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Enabling Solutions for Deepwater Drilling Riser Management—A Critical Evaluation

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Abstract

As exploration activity increases and day rates increase for drilling vessels there is significant pressure on drilling contractors to push the limitations of both vessels and drilling equipment, as such deepwater drilling riser management has become a critical aspect of any well drilling operation. This is particularly the case in deepwater operations combined with potentially harsh environmental conditions (currents, wind, wave combinations) where maintaining operability is a potential problem as is maintaining riser integrity. There are several areas of technology development that may allow continued operations or planning of operations to allow minimal downtime related to environmental conditions. There are also several areas of key technology that could enable riser operations in deeper water depths. The items outlined will be assessed critically with respect to rig operations and highlight key areas that require development.

Introduction

It is accepted that for deepwater drilling riser analysis drilling contractors and operators adhere to the guidance provided by API RP16Q to define riser tensions and assess operability, hang-off, drift-off and weak point analysis, however each operator / drilling contractor may have procedures in place to enhance operability, maintain mean riser angles and so on. It is the intent of this paper to assess what procedures are in place as compared to what aspects are typically analyzed. The intent of the paper is to also offer a critical assessment of potential enabling technologies be they the deployment of fairings, composite auxiliary lines, riser materials, drilling riser management software or real time monitoring systems.

Drilling Riser Management

The operation of deepwater drilling riser systems are generally dependent upon the current regime at any particular

well location, with the most significant impact on riser response from the full depth current profile rather than just from surface current alone. It should also be noted that it is not sufficient to just address the drilling riser alone since interaction with the wellhead and conductor becomes considerably more important as tension in the riser increases.

It is generally accepted that riser analysis allows operators and drilling contractors a perception of what potentially will influence riser operations during the drilling program. Riser operations being considered as the following:

- Open water operations
- Operability
- Hang-off performance
- Fatigue
- Running and retrieval

The main driver for good drilling riser management (see figure 1) practice is the concept that no drilling contractor wants to have to pull the riser in a storm, or leave it hanging from the spider / tensioners and hence there is pressure applied to provide a system robust enough to remain connected during a storm and preferably remain drilling ahead.

In order to manage long strings of drilling riser it is accepted that certain strategies can be applied in an attempt to combat the loss of operability:

- Control riser tension (increase to reduce LFJ angle)
- Control vessel position
- Spaceout modifications
- Alter riser drag (with fairings or otherwise)

In order to manage long strings of drilling riser in harsh environments, that may comprise high currents in combination with severe wave regimes, it is necessary for a vessel operating at a particular well location to have access to significant amounts of data related to drilling equipment and metocean conditions.

These data may include the following: