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Energy efficient safe SHip OPERAtion (SHOPERA)

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Abstract

The 2012 guidelines on the method of calculation of the attained Energy Efficiency Design Index (EEDI) for new ships, MEPC.212(63), as updated by MEPC 245(66) in April 2014, represent a major step forward in implementing energy efficiency regulations for ships through the introduction of the EEDI limits for various types of ships. There are, however, serious concerns regarding the sufficiency of propulsion power and steering devices to maintain manoeuvrability of ships in adverse conditions, hence regarding the safety of ships, if the EEDI requirements are achieved by simply reducing the installed engine power. This was the rationale for a new EU funded research project with the acronym SHOPERA (2013-2016), aiming at developing suitable methods, tools and guidelines to effectively address these concerns. The paper discusses the background of project SHOPERA and outlines the formulation of suitable criteria and methods for the assessment of ship's manoeuvrability and safety under adverse weather conditions.

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1. Introduction

The introduction of the Energy Efficiency Design Index (EEDI) was a major step towards improving energy efficiency and reducing GHG emissions of shipping; however, it has also raised concerns that some ship designers might choose to lower the installed power to achieve EEDI requirements instead of introducing innovative propulsion concepts. This can lead to insufficient propulsion and steering abilities to maintain manoeuvrability of ships under adverse weather conditions, thus to a serious ship safety problem. Work carried out by IACS highlighted this issue and led to the development of first draft guidelines for consideration by IMO in 2011 (see IMO MEPC 62/5/19 & MEPC 62/INF.21), which later resulted in *2012 Interim Guidelines* (see IMO MEPC 64/4/13 & MEPC 64/INF.7), updated in 2013 in Res. MEPC.232 (65). Even though the *2013 Interim Guidelines* prevent irrational reduction of installed power, their sufficiency was disputed, especially concerning the set-up of the minimum power lines for some ship types and sizes and the adversity of the weather conditions to be considered in the assessment and removal of comprehensive assessment. Several research initiatives in various European countries and Japan, aiming at updating the guidelines (see, e.g. IMO submissions MSC 93/21/5 and MSC 93/INF.13 by Greece, MEPC 67/INF.22 by Japan, MEPC 67/4/16 by Denmark, Japan and the Republic of Korea, and MEPC 67/INF.14 by Germany, Norway and the United Kingdom) were noted and are expected to lead to the rationalization of the interim guidelines, may be at MEPC 70 in October 2016.

To address the above challenges by in-depth research, the EU funded project SHOPERA (Energy Efficient Safe SHip OPERAtion) (2013-2016) was launched in October 2013. SHOPERA is developing suitable numerical methods and software tools and is conducting systematic case studies, which will enable the development of improved guidelines and their submission for consideration to IMO. A strong European RTD consortium was formed[1] , representing the whole spectrum of the European maritime industry, including classification societies, universities, research organisations and model basins, ship designers, shipyards and ship operators. The project's objectives are:

- Develop criteria and corresponding environmental conditions to assess sufficiency of propulsion and steering systems of ships for manoeuvrability in adverse conditions, including open sea, coastal waters & restricted areas.
- Develop and adapt existing high fidelity hydrodynamic simulation software tools for the efficient analysis of the seakeeping and manoeuvring performance of ships in complex environmental and adverse weather conditions.
- Perform seakeeping and manoeuvring model tests in seaway by using a series of prototypes of different ship types to provide the required basis for the validation of employed software tools.
- Develop simplified assessment methods, to the extent feasible, which should enable a quick assessment of the safety margins of ship designs with respect to the minimum propulsion and steering requirements for manoeuvrability in adverse weather conditions.
- Integrate validated methods and software tools for the hydrodynamic manoeuvrability assessment of ships in adverse weather conditions into a ship design software platform and combine it with a multi-objective optimization procedure, which is targeting sufficient propulsion and steering requirements for safe ship operation in adverse weather conditions, while keeping the right balance between ship economy, efficiency and safety of ship and the environment.

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