Challenges of 'Deep' Water To Jackup Conductors And Risers

A. Rimmer

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Alex Rimmer
Engineering Team Leader, 2H Offshore
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Overview

- What is ‘deep’ water for jackup rigs?
- Jackup conductor/riser arrangements
- What are the limitations in ‘deep’ water?
- How do we overcome the limitations in ‘deep’ water?
What Is ‘Deep’ Water For Jackup Rigs?

Drilling, Completion & Workover

- Marine drilling risers
- Jack-up risers
- Subsea well conductors
- Completion & workover risers

Surface BOP drilling risers
- FPS dry tree production risers
- Fixed platform well conductors
- Jack-up production risers

Production & Export
- Steel catenary risers
- Freestanding hybrid risers
- Flexible risers
- Umbilicals

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Jackup Conductor/ Riser Arrangements

- Jackup
- Access/tensioning deck
- Conductor
- Surface wellhead
- Surface casing
- Surface BOP
- Overshot
- Diverter
- Casings
- Pull-up tensioner
- Push-up tensioner
- Template
- Mudline suspension (MLS)
- Subsea housing/wellhead
- Full-bore HP drilling riser
What Are The Theoretical Limitations In ‘Deep’ Water?

- System doesn’t scale well – increased jackup & riser deflections
- Limited ‘deep’ water experience in harsh environments
- High pressure typically requires large BOP – very stiff

50 Year Wave + Current

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Conductor and Riser Design Issues

- Conductor/riser joints through tensioner (>1.0 $\sigma_y$, fatigue, >connection capacity)
- Conductor/riser joints above subsea wellhead (>1.0 $\sigma_y$, fatigue, >connection capacity)
- Connections to wellhead, tree and BOP (> capacity)
- Conductor joints below subsea wellhead (>1.0 $\sigma_y$, connection capacity)*
- Overshot lateral load (~40-60Te)
- Lateral load on tensioner and/or tension deck (~80-120Te)
- Overshot rotational lockup (0.5-5deg) induced load

* Generally improved compared with semi-submersible for subsea well with HP riser
How Have The Limitations In ‘Deep’ Water Been Overcome?

- Reduced conservatism in analysis methodologies
- Riser operational procedures
- Design changes to riser and vessel
- Monitoring and Integrity Management

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Reduced Analysis Conservatisms

- >30% improvement in response achievable

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Riser Operational Procedures

- De-pressurise (plug/water fill) – improve system capacity
- Disconnection of overshot mandrel

Large deflections/rotations

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Design Changes

- **Riser**
  - VIV suppression – strakes, fairings
  - Secondary tensioner systems
  - Flanged riser connections
  - Flange bolt material grade and preload increase
  - Localised wall thickness and material grade
  - Integrally forged / non-welded joints

- **Vessel**
  - Increase rig load capacities
    - Vertical - cantilever/tension deck
    - Lateral - tension deck/overshot

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Monitoring and Integrity Management

- Instrument riser
- Define integrity management plan
- Define key performance indicators (KPI) to assess response against
- Determine calibration between measured and predicted responses
  - Validate analysis models
  - Calibrate riser models if required
  - Redefine KPI’s if required
Conclusions

- Conventional jackup conductor and riser arrangements do not scale well to ‘deep’ water (>>80m)
  - Large dynamic jackup motions
  - High dynamic loading on riser
  - Limited flexibility in riser components

- Jackups in depths of ~130m with 7000psi pressures are already drilling offshore Norway through:
  - Improved analysis methodologies
  - Operational procedures
  - Design changes to riser and vessel
  - Integrity management of installed riser

- Jackups rated for 150m are currently under construction

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Questions?

E: Alex.Rimmer@2hoffshore.com
T: +44 1483 774925
W: http://www.2hoffshore.com

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