The European Association of Internal
Combustion Engine Manufacturers

EUROMOT

# EUROMOT POSITION

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# EUROMOT Comments on the Commission Proposal for a regulation on the monitoring, reporting and verification of carbon dioxide emissions from maritime transport and amending Regulation (EU) No 525/2013 (2013/0224 (COD)) with a special view to the monitoring of carbon dioxide ($CO_2$) and nitrogen oxides ($NO_x$) Emissions

Referring to the Commission Proposal for a regulation on the monitoring, reporting and verification of carbon dioxide emissions from maritime transport and amending Regulation (EU) No 525/2013 (2013/0224 (COD)) and amendments drafted on 8th November 2013 by the European Parliament Committee on the Environment, Public Health and Food Safety to aforementioned proposals, EUROMOT would like to comment on both papers and in particular emphasizing on the proposed monitoring of carbon dioxide ($CO_2$) and nitrogen oxides ($NO_x$) emissions.

## 1. Intention and applicability of $CO_2$- and $NO_x$-monitoring

EUROMOT acknowledges the strive towards a $CO_2$-monitoring as reflected in document 2013/0224 (COD). By using already existing reporting tools on board ships, the *"Monitoring, Reporting and Verification"* (MRV)[1] can be implemented in a *"simple and lean"*[2] manner due to *"the proposed lean MRV approach based on existing documents and equipment on board of*

[1] Explanatory Memorandum to 2013/0224 (COD)
[2] Explanatory Memorandum to 2013/0224 (COD)

*ships…"*[3]. To us, this approach appears to be a meaningful and fast way to $CO_2$-emission monitoring which creates at the same time a minimum burden to ship operators.

The amendments proposed by the EP Committee on the Environment, Public Health and Food Safety are a substantial deviation from the initial intention of the MRV, as expressed by the Commission paper. On several occasions, reference is made to the regulations of IMO MARPOL Annex VI. The international IMO-regulations stipulate $NO_x$-emission limits in {g} emissions per {kWh} engine output. Instead, monitoring emission on an absolute mass basis in tons per year or tons per voyage is a very different requirement. Chapters 2 and 3 of this paper provide further background thereto.

We are concerned about the proposed deletion of transport work and the number of passengers in Article 9, Article 10 and in Annex II of the Commission proposal. Following this approach, remaining performance indicators are the $CO_2$-emissions and fuel consumption in relation to the time at sea, respectively at berth, and the distance travelled. In our understanding, the transport capacity of ships is, apart from the travelled distance, a major parameter. When applying instruments[4] for efficiency improvements, the comparability of $CO_2$-footprints of ships is essential.

We propose to consider the following correlations:

$$\frac{CO2 - emissions\ in\ tons\ \{t\}}{Distance\ in\ nautical\ miles\ \{nm\} * Cargo\ carried\ in\ tons\ \{t\}}$$[5]

$\equiv$

$$\frac{Fuel\ consumption\ in\ tons\ \{t\}}{Distance\ in\ nautical\ miles\ \{nm\} * Cargo\ carried\ in\ tons\ \{t\}}$$[6]

## 2. $CO_2$-monitoring as outlined in 2013/0224 (COD)

Modern lean burn diesel-, dual fuel- and gas-engines are state of the art technologies. Lean burn means that the combustion process takes place under "over-stoichiometric" conditions, i.e. under an excess of oxygen. This assures a nearly complete conversion of the hydrocarbons to water vapour ($H_2O$) and carbon dioxide ($CO_2$) resulting in very high engine efficiency. The carbon content of the fuel directly affects the formation of $CO_2$.

In contrast, ambient conditions as well as the combustion process do not alter the carbon content in the combustion products, i.e. engine out emissions. Due to this, the carbon content of the fuel in conjunction with the fuel oil consumption of an engine can be the baseline for

[3] Explanatory Memorandum to 2013/0224 (COD)
[4] *"…options for market-based measures…"* Explanatory Memorandum to 2013/0224 (COD)
[5] For passenger ships substitution by number of passengers, Annex II to 2013/0224 (COD)
[6] For passenger ships substitution by number of passengers, Annex II to 2013/0224 (COD)

reliable and robust calculations of $CO_2$-emissions. EUROMOT agrees with the proposed $CO_2$-monitoring methods as stipulated in document 2013/0224 (COD).

## 3. $NO_x$-monitoring as outlined in draft amendments of 8th November 2013

$NO_x$-emissions from engines are due to two different Nitrogen sources. Firstly, hydrocarbon fuels contain minor amounts of nitrogen ($N_2$) as "impurity" and secondly, the major source for $NO_x$, an approx. 78 v/v% $N_2$-content in the ambient air feeding the engine.

Most of the $N_2$ is not converted during the combustion process due to the inert character of the gas and the portion which is reacting with the oxygen to $NO_x$ is neither proportional to the $N_2$-content of the fuel nor directly linked to the fuel consumption. In fact tuning the engine to an optimum tradeoff of meeting IMO $NO_x$-emission limits and simultaneously low fuel consumption and therefore low $CO_2$-emissions has an impact on the $NO_x$-emissions over a given test cycle.[7] Ensuring absolute $NO_x$-emissions are determined would therefore require a continuous measuring method.

The IMO $NO_x$ Technical Code 2008 (NTC 2008) describes in more detail how measuring and monitoring of $NO_x$ on board ships could be implemented. The following Appendices of the NTC 2008 are relevant for on-board measurements:

- Appendix III
  "Specification for analysers to be used in the determination of gaseous components of marine diesel engine emissions"

- Appendix IV
  " Calibration of the analytical and measurement instruments"

- Appendix VI
  "Calculation of exhaust gas mass flow (carbon balance method)"

- Appendix VIII
  "Implementation of the direct measurement and monitoring method"

In principle, two parameters need to be determined in order to conduct a continuous $NO_x$-monitoring: The $NO_x$-mass flow rate in the plume {mg/m³} and the exhaust volume flow {m³/hour}.

[7] $NO_x$ Technical Code 2008 (NTC 2008) stipulates the measurement of $NO_x$ over a test cycle and weights the emissions at mode points differently

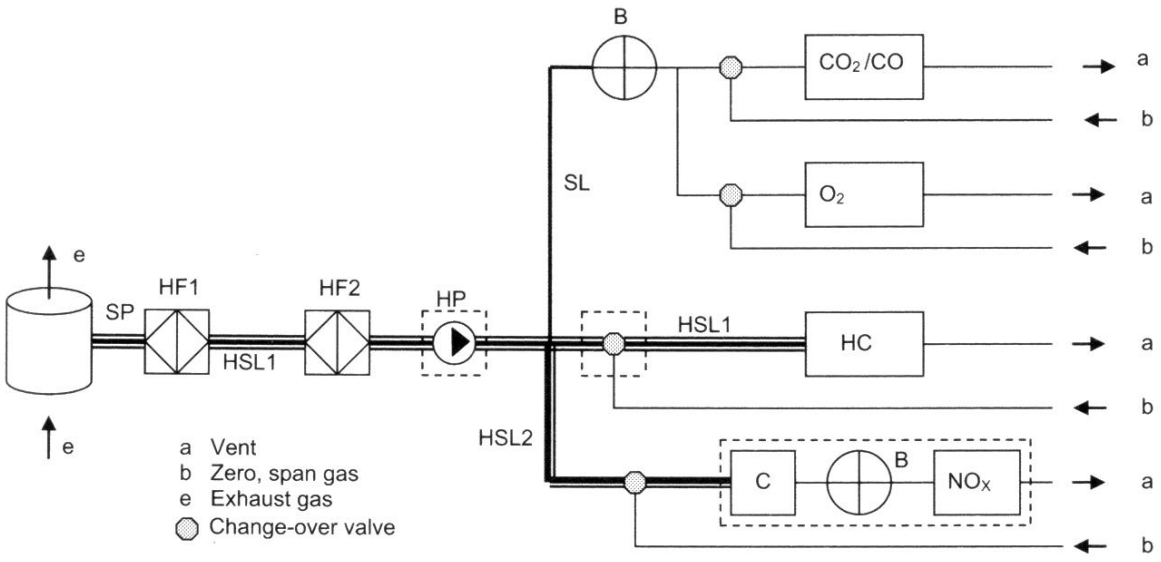
### 3.1 Concentration of $NO_x$ in the plume

The measurement equipment, measurement procedure and interpretation of results are described in detail in the appendices of NTC 2008 (see above). Calibration of the equipment in accordance with the requirements of NTC 2008 Appendix IV has to be conducted on a regular basis.

The measured $NO_x$-concentration {ppm} in the plume is converted via density to a correlation in {mg/m³}[8].

EUROMOT is of the view that any stipulated measurement equipment and procedures shall be aligned with IMO MARPOL Annex VI standards for assuring comparability of the results, a level playing field for all ships, ship operators and ship owners and to facilitate the implementation of worldwide applicable standards for the maritime sector.

**Figure 1** shows a schematic arrangement of an exhaust gas analysis system:[9]




### 3.2 Determination of exhaust gas volume flow

NTC 2008 describes in 5.5 three methods for ascertaining the exhaust gas flow. The simplest is called “carbon balance method” as described in NTC 2008 Appendix VI. The method requires measuring of the following raw exhaust emission species: carbon dioxide ($CO_2$ in %), carbon monoxide (CO in ppm) and hydrocarbons (HC in ppm). The absolute humidity of the intake air has to be determined as well.

[8] $NO_x$ Technical Code 2008 (NTC 2008) 5.12.5.
[9] $NO_x$ Technical Code 2008 (NTC 2008) Appendix III

Measuring the fuel oil consumption of the engine by use of a calibrated fuel oil counter is required. Commonly, the fuel oil flow is measured on a volume-basis. The fuel oil mass flow derives from inserting the actual fuel oil density that has to be evaluated for each fuel charge in a laboratory ashore. The laboratory analysis of the fuel sample shall provide further data of the mass percentage of following fuel components: hydrogen (H), carbon (C), nitrogen (N) and oxygen (O).The fuel oil temperature at the counter needs to be monitored continuously. Measuring the fuel oil mass flow directly is an available technique, however, at the time being, not wide-spread on board current ships.

The ascertained values have to be inserted to the equations of NTC 2008 Appendix VI. The result is given in {kg/h}. NTC 2008 provides in chapter 5.12.5. a nominal exhaust gas density of 1.2943 kg/m³ for converting mass flow into the required volume flow.

### 3.3 Evaluation of results

The provisions and technical rules of IMO MARPOL Annex VI and the NTC 2008 are designed for verifying $NO_x$-emission limits under stable steady state conditions. They are not intended to be applicable to continuous monitoring and under transient engine conditions. As mentioned above, engines do not show the same $NO_x$-emission characteristic over their entire operating range. Each single load change may alter the emissions with view to the $NO_x$-concentration in the exhaust and the exhaust gas volume flow at the same time. Calculating $NO_x$-emission over a voyage and a year, including all load changes hence requests to reduce the individual emission sampling time to very short slots. At heavy weather conditions, when the engine governor is actuating continuously, no stable measurement conditions can be assured, consequently the emission results will then not useable.

## 4. Conclusions

Document 2013/0224 (COD) discloses a practical way forward for implementing a MRV for $CO_2$-emissions from maritime transport under consideration of a lean and simple process as stipulated in the Explanatory Memorandum to the Commission proposal.

The amendments drafted by the Environmental Committee on November 8, 2013 introduce the measurement of $NO_x$-emissions, without considering that this would require continuous measurement. The procedures as usually utilized for $CO_2$-monitoring, comprising the measurement of fuel consumption and analyzing the fuel quality, cannot be applied. EUROMOT is very concerned that the amendment stipulates additional requirements without addressing at all their technical feasibility. The reference to IMO MARPOL Annex VI is not justified as these procedures are verifying compliance with applicable $NO_x$-limits under stable steady-state conditions. In-use monitoring is neither a required technique for complying with IMO $NO_x$-regulations nor in common use at present on board of most ships. The proposed amendments would call for installations of $NO_x$-measurement equipment, as schematically illustrated in Figure 1 (article 3.1), on all ships under the jurisdiction of the regulation.

With a view to a fast implementation of practicable provisions for a $CO_2$-monitoring, EUROMOT urges the Environmental Committee not to extend the scope of the Commission proposal by adapting amendments for $NO_x$-monitoring.

Any proposed measurement instruments, measurement procedures and tolerances for all emission measurement schemes shall strictly be aligned with internationally applicable regulations as set out in IMO MARPOL Annex VI and NTC 2008.

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EUROMOT is the European Association of Internal Combustion Engine Manufacturers. It is committed to promoting the central role of the IC engine in modern society, reflects the importance of advanced technologies to sustain economic growth without endangering the global environment and communicates the assets of IC engine power to regulators worldwide. For more than 20 years we have been supporting our members - the leading manufacturers of internal combustion engines in Europe, USA and Japan - by providing expertise and up-to-date information and by campaigning on their behalf for internationally aligned legislation. The EUROMOT member companies employ all over the world about 200,000 highly skilled and motivated men and women. The European market turnover for the business represented exceeds 25 bn euros. Our **EU Transparency Register** identification number is **6284937371-73.**

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