

MARINE ENVIRONMENT PROTECTION  
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Agenda item 18

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**REPORT OF THE MARINE ENVIRONMENT PROTECTION COMMITTEE  
ON ITS SEVENTIETH SESSION**

**Corrigendum**

**Annex 7 Draft amendments to MARPOL Annex VI**

1 Amendment no.5 is renumbered as no.4 and the subsequent amendments are renumbered accordingly.

**Annex 9 Resolution MEPC.281(70) - Amendments to the 2014 Guidelines on the method of calculation of the attained Energy Efficiency Design Index (EEDI) for new ships (resolution MEPC.245(66), as amended by resolution MEPC.263(68))**

2 Paragraph 2 in the annex to the resolution is replaced by the following:

"Paragraph .1 is replaced with the following:

.1  $C_F$  is a non-dimensional conversion factor between fuel consumption measured in g and CO<sub>2</sub> emission also measured in g based on carbon content. The subscripts  $ME(i)$  and  $AE(i)$  refer to the main and auxiliary engine(s) respectively.  $C_F$  corresponds to the fuel used when determining *SFC* listed in the applicable test report included in a Technical File as defined in paragraph 1.3.15 of NO<sub>x</sub> Technical Code ("test report included in a NO<sub>x</sub> technical file" hereafter). The value of  $C_F$  is as follows:

Type of fuel	Reference	Lower calorific value (kJ/kg)	Carbon content	$C_F$ (t-CO <sub>2</sub> /t-Fuel)
1 Diesel/Gas Oil	ISO 8217 Grades DMX through DMB	42,700	0.8744	3.206
2 Light Fuel Oil (LFO)	ISO 8217 Grades RMA through RMD	41,200	0.8594	3.151
3 Heavy Fuel Oil (HFO)	ISO 8217 Grades RME through RMK	40,200	0.8493	3.114
4 Liquefied Petroleum Gas (LPG)	Propane	46,300	0.8182	3.000
	Butane	45,700	0.8264	3.030

5	Liquefied Natural Gas (LNG)		48,000	0.7500	2.750
6	Methanol		19,900	0.3750	1.375
7	Ethanol		26,800	0.5217	1.913

In case of a ship equipped with a dual-fuel main or auxiliary engine, the  $C_F$ -factor for gas fuel and the  $C_F$ -factor for fuel oil should apply and be multiplied with the specific fuel oil consumption of each fuel at the relevant EEDI load point. Meanwhile, gas fuel should be identified whether it is regarded as the "primary fuel" in accordance with the formula below:

$$f_{DFgas} = \frac{\sum_{i=1}^{n_{total}} P_{total(i)}}{\sum_{i=1}^{n_{gasfuel}} P_{gasfuel(i)}} \times \frac{V_{gas} \times \rho_{gas} \times LCV_{gas} \times K_{gas}}{\left( \sum_{i=1}^{n_{Liquid}} V_{liquid(i)} \times \rho_{liquid(i)} \times LCV_{liquid(i)} \times K_{liquid(i)} \right) + V_{gas} \times \rho_{gas} \times LCV_{gas} \times K_{gas}}$$

$$f_{DFliquid} = 1 - f_{DFgas}$$

where,

$f_{DFgas}$  is the fuel availability ratio of gas fuel corrected for the power ratio of gas engines to total engines,  $f_{DFgas}$  should not be greater than 1;

$V_{gas}$  is the total net gas fuel capacity on board in  $m^3$ . If other arrangements, like exchangeable (specialized) LNG tank-containers and/or arrangements allowing frequent gas refuelling are used, the capacity of the whole LNG fuelling system should be used for  $V_{gas}$ . The boil-off rate (BOR) of gas cargo tanks can be calculated and included to  $V_{gas}$  if it is connected to the fuel gas supply system (FGSS);

$V_{liquid}$  is the total net liquid fuel capacity on board in  $m^3$  of liquid fuel tanks permanently connected to the ship's fuel system. If one fuel tank is disconnected by permanent sealing valves,  $V_{liquid}$  of the fuel tank can be ignored;

$\rho_{gas}$  is the density of gas fuel in  $kg/m^3$ ;

$\rho_{liquid}$  is the density of each liquid fuel in  $kg/m^3$ ;

$LCV_{gas}$  is the low calorific value of gas fuel in  $kJ/kg$ ;

$LCV_{liquid}$  is the low calorific value of liquid fuel in  $kJ/kg$ ;

$K_{gas}$  is the filling rate for gas fuel tanks;

$K_{liquid}$  is the filling rate for liquid fuel tanks;

$P_{total}$  is the total installed engine power,  $P_{ME}$  and  $P_{AE}$  in  $kW$ ;

$P_{gasfuel}$  is the dual fuel engine installed power,  $P_{ME}$  and  $P_{AE}$  in  $kW$ ;

- .1 If the total gas fuel capacity is at least 50% of the fuel capacity dedicated to the dual fuel engines, namely  $f_{DFgas} \geq 0.5$ , then gas fuel is regarded as the "Primary fuel," and  $f_{DFgas} = 1$  and  $f_{DFliquid} = 0$  for each dual fuel engine.
- .2 If  $f_{DFgas} < 0.5$ , gas fuel is not regarded as the "primary fuel." The  $C_F$  and SFC in the EEDI calculation for each dual fuel engine (both main and auxiliary engines) should be calculated as the weighted average of  $C_F$  and SFC for liquid and gas mode, according to  $f_{DFgas}$  and  $f_{DFliquid}$ , such as the original item of  $P_{ME(i)} \cdot C_{FME(i)} \cdot SFC_{ME(i)}$  in the EEDI calculation is to be replaced by the formula below.

$$P_{ME(i)} \cdot (f_{DFgas(i)} \cdot (C_{FME\ pilot\ fuel(i)} \cdot SFC_{ME\ pilot\ fuel(i)} + C_{FME\ gas(i)} \cdot SFC_{ME\ gas(i)}) + f_{DFliquid(i)} \cdot C_{FME\ liquid(i)} \cdot SFC_{ME\ liquid(i)}) "$$

**Annex 10 Resolution MEPC.282(70) – 2016 Guidelines for the development of a Ship Energy Efficiency Management Plan (SEEMP)**

- 3 Appendix 3 in the annex to the resolution is replaced by the following:



"APPENDIX 3

**STANDARDIZED DATA REPORTING FORMAT FOR THE DATA COLLECTION SYSTEM**

Method used to measure fuel oil consumption <sup>9</sup>	Fuel oil consumption (t)	Other(.....) (C <sub>1</sub> ;.....)	Ethanol (C <sub>1</sub> : 1.913)	Methanol (C <sub>1</sub> : 1.375)	LNG (C <sub>1</sub> : 2.750)	LPG (Butane) (C <sub>1</sub> : 3.030)	LPG (Propane) (C <sub>1</sub> : 3.000)	HFO (C <sub>1</sub> : 3.114)	LFO (C <sub>1</sub> : 3.151)	Diesel/Gas Oil (C <sub>1</sub> : 3.206)	Hours underway (h)	Distance Travelled (nm)	Power output <sup>8</sup> (rated power) (kW)	Ice class <sup>7</sup> (if applicable)		EEDI (if applicable) <sup>6</sup> (gCO <sub>2</sub> /t.nm)	DWT <sup>5</sup>	NT <sup>4</sup>	Gross Tonnage <sup>3</sup>	Ship type <sup>2</sup>	IMO number <sup>1</sup>	End date (dd/mm/yyyy)	Start date (dd/mm/yyyy)
														Main Propulsion Power	Auxiliary Engine(s)								

- 1 In accordance with the *IMO Ship Identification Number Scheme*, adopted by the Organization by resolution A.1078(28).
- 2 As defined in regulation 2 of MARPOL Annex VI or other (to be stated).
- 3 Gross tonnage should be calculated in accordance with the International Convention on Tonnage Measurement of Ships, 1969.
- 4 NT should be calculated in accordance with the International Convention on Tonnage Measurement of Ships, 1969. If not applicable, note "N/A".
- 5 DWT means the difference in tonnes between the displacement of a ship in water of relative density of 1025 kg/m<sup>3</sup> at the summer load draught and the lightweight of the ship. The summer load draught should be taken as the maximum summer draught as certified in the stability booklet approved by the Administration or an organization recognized by it.
- 6 EEDI should be calculated in accordance with the *2014 Guidelines on the method of calculation of the attained Energy Efficiency Design Index (EEDI) for new ships*, as amended, adopted by resolution MEPC.245(66). If not applicable, note "N/A".
- 7 Ice class should be consistent with the definition set out in the International Code for ships operating in polar waters (Polar Code), adopted by resolutions MEPC.264(68) and MSC.385(94)). If not applicable, note "N/A".
- 8 Power output (rated power) of main and auxiliary reciprocating internal combustion engines over 130 kW (to be stated in kW). Rated power means the maximum continuous rated power as specified on the nameplate of the engine.
- 9 Method used to measure fuel oil consumption: 1: method using BDNs, 2: method using flow meters, 3: method using bunker fuel oil tank monitoring."