

# 2H offshore

20 YEARS

of Riser & Conductor Engineering Excellence

Houston | Rio de Janeiro | Aberdeen | London | Kuala Lumpur | Perth | Beijing

an **ACTEON** company

# **High Pressure Drilling Riser Overview and Challenges**

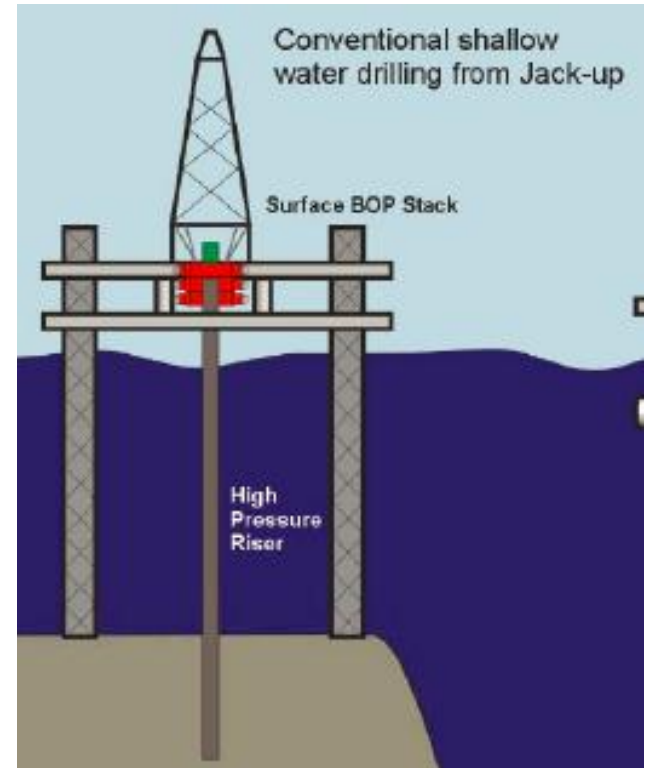
27th March 2014

## Agenda

- Overview of high pressure drilling riser configurations
  - Jack Up
  - TLP/Spar
- Strength and fatigue challenges
- Technology and approach to address the challenges

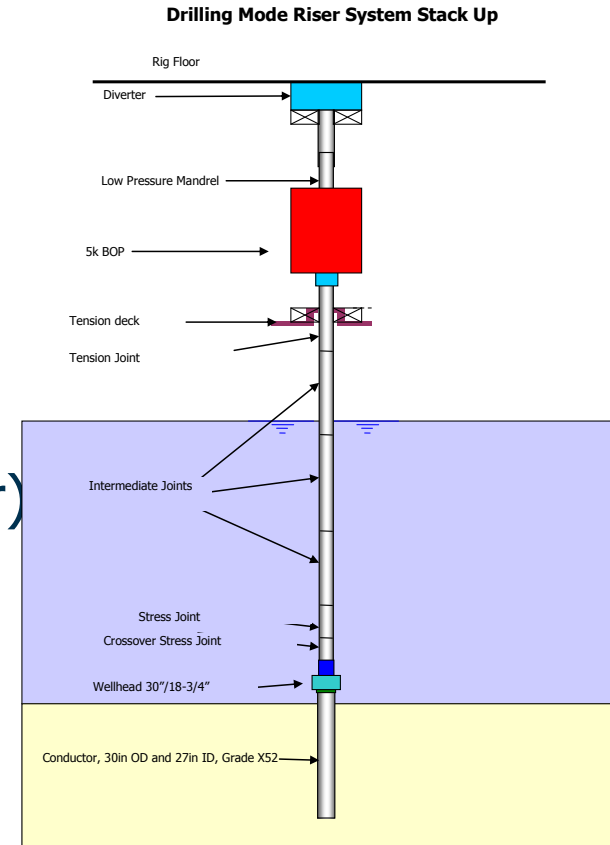
# Drilling Riser Configuration Overview

- Shallow water from a Jack-up
  - Surface wellhead such as on fixed platforms or exploration well (Shallow water)
    - Surface BOP
    - Conductors as the primary strength member without any dedicated riser



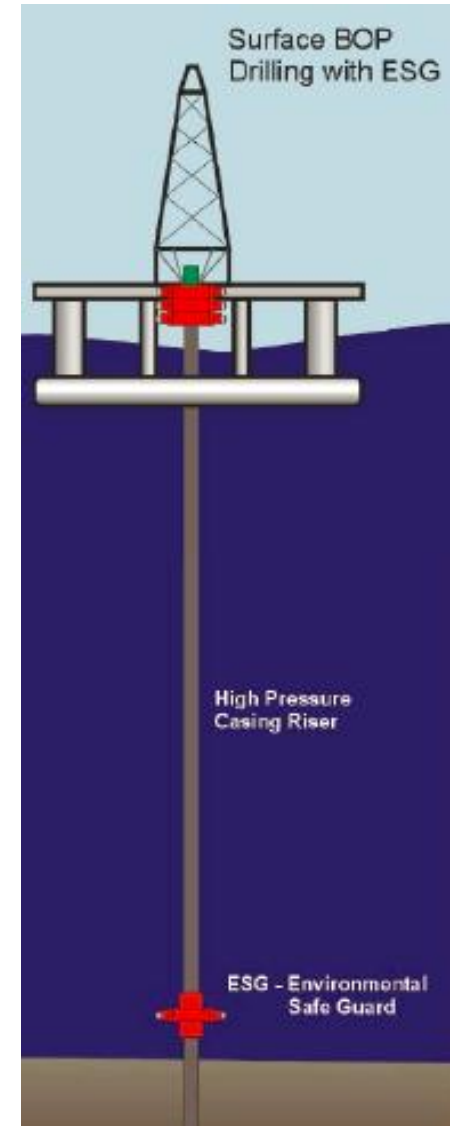
# Drilling Riser Configuration Overview

- Shallow water from a Jack-up
  - Surface wellhead such as on fixed platforms or exploration well (Shallow water)
    - Surface BOP
    - Conductors as the primary strength member without any dedicated riser
  - Subsea wellhead tie-back (Shallow water)
    - Surface BOP
    - Dedicated HP drilling riser



# Drilling Riser Configuration Overview

- Shallow water from a Jack-up
  - Surface wellhead such as on fixed platforms or exploration well (Shallow water)
    - Surface BOP
    - Conductors as the primary strength member without any dedicated riser
  - Subsea wellhead tie-back (Shallow water)
    - Surface BOP
    - Dedicated HP drilling riser
- Deep water from a floating drilling units or a Spar/TLP
  - Surface BOP
  - Dedicated high pressure drilling riser



# High Pressure Drilling Riser Challenges

## Stability

- Support wellhead, BOP and riser weight by providing riser tension

## Strength

- Vessel static and dynamic motions combined with dynamic wave loading on the riser

## Fatigue

- Wave induced fatigue damage
- Current loading induced vortex induced vibration

## High Pressure > 10Kpsi

- Withstand internal pressure

# Riser Tension

- Maintain tension to support the suspended riser weight
- Improve strength and stability should there be a requirement for secondary tensioning system
- Improved riser response to wave and VIV loading

Deepwater Application



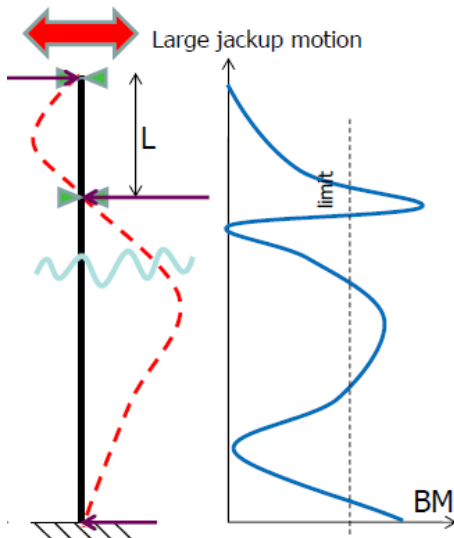
Shallow water Application





# Special Joint Design for Riser Dynamic Loading and Vessel Motions

- High bending moment near the top addressed with thicker riser section and/or higher material grade
- High bending moment at the bottom addressed with a tapered stress joint
- Spar/TLP HP drilling risers include a keel joint to minimise stress utilisation



Tapered Stress Joint



# VIV Response Improvement

- VIV suppression device such as strakes and fins
- Minimise VIV fatigue damage

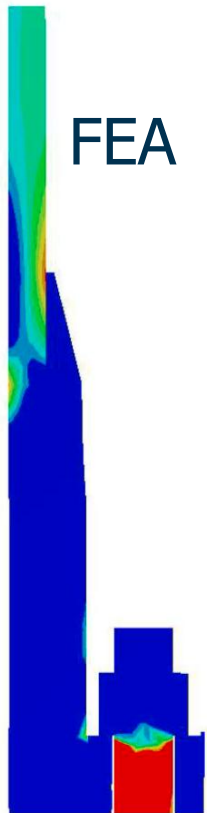
Strakes



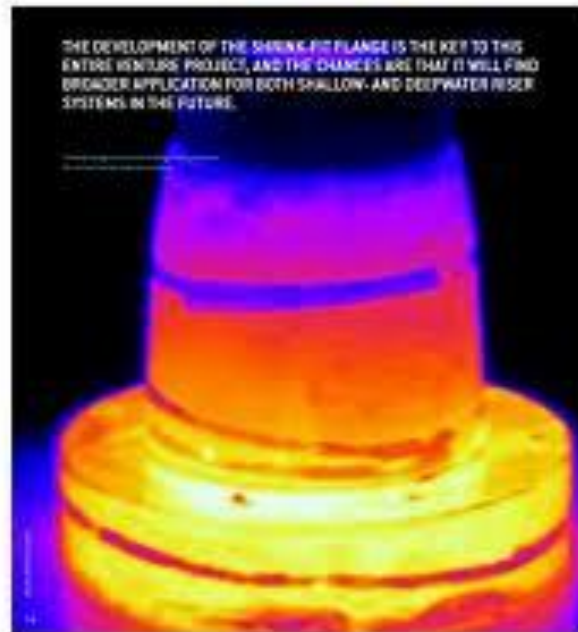
Fins

# Technology to Accommodate High Internal Pressure

- Internal pressure > 10k
- Utilise high strength material and reduce riser weight



## Shrink Fit Process



## Conclusions

- HP drilling riser strength challenges due to dynamic loading is addressed with:
  - Appropriate riser tension
  - Utilising speciality joints such as tapered joints, keel joints and tension joints with increased joint thickness and higher material grade
- Fatigue challenges addressed by:
  - Utilising VIV suppression devices
  - Field proven threaded and coupled connections with better fatigue performance
- For internal pressures exceeding 10Kpsi
  - Utilise integral shrink fit flanges avoiding fatigue critical girth welds
  - Utilise high strength steel thus reducing riser weight and payload without a need for upgrading tensioner system capacity

Thank you

**2H**  
offshore

[www.2hoffshore.com](http://www.2hoffshore.com)