Dry or Wet Trees in Deepwater Developments from a Riser System Perspective

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ABSTRACT

Riser weight increases with water depth. Supporting the risers, tensioning them to control their response, or optimising the platform motions in order to be “riser-friendly” is often one of the most challenging aspects of converting an old floater for use as a deepwater production or drilling platform. A new build platform will address these issues as part of its design for a particular application, but it will soon have payload and water depth limitations when used generically for multiple applications.

A solution is proposed, with a focus on the important issues of well access and riser design, which will remove the payload and water depth constraints from the platform, be it a new design or a conversion.

Utilising direct access subsea trees and free standing single line offset risers (SLOR), a semi-submersible equipped with production and drilling facilities not only challenges a dry tree platform solution, such as TLP and spar, it offers many additional safety and operational advantages. The benefit of this SLOR production system is best realised in the very deep water depths, when the design of top tensioned dry tree risers and their impact on the platform become even more imposing and costly.

This paper compares the merits of the SLOR production system against the more familiar dry tree production systems, and points to ways of implementing this solution in the emerging offshore regions.

KEY WORDS: Deepwater; Riser; Tree; Drilling

INTRODUCTION

Deepwater oil and gas fields are currently developed using wet (subsea) trees or dry (surface) trees, or a combination of both. Once the reservoir characteristics have been determined, the evaluation of development options for a new field is usually focussed around the type of floating production vessel required to develop the field, whilst the well and riser systems are often ignored until the development scenario has been selected.

Dry tree units provide direct access to the wells for workover and improved recovery but require motion optimised hulls to accommodate the riser systems and are considered limiting with respect to water depth and development flexibility. Although widely used for developments in shallow to medium water depth, dry tree units are not considered the optimum way to develop the deep and ultra deep opportunities, despite the industry’s preference to extrapolate field proven solutions.

Subsea developments are suitable for widespread reservoir structures. They provide a degree of vessel and field expansion flexibility with simplified riser interfaces, but at the expense of high drilling and workover costs.

Due to the increasing costs of developing fields in deeper waters, the focus of development solutions should be placed on key ‘enabling’ technologies such as the well and riser systems, and in developing floating production systems which are safe, cost effective, flexible enough to accommodate changes, and capable of being built locally. This is particularly applicable in the upcoming oil and gas plays of the world such as South East Asia where, being remote to the current deepwater activities elsewhere in the world, construction vessel availability is limited and mobilisation costly. The ability to construct or convert the vessel locally will boost employment and the economy of the developing country.

DEEPWATER DEVELOPMENT DRIVERS

The primary design driver is always cost. In deep water, large oil and gas reserves are required for economic recovery of the hydrocarbons. In water depths above 5000ft, reserves lower than 100MMBOE are generally considered marginal if a ‘stand alone’ floating production system is required. This implies that deep and ultra deep water developments will include a large number of wells to recover the large reserves.