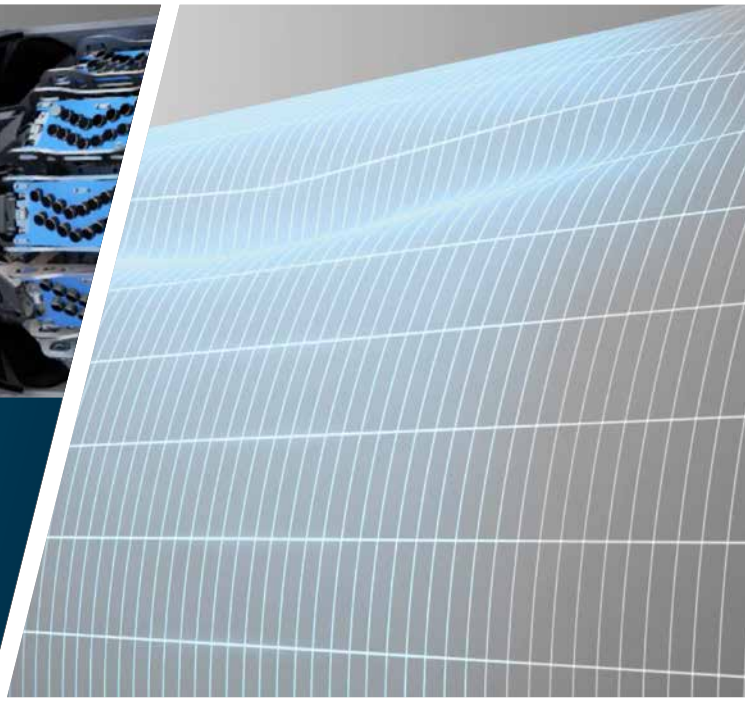


CASE STUDY

DELIVERING PRECISION BY COMBINING FEA WITH INLINE INSPECTIONS

CHALLENGE

NDT Global conducted a combined inline inspection service and a fitness for purpose analysis (FFP) for South American pipeline operator SONACOL. The FFP is a comprehensive study that commonly includes Level 1, and Level 2 assessment methodologies (per API 579-1) which revealed a crack feature showing critical pressures located in a natural reservoir.
This 6” pipeline system transports jet fuel across high-consequence areas (HCAs). The FFP identified diverse anomalies, that require attention and mitigation measures.

HCAs are defined in pipeline safety regulations as an area where pipeline releases could have greater consequences to health and safety or the environment with some regulatory entities limiting response times. NDT Global proposed a finite element assessment (FEA) with the objective of obtaining a better understanding about the behavior of the anomalies identified in the FFP.
The FFP identified the need for a repair, the operator assumed responsibility, and based on the location (HCA) they opted for an FEA to get a better understanding. If the repair was required (anomaly accepted or rejected) and also insight of the timeline.

SOLUTION

SONACOL worked with NDT Global to perform an FEA, a method that is optimized to provide operators with an accurate estimation of pressure behaviors. FEA is considered one of the most complex assessment methodologies available and is a Level 3 assessment in standards such as API 579-1. The outcome of the assessment is only as accurate as the ILI data collected during the inspection run.

NDT Global overcomes accuracy challenges by:

- using best-in-class ultrasonic technology to determine the geometry of pipelines, including detection of crack, dent, and corrosion anomalies
- ensuring direct access to the data and correct handling of it
- having multiple input sources (combined inspections)
- providing integrity engineers access to the specific behavior (e.g. tolerances, variances, noise inducers) of each robot sensor carrier within the individual pipeline inspected
- using skilled engineers with specific FEA experience in pipelines

By using this method, NDT Global can provide the most accurate FEA results. The team used the following ILI robots for the assessment:

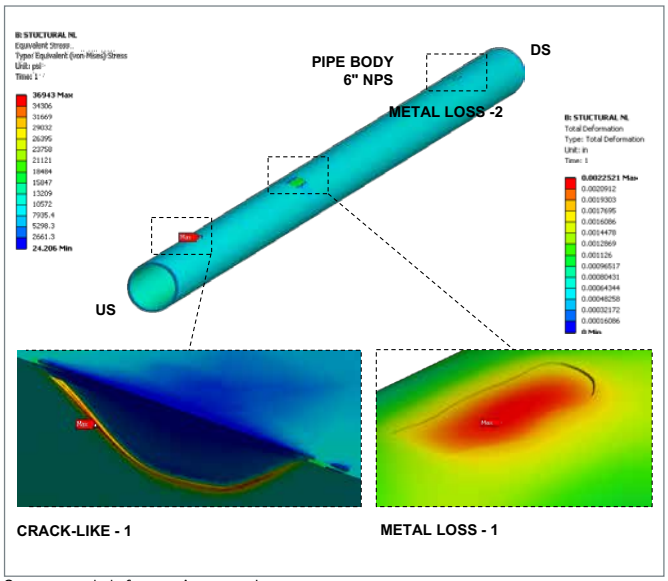
- Ultrasonic Geometry (UG) – detects deformations and geometric anomalies
- Ultrasonic Wall Measurement (UMp) – detects wall thickness variations (i.e. metal loss)
- Ultrasonic Crack (UCx) – detects cracks and crack-like defects

RESULTS

The FEA results showed that the maximum stress generated was an effect of the internal pressure and longitudinal loads located inside of a “crack-like” anomaly in a specific area of the depth profile.
Under the pipeline’s current operational conditions, the remaining life is 1,481 cycles of load, with every operative cycle corresponding to 24 hours; therefore, the remaining life of the joint is approximately four years.

Because the maximum stress generated was less than the SMYS of the pipe material, NDT Global concluded that the deformation generated was within the boundary of an elastic behavior. The failure pressure and safe pressure indicated the mechanical capacity was calculated at 1,440 psi (99.3 bar). These results, in addition to the remaining life, allowed the operator to manage the pipeline understanding the mechanical capacity subject to completing the repair within four years.

NDT Global provided the elements, precise assessments and results to enable a better decision on the operator side a timeline to safely and cost-effectively continue operations, while simultaneously planning a strong course of action for the future.



Stress and deformation results.

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