Benchmarking Pipeline Integrity: The new pipeline insights tool for understanding peer comparisons

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In the complex world of oil and gas pipeline operations, ensuring the safety, reliability, and performance of pipeline assets is critical. Over the years, operators have relied on In-Line Inspection (ILI) data to assess the integrity of their pipelines and make informed decisions for maintenance and upgrades. While these assessments are valuable, there has always been a missing piece: the ability to benchmark a pipeline's integrity against its peers. At ROSEN, we have developed a benchmarking tool that addresses this gap, offering operators a comprehensive view of their pipelines in the context of regional and global trends.

This article provides an overview of Pipeline Insights benchmarking, which leverages key technical indicators to compare the condition of inspected pipelines and identify actionable insights. Designed with a user-friendly dashboard, this solution aims to empower operators with the knowledge to prioritize resources effectively and navigate the complexities of pipeline integrity management. Enabling this powerful benchmarking capability is the ROSEN Integrity Data Warehouse, a comprehensive record of historical inspections conducted by ROSEN covering millions of pipeline joints and thousands of unique pipelines worldwide. We store billions of anomalies from millions of kilometers of inspected pipeline distance. An extensive set of geospatial data complements this data and is used to enrich inspection data and provide necessary contextual information.

The Need for Benchmarking in Pipeline Integrity

Pipelines operate under various environmental, operational, and material conditions that directly impact their performance and longevity. For operators, the challenge has always been to determine whether the state of their pipeline is acceptable in isolation and comparison to others in the industry.

The ability to benchmark pipeline integrity offers several key benefits:

1. Contextual Decision-Making: Understanding how a pipeline's integrity compares to its peers allows operators to set realistic performance targets and identify areas needing improvement.
2. Prioritized Maintenance: Benchmarking can help operators identify whether certain anomalies, such as internal corrosion or geometric deformations, are more prevalent in their pipelines compared to others.
3. Strategic Insights: By analyzing differences in pipeline conditions, operators can uncover the underlying causes, such as the performance of the integrity management system, rapidly aging infrastructure, untoward operational stresses, or environmental factors not accounted for in the design.

With these goals in mind, our Pipeline Insights benchmarking solution provides operators with unprecedented insight by aggregating and analyzing industry-wide data in a structured manner.

How the Benchmarking Tool Works
Our tool draws on ROSEN's extensive expertise in pipeline integrity, leveraging a wealth of ILI data and advanced analytics. The solution is centered around five key technical indicators:

- Internal Corrosion: Damage caused by corrosive substances within the pipeline, such as water, carbon dioxide, or hydrogen sulfide.
- External Corrosion: Degradation due to environmental exposure, coating failure, or cathodic protection inefficiencies.
- Geometric Anomalies: Structural deformations such as dents, wrinkles, or ovalities that may compromise the pipeline's integrity.
- Girth Weld Anomalies: Flaws or inconsistencies formed during girth weld construction.
- Milling Anomalies: Anomalies originating from the pipe manufacturing process, including laminations and seam weld issues.

Each indicator is analyzed to generate a detailed profile of a pipeline's condition. This profile is then compared to a carefully curated peer group, which is determined by two primary parameters:

- Region of Operation: Pipelines operating in similar geographical contexts are grouped to account for environmental and regulatory similarities.
- Product Type: Benchmarks are segmented by whether the pipeline transports oil or gas, ensuring meaningful comparisons based on the product's impact on pipeline conditions.

A Significant Step in Pipeline Integrity Management
While the benchmarking tool is already a valuable resource, our vision is to enhance its capabilities continuously. Future developments include:

- Enhanced Peer Grouping: Incorporating additional parameters such as pipeline material, age, and operational conditions for more granular comparisons.
- Predictive Analytics: Leveraging machine learning to predict how a pipeline's condition might evolve over time relative to its peers.
- Global Insights: Expanding the database to include a broader range of pipelines, enabling operators to benchmark against global trends.

These advancements will ensure that the tool remains at the forefront of pipeline integrity management, helping operators navigate an increasingly complex operational landscape. By enabling comparisons across key technical indicators and facilitating drill-down analyses, the tool helps operators understand where they stand relative to their peers and identify opportunities for improvement.

At ROSEN, we are committed to empowering the oil and gas industry with innovative solutions that drive efficiency, safety, and reliability. Our benchmarking tool represents a significant step forward in pipeline integrity management, providing operators with the context they need to make informed decisions and stay ahead of the curve.