Ship Hull Resistance Calculations Using CFD Methods

by

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Submitted to the Department of Mechanical Engineering in Partial Fulfillment of the Requirements for the Degrees of

Naval Engineer
and
Master of Science in Mechanical Engineering

ABSTRACT

In past years, the computational power and run-time required by Computational Fluid Dynamics (CFD) codes restricted their use in ship design space exploration. Increases in computational power available to designers, in addition to more efficient codes, have made CFD a valuable tool for early stage ship design and trade studies.

In this work an existing physical model (DTMB #5415, similar to the US Navy DDG-51 combatant) was replicated in STAR-CCM+, initially without appendages, then with the addition of the appendages. Towed resistance was calculated at various speeds. The bare hull model was unconstrained in heave and pitch, thus allowing the simulation to achieve steady dynamic attitude for each speed run. The effect of dynamic attitude on the resistance is considered to be significant and requires accurate prediction. The results were validated by comparison to available data from tow tank tests of the physical model.

The results demonstrate the accuracy of the CFD package and the potential for increasing the use of CFD as an effective tool in design space exploration. This will significantly reduce the time and cost of studies that previously depended solely on physical model testing during preliminary ship design efforts.

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