HYDRODYNAMIC ANALYSIS OF MOORING LINES OF SEMI SUBMERSIBLE PLATFORM IN OPERATIONAL AND SURVIVAL CONDITIONS

Mohammad Javad Ketabdari
Assistant Professor, Faculty of Marine Technology,
Amirkabir University of Technology
ketabdar@cic.aut.ac.ir

Mesbah Saybani
Assistant Professor, Faculty of Marine Technology,
Amirkabir University of Technology
msaybani@cic.aut.ac.ir

ABSTRACT
In last few decades increasing demand for energy lead to developing deep water technology for oil exploitation in severe ocean environment. An engineering idea is to minimize the structural resistance to environmental loads using compliant structures such as TLP and semi submersibles. However this structural flexibility causes nonlinearity in the structural stiffness because of large deformations. Therefore the dynamic governing equations are complex to solve due to theses nonlinearities. Semi submersibles have been dramatically improved in recent years due to their capability for deep water operation. Waves and currents are important environmental phenomena affecting these offshore structures. Estimation of platform movements in six degrees of freedom is vital in offshore structure design. In this research a detailed mooring analysis for a typical semi submersible was performed to make suere if the platform meets the necessary requirement in operational and survival conditions using ROMEO software.

Key words: Mooring analysis, Operational condition, Survival condition, Finite element analysis, ROMEO software

INTRODUCTION
Due to Iran's grate role in world oil and gas equations and considering the high potential fields of Persian Gulf & Caspian Sea; offshore operations including discovery, installation, feasible studies & filed development of current and future offshore fields is vital to develop offshore production capacity significantly. Semi-submersibles play a major role in dealing with such problems especially in deep water harsh environments when other production vessels such as FPSO's are not efficient. Safe and efficient operation of a semi-submersible platform is hence required to achieve the above mentioned goals. Figure 1 shows a schematic of semi submersible with spread catenary mooring. It is a conventional mooring which reacts against environmental loading regardless of its direction. Mooring system may be composed of chain, wire rope, cain/wire rope and wire mooring line. Figure 2 shows the structure of some of these moorings. In order to cover all offshore operations safe and secure and to increase the production activities in an efficient manner it is necessary to perform a detailed mooring analysis for a semi-submersible unit under environmental loading to meet the essential requirements in operational and survival conditions [1].

BACKGROUND STUDY
In this section a background study was performed on previous related research done in the same area based on available articles [2]. MODUs are moving drilling units for excavation and extraction of under sea bed hydrocarbon fluids. The MODUE which is considered in this study is a semi submersible with moorings and vertical risers. The role of moorings is sea keeping in determined area in worst environmental conditions and resisting against constant and low frequency loads such as current, wind and slowly varying wave loads. Usually two types of spread mooring and single point mooring is used. Moorings should be able to resist in damaged condition assuming one of the mooring lines is broken [3]. Hove (1995) analyzed the failure of moorings due to harsh environmental conditions and fatigue. Haver et al. (1999) studied the stability of a moored semi