



# FlexIQ

Redefining flexible riser  
integrity management

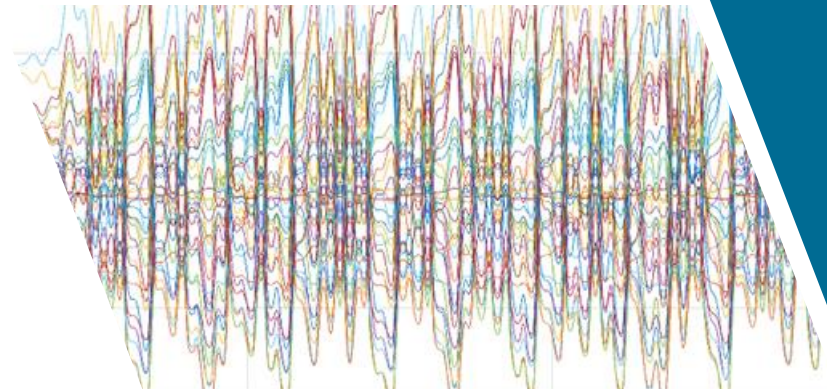
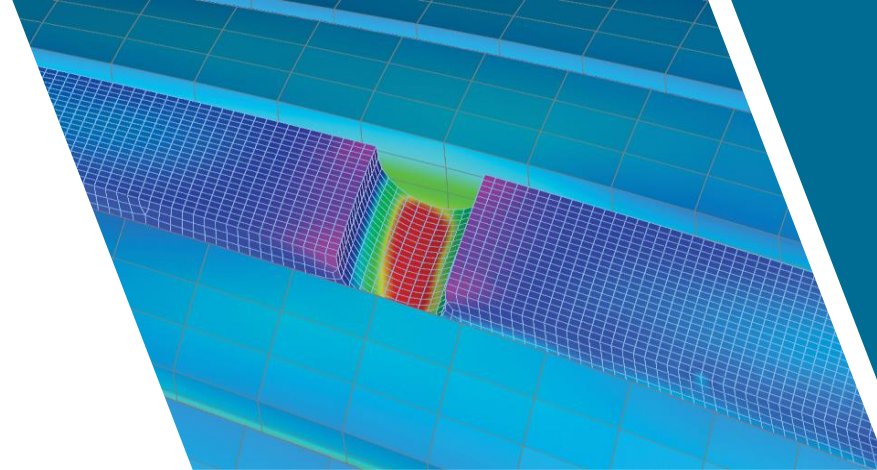
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# Value proposition

Best in class inspection and computational simulation

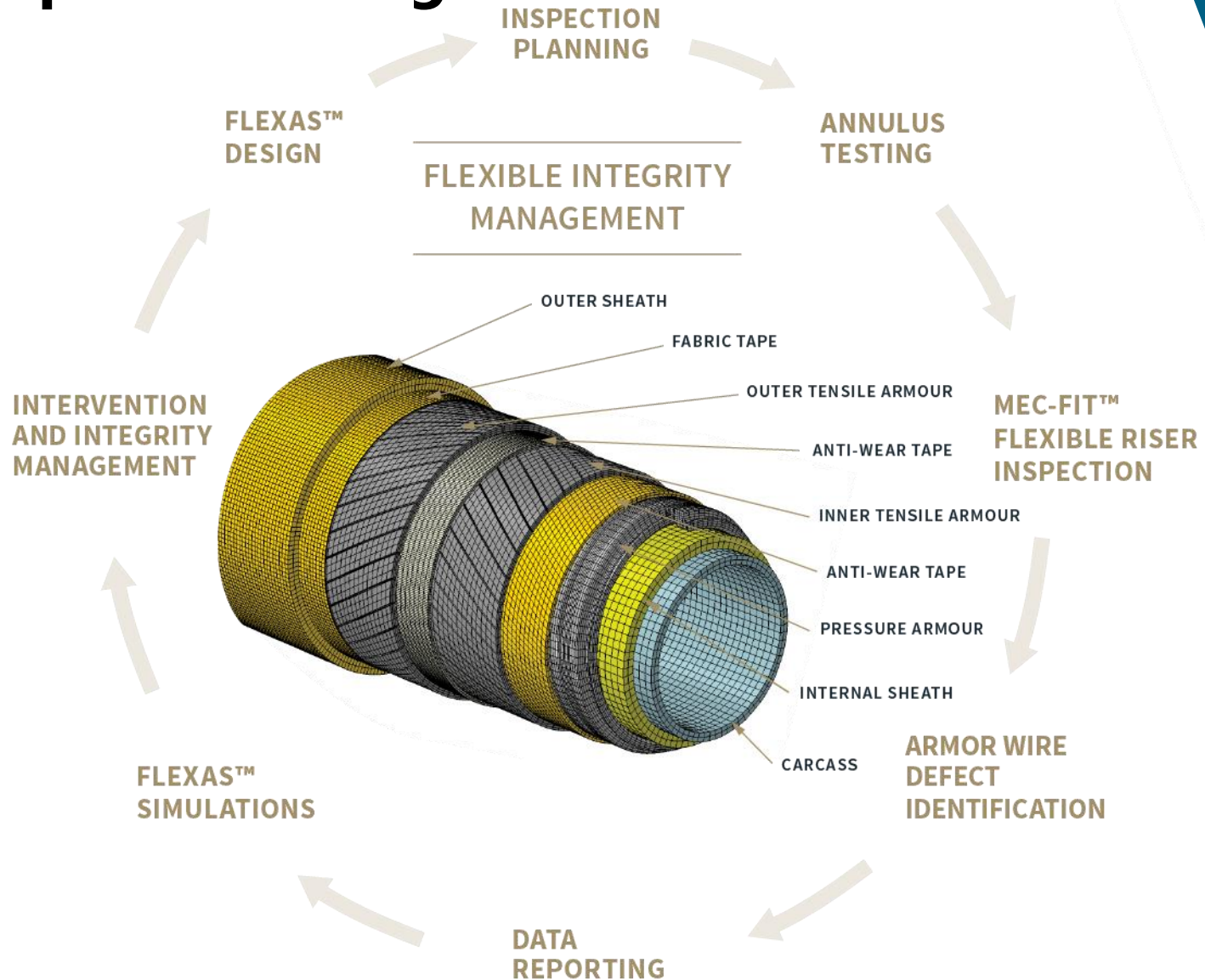
Accurate damage detection and impact on design life

Improved understanding of operational risk

A fully integrated service for inspection, analysis, and data management

**Bottom line: we deliver insight, not just data.**

# A complete offering

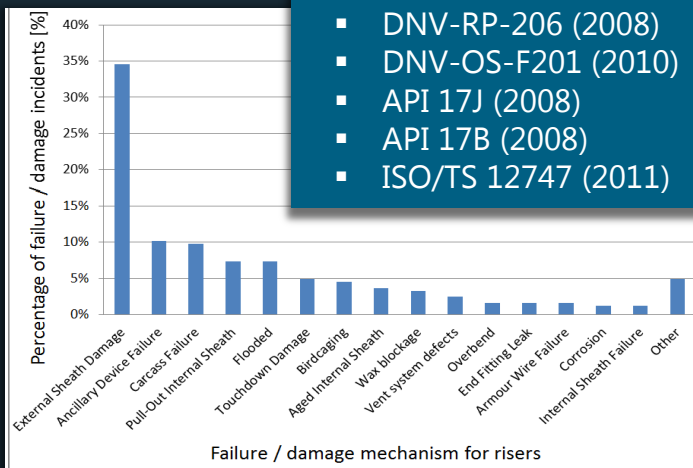


# Understanding and managing operational risk

- Workshop oriented process aligned with industry guidance on risk based integrity assessment / life extension processes
- Enables identification of key riser elements (layers) at "high risk"
- Highlights process, technology, and policy aspects of integrity management and life extension

## Key Industry Guidance

- Handbook of Flexible Pipe (2014)
- DNV-RP-206 (2008)
- DNV-OS-F201 (2010)
- API 17J (2008)
- API 17B (2008)
- ISO/TS 12747 (2011)



Consequence	Very High 5		Tensile Armour 2		Pressure Armour 1	Tensile Armour 2
	High 4					Tensile Armour 1
	Medium 3			Pressure Armour 1	Tensile Armour 1	Carcass 1
	Medium Low 2			Carcass 1		
	Low 1					
Note: Numbers after layer names indicate different degradation modes.		1 Low	2 Medium Low	3 Medium	4 High	5 Very High
Probability						

- Documents and justifies decisions to ensure a comprehensive solution
- Defines "ALARP" for the company/ application
- Define and prioritize industry leading technologies to obtain data and validate design
  - Annulus testing
  - MEC –FIT™ inspection
  - FLEXAS™ numerical simulation

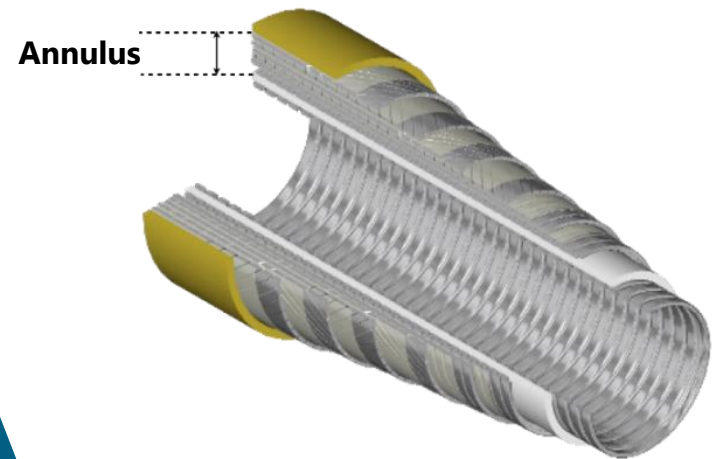
# Annulus Testing Technology

- Fast mobilization
- Only operated by trained, competent engineers
- Positive pressure annulus test and riser vent path assessment
- Temperature calibrated for accuracy
- Gas sampling for corrosion assessments
- Secondary volumetric flow meter digital readout
- Improved quick connect kit to reduce pressure loss and eliminate leak paths

**Improving risk assessment.**



State-of-the-art annulus kit  
developed in-house





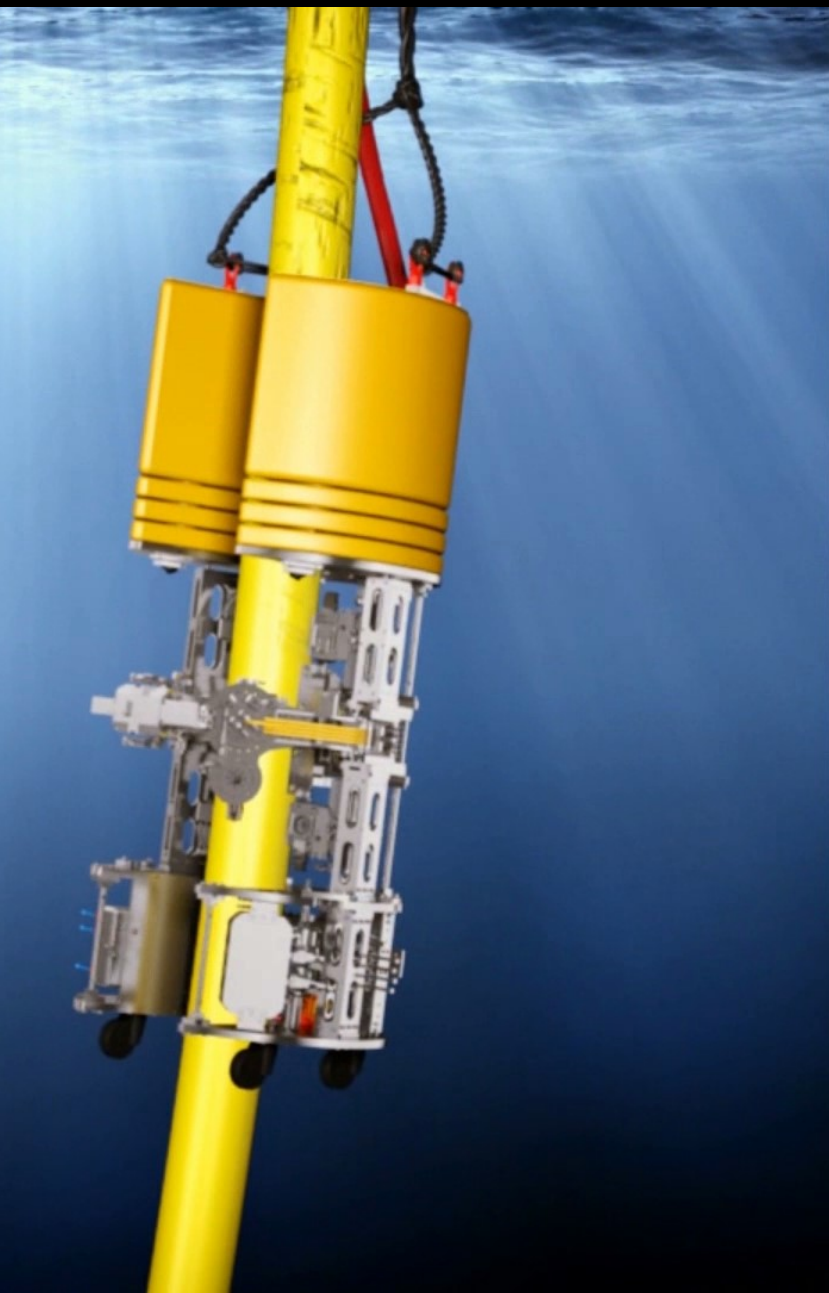
# MEC-FIT™ Inspection



## Magnetic Eddy Current Flexible Riser Inspection Tool

- Combined DC magnetic and eddy current fields to detect single or multiple wire damage in up to 3 metallic layers
- Detects cracking, pitting, general corrosion, and wire misalignment and gaps
- Mapping of wire layers and identifying details of individual findings
- No requirement for annulus to be flooded
- Deployment from topside or remotely operated vehicle (ROV)

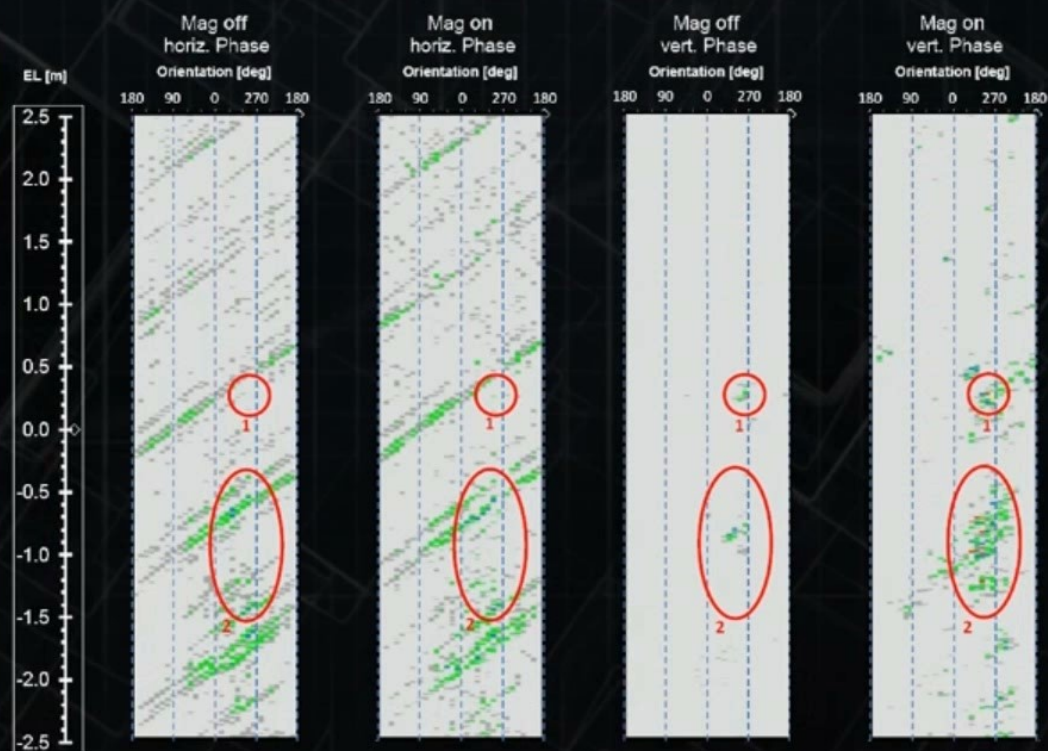
**Delivering unparalleled data.**



## MEC-Hug inspection data:

- External scanning
- OD from 4" to 12"
- Coating thickness up to 15mm
- Focused on crack or corrosion detection in armour layers

### Riser Section 2 ( EL -2.5 m to EL 2.5 m)



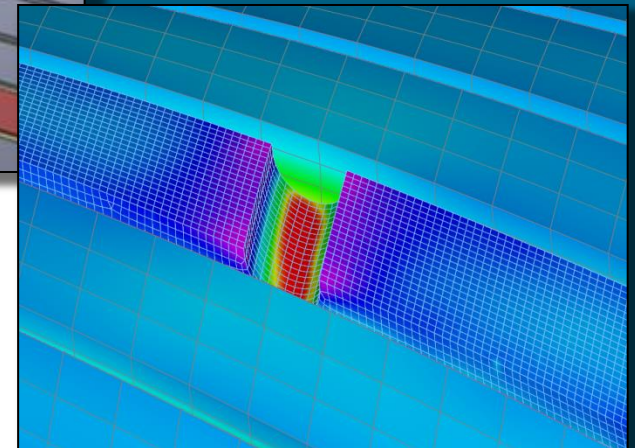
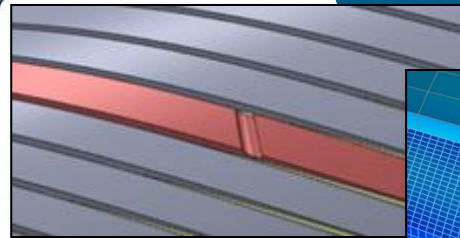


# FLEXAS™ Numerical Simulation

- More realistic simulations leading to increased accuracy for fatigue life predictions
- Incorporation of MEC-FIT™ detected damage into simulations
- Single integrated flexible riser global analysis with detailed multi-layer models and direct stress recoveries

## Fully validated tool

- DeepStar qualification program
- Independent operator experimental benchmarking
- Selected by NASA and qualified for mission-critical analysis for manned space flight



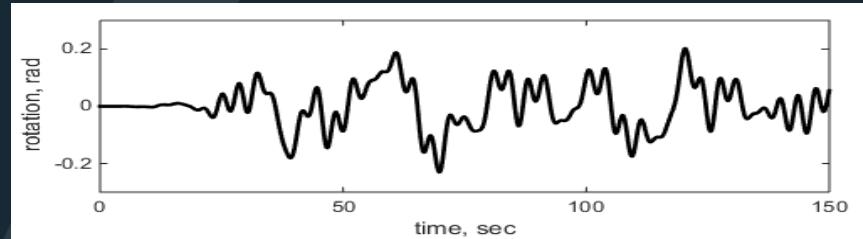


# FLEXAS™ Numerical Simulation

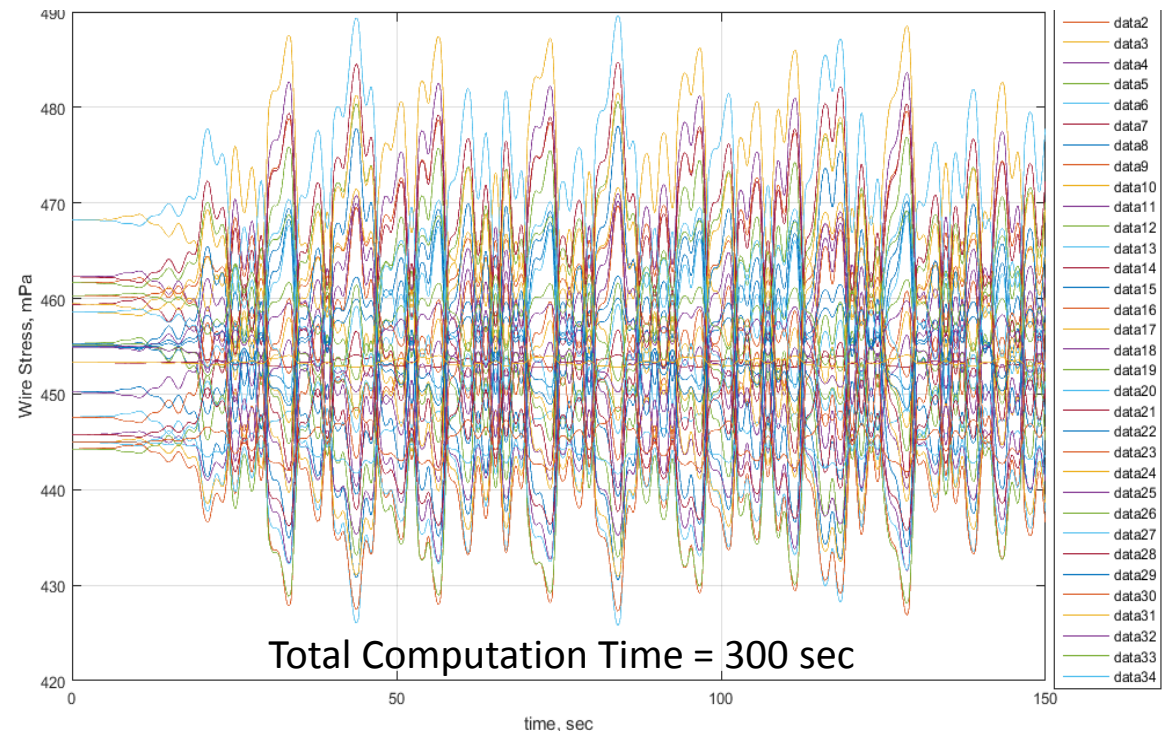
Non-linear dynamic simulation of 20 pitch length (12m) flexible

Multi-layered, detailed finite element model

Irregular wave input for real-world conditions



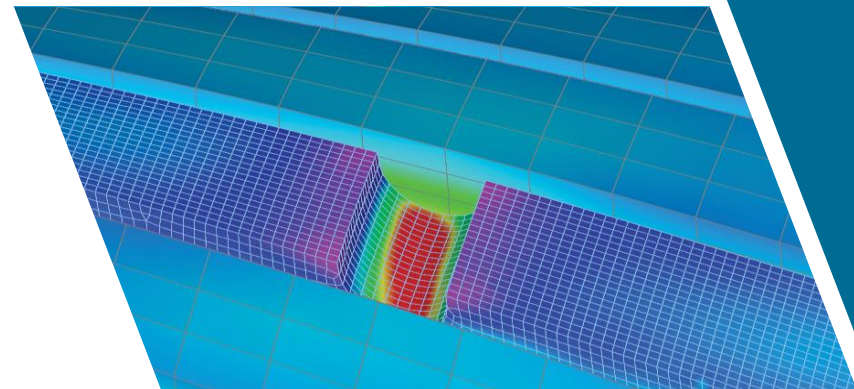
Individual armor wire stress time-histories





Delivering insight through:

- Risk-based integrity management and inspection planning
- State-of-the-art annulus testing
- Visual and MEC-FIT™ inspection
- Dynamic riser simulation using detailed, multi-layered finite element models with FLEXAS™
- Intervention planning and construction management
- Life of field riser analysis and model updates





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