# Pipeline Research Council International

## Pipeline & Hazardous Materials Safety Administration (PHMSA) Projects Update & PRCI Strategic Priorities

Gary Hines, Vice President, Operations

IDTExpo Winter Meeting | December 5, 2019
Houston, TX, USA

PRCI

LEADING PIPELINE RESEARCH

IDTEXPO

# Emojis for Engineers

| | | | | |
|:---:|:---:|:---:|:---:|:---:|
| Happy | Sad | Mad | Amused | Love |
| Confused | Disgust | Surprised | Joy | The project is finished |

# Our Mission

**To collaboratively deliver relevant and innovative applied research to continually improve the global energy pipeline systems.**

PHMSA Projects

# PHMSA Projects

**Existing**

- *Modernize the Assessment of Pipeline Water Crossings*
- *Evaluation of Well Casing Integrity Management for Underground Storage Wells*

**New in 2019**

- *Validate In-Line Inspection (ILI) Capabilities to Detect/Characterize Mechanical Damage\**
- *Systematize 20 Years of Mechanical Damage Research \**
- *Improve Dent/Cracking Assessment Methods \**
- *Advance Computed Tomography (CT) for Pipeline Inspection*
- *Improve ILI Sizing Accuracy*
- *Increase Computational Pipeline Monitoring (CPM) Performance with Liquid Leaks*
- *Develop Remote Sensing and Leak Detection Platforms that can Deploy Multiple Sensor Types*

*\*Part of Mechanical Damage Strategic Research Priority*

# New Funding Model for PRCI

- **Why?**
  - Apply targeted focus on high priority energy industry issues
  - Higher level of collaborative coordination across multiple areas of expertise

- **How?**
  - Aggregating percentage of dollars from membership to aggressively attack strategic issue
  - Top-down and bottom-up collaboration through PRCI leadership groups
    - *Technical through executive governance*

- **What?**
  - Strategic Research Priorities (SRPs)

# Potential SRPs (Under Development)

- *Optimize the Detection and Mitigation of Mechanical Damage (Approved 2019)*

- Crack Management

- Weld Undermatch & HAZ Softening

- Comprehensive Assessment Models

- Geohazard Management

- Green House Gas Emissions Reductions

- Liquid Leak Detection

- Emerging Fuels

# R&D and Leadership Teams

# Research Program Managers



### Carrie Greaney, Program Manager

- Surveillance, Operations, & Monitoring
- Contact: cgreaney@prci.org



### Laurie Perry, Program Manager

- Corrosion
- Contact: lperry@prci.org



### John Lynk, Program Manager

- Inspection & Integrity
- Subsea (new committee for 2019)
- Contact: jlynk@prci.org



### Zoe Shall, Program Manager

- Inspection & Integrity
- Underground Storage
- Contact: zshall@prci.org



### Tom Marlow, Program Manager

- Design, Materials, & Construction
- Contact: tmarlow@prci.org

# Leadership Team

11



**Cliff Johnson, President**

- Contact: cjohnson@prci.org



**Gary Hines, Vice President of Operations**

- Contact: ghines@prci.org



**Natalie Tessel, Director of Brand & Member Engagement**

- Contact: ntessel@prci.org



**Gary Choquette, Director of Research Execution**

- Compressor & Pump Station
- Measurement
- Contact: gchoquette@prci.org

# Pipeline Research Council International

## Wrap Up, Questions, Discussion

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*Vice President, Operations*
*Pipeline Research Council International*
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**PRCi**

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# *Modernize the Assessment of Pipeline Water Crossings*

- **PHMSA PRIMIS Public Reporting Project Portal**
  - https://primis.phmsa.dot.gov/matrix/PrjHome.rdm?prj=746
- **Main Objective**
  - This project intends to supplement guidance from API RP 1133, and to expand and improve the capabilities of existing tools available to assess and monitor pipeline riverine crossings. Additionally, the project aims to develop and adapt risk screening tools through advances in engineering analysis that are field validated. As a PRCI-organized project, this project will benefit from the broad participation of pipeline companies that are focused on enhancing pipeline integrity.
- **Primary Contractor & Principal Investigator**
  - **Arcadis – Jeffrey Budzich**
- **Start Fiscal Year**
  - **2018**
- **End Fiscal Year**
  - **2020**

# *Evaluation of Well Casing Integrity Management for Underground Storage Wells*

- **PHMSA PRIMIS Public Reporting Project Portal**
  - https://primis.phmsa.dot.gov/matrix/PrjHome.rdm?prj=747
- **Main Objective**
  - Provide the industry a better understanding of the current state of the storage well logging tool technologies and their performance, factors affecting the tool response, and the suitability of available methods to calculate remaining casing strength. This understanding will reduce uncertainty in the evaluation of storage well casing integrity through accurate assessment of reliability, leading to improved decisions regarding well interventions and allowable operating parameters.
- **Primary Contractor & Principal Investigator**
  - **CFER Technologies – Gang Tao**
- **Start Fiscal Year**
  - **2018**
- **End Fiscal Year**
  - **2020**

# *Validate In-Line Inspection (ILI) Capabilities to Detect/Characterize Mechanical Damage*

- **PHMSA PRIMIS Public Reporting Project Portal**
  - https://primis.phmsa.dot.gov/matrix/PrjHome.rdm?prj=858
- **Main Objective**
  - This project will expand the current state of knowledge for ILI system performance to detect and characterize corrosion, welds, gouges and crack/crack field features interacting with dents. Understanding current performance of ILI systems will support technology enhancements and identify requirements for new technologies. The project will generate data supporting the development of revised dent response criteria being pursued in PRCI R&D projects and address recommendations issued to PHMSA by the National Transportation Safety Board (NTSB) to promulgate new regulations that address dent acceptance criteria.
- **Primary Contractor & Principal Investigator**
  - **BMT – Aaron Dinovitzer**
- **Start Fiscal Year**
  - **2019**
- **End Fiscal Year**
  - **2022**

# *Systematize 20 Years of Mechanical Damage Research*

- **PHMSA PRIMIS Public Reporting Project Portal**
  - https://primis.phmsa.dot.gov/matrix/PrjHome.rdm?prj=857
- **Main Objective**
  - A summary of work supporting the current state-of-knowledge related to mechanical damage will be presented, with a focus on formation and behavior, detection and characterization, assessment and management, remediation and repair, and recommended practices and standards. The summary will provide a consolidated review of previous research over the past 20 years, including requisite bibliographic references, and will characterize the achievements made as well as opportunities for improvement.
- **Primary Contractor & Principal Investigator**
  - **BMT – Vlad Semiga**
- **Start Fiscal Year**
  - **2019**
- **End Fiscal Year**
  - **2021**

# *Improve Dent/Cracking Assessment Methods*

- **PHMSA PRIMIS Public Reporting Project Portal**
  - https://primis.phmsa.dot.gov/matrix/PrjHome.rdm?prj=855
- **Main Objective**
  - This project will enhance previously developed tools being adopted in an industry recommended practice (API RP 1183) to improve its ability to support pipeline MD integrity assessment and management by considering three gaps: 1) ILI tools are proving increasingly effective at detecting and sizing cracks. The importance of cracks on MD failure pressure and fatigue life warrants that dent shape indentation crack formation criteria, should be applied and this project will enhance them by defining the upper bound strain in unrestrained dent features. 2) The existing fatigue life evaluation tools rely on a description of dent shape and interacting feature size reported by ILI systems. A review of ILI measurement data and pull-test trial data will be used to quantify typical levels of uncertainty in these measurements and quantify their impact on fitness for service evaluations. 3) Existing fatigue life estimation techniques are conservative, however, the appropriate factor of safety to be applied to analysis results is not well defined. This project will consider the variability of the assessment tool validation to define appropriate fatigue life safety factors.
- **Primary Contractor & Principal Investigator**
  - **BMT – Sanjay Tiku**
- **Start Fiscal Year**
  - **2019**
- **End Fiscal Year**
  - **2021**

# *Advance Computed Tomography (CT) for Pipeline Inspection*

- **PHMSA PRIMIS Public Reporting Project Portal**
  - https://primis.phmsa.dot.gov/matrix/PrjHome.rdm?prj=853
- **Main Objective**
  - The primary project deliverable will be a validated data set and process that confirms the use of CT as an NDE technology system that can be used for measuring crack and seam anomalies in pipe steels. Validating the CT Technology System will enable the pipeline industry to establish a set of reference standards that can be used for a wide range of purposes, including technology development and qualification, personnel training and competency testing. These reference standards will not require destructive testing to confirm the crack profile and can be used on a repeated basis. This is a significant step for the pipeline industry and will advance training, technology development, and integrity management programs.
- **Primary Contractor & Principal Investigator**
  - **ADV Integrity – Chris Alexander**
- **Start Fiscal Year**
  - **2019**
- **End Fiscal Year**
  - **2021**

# *Improve ILI Sizing Accuracy*

- **PHMSA PRIMIS Public Reporting Project Portal**
  - https://primis.phmsa.dot.gov/matrix/PrjHome.rdm?prj=856
- **Main Objective**
  - The goal of this work is to understand the probability of detection by the current state of the art ILI for immediate conditions, where the industry aspiration is 100% detection of critical integrity conditions. In addition, it is important to understand the probability of identification in order to minimize the number of missed defects without increasing the number of false indications, optimizing the number of excavations needed for a safe operation of the pipelines, and with a better utilization of resources in the threats with the highest risk to the safe operations of the pipeline systems.
- **Primary Contractor & Principal Investigator**
  - **Blade Energy Partners – Pablo Cazenave**
- **Start Fiscal Year**
  - **2019**
- **End Fiscal Year**
  - **2022**

# *Increase Computational Pipeline Monitoring (CPM) Performance with Liquid Leaks*

- **PHMSA PRIMIS Public Reporting Project Portal**
  - https://primis.phmsa.dot.gov/matrix/PrjHome.rdm?prj=859
- **Main Objective**
  - This project will address three primary leak detection systems gaps: [1] the ability to find smaller leaks, [2] the ability to find leaks faster and [3] the ability to find leaks more reliably (higher confidence, lower false alarms) than is possible with conventional CPM systems. The resulting machine learning (ML) CPM development will not be a replacement of current CPM algorithms, but will be an enhancement that will augment current CPM algorithms with highly sophisticated machine learning models to find smaller leaks than are possible today by going below the threshold (or noise floor) of those algorithms.
- **Primary Contractor & Principal Investigator**
  - **Southwest Research Institute – David Vickers**
- **Start Fiscal Year**
  - **2019**
- **End Fiscal Year**
  - **2021**

# *Develop Remote Sensing and Leak Detection Platforms that can Deploy Multiple Sensor Types*

- **PHMSA PRIMIS Public Reporting Project Portal**
  - https://primis.phmsa.dot.gov/matrix/PrjHome.rdm?prj=860
- **Main Objective**
  - The objective of this research project is to validate the performance of a complete end-to-end system, operating on a long-range, long-endurance unmanned aircraft that operates over hundreds of miles of pipeline ROW providing automated multi-threat ROW monitoring and surveillance through remote sensing systems. The project will generate data from multiple sensors deployed on aerial patrol in supporting pipeline performance and safety improvement programs. It will also provide data of value to the FAA with respect to the integration of long-range UASs into the National Airspace System.
- **Primary Contractor & Principal Investigator**
  - **American Aerospace Technologies – David Yoel**
- **Start Fiscal Year**
  - **2019**
- **End Fiscal Year**
  - **2021**

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**Technology Development Center**

# Technology Development Center

# Technology Development Center

# ILI Pull Test Facility Technical Specifications



| Technical Specifications | |
|---|---|
| pipe sizes available | 8", 12", 16", 20" and 24" (up to 42") |
| Pipe strings length | Up to 550ft long |
| operating speed range | 0.5 to 5 m/s (1 to 11 mph) |
| average time per pull test | 45mins (up to 8 pull tests per day) |
| maximum pull force | 40,000lbs |
| Recorded data | Distance, Speed, and Pull Force |
| Testing product | Air |
| product temperature | Ambient (above ground piping) |

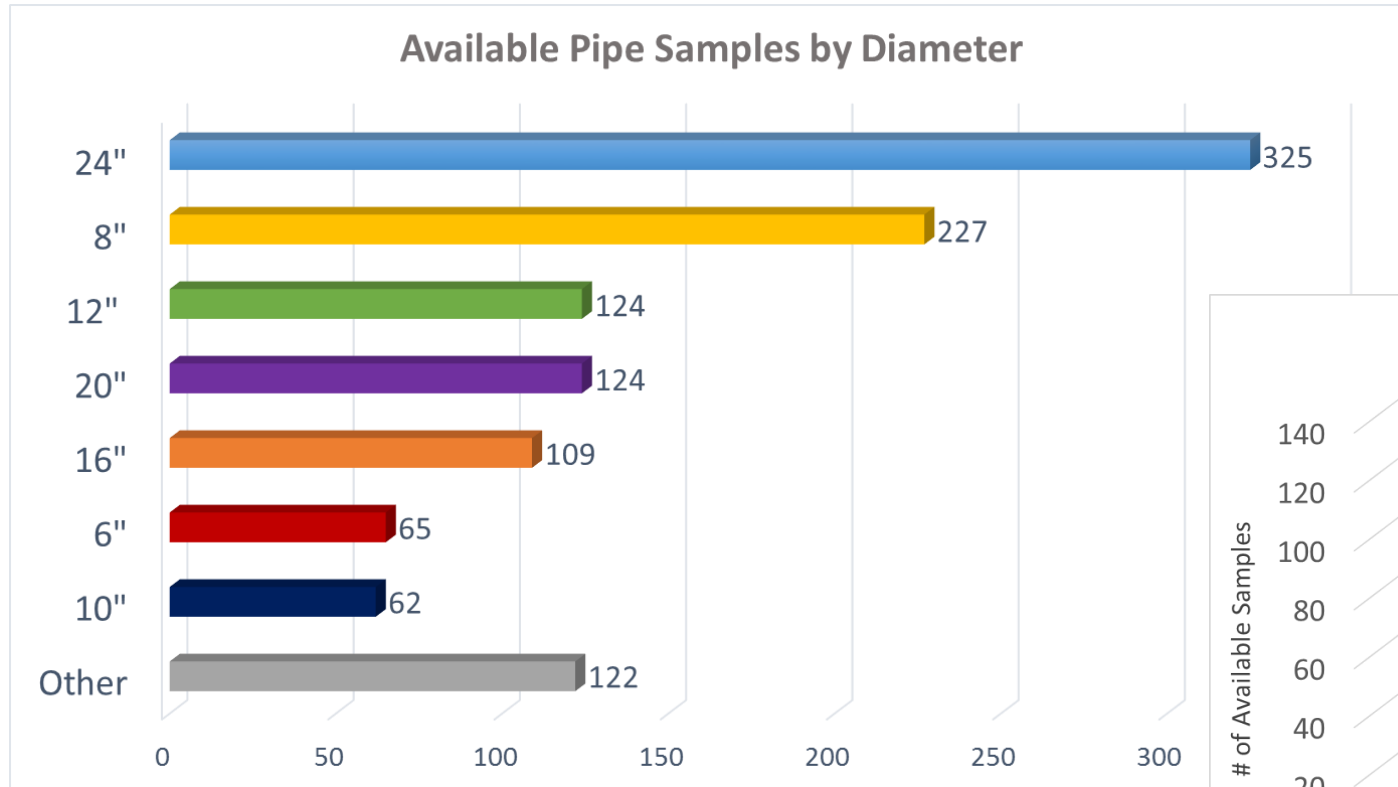# Liquid Loop Facility Technical Specifications



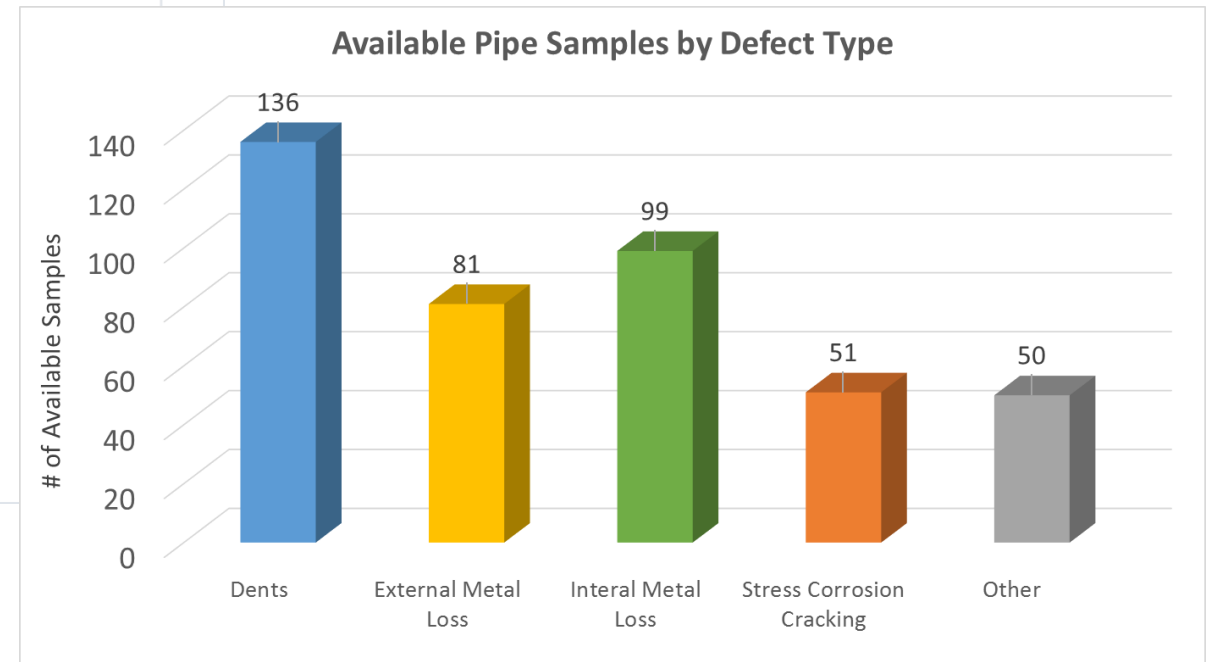| Technical Specifications | |
|---|---|
| pipe sizes available | 6" and 12" |
| piping length | 400ft (up to 800ft) |
| Testing product | Water |
| product temperature | Ambient (above ground piping) |
| maximum operating pressure | 2,000 Kpa (285 psi) |
| operating speed range | Up to 3.3 m/s (7.4 mph) |
| minimum pipeline bend radius | 5d (smaller bends available) |
| average cycle time | 5 minutes |

# Pipe Sample Inventory at TDC

## Available Pipe Samples by Diameter

| Diameter | Count |
|----------|-------|
| 24" | 325 |
| 8" | 227 |
| 12" | 124 |
| 20" | 124 |
| 16" | 109 |
| 6" | 65 |
| 10" | 62 |
| Other | 122 |

- **Now over 1,200 pipe samples**
- **Pipe size range from 2in to 52in**
- **A variety in wall thickness, vintage, and defect type**

## Available Pipe Samples by Defect Type

# of Available Samples

| Defect Type | Count |
|-------------|-------|
| Dents | 136 |
| External Metal Loss | 81 |
| Interal Metal Loss | 99 |
| Stress Corrosion Cracking | 51 |
| Other | 50 |

# Come Visit Us!

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# Save the Date!

## 2020 Research Exchange

## (REX2020)

# March 3-4, 2020 | San Diego

Registration: http://www.cvent.com/d/tyqb9q

*Please Contact Us (rex@prci.org) if Your Company is Interested in Sponsoring*

Research
Objectives

# Research Objectives

1. Develop and/or validate technology and analytical processes capable of **confirming pipeline material properties for pipeline integrity assessments**.

2. Develop and **enhance ILI technology** to reliably detect, size and characterize specific indications that may be harmful to the integrity of the pipeline.

3. Develop, evaluate and **enhance NDE technologies and operator & data analyst performance** to assess the integrity of pipelines and associated infrastructure from outside or above the pipeline or facility.

4. Confirm the fundamental integrity and safe operation of **vintage pipelines** by expanding the applicability and reducing the uncertainty of **Fitness for Service** methodologies, including defining critical feature dimensions, associated models & response criteria.

5. Develop, demonstrate and validate **repair systems, including those that can be deployed on in-service facilities**. Determine the useful life and safe operating envelopes of such repair systems.

6. Develop, demonstrate and validate **intrusion monitoring and surveillance technologies** to enhance detection of third-party activities, ground movement and interferences potentially affecting pipeline infrastructure.

7. **Reduce all product leaks and equipment emissions** from all parts of the hydrocarbon transport and storage infrastructure by developing, demonstrating and validating processes and technologies to detect, quantify and mitigate such releases.

8. Improve the efficiency, operational flexibility and availability of **compressor & pump station, measurement and storage facilities**. Reduce the lifecycle cost of these facilities as flow patterns and market demands shift. Reduce custody transfer uncertainty and better identify trace gas constituents.

9. Define, understand and improve the **key practices, including models**, involved in the design, construction and integrity management of pipelines and related facilities.