Singapore: New Approach to Assess Ship Resistance in Seaways
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The impact of sea waves on the speed and performance of ocean-going vessels, as well as their fuel consumption, contributes to maritime greenhouse gas (GHG) emissions. However, assessing this effect has proven challenging.

With this, researchers from Nanyang Technological University, Singapore (NTU Singapore) and the National Technical University of Athens (NTUA) led by Dr Liu Shukui, a professor at the School of Mechanical and Aerospace Engineering at NTU Singapore, and Professor Apostolos Papanikolaou of NTUA have developed a new method that can more accurately and easily estimate this wave effect, allowing ship operators, among other things, to account for it when planning shipping routes.

On the other hand, the maritime industry is also in the process of updating an existing International Organisation for Standardisation (ISO) requirement using the new method as part of a larger revision.

According to the researchers' estimates, the new method has the potential to reduce a ship's fuel consumption and GHG emissions by 5 per cent to 10 per cent. Depending on the ship's design and shipping operations, this reduction could be even greater.

Tag as the SHOPERA-NTUA-NTU-MARIC (SNNM) method has been accepted by some international organisations as the recommended system for analysing a ship's speed and power performance.

The method has also been incorporated into the official International Maritime Organisation (IMO) standards for determining the minimum propulsion power and aims to cut shipping-related greenhouse gas emissions by 50% by 2050.

In addition, the SNNM method is an improved method for the correction of added wave resistance to be used worldwide, particularly for the confirmation of a ship's Energy Efficient Design Index (EEDI) – an initiative that strives to foster innovation and technical improvement of the components that influence the fuel efficiency of ships.

Moreover, the existing software tools calculate the extra resistance from waves based on the design of a ship's hull, whereas the new method estimates it using eight parameters. These include the length and breadth of a vessel, as well as its loading state.

This means that ship operators can accurately predict this additional resistance even in the absence of specific knowledge about the hull design. Such hull information is typically confidential and difficult to get.

To construct the method, researchers compiled a database of the additional resistance encountered by ships of various sizes and shapes. From more than 5,000 experimental data points, they determined the most significant characteristics that define the added resistance from waves.

Independent validation tests conducted by a specialist committee demonstrated that the new approach accurately predicts the wave resistance encountered by ships. Thus, the researchers are currently collaborating with industry partners to implement the novel method.

If implemented appropriately and to a large extent, the SNNM approach represents a significant step forward that has the potential to assist the worldwide shipping sector in accomplishing this objective.

Its scientific originality and significance have been demonstrated by the adoption or recommended in related documents from some international organisations.

Predicting ship performance in a seaway with accuracy and efficiency is crucial for successful ship operations. The ability to anticipate the achievable speed and power consumption in each sea state are vital for ship design review, weather routing, sea margin prediction, and logistics planning, and for that reason, the overall resistance in waves is a crucial parameter.

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