Victor Fernando Deorsola Sacramento

Integrity of an offshore structure subjected to waves

TESE DE DOUTORADO

Rio de Janeiro
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I dedicate this work to my wife, Adriana, to my daughter Maria Carolina and to my son, Pedro Henrique. During the time that I dedicated to this work I stopped doing a lot of things together with them.

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Abstract

This work presents a method for evaluation of the fatigue resistance of a drilling tower considering the sea surface elevation, the dynamics of the platform on which the tower is installed and the dynamics of the tower itself. Reduced order models are used for obtaining the sea surface elevation and the dynamics of the tower, and the uncertainties on the parameters of the components of the system can be included in the analysis as well. The analysis can be done for several sea states, according its probability distribution, and no assumption about the probability distribution of the stress ranges has to be made previously. The histogram for the distribution of stress ranges for the entire working life of the equipment is obtained using a Rainflow technique. The results and the uncertainties on them are discussed.

Keywords

Resumo

Sacramento, Victor Fernando Deorsola; Sampaio Filho, Rubens; Ritto, Thiago Gamboa. **Integridade de uma estrutura offshore sujeita à ondas**. Rio de Janeiro, 2014. 82p. Tese de Doutorado — Departamento de Engenharia Mecânica, Pontifícia Universidade Católica do Rio de Janeiro.

Este trabalho apresenta um método para calcular a resistência à fadiga de uma torre de perfuração considerando a elevação da superfície do mar, a dinâmica da plataforma na qual a torre está instalada e a dinâmica da própria torre. Modelos de ordem reduzida são utilizados para obter a elevação da superfície do mar e a dinâmica torre, e as incertezas nos parâmetros dos componentes do sistema podem ser incluídas na análise também . As análises podem ser feitas para vários estados de mar, conforme sua distribuição de probabilidade, e nenhuma hipótese sobre a distribuição de probabilidade precisa ser feita inicialmente. O histograma de distribuição de ciclos de tensão para toda vida útil do equipamento é obtido usando um procedimento de contagem de ciclos Rainflow. Os resultados e as incertezas nos mesmos são discutidos.

Palavras–chave

Ondas oceânicas aleatórias;   Base de Karhunen Loève;   Modelo de ordem reduzida;   Dinâmica de estruturas offshore;   Dano em fadiga;

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