

**Inline Inspection (ILI) & Condition Assessment**  
 Smart Solutions for Pressure Pipelines  
 David Henderson, Applus+, UAE

2021  
 TRENCHLESS  
 MIDDLE EAST  
 Applus+  
 acovaint

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**Applus+ at a glance**

Applus+ is a worldwide leader in the testing, inspection and certification sector. We are a trusted partner, enhancing the quality and safety of our clients' assets and infrastructures, while safeguarding their operations and improving their environmental performance.

Our innovative approach, technical capabilities and highly-skilled and motivated workforce of over 23,000 employees assure operational excellence across multiple sectors in more than 70 countries.

We offer a complete portfolio of solutions that address a range of needs, from asset integrity management to statutory compliance-based inspections. We place a strong emphasis on technological development, digitalisation and innovation, as well as having the latest knowledge of regulatory requirements.



**23,000+**  
people in 2020

**€1,558**  
million total  
revenue in 2020

**70+**  
countries across  
all continents

**accredited**  
by major international  
organisations

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**Speaker**



**David Henderson**

**Service Line Manager – Pipeline Inspection & Rehabilitation Services**

Service Line Manager for Pipeline Inspection and Rehabilitation Services since 2017.

30 years of experience managing inspection and rehabilitation projects for the water and wastewater industry in the UK, Hong Kong, New Zealand, Angola, UAE and currently is based in Doha, Qatar.

Framework Manager for the Ashghal Catchment Zone Framework



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**Energy & Industry Division**



**Key figures**

Energy & Industry Division employs

**13,848 people**

**60+ countries**



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**Core services**

- Pipeline Inspections and Trenchless Rehabilitation
- Non-destructive testing
- Engineering and consulting
- Certification services
- Supervision, Quality Assurance and Quality Control
- Testing and analysis
- Vendor surveillance



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In-line Inspection and Condition Assessment



# Intelligent Pigging for Water & Wastewater Pipelines

The Smart tool for the internal condition assessment of pressure pipelines



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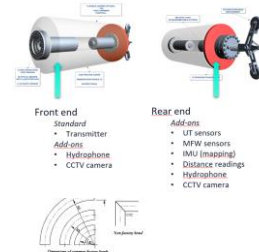
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In-line Inspection and Condition Assessment



- Un-Tethered
- Bi-Directional
- Std 30% bore reduction
- Unlimited number of bends
- Short radius bend (<1D)
- Internal data storage
- Selection Type Sensor range
- Modular inspection carrier



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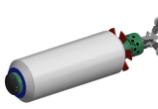
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In-line Inspection and Condition Assessment



- AGING ASSETS
- >50% OF THE PIPELINES OK
- WHERE TO START?



- REDUCE RISKS
- PRIORITIZE ACTION
- 100 % INSIGHTS & CONTROL



### THEORETICAL MODELS vs REAL LIFE SITUATION

"It has become increasingly clear that when applying condition models, the accurate results depends on the availability and reliable data entered that describes the condition and situation of the pipeline with sufficient detail. It has also been found that the availability of such data to date is limited" (JWR 2020)



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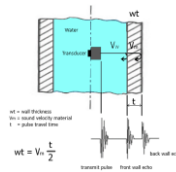
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In-line Inspection and Condition Assessment



### Why Ultrasonics

- More than just leak detection
- Proactive rather than reactive
- Wall thickness, every millimeter
- Anomalies
- Pipe deformation
- Manufacturing errors
- Predict condition of the uninspected



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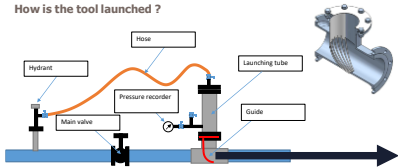
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How is the tool launched ?



Using a guide will improve the ability to launch the tool. If the waterflow can be reversed, then the same location can be used for tool extraction. Water flow will pass the guide. If there is a valve installed on the T-piece, then a guide is not particular necessary. In that case you will need flow through the main line as well.

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In-line Inspection and Condition Assessment



Host Pipe Materials & Failure Mechanisms

- Asbestos Cement
- Reinforced Concrete
- PVE/(HD)PE
- GRP (GVK, GRE)
- Cement lined Ductile Iron
- Cast Iron
- Steel

Material	Failure mechanism	Accuracy	Material	Failure mechanism	Accuracy
Asbestos cement	Cracking	10-20%	Cast Iron	Cracking	10-20%
	Scale build up	10-20%		Water hammer	10-20%
	Corrosion	10-20%		Internal erosion	10-20%
	Blockage	10-20%		Internal corrosion	10-20%
	Leakage	10-20%		Cracking	10-20%
Reinforced concrete	Cracking	10-20%	GRP (GVK, GRE)	Cracking	10-20%
	Blockage	10-20%		Water hammer	10-20%
	Leakage	10-20%		Internal erosion	10-20%
	Corrosion	10-20%		Internal corrosion	10-20%
	Scale build up	10-20%		Cracking	10-20%
PVE/(HD)PE	Cracking	10-20%	Steel	Cracking	10-20%
	Blockage	10-20%		Water hammer	10-20%
	Leakage	10-20%		Internal erosion	10-20%
	Corrosion	10-20%		Internal corrosion	10-20%
	Scale build up	10-20%		Cracking	10-20%

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Launching examples



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Joint Condition - Angular Misalignment



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**In-line Inspection and Condition Assessment**



**Joint Condition - Joint Gap Width**



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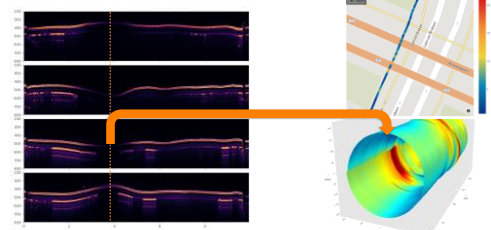
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**In-line Inspection and Condition Assessment**



**Non-Metallics – Ovality PVC, (HD)PE, GRE, GRP**



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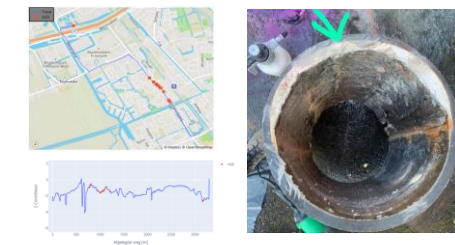
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**In-line Inspection and Condition Assessment**



**Sulphate Attack**



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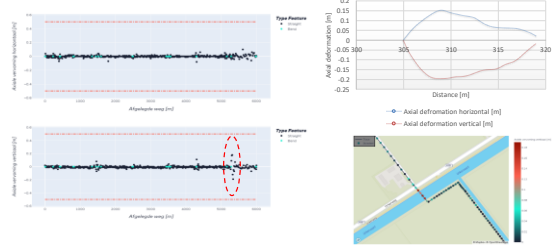
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**In-line Inspection and Condition Assessment**



**Non-Metallics – Axial Deformation PVC, (HD)PE, GRE, G**



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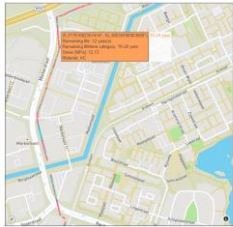
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**In-line Inspection and Condition Assessment**



**Lifetime Calculation**

- For all materials, based on:
- Depth profile
- Land use
- Buildings/roads
- Soil types
- Remaining wall thickness
- Deformation
- Ground water level
- Material properties



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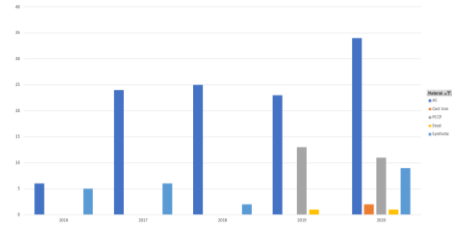
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**In-line Inspection and Condition Assessment**



**Host Pipe Materials Inspected in past 5yrs**



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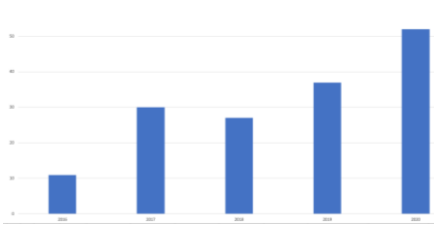
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**In-line Inspection and Condition Assessment**



**Number of Inspections in past 5yrs**



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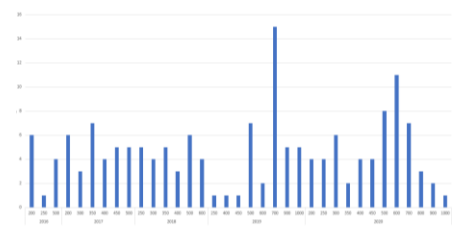
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**In-line Inspection and Condition Assessment**



**Range of Diameters Inspected in past 5yrs**



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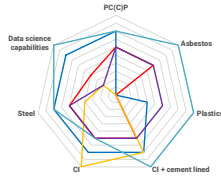
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Tech Comparison

— Pure — Echologica — Pica — Hydromax — Acquaint



Benchmark - Long Distance Condition Assessment

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