Best Practice for Management of Pipeline Integrity by Pigging

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Agenda

- Pigging: What, why and when?
- Pipeline inspection by MFL tools
- Pipeline inspection by UT tools
- ILI tool selection
What is ILI and why use it?

- **In-line inspection**
  - Method of collecting wall thickness or metal loss data to enable assessment of pipeline fitness for purpose

- **ILI can provide information on**
  - General and local wall thickness / metal loss
  - Corrosion
  - Cracks
  - Laminations
  - Weld defects

- **Best practice for management of pipeline condition**
  - Often in conjunction with operational pigging
Operational pigging

- **Management of internal condition to reduce risk**
- **Sphering**
  - Liquid sweep in gas lines
  - Spreading inhibitors
- **Cleaning**
  - Removal of debris e.g. wax
When to do ILI?

- **Installation and commissioning**
  - Baseline inspection

- **Design operational life**
  - Regular re-inspection (frequency is risk-based)

- **Extended operational life**
  - Validation for lifetime extension
  - Re-validation

- **Decommissioning**
  - Operational pigging throughout lifecycle if required
Pipeline piggability

- Not all pipelines are suitable for pigging
- Availability of suitable facilities and pig traps is critical
- Bore range
  - Single diameter preferable
  - Multi-diameter lines can be piggable, often need bespoke tools
- Minimum bend radii
  - 5D preferred
  - 3D possible with most tools
  - 1.5D possible with a few tools
- Pipeline features and restrictions
  - Back to back bends
  - Valves
  - Offtakes (tees & wyes)
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Magnetic flux leakage (MFL) tools

16” PII MFL tool
Principle of operation

No defect present

Defect present

Leakage of field

Section of pipe wall

Defect
Output interpretation
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Ultrasonic technology (UT) tools

12” NDT ultrasonic ILI tool
Principle of operation

Diagram courtesy of NDT Systems & Services
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Operational constraints

- **What is the available drive medium?**
  - UT – needs liquid couplant
  - MFL – can operate in gas or liquid

- **What are the process conditions during pigging and how controllable are they?**
  - Flowrate
    - UT – requires low, controlled flowrate (c. 0.5 – 1.0 m/s)
    - MFL – can tolerate higher flowrates and fluctuation (up to 4.0 m/s)
  - Pressure
    - UT and MFL – most tools c. 120-150 bar, some up to 300-400 bar
  - Temperature
    - UT and MFL – most operate up to c. 65°C
Defect detection requirements

What is the pipeline construction?
- MFL – can only magnetise carbon steel lines
- UT – can measure wall loss in most materials (CS, duplex, CRA)

What are the specific degradation mechanisms and threats to the pipeline?
- Global metal loss – MFL or UT generally suitable
- Pitting – UT provides higher resolution data
- Cracking – specific tool setup required whether UT or MFL
What sections of the pipeline can be inspected?

• Full pipeline from trap to trap
  • Traditional MFL or UT tool suitable

• Local riser/spools only
  • Crawler tool (usually UT)
  • Bi-directional ILI tool (MFL or UT)
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Thank you for listening

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