Parametric Study of Intervention System in Ultra-deepwater up to 3000m Using Passive Heave Compensation

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ABSTRACT

Deepwater technologies available nowadays are based on the experience of installations, designs, and procedures for water depth up to 1000m. These technologies have been developed along the last twenty years. Today, the Roncador and Marlim Sul Fields, the deeper fields in Campos Basin Offshore Brazil, are located in water depth up to 2500m. The 3000m case is under evaluation. This demands new studies about equipment installation even when a dynamic positioning support vessel is used.

This paper describes a dynamic response parametric study of a subsea tool installation suspended from a cable, in water depths up to 3000m, using a Passive Heave Compensation System. Expedite procedure using a simplified model in frequency domain and simulations with non-linear time domain analysis were performed in order to predict response amplitude and snap loading condition. This study is important to extend the present installation systems used such as Control Module, for example, that operate in 1000m to operate in up to 3000m water depth. A sensibility analysis changing dynamic excitation and Passive Heave Compensation System Configuration is also discussed.

KEY WORDS: Subsea equipment installation, Passive Heave Compensation, Deep water installation, Deep water intervention

INTRODUCTION

Rigs usually have heave compensation system which make them adequate for subsea equipment installation. However, the unavailability of these rigs has increased its daily rate. Basically, this is due to the deepwater activity that has been increasing throughout the world. Consequently, the use of a support vessel with dynamic positioning (DP) system has becoming inevitable to install subsea equipment mainly due to its low cost daily rate together with its availability in the international market. On the other hand, this option has some disadvantages, such as higher vertical amplitude motion.

Subsea equipment installation by using a DP support vessel, changes the drill string philosophy to cable. However these vessels do not have compensation systems, since they are not necessary for most operations. Besides, the heave compensation systems are expensive and requires more space on the deck.

An alternative that avoids heave compensation systems on board but still allows the use of a DP supporting vessel is discussed next.

PROBLEM DEFINITION

The running/installation tool under consideration is an equipment intended to run, position, attach or retrieve the subsea equipment to another one previously installed. This tool can be run from a DP vessel by means of a cable.