Pipeline Research Council International, Inc.

PHMSA R&D Forum
Working Group #2

Remote Sensing/Leak Detection-Mitigation

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Presentation Overview

- PRCI Overview
- Recent Completed Work
- Ongoing Work
- Areas of Interest

Mission Statement

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

PRCI Membership

- **32 Energy Pipeline Operating Companies**
  - 17 Natural Gas Transmission; 7 Liquid
  - 8 Liquid/Natural Gas
- **4 Pipeline Industry Organization (PIO) Members**
  - American Petroleum Institute (API)
  - Association of Oil Pipe Lines (AOPL)
  - Canadian Energy Pipeline Association (CEPA)
  - Operations Technology Development (OTD)
- **34 Associate Members & Technical Program Associate Members**
  - Australia, Canada, China, Europe, Japan, U.S.
- **Worldwide Research Organization**
  - 45 North American Companies (U.S. & Canada)
  - 25 Non-NA (Australia, Brazil, China, Europe, India & Japan)

Current Operator Membership

Natural Gas

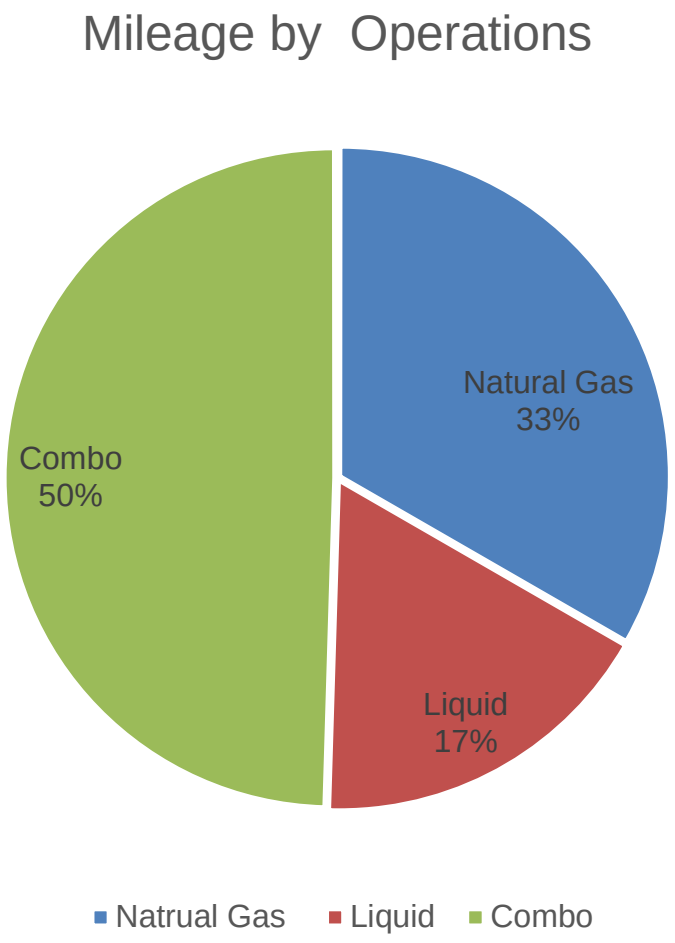
- Alliance
- ATCO
- Boardwalk
- Cadent
- Dominion
- Energy Transfer
- Gassco
- Gasunie
- GRTgaz
- National Fuel
- National Grid
- OTD
- PG&E
- SoCalGas
- Total
- TransGas
- Williams

Liquid

- API
- AOPL
- Buckeye
- Chevron
- Colonial
- ExxonMobil
- FHR
- Marathon
- Phillips 66
- Plains

Combo

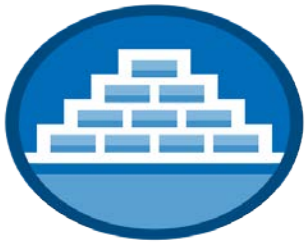
- ConocoPhillips
- Enbridge
- Enterprise
- Kinder Morgan
- Petrobras
- PetroChina
- Shell
- TransCanada



PRCI Research

PIPELINE TECHNICAL COMMITTEES

Corrosion



Design,
Materials
& Construction

Integrity
& Inspection

Surveillance,
Operations
& Monitoring

FACILITY TECHNICAL COMMITTEES

Compressor
& Pump Station

Measurement

Underground
Storage

Technology Development Center (TDC)

SOM Committee Overview

Surveillance, Operations & Monitoring

Technical Committee

- **Right-of-Way Threat Detection/Monitoring**
  - Remote- intermittent Leak Detection, 3rd Party Threats
- **Geohazard Monitoring**
- **Continuous Leak Detection**
- **Human Organizational Factors** – Safety Engineering & Damage prevention

CHAIRWOMAN
Leanne Meyer
Marathon Pipe Line

VICE CHAIRS
Mike McCutcheon
TransCanada

Mohamed Elaoudiy
Phillips 66

Niko Salmatanis
Chevron

ROW Monitoring Completed Work

Right-of-Way Automated Monitoring (RAM) Threat Detection Package

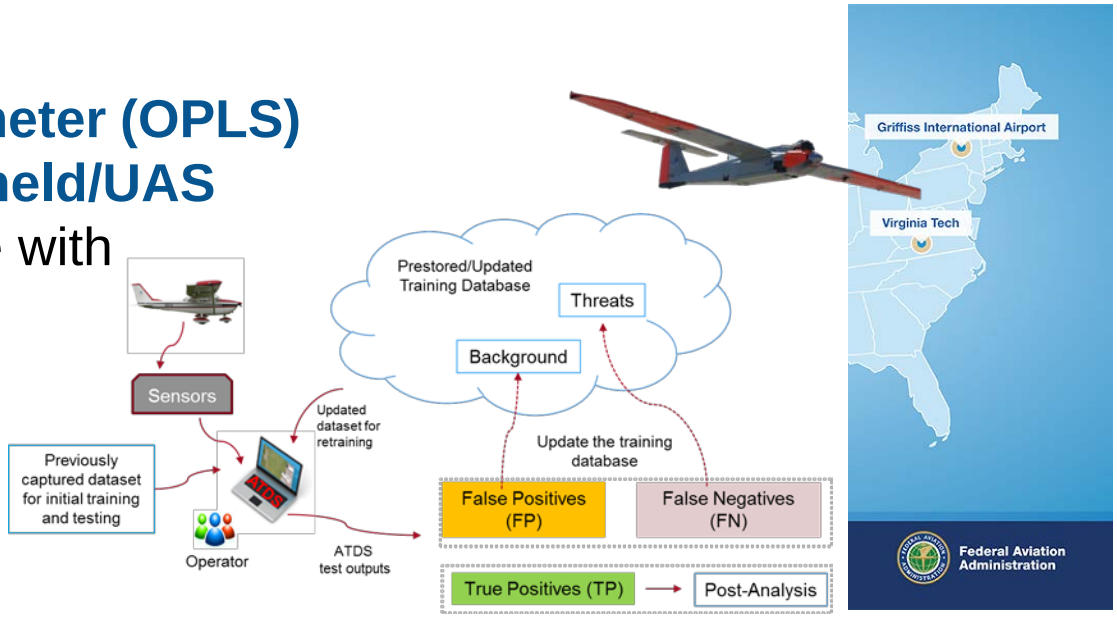
- Final Report: *SM-403-148100-R01*

Demonstration of the Use of Long Endurance Unmanned Aircraft System (UAS) to Conduct Machinery Threat Detection and Oil Spill Detection on a Pipeline Corridor in the National Airspace System

- Final Report: *PR-403-123706-R01*

Open Path Laser Spectrometer (OPLS) Methane Detector – Handheld/UAS

- Commercially available with RKI & SeekOps



ROW Monitoring On-going Work

Methane/Ethane Detector UAS

- **Objective:** Phased development of a methane detector for handheld and UAS platforms (VTOL & fixed-wing) to include ethane for biogenic differentiation
  - *The sniffer optical head is an open-path, multi-pass tunable laser spectrometer and plots all data atop a 2D map in real-time on a tablet*

Evaluation of Current ROW Threat Monitoring, Applications and Analysis Technology

- **Objective:** Determining which ROW monitoring systems are best suited to specific information requirements of the pipeline sector, and determining which systems add value to the existing monitoring approaches

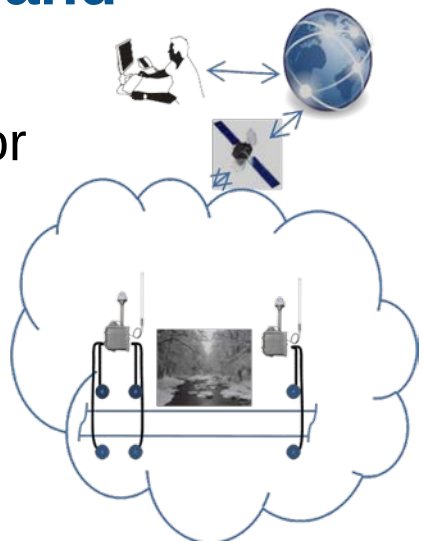
ROW Monitoring On-going Work

Use of Aerial LiDAR Data Collection for Geohazard Assessment

- **Objective:** Develop lessons learned about how to deploy and operationalize LiDAR for pipeline integrity and ROW surveillance. Validation includes data to support topographic/depth of cover change comparison.

System for Monitoring Integrity, Geohazards, and Leaks at River Crossings

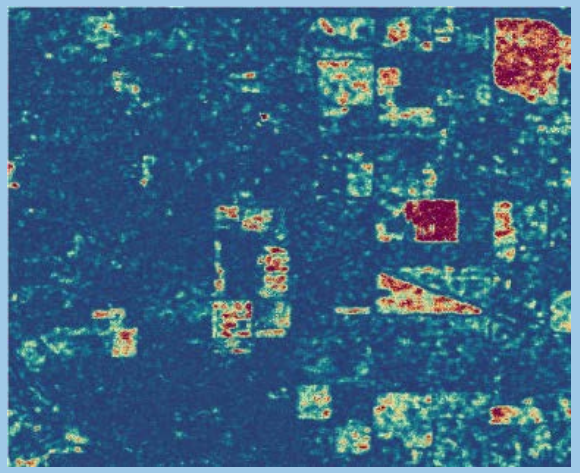
- **Objective:** The development of a dedicated system for monitoring underground pipeline facilities at river crossings, especially those without ready access to power and communications.



ROW Monitoring On-going Work

Optimal Approach to Cost Effective, Multi-source, Satellite Surveillance of River Crossings, Slope Movements and Land Use Threats to Buried Pipelines

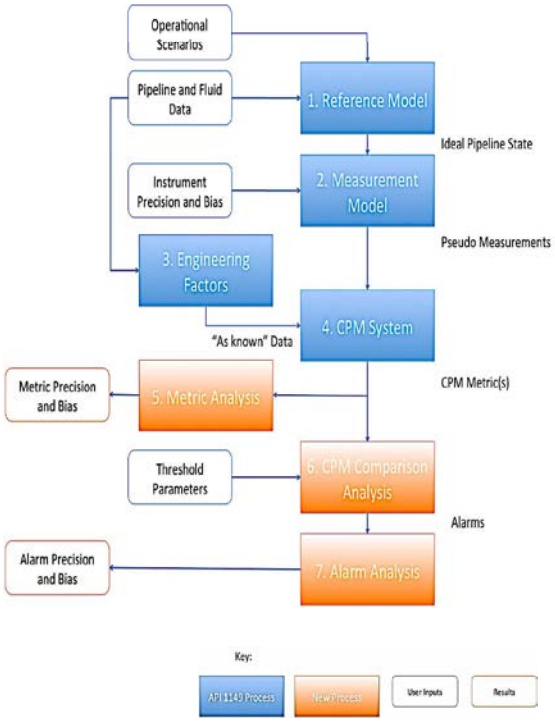
- **Objectives:** Investigate the application of satellite monitoring of river bank deformation, channel dynamics, changes to soil (erosional) conditions and land cover/land use over buried pipelines.



Continuous Leak Detection Completed Work

PRCI API 1149 Software Tool - A New Look at the Pipeline Variable Uncertainties &Their Effects on Leak Detection Sensitivity Software Tool

- softwaresupport@pric.org to request

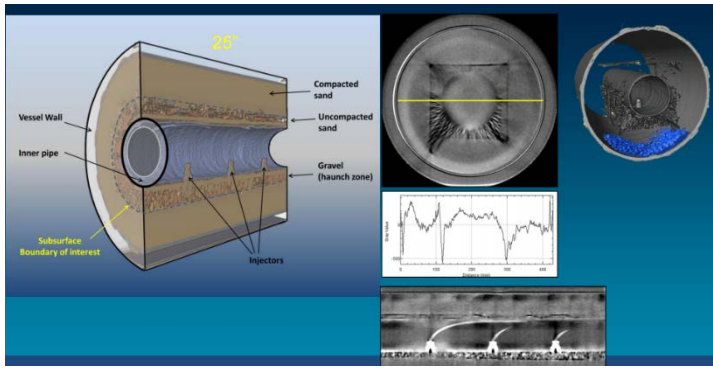


Numerical Modelling and Lab Simulation of Subsurface Fluid Migration

- Final Report: PR-487-143727-R01

Field Testing of Selected Technologies for In-situ Detection of Small Leaks from Liquid Pipelines – DAS Systems

- Final Report: PR-015-163766-R01



On-water Leak Detection Technology Evaluation – Phase 1

Continuous Leak Detection On-going Work

Evaluation and Development of a Petroleum Pipeline Leak Detection Cable Utilizing Polymer Absorption Sensor Technology Large Scale Testing

- **Objective**: To demonstrate a proof-of-concept cable system incorporating Polymer Absorption Sensors (PAS) for hydrocarbon leak detectors.

Retrofitting Pipelines with Cable-Based Technology

- **Objective:** Improve pipeline monitoring options for the extensive installed pipeline infrastructure by identifying, developing and testing approaches for retrofitting pipelines with cable-based sensor technology

Literature Survey of Sensor Capability When Embedded in Coatings in the Detection of Small Leaks

- **Objective:** Review of commercially available sensors applied in coatings for small leak detection

Emerging Areas of Further Interest

Right-of-Way Monitoring – Remote Sensing

- Geohazards
  - *Field demonstrations and validation of technologies over a range of terrain and environmental conditions*
  - *River crossings – better modeling and prediction of stress/strain on pipe based on above-ground monitoring data*
- Third-Party Threat and Change Detection
  - *Industry Operational best practices of technology deployment*

Leak Detection

- Need for publicly available or industry wide information on accuracy and robustness of leak detection technologies
- Methane/ethane leak detection and *reliable* quantification of emissions/leaks
- Validation of technologies in operating conditions for pipelines – most industry focus has been in upstream and downstream technologies

Pipeline Research Council International

LEADING PIPELINE RESEARCH

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