In-service Riser Inspection System (IRIS)

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Agenda

- Inspection technologies applied to flexible pipe
  - Manufacturing inspection technologies
  - In-service inspection technologies
- IRIS
  - Electromagnetic Testing (ET)
  - Ultrasonic Testing (UT)
  - X-Ray Computed Tomography (X-Ray CT)
  - Development strategy
Integrity & Inspection

Assets Integrity Management

- Offshore Subsea Assets Integrity
- Flexible Pipe Integrity
- Integrity Management Engineering
- Monitoring Solutions
- Inspection Solutions
- Data Management
- Offshore Services / Repair

Other Assets Integrity

Other Subsea Assets Integrity
TECHNIP- Manufacturing inspection technologies

**GOAL**
- Certifies that manufactured product is conform to Client specification and TECHNIP Manufacturing Quality Standards
- Certifies that all non conformances have been closed out in accordance with our standards and Client requirement

**EQUIPMENT**
- Diameters at all manufacturing steps
- Thickness on plastic sheath (using ultrasonic technic)
- Metal chip detection on plastic sheath (spark tester)
- X-ray for smooth bore tubes
- Pitch on carcass, zeta and flat wire spiral and armouring
- Dye penetrant or Magnetic Particle Inspection on welds (wires and steel strip)
TECHNIP - Manufacturing inspection technologies

- Carcass: Spark testing of Sheath, On-line Phased-array Ultrasonic System (OPUS)
- Pressure sheath: Manual UT thickness measurement, Automatic UT thickness measurement, Automatic Diameter measurement
- Pressure vault: Automatic Diameter measurement
- Armour layers: Eddy current & Magnetic particle on welds, Manual UT thickness measurement
- External sheath: X-Ray inspection, Eddy current & Magnetic particle on welds
TECHNIP - Manufacturing inspection technologies

- In-house development of dedicated inspection devices

ULTRASONIC MEASUREMENTS

SMOOTH BORE X-RAY INSPECTION

OPUS - On-line Phased-Array Ultrasonic System
In-service Inspection technologies applied to Flexible pipes

- The complex structure of flexible pipes
  - Fit for purpose design
  - Multilayer structure design (thermoplastic, steel, insulation)
  - Various materials, profiles and thicknesses in a single product

- Develop a dedicated inspection strategy for each flexible pipe

- Operate in parallel multiple non-destructive testing technologies (UT, ET, X-Ray CT)
IRIS: In-service Riser Inspection System & Services

Versatile inspection tool - Underwater NDT laboratory

IRIS (a new generation of in-service subsea inspection system for risers) will allow to deploy and operate 3 different NDT technologies in parallel (Ultrasonic Testing, Electromagnetic Testing and X-ray Computed Tomography).

![Image of IRIS system](image_url)
Electromagnetic Testing

Detection objectives:

1. Annulus flooding detection
2. Detection of defects in armour layers (transversal breaks and corrosion)
3. Armour wire layers disarray

- Magnetic Flux Leakage, Eddy Current, Pulsed Eddy Current
Ultrasonic Testing

Detection objectives:

If coupling conditions are satisfied
1. Detection of defects in armour layers (transversal breaks, corrosion)
2. Armour wire layers disarray

- Pulse echo method
X-Ray Computed Tomography

Detection objectives:

1. Annulus flooding detection
2. Detection of defects in armour layers (corrosion, transversal breaks)
3. Armour wire layers disarray
4. Detection of defects in pressure vault layer (longitudinal cracks and transversal break)
5. Defect in Pressure sheath
Development strategy

- The tool has been developed primarily for complex flexible pipe and umbilical structures…

- It is also suitable for inspection of umbilical, rigid pipe and pipe-in-pipe.

IRIS: Versatile inspection tool
Main functions of IRIS

- Operated by Technip
- Deployed from a support vessel
- Hang up onto the riser (OD range 7” to 18”)
- Move along the riser independently (crawler function)
- Carry and implement several inspection technologies (UT, ET and X-Ray CT)
- Perform NDT scans along a generatrix
- Perform NDT scans of areas on 360°
- High resolution video system to monitor 360 degrees
- Operational depth range: from +20m above sea surface, down to -200m
- Clean the pipe

This new “Underwater nondestructive testing laboratory” allows to inspect risers without stopping the production in the splash zone and in its aerial part.
Thank you