

In-service Riser Inspection System (IRIS)



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Pau, April 6

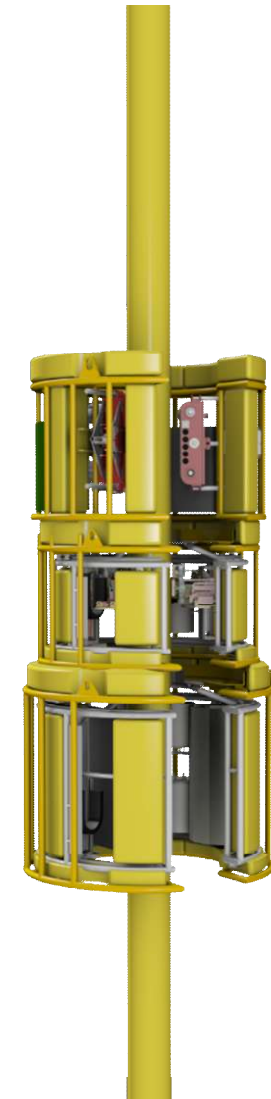
Technip

take it further.

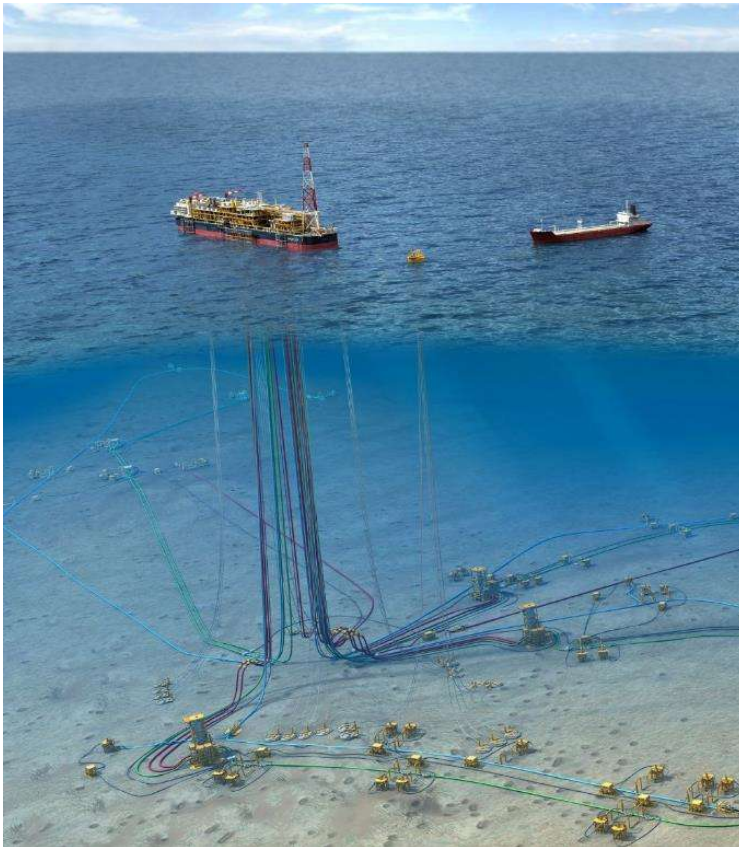


Agenda

- **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

Other Assets Integrity

Flexible Pipe Integrity

Other Subsea Assets Integrity

Integrity Management Engineering

Monitoring Solutions

Inspection Solutions

Data Management

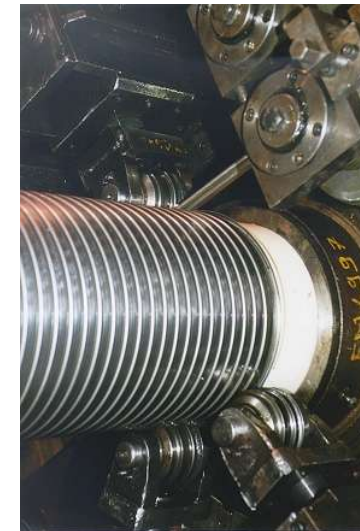
Offshore Services / Repair



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

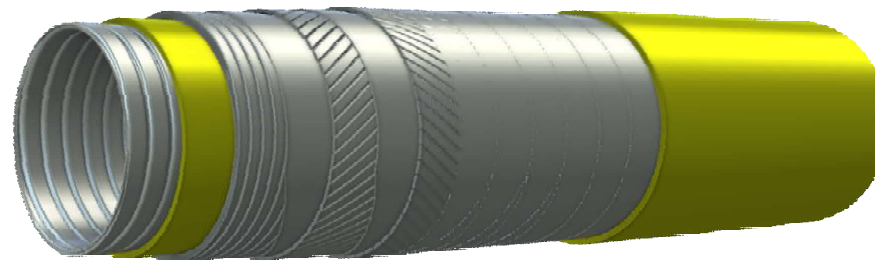
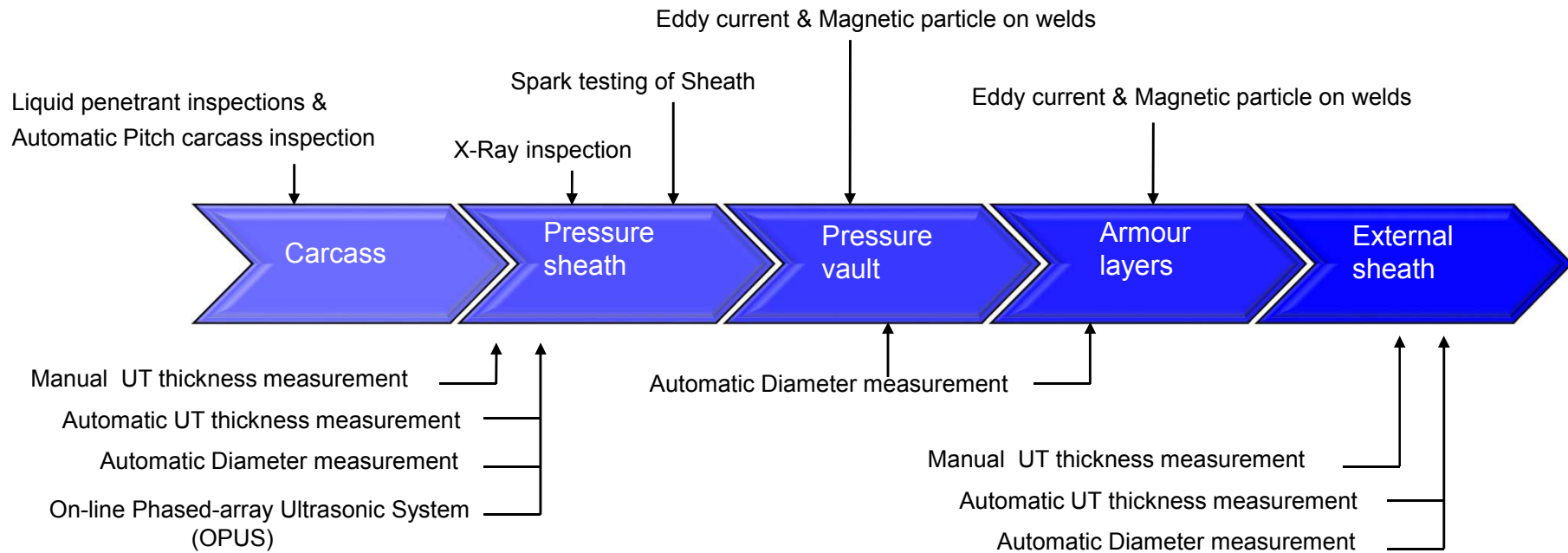


EQUIPEMENT

- 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)

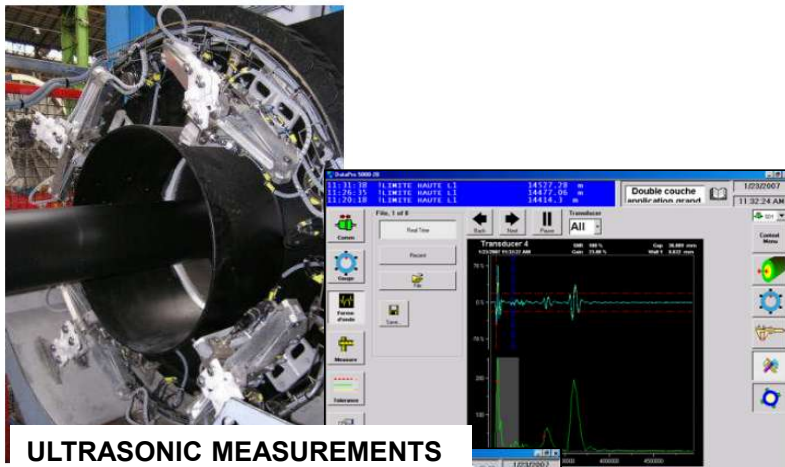


TECHNIP- Manufacturing inspection technologies



TECHNIP- Manufacturing inspection technologies

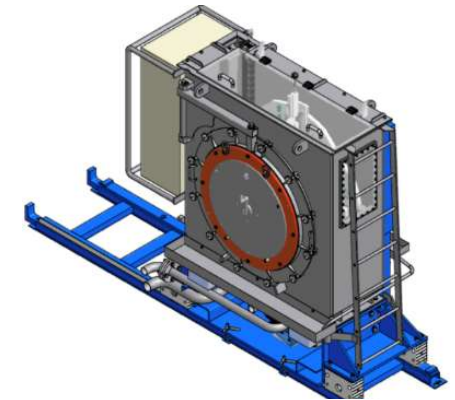
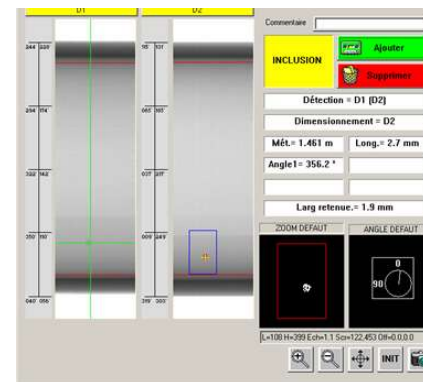
- In-house development of dedicated inspection devices



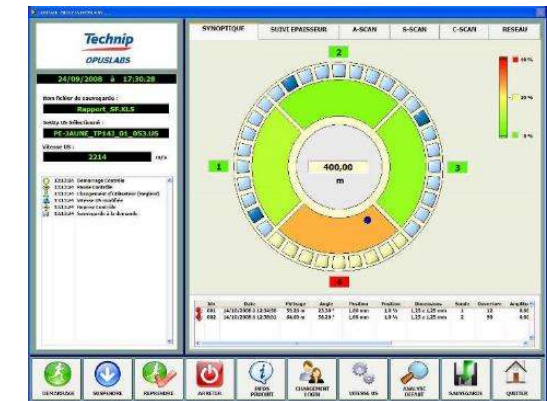
ULTRASONIC MEASUREMENTS



SMOOTH BORE X-RAY INSPECTION

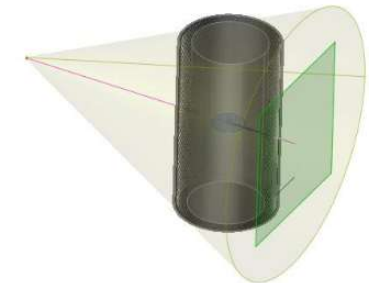
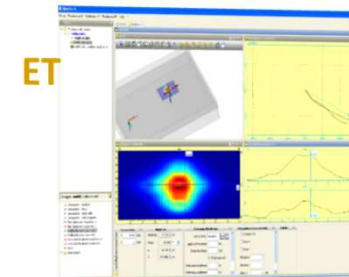


OPUS- On-line Phased-Array Ultrasonic System



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

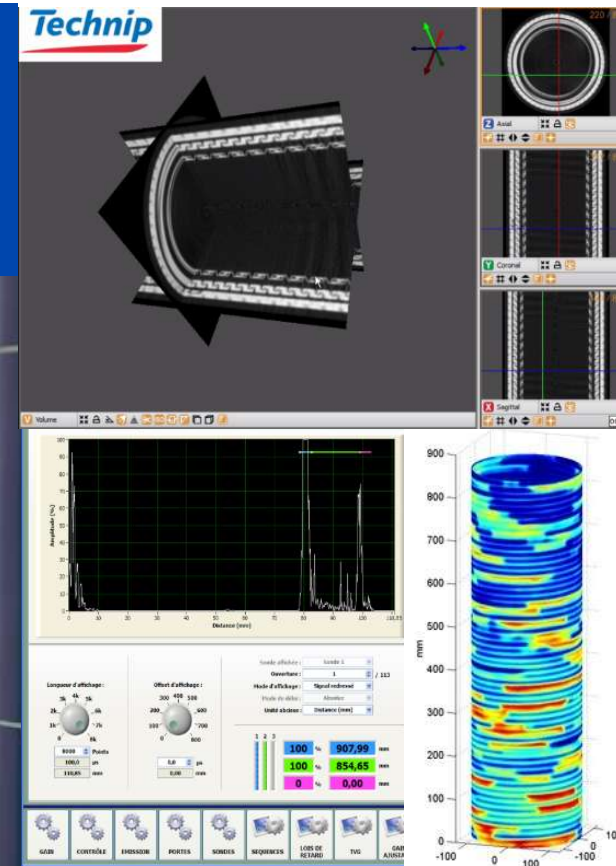
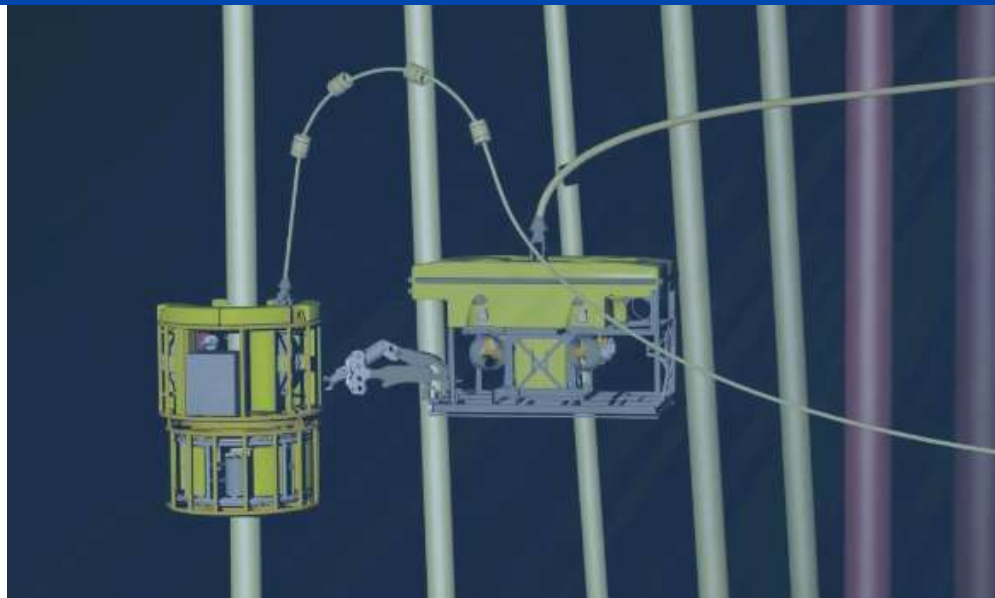
Operate in parallel multiple non destructive testing technologies (UT, ET, X-Ray CT)



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).

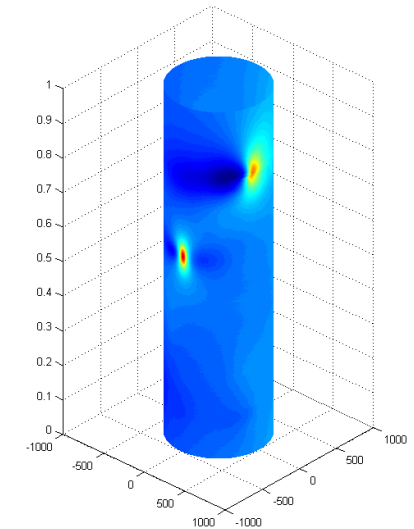
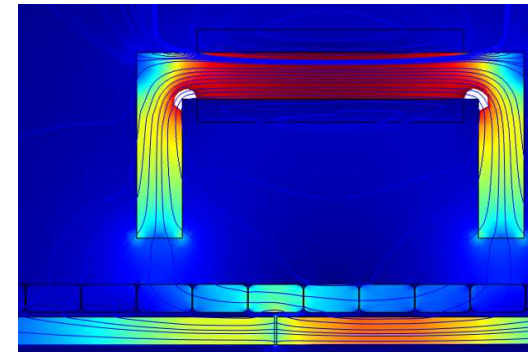
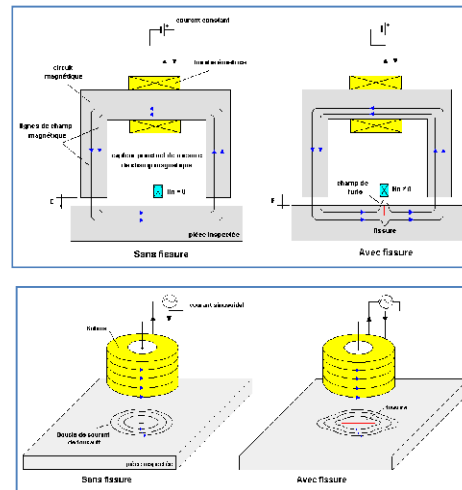
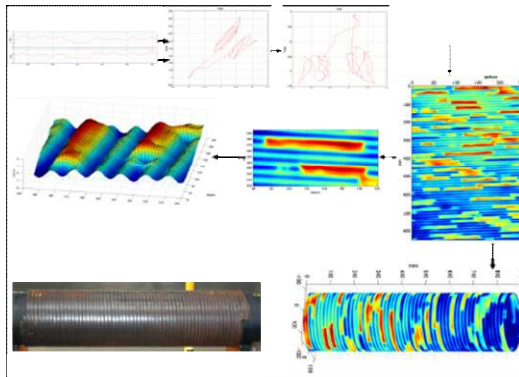
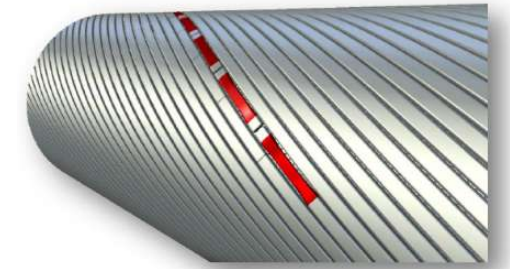
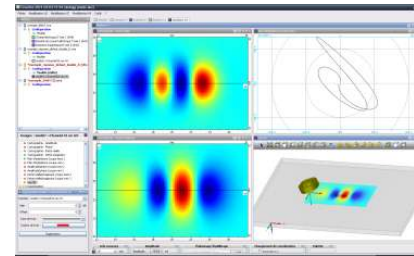


Electromagnetic Testing

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



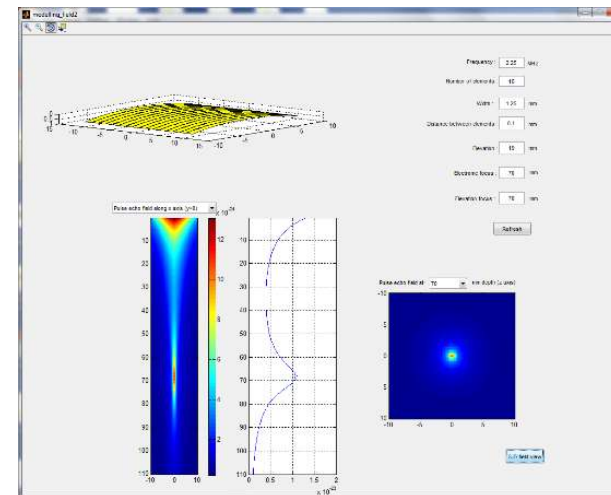
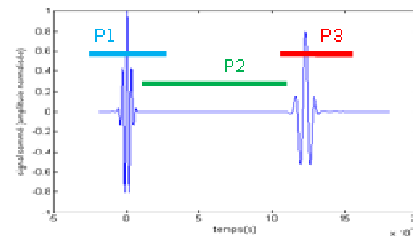
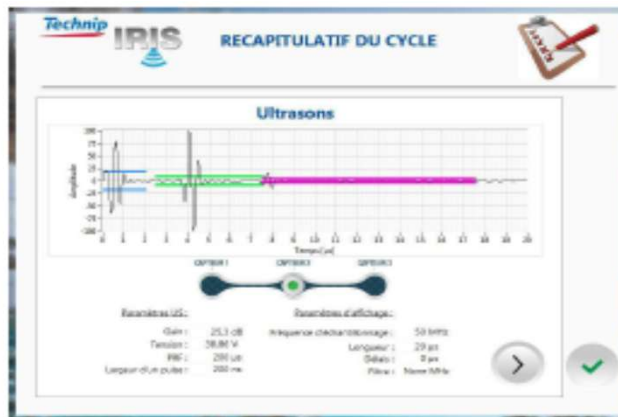
Ultrasonic Testing

Detection objectives:

If coupling conditions are satisfied

1. Detection of defects in armour layers (transversal breaks, corrosion)
2. Armour wire layers disarray

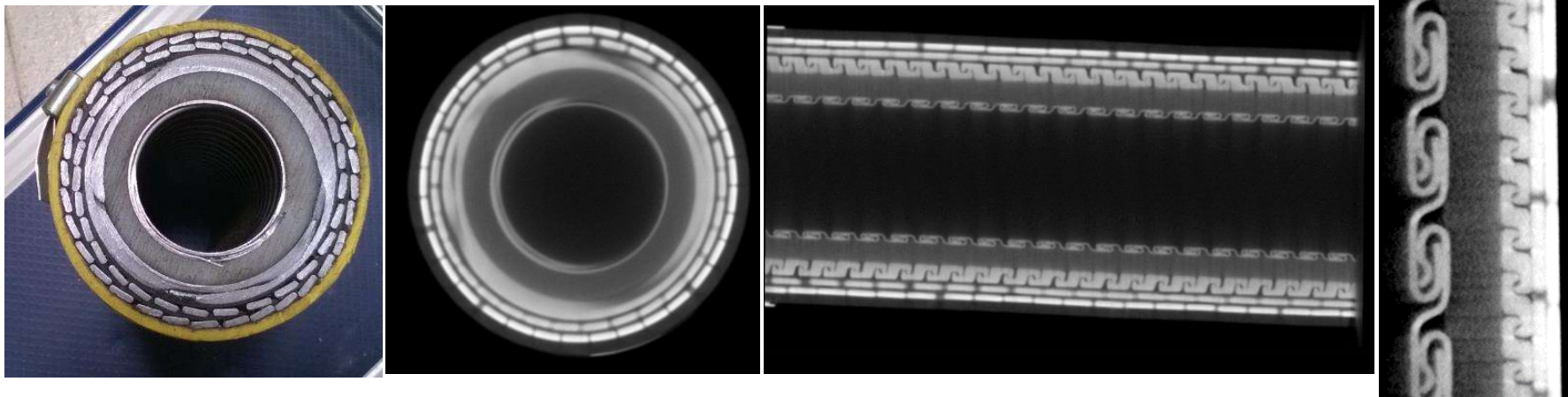
➤ Pulse echo method



X-Ray Computed Tomography

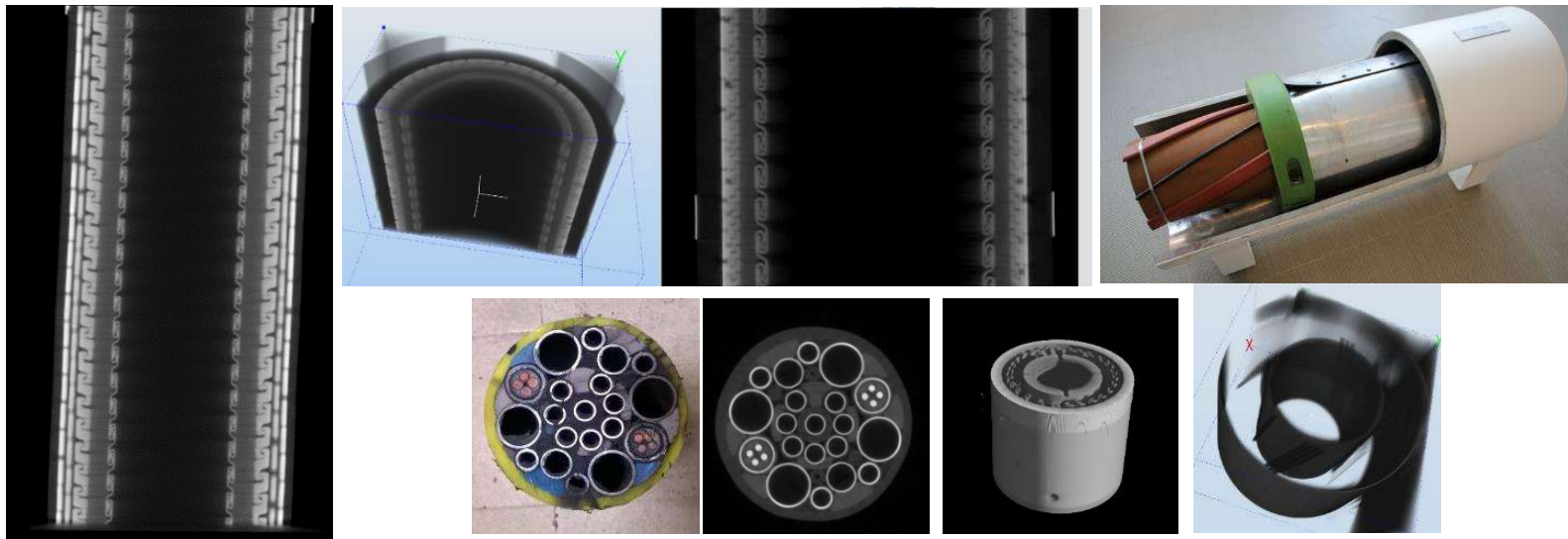
Detection objectives:

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.

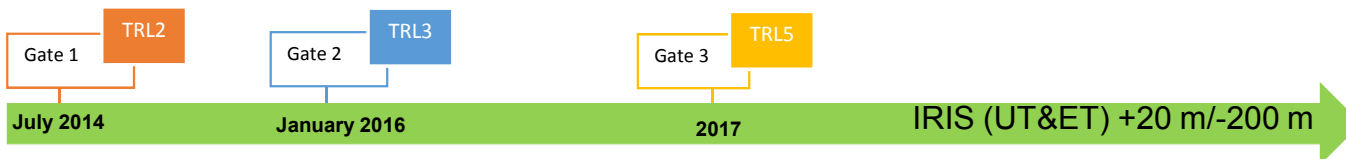
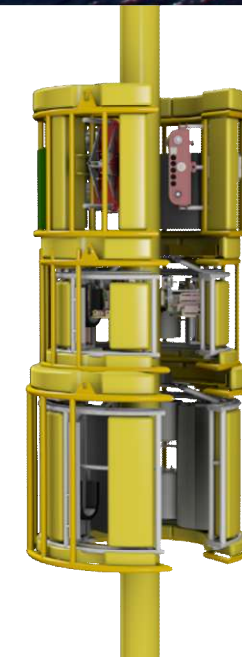
IRIS: Versatile inspection tool



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



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take it further.