MARINE ENVIRONMENT
PROTECTION COMMITTEE
58th session
Agenda item 4

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GREENHOUSE GAS EMISSIONS FROM SHIPS

Monitoring of the Operational Index

Submitted by the Royal Institution of Naval Architects

SUMMARY

Executive summary: The NGO RINA proposes amendments to the method of monitoring the operational index.

Action to be taken: Paragraph 10.

Related Documents: MEPC58/WP8

1. The paper MEPC/58/4/13 from Intertanko, OCIMF and BIMCO, proposes a rolling average calculation of the Index to give a figure for tonnes CO_2 per tonne mile of cargo carried. Use of the rolling average technique smoothes out the variations of individual voyages. However, it can be seen from the example voyages included in the paper that the index for individual laden and ballast voyages combined varies from 7.0 to 25.7 (ignoring the "outlier" of 152.9). The rolling average process masks not only this variation, but would also mask any small reduction due to efficiency improvements, which would probably be less than 5%. It is therefore not a useful technique for demonstrating any reduction in emissions.

2. Reasons for the variability in the index between individual voyages are:

- Weather conditions
- Draught variations
- Speed variations
- Differences between laden and ballast voyage distances
- Using speed over the ground instead of speed through the water (current effects)
- Possible small variations due to hull and propeller condition

3. If the Index is to be used to monitor operational performance and validate small improvements due to increased efficiency, it should be under the following conditions:

4. Speed should be measured *through the water*, using a reliable log. If speed *over the ground* is used (i.e., average voyage speed from port A to port B, or speed obtained from satellite

fixes) a following current of just 1 knot will cause an apparent improvement of over 6% in the Index if the ship is travelling at 16 knots through the water.

5. Main engine horse power, speed through the water and specific fuel consumption should be measured by the ship under steady conditions when wind strength and sea state are Beaufort 3 or less, over a period of about 1 hour, once per voyage. It is also useful to record propeller rpm, which can be measured more accurately than any other performance parameter, for use as a consistency check.

6. The index calculated from these data needs to be corrected for any variation from a "standard" cargo deadweight, speed, horse power and **Sfc**:

Calculated index =

$$\frac{\mathbf{Hp_{mevoy}\ x\ SFC_{me}\ x\ C_{carbon}}}{\mathbf{Deadweight_{voy}\ x\ Speed_{voy}\ through\ water}}$$

Corrected Index =

$$\mathbf{Calculated\ index\ x\ \frac{Displacement_{st}^{2/3}}{Displacement_{voy}^{2/3}}\ x\ \frac{Speed_{st}^{3}}{Speed_{voy}^{3}}\ x\ \frac{Hp_{mevoy}}{Hp_{mest}}\ x\ \frac{SFC_{voy}}{SFC_{me}}}$$

where the subscript **st** refers to the values for standard displacement, speed and horse power and the subscript **voy** refers to the values measured on the voyage.

7. Alternatively on-line monitoring equipment could be mandated for all new ships. Such equipment is already available, proven in service and is marketed by several companies.

8. The basic equipment comprises:

- Fuel flow meter
- Propeller shaft(s) torsion meter(s)
- Ship speed log
- Rpm counter
- Computer to collect data and calculate the index.

9. In this event all the corrections described above could be done by the computer.

10. The working group is invited to consider the information provided and take action as appropriate.