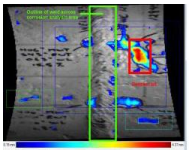
Validation of 3D Scanners for Pipeline Anomaly Assessment

Research into the capabilities of two currently available 3D scanners was conducted. Demonstrations of the products found that 3D scanners could potentially replace manual pit-gauge measurements by providing more accurate measurements in an automated operation.



Project Description

Gas pipeline operators are required to assess the severity of anomalies found in direct assessment and in-line inspections to determine the need for repair. This often involves investigating indications and manually performing in-the-ditch measurements with a pit gauge. However, accurate pit-gauge measurements can be difficult to obtain if the anomaly is on the side or bottom of the pipe. Additionally, the accuracy, repeatability, and reliability of pit-gauge measurements are highly dependent on the skill and experience of the user.

Several 3D optical-scanner products have entered the market that are intended to automate in-ditch anomaly measurement and assessment, increase data quality, and improve operational efficiencies.

In this project, research on the capabilities of two currently available 3D scanners was conducted. Demonstrations of the products were performed with the participation of the manufacturers. Research found that these products could potentially replace manual pit-gauge measurements.

Deliverables

Results of the testing and validation program of 3D scanning technologies was provided in a report issued in October 2013.

Benefits

A validated tool that eliminates manual data collection of in-the-ditch anomaly measurements using a pit gauge will improve data quality and increase operational efficiency.

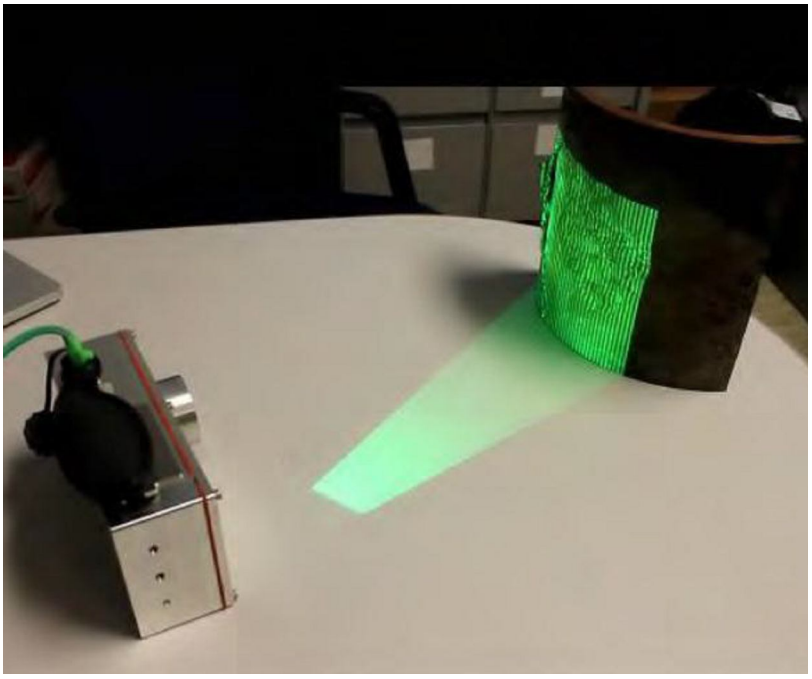
Automating the process of measuring anomalies found through direct assessment and in-line inspection runs was identified as a significant opportunity.

Technical Concept & Approach

Specific tasks for this project included:

- **Technology Search**

  A technology search was conducted to identify laser or structured light-scanning tools that could



be applied to pipeline anomaly measurement. Previously performed testing was also reviewed.

- **Testing and Validation**

  A testing methodology was developed to allow the performance of the 3D scanner measurement tools to be validated for the capabilities to measure external corrosion, dents, and gouges. The testing was performed on pipe samples with real and manufactured anomalies.

- **Demonstrations**

  Upon completion of the testing and validation, demonstrations of the selected technologies were conducted with participating operators.

Results

Two 3D scanner technologies suitable for external pipeline anomaly assessments were evaluated. Both products feature analysis software tailored specifically to external pipeline anomaly assessment and proved capable of generating virtual 3D surface representation of pipeline features at greater accuracy and resolution than is typically achieved with conventional manual pit-gauge readings.

These non-contact measurement technologies permit more reliable and repeatable assessments of anomalies and offer significant potential to streamline in-ditch assessments via the largely automated analysis and reporting systems provided in both vendors' products.

A workshop to evaluate the performance of the 3D scanners was conducted. Each vendor provided background presentation material, answered questions, and performed live field scans on a set of prepared pipe samples. Machined defects and general corrosion features were scanned and results compared.

Some limitations were observed during the surface-image acquisitions, including difficulties scanning features exhibiting shiny surfaces or high-aspect ratios. Apart from features such as deep, narrow gouges or cracks, these devices proved capable of acquiring and assessing most anomalies.

An in-depth comparison of device set-up, calibration, 3D surface acquisition, analysis, and reporting features was provided a report.

Status

This project was completed in 2013.

The two 3D scanners that were tested demonstrated the ability to provide more accurate and reliable anomaly assessments compared to manual pit-gauge measurements.

Recommendations for further assessment include:

- Evaluating the cost of the products in relation to the value that they provide in terms of improved data accuracy, reliability, and time savings during data collection and management
- Ensuring that 3D scanners are compliant with federal and state regulations
- Discussing product performance with existing customers.

For more information:

Maureen Droessler
Program Administrator
Operations Technology Development, NFP
Phone: 847/768-0608
maureen.droessler@otd-co.org