

# THE PPIM 2023 INNOVATION AWARD

## PROTON – Phased Array In-Line Inspection Platform

NDT Global LLC

### 1 What is PROTON

PROTON™ is a phased array ultrasonic inspection platform for crack detection, sizing, and characterization as well as high-resolution wall thickness measurements. These measurements are achieved through a combination of multiple angle ultrasonic sampling and crack measurement techniques including pulse-echo as well as pitch and catch. The multiple angle sampling provides the best depth tool tolerance available in the market by means of these multiple indirect crack measurement techniques and a revolutionary direct crack tip measurement. The multiple angles cover a wide range of crack features such as hook cracks, lack of fusion, lack of penetration, weld anomalies, and stress corrosion cracking amongst other linear indications. The high-resolution wall thickness measurement enables measurements of the pipeline and weld unique attributes such as peaking, weld misalignment, weld width, and weld height.

### 2 Why it is significant

*"It's important to innovate, and it's also important to innovate at a fast pace" "We're constantly driving toward the development – and timely implementation – of solutions that meet our business needs" Enbridge director of Research, Development, and Innovation.*

PROTON was developed as an advanced inline inspection crack diagnosis solution to reduce or eliminate the need for hydrostatic testing on a pipeline that is challenging to inspect. It was developed to detect flaws where the pipeline manufacturing process was outside of optimal process control and produced a geometry variation across the long seam length within the same pipe joint. In this pipeline, traditional inline inspection crack detection technologies proved to have limited performance due to the inconsistent long seam misalignment and geometry.

### 3 How it is different from what already exists

The PROTON service is unique in that it successfully incorporates most of the capabilities of a traditional handheld phased array ultrasonic testing (PAUT) instrument into an inline inspection tool to withstand and operate within the harsh conditions of a pipeline environment.

## 4 How it will benefit the industry

*"This next-generation robot will allow us to greatly reduce the uncertainty of a given crack's size, so we focus more on those cracks that need our attention" Enbridge pipeline engineer Owen Burdeck*

The information PROTON provides a pipeline operator allows the understanding of the truest condition of the pipeline asset to improve decision-making resulting in risk mitigation and cost avoidance. The performance of the inspection system during its commercial inspections enabled an operator to move forward with a crack management program that significantly improved their fitness-for-service assessment and ultimately eliminated the need for hydrostatic testing on a challenging pipeline thereby achieving significant cost savings and improving pipeline integrity. The benefit of this platform also allows wide adjustments for optimal performance in pipeline operators' assets. Its flexibility can be used to program special inspection modes for Double Submerged Arc Welds, Electric Resistance Welds, Flash Welds, or other conditions without making mechanical modifications to the tool. Optimized measurement scenarios for all kinds of threats can be programmed via firmware including the axial and circumferential resolution and the angle of incident of each single ultrasonic shot, improving efficacy and operational efficiency.

## 5 References

Patent No. US 11067540 United States

- ["At the Forefront of In-Line Crack Inspection Services: A Highly Versatile Crack Inspection Platform for Complex Flaw Morphologies and Absolute Depth Sizing"](#) – Pipeline Technology Conference
- [Newsletter Piggings Product & Services Association Newsletter](#) - PPSA
- ['Cracking' the code on pipeline crack inspection tools](#) – Enbridge Blog
- [NDT GLOBAL, Enbridge take a 'big leap ahead' on next-generation pipeline inspection tool](#) – Enbridge Blog
- [Enbridge Spotlight video](#) – Enbridge
- PS-047-en Performance Specification PROTON Crack Detection (attached)

