Pipeline Research Council International, Inc.

PHMSA R&D Forum
Working Group #2

Remote Sensing/Leak Detection-Mitigation

Carrie Greaney
Program Manager
Surveillance, Operations & Monitoring
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

#### Mileage by Operations

- **Natural Gas**: 33%
- **Combo**: 50%
- **Liquid**: 17%

---

**Legend**
- **Natural Gas**
- **Liquid**
- **Combo**
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
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.
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