

IS MOVEMENT STRAINING YOUR PIPELINE?

▶ **WHEN THE EARTH MOVES:** So do your pipelines, and that creates strain. Knowing how much strain is critical to maintaining safe pipelines and mitigating line movement events.



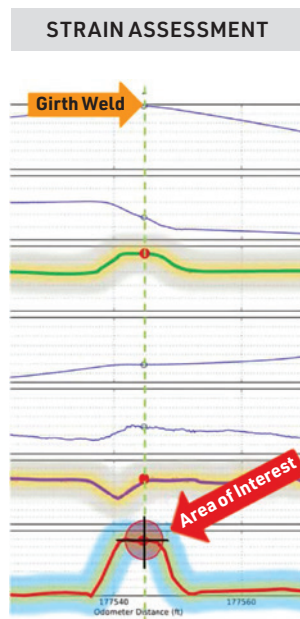
STRAIN AND LINE MOVEMENT ASSESSMENT

Ground instability, water course movement, geotechnical impacts and weather events can all cause line movement. To assess the associated strain, TDW uses inertial measurement unit data collected from in-line inspection (ILI) tools. After just one tool run, we can see how far your pipeline's strain is from an acceptable level. With multiple tool runs, we can measure any curvature growth. We can also help determine where mitigation is required.

APPROACH

XYZ – X-ray, Yankee, Zulu

We use the raw XYZ data from the inertial measurement unit to extract the key curvature data. From this, we can delineate features such as field bends and then focus on unintentional bending as a result of outside force. When two runs are utilized, we can assess any increased movement in the pipeline and the accumulated strain.



VALUE

Grading strains for mitigation

This assessment can be used to identify and prioritize strain / movement events, align with other features such as girth welds and confirm, when implemented, that remediation / mitigation actions are working.

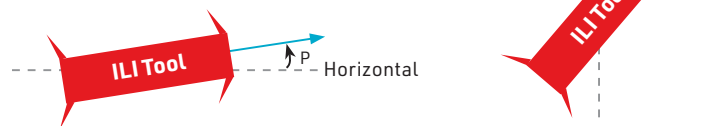
IMU DATA CONVERSION

$$K_h = -\frac{dA}{ds} \cos(P)$$

$$K_v = -\frac{dP}{ds}$$

Where:

- K_h = horizontal curvature (m^{-1})
- K_v = vertical curvature (m^{-1})
- A = ILI tool azimuth angle (rad)
- P = ILI tool pitch angle (rad)
- S = ILI tool odometer distance (m)



EXTENDING BEYOND INSPECTION

- ▶ Improving safety, efficiency and productivity throughout the life of your pipeline.

ASSESSMENT SERVICES



Immediate Integrity Assessment

IMMEDIATE THREATS:

- ▶ Metal loss
- ▶ Dent strain
- ▶ Bending strain
- ▶ Selective seam weld corrosion
- ▶ Cracks
- ▶ Mechanical damage



Future Integrity Assessment

TIME-DEPENDENT THREATS:

- ▶ Corrosion growth
- ▶ Line movement
- ▶ Crack growth
- ▶ Dent fatigue
- ▶ Other changes in pipeline conditions



Advanced Integrity Assessment

MORE COMPLEX THREATS:

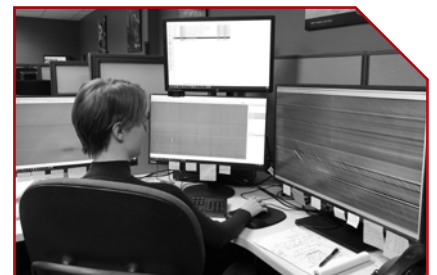
- ▶ Non-axial stress corrosion cracking
- ▶ Branch connection loading
- ▶ Wrinkle bends
- ▶ Hard spots
- ▶ Other threats requiring finite element analysis (FEA)

Using the right approach

The right assessment approach, consistent with codes, industry-accepted methods and operator mandates, ensures compliance and auditability.

Focus on the right decisions

By focusing on the anomalies that matter most, you can make the best integrity decisions for your pipeline.



Contact your TDW sales representative for more info.

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