Northeast GAS ASSOCIATION

NYSEARCH

Technology Brief

Testing Program for Remote Inspection using Magnetic Tomography

Description: **Evaluation of a commercial aboveground pipeline inspection technology through a formal validation process.**

Status: **Validations of defect predictions through direct assessments are in progress.**

BENEFITS

Transkor's magnetic tomography method (MTM) is a commercial, non-intrusive, non-contact aboveground technology for pipeline inspection. MTM provides flexibility to pipeline inspection by avoiding the need for an electrical connection to the pipeline. MTM locates stress-causing defects in a pipeline; therefore this may be a unique aboveground technology which can locate structural defects that could exist under a healthy coating. If warranted by the validation effort and operator support, NYSEARCH will work with utilities to notify regulators that MTM should be considered an "Other Technology" for pipeline integrity inspection. As a result, the study may help operators meet external corrosion direct assessment (ECDA) or internal corrosion direct assessment (ICDA) requirements under PHMSA guidelines more thoroughly.

BACKGROUND

All transmission pipeline sections in high consequence areas require assessment by in-line inspection, pressure testing, direct assessment or an 'Other Technology'. NYSEARCH/NGA and previously, NYGAS, have worked in earlier years to find a remote inspection technology that could determine active corrosion. The development of a remote sensing corrosion detector with Johns Hopkins University, the Pipeline Current Mapper and Stray Current Mapper with Radiodetection were some previous investments to address the detection of active corrosion and coating failure. One of the technological obstacles for such electromagnetic techniques was that active corrosion could not be predicted on coated pipes. The early techniques required an electrical signal to be applied to the pipe.

MTM was developed by Transkor-K of Russia and has been used for pipeline inspections worldwide in multiple commercial applications. MTM differs from earlier techniques because it passively measures a pipeline's inherent magnetic field (no signal is applied). MTM is intended to detect a range of stress-caused magnetic anomalies on coated or bare pipe. If successful in a sufficient number of applications, this technology could be the breakthrough that has been sought for years (Figure 1). Members of NYSEARCH were intrigued by the technology's benefits and suggested that the consortium to begin a collaborative validation study of MTM.

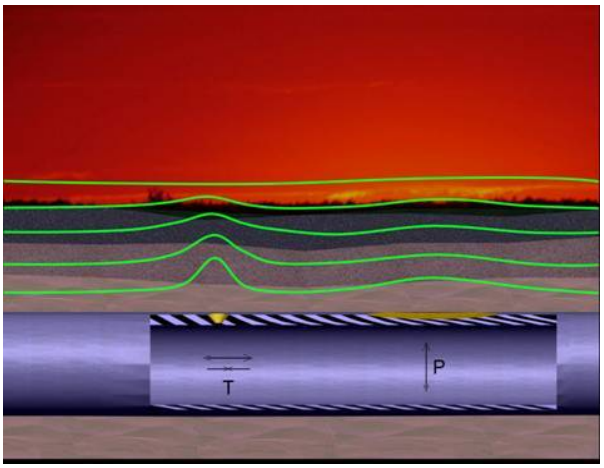


Figure 1: MTM Detection of Magnetic Anomalies in a Pipeline's Inherent Magnetic Field Caused Mechanical Stress

TECHNICAL APPROACH

MTM detects magnetic anomalies caused by mechanically stressed areas on a pipeline.

Stressed areas may occur from excessive mechanical loading (Figure 2), changes in the structural condition of the steel (dents, cracks, laminations, inclusions and metal loss from corrosion, gouges, etc.). Coating failures can also be detected by MTM although not as reliably as stressed areas.

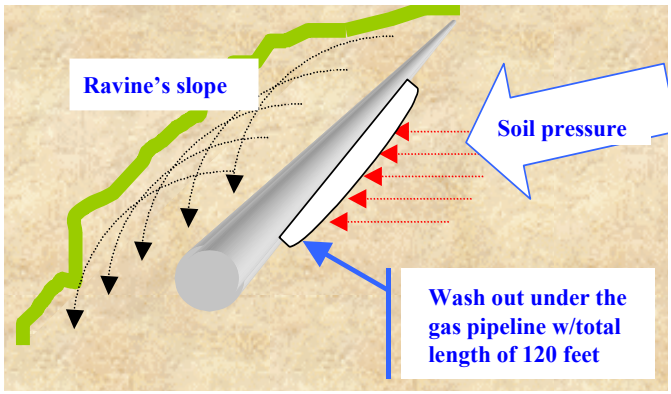


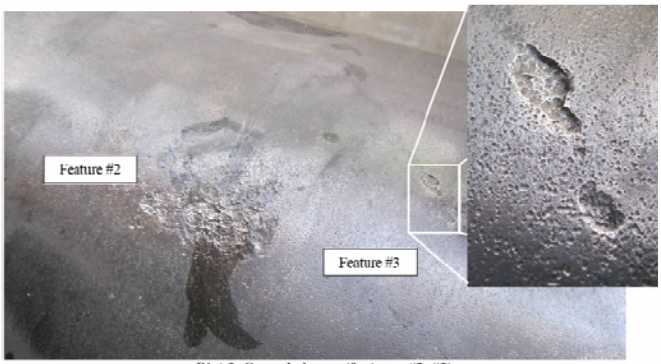
Figure 2: Geophysically Induced Stress-Deformed Condition

First, MTM uses a proprietary device called 'SKIF' to perform the aboveground survey (Figure 3). This device is a combination of

Figure 3: MTM Survey in Progress

sensitive magnetometers, odometry, and flash memory. Next, Transkor calibrates the data with information from a 'calibration dig'. A calibration dig entails a direct assessment which allows Transkor to extrapolate severity predictions for the remaining indications in the survey. Last, a Final Anomaly Log report follows the calibration; providing the pipeline integrity engineer with flaw types and severity predictions.

This NYSEARCH program is evaluating MTM using field surveys of (15) live pipelines. Each utility hosting a survey selects a number of Transkor's final predictions for self-verification via direct assessment (Figure 4). The verification results are submitted to an independent third party assessor who will develop a final report evaluating the overall performance of MTM. If appropriate, NYSEARCH will assist a champion utility in providing notification to PHMSA that MTM should be considered an "Other Technology".



Pict 3. Corroded area (features #2, #3)

Figure 4: Metal Loss Defects Detected Using MTM

PROGRAM STATUS

Transkor has completed all (15) surveys with respective calibration operations and has provided Final Anomaly Logs to the utilities which hosted surveys. These utilities are currently performing self-assessments of the Transkor predictions with internal sources or non-destructive testing (NDT) contractors. An independent third party assessor is collecting the verification data for evaluation.

Highlights

- Locate defects when coating is not compromised
- Detect stress-caused anomalies
- Inspect without electrical connection
- Potentially meet ECDA or ICDA requirements

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