

Ship scale validation of CFD model of self-propelled ship

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ABSTRACT

This paper presents a comparison of towing tank testing, ship scale computational fluid dynamics (CFD) simulations, sea trial measurements and in-service performance. The study includes extensive convergence tests and validation of both resistance, open-water and self-propulsion CFD simulations in both model and ship scale. The self-propulsion CFD simulations are conducted using a novel method. This method includes calculating the wave-making resistance separately, in order to reduce the computational cost.

The results of the ship scale self-propulsion CFD show an average overestimation of delivered power of 2% compared to the sea trial results, where the predicted delivered power using the towing tank approach shows an average overestimation of delivered power of 6%. Both predictions are within the uncertainty of the speed trial measurements. The study shows that both the towing tank approach and ship scale CFD can make reasonable and similar estimations of the ship scale performance of a ship. Furthermore, we find that for the present ship, CFD is able to predict performance as accurately as towing tank procedures, indicating that ship scale CFD is a mature tool for use in future ship designs.

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