

Implementation of Shipping MRV Regulation

European Sustainable Shipping Forum
Subgroup on Shipping MRV Monitoring

Identification and assessment of possible
amendments to Annex I and II

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I Monitoring Methods

Contents Part I: Monitoring Methods

1. Pressure measurement (Methods A/B/C/D)
2. Emission factors (Methods A/B/C/D)
3. Direct emission measurement (Method D)
4. Mass flow (Method D)

1. Pressure measurement (Methods A/B/C) (1/2)

1.1 International and European rules and standards

Pressure is relevant for all methods A/B/C using LNG or other (liquefied) gaseous fuels and for method D for the CO₂ direct emission monitoring.

ISO 10976:2012: Refrigerated light hydrocarbon fluids - Measurement of cargoes on board LNG carriers.

LNG: ISO 15970:2008 Natural gas -- Measurement of properties -- Volumetric properties: density, pressure, temperature and compression factor

This chapter is still under development, at best with the input of members like SIGTTO and others.

1. Pressure Measurement (Methods A/B/C) (2/2)

Questions for discussion

- 
- 1.1 Technological and scientific developments**
 - 1.2 Impact on the regulation**

1.3 Questions for discussion

- Which international or European standards, as well as scientific and technological developments apply?**
- Does this trigger any amendments to Annex I?**

2. Emission factors (Methods A/B/C/D) (1/3)

2.1 International and European rules and standards

Default values

2006 IPCC Guidelines for National Greenhouse Gas Inventories: Default, upper and lower (uncertainty) emission factors in kg CO₂/TJ.

Commission Regulation (EU) No^o601/2012 Annex VI refers to IPCC 2006. This also includes biofuels.

IMO MEPC.1/Circ. 681: Interim Guidelines on the Method of Calculation of the EEDI for New Ships. Carbon content of fuels and CO₂ emission per ton fuel in t CO₂/t-fuel.

EN 16258:2012: Methodology for calculation and declaration of energy consumption and GHG emissions of transport services.

American Petroleum Institute (API) 2009 Table 4-3 page 150

Comment:

Data from IPCC 2006 contain fuel emission factors in tons CO₂ per Tera Joule [t CO₂/TJ] and net calorific values per mass of fuel [TJ/Gg]. 1 Gg = 1000 t

Emission factors are not given for biofuels.

2. Emission factors (Methods A/B/C/D) (2/3)

2.2 Technological and scientific developments

IPCC Emission Factor Database currently contains default emission factors of the 2006 IPCC Guidelines.

New data are expected to be provided by the global scientific and inventory society and lead to permanent updates.

2.3 Impact on the regulation

None as Annex 1, chapter A, paragraph 6 of the adopted MRV already refers to the IPCC Guidelines.

Alternatively, the use of established IMO emission factors for heavy fuel oil, light fuel oil and marine diesel and gas oil should be allowed.

The advantage would be that no conversion from net calorific values (TJ) per mass of fuel (Gg) to tons CO₂ per net calorific value (TJ) would have to take place.

In case the use of IMO emission factors shall be allowed, the following text could be added: “Alternatively, IMO emission factors (MEPC.1/Circ.681, 2009) can be applied”

2. Emission factors (Methods A/B/C/D) (3/3)

Questions for discussion



- 1) The majority of the members supported the use of the existing IMO emission factors which are expressed per tonne of fuel instead of the IPCC ones that are per unit of energy. The IMO emission factors also include LNG and LPG. Do you agree with the exclusive use of IMO emission factors or should the use of several emission factors (IPCC/ Commission Regulation (EU) No°601/2012, IMO) be allowed?***

3. Direct emission measurements/CO₂ analyzers (Method D) (1/3)

3.1 International and European rules and standards

MARPOL Annex VI Resolution 2 Appendix 3: Specification for analysers to be used in the determination of gaseous components of diesel engine emissions.

CO₂ analysis shall be carried out with Non-Dispersive InfaRed (NDIR) absorption type.

Other analyzers may, subject to approval by the Administration, be accepted if they yield equivalent results to that of NDIR absorption.

Calibration methods: MARPOL Annex VI Resolution 2 Appendix 4: Calibration and permissible deviation (uncertainty) of the analytical instruments.

Draft amendments for the 2009 Guidelines for Exhaust Gas Cleaning Systems:

3.2 Technological and scientific developments

Amendments for the 2009 Guidelines for Exhaust Gas Cleaning Systems:

RESOLUTION MEPC.259(68) contained in MEPC 68/21/Add.1, Annex 1: Allowance of CO₂ Analyzers measuring on a wet basis.

3. Direct emission measurements/CO₂ analyzers (Method D) (2/3)

3.3. Impact on the regulation

A specification of CO₂ analyzers (Non-Dispersive InfaRed (NDIR) absorption type (**measurement on a dry or wet basis**) or equivalent CO₂ analyzers in terms of accuracy could be added to Annex I.

Note: CO₂ is measured as gas volume concentration in the exhaust gas volume: ppm (V/V). Conversion to mass is required.

3. Direct emission measurements/CO₂ analyzers (Method D) (3/3)

Questions for discussion/Conclusions/Best Practice



1) Do you consider the above suggestion on a specification of CO₂ analyzers relevant and desirable?

2) Does any other international or European standards, as well as scientific and technological developments trigger any amendments to Annex I?

3.4 Conclusions

To be discussed

3.5 Best Practices and Guidelines

What to do in case of failure of direct CO₂ monitoring emissions equipment?

4. Mass Flow calculation (Method D) (1/3)

4.1 International and European rules and standards

Mass flow is calculated in kg/h, CO₂ analyzers measure Volume CO₂ in a Volume of gas. This requires conversion to mass.

MARPOL Annex VI, NO_x Technical Code, Chapter 5

- **5.5.1: Direct measurement method.** Direct measurement of exhaust gas flow by flow nozzles or equivalent metering systems.
- **5.5.2: Air and fuel measurement method**
- **5.5.3: Calculation** of the exhaust gas mass flow (carbon-balance method)

The latter two methods include fuel consumption data.

In case the exhaust flow is measured directly by e.g. nozzles in the exhaust gas system (5.5.1), the NO_x Technical Code requires the instrument to be approved according to a recognized international standard.

In a Note it says that "Precautions shall be taken to avoid measurement errors which will result in emission value errors."

Directive 2004/22/EC (Annex MI-010) on measuring instruments: Defines the requirements that the devices have to satisfy.

4. Mass Flow calculation (Method D) (2/3)

4.1 Technological and scientific developments

Normally the air/fuel ratio serves as basis for the mass flow calculation.

4.2 Impact on the regulation

As two of the three mass flow measurement or calculation methods require fuel consumption data, there will be a link to the other methods on measurement of fuel consumption.

This way method D will fall back in most cases to methods A/B/C. This could be mentioned in Annex I.

4. Mass Flow calculation (Method D) (3/3)

Questions for discussion



- 1) Do you consider the above suggestion on a reference to methods A/B/C relevant and desirable?***
- 2) Are there any other relevant international and European rules and standards or technological and scientific developments to be considered?***
- 3) Should the above mentioned international and European rules and standards or technological and scientific developments trigger any amendments to Annex I?***
- 4) If amendments are considered necessary or desirable, what would be their nature and scope?***

4.3 Conclusions

To be discussed

II Key elements with regard to monitoring other relevant information

Contents Part II: Key elements with regard to monitoring other relevant information

1. Distance sailed and Total time spent at sea
2. Amount of cargo
 - a) Passenger ships
 - b) Ro-ro ships
 - c) container ships

1. Distance Sailed and Total time spent at sea

1.0 Aim

Clarify definition of ‘voyage’ to be used for monitoring distance sailed and total time spent at sea, while keeping the additional administrative burden to a minimum.

1.1 International and European rules and standards

IMO Assembly Resolution A.916(22) / Annex 22 of Solas chapter V:

records must be kept so that ‘a complete record of the voyage’ can be restored.

EEOI guidelines:

define ‘distance sailed’ as ‘the actual distance sailed in nautical miles (deck log-book data) for the voyage or period in question.’

COLREG ‘underway’: not at anchor, or made fast to the shore, or aground

VTMIS directive (2002/59/EC): time of arrival in port or at pilot station

Logbook entries ‘Full Away on Passage (FAOP)’ and the time and location of the ‘End of Passage (EOP)’

1. Distance Sailed and Total time spent at sea

1.3 Impact on the regulation

Distance could be calculated from berth in one port to berth in another for the following reasons:

The Regulation requires ships to monitor and report emissions during voyages and also separately when at berth. A pilot station does not fit the definition of ‘voyage’ in Article 3 of the regulation because no cargo is loaded or unloaded.

The time and distance parameters shall relate to voyages as different from activities ‘at berth’ when the ship ‘securely moored or anchored in a port falling under the jurisdiction of a Member State while it is loading, unloading or hotelling, including the time spent when not engaged in cargo operations ‘, defined by Art 3. (n)

1. Distance Sailed and Total time spent at sea

1.3 Impact on the regulation

It is logical that the definitions for the beginning and end of a voyage determine the way both ‘distance travelled’ and ‘time spent at sea’ are to be calculated. In this perspective, when a ship drop anchor at the pilot station, the time at anchor is not part of the voyage.

The EEOI definition is not suitable, as it includes anchoring at a pilot station.

The COLREG definition of ‘underway’ is impracticable because a new voyage starts after every stop.

The 'berth-to-berth' concept could be specified in Annex II, section A, point 1. (a).

1. Distance Sailed and Total time spent at sea

Questions for discussion



Are robust data for the 'berth-to-berth' concept available?

Do you agree with the above suggestion?

3. Amount of cargo

Passenger ships

3.1 International and European rules and standards

SOLAS defines a passenger ship as ‘a ship which carries more than twelve passengers’.

Statcode 5 v1082 contains different definitions for ‘passenger (cruise) ships’, ‘passenger/ro-ro cargo ships’, as well as a number of other ships with the ability to take passengers on board (e.g. general cargo/passenger ships).

3.2 Technological and scientific developments

Not applicable

3.3 Impact on the regulation

Triggered by the SOLAS definition, ‘passenger ships’ could be defined as ‘ships that carry more than twelve passengers but not cargo’.

3. Amount of cargo

Passenger ships - Questions for discussion



1) Do you agree with the definition of passenger ships?

3. Amount of cargo

Ro-ro ships

4.1 International and European rules and standards

Guidelines regarding the verified gross mass of a container carrying cargo, (MSC.1/Circ.1475) applies to ro-ro ships if the ship has been determined by the Administration to be subject to SOLAS chapter VI .

The shipper shall inform the master of a ship about the verified gross mass of a packed container in writing and prior to loading a container.

The EEOI guidelines prescribe the use of mass of the cargo for ro-ro ships.

4.2 Technological and scientific developments

Not applicable

4.3 Impact on the regulation

Mass of cargo could be added as an option.

3. Amount of cargo

Ro-ro ships - Questions for discussion



- 1) *Should the rules for determining cargo for ro-ro vessels be amended in the light of the Guidelines regarding the verified gross mass of a container carrying cargo?***
- 2) *If yes, how?***

3. Amount of cargo

Container ships

5.1 International and European rules and standards

Guidelines regarding the verified gross mass of a container carrying cargo, (MSC.1/Circ.1475) applies to ro-ro ships if the ship has been determined by the Administration to be subject to SOLAS chapter VI .

The shipper shall inform the master of a ship about the verified gross mass of a packed container in writing and prior to loading a container.

5.2 Technological and scientific developments

Not applicable

5.3 Impact on the regulation

A specific reference should be made to MSC.1/Circ.1475.

3. Amount of cargo

Container ships - Questions for discussion



- 1) Should the rules for determining cargo for container ships be amended in the light of the Guidelines regarding the verified gross mass of a container carrying cargo?***
- 2) If yes, would you agree to add a reference to these Guidelines or would you suggest another option?***

Thank you for your input

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