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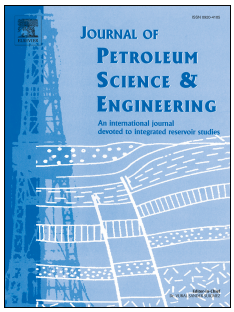

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Yingying Wang, Haohu Tuo, Liwei Li, Yu Zhao, Hua Qin, Chen An

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Dynamic Simulation of Installation of the Subsea Cluster Manifold by Drilling Pipe in Deep Water based on OrcaFlex

Yingying Wang*[1], Haohu Tuo[1], liwei Li[2], Yu zhao[1], Hua Qin[1], Chen An[1]

[1]Institute for Ocean Engineering, China university of Petroleum, Beijing102249, China

[2] CNOOC Research Institute, Beijing 100027 PR, China

(*Corresponding author, Tel.: +86 13501099187, E-mail: wyy5186@126.com)

Abstract: The external environment in deep water is quite complicated, during the installation process of subsea cluster manifolds by the drill pipe, the safety and precise localization need to be addressed desperately. In this paper, based on small deformation theory, basic theoretical model on the drill pipe installation of subsea manifolds is proposed and OrcaFlex software is used to make a simulation on setting up the corresponding numerical model in which the installation process is divided into three main phases. Its main purpose is to make a simulation research in guiding for engineers before the practical installation. The displacement and stress state of drill pipe are simulated and their curves in the different phases are obtained. In the different phases of lowering subsea cluster manifold, three factors: current velocity, wave height and manifold weight have an evident impact on tension, bent moment, Mises stress of drill pipe and displacement of subsea manifold, which are quite useful for actual installation in deep water.

Key words: Installation of subsea manifold； Drill pipes; Theoretical model； Simulation on OrcaFlex.

1 Introduction

With the advantages of the flexibility, avoiding the harsh weather surroundings and so on, the subsea production system has been widely applied to the development of deep-water oil and gas fields, especially ultra deep-water (*Miura ET AL, 2006; Xavier et al ,2008; Souza et al, 2010; Cai et al 2012; Lin et al, 2013; Wang et al, 2015*). More and more attentions for the engineers have been paid to the cluster manifolds as the hub of the transportation facilities in subsea production systems *(Chatas, et al, 1974; Kelly and Strauss, 2009; Ratnayake et al, 2015; Mao, et al, 2016).*

The subsea cluster manifold is a large structure with piping, valves, headers, pigging loops and some fittings. It serves as a central gathering point for the production from subsea wells, and also as the distributing point for the water, gas and chemical agent injection from the host facility *(Jasmin and Mohame, 2008; Wang, et al,2012)*. The typical cluster manifolds have four slots, six slots or eight slots, depending on the subsea well number connected to this manifold. The more number of well slots there is, the greater the weight of cluster manifold is. That leads to the greater challenge for the installation of subsea cluster manifolds because of the high scarce resources and daily fees in deep-water. Thus, taking into consideration the factors of size, weight, water depth, deep-water installation