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PREVENTION OF AIR POLLUTION FROM SHIPS

Energy Efficiency Design Index (EEDI) – Definition of Deadweight for Containerships Response to MEPC 59/4/2

Report of the second Intersessional Working Group on GHG Emissions from Ships

Submitted by the Republic of the Marshall Islands

SUMMARY	
Executive summary:	To minimize CO_2 emissions and avoid unintended consequences associated with new containerships optimized to a 100% DWT load condition, this document proposes that a fixed value of 65% of the deepest operational deadweight (where the ship is normally operating) be used when calculating the EEDI for containerships
Strategic direction:	7.3
High-level action:	7.3.1
Planned output:	7.3.1.3
Action to be taken:	Paragraph 14
Related document:	MEPC 59/4/2

Introduction

1 This document is submitted in accordance with paragraph 4.10.5 of the Committee's guidelines on the organization and method of work, MSC-MEPC.1/Circ.2 and it is providing comments in response to document MEPC 59/4/2.

2 During MEPC 58, concern was raised that without careful attention, the proposed EEDI may lead to paragraph ships optimized to fulfil the Index rather than optimized to increase energy efficiency. This matter was further discussed during the second Intersessional Meeting of the Working Group on GHG Emissions from Ships (GHG-WG 2) and its subsequent report of the meeting (MEPC 59/4/2). The Marshall Islands shares the concern that the current formula may lead to unintended consequences for container vessels, and is proposing a modification to the

capacity factor for container ships that will result in lower CO_2 emissions from newly-built container vessels. As the current formula is structured, new container vessels will be optimized at the deepest operational draught (100% DWT), rather than optimized at the condition that better represents normal operation.

Objective

3 MEPC 59/4/2 specifically called upon interested Member States and observer organizations to respond with any proposals for improvement of the EEDI with respect to specific ship types. Annex 2 of MEPC 59/4/2 further addressed capacity factors and definitions to be used in the respective ship classes. In this regard, the objective of this submission is to refine and improve the calculation of the Energy Efficiency Design Index in order to ensure that it will provide more energy-efficient ships by effectively leading to reduced CO_2 emissions during the normal operation of container ships.

4 Measurements undertaken on a set of over 150 container vessels of varying size show that optimizing a containership to the maximum operational condition (i.e. 100% DWT) will lead to greater **total** CO_2 emissions in many cases than optimizing the ship to a lesser draught that more closely represents operating conditions found in the world's container fleet.

5 To overcome this inadequacy in the index, this document proposes that the deadweight used for calculation of the efficiency index for container ships should correspond to the average draught at which such ships operate. Examination of the 150+ container vessels noted above indicate that this draught corresponds to about 67% or approximately 2/3 of the deepest operational deadweight.

Background

6 Analysis of almost 5 million hours of loaded operation involving 150 individual ships shows that modern containerships only sail in the maximum operational (full load) condition for about 10% of the time. While average load conditions vary by containership and the respective trade, the actual load varies across a range of approximately 50% to 88% of the full load with the average load condition in the mid-sixties as a percentile of the deepest operational deadweight.

7 This is not surprising for containerships since any voyage involves a wide variation in the weight of full containers as well as the fact that many voyages also involve the movement of empty boxes. As such, a containership rarely sails at its scantling draught since the weight of the total cargo is almost always less than what the ship can handle since it is highly unusual for all the containers on a respective voyage to be loaded with heavy cargo. It is also important to recognize that this is not primarily a function of moving empty containers; rather, it is a result of the fact that many containers contain relatively light cargoes. This is generally a positive condition, since lighter cargoes result in less fuel consumption and lower CO_2 emissions, but when considering the optimization of a capacity value in the design index, it is important to incorporate a value that better reflects the real world operation of containerships.

8 Correspondingly, containerships should be optimized to a percentile DWT figure (as opposed to 100% DWT) that will not only better reflect average operating conditions, but will also lead to reduced CO_2 emissions.

Optimization

9 During the design process of a ship, the energy efficiency is normally optimized at the draught where the ship is to be operated. However, with the EEDI being calculated at the deepest operational condition, designers will be motivated to optimize at the highest load condition. This makes sense in those cases where vessels sail at a fully loaded condition and weight. However, in the case of container ships, the fully loaded condition does not lend itself to the full weight condition. Recognizing this, adjustment of the design index capacity value for container vessels to a fixed percentile of DWT will lead to more energy efficient ship designs than would be seen with the capacity value set at 100% DWT.

10 Furthermore, since the required efficiency standards for ships is expected to increase over time through application of the EEDI, naval architects and designers will find less flexibility to optimize to a capacity condition that is not reflected in the EEDI formula.

11 For example, optimizing the ships energy efficiency for the deepest operational deadweight will for most ships mean that the full efficiency benefit of the bulbous bow will be calculated at the 100% DWT figure. When the bulbous bow is below the water it will increase the energy efficiency of the ship thus decreasing the total CO_2 emission in this condition. However, when the ship is loaded to a lesser draught (which represents 90% of the time of container ship operations), part of the bulbous bow will be nearer to the surface or even above the waterline. This condition would lead to decreasing energy efficiency and therefore increasing CO_2 emissions relative to the emissions of a vessel optimized to more realistic load levels, especially at lower speeds.

12 The analysis indicates that optimizing containerships at the maximum operational deadweight (e.g., 100% DWT) will increase the CO_2 emission at lesser draughts (where containerships normally operate), rather than optimizing the ship for normal operating conditions where the emissions will be low for the majority of the ship's operation throughout the lifetime of the vessel.

Proposal

13 In order for the new EEDI to help increase the energy efficiency of new containerships and to avoid the design of paragraph ships, it is proposed that **for calculating the EEDI value of containerships the capacity parameter should be established at 65% of DWT**.

Action requested of the Committee

14 The Committee is invited to consider the information and proposal above to use a fixed value of 65% DWT for container vessels in the draft EEDI formula and take action as appropriate.

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