Designing for Ship Performance

Monitoring and Analysis for CO2 Emission Reduction

Example of vessel whereby the amount of cargo carried is difficult to quantify in single MRV indicator.

(Picture courtesy of Spliethoff)

In April 2015, the European Union adopted a mandatory Monitoring, Reporting and Verification (MRV) regulation for CO2 emissions resulting from maritime transport. The MRV requires operators of large ships to monitor and annually report the verified amount of CO2 emitted on journeys to, from and between EU ports.

Using basic input data (distance, fuel, time, cargo weight) and indicators the ship's performance is determined and reported publicly. Over the past two years MARIN has worked together with the Royal Dutch Shipowners' Association (KVNR) to evaluate the implications of these performance indicators for general cargo ships and reefers.

The performance of these vessels is difficult to determine in comparison to tankers and containerships, due to the large variety of cargo types. Daily performance data from more than 200 ships was collected and analyzed to evaluate and suggest fairer performance indicators, and these new indicators were then put forward to the European Commission.

Although the MRV performance indicators generated from only basic data may be useable for global CO2 monitoring, they provide little information to the operator. Through several JIPs, commercial projects and in-house research directly related to service performance analysis, MARIN has led the research into the causes of scatter in performance indicators. Even with the availability of monitoring systems providing almost real-time data, and the use of state-of-the-art correction methods for wind and added wave resistance, scatter is still a widespread phenomenon. Having confirmed the reliability and accuracy of important sensors such as the speed log, power meter and weather data, research over the past year focused on added resistance. The ship's resistance is often defined as RT = Rcalm + Rwind + Rwave. And the effect of drift and asymmetric drop in propeller efficiency with drift is often neglected.

CFD ReFRESCO calculations with a steady wave pattern, free surface and rotating propeller proved relations found in service performance data that leeway drift can lead to an increase in fuel consumption up to 15%. New insights allow corrections to be applied to these off-design conditions and lead to a reduction in performance indicators. In this way MARIN helps shipowners to reduce CO2 by providing accurate performance evaluations.

About the Author

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