

ULTRA DEEPWATER MARINE RISER ANALYSIS

BACKGROUND

A long-term drilling programme offshore Indonesia was to take place in water depths ranging from 500m (1640 ft) to 1900m (6233 ft). AS Mosley were contracted to support marine riser operations from a newbuild Ultra Deepwater (UDW) drillship. Global riser analysis was performed for the shallow (500m), mid (1000m) and ultra deep (1900m) water depths to cover all planned marine riser operations.

CHALLENGE

Riser operations offshore Indonesia are challenged by strong and complex current profiles. Layers of localised density variations were found across the water column which were mostly associated with river runoff from onshore. Variations in density resulted in the presence of both internal and soliton waves, contributing to challenging environmental loading conditions. The strong currents resulted in large deflection of the heavy wall marine riser, inducing high flex joint angles.

Deflection and flex joint angles of deepwater marine

risers can be improved by increasing top tension to impart a 'straightening' effect on the riser. Whilst top tension is limited by the tensile capacity of the tensioning system, a second limitation on top tension is required to ensure that excessive riser recoil does not occur.

Riser recoil can occur during an emergency disconnect of the LMRP from the BOP. If excessive tension is pulled, the sudden imbalance in tension results in travel of the riser at a velocity which may result in large impact forces due to the telescopic joint running out of travel.



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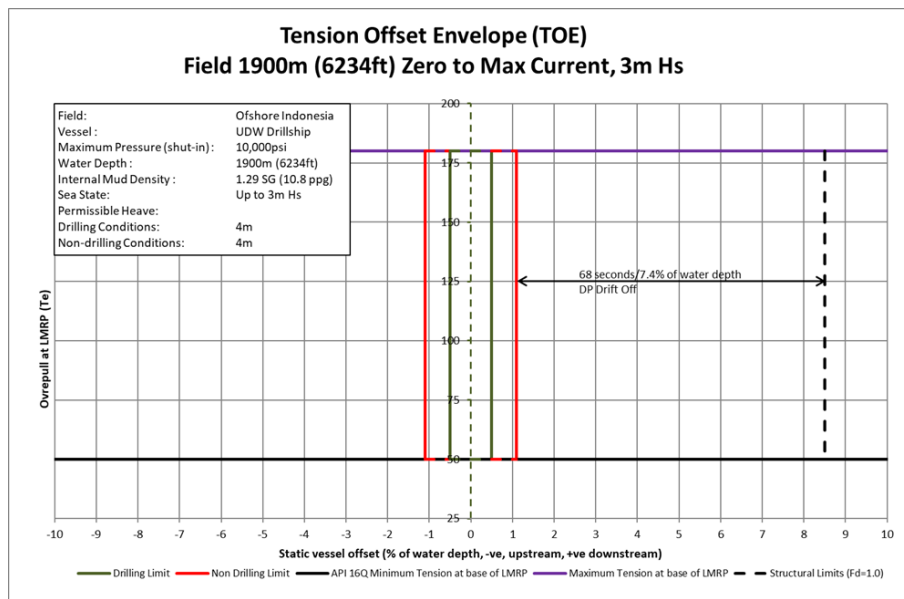
SOLUTION

Optimisation of the riser top tension was key to maximising operability. An upper limit of top tension was developed by AS Mosley using riser recoil analysis. A riser recoil analysis requires a detailed understanding of the tensioners, recoil-control valves, control system and plumbing, for which AS Mosley have experience with.

A limit of 180 Te (397 kips) was determined through the analysis which prevented excessive recoil of the riser system, whilst also specifying a minimum tension of 50 Te (110 kips) to ensure the LMRP was lifted clear of the BOP stack.

With the limits of the tensioner system established, AS Mosley could then develop tension offset envelopes (TOE) which established the vessel offset limits for Normal Drilling, Non-Drilling and Accidental DP Drift off conditions.

The timings of the emergency disconnect system (EDS) were used to establish the maximum distance the vessel could travel in the accidental event of a dynamic positioning system blackout. This distance was then used to define Normal Drilling and Non-Drilling limits which ensured that a DP drift off scenario could be sustained without overloading the marine riser and wellhead system.



Tension Offset Envelope – UDW Drillship

RESULTS

AS Mosley’s experience with optimising riser operations in regions of strong currents was a key factor in the handling of this project. Top tension sensitivity was performed within the recoil limits to minimise riser deflection and flex joint angles, increasing the operating window of the ultra deepwater vessel. Clear guidance was provided to the operator through the tension offset

envelopes, providing direct input to the Well Specific Operating Guidelines (WSOG) for application during offshore operations.

The initial wells have been successfully drilled and AS Mosley continues to build upon our extensive deepwater global riser analysis experience.