Emerging Technologies for Deepwater Riser Design

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Overview

- Introduction
- Current State of the Art
- Towards more Challenging Conditions
- Flexible Riser Technology
- SCR Technology
- Hybrid Riser Technology
- Summary
Current State of the Art

- Shallow water
- Disconnectable turret
- Flexible risers with buoyancy (modules/arch)
- Up to 12” ID
- PVDF internal pressure sheath

Stybarrow Field

Pyrenees Flexible Riser System
Towards more Challenging Conditions

- Deep water (up to 1500m)
- Gas projects:
  - Larger diameters
  - Higher temperature/pressure (up to 150°C/15,000 psi)
- Minimum down time requirements:
  - Design for harsher conditions (10,000 yr RP)
Flexible Riser – Conventional Technology

- Current Limits: ID vs Pressure

![Graph showing current limits for ID vs Pressure with various data points and labels indicating different pressures and services such as production, gas, and water.]
Flexible Riser – Conventional Technology

- On Going Developments:
  - Pressure Sheath
  - Pressure Armour Wire designs
  - Water Depth Qualification
  - 50-year Design Lives
  - Better operational data predictions (P,V,T, metocean)
Flexible Riser – Alternative Technology

- Non-metallic flexible pipe (Deepflex, Airborne)
- Particularities:
  - No corrosion issues
  - Light
- Some of the considerations
  - Limited operational history
  - non-standard/industry design specs
• SCR Technology Development

- SCR & TTRs:
  - Offer larger diameter solutions
  - Field Proven in deepwater

- SCRs
  - Satisfying Australian requirements
    - Fatigue – All about the weld
    - Interface with floater
    - Controlling ultimate load performance
• Ultimate Load Design
  – Multiple wall size section
  – Near seabed buoyancy “BC-10”
  – FJs – 24” delivered
• **Fatigue Load Design (50 year designs)**
  
  – Inconel welds (close to C curve performance (up to 5 times better than assumed in service welds))
  
  – Clad (sour service)
  
  – Upset Ends in fatigue critical regions
  
  – Flexible Joint qualification needed
A new wave of riser projects is coming

- Requirements for size, deeper water, higher pressure and temperature increasing
- Reliable operational predictions important (particularly flexibles)
- Qualifications on going to satisfy new requirements
- Flexible riser conventional vs. alternative
- SCR geometric refinement & improvement in weld performance potentially a game changer
- Hybrid risers a possibility, flexible jumper size needs qualification
Questions...