OTC 17892

Novel Tow Methods for Deepwater Riser Towers Transportation in West-of-Africa Environment

R. Di Silvestro, F. Casola, G. Fatica, A. Mameli, and A. Prandi, Saibos sas

This paper was prepared for presentation at the 2006 Offshore Technology Conference held in Houston, Texas, U.S.A., 1–4 May 2006.

Abstract

Riser Towers are characterized by very low in service fatigue damage and present competitive advantages over other riser configurations in deepwater fields with floating production facilities. However, the transportation from the fabrication yard to site usually constitutes an area of possible concern. In fact this phase can be associated with the utilization of a significant portion of the allowable fatigue damage and grows with the distance towed. The current paper analyze two viable tow configurations aimed to minimize the fatigue damage allowing longer tow distances and offering the possibility of contingency stand by configuration to face unexpected events (meteorological or operational). In particular, the proposed methods and associated fatigue results are specifically oriented to the West of Africa environment, characterized by oceanic swell, and are based onto the Saibos patented Bundle Hybrid Offset Riser (BHOR) concept.

The paper gives an outline description of the BHOR as the basis of the presented analysis and sets as the reference case a traditional surface tow configuration. A contingency configuration is also described and analyzed to allow extended stand by of the transportation operation to face adverse whether conditions and/or unexpected operational constraints (e.g. access to site not allowed).

Moving from this contingency configuration, the possibility and the advantages of performing or completing the bundle transport in the contingency configuration is investigated.

Finally, for long tow distances, an innovative mid water tow configuration is described with very promising results in term of fatigue damage. In particular, this last tow configuration has the advantage of being much less sensitive to the sea state and intrinsically suited for safe stand by.

Introduction

The use of riser towers for the exploitation of deep water field in West of Africa has become more and more attractive in recent years. The very low in service fatigue damage, the high thermal performance and the possibility of accommodating a large number of risers and umbilicals represent competitive advantages over the more traditional riser concepts, such as flexible and steel catenary risers or Single Hybrid Riser systems (1). Indeed, a riser tower can be an attractive solution when stringent thermal insulation requirements are necessary to transport heavy production oil or where connecting a very complex flowline layout (2). Furthermore, the presence of the FPSO is not required prior to the installation of the tower, resulting in a larger flexibility in the installation sequence and in the reduction of the time to first oil from the FPSO arrival to site.

The transportation of the tower from a suitable fabrication yard to the field is a very critical and fatigue consuming operation that has to be properly managed in order to mitigate the installation fatigue damage and the risk associated to the towing operation.

The management of towing is becoming one of the key aspects of riser tower technologies in this phase of the oil industry driven by the growing distance between fabrication and installation sites which are progressively moving to deeper waters far from the coast. .

The present paper deals with the tow methods developed by Saibos for the transportation of the riser tower developed in line with the Bundle Hybrid Offset Riser (BHOR) concept. Both surface and submerged configurations are considered in order to mitigate the dynamic fatigue response of the tower to wave periods and facilitate tow operation lasting many days.

BHOR Concept Overview

The Bundle Hybrid Offset Riser (BHOR) is based on the evolution of the SHR concept and consists of a free-standing riser assembly incorporating several risers in a bundle configuration, top tensioned by a Buoyancy Tank and anchored to the seabed by means of a gravity-skirted foundation.

The connection of the Bundle Main Section (BMS) to the seabed foundation is made by means of a mechanical flexible joint similar to that employed for TLP tendon that is able to accommodate the small angular excursions of the bundle with