Case Study

An Alternative to Hydrostatic Testing for Complex Cracking

Challenge

When it comes to the identification of critical features, hydrostatic testing has been a viable solution to detect complex cracking problems (e.g. hooked, skewed, stacked). By nature, it is a costly method of ensuring seam integrity in pipelines, with large operational impacts and can fatigue non-threatening features to failure. Widely used for crack detection and sizing, 45° Pulse Echo (PE) shear wave technology is based on an ultrasonic sender/ receiver configuration in which the sender and receiver comprise of a single element.

To identify an alternative to hydrostatic testing, our client wanted to explore the feasibility of an ultrasonic solution, to provide a proven and alternative method for inspecting their critical lines. Despite the ability to detect hook cracks, they are typically undersized with conventional technology, leading to an underestimation of severity which may later cause in service failures.

Partnering with NDT Global, a collaborative 5-year development program was undertaken to not only develop but also deliver a proven ultrasonic solution to negate the need for future hydrostatic testing.

Solution

In collaboration with our client, NDT Global designed a tool development program. This unique program began in 2016, with NDT Global's development of high-resolution crack inspection tools and new analysis methodologies. Together, these technologies introduced tools with a circumferential resolution of 5.0 mm (0.2 in).

Circumferential resolution on its own is a significant enhancement to any crack inspection. By at least doubling the number of sensors emitting and receiving signals, several aspects are enhanced.

NDT Global has successfully overcome these remaining challenges in liquid crack detection technologies. To address tilted (hooked) and skewed cracks, a modified sensor arrangement was introduced to the fleet of tools. Instead of arranging clockwise and counter-clockwise sensors independently from each other, the new arrangement combines a clockwise and a counter-clockwise sensor as a pair. This allows the recording of a third type of signal, in addition to the conventional pulse echo and Enhanced Sizing information.

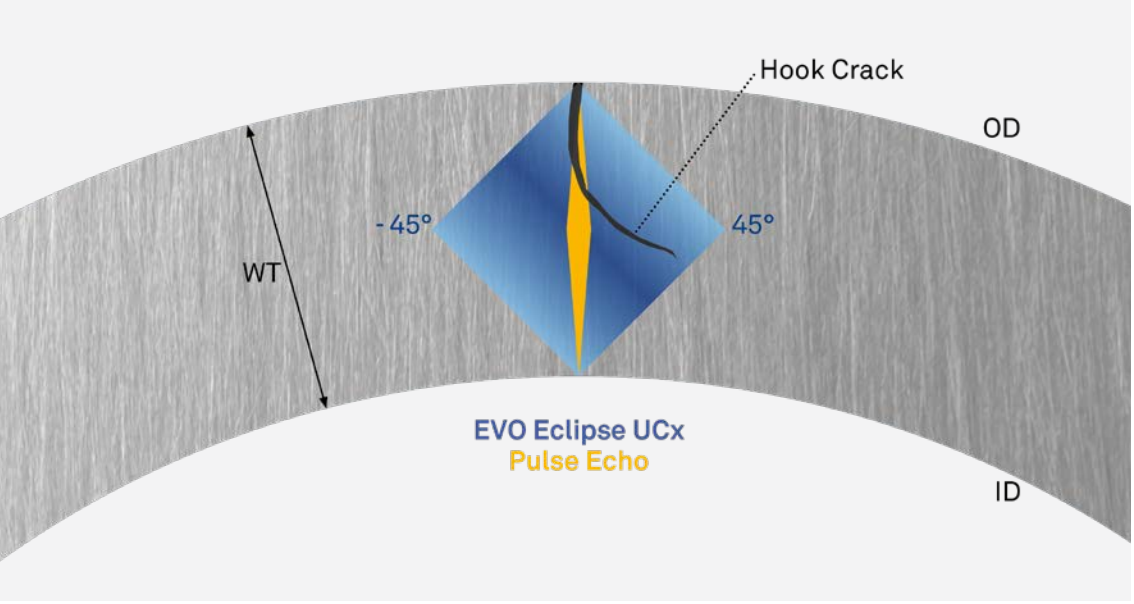
Axial Cracks

Circumferential Cracks

Metal Loss

Geometry Ovalities

Mapping



Results

- With hydrostatic testing, there is a probability of damaging the pipeline wall. This latest development has enabled us to detect critical defects by avoiding the use of Hydrostatic Testing, ensuring 99% probability of detection for severe flaws without the risk of causing plastic deformation to the pipeline.
- The operator used a third party to independently verify inspection results.
- Ultrasonic critical feature detection tool, EVO Eclipse UCx, has taken the ILI industry to the next level, not only with the advanced hook crack detection but with a full spectrum of additional features that are changing the way operators approach their inspection decisions.

> **EVO Eclipse UCx is one of the most important advances in the history of ILI technology.**

Key Tool Specifications: EVO Eclipse UCx

Tool sizes	6" to 48"	6" to 48"
Pipeline medium	Liquid	Liquid
Max. operation speed	4 m/s	9 mph
Temperature range	-10 to +50 °C	14 to 122 °F
Max. pressure	120 bar	1740 psi
Min. bend radius	1.5 D 90°	1.5 D 90°
Min. axial sampling distance	0.75 mm	0.03 in
Circumferential sensor spacing	5 mm	0.20 in

Max. operating speed and min. axial sampling distance depend on specific ILI tool set-up. Special configurations for high-temperature, high-pressure, multi-diameter and bi-directional inspections available upon request.

Defect Location Accuracy

Axial from nearest girth weld	±0.1 m	±3.94 in
Circumferential		
• for Ø < 20"	±10°	±10°
• for Ø ≥ 20"	±5°	±5°

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