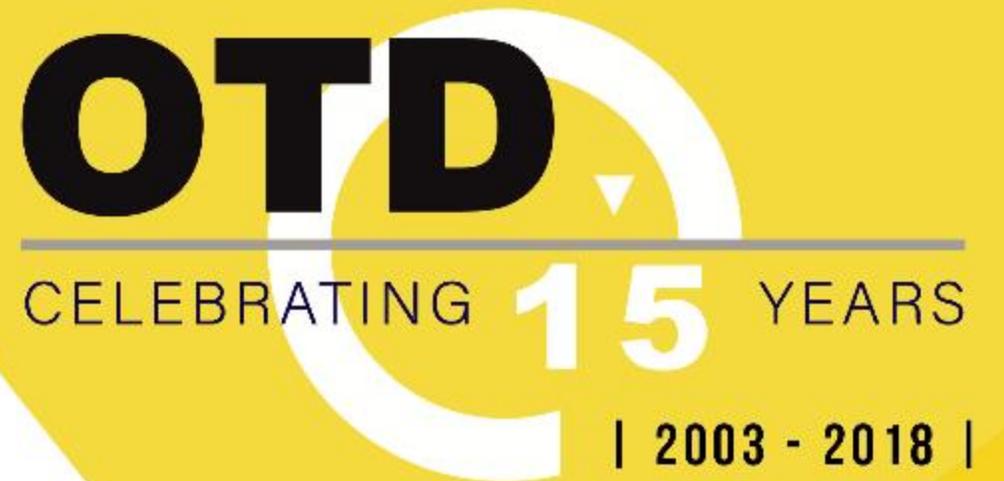


September 11, 2018

ILI Capabilities / Application Research Updates

Maureen Droessler
VP Operations

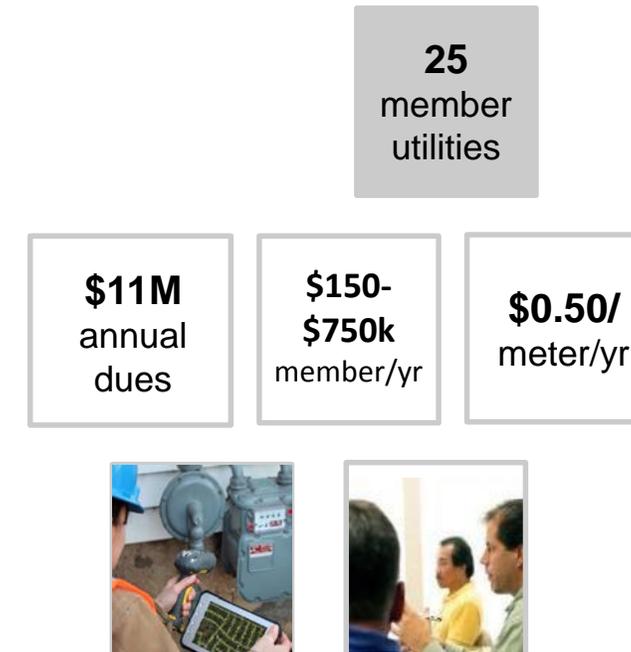
WWW.OTD-CO.ORG



Operations Technology Development Overview



- Established in 2003
- Stand-alone, not-for-profit, member-controlled company where gas utilities work together to develop technology solutions to common issues
- Membership dues based on number of customers
- New projects identified by members based on needs
- Each member votes own dollars to specific projects
- All members have access to all project information
- otd-co.org



Technology Focus Areas

OTD Working Groups

- > Smart Utilities
- > Risk & Integrity Management and Environmental Matters
- > Infrastructure and Gas Operations



Crosscutting

- > Safety & System Integrity
- > Efficiency of Operations
- > Renewable Energy and Alternative Fuels
- > Smart Energy Future



EMAT Sensor for Small Diameter and Unpiggable Pipes, Prototype and Testing - Phase 3

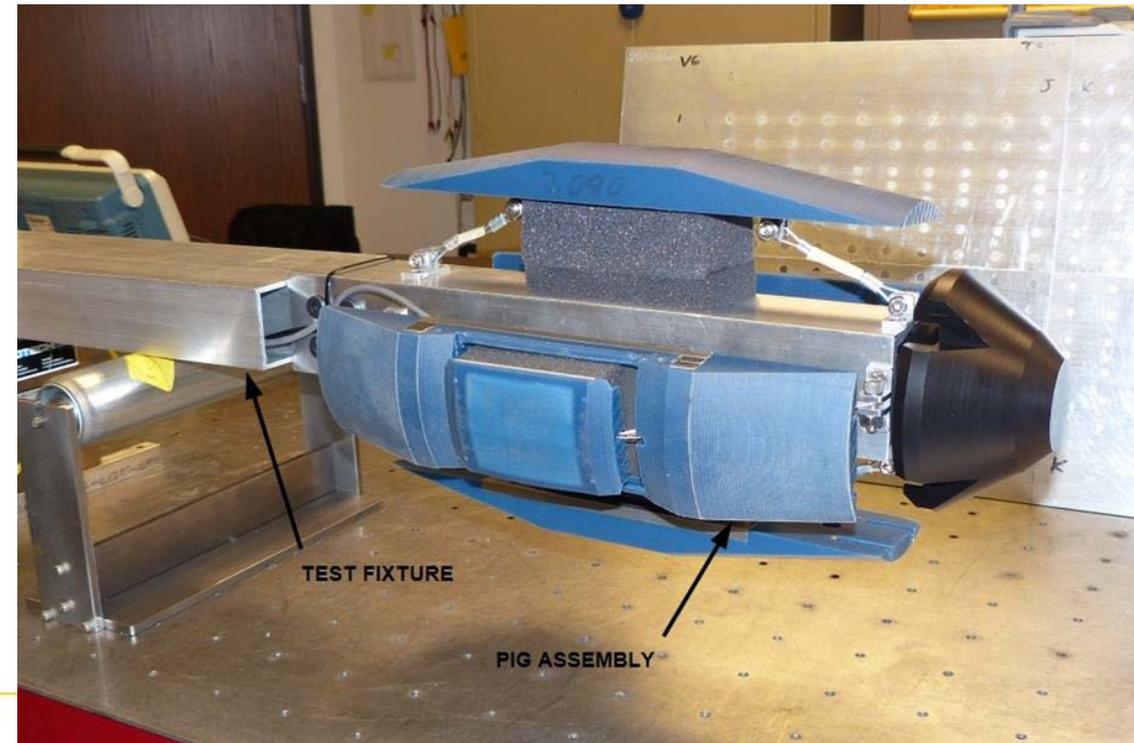
Background

- EMAT is an ultrasonic non-destructive testing (NDT) method which does not require pipe contact as the sound is directly generated within the pipe adjacent to the transducer.
- The EMAT transducer generates several guided-wave modes which can be used for crack detection and characterization.
- The EMAT is currently being used in traditional ILI platforms for large diameter piggable pipes.

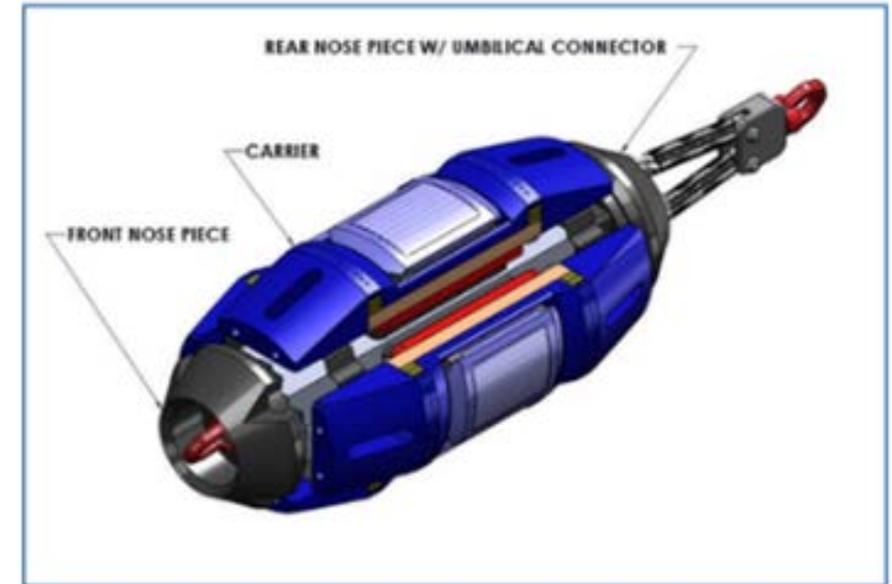
EMAT Sensor for Small Diameter and Unpiggable Pipes, Prototype and Testing - Phase 3

Phase - 1

- Phase-1 project was performed by OTD, GTI, and Quest Integrated (Qi2) with funds from OTD and PHMSA. PHMSA Project: PHMSA DTPH56-13-T-00007.
- A “bench-top” unit of the sensor was developed, fabricated, and tested for technology validation.
- Initial market focus on 8-12 inch diameter unpiggable pipe, selected 8”



EMAT Sensor for Small Diameter and Unpiggable Pipes, Prototype and Testing - Phase 3



Phase - 2

- Produced working Prototype for full-scale tests.
- Demonstrated at Qi2 facility in Nov. 2017 and operator facility in Feb. 2018 (blind test).

- **Bi-directional**
- **1.5 D bend capability**
- **80% collapse factor**
- **Towable**
- **Small umbilical**

EMAT Sensor for Small Diameter and Unpiggable Pipes, Prototype and Testing - Phase 3

Phase - 3 (current)

- Results from the integrated system are consistent with electrical, acoustic and signal processing perspective. A significant amount of testing and comparison with expected results will be completed in Phase 3.
- The system will be used with typical platforms to allow integration into commercial work and provide more field evaluation.
- Commercial licensing agreements



Key Next Steps / Key Need

- System validation with sensor and platform
 - This includes numerous runs with operators under many conditions and validation of the indications
- Determine what other related sensor modules are needed or does the commercializer have them, i.e. visual, secondary sensing, location, energy harvesting, etc.

Key need still exists:

Tools to internally inspect small diameter, unpiggable pipe