Pipeline Research Council International, Inc.

Advancing Leak Detection Technologies for Operating Energy Transmission Pipelines

PRCI Research Programs – Review & Challenges

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LEADING PIPELINE RESEARCH



PRCI Membership Drives Research

• 38 Energy Pipeline Operating Companies

- 25 Natural Gas Transmission; 11 Liquid
- 2 Operators both Liquid and Natural Gas Transmission

World-wide Research Organization

- 26 U.S. Companies
- 12 Non-U.S. (Brazil, Canada, Europe, Saudi Arabia)

14 Associate Members

U.S.; Canada; Mexico; Japan

Total mileage represented ~355,000 miles

PRCI

LEADING PIPELINE RESEARCH WORLDWIDE

Applus RTD Association of Oil Pipe Lines (AOPL) Berg Steel Pipe Corp. **Boardwalk Pipelines** BP **Buckeye Partners, LP Cameron Compression CenterPoint Energy Gas Transmission Chevron Pipe Line Company Colonial Pipeline Company Colorado Interstate Gas** Columbia Gas Transmission Corp. **ConocoPhillips Pipe Line Company Dominion Transmission Corp. Dresser-Rand Corporation El Paso Natural Gas Enbridge Energy Partners, LP** EPCO, Inc. **Explorer Pipeline Company ExxonMobil Pipeline Company** GE Oil & Gas **Lincoln Electric Company** Sumitomo Metal Industries **Marathon Pipe Line LLC** National Fuel Gas Supply Corp. NDT Systems & Services Inc. Pacific Gas & Electric Co. **Panhandle Energy Company** Rosen **Shell Pipeline Company LP** Siemens Energy & Automation, Inc. Solar Turbines Inc. Southern California Gas Co. **Southern Natural Gas Spectra Energy Transmission, LLC** T.D. Williamson, Inc. **Tennessee Gas Pipeline Transwestern Pipeline Co.**

Williams Gas Pipeline

Alliance Pipeline Ltd. **Enbridge Pipelines Inc.** Evraz Inc. NA TransCanada PipeLines, Ltd. TransGas, Ltd.

N.V. Nederlandse Gasunie

National Grid

Total S.A.

Gassco A.S.

GDF Suez

Saudi Aramco

Tubos de Acero de Mexico

Petrobras

Australian Pipeline Industry Association

Nippon Steel



PRCI Research Development & Implementation

Research Project Development

- Annual process ballot voting and project funding
- Approximately \$10-13 MM annual funding commitments
 - Includes membership allocations and other funding sources

Success through Collaboration

- Within the membership
- Other organizations
 - Industry groups and trade organizations
 - PHMSA
 - Other cofunding sources with interest

www.prci.org



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Why is this Forum & Process Important?

- Demonstrated, Positive Benefits of PHMSA R&D
 - Standards
 - Knowledge
 - Technology
- Leveraged Research Investment
- Broad Access to Research Results
- Sustaining & Expanding the Industry Knowledge Base
- Peer-based Planning, Implementation, and Results
- A Consortium of Ideas and Solutions
- A Proactive Commitment to Industry and the Public



Leak Detection - Drivers & Challenges





Research Drivers for Leak Detection

Safety and Environmental Performance

- Potential for unknown/unexpected worker and public exposure
 - Incidental contact
 - Vapor/gas intrusion concerns (liquids)
- Liability for natural resource impacts and damages
 - Remediation and restoration
 - Legal claims
- LAUFE emphasis on greenhouse gas releases

Financial and Economic Considerations

- Keeping product in the pipe and delivery to market
- Paying for liabilities from above
- Credits and trading

Public Perception and Corporate Citizenship

- Encroachment
- Enhanced awareness

The Best Leak is One that Never Happens (API website)







PRCI Leak Detection Research

- Past Efforts Conducted to Research a Number of Leak Detection Approaches and Technologies
 - Satellite and remote sensing linked to Damage Prevention
 - Fiber Optic cables
 - Human Factors and Control Room Operations
 - Computational Pipeline Monitoring (CPM)
 - Acoustic methods

Recent Gap Analysis

- 2007 Report from SwRI
- Aerial reconnaissance primary method
- PRCI Facilities Program







Current State of Leak Detection

- Two General Approaches to Leak Detection
- Direct visual, soil sampling, instruments & sensors
- Indirect changes in measurements/data





Key Industry Challenges and R&D Needs

- Challenging Environments and Conditions (e.g., urban/asphalt, ice, water)
- Continued Aging of Infrastructure
- New Standards and Regulations Technology Adaptability
- Sensitivity of Measurement Systems Relative to Minimal Release Volumes/Rates – False Calls and Reliability
- Locating a Release after Detection
- Increased Scrutiny on LAUFE
- Development of Cost Effective Approaches
 - Substantial mileage of energy transmission systems
 - Varying needs based on unique conditions for individual operators
 - No single technology can address all pipeline issues tiered approach, multiple technologies
 - Inside & outside the fence



Research Focus for Path Forward

- Renewed focus on leak detection interest increasing as a key aspect of GHG programs
- Improved ROW monitoring identification of small leaks early detection and mitigation – understanding of L vs R boundary
- External leak detection and slack line conditions
 - Imaging IR, GPR, laser-dispersion
 - Vapor monitoring
 - Acoustic emission sensors
- Capitalize on current commercial methods and technologies
- Research new and emerging technologies
 - Land-based, fixed wing, UAV, and satellite
 - Continued Human Factors analysis
 - Methods for monitoring both internally and externally
 - Opportunities with new construction/systems
 - Improving SCADA & CPM capabilities



Key Industry Challenges and R&D Needs

- Improve understanding of current system performance and capabilities – POI, POD, POFC; satellite, aerial patrol, ground surveillance, in-situ monitoring etc.
- Improved integration of industry-government databases; mining existing information and extracting the value – Predictive Modeling (PPTS)
- Developing new technologies that can be integrated into existing platforms
- Application of emerging technologies hyper-spectral, DIAL, LiDAR
- Real time processing, communication, and reporting
- Continued focus on public awareness and Best Practices







Additional Projects Being Considered

- PRCI 2010 Ballot Items
 - Several projects that focus on leak detection and threat prevention



Questions?