Title: Applicability of J.N. Newman Ship Wave Integral Equation of Linear Thin Ship Theory for a Fuller Hull Form Solved by Final Root Method

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Abstract:

J.N. Newman ship wave integral of a linear thin ship theory Rw is a well-known equation for analysing wave energy generated by moving ships. The equation derived on the assumption that the wave energy radiated downstream by a 3-dimensional ship is equal to the wave resistance that needs to be overcome. This wave energy is the transformation of the power or work done partially from the propulsion engines. In earlier studies, Asymptotic Method of solution was applied to solve the wave integral equation. Alternatively, Final Root Method is used to solve Rw in the present study to determine the ship wave resistance of a product tanker with a block coefficient of 0.75. The study is an extension of the previous works carried out by the main author on a Wigley hull form ship and a V-shape hull form of a naval vessel. The main objectives are to investigate and verify the applicability and validity of the J.N. Newman integral equation applied to a fuller hull form. The total resistances from the model experiments at low Froude numbers of equal to or less than 0.2 were analysed to determine the (1+k) form factor for the extraction of the wave resistance components. The calculations were performed based on the input data of the principal dimensions, hull offsets data, trial speeds and the density of the water in the towing tank. The calculated results were subsequently verified against the experimental results and compared with those results of the thinner hull forms obtained from the similar investigations performed earlier on. The Rw solved by Final Root Method as presented matched very closely with those of the experimental results. Henceforth, the J.N. Newman ship wave integral equation is remarkably reliable and indeed applicable for use in fuller hull form ships as verified in the study.

Keyword. Newman ship wave integral, Ship wave resistance, Linear thin ship theory, Asymptotic method, Final root method, Fuller hull form, Form factor.