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Integrated Design of Propeller and Multiple Energy Saving Devices with Consideration of Their Interaction

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コメントの追加 [DA1]: 一ノ瀬さんの苗字だけが、小文字になっていたので、修正しています。

ABSTRACT

In recent years, the EEDI (Energy Efficiency Design Index) and the EEXI (Energy Efficiency Existing Ship Index) have been established as ship performance regulations. Shipyards and shipowners now place greater focus on energy saving than before. Many naval architects have conducted research into improvement of propulsion performance. For example, various energy-saving devices (hereinafter, referred to as ESD), such as the ECO-Cap, Ultimate Rudder Bulb and Neighbor Duct, have been developed to reduce fuel oil consumption[1)]. In addition, these ESDs have been shown to enhance propulsion performance. However, it is important to consider the interaction of propeller with multiple ESDs in order to achieve greater performance improvements, as the effectiveness of ESDs also depends on propeller design[2)3)]. This study investigated the interaction of propellers and multiple ESDs by conducting CFD[4)] (Computational Fluid Dynamics) analysis. Furthermore, the integrated design, which consider the interaction of propeller and ESDs was carried out using CFD for an actual merchant ship, and its effectiveness was confirmed through a sea trial. The sea trial reveals the energy-saving performance of the integrated design scheme of the propeller and multiple ESDs developed in this study. An energy-saving effect of approximately 9%, as estimated from the model test at the design draft, is indicated based on the power curve obtained during the sea trial.

コメントの追加 [YI2]: 学術論文なので、商業的な感じを薄くした方がよく。少なくとも ABSTRACT では、ナカシマプロペラの社名は控えた方が良いかと思いました。

コメントの追加 [DA3]: 具体的な数値の結果を示したほうが説得力がある気がします。また、普遍的な内容に関しては、現在形か現在完了形にしてください。

References

1) Y. Okada, K. Katayama, A. Okazaki, M. Okazaki, K. Fukuda, Y. Kobayashi, T. Kajino : The Battle Royal of Energy Saving Devices for a Ship, Proceedings of Fifth International Symposium on Marine Propulsors smp'17, 2017.

2) Y. Okada, K. Katayama, Y. Kobayashi, T. Hiroi, Y. Ichinose and J. Ando : A Study about Interaction of Propellers with Multiple Energy Saving Devices -The Effect to Self-Propulsion Factors due to Propeller Position and Pitch Distribution -, Journal of the Japan Society of Naval Architects and Ocean Engineers, Volume 32, pp.1-8, 2020.

3) Y. Okada, K. Katayama, Y. Kobayashi, T. Hiroi, D. Wako, Y. Ichinose and J. Ando : Interaction of Propeller Pitch Distribution and Multiple Energy Saving Devices -The Effect of Propeller Pitch Distribution and Stern

Duct on the Flow Field around the Rudder-, Journal of the Japan Society of Naval Architects and Ocean Engineers, Volume 37, pp.9-17, 2023.

4) K. Ohashi, T. Hino, H. Kobayashi, N. Onodera and N. Sakamoto : Development of a structured overset Navier-Stokes solver with a moving grid and full multigrid method, Journal of Marine Science and Technology, Volume 24, pp.884–901, 2019.