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Motion Behaviour of the Mono-Column FPSO Sevan Piranema in Brazilian Waters

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Abstract

The world's first floating, production, storage and offloading (FPSO) mono-column type platform was installed in June 2007 in the Piranema field, located offshore Sergipe state, Brazil, in 1,090 meters water depth. The unit is equipped with a process plant capable of handling 30,000 bpd (41 to 44° API) of crude, and capacities for 2,400,000 Nm³/day gas compression and 300,000 barrels oil storage. It was designed, built and commissioned by Sevan Marine according to the novel concept. The unit is currently being operated by Sevan Marine for Petrobras under a long-term charter contract.

A Technical Cooperation Agreement, between Petrobras and Sevan Marine to investigate the mono-hull concept since initial tank tests, also allowed monitoring motions and environmental data since the platform was commissioned, under a project led by Petrobras Research and Development Center.

This paper is intended to provide information on the motion behavior of a mono-hull production platform in real environmental conditions, and presents a comparison among data acquired from field measurements and results from numerical simulations as well as from model tests performed during the design phase. Other FPSO key functionalities are also addressed in this paper, such as the offloading operations and mooring system performance.

Introduction

The current drive to produce offshore oil fields in deep and ultra deep waters has pushed oil companies and operators to pursuit novel concepts for production units which are capable of storing and offloading the oil to shuttle tankers. The mono-column floating production platform is considered a unique concept of great interest by the industry. The expected enhanced motion behavior of this concept in comparison to ship-shaped production units is very beneficial for the performance of the production plant, safety of the crew and mainly for long-term integrity of the risers connected to the platform. Moreover, the mono-hull concept has good constructability with low capital expenditure during construction. Easiness of installation is also considered one of the advantages of this mono-column concept.

Under a long term contract with Petrobras to produce the Piranema field, Sevan Marine ordered in 2004 the construction of the first mono-column hull at the Yantai Raffles shipyard in China. The hull was dry-towed to Holland-Verolme Bootlek to continue the topsides integration and commissioning, and then wet towed to



Figure 1: FPSO Sevan Piranema being built in China