ASEF for International Maritime Technical Initiative in Korea

Comments On the proposed attained new ship design CO2 index

Li Xiaoping
Assistant president of MARIC
Nov., 2008

Contents

- **Background**
- **Comments by China**
  - Comments after GHG WG 1st Intersessional meeting,Oslo
  - Comments in MEPC58
  - Further comments
- **Closing Remarks**

Background

- (1997) MEPC invited to consider CO2 reduction strategies
- (2000) IMO study on GHG emissions from ships (MEPC 45/8)
- .....

- (2008.03) MEPC57

- (2008.06) GHG WG 1st Intersessional meeting, Oslo

  The attained new ship design CO2 index
- (2008.10) MEPC58, London

  The attained new ship Energy Efficiency Design Index (EEDI)

Background

- (2008.06) GHG WG 1st Intersessional meeting, Oslo

The attained new ship design CO2 index

(Ref to Annex 5 to document MEPC 58/4)

$$Attained\ new\ ship\ design\ CO_2\ index = \frac{\left(\prod_{j=1}^{M} f_j\right)\left(\sum_{i=1}^{NME} C_{FMEi}\ SFC_{MEi}\ P_{MEi}\right) + \left(\prod_{k=1}^{L} f_k\right)\left(\sum_{i=1}^{NAE} C_{FAEi}\ SFC_{AEi}\ P_{AEi}\right)}{Capacity \times \quad V_{ref} \times f_W}$$

Background

- (2008.10) MEPC58, London

The attained new ship Energy Efficiency Design Index

(Ref to Annex 1 of MEPC58/WP.8)

$$\frac{\left(\prod_{j=1}^{M} f_j\right)\left(\sum_{i=1}^{nME} C_{FMEi}\ SFC_{MEi}\ P_{MEi}\right) + P_{AE} C_{FAE} SFC^{*}_{AE} + \left(\sum_{i=1}^{nPTI} P_{PTIi} - \sum_{i=1}^{nWHR} P_{WHRi}\right) C_{FAE} SFC_{AE} - \left(\sum_{i=1}^{neff} f_{eff} P_{eff} C_{Feff} SFC_{MEi}\right)}{fiCapacity \quad V_{ref} \quad f_W}$$

Comments by China

- Comments after GHG WG 1st Intersessional meeting,Oslo
  - Comments on the proposed CO2 index formula (MEPC58/4/33)
  - Comments on the proposed baseline (MEPC58/4/34)
  - Application of the principle of “common but differentiated responsibilities” to the reduction of greenhouse gas emissions from international shipping (submitted by China and India) (MEPC58/4/34)
- Comments in MEPC58
  - Meeting discussion
  - Comments by China
- Further comments

Comments after Oslo meeting

Comments after GHG WG 1st Intersessional meeting,Oslo

- Comments on the proposed CO2 index formula (submitted by China) (MEPC58/4/33)
- Comments on the proposed baseline (submitted by China) (MEPC58/4/34)
- Application of the principle of “common but differentiated responsibilities” to the reduction of greenhouse gas emissions from international shipping (submitted by China and India) (MEPC58/4/34)

Comment by China_MEPC58/4/33

MEPC58/4/33

MEPC58/4/33 Comments on the proposed attained new ship design CO2 index contained in annex 5 to document MEPC 58/4

$$\text{Attained new ship design } CO_2 \text{ index} = \frac{\left(\prod_{j=1}^{M} f_j\right)\left(\sum_{i=1}^{NME} C_{FMEi}\, SFC_{MEi}\, P_{MEi}\right) + \left(\prod_{k=1}^{L} f_k\right)\left(\sum_{i=1}^{NAE} C_{FAEi}\, SFC_{AEi}\, P_{AEi}\right)}{Capacity \times \quad V_{ref} \times f_W}$$

Comments on:

- **Power**
- **Speed**
- **Capacity**
- **f_w coefficient**

Comment by China_MEPC58/4/33

MEPC58/4/33----on Power of M/E and Aux engine

- .1 In the formula, MCR -- designed power of main engine.
  In design practices, relevant value (75% MCR, 91% RPM) of test cycle type E3 for engine Nox emission in Annex VI of MARPOL,
  or the power (0.75 MCR-0.8 MCR) in correspondence to the service speed

- .2 Power redundancy required by some owner:
  (e.g, “the Gulf condition” _P_{ME} +3% P_{AE} + 5%)

- .3 Other specific design elements :
  bow thrusters and ballast water treatment plant, etc.

Comment by China_MEPC58/4/33

MEPC58/4/33

---- on Speed

- In the formula -- design speed corresponding to power output at 100% MCR of the main engine

- But the guarantee speed in building contract --the service speed corresponding to power output at 75%-80% MCR of the main engine.

---- on Capacity

- As for container ships, the *number of TEUs x average weight* should be used as *Capacity*, so as to avoid the inclusion of the weight of the ballast water which is the un-payload of the ship.

Comment by China_MEPC58/4/33

MEPC58/4/33---- on f_w

- Many factors causing the decrease of ship's speed--wave height, wave frequency and wind speed, etc.
- Different ship types (main dimension, block coefficient, etc.) and different loading conditions (full loading, half loading and ballast condition) may result in different speed reduction under the same sea conditions.
- Limited data available on the speed reduction of existing ships Difficult to find sample material relating to *f*w.

Comment by China_MEPC58/4/33

MEPC58/4/33---- on f_w

Suggestion:

- At this stage, fw = 1;
- Further studies to provide a basis for future determination of the fw value
  - ✓ the selection of different sea conditions (wave height, wave frequency and wave spectrum) ;
  - ✓ loading conditions (full loading, half loading and ballast condition), their contributions to the reduction of ship's speed.

Comment by China_MEPC58/4/34

MEPC58/4/34 Comments on the proposed baseline formula

On the basis of the proposals submitted by Denmark and Japan (documents GHG-WG 1/2/1 and GHG-WG 1/2/2)

The equation “baseline value = $a \times b^{-c}$” was determined based on regression analysis of ships delivered in the period from 1995 to 2004 using the Fairplay database, utilizing a simplified calculation formula of new ship design CO2 index.

Review other proposals

MEPC58/4/34 Comments on the proposed baseline formula

$$\text{“baseline value} = a \times b^{-c}\text{”}$$

Determination of values “a” and “c”

- To be further verified and analysed using a sufficient number of new ship samples, taking into account, in particular, the impacts on CO2 index of the latest measures adopted by IMO to improve ship safety.
- As for container ships, no matter which unit was used (TEU or DWT) in the calculations, the discrepancies were too significant to form regression curves. This indicates that the proposed baseline formula can not be verified for container ships.

Comment by China_MEPC58/4/34

MEPC58/4/34 Comments on the proposed baseline formula

Impacts of CSR ship (Common Structural Rules) on CO2 index

The results show that, in Group 1, the CO2 index is less for the CSR ship of greater DWT, while in Groups 2 and 3, the CO2 index is greater for the CSR ship of less DWT.

Table 1

No.	DWT(Ton)		design CO_2 index (g/tkm)		
	CSR	Non-CSR	CSR	Non-CSR	Difference
1	23,000	22,019	6.29	7.19	**14.31%**
2	38,000	38,033	5.03	3.86	**23.26%**
3	57,500	57,596	4.54	4.16	**8.37%**
4	180,000	174,766	2.58	2.36	**8.52%**

Comment by China_MEPC58/4/34

MEPC58/4/34 Comments on the proposed baseline formula

- DSS bulk carriers Vs. SSS bulk carriers of the same main scantlings and DWT:
  CO_2 index of the former is, on average, approximately 2% greater than the latter.

  – Indicates that further improvement and verification should be made to the proposed baseline formula with regard to ship categorization. For example, consideration should be given to the impact by the increase of the weight of hull steel for the CSR ships.

Comment by China_MEPC58/4/34

MEPC58/4/34 Comments on the proposed baseline formula

- New IMO safety measures, may likely cause an increase in design CO2 index:
  - ✓CSR ships
  - ✓Double/single-side skin bulk carriers
  - ✓GBS ships (Goal-based Standards)
  - ✓Protected fuel tanks
  - ✓PMA (Permanent Means of Access)
  - ✓ Ballast Water Management Convention
  - ✓ The revised MARPOL Annex VI on NOx and SOx

Comment by China_MEPC58/4/34

MEPC58/4/34 Comments on the proposed baseline formula

Proposal:

.1 To be developed on the basis of analyzing different ship types and, using a sufficient number of new ship samples.

.2 A group of experts to conduct analysis using a consistent methodology (mathematical model) and database comprising data of new ships from 2005 to 2007.

Samples selected from the database should be representative of ships engaged in international voyages worldwide.

.3 Premature to establish the baseline formula at present, no mandatory at this stage, but interim guidelines on a voluntary basis.

Comment in MEPC58

Comments in MEPC58

- Meeting discussion
- Comments by China

MEPC58 Meeting discussion

- Detail review the formula
- Finalize the interim guideline, with a view to further refinement and improvement
- Identify the remaining tasks

Draft Guidelines on the method of calculation of the the attained new ship Energy Efficiency Design Index **(EEDI)**

(Ref to Annex 1 of MEPC58/WP.8)

$$\frac{\left(\prod_{j=1}^{M} f_j\right)\left(\sum_{i=1}^{nME} C_{FMEi}\ SFC_{MEi}\ P_{MEi}\right) + P_{AE} C_{FAE} SFC^{*}_{AE} + \left(\sum_{i=1}^{nPTI} P_{PTIi} - \sum_{i=1}^{nWHR} P_{WHRi}\right) C_{FAE} SFC_{AE} - \left(\sum_{i=1}^{neff} f_{eff} P_{eff} C_{Feff} SFC_{MEi}\right)}{fiCapacity \quad V_{ref} \quad f_W}$$

Comment in MEPC58

Comments on

- Principle
- Ship type concern
- f_w
- Same comments as of other countries

Comment in MEPC58

Principle

- Common but differentiated responsibilities

  Reiterate and emphasize the principles of “common but differentiated responsibilities” and “respective capabilities”

  China supported action by IMO on control of GHG from international shipping but only in line with the principles of the UNFCCC.

- Positive acceptance instead of tacit acceptance

  The tacit acceptance procedure may not be appropriate

Fully supported by India, Brazil and South Africa, Saudi Arabia, etc.

Comment in MEPC58

Ship type concern

Regarding diversities and complexities of ship types different index calculation methodology for different types of ships should be taken into consideration

- Container ship
- oil tanker, bulk carrier, ore carrier
- Multi-purpose vessel
- etc.

Comment in MEPC58

Ship type concern

a)Container ship: Ballast water as less as possible to increase the load of TEU. The design improvement of extreme V type may sacrifice a bit of the speed. In the formula, deadweight is only the parameter for the capacity, so the calculated CO2 index will be increased.

b) For oil tanker, bulk carrier, ore carrier, full loading , unloading, ballast sailing, loading condition to be taken into consideration. The formula is lack of reflection of the difference between ballast, loading/unloading efficiency and short/long voyage.

c) For multi-purpose vessel, the sailing condition is more complex.

Comment in MEPC58

f_w _the actual sea condition

The new technology, like optimal hull form of special bow shape/propeller/rudder and super structure of streamed line shape and corner cut, will contribute to design a ship with better actual sea performance. But while evaluate the benefit of such technology, we have to consider:

- The time percentage of the vessel sailing in such bad sea in her voyage;
- The actual gain from saving by higher speed and less FOC: Direction could be changed while encounter the big wind, so it will sail more distance and take more time as a result. The gain will be not as predicted.

Comment by China

Further comments

Energy saving concept

e.g. Oil price and new technology play a role in the change of concept. In the time with high oil price, some owner prefers to equip the more powered main engine while keep the operational power. like SMCR (or CMCR)=80%MCR, to decrease the SFC or increase the propulsion efficiency of the the propeller. But while taking this formula for evaluation of CO2 index, the result is going opposite.

Comment in MEPC58

Same comments as of other countries

- 1. Proposal by Marshall Island (MEPC58/4/11)
  on difference between long and short voyage
- 2. Proposal by CESA (MEPC58/4/12)
  on the entire operational profile of the intended use
- 3. Proposal by CESA (MEPC58/4/12)
  on safety aspect
- 4. Proposal by CESA (MEPC58/4/12)
  on Influence factors
- 5. Proposal by INTERTANKO (MEPC58/4/14)
  on Hotel requirement

Comment in MEPC58

Same comments as of other countries

on difference between long and short voyage

voyage length is also a critical factor where long trans-ocean voyages with the ship operating at design speed experiencing a lower index as compared to ships on short voyages where a greater proportion of time is spent at a less efficient lower transit or maneuvering speed

on the entire operational profile of the intended use

Taking into account the entire operational profile of the intended use. Additionally: Multi-purpose vessel, normally with one way full load and one way ballast, or one full load one partial load, or multi-port unload, need special consideration .

Comment in MEPC58

Same comments as of other countries

on safety aspect

An unbalanced strategy of pure reduction of the installed propulsion and auxiliary power could induce negative side effects such as manoeuvrability and stopping ability and the ability of a ship to safely navigate in ice-covered waters. A proposed CO2 reduction schedule might lead to requirements that are incompatible with minimum power and redundancy demands *by existing mandatory IMO safety regulations or by an enhanced safety policy of the owners*.

on Influence factors

the actual method of establishing the value of this factor still has to be investigated and agreed upon. The factors fj and fk should be reassessed for the long-term development

Comment in MEPC58

Same comments as of other countries

on Hotel requirement

modification to the definition of P for Hotel requirement.

PAE is the required auxiliary Power to supply normal maximum sea load including necessary Power for machinery, systems, equipment and hotel requirements where the ship is engaged on a voyage at the designed speed (Vref) under the design loaded condition of Capacity. The auxiliary engine Specific Fuel Consumption (SFC) is that recorded on the EIAPP certificate at the engine's 50% MCR Power or torque rating. Required fuel consumption for boiler(s)……

Closing remarks

1. Taking all the factors as mentioned above into consideration, China believes that the design CO2 index formula is needed to be further clarified and developed, and it is far premature to make it mandatory.

2. At this stage there are still deficiencies in the EEDI formula itself, The feasibility of applying one single formula to all types of ships.

3. Some relevant parameters in the formula need to be clarified and verified further .The scientific basis of Capacity and the factor of defining “Deadweight” used as Capacity on which we still have a strong reservation.

4. Further transparent verification was necessary so as to ensure that such formula is rational and consistent with the ship design practice.

Closing remarks

5. Environmental friendliness design concepts should be used in the development of new vessel.

6. So, Complying with latest requirements of effluent standard of NOx,SOx ,etc.,we should do more study and take the measure in hull line design, the integrated optimization design of aft hull form, propeller and rudder, main engine power selection, and reducing the lightship weight to control emission.

7. We also strongly suggest that power supplier should do more study to reduce oil consumption and emission.

Thank You for your attention !