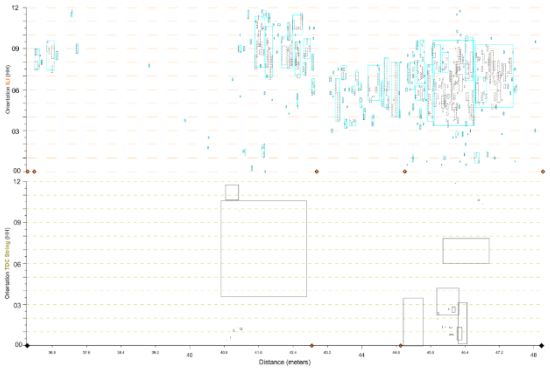
New Work (ILI)

- **Analysis of ILI Technology Performance Specification for Corrosion Features - Real vs Replicated/Machined Samples**



Artificial

Natural



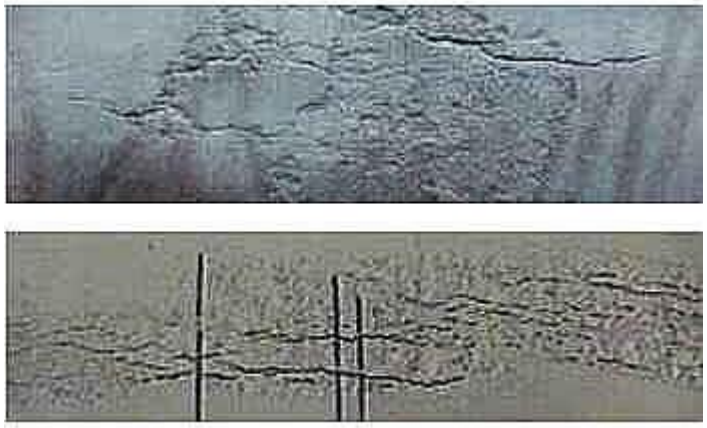
- **Pinhole In-line Inspection and Evaluation**

Crack Management (CM)

- **CM Projects & Program Overview**
  - Provide operators with a comprehensive framework and guidance for integrity management of longitudinal seam welded pipe
  - Evaluation of ILI Technologies to Characterize Long Seam Features
  - Qualification of NDE Methods for In-ditch Analysis of ERW Pipe Weld Seam Anomalies

Ongoing and New Work (CM)

- **Performance Capabilities Evaluation of ILI for Long Seam Features In ERW Pipe (continuing into 2017)**
- **ILI Crack Tool Reliability and Performance**



		Reality	
		False	True
Specification	Reject	*Correct Call*	*Type I Error (False Positive)*
	Not Reject	*Type II Error (False Negative)*	*Correct Call*

Significance Test Outcomes

- **NDE Crack Depth Sizing Performance Validation for Multiple UT Techniques used to Establish Actual Crack Depths for PRCI Reference Standards and ILI Performance Verification**

Non-Destructive Evaluation (NDE)

- **NDE Projects & Program Overview**
  - Technology capabilities to characterize Critical Damage/Feature for integrity assessment (Metal Loss, Mechanical Damage)
  - Technology capabilities to characterize Critical Damage/Feature or material parameter for integrity assessment (planar and volumetric) and standardized terminology, data collection and reporting
  - Deployment of Technology (Hardware, Procedures, Standards)

Ongoing and New Work (NDE)

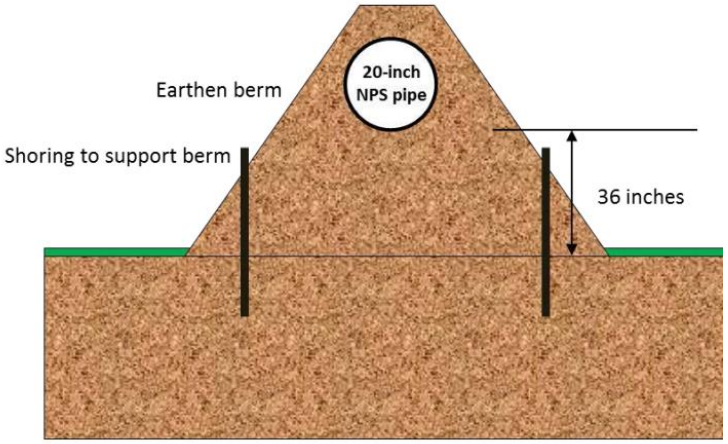
- Determining the Impact of Human Factors on the Performance of In-Service Non Destructive Examination
- In Ditch Methodology to Identify Pipe Properties (comminuting in 2017)
- Integrity Assessment of Crack Colonies with the Aid of Advances in NDE including EMAT and Ultrasonic Imaging
- Hard Spot NDE Evaluation

Difficult to Inspect Pipelines (DTI)

- **DTI Projects & Program Overview**
  - Define the capabilities of inspection technology to detect and differentiate mechanical damage features, including coincident and closely aligned features in difficult to inspect pipelines

Ongoing Work

- **Evaluation of Large Stand Off Magnetometry (LSM) Technologies for detecting features on buried pipe**



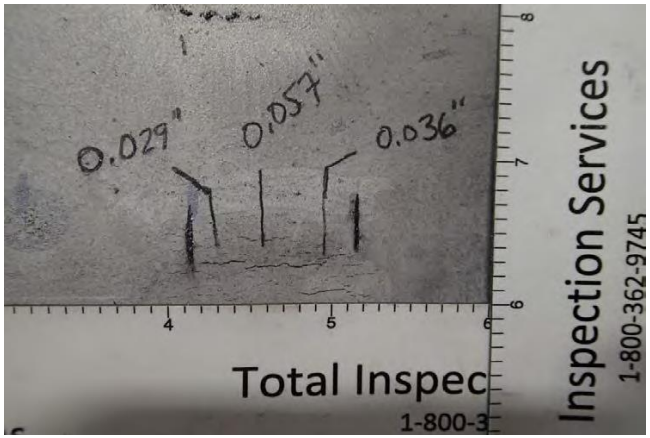
- **Integrity Assessment of Difficult to Inspect Pipelines Evaluating Select Areas Using High Resolution NDE**
- **Condition Assessment of Un-piggable Pipelines Using Electromagnetic Impedance Testing (EMIT)**
- **Un-piggable NDE Tool Evaluation Focus**

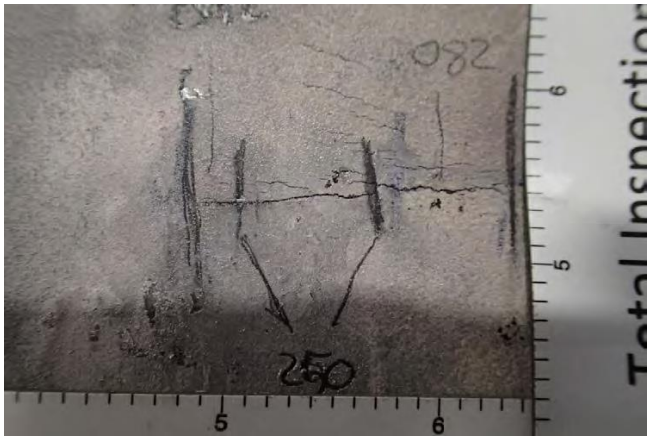
Mechanical Damage (MD)

- **MD Projects & Program Overview**
  - Define the capabilities of inspection technology to detect and differentiate mechanical damage features, including coincident and closely aligned features
  - Provide the methods to assess the severity of mechanical damage anomalies to distinguish between benign features and defects that require response action

Ongoing Work

- **Performance Evaluation of ILI Systems for Detecting and Discriminating Metal Loss, Cracks and Gouges in Geometric Anomalies**





Technology Development Center - TDC

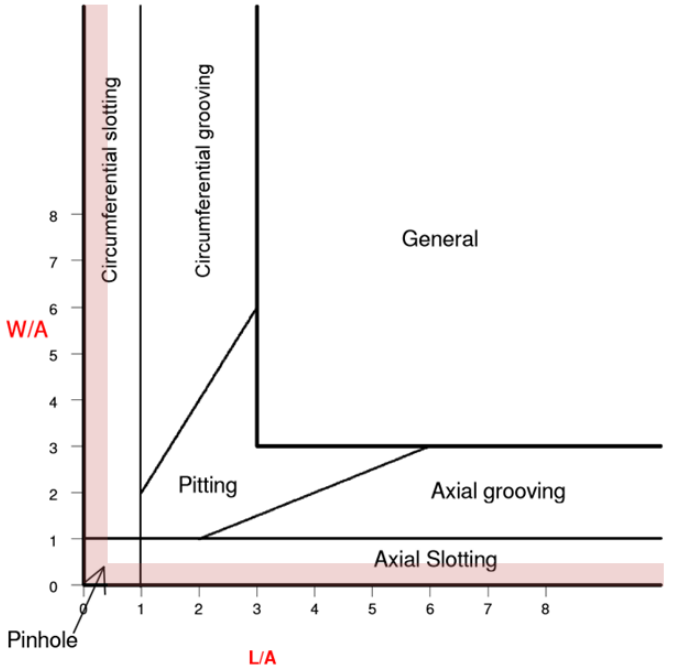
Industry Drivers

- **ILI specs vs Trial Results**
  - Work in progress
    - *All metal loss combined (artificial+natural+gouge)*
    - *Needs further NDE checkup*

Inside specification

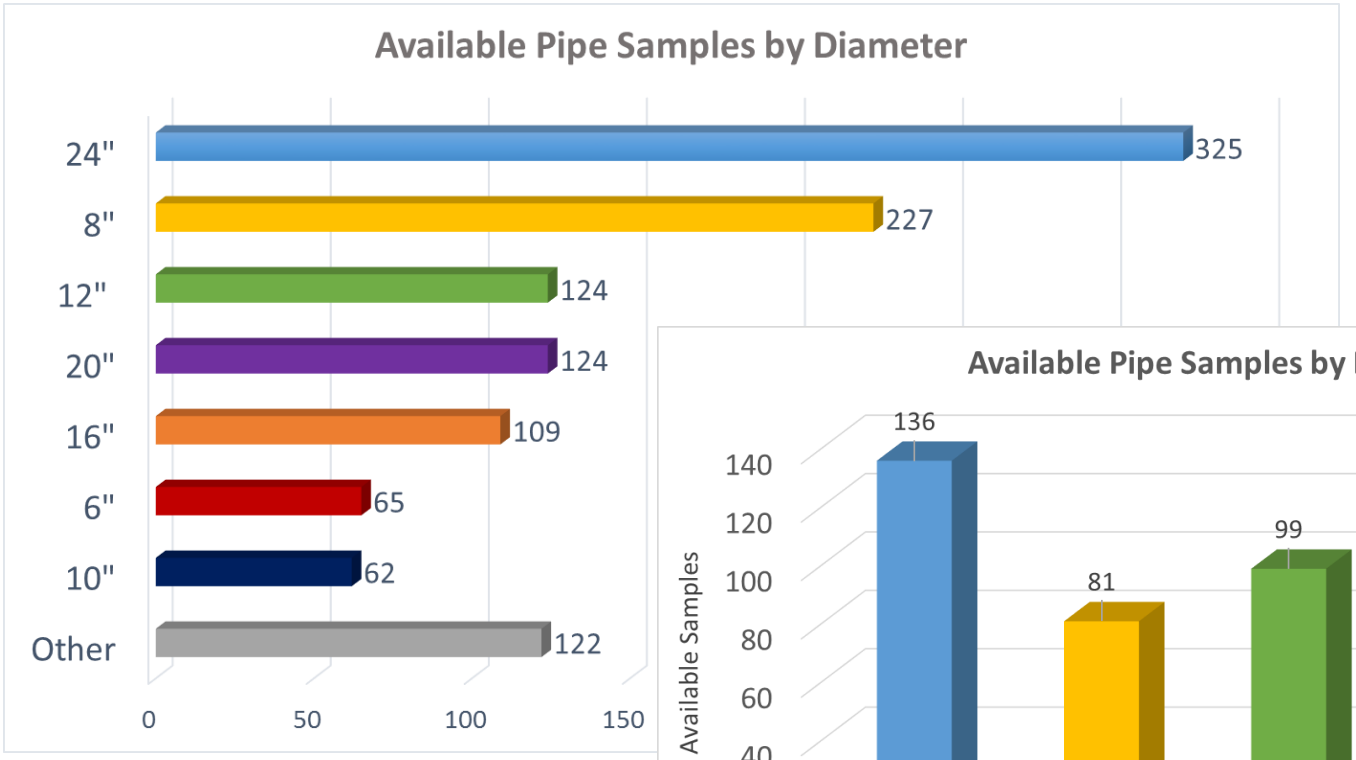
Outside specification

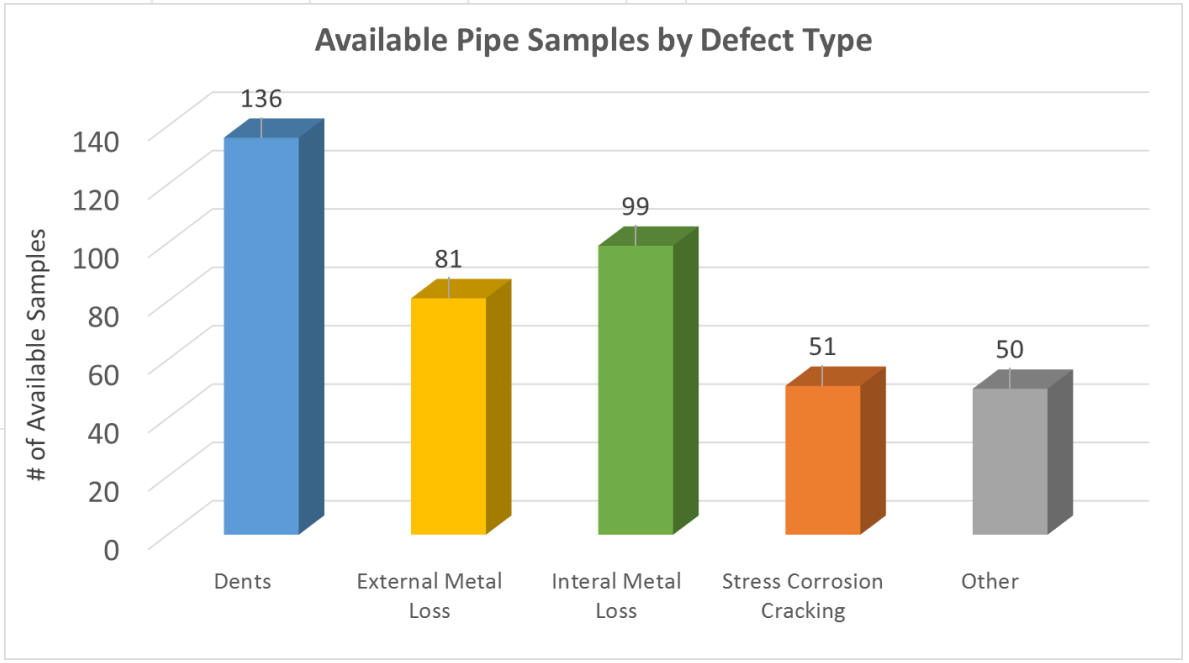
In progress



	GENE	PITT	AXSL	AXGR	CISL	CIGR	PINH	Below detection capability
POD								
POI								
Sizing Spec (d)								
Sizing Spec (L)								
~~Sizing Spec (FP)~~								

Pipe Sample Inventory at TDC





- 1,158 total pipe samples; pipe size range from 2” to 52”

Thank You