

Title: Mathematical modelling and verification of a full-scale naval training ship progressive power-speed trial

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Abstract:

A progressive speed trial was conducted on a full-scale naval training ship of twin propellers to establish the power-speed characteristics as to fulfill one of the contractual obligations by the shipbuilder to the ship owner. The trial was conducted in Sea State 1 conditions at full load displacement. The readings taken prior and during the trial include; ship speed, engine horsepower, displacement, draft, wind speed, wind direction, wave height, water depth, sea water temperature, sea water density, atmospheric temperature, rotational speed of the propulsion engine and propeller shaft rate of rotation. As usual the trial was performed progressively at about equal speed intervals. The engines brake horsepower at the respective trial speed was measured during the trial. Whereas the effective power available at the propellers corresponds to each trial speed was predicted theoretically based on the measured engine horsepower according to the formulations contained in the relevant Recommended Procedures and Guidelines of the International Towing Tank Conference (ITTC). The calculated or the theoretical effective power derived from the real full-scale trial was then modelled mathematically as a function of speed. The resulting effective power-speed curve generated from the ITTC method and that obtained from the mathematical modelling were cross-plotted to examine their exactness to each other. As indicated by the closeness of the overlapping of the cross-plots of the power-speed curves, it signifies the precision or accuracy of the results. Therefore, the progressive-speed trial of the full scale naval training ship has been successfully modelled mathematically and verified.

Keyword. Progressive power-speed trial, Sea state 1, Full load displacement, Mathematical modelling, Delivered power, Effective power, International Towing Tank Conference (ITTC).