Model Tests for the DP System of a Drilling Semi-Submersible

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Abstract

As operators continue to explore and develop deepwater plays, demand for drilling units designed for deepwater operations has increased. Along with conventionally moored units, some operators are expressing a preference for Dynamically Positioned (DP) vessels for deepwater drilling projects. Among the reasons cited for this are subsurface conditions, such as pipelines or production equipment may make the use of DP vessels more active. Additionally, DP units may offer enhanced station keeping ability during extreme weather events, such as those found in the hurricane-prone Gulf of Mexico.

As a result of the demand and to meet market needs, Noble Drilling Services Inc (Noble) is converting its bare deck hulls to sixth generation semi-submersibles DP vessels. Noble developed an extensive upgrade program and it was decided that in line with established DP practices, and to satisfy client requirements, a process of DP capability based verification should be undertaken. These vessels will be outfitted with 8 azimuth thrusters, 2 at each corner of pontoon. This complex design accommodates several variables that affect the performance of thrusters and thus vessel's station keeping capability. Some of these variables are relative wave incidences and include interactions between thruster-thruster, thruster-hull.

An extensive model test program was developed to ensure that the vessel and the selected dynamic positioning system (DPS) would perform as expected. Model tests were conducted at a model test facility in California to assess the capability and reliability of the dynamic positioning system and the thrusters. The objectives of these tests were to investigate the capabilities of the selected DPS and thrusters to hold station during designed normal operating conditions in the Gulf of Mexico (GoM), Brazil, and West Africa (WA) or any other part of the world with similar metocean characteristics. The DP software and control system used during the test was a DP Class-3 system and it was designed especially for the purpose of the test and truly representative of the prototype system that will be installed on the semi-submersible.

This paper discusses the findings and benefits of the model tests, as well as the lessons learned. The paper also makes recommendations as to how they can be implemented in future projects.

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