Discover ROSEN's non-intrusive pipeline assessment for unpiggables

Written by Lewis Barton, Service Manager Above Ground Services (ROSEN Group), and Joe Short, Business Line Manager Integrity Management Services (ROSEN Group).

ROSEN is known for its industry-leading inspection capabilities, as well as for its new and revolutionary approach when it comes to direct assessment.

Pipeline operators have a regulatory responsibility to demonstrate that their pipelines are safe for operation, but they also have to balance organisational responsibilities to maximise the value of their assets, minimise risks, and control costs.

Corrosion and other time-dependent anomalies are some of the major threats faced by operators, costing millions annually in identification, mitigation, and repair. The situation is often even more complicated for "unpiggable" pipelines, which pose their own unique challenges.

ROSEN is known for its industry-leading inspection capabilities. Where in-line inspection (ILI) is not possible or impractical, knowledge-based models reliant on data and assumptions for multiple variables are used.

Direct assessment (DA) is recognised as one such integrity assessment approach in Australian Standards (AS) 2885.3:2022; it involves combining the variables that are believed to contribute specifically to a given threat through a process of data alignment, engineering assessments and targeted in-field activities.

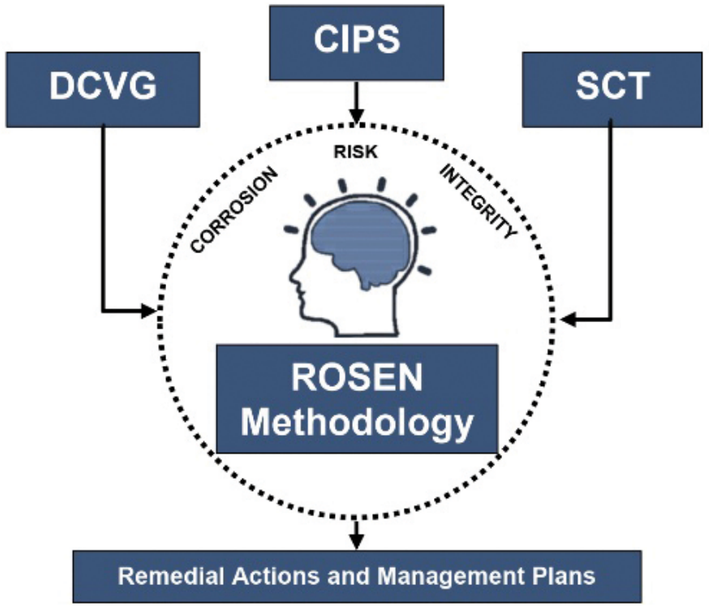
DA can often require multiple iterations of costly excavations to obtain the data and clarity required to perform a robust assessment.

To address the concerns and challenges of the industry, ROSEN has developed its own approach to DA, the non-intrusive pipeline assessment (NIPA).

The NIPA methodology consists of integrating and overlaying pipeline datasets, such as construction and operational records, in conjunction with data obtained from large standoff magnetometry (LSM) surveys to gain a holistic picture of the pipeline integrity condition.

This process involves an assessment of pipeline condition along with a review of data collected to support other critical elements of an integrity management plan, such as cathodic protection performance, internal corrosion control, and the potential for pipe deformation due to ground movement or external interference.

All that is achieved without suspending or upsetting the operation of the pipeline.



The combination of different surveying techniques provides a holistic picture of the pipeline condition.

A holistic approach

ROSEN recently signed a strategic partnership with Speir Hunter, a market leader in LSM technology, to develop and improve the stress concentration tomography (SCT) tool.

The basic principle of SCT relies on the fact that whenever there is wall thickness loss or disruption in the pipe wall, there will be an increase in stress.

SCT can identify these abnormalities in the magnetic field of a pipeline and apply an engineering evaluation to infer a stress value at these points in the pipeline.

As any mechanical or metallurgical anomaly will lead to localised stress zones in the pipeline wall, SCT will be able to support the detection of multiple anomaly types that can affect buried pipelines (including: dents, bending strains, gouging and corrosion).

It is clear how this can dramatically improve the traditional DA process currently practiced across the industry and extend the DA process beyond its current focus on corrosion identification and management.

When SCT is combined with other complementary survey techniques, such as close interval protection survey (CIPS) and direct current voltage gradient (DCVG) assessment, it provides a more holistic picture of the pipeline condition without the need for intrusive inspections while minimising false positives – which reduces unnecessary excavations.

Using the ROSEN developed NIPA methodology, operators will benefit from the combination of a novel approach to applying LSM technology with ROSEN's broad pipeline integrity expertise to screen for critical integrity threats and prioritise locations down to centimetre-scale accuracy for field verification.

The combination of multiple datasets and ROSEN's proprietary alignment and prioritisation algorithms has been proven through field experience to significantly improve identification of problem areas along a pipeline and aid in optimising excavation locations for further investigation, all without upsetting pipeline operation.

This data can then be used to enhance ongoing monitoring programs or to carry out remediation measures.

Track record

Based on the science of stress-magnetisation and recently incorporated into the latest version of the International Organisation for Standardisation (ISO) 22974:2023, SCT is a proven screening technology that can either be deployed to supplement an existing in-line inspection (ILI) program or used in unpiggable pipeline infrastructure as part of an enhanced DA process to focus and optimise excavation and inspection costs.

The NIPA approach has been developed and implemented by ROSEN since 2019; during this time, it has been constantly evolving and improving to meet the challenges posed by pipelines operating in differing external environments around the world. The approach has been so successful in Europe that many clients now request repeat inspections to aid identification of changes in pipeline condition, counting on the high repeatability of the approach.

ROSEN is also now incorporating machine learning into the NIPA process using its V-ILI condition prediction models, which are based on the ROSEN Integrity Data Warehouse (IDW), a continuously expanding library of ILI data collected over many years by ROSEN that as of January 2024 contained information from more than 26,000 pipelines. This offers a truly unique proposition in the industry.

ROSEN's V-ILI combines other relevant data, such as rainfall, soil type and coating, with information about corrosion trends across thousands of pipeline segments stored in the IDW. Through machine learning algorithms trained on this historical data, the incorporation of V-ILI into NIPA has the potential to substantially reduce uncertainty in the DA process.

This expands the data horizon by not only considering the local results of the pipeline in question, but also how every other pipeline identified in the IDW has behaved, which provides valuable insights for condition prediction. **P**

For more information, visit **rosen-group.com**

Data collected on site underpins the accuracy of ROSEN's direct assessments.

Images: ROSEN Group