

MARIN provides assistance from concept to operation

## CONCEPT TESTING

By combining hydrodynamic knowledge and operational experience we can give advice at all the stages of the project; “from concept to operation.” This leaflet gives an overview of facilities and tools available to improve your design concept and more information on possibilities with concept model testing.

### Integrated approach for concept improvement

In the early stage of a design not all parameters are fixed and it is still possible to make significant changes and improvements. MARIN's hydrodynamic and operational experts are ready to contribute to your concept design. For many decades we have developed, improved and worked with:

- model tests
- computer simulations
- full-scale measurements
- (full-mission) bridge simulators.

The combination of tools and facilities can be used to improve concept designs. For example:

- Operational feedback from an exercise at the bridge simulator can be fed into the numerical simulations and the design.
- Results from (concept) model testing can be used to obtain a more accurate numerical assessment of the operability in the conceptual design phase of the project.
- Model tests performed in the concept phase may be focused on one specific design subject or used to give a quick first impression of the overall performance of the concept.



## Concept modeltests

Model tests performed in the concept stage require a different approach to those performed in the final design stage. Where verification tests for a final design require the simulation to be as realistic as possible for the most accurate prediction, the concept stage needs maximum flexibility, coupled with minimised costs. The concept model test approach proves itself particularly valuable when it flags up design changes that need to be made to mitigate possible issues during an existing test campaign. To achieve maximum flexibility and minimised costs, MARIN reduces any unnecessary model complexity, procedures and instrumentation.

Possibilities to reduce the complexity of the model test campaign:

- Simplifying the mooring system by using just three mooring lines, consisting of a spring and steel wire, or a standard chain type.
- Building the model with a larger tolerance than normal, so that it can be built from readily available materials.
- Use of stock models available at MARIN
- Reducing the appendages on the model if considered less relevant.
- Saving basin time by not calibrating the waves, but still measuring them during the model tests. Alternatively, waves from MARIN's database may be selected.
- Using standard instrumentation and simplifying the model test setup.
- Delivering only the measured data (ASCII data) of the signals and a global data report with limited discussion or conclusions on the results.

A reduction in complexity seems justified as the design is still in the concept phase and tests are mainly performed for getting first impressions and validating numerical simulation codes. Furthermore, the tests give insight into complex loading effects on the structures that are difficult to predict with numerical tools, such as extreme wave loads, green water and extreme motions

### Tolerance and accuracy

A distinction has to be made between tolerance and accuracy. For example, in the early stage of the design the exact weight distribution is not known yet. It may be less relevant to adjust the weight distribution to the specified values exactly. Instead, the weight distribution can be

approximated to the specified values with a higher tolerance. On the other hand, the actual weight distribution is measured and documented accurately, so it is reliable and can be used in a numerical assessment. During the model tests MARIN's standard quality procedures are followed so there is no doubt that the obtained results are accurate and reliable.

## Green water assessment for SBM concept



A typical example of concept modeltest was the test series performed for SBM. A green water assessment was made in the Offshore Basin. For these tests a tanker from MARIN's stock was used with a large number of wave probes at the bow. Adjustments to the test conditions were realized directly responding to the test results.

According to SBM: *"The tests, which focused on enlarging SBM's in-depth knowledge on green water phenomena, were very illustrative for the behaviour of an FPSO in relatively severe seas. The electronic delivery of measured data, as MARIN made for these conceptual tests, perfectly suited our needs for this internal R&D project."*

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