Wireless Robotic MFL Inspection of In-Service Natural Gas Pipelines Using Inlir Charging Technology

PPSA Seminar
16 November 2022

CONFIDENTIAL & PROPRIETARY

What is Challenging?

Physical Attributes
• Unbarred tees • Mitered elbows • Short-radius elbows • Valves • Diameter changes • Obstructions • No records

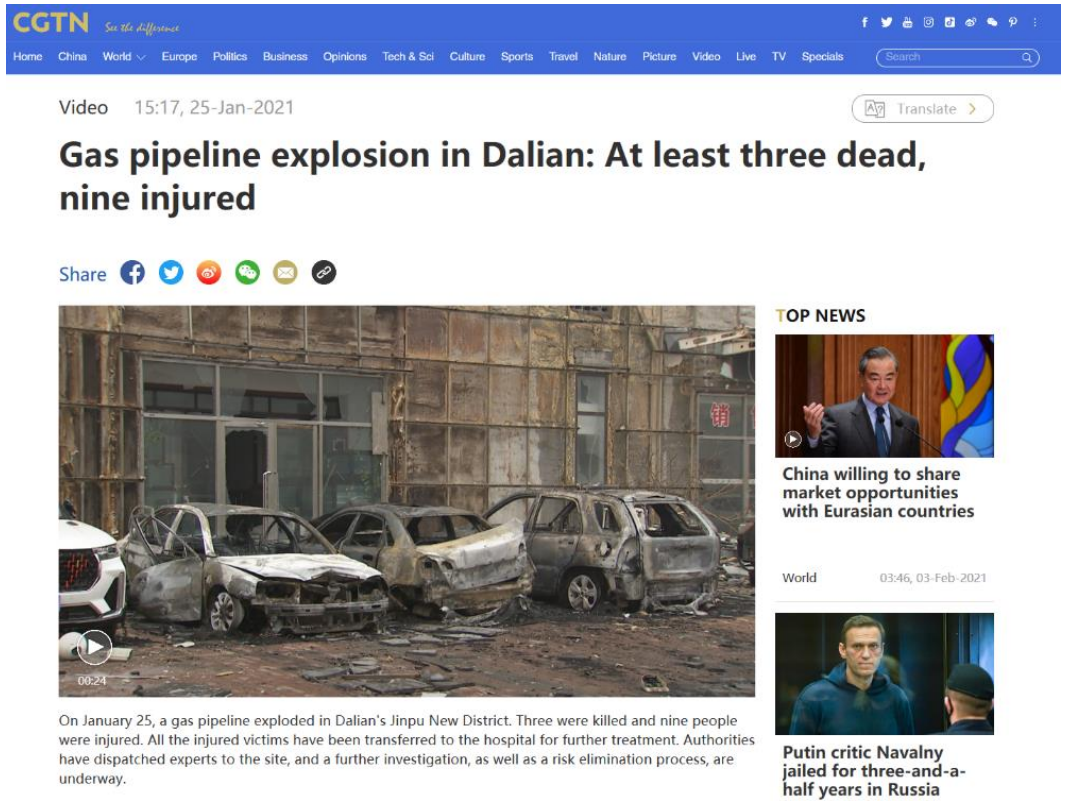
Infrastructure
• Lack of Launcher/ Receiver

Operating Conditions
• Pressure • Flow rate • Disruption to gas services

"Challenges don't come alone, they like to arrive in groups"

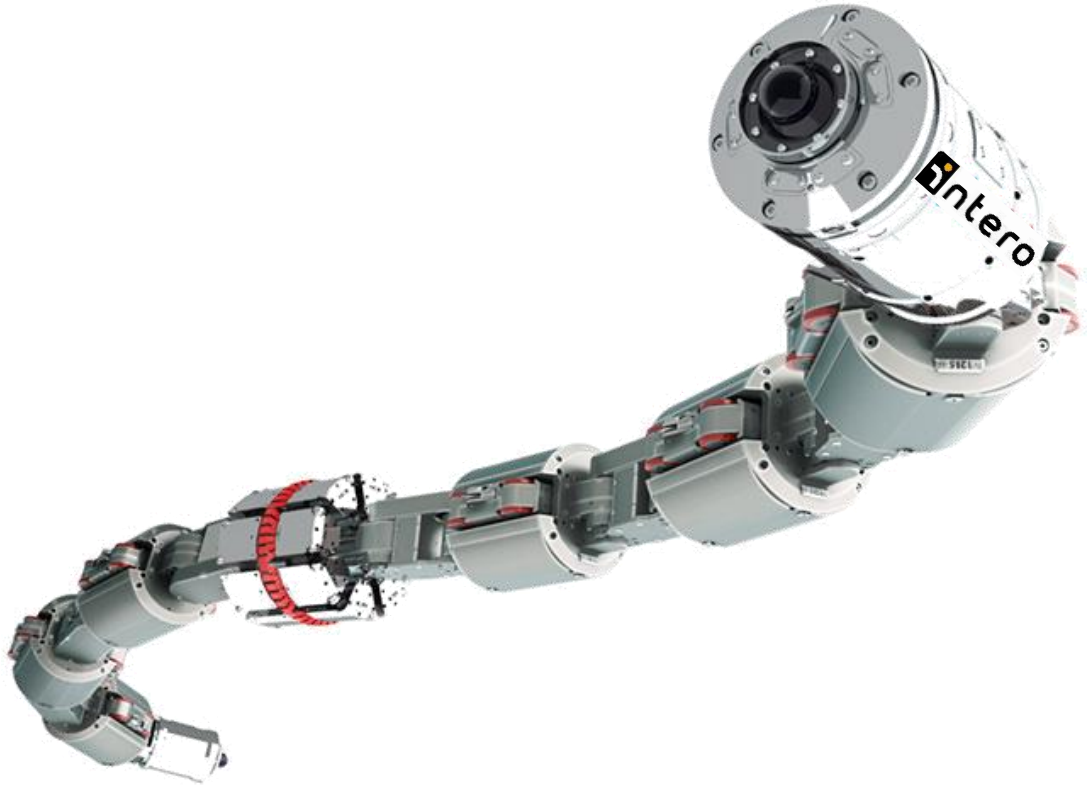
Benefits

- Certainty and reduce risk in “challenging-to-inspect” pipes
- Peace of mind on safety and integrity of pipes
- Data driven decision making
- Planned maintenance
- Ensure product delivery
- Confidence to increase throughput
- Towards zero incidents

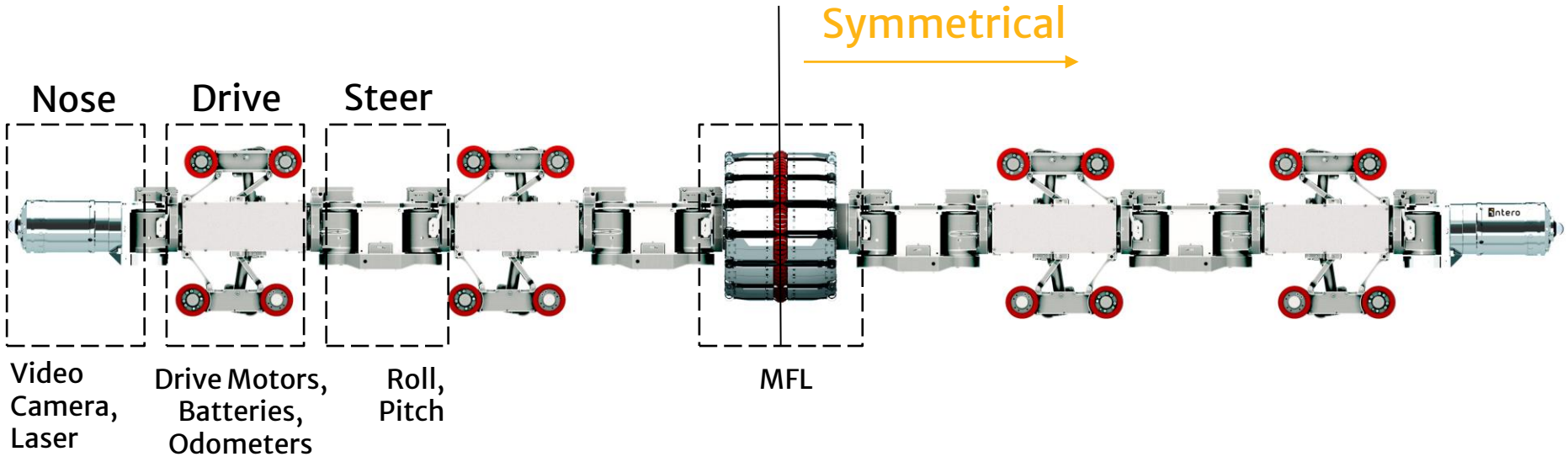


Robotic Inline Inspection

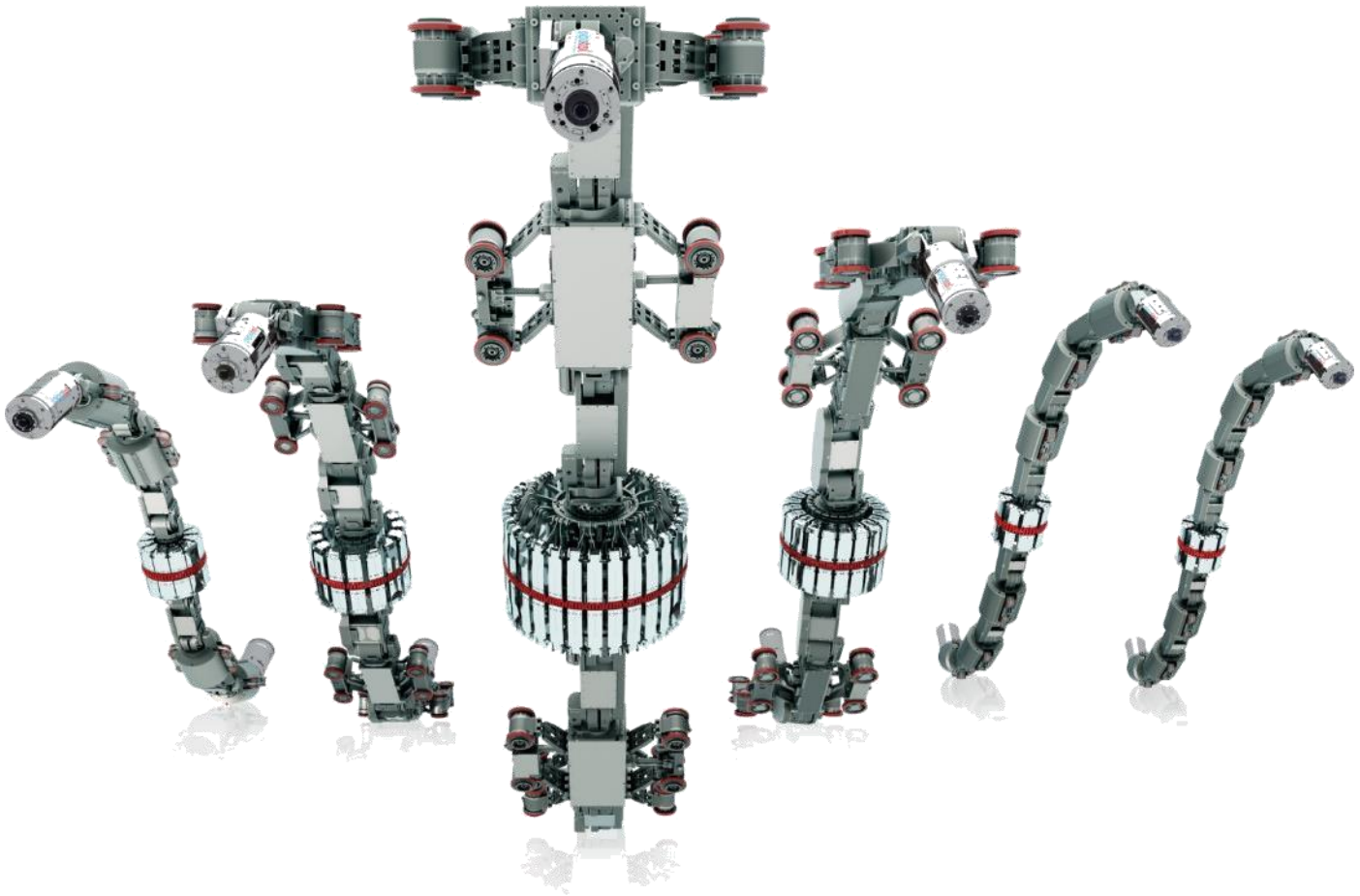
- Pipe Explorer has been commercially available since 2010
- More than 1,000 inspections completed
  - MFL Sensing
  - LDS sensing
  - Video inspection
- 99% success rate, > 90% FRS
- Can be recharged with Inline Charging (ILC) technology



Pipe Explorer Robotic ILI



Pipe Explorer Robotic ILI Fleet

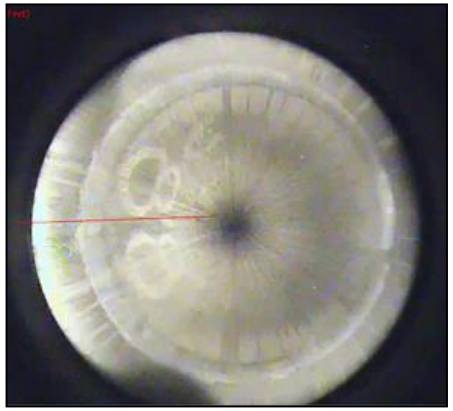


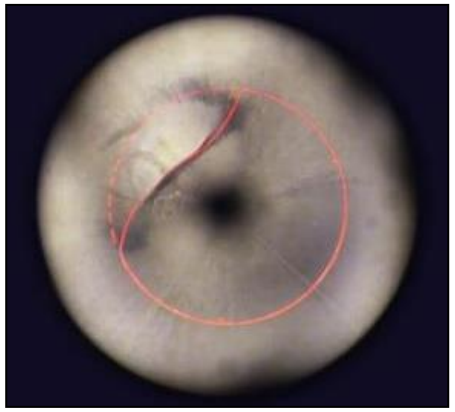
Pipe Explorers are available in sizes from 6 to 36 inch:

- Pipe Explorer 6
- Pipe Explorer 8
- Pipe Explorer 10/14
- Pipe Explorer 16/18
- Pipe Explorer 20/26
- Pipe Explorer 30/36

Pipe Explorer Robotic ILI

- Non-tethered
- Self-propelled
- Constant 300 m/hr, no speed excursion
- Bi-directional
- Up to 50bar in-service inspection
- Mitered elbow (no radius)
- Barred/Unbarred tee navigation
- 20% bore reduction
- Camera, MFL, and Laser sensors





VIDEO

Visual Inspection

MFL

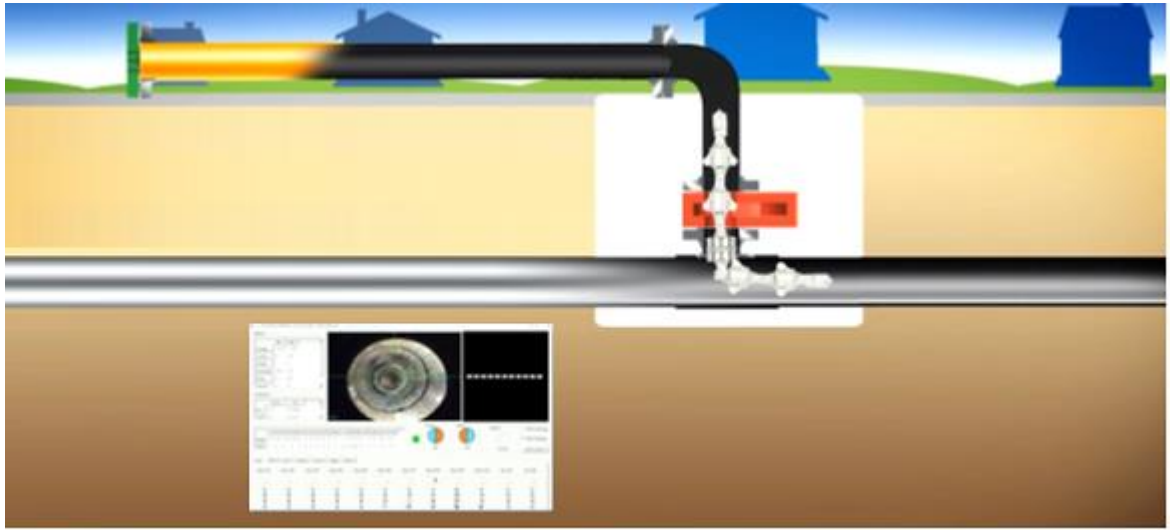
Internal & External Metal Loss

LASER

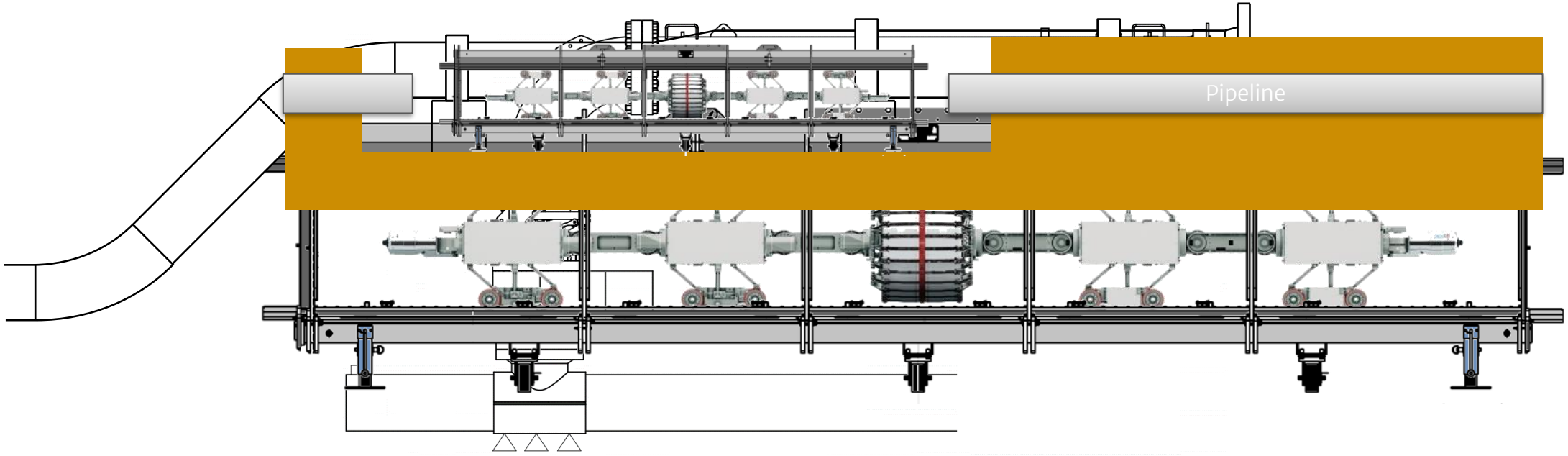
Dents and Mechanical Damage

Pipe Explorer Robotic ILI

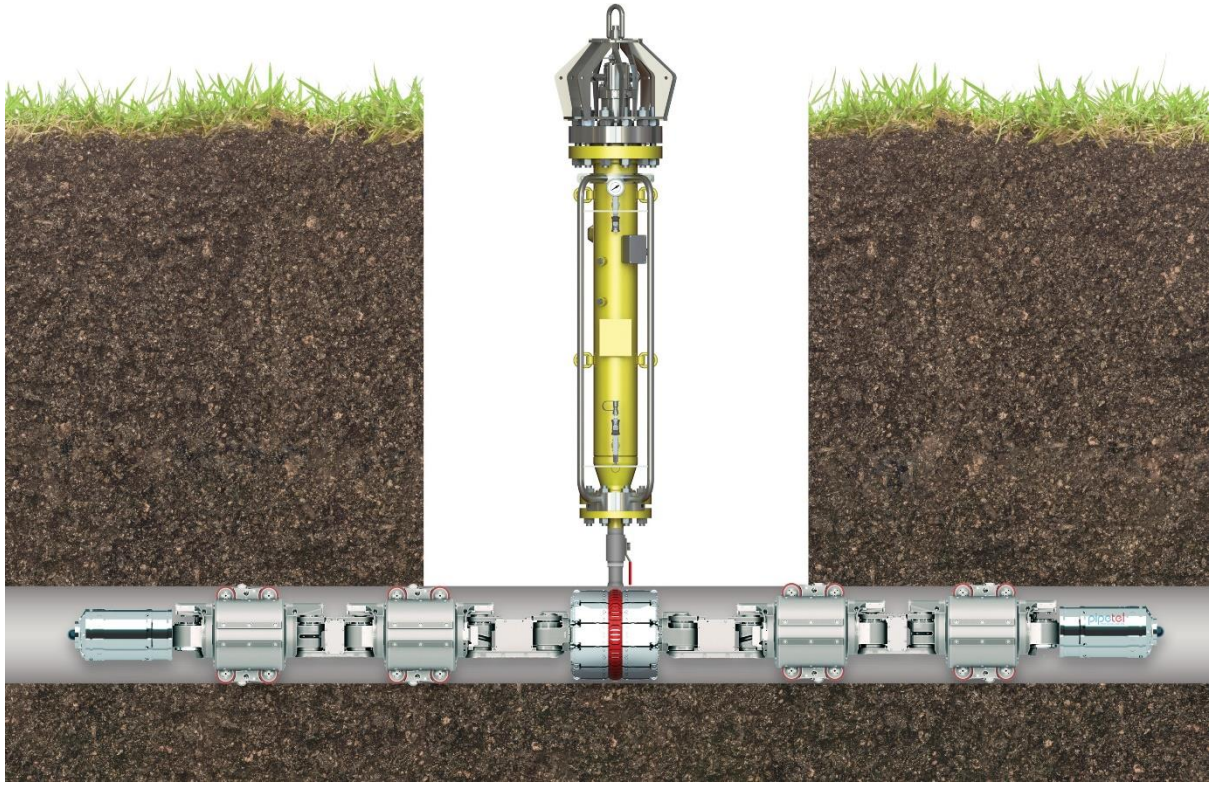
Pipe Explorer entry and exit through hot tap fitting



Our service offering



Range and Inline Charging



Pipe Explorer ILI Range

- Able to inspect up to 750m on a single launch (one direction)
- Recharging capabilities extend the range to suit the specific project requirement

Case Study

The inspection is for a natural gas and electricity supplier based in Canada with more than 580,000 electrical and 284,000 natural gas customers.

The scope of inspection covered 8.3 km of 10”, unpiggable pipeline in Central Canada.

Main Customer Challenges

- Built in the 1950's, never been inspected
- Plug and valve station unsuitable for traditional pigs
- Unknown pipeline geometry, fittings, wall thickness, cleanliness
- Lack of records
- Possibility of different diameters
- Lack of existing launching receiving infrastructure

Solutions and Inspection Options

Propulsion	Sensor
• Non-tethered, propelled by product (free swimming) • Tethered, non-self propelled • Tethered, self-propelled (robotic) • Non tethered, self-propelled (robotic)	• MFL • EMAT • UT • Eddy Current • Caliper • ID/OD • Laser • Video • IMU

Pipe Explorer 10/14 - 8 km Inspection

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Pipe Explorer 10/14 - 8 km Inspection

- Four launch and receive sites used to extend range from 750m to 8,300m
- Inspection completed in 9 days
- Over 99% MFL and LDS data coverage
- Identified previously unknown taps and bottom out fittings

Summary

- Provide certainty and reduce risk in “challenging-to-inspect” pipes
- Planned maintenance
- Aid decision making
- Ensure product delivery
- Confidence to increase throughput
- Towards zero incidents

Ever-evolving solutions