

**Information on trials according to the Interim Guideline for Voluntary Ship CO<sub>2</sub> Emission Indexing and its relevance to application of the Energy Efficiency Operational Indicator for measuring ship efficiency.**

**Australian Shipowners Association  
[Provided by Australia]**

**Summary**

1 This document provides information from detailed trials of the Energy Efficiency Operational Indicator on two Australian ships to investigate the influence of various voyage characteristics on the indicator value. The indicator was found to vary considerably between voyages, and cargo load was determined to be the primary cause of the variation, more so than weather conditions, sea state or ship speed.

**Introduction**

2 In 2005, MEPC 53 approved interim guidelines for voluntary ship CO<sub>2</sub> emission indexing for use in trials. The formula for this index, now called the Energy Efficiency Operational Indicator (EEOI), incorporates the fuel consumption, distance sailed and cargo mass, along with the carbon content and CO<sub>2</sub> conversion factor for particular fuels, to calculate a “Carbon Dioxide Transport Efficiency Index” which represents the ratio of mass of CO<sub>2</sub> per unit of transport work. Applications proposed for the index included, for shipowners and ship operators, the evaluation of fleet performance with regard to CO<sub>2</sub> emissions, and monitoring of the effects of emission reduction measures.

3 MEPC/Circ.471 circulated these Guidelines and invited industry, organizations and interested Administrations to promote the use of the Guidelines in trials and report their experiences back to MEPC. The Australian Shipowners Association undertook a detailed trial of the EEOI in late 2008.

**Trial details**

4 The trial of the EEOI was undertaken on two Australian Ro-Ro cargo ships over a two month period. Both vessels operate daily on a voyage of approximately 240 nautical miles, which provided data for 89 individual voyages during the trial period. In addition to the voyage data required for calculation of the EEOI (fuel consumption, fuel type, mass of transported cargo, distance sailed), data were obtained on average ship speed, sea state and apparent wind direction.

**Results**

5 The calculated values of the EEOI were highly variable with a coefficient of variation of approximately 20 and 30% across all voyages. Calculating a rolling average on sequential sets of 10 voyages smoothed out the variability and reduced the coefficient of variation to less than 5%. However, this transformation masked trends in the voyage to voyage variability.

6 With voyage distance mostly constant, the two variable factors in the EEOI calculations in this trial were fuel consumption and cargo mass. These two variables are weighted equally in the EEOI formula. Variability in cargo mass was much higher than in fuel consumption, with coefficients of variation of approximately 25 and 30% against 14 and 20%. Although there was generally a linear increase in fuel consumption with increasing cargo load, this relationship was less than 1:1, so cargo load had the greatest influence on the value of the EEOI. Increases in the cargo mass on a voyage caused a correlative drop in the EEOI irrespective of fuel consumption remaining relatively unchanged. Some voyages undertaken at low speed with lower than average fuel consumption resulted in higher than average EEOI values due to the lower cargo load on these voyages.

7 The EEOI was only significantly influenced by weather on one voyage of one ship during the trial period, when a sea state at Beaufort Scale 8 to 9 and wind on the bow was reported. On this voyage, ship speed was reduced by 26% despite an increase of 45% in fuel consumption compared to average voyage data. This more than doubled the EEOI from average.

8 EEOI values calculated in this trial were higher than many reported to MEPC from other trials. The two ships are relatively small (gwt 8000 and 14000) and the higher EEOI can be attributed to the strong negative relationship between the EEOI and the ships size, as reported previously (e.g. GHG-WG 2/3/1).

## **Conclusion**

9 The establishment, comparison and interpretation of CO<sub>2</sub> efficiency baselines for ship categories in which cargo load varies will be significantly influenced by this factor.

## **Further Information**

10 The full report is available on the Australian Shipowners Association web-site on [www.asa.com.au/environment/ASA\\_EEOI\\_Trial\\_Report.PDF](http://www.asa.com.au/environment/ASA_EEOI_Trial_Report.PDF) . For additional information, contact Ms Angela Gillham ([angela.gillham@asa.com.au](mailto:angela.gillham@asa.com.au))

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