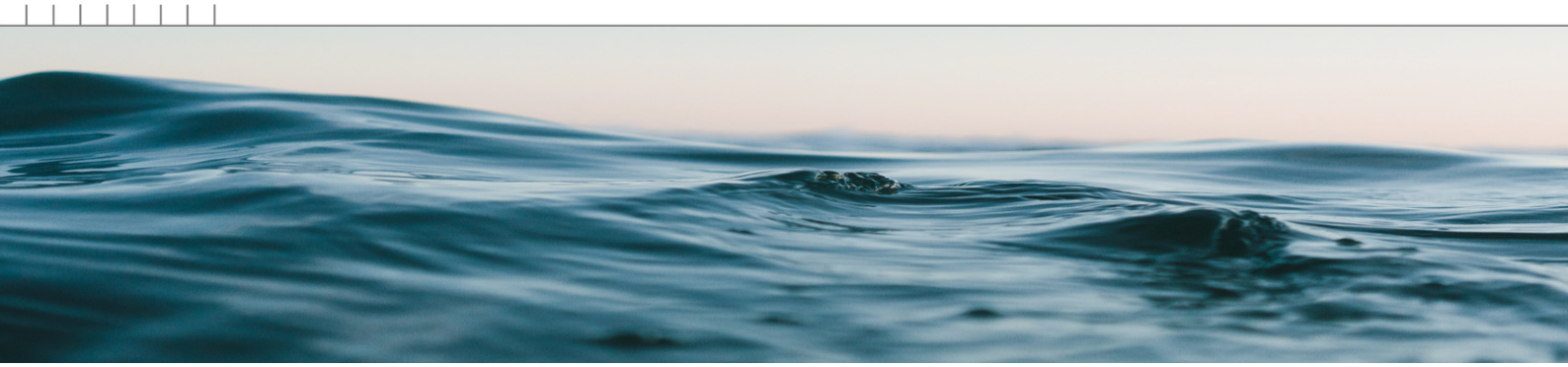
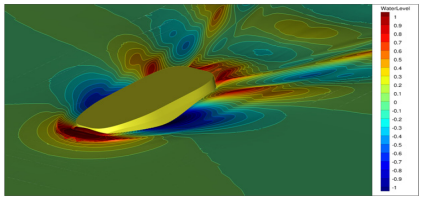


EEDI performance by means of CFD

An EEDI performance assessment can be done by means of model tests or CFD. CFD can be used for two cases: Firstly, if a sister ship is built and the model test results of the existing ship are available as reference. Secondly, if the EEDI draught of an existing ship is different from the draughts tested in the model basin.
For the CFD based EEDI assessment three solutions are offered by MARIN:



Option 1:
CFD calculations will be conducted for a draught of which model tests results are available and for the EEDI draught, both at model scale. The calculations will be done at multiple speeds with a RANS solver, taking into account the free surface and viscous effects. The objective of the calculations is to determine the bare hull resistance. Thereafter, the calculated resistance will be correlated with the existing model test results at ballast draught, taking into account resistance of the appendages. The propulsive coefficients derived from the model tests will be applied to the calculated resistance and in this way the propulsive power will be determined, using the same extrapolation procedures and correlation allowances as used in the model tests. Thereafter, the propulsive coefficients for the EEDI draught will be determined using the propulsive coefficients from the model tests at design and/or scantling draught. These propulsive coefficients will be used to determine the propulsive performance at the EEDI draught.

Option 2:
In this solution a similar approach as in option 1 is followed, but the RANS calculations will be done for full scale now, omitting extrapolation procedures and part of the correlation allowances to be used. Only allowances for the hull roughness and wind resistance due to the exposed frontal surface area will be applied.

Option 3:
Solution 3 is the most advanced method, performing self propulsion Free Surface computations for the draught of which model tests results are available and the EEDI draught at full scale including all appendages and the propeller. The calculations will be done using a RANS method either coupled to a propeller BEM method or by including the propeller in the RANS calculation based on the sliding interface approach. In this case propeller – hull interaction coefficients will be fully obtained from the CFD calculations. Checks will be made with the extrapolated performance prediction from the model tests. Which option to choose for the EEDI assessment depends on the demands of the client and the class society.

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