

CPMC system provides better than ever PMM testing alternatives

MARIN's captive capabilities boosted

Frans Quadvlieg reports on the numerous opportunities for captive model testing available thanks to MARIN's new Computerised Planar Motion Carriage (CPMC) capability.

Both MARIN's Seakeeping and Manoeuvring Basin and Offshore Basin are equipped with a carriage, able to operate in follow-me mode and pre-defined-track mode.

'Follow-me' is extensively used and well known in seakeeping and free sailing manoeuvring tests. Ship models sail under influence of its control means and the environmental loads, while the carriage follows and measures the model's motions. Pre-defined-track mode enables the carriage to operate as a CPMC (Computerised Planar Motion Carriage), allowing both PMM and rotating arm tests to be carried out. It even allows the carrying out of arbitrary tracks of transient manoeuvres while the model is kept captive.

PMM facilities

The purpose of the carriage is that especially for larger models and for higher speeds, manoeuvring predictions can be made, not only using free sailing tests, but also using captive tests, an important addition to MARIN's large amplitude PMM facilities, which have been operational in the Deep Water Towing Tank since 1993.

Other PMM facilities at MARIN are the hydraulic oscillator operated in the High Speed Towing Tank which amongst others, is often used for submarine research. A third PMM oscillator is present in the Shallow Water Basin, used to determine the mathematical model of ships in shallow water.



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First CPMC project

The first project to use the CPMC capability recently showed the applicability of the carriage to perform rotating arm tests particularly with large models. The accompanying picture shows a captive test where a circular motion is carried out using a 7 meter model. The carriage is completely computer controlled. A time trace of X and Y position and yaw angle is fed to the carriage. This trace is followed accurately. Two struts formed the connection between the carriage and the model, and longitudinal and transverse forces and the heeling moment were measured. Based on these forces, a numerical model was constructed describing manoeuvring and course keeping properties of the vessel. Speeds, drift angles, rates of turn and heel angles varied during the tests are sufficient to cover the drift angles and rates of turn that vessels encounter during manoeuvring. The numerical model constructed is a non-linear model using the four-quadrant approach, yielding stable numerical models describing manoeuvring and course keeping properties of the ship where necessary. Each captive test program is specially tailored for the mission and properties of the vessel. Identical functionality is available in both the Seakeeping and Manoeuvring Basin and in the Offshore Basin, where the movable floor means tests can be performed in wind, waves and current in deep and shallow water.

Captive model test in rotating arm set-up on 7 meter model.

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