

# Corrosion Growth Assessment

Using data driven insights to strengthen repair decisions and reduce operational costs



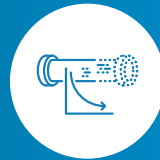
Deep understanding of corrosion activity, improving long-term planning



Increased accuracy in corrosion growth estimates when using pro service levels



Greater confidence in the remaining safe operational life of assets



Reduced impact of sizing differences with signal-level comparisons



Optimized inspection and rehabilitation strategies to reduce cost and downtime

**Corrosion is the most common time-dependent threat for pipelines with millions of dollars being spent annually by operators to ensure its control. An effective and proactive corrosion management strategy will reduce those costs. To implement an effective corrosion management plan, the causes of corrosion, reliable estimates of associated growth rates, and appropriate mitigation must be established. Identifying and measuring corrosion is our job. We can see how corrosion has behaved in the past and predict what it will do in the future with the use of sophisticated tools. This information allows the remaining life of an asset to be determined, which in turn leads to better economic management and safer pipeline operations.**



## Challenge

In order to plan corrosion remediation, prevention, and mitigation effectively, operators need to know the location and severity of corroded areas, as well as the expected rates of future growth. Often pipeline operators have gathered multiple InLine Inspection (ILI) data sets but lack the tools and expertise to extract the most value from this data and answer key questions about corrosion behaviour. Uncertainty in Corrosion Growth Rates (CGRs) can lead to unnecessary repairs as operators follow a conservative approach resulting in costly and avoidable maintenance programs. Contemplating these challenges - and working to overcome them - leads an operator to a considered extrapolation of an asset's future condition and performance.

## Solution

ROSEN's Corrosion Growth Assessment - CGA - is an essential integrity management service for pipeline operators, giving them a clear understanding of corrosion activity in their assets following an inline inspection. Experience has taught us that different pipelines and operators need varying levels of support, so ROSEN's flexible CGA service levels can be tailored to meet every client's need. Tracking corrosion activity over time with regular CGAs enables operators to monitor the effectiveness of their corrosion mitigation activities. We are at the forefront of CGA development and have the following advanced services which provide unrivalled insight into corrosion behaviour in a pipeline.

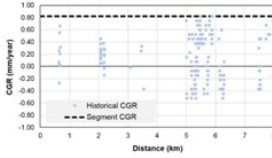
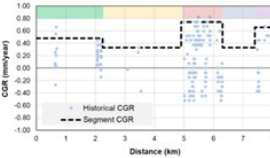
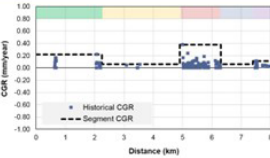



Service level	CGA Box Matching	CGA <sup>PRO</sup>	CGA <sup>PRO</sup> with AutoSCAN
Characteristics	General-purpose solution	Best in class solution when switching ILI vendor	Market leading accuracy, least conservative
CGR Method	Conservative CGR	Segmented + 95 <sup>th</sup> percentile	Segmented + Max CGR
Selection Criteria	<b>Low risk pipelines</b> Easy access and low-cost Repairs	<b>Medium risk pipelines</b> Reasonable access and mid-cost Repairs	<b>High risk pipelines</b> Difficult access and high-cost Repairs.
Delivery time (in weeks)	1-2 (Listing only)	3-4 (Report & Listing)	6-8 (Report & Listing)
Other Vendor Data	Yes	Yes	ROSEN MFL-A only
Differing Technologies	Yes	Yes	No
Signal Comparisons	No	Yes (as available)	Yes
Impact on Future Integrity			
Impact on Required Digs			

Figure1: Service levels comparison.

### CGA<sup>PRO</sup>

Our advanced corrosion growth service - CGA<sup>PRO</sup> - gives a clear understanding of historic corrosion activity by comparing repeat sets of ILI data, identifying active corrosion areas and their level of growth. However, to get the best value from this data, it is essential to understand how to properly use CGRs within an integrity management process, where repair plans, scheduled mitigation activities and defined re-inspection intervals are established practice. This premium service provides input for these critical analyses by predicting corrosion behaviour in the future. How? Historical Corrosion Growth Rates are optimized through statistical analysis to represent future growth rates and the pipeline is segmented to highlight different levels of corrosion growth and susceptibility along its length. CGRs which are demonstrably safe but allow for cost effective repair and inspection planning are generated allowing for an estimation of an asset's remaining safe operational life.

### AutoSCAN

CGA<sup>PRO</sup> can be supported by our Automated Signal Correlation and Normalization process - AutoSCAN. Using pattern recognition technology, AutoSCAN precisely matches metal loss indications between two axial field Magnetic Flux Leakage (MFL-A) inspections based on raw signal data comparison. Historic depth changes are then estimated using the change in signal amplitude and shape giving more accurate CGRs. The AutoSCAN output offers unrivalled support to operators, not only highlighting the peak activity within a pipeline, but also providing a corrosion growth rate distribution which can be used to estimate the pipeline's remaining life and

support life extension initiatives. Corrosion activity associated with shallow features can also be identified which allows for the early identification of corrosion activity before significant damage is caused.

## Corrosion Consultancy

Our consultancy provides a holistic diagnosis of corrosion based on design and operational data. We can use various tools, such as flow assurance models, corrosion modeling software and cathodic protection analysis to assist in our evaluation. This information, when aligned with the CGA results, gives us a full picture of what is causing corrosion. After the identification of the causes of corrosion, our experts support operators with recommendations for mitigation, control and monitoring.

## Team Work

ROSEN has unparalleled experience in conducting CGAs and offers state-of-the-art solutions for understanding pipeline corrosion activity. We have a team of data analysis experts working closely with corrosion and integrity engineers to maximize the value of your ILI data. Our assessments, products and services are developed with the aim of ensuring pipeline safety whilst providing essential decision support for a cost effective repair and reinspection strategy.

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