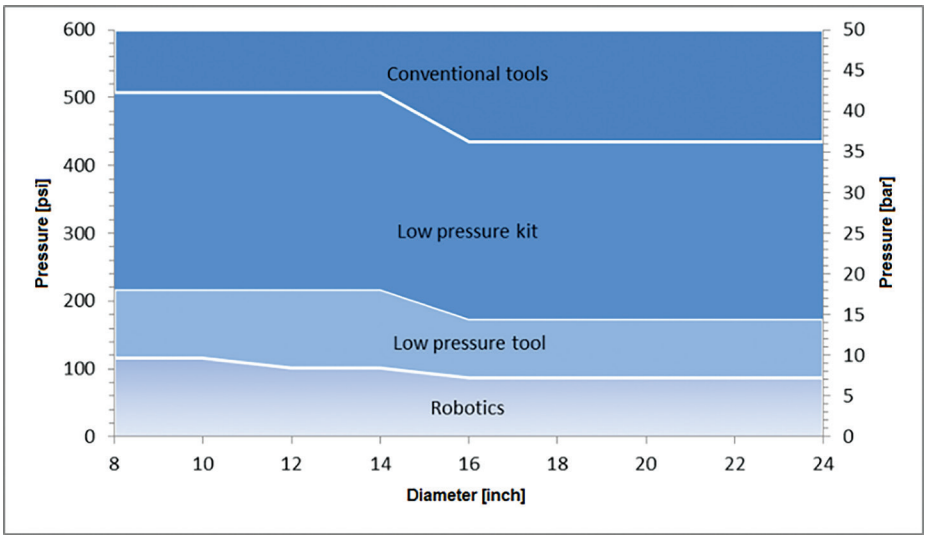
An alternative solution for high-quality data in low-pressure gas pipelines

Pipelines come in all shapes and sizes, but they can also display a variety of operating conditions. One not-so-popular operating condition is low pressure, meaning a gas pipeline operates at pressures lower than "normal" and often does not allow for standard ILI, so a solution must be found.



Tool selection guideline for low pressure gas pipelines.

There are a few golden rules when addressing challenging pipelines, including:

1. What goes in must come out
2. The inline inspection (ILI) must be worth it.

'Worth it' is not only meant from a high-quality data collection standpoint, which of course is arguably the sole purpose of an inspection, but also at a cost that makes sense – demonstrating how creating a solution for a low-pressure gas pipelines must take into consideration many factors.

In 2019, the ROSEN Group was challenged to create one of these unique solutions. The goal was to complete a full internal and external metal loss inspection of a 16 inch (406 mm), 17 km onshore gas pipeline; however, this unique asset posed its challenges, one being the low operating pressure of 3 bar, while a "normal" standard for operating pressure is between 30 and 35 bar.

Additionally, temporary launcher and receiver traps were required, as none were present.

The solution

When creating an inspection solution for any pipeline, it is always best to make sure the full picture is understood, meaning solution experts collect all data available on the pipeline before making a suggestion. In this case, things to be considered were propulsion methodology, such as how the tool would best move through the pipeline at speeds to guarantee high-quality data collection, technology choice and subsequent tool modification.

In this case, ROSEN experts chose nitrogen as the propulsion element. The conventional way of using nitrogen as a propellant is to use a nitrogen-pumping spread. This method requires a huge amount of nitrogen liquid, which then needs to be converted to gas; the gas, in turn, is then used to create the pressure needed for tool propulsion.

This is a massive expense, which is why ROSEN experts initiated a feasibility study for using a so-called nitrogen membrane instead. This membrane is a generating unit that can separate oxygen from air and produce a continuous supply of N2 gas, ensuring a dependable supply of nitrogen without needing to rely on liquid nitrogen, therefore cutting operational cost significantly.

With the propulsion problem solved, the technology and tool challenge were to follow. Although the N2 membrane does allow for increased pressure, it also has its limitations. The pressure would not rise to 30 bar, which is the pressure standard tools need to perform best.

Looking at the ROSEN technology portfolio, it was clear magnetic flux leakage (MFL) would be the best technology for the job. Widely known and used technology in ILI, MFL is robust and dependable, and is applied in both gas and liquid lines.

The technology choice was clear, but an additional concern would be the tool itself. It needed to be optimised to carry the MFL unit through the pipeline and still collect high-quality data. In the case of low-pressure pipelines, a dominant challenge is to overcome speed excursions, which normally occur during inspection runs because of passing bends, wall thickness variances, welds or the presence of debris.

In this case, the system was adapted by using the following elements:

- low-friction wheeled magnetizer yokes
- enhanced cup design for reduced and constant friction
- customized yoke support system
- friction reducing odometer unit
- ultra-compact and lightweight design.

A gas pipeline operating at pressures lower than normal often does not allow for a traditional ILI.

Outcome

The solution resulted in successful findings that met POF standards, and the data obtained from this inspection has helped the operator to decide on the next steps for further integrity management of the pipeline. This operation has achieved the main objective of completing the ILI with a cost-effective measure without compromising data quality. **P**

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