

SwRI Long Term Monitoring Using Magnetostrictive Sensors (MsS) for Cased Pipe Applications

Description: A modified approach to Long Range Guided Ultrasonics that offers simple, low-cost sensors which remain in place on the pipe to allow integrity monitoring from above ground.

Status: Funded product development is now complete. Additional needs and/or next steps are being evaluated.

BENEFITS

The ideal information desired from inspection tools for difficult applications of DA is location of anomalies, type of anomaly (defect, spacer, weld, etc), and size (pit depth, width, length or percent wall loss). Based on early NGA member testing of commercial technologies and NYSEARCH/NGA testing of guided wave technologies under development, no tools are complete in providing the desired level of data. The MsS technology has the potential to provide shape, cross sectional area, width, and the axial length of the defect. The added feature of monitoring over time can also provide defect growth rates and a measure of presence of active corrosion.

The cost for a commercial service company to install MsS at 200' intervals on 20" pipe is approximately \$1500

per sensor set (does not include excavation costs, pipe preparation, coating reinstatement, and site restoration). The cost currently associated with pipe inspection in cased crossings is extreme; primarily due to costs related to exposing, replacing and/or restoring areas of cased lines. Pipeline Integrity engineers desire alternative technologies for addressing costly situations.



MsS at the RG&E Field Mockup

The proposed SwRI effort remains a guided wave technology. However, it applies lower-cost and different materials and new

procedures to gain additional information about location, size, shape and growth rates of defects.

BACKGROUND

NYSEARCH issued a worldwide Request for Proposal (RFP) to identify new technologies addressing difficult or special applications of DA. Inspection of cased crossings fits the definition of "difficult" applications of DA.

The final DOT/OPS Pipeline Integrity Rulemaking that was issued in 2003 contains a requirement for an integrity management program on *gas transmission pipelines*, as defined by Part 192. Assessment options identified in the rule are: 1) in-line inspection, 2) pressure testing, 3) direct assessment (i.e., external corrosion direct assessment (ECDA); internal

corrosion direct assessment (ICDA); and stress corrosion cracking direct assessment (SCCDA)), and 4) other technology that an operator demonstrates can provide an equivalent understanding of the condition of the pipe. Options #1 and #2 are considered either too costly or impractical given the characteristics of the pipeline and the issue of customer disruption. MsS technology is being considered for options #3 and #4.



Installation of the Magnetostrictive Strip

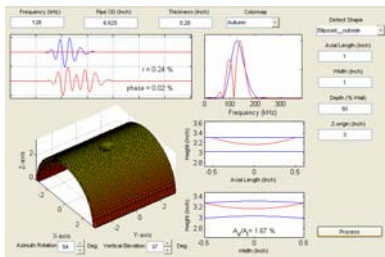
TECHNICAL APPROACH

Long Range Ultrasonic Testing (LRUT) is a screening tool to detect external/internal corrosion and coating defects in gas pipes. It is particularly useful where traditional DA or inspection technologies cannot be used. The SwRI MsS and traditional LRUT both operate using guided waves. However, the MsS incorporates magnetostrictive sensing strips instead of piezoelectric transducer materials and procedures. In contrast to previously DOT/PRCI-funded MsS work, current MsS technology has advanced to permanent installations and monitoring anomalies over time.



Complete MsS Installed

The work scope in the first NYSEARCH/NGA phase developed material stability despite changes in pressure, sensor resilience to cathodic protection, and material bonding strength. The second phase developed advances in the user interface, defect characterization, bonding adhesives, sensor durability, and field performance.



MsS Software

PROJECT STATUS

The second phase of the project is complete. A potential third phase may focus on limitations with certain coatings that result in high signal attenuation. If a third phase is not pursued, the product could be used for pipes with specific coatings and for providing information about defect location, size and % cross sectional wall loss. Information on defect axial length would be limited.

HIGHLIGHTS

- Addresses cased pipe applications
- Expands defect characterization capabilities
- Provides long term monitoring
- Provides a new way to meet regulatory requirements

FOR ADDITIONAL INFORMATION

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