Complementary Mathematical Model for Underwater Vehicles under Load Variation Test Conditions

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Abstract : This paper aim to construct a mathematical model for Underwater vehicles under load variation test conditions. Propeller effects on underwater vehicle are investigated. Body with counter rotating propeller model is analyzed by CFD methods, thus forces and moment are obtained. Propeller effects of vehicle's hydrodynamic performance under load variation conditions will be investigated. Additionally, pressure contour is examined for differences between different load conditions. Axial force equation is established using hydrodynamic coefficients, which contains resistance, thrust, and additional coefficients occurs due to load variations. Additional coefficients helps to express completely axial force on underwater vehicle. When the vehicle accelerates, additional force occurs besides thrust force increment. This is propeller effect on the body. Hence, mathematical model cover this effect. For CFD analysis, the incompressible, three-dimensional, and unsteady Reynolds Averaged Navier-Stokes equations will be used Numerical results is verified with experimental results for verification. The overall goal of this study is to present complementary mathematical model for body with counter rotating propeller.
Keywords : counter rotating propeller, CFD, hydrodynamic mathematic model, hydrodynamics analysis, thrust deduction
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