

Installing new topside modules on an existing Floating Production Unit (FPU) in deep water can be a challenging task. The crane vessel and semi submersible move independently and lowering a relatively light module on a moving unit – which is also influenced by the load – is no easy feat.

Combined Model Tests and Simulations in the Lift



Installation of 2nd module.



Visund FPU.



Visualisation of LIFSIM simulations.

These were reasons enough for Statoil and Heerema Marine Contractors to ask MARIN for a combined model test and simulation lift study.

A combined study using simulations and model tests was performed by MARIN to investigate the feasibility of an offshore installation of two gas modules onboard the Visund FPU from the Dynamically Positioned (DP) crane vessel, Thialf. The modules must be lowered offshore on to the FPU deck, while at the same time preventing damage to both the existing equipment and the new modules. The focus of the study was mainly to derive design loads for the guiding system and to assess the motions of the modules during the lowering operation.

Statoil (owner and operator of the Visund FPU), Heerema Marine Contractors, Thialf's owners and ABB, the company responsible for the design of the guiding system, were all extensively involved in this study.

The model test program used very accurate models of the crane vessel, the FPU and the modules, including the complete guide and bumper system. All guides were instrumented to measure the loads during installation. As the Thialf is a DP crane vessel the Thialf model was kept in position during the model tests using a DP system, in order to simulate the correct, low frequency, motion behaviour.

Different stages of the installation process were assessed in the model tests, from the modules approaching the guiding system, to the actual lowering of the modules on the FPU deck. Furthermore, various sea states and wave directions were tested to determine the operational limits of the installation.

After the model tests a numerical model in the LIFSIM program was fine tuned using the model test results. This numerical model allows evaluation of sea states and wave directions not tested in the model test program. This information can be used in the evaluation of workability, as well as Monte Carlo simulations to derive design loads.