Alternatives to In-Line Inspection (ILI) for Inspecting Offshore Pipelines and Risers

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Existing Technology

Alternatives to ILI –
- Umbilical inspection (non-piggable pipelines)
- External inspection

NDE – Methods applied

- Ultrasonic
  - Long Range UT
    Not through the coating; requires a point of access
  - ART (Acoustic Resonance technique)
- Radiography
- Electromagnetic
  - Pulsed Eddy Current (PEC)
  - Magnetic biased Eddy Current (MEC/SLOFEC)

One of the characteristics for external inspection of offshore pipelines and risers is the need to inspect through thick coating.
Application of PE for subsea pipeline inspection

Advantages of PEC:
Has been used for CUI (Corrosion under insulation for up to 150 mm)

Drawback:
Resolution limited, not a fast scanning technique
The task
PE coating on a riser

- Several risers had to be inspected with a neoprene coating of 12.7mm and up to 25.4 mm wall thickness.

- Pipes for testing and calibration were produced to stipulate the performance under these conditions.
- Defects in the range of 10 mm diameter and 10% wall loss had to be detected.
The MEC/SLOFEC Inspection technology
2D and 3D FEM calculations carried out to understand performance of sensors.

Eddy current sensors have an active field contrary to Hall Sensors for MFL. Placed in an array and excited continuously, the field will form like in a large coil, but with high resolution.
The MEC-MPS200+ inspection tool

• **Standard equipment:** array of eight magnetic eddy current sensors
• **Additional depending on project:**
  – Cleaning nozzle
  – UT wall-thickness (probe array with stand-off)
  – Camera
Sequence of 20 mm near-side defects in an 8” pipe of 23 mm wall thickness under 12.7 mm (½”) coating.

A clear almost linear dependency of amplitude versus defects depth is found.

The double peak structure of the differential sensors allows for a precise determination of the defect length.

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<th>5%</th>
<th>10%</th>
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<th>30%</th>
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MPS200+ Tool on the riser

No major defects found. Focus put on even small indications in the range of 10% wall loss.
Subsea pipeline
MEC-Combi Pipe Crawler – ROV deployed

Self crawling systems with Inspection technology adaptations: SLOFEC, UT, Visual, Laser, PEC
Project:
Detection of wire misalignment on flexible riser
The standard pattern for the intact pipe
Dependency on lift-off

With higher lift-off signal strength decays. Increasing gain can restore signal until electronic noise level interferes.

In this configuration a lift-off (incl. a coating) can be up to 18-20mm.
Tool in the sea

- The tool had to inspect on a flexible with bends of unknown curvature.

- It was important to be able to sense at different levels of lift-off and to easily adjust the signal with a variable gain.

- No wire disorganisation detected
Magnetic Eddy current offers a good compromise between the three goals of high resolution data, high stand-off data acquisition and speed of data acquisition.

It is applicable in various fields external pipeline inspection and possibly of internal inspection.