

DOT 460 Quarterly Report – Public Page

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Prepared for: DOT

Project Title: “MWM-Array Characterization of Mechanical Damage and Corrosion”

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Public Page Section-

This project is aimed at advancing the JENTEK MWM-Array technology to provide quantitative characterization of corrosion and mechanical damage. This includes characterization through coatings/insulation; followed by higher resolution imaging with coatings/insulation removed. For mechanical damage, quantitative characterization includes geometric variations and multidirectional residual stresses (near the surface and deeper within the pipeline). In addition, this program will develop capability to detect cracks at damage sites. For corrosion, enhanced high resolution imaging of both external and internal corrosion will be developed for specific applications to support life management decisions. This team will build on demonstrated MWM-Array (and MR-MWM-Array) detection capabilities to deliver substantially enhanced characterization of damage and practical means for implementation. This technology has been successfully applied in the aerospace and manufacturing industries and provides substantially improved performance for imaging surface and buried damage through coatings and for curved surfaces compared to conventional NDE methods.

During the second quarter of this program, we have: (1) Performed field tests on a natural gas pipeline in eastern Canada containing two mechanical damage sites in late January. Scans were performed by JENTEK that included magnetic profilometry, permeability imaging, and detection of cracks at mechanical damage sites; (2) Continued development of a mechanical damage characterization capability to support deliverable #2. A prototype scanner was developed to support the testing opportunity in Canada and this concept will be further developed as part of a preliminary mechanical damage characterization capability. The data collected in Canada also advanced the development of practical data processing algorithms, including three-dimensional visualization techniques; (3) Continued low frequency sensor array development efforts and started investigating procedure adaptations to accommodate scanning sensor array operation; (4) Performed field tests using our next generation corrosion under insulation (CUI) scanners on riser sections provided by Chevron; and (5) Initiated developing conceptual and/or prototype scanning fixtures for field implementations. The point of contact for this program is Todd Dunford (todd.m.dunford, 781-577-2315).

General Information required on all Public Quarterly Reports

Results and Conclusions:

This section summarizes progress made in this program. This project is aimed at advancing the JENTEK MWM-Array technology to provide quantitative characterization of corrosion and mechanical damage. This contract is complemented by funding from Chevron, and other sources.

Progress has been made in a number of areas:

- **Demonstration Measurements – Mechanical Damage:** Performed field tests on a natural gas pipeline in Canada containing two mechanical damage sites in late January. Scans were performed by JENTEK that included magnetic profilometry, permeability imaging, and detection of cracks at mechanical damage sites. On-going work is focused on correction of the liftoff and permeability images to account for the defect geometry effects, as well as multidirectional stress effects.
- **Demonstration Measurements – Corrosion through Insulation:** Performed field tests using our next generation corrosion under insulation (CUI) scanning fixtures on several 40-foot riser sections. Also performed preliminary scan to detect CUI through a metallic weatherjacket.
- **Low frequency measurement capability:** Continued low frequency sensor array development efforts and started investigating procedure adaptations to enable imaging with a scanning MR-MWM-Array.
- **Scanner development for field implementation:** Developed a prototype scanning fixture for field testing in Canada for mechanical damage. Initiated design of scanning fixtures for field implementations.
- **Procedure development – Welds:** Began developing procedures for inspecting weld samples. Held discussions with team members about other ferrous and non-ferrous weld samples and needs.

Plans for Future Activity:

1. Continue development of scanning techniques for mechanical damage imaging in the field.
2. Continue adapting instrumentation to support low frequency measurements.
3. Continue to adapt procedures for weld assessment.
4. Continue to develop corrosion under insulation detection capability
5. Continue hardware modifications for field implementation