# UNPIGGABLE NO MORE!

## PRACTICAL SOLUTIONS FOR CHALLENGING PIPELINES

PIGGING PRODUCTS & SERVICES ASSOCIATION

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***PPSA Seminar – Aberdeen, 20th November 2013***

# CONTENT

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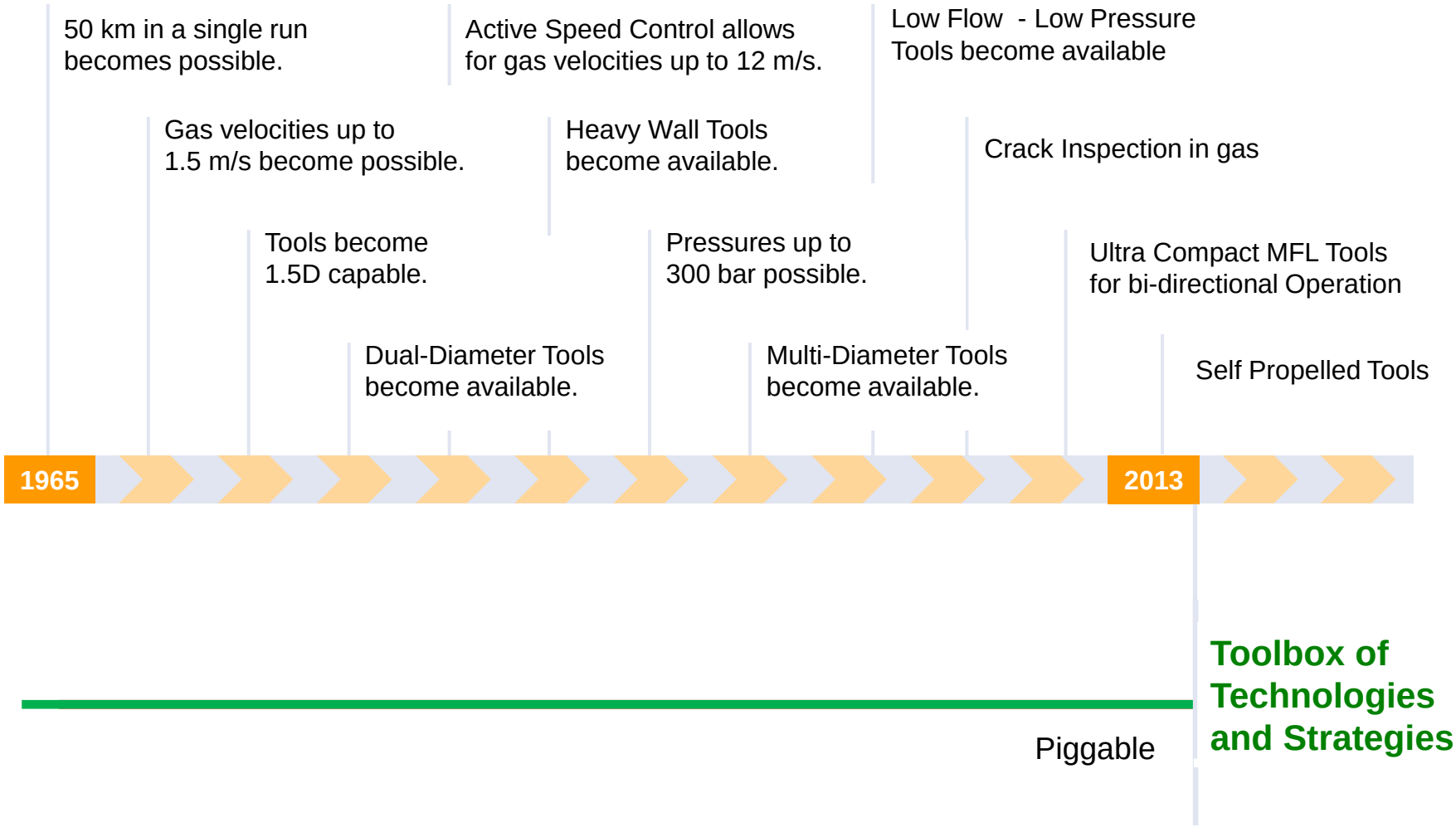
1. Evolutional Process
2. Managing Complexity – Simplified View
3. Risk Based Inspection / Selection
4. Case by Case – Examples

# EVOLUTIONAL PROCESS

## “Unpiggable” a function of time and market needs



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# MANAGING COMPLEXITY – SIMPLIFIED VIEW

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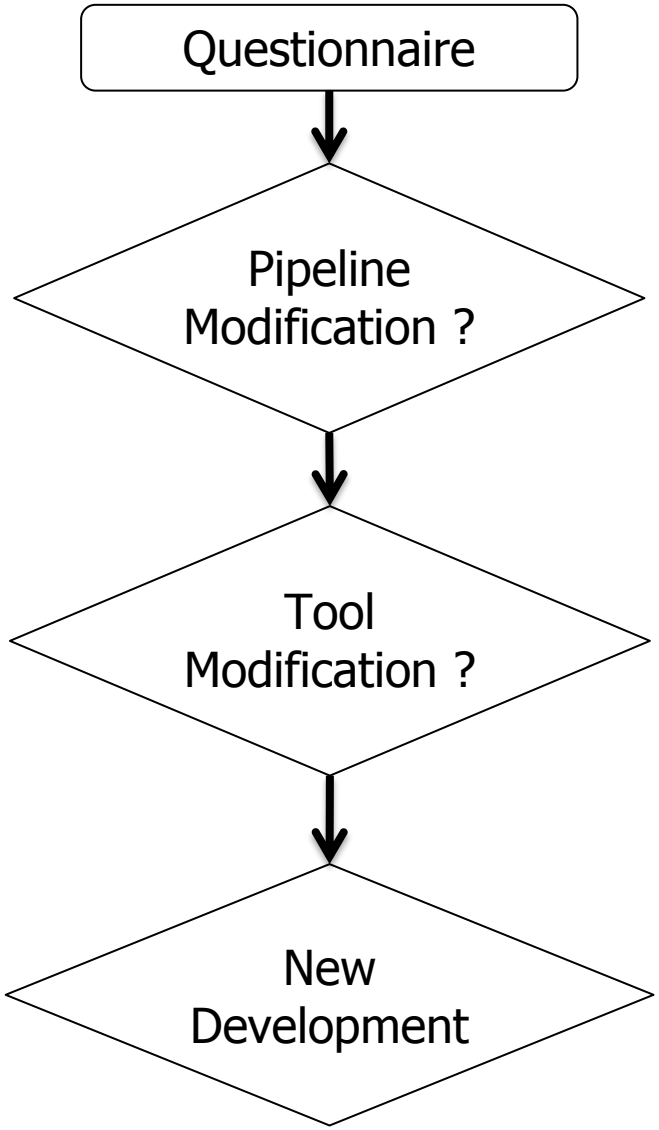


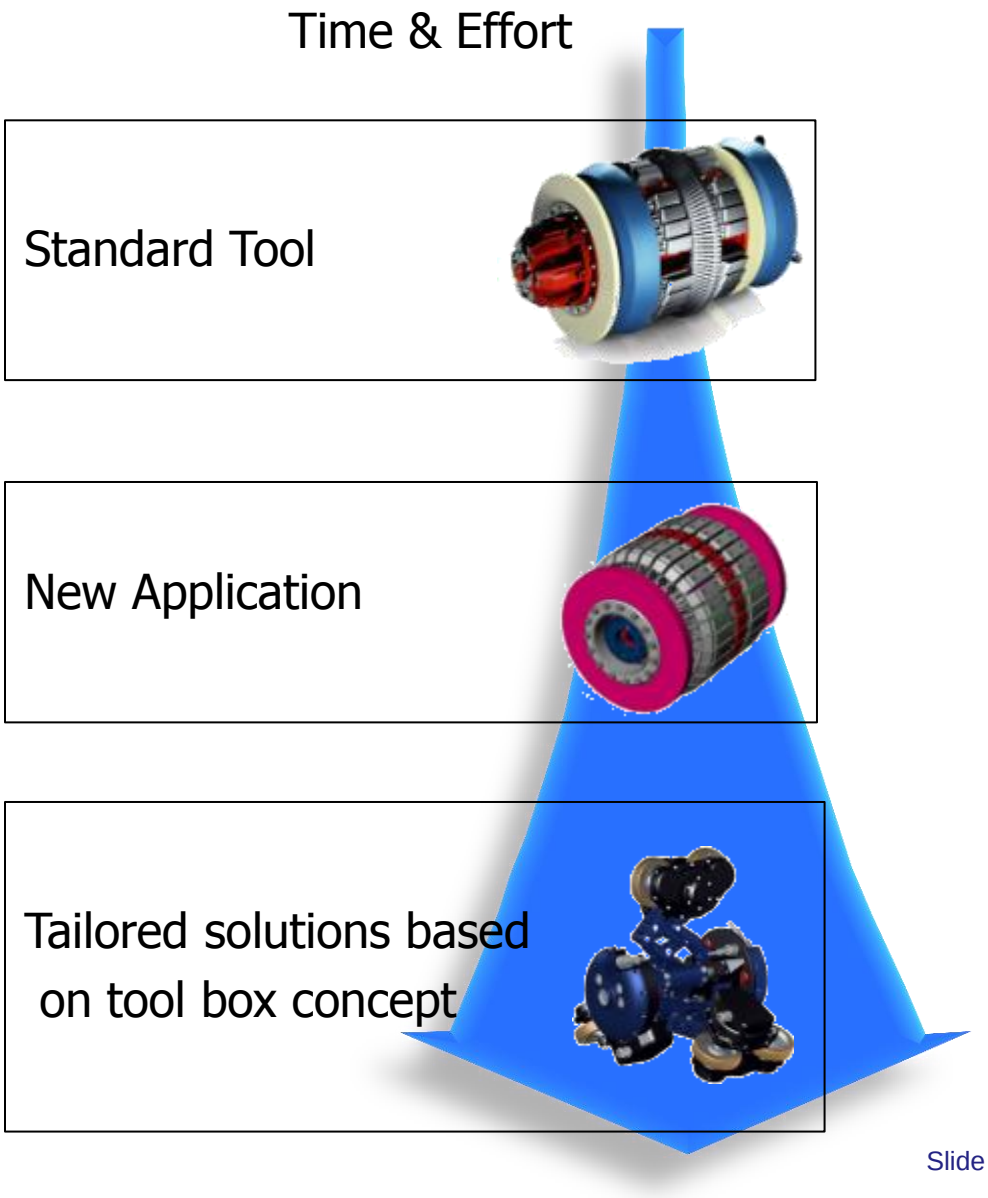

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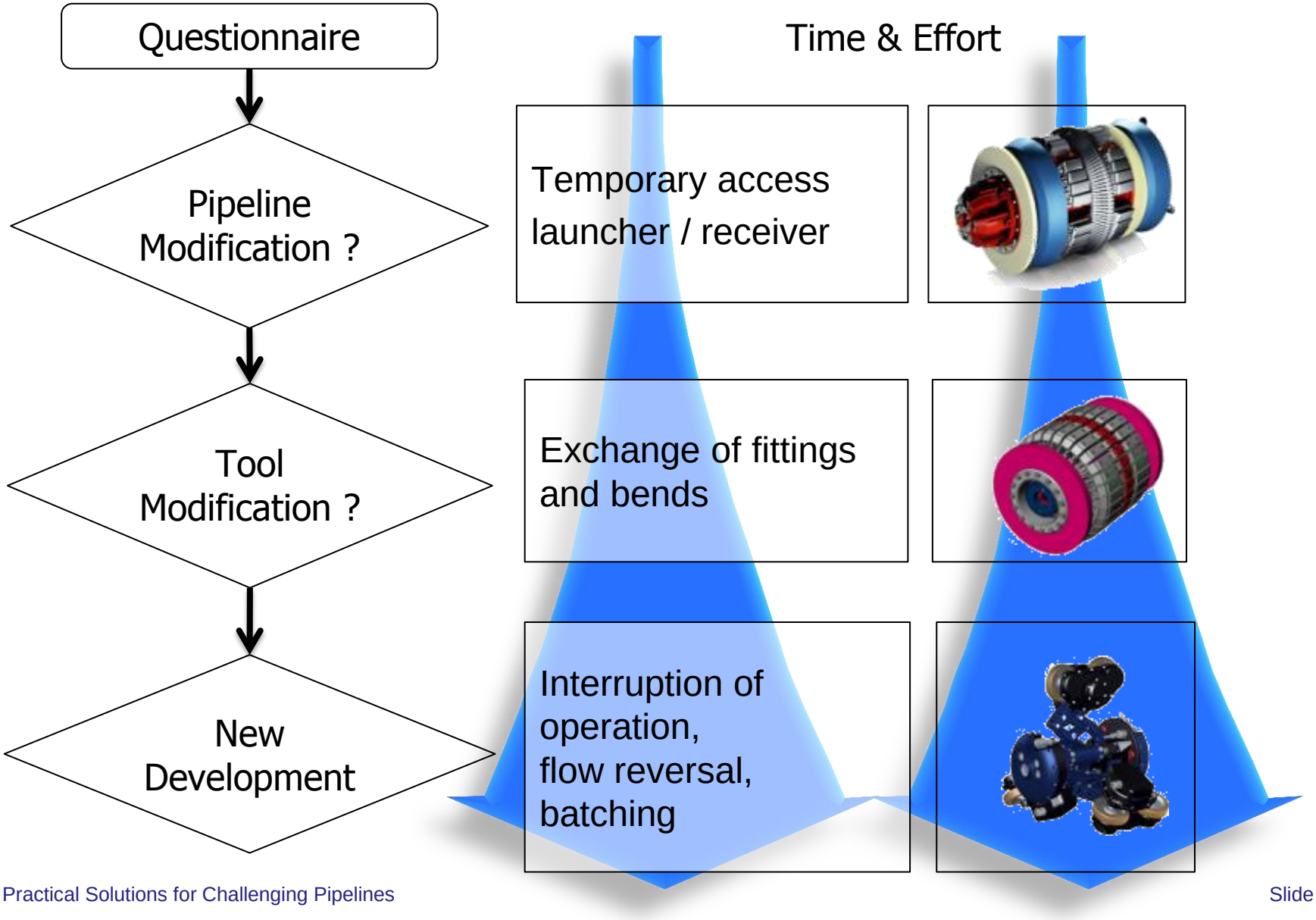

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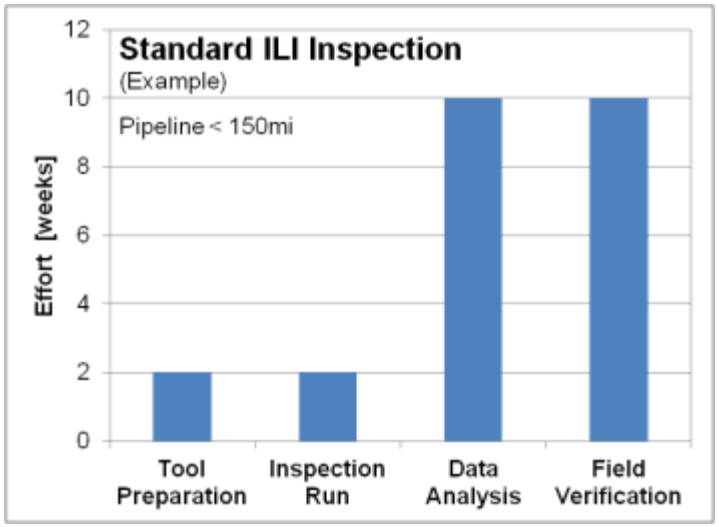
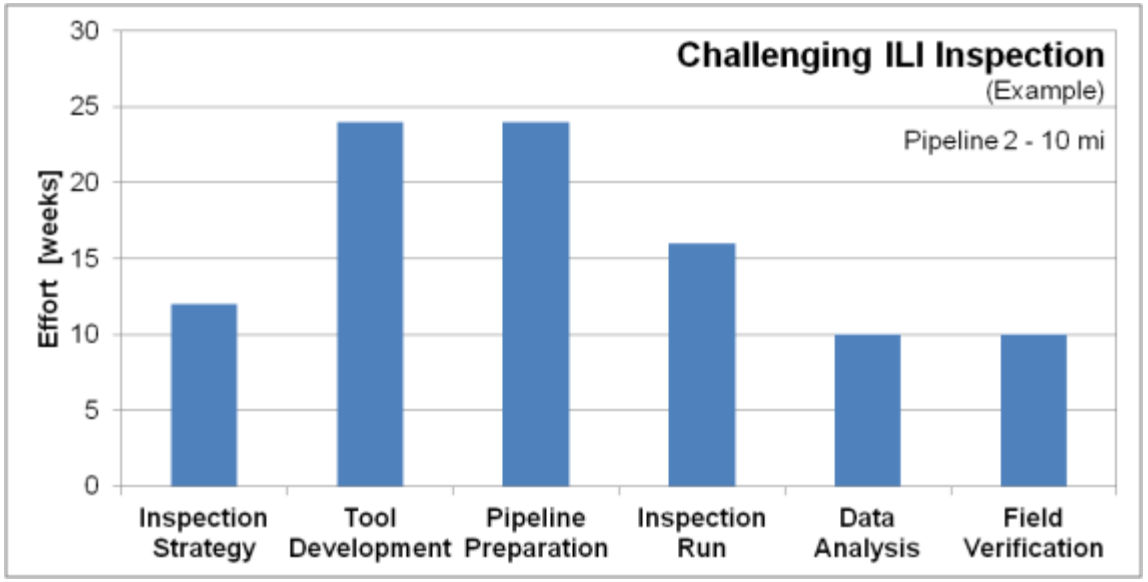



ILI standard focus on data analysis and verification (repair)

Challenging pipeline add up-front strategies, preparation and technologies

Note Inspection Run Time is increasing for shorter sections !



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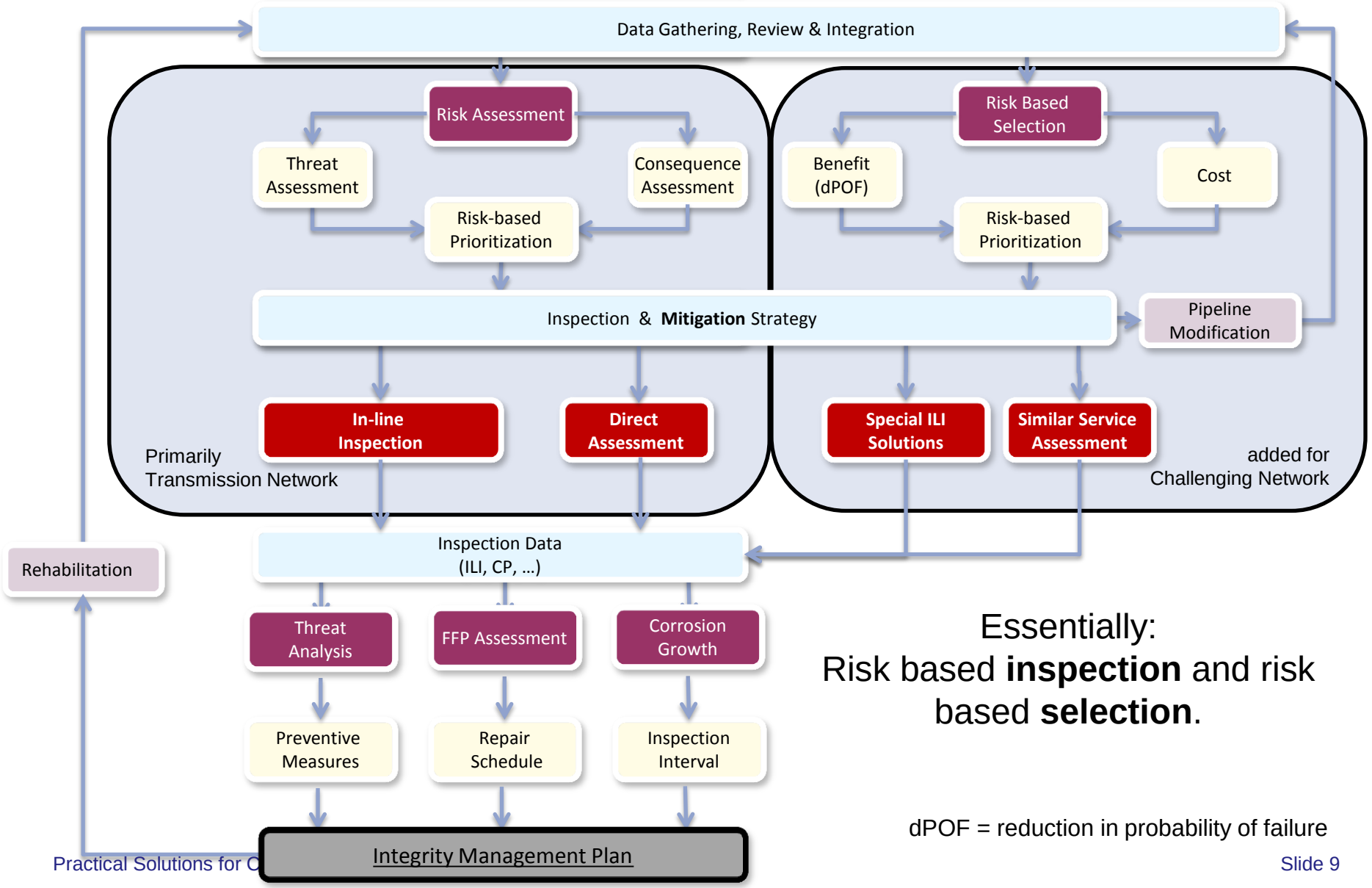
# RISK BASED SELECTION / INSPECTION




Essentially:
Risk based **inspection** and risk based **selection**.

dPOF = reduction in probability of failure

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# CASE BY CASE – BIDIRECTIONL MFL SERVICE

Versatile Elements –
Bi-Directional ILI Tools

**24” BiDi MFL ILI Tool**

Travel in either direction and capture data both ways (redundancy).

Asymmetric pigging operation for cleaning, gauging and inspection

# CASE BY CASE – BIDIRECTIONL MFL SERVICE

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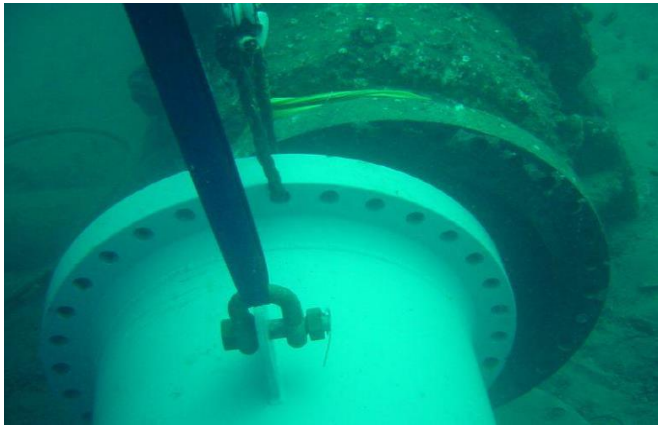
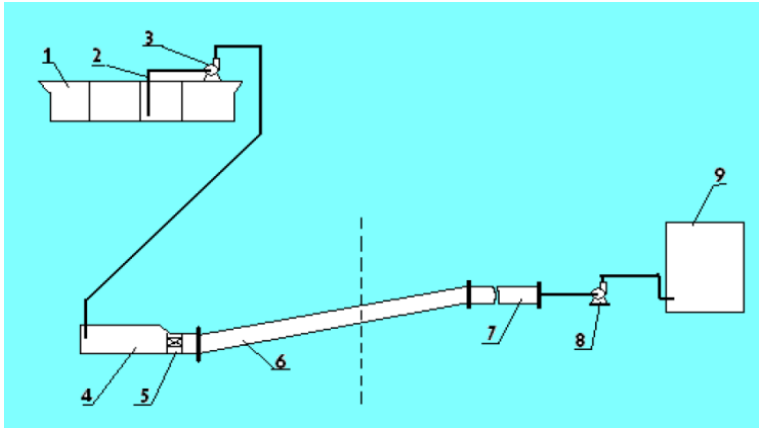
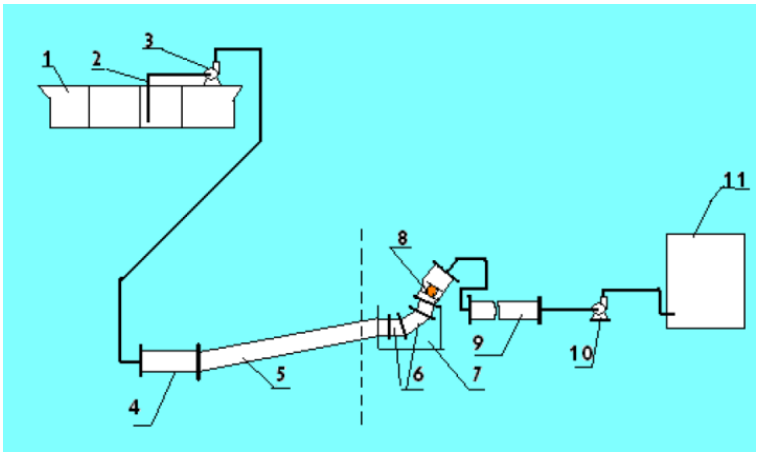
**Inspection of 16”, 24” and 32” Loading Lines**

Onshore / Offshore operation. BiDi operation. Gauging program identified severe or impassable dents. First line completed with BiDi MFL. Second line Geometry only. Third line rescheduled.





# CASE BY CASE – BIDIRECTIONL MFL SERVICE

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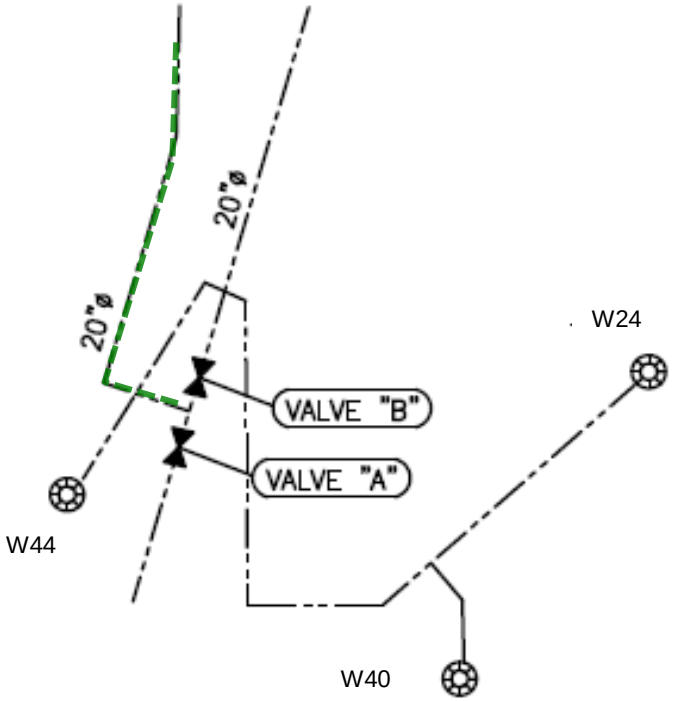
**Bi-Directional ILI Tools for Pig-Valve Operation**

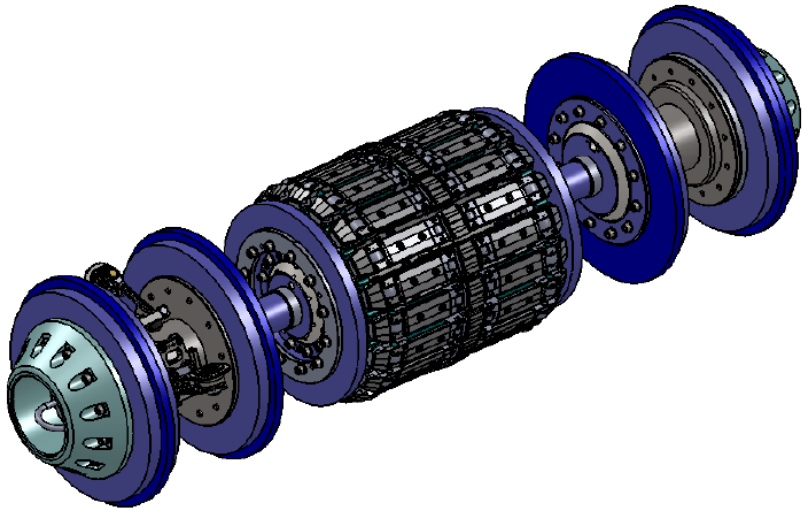
10” 3-Way-Valves typically used for spheres and cylindrical pigs with a length of 1.4 x D

# CASE BY CASE – BIDIRECTIONL MFL SERVICE

**Bi Directional Inspection of 20” In-Field Gathering Line**

Tie in into piggable 20” trunk line. Inspection from launcher to full bore unbarred tee and back. Single body tool with tee-extension.



# CASE BY CASE – LOW PRESSURE RUN

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## Inspection of 10” In-Field Gathering Lines

Pipeline pressure 116 psi (8 bar). Required differential pressure for tool 10 psi (0.7 bar)only; 20 psi (1.4 bar) at forged bend. Unidirectional set-up of BiDi tool.

# CASE BY CASE – TETHERED BIDI MFL SERVICE

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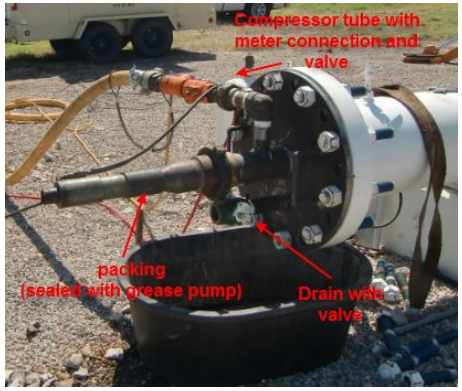
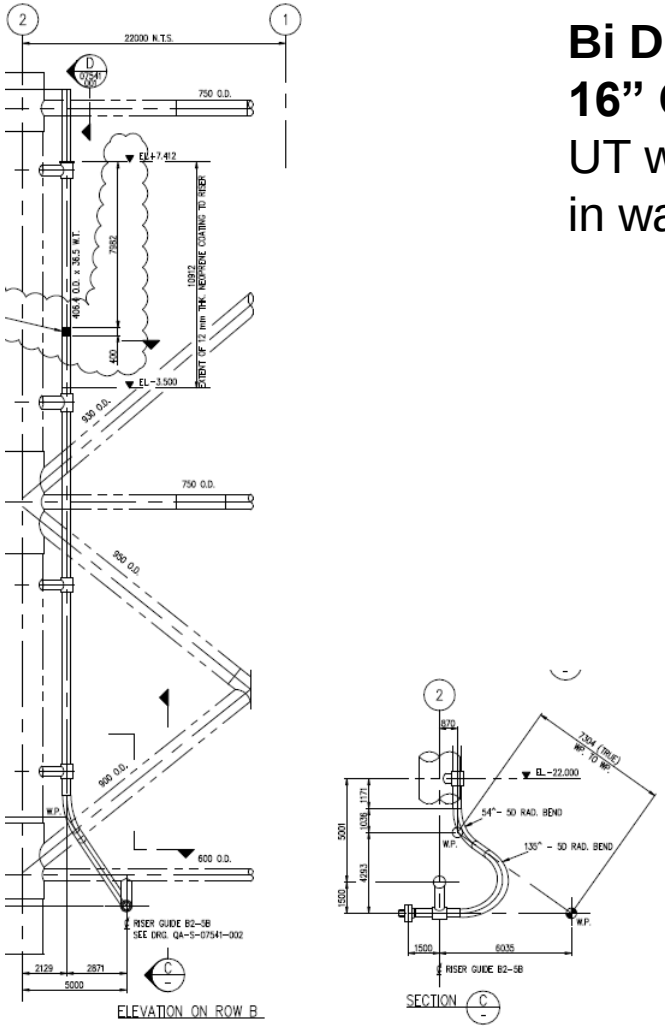
**Inspection of 12” Lateral Flow Lines Tied into 16” Trunk Line**

12” BiDi MFL ILI tool used. Lateral connection from well to 16” trunk line. Inspection during revision program. Push in with air 100 psi (7 bar). Pull back with winch. Provision of Gauging, Geometry and Corrosion Services.




# CASE BY CASE – TETHERED BIDI UT SERVICE



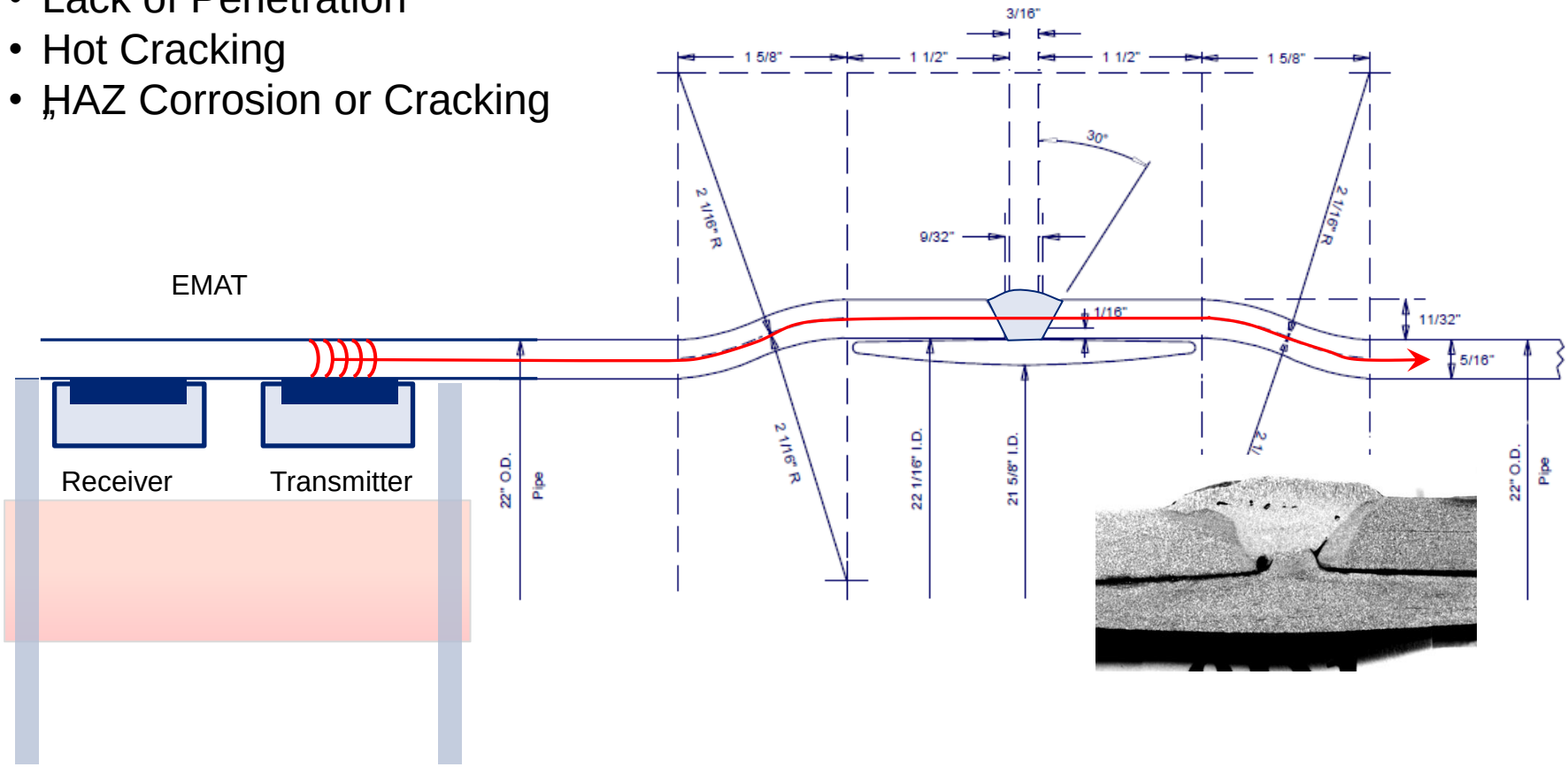

**Bi Directional Inspection of 16” Off-shore Riser**

UT wall thickness tool was lowered in water and pulled back.

# CASE BY CASE – ROBOTIC BIDI EMAT SERVICE

Inspection of Girth Welds

- Lack of Penetration
- Hot Cracking
- HAZ Corrosion or Cracking



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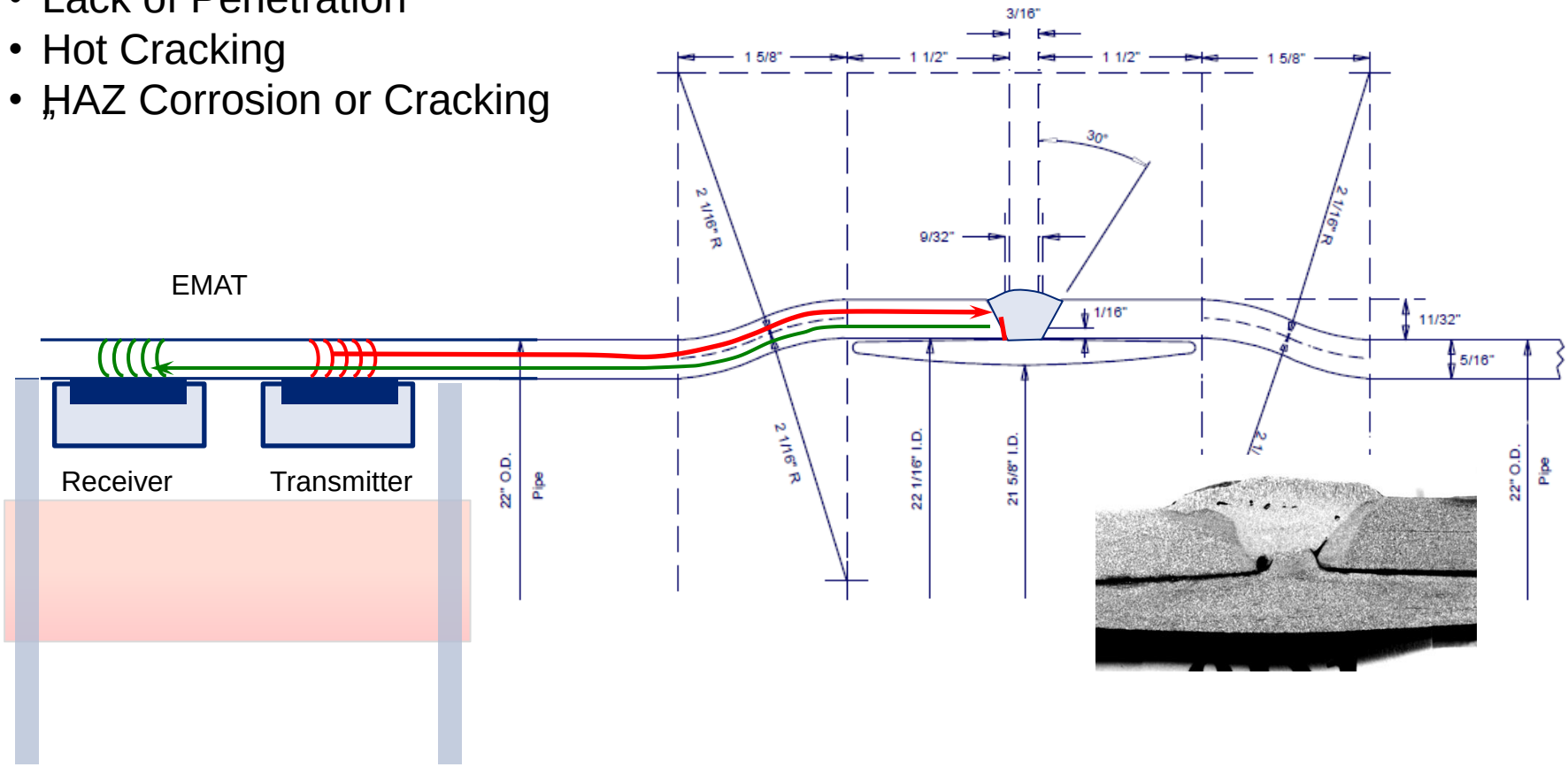

# CASE BY CASE – TETHERED BIDI EMAT SERVICE

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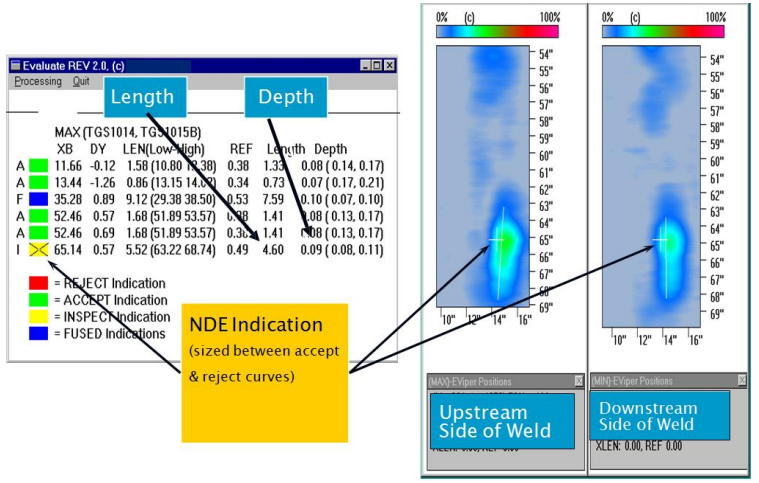
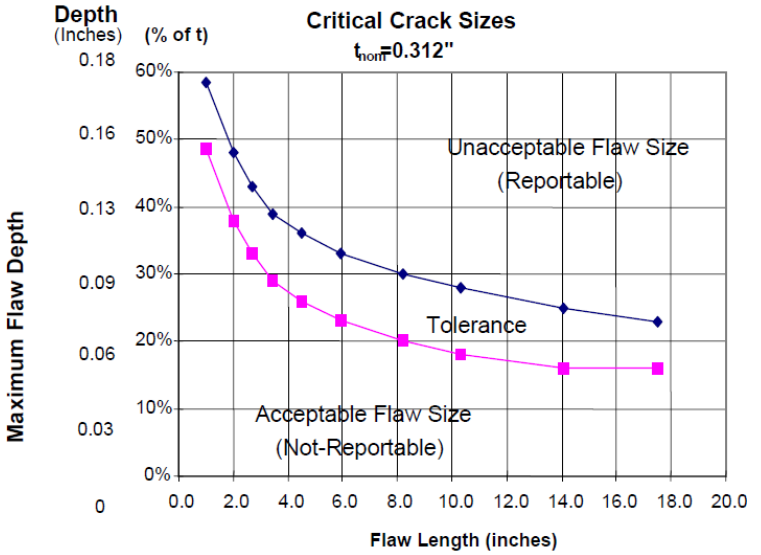
Acceptance & Rejection Curves
semi automated process to accept or reject a weld with user interface onsite



# CASE BY CASE – ROBOTIC HELIX TOOL

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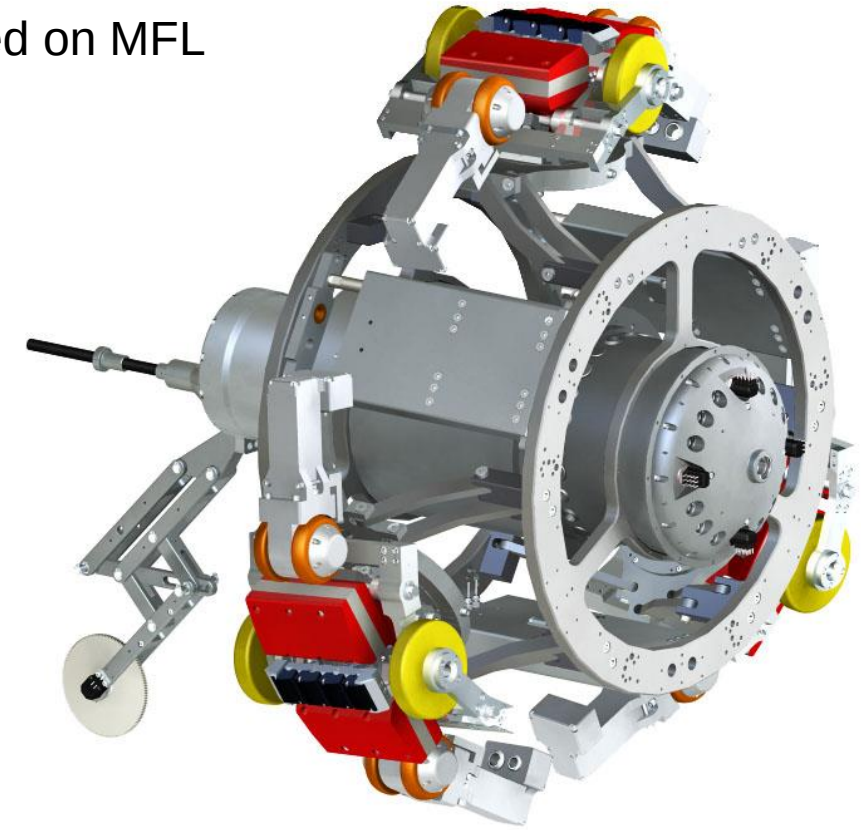
- Single body
- Rotating measurement system based on MFL
- Light weight
- Easy to handle
- Front & rear camera system



Single Tractor & Inspection Unit

# CASE BY CASE – 10” ROBOTIC  MFL CRAWLER

The self-propelled RoCorr MFL/BiDi/MTC inspection solution consists of the following elements:

| | |
|---|---|
| Inspection technology: | MFL |
| Carrier: | Bi-directional / low friction |
| Propulsion: | Multi Trotter Crawler |
| Power: | Onboard accumulators |
| Operation & control: | External via wire line |
| Fail safe: | Cable |

# CASE BY CASE – 10” ROBOTIC MFL CRAWLER

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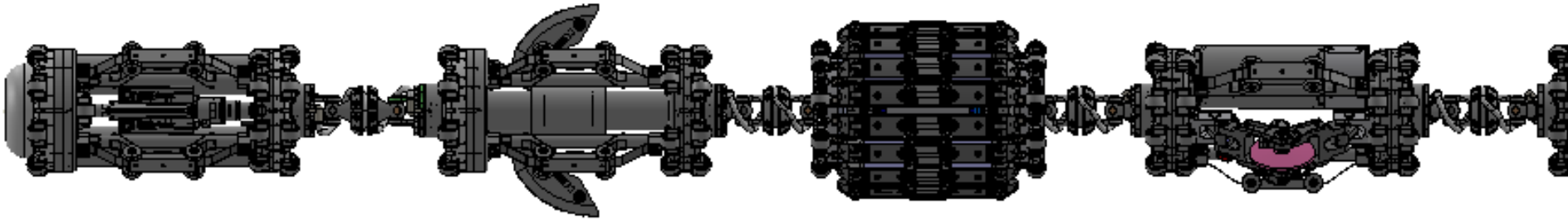

| **Technical Specifications** | |
|---|---|
| Inspection Range | 200 mtr |
| Nominal Inspection Velocity | 50 m/h |
| Nominal Pulling Power | 11,000N |
| Peak Pulling Power | 22,000N |
| Pressure Resistance | 2 Mpa (20 bar) |
| Operating Pressure | ambient |
| Product Temperature Range | 0 - 45 ºC |
| **Sensor specification 10” MFL configuration** | |
| MFL channels | 144 |
| Wt range | 4.0 - 10.0 mm |
| Magnetization level | 10 – 30 kA/m |

| **Mechanical Specifications** | |
|---|---|
| Tool length | 5200 mm |
| Operational weight | 293 kg |
| **Tool locating system** | |
| Transmitter | ITX 503 |
| **Pipeline requirements** | |
| Min. Bend Radius | 1.5 D |
| Min.Bore in Straight Pipe | 232 mm* |
| Min.Bore in 3D Bend | 240 mm* |
| Straight Pipe between b2b bends | 1000 mm |
| Max ID Step Changes | 10 mm* |

*) Limited by the MFL unit

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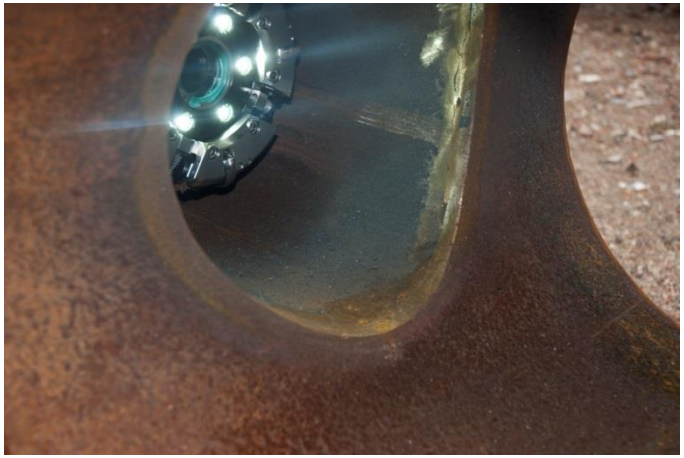
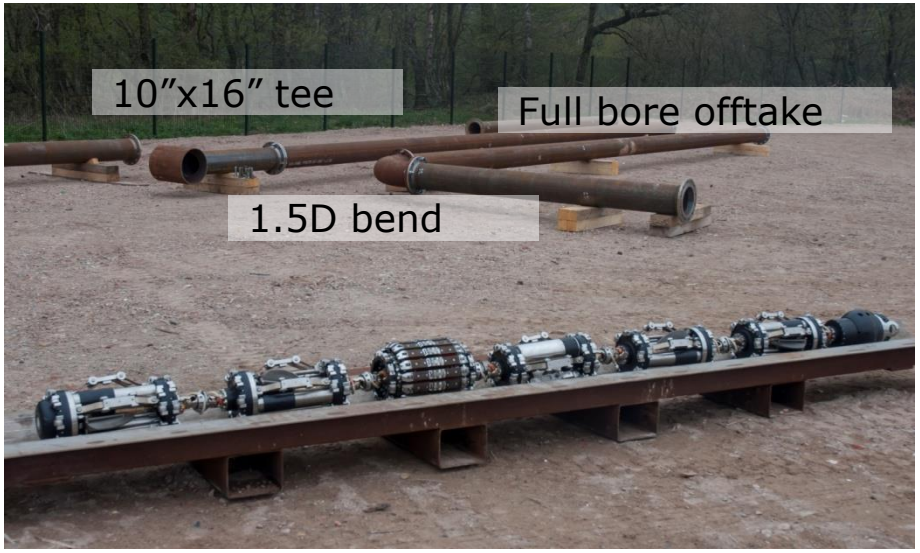
## Full-scale testing





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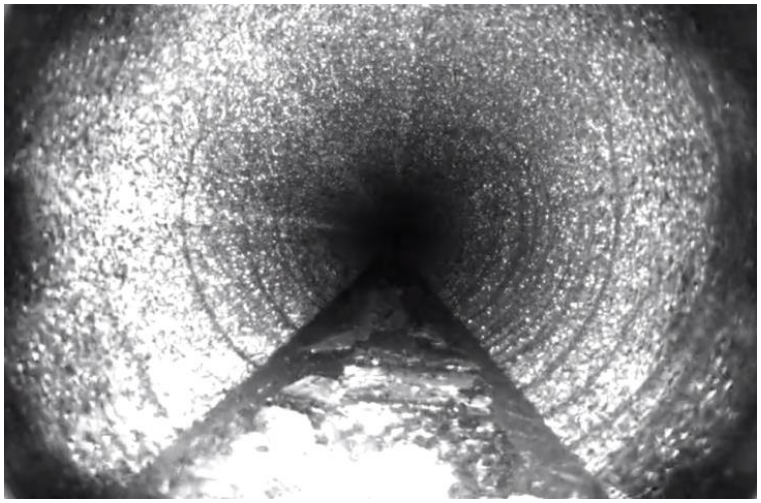
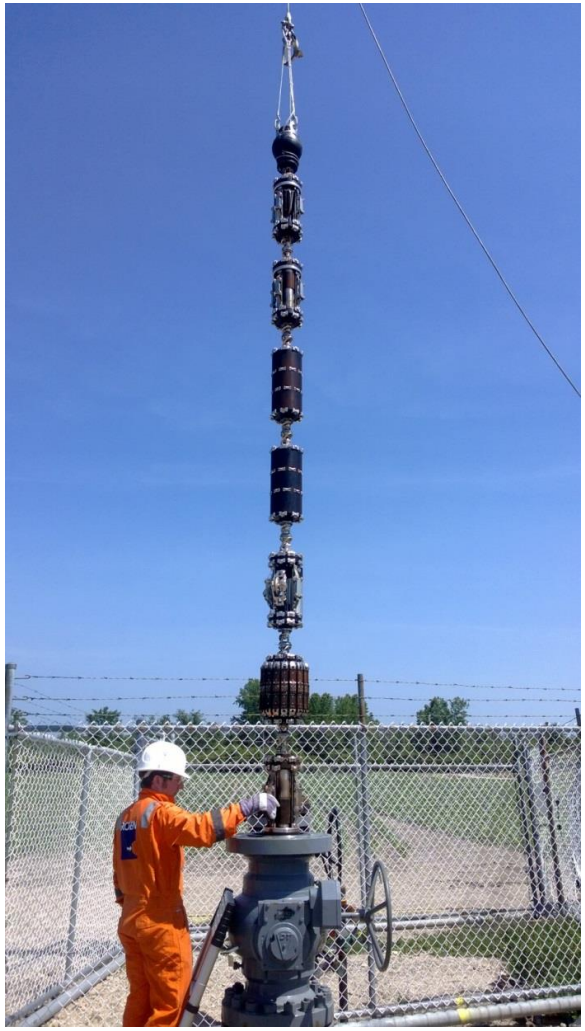
## Field Operation





# CASE BY CASE – 10” ROBOTIC  MFL CRAWLER

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Cost effective - Bi-directional approach avoids the need for expensive receiver while the MFL technology avoids the need to liquid fill the line

Safe - Extremely powerful crawler provides full control over the tool movement whilst well designed  fail safe measures ensure the tool can always be recovered

Quality - high resolution MFL data quality, 100% coverage in one single pass and tool records both ways

Reliable - MFL technology is a robust and proven technology known to be least sensitive to debris

Easy - The crawler approach avoids the need for heavy equipment such as compressors/ wire line trucks

# CASE BY CASE – ROBOTIC SURVEY SYSTEM (RSS)

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- Configurable for different sizes (here 16”)
- Eddy current sensor unit for shallow internal corrosion measurements
- Unit with geometric measurement sensors
- Camera for visual inspection

# CASE BY CASE – ROBOTIC SURVEY SYSTEM (RSS)


Field test with the RSS 16”. Line was approximately 150 meters long and subjected to significant debris. Tool travelled in both directions.

# THANK YOU FOR JOINING THIS PRESENTATION.

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