

MARIN's Next Top Models

A stable partner in station-keeping

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MARIN is continuously developing modelling techniques to assist clients in optimising their DP configurations. Two examples of recent projects are highlighted in this article.

Recent developments in the offshore industry show an increasing interest in DP assisted vessels and MARIN is supporting this demand by broadening its modelling techniques. This includes numerical models as well as model tests. In addition, there is an ongoing development in small-scale thrusters that allows accurate model testing. Effects that are difficult to model numerically, such as thruster-hull and thruster-thruster interaction, can be very important for overall performance. Therefore, model tests are required in many projects.

DP model tests for a Lauritzen accommodation and support vessel

Lauritzen tankers has recently bought a cable-laying vessel which will be converted into a dynamically-



positioned accommodation and support vessel. To be deployed in Campos Basin, the vessel will be used to accommodate personnel working on-board offshore platforms and FPSOs. Transfer of personnel is done by means of a flexible gangway. At present set to be 7.5 m, the maximum stroke of this gangway is an important factor in the down-time of the system. The DP system is controlled such that it tries to limit the stroke by letting the DP vessel follow the moving connection point of the gangway on the platform or FPSO.

Lauritzen tankers asked MARIN to evaluate the system by means of numerical simulations and model tests. The situation under consideration was one where the accommodation vessel was supporting a typical turret-moored FPSO. Simulations were carried out with RUNSIM (DP control software also used in model tests), coupled to LIFSIM (time-domain simulation of multi-body systems). In these simulations, the hydrodynamic wind, wave and current interactions between the vessels were taken into account. They showed that the concept is feasible and were used to select appropriate environmental conditions and DP control coefficients for the model tests. Model tests were then carried out in the Offshore Basin in combined wind, waves, current and swell. Several sea states and environmental directions were considered, as well as very high wind speeds, current speeds and wind squalls. In all the tests a significant swell was present on the natural roll period of the FPSO. The tests showed that the concept is working well.

DP model tests for the DSS38 semi-submersible

In January 2007, model tests on the semi-submersible drilling vessel DSS38 were carried out at MARIN. Designed jointly by Keppel FELS and Marine Structure Consultants (MSC), the vessel is a four-column stabilised semi-submersible drilling vessel that is equipped with a dynamic positioning system consisting of eight azimuthing thrusters. MARIN was involved in the DP and sea-keeping behaviour analysis of the DSS38. Full DP model tests were carried out, as well as thruster interaction tests to assess the total available thrust at different current speeds. The tilt of the thruster tunnel with respect to the keel was modelled as required. This, in combination with other effects resulted in a system which has very good operability. The RUNSIM program DP system includes an extended Kalman filter and wind feed forward functionality and is much like the actual DP system on board. The allocation algorithm that controls the thrusters RPM and azimuth includes the forbidden zones which avoid thrusters operating in each others' wake. Thruster failure cases were modelled to investigate the redundancy of the design. This model test program was successfully completed by the end of January 2007.

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