

Mechanical Damage Technical Workshop

- > Detection and Characterization
Technology Research

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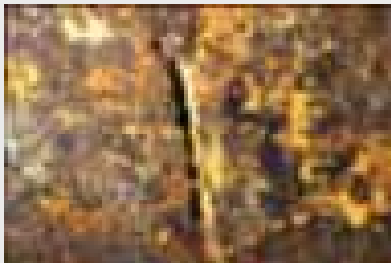
Operations Technology Development (OTD)

- > OTD is a stand-alone, member-controlled company where gas utilities work together to develop technology solutions to common operations issues
 - Membership dues are based on the number of customers
 - Each company votes and allocates their own dollars toward specific projects
 - All members have access to all project information
 - Established in 2003
- > Currently 17 members
- > 2006 Dues are approx. \$7.4mm

Research Program Areas

- > OTD Funds 6 Program Areas
 - Pipe and Leak Detection
 - Pipe Materials, Repair, and Rehabilitation
 - Excavation and Restoration
 - Pipeline Integrity Management and Automation
 - Operations Infrastructure Support
 - Environmental Science and Forensic Chemistry

- > 17 new projects starting in 2006



Damage Detection and Characterization Technology Challenges

- > Improved inspection capabilities
 - From the surface to avoid cost of excavations or entering the pipe
 - Detection of specific points of coating disbondment and shielding
- > Increased “smartness” of the pipe to communicate the conditions leading to damage
 - Internal coatings
 - Wraps

Keyhole Excavation Programs

- > Description:
 - Addresses inspecting, characterizing damage, and repairing any buried pipe system
 - Develop tools to externally and internally inspect and repair buried facilities through smaller, less expensive openings. Keyhole excavations are 18 inches in diameter or smaller.
 - > Adapt broadband electromagnetic technology to allow direct pipeline inspections through the keyhole to measure pipe-wall thickness externally
 - > Modify an internal inspection camera to launch into a live main through a keyhole
- > Status:
 - Prototype tools are being developed and commercializing partners are being sought for each tool
- > Contractors: GTI and developers
- > Time Frame and Funding: 2004-7, \$745k, Cofunded by utilities

Flaw Acceptance Criteria and Repair Options for Low-Stress NG Pipelines

- > Description:
 - Address characterizing denting and metal deformation for all metallic low stress pipelines
 - Demonstrate that flaw acceptance criteria and repair options that apply to highly stressed pipelines (greater than 30 or 40% Specified Minimum Yield Strength, SMYS) are overly conservative and may need to be relaxed for low stress pipelines
 - If the data and validation tests are accepted, operators of low stress pipelines could then accept larger flaws and use less expensive repair methods. Develop alternative repair tools.
- > Status:
 - Evaluate potential repair techniques and fittings during 2006
 - Keep ASME B31.8 committee and DOT PHMSA up to date
- > Contractor: GTI
- > Time Frame and Funding: 2004-8, \$900k

Reduce Inspection Costs through Remote Field Eddy Current Inspection of Unpiggable Pipelines

> Description:

- Addresses detecting and characterizing metal loss for gas pipelines
- Develop remote field eddy current inspection technique using relatively small components as a solution for inspecting pipelines with multiple diameters, valve and bore restrictions, and tight or miter bends
- Small-size inspection elements provide low cost in addition to the ability to inspect a wider range of pipelines. The system will operate non-tethered in “live” conditions.

> Status:

- Currently building a prototype and conducting bench-level tests
- For use with Explorer II robot as part of larger DOE program

> Contractor: GTI

> Time Frame and Funding: 2003-3, \$600k, cofunded by PRCI,DOE

Inspection Sensor and Platform for Unpiggable Pipelines

- > Description:
 - Addresses detecting and characterizing metal loss in gas pipelines
 - Objective is to design, construct, and test a Magnetic Flux Leakage sensor and a robotic platform that when integrated are able to negotiate all obstacles in a pipeline when performing an inspection on unpiggable systems
- > Status:
 - Prototype systems are being built and tested in 2006
 - Discussions underway with potential commercializers
- > Contractors: NYSEARCH/NGA and developers
- > Time Frame and Funding: 2003-6, \$810k to cofund the NYSEARCH program with DOT, SoCal Gas, PRCI

Monitor Internal Corrosion Using Fluidized Sensors

> Description:

- Addresses detecting and characterizing internal corrosion that may lead to metal loss for metallic gas systems
- Develop small sensors that can be introduced to the gas stream and identify likely locations of internal corrosion as they flow through the pipeline
 - > Sensors positively detect the presence of liquid water, measure its corrosivity, and determine the likely internal corrosion rate at that location
- Develop a method to retrieve the sensors at a convenient location

> Status:

- Focus on packaging the sensor and testing in the laboratory during 2006. Also, assess the durability of the sensor.

> Contractors: GTI and developer

> Time Frame and Funding: 2005-7, \$300k, DOT Cofunding

Internal Inspection Using Laser-Based Ultrasonic Technology

- > Description:
 - Addresses detecting and characterizing dents and deformations for gas piping systems
 - Develop the use of laser-based ultrasonics as an internal inspection tool under live conditions for cast iron and steel distribution systems
 - Objective is to achieve superior inspection capability detecting slit failures, joint defects, and wall damage
- > Status:
 - Pre-prototype will test pipe defects in the laboratory in 2006
- > Contractor: GTI
- > Time Frame and Funding: 2006-2007, \$350k

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