Technologies to Enhance Pipeline Safety

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New England Pipeline Safety Conference

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Value of Gas R&D Programs

R&D Programs Help Gas Operators

- Understand and mitigate risk
- Enhance safety
- Minimize operating and capital costs
- Provide for more efficient operations

Ensuring a safe and reliable natural gas delivery infrastructure
## R&D Sponsors

<table>
<thead>
<tr>
<th>Alagasco</th>
<th>Ameren</th>
<th>APGA</th>
<th>Atmos Energy</th>
<th>Avista</th>
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<td>ConEdison</td>
<td>Duke Energy</td>
<td>Enbridge</td>
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<td>Intermountain Gas Company</td>
<td>National Fuel</td>
<td>National Grid</td>
<td>NiSource</td>
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<td>NYSEG</td>
<td>RG&amp;E</td>
<td>Oklahoma Natural Gas</td>
<td>Pacific Gas and Electric Company</td>
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<td>Questar Gas</td>
<td>Southern California Gas Company</td>
<td>Southwest Gas</td>
<td>TECO Peoples Gas</td>
<td>Washington Gas</td>
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</table>
Asset Tracking & Traceability

> Provides comprehensive traceability for materials, fusions/welds, and OQ status

> Component level material traceability with high accuracy GPS to locate specific fittings

> Fusion and weld traceability to capture parameters

> OQ traceability to ensure quality workmanship

> Enables regulatory compliance
  - DIMP “Know Your System”
  - Plastic Pipe Rule NPRM
  - IVP NPRM, RTVC records

> Benefits beyond regulatory compliance
  - Improves the quality & efficiency of data collection
  - Promotes quality and oversight through the use of technology
Asset Tracking & Traceability

> Streamlines the process of getting material traceability data from the field into the enterprise system

> Increased the quantity and quality of as-built data collection
Natural Gas Distribution Standard

> Algorithm and ASTM Standard

- Unique identifier for distribution asset tracking and traceability
- ASTM F2897-11a
- Manufacturer implementation through barcoding
- ~75% vendor compliance

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Information Mfg. Values
Lot Number 1234567
Production Date 1/4/2010
Material Type PE2708
Component Type Electrofusion tapping tee with a stab outlet
2” IPS SDR 11 x 1” IPS SDR11
Component Size 2” IPS SDR 11 x 1” IPS SDR11
Operator Qualifications, Recalled Assets, & Component Validation

> Developed software components for:
  
  - **Operator qualifications (OQ)** – validate OQ during fusion process
  
  - **Recalled assets** – in-field validation of gas system components being installed
  
  - **Component validation** – validating components during installation against company approved materials list.
Supporting Implementation

GTI spinout, LocusView Solutions, created to provide implementation services for advanced mobile and geospatial technologies customized for the natural gas industry

- LocusMap for tracking & traceability of materials, fusions/welds, OQ status, and pressure tests for plastic and steel assets
- LocusIQ for intelligent inspections of new construction quality using statistical quality control and risk-based models
RFID Marker Ball Program

> Reduce excavation damage by enhancing the ability of locators to properly identify the location of underground facilities

  – Overcomes many of the issues of tracer wire including broken connections and limited access
  – No signal, interference from nearby structures, poor GPS signal
  – Provides a mechanism to locate facilities where traditional locating tools don’t work
Intrinsically Locatable Technology for Plastic Piping Systems

> Objective
  — Develop and test a viable solution for intrinsically locatable polyethylene (PE) materials with an integral electronic marking system
  — Partner with 3M Company and a large pipe manufacturer to develop the electronic markers and attach the marker to PE pipe
  — GTI will provide third party testing and analysis of the developed system

> Focus
  — Complete the development, define and test the electronic marker capability, validate the attachment design, and perform laboratory and field testing
ROW Monitoring with GPS

> **Value** – Provides situational awareness of potential excavation damage, allowing time for pre-emptive actions

> **Objective** – Develop technology that uses GPS to track excavation activity and provide warnings of encroachment

> **Deliverables** – Pilot projects in California, New York, and Texas; award pending with CEC for scaled deployment and evaluation
Residential Methane Detector Program

- Customer behavior suggests that odorant alone is not enough for customers to report leaks
- Recent events have heightened the focus on how unreported leaks can result in tragic outcomes
- Having an alert system such as a residential methane detector benefits both the customer and the utility
Residential Methane Detectors

Program and Timeline

2014
- Phase 1 testing of commercially available residential methane detectors*
- Phase 2 testing of commercially available residential methane detectors (includes international products)

2015
- Consumer behavior study
- Address existing product’s detection levels
- Begin effort to create a fit-for-purpose UL standard
- Establish plan for pilot program

2016 - 2017
- Execute pilot program
- Education/public awareness campaign
- Work with manufacturers to get products into market with lower detection levels

*Testing was done in 2010
Residential Methane Detectors
Phase 2 Testing (2014)

> 13 brands (US and international) were tested at methane levels ranging from 6% LEL to 25% LEL and for 19 interfering chemicals (typical household chemicals)

> 11 of the 13 brands alarmed at 25% LEL (UL standard)

> 7 of the 13 responded to interfering chemicals

> 3 UL certified brands were selected for the pilot study based on performance in lab testing
  
  ─ 2 brands alarmed at 6% LEL
  ─ All 3 brands did not respond to any interfering chemicals
Pilot Study - Test Plan

> Three manufacturers selected based on previous lab testing/performance and market share

> GTI will provide all detectors and components for installation; utilities will install in residential customer homes

> Pilot study duration will be 12 months

> Utilities will need to remove detectors from homes once pilot is complete and return to GTI for post testing

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
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<tr>
<td>Residence</td>
<td>Single Family</td>
<td>Multi-family</td>
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<tr>
<td>Location</td>
<td>Sleeping Area</td>
<td>Living Area</td>
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Remote Gas Sensing and Monitoring

> Objective: To create a device to remotely monitor the level of gases during emergency gas leak situations

> Need: First Responders need a tool that enables the monitoring of methane, CO, and other gases over a local area

> Remote monitors can be placed in each home and confined space. The remote monitors would transmit data to on-site personnel, providing concentration levels in real time

> This approach will enhance the safety of first responders and also the general public
Breakaway Fittings for Meter Safety

> Breakaway disconnect / shutoff fitting for meter set assemblies (MSA) and other aboveground gas systems
> Reduce the risk from vehicle collision or ice/snow falling from a building
> Beta prototypes available 2016

— OPW Engineered Systems
Solution

EFV’s can mitigate risk when installed on new and replaced services but cannot be easily installed on existing services to mitigate risk.

Other industries utilize breakaway disconnects. For example, gas stations utilize them on their fueling pumps.
Designs and Prototypes

> Several conceptual designs were created.

> The design selected was due to:
  ─ Simple design
  ─ Minimal moving parts
Breakaway Fitting Installed at Utility Site

Meter set “as found”

Meter set after breakaway installed
Kleiss Flow Stopping System

> **Inflatable Stoppers**: an alternative to currently employed stopping equipment for use on pipes **up to 18” in diameter and pressures up to 60 psig** for the following pipe types:
  - Cast iron
  - Steel
  - PE
  - PVC pipes

> No-blow operations

> Small fittings with taps up to 3”

> **Lightweight** equipment

> **Alternative to squeezing PE pipe**
  - Vintage PE susceptible to cracking
  - Large diameter thick-walled PE

> Commercially available through Mainline Control Systems (MCS) and Mulcare Pipeline Solutions (Northeast Distributor)
Innovations that Provide Safety & Integrity Opportunities

Daphne D’Zurko
Executive Director, NYSEARCH
Current NYSEARCH Members

- Alagasco
- BG & E
- CHG & E
- Con Ed
- Enbridge Gas
- NGrid/Keyspan
- National Fuel Gas
- NGrid/Niagara Mohawk
- NYSEG
- O & R
- PSE&G
- PECO Energy
- PG & E
- Questar
- RG & E
- SoCal Gas
- SouthWest Gas
- Union Gas
- Washington Gas
- Xcel Energy
Inspection of LDC-owned Transmission Pipes

- Have completed all planned Explorer robotic inspection platform sizes for un-piggable pipe
  - 6” – 36” pipeline sizes; up to 750 psig
  - Visual and MFL data; operate thru bends and plug valves
  - Tetherless, battery powered, wireless communication, operation under live conditions

www.pipetelone.com
Supporting Technologies Enhance Inspection

- Addition of sensing functionality to Explorer platform
  - Mechanical damage/ovality
  - Crack sensor (TMFL/EMAT and EC)
  - Hardness Tester
  - Higher quality data in bends

![Image of mechanical damage sensor data](image1)

![Image of cracked sample](image2)
Scenes from Commercial Jobs

Over 30 gas companies in N. America have used these tools
Technologies Available or On the Horizon

- Live Electrofusion Repair Sleeves for PE
- Cased Pipe Vent Inspection
Technologies Available or On the Horizon (cont.)

- Better Techniques/Tools for Non-Destructive Evaluation of PE joints
- sUAS (drones) for inspection & methane detection
- Next Generation Methane Detector for Use in Homes

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Implementation and market development of innovations in a regulated, risk-averse pipe environment are challenging!

Experienced personnel are essential to support testing and secure variance from traditional work practices.

Thanks to the many gas companies that are proactive in innovations for safety and integrity.