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Combined Tow Method for Deepwater Pipeline and Riser Installation

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Abstract

During the last years the number of deepwater oil field developments has increased significantly, resulting in a strong demand for pipe lay vessels. The continuously increasing day-rates of lay vessels is making the combined tow method for deepwater pipelines and riser more competitive. Also a requirement for more sophisticated materials and strict qualification requirements to welded joints, due to sour service and fatigue performance, make the tow method a more preferred solution since the pipeline is fabricated and welded onshore. More than 50 bundles have been installed in the North Sea towed out from the Wick fabrications site located in the northeast of Scotland.

This paper describes a method of towing deep water pipelines and risers, fulfilling both strength and fatigue requirements. The concept incorporates presently available equipment and technology. The proposed method is demonstrated through two case studies presenting the installation of a gas export pipeline at a water depth of 800m and a riser/pipeline string at a water depth of 300m.

Introduction

Pipelines may be installed by the towing techniques where long sections of the line are made up onshore and towed with tug boats to the field. The design procedures for towed or pulled lines are very dependent on the type of tow method chosen. It is also important to control the submerged weight of a towed line to minimize towing forces and at the same time have sufficient weight for stability on the seabed in cross currents.

The combined tow concept reported in this paper incorporate the following tow methods for deep water pipelines and risers:



Figure 1 Controlled depth tow method

- The off-bottom tow method (with buoyancy tanks and chains) from the fabrication site to approximately 5km offshore.
- The CDTM (Controlled Depth Tow Method, Figure 1) from 5km offshore to a temporary location where the buoyancy tanks are removed.
- The catenary tow method for the deep water tow to the installation site (without buoyancy tanks and chains).

For the off-bottom- and controlled depth tow method, buoyancy steel tanks are mounted at selected intervals. Chains are also mounted at frequent intervals along the pipeline to overcome the excess buoyancy and keep the system stable. During the catenary tow method the buoyancy modules and chains are removed and the submerged weight of the system increases.

Tow Methods

In order to use the tow methods, the pipeline is normally constructed at an onshore site with access to the sea. Once the pipeline sections are welded together to a determined length and hydro tested, the pipe is de-watered and launched into the water by a tow vessel attached to the lead end as seen in Figure 2. Onsite winches are attached to the trail end to ensure back tension and control the launch speed.

During this operation the varying curvature of the pipeline string due to the tidal current is continuously monitored and corrected by the lead tug. When the whole length of the pipeline is launched, submerged weight checks are carried out to ensure that the pipeline is suitable for towing. Chains are added or removed to achieve the desired submerged weight before the tow vessels begin to tow the pipeline along the predetermined tow route.

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