A Numerical Study on the Effect of an Air Lubrication System for the Frictional Resistance Reduction of a Ship

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Abstract

IMO has mandated a 30% reduction in CO2 emissions by 2025 for ships taking 3.3% of global CO2 emissions. In order to reduce CO2 emissions, it is necessary to improve the ship's resistance and propulsion performance. In general, the frictional resistance accounts for more than 60% of the total resistance of the ship. When an air lubrication system is applied to a ship, air is injected onto the surface of the hull to form a continuous air layer. It is possible to reduce the frictional resistance on the hull surface and reduce the fuel consumption by the air. In this study, the effect of an air lubrication system on the reduction of frictional resistance of a ship was investigated by the computational fluid dynamics based on the Eulerian mutiphase mixture model. At first, the numerical simulation method was verified comparing with the experimental data performed with a flat plate. The effect of an air lubrication system was evaluated for a model ship and a full-scale ship. And the behavior of air layer was investigated to understand the mechanism of frictional resistance reduction by the air lubrication system.

Keywords: *Air lubrication, Frictional resistance, Computational fluid dynamics, Air layer*

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Biography

Kwang-Jun Paik is an Associate Professor of Department of Naval Architecture and Ocean Engineering in Inha University, South Korea. He received a Ph.D. in Mechanical Engineering from the University of Iowa in USA in 2010. He worked as a Principal Engineer for the propeller design and analysis in Samsung Heavy Industries from 2000 since 2015. And then He joined Inha University in 2016.