

US Environmental Protection Agency

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Control of Emissions from New Marine
Compression-Ignition Engines at or Above
30 Liters per Cylinder

The Euromot Comment

as of 24 September 2009

EUROMOT

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ENGINES IN SOCIETY

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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 ICE power to regulators worldwide. For almost 20 years it has supported its members, consisting of national associations and companies from all over Europe and abroad, by providing expertise and up-to-date information and by campaigning on their behalf for internationally aligned legislation.

For further information about the Association, please visit our website:
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Euromot appreciates the opportunity to submit comments to US EPA on the Proposed Rule for Control of Emissions from New Marine Compression-Ignition Engines at or Above 30 Liters per Cylinder.

Euromot is the European Association of Internal Combustion Engine Manufacturers representing manufacturers of internal combustion engines used in a broad range of nonroad and marine applications (construction, mining and material handling equipment, agricultural and forestry equipment, commercial marine and seagoing vessels, workboats and pleasure boats, rail traction, lawn/garden and recreational equipment, power generation). We are contributing with our expertise and opinion to international rulemaking processes and institutions such the European Commission, European Parliament and Member States of the European Union, UN-IMO, UN ECE and IFC/Worldbank. This is the basis for also submitting comments to US EPA.

The majority of the Euromot member companies are operating globally, many of them either of US origin or with major operations in the USA. Concerning Category 3 marine engine manufactures, the following European headquartered companies are Euromot members:

- Caterpillar MAK
- MAN Diesel SE
- Wärtsilä Corporation

Introductory Remarks

Euromot strives for a worldwide harmonisation of emission regulations for nonroad mobile sources including seagoing ships. As an accredited observer to UN-IMO we have substantially contributed to the development of the Revised MARPOL Annex VI and the Revised NO_x Technical Code 2008. With their adoption by IMO MEPC 58, amongst others, new Tier II and Tier III emission limits as well as provisions for lower Sulphur fuels will enter into force from 2011. Since then we have been urging flag states to fully implement and apply IMO regulations and not to seek for individual national provisions.

The Euromot Position¹

Generally, Euromot urges US EPA to fully take over the Revised MARPOL Annex VI and the NO_x Technical Code 2008 without any substantial modification to either the technical contents of the regulations or the administrative proceedings, such as certification requirements or testing procedures. In particular our comments on the EPA proposal are as follows:

¹ The footnotes refer to individual chapters of EPA's NPRM (Preamble Text as of June 26, 2009)

Use of Alternative Emission Control Devices (AECD) and “On-off-technologies”

EPA requires that engine-out emissions, i.e. from engines without aftertreatment devices mounted, need to be compliant with Tier II.²

The EPA proposal does restrict the operation of a vessel to an on/off switching of the aftertreatment system when entering or leaving an ECA. It does not take into account the option of permanently operating a vessel with the aftertreatment system switched on, i.e. in- and outside an ECA. To optimise fuel consumption and lower operation costs a permanent operation is a viable option currently under investigation by manufacturers. Thus, Euromot proposes to permit engine-out emissions higher than Tier II values, provided the engine is equipped onboard with an aftertreatment system and designed for permanent operation.

NOx Monitoring

EPA proposes to monitor on-off technologies by means of continuous NOx-measurements.³ In our view, the available onboard measurement technology has not yet proven to be a robust and durable solution. For monitoring the switch on-off system a continuous NOx- measurement is not required and, if requested at all, should only be one out of a few options. Alternatively to continuous NOx monitoring, more efficient, robust and simpler to operate technical solutions would readily be available such as monitoring of reducing agent consumption for SCR or temperature and pressure differences up- and downstream of the SCR catalyst. We would also like to refer to the IMO regulations offering for demonstrating NOx compliance options to choose from.⁴

Additionally to the technical aspects, a continuous NOx-measurement would in our view create a substantial financial burden for manufacturers and operators not justified by the additional information that could be gained.

PM Measurements During Certification Testing

Though not proposing PM limits, EPA requests engine manufacturers to collect PM emissions during every certification test run.⁵

Euromot rejects this proposal as due to the lack of appropriate testing methods and procedures for Cat.3 engines, the accuracy and reproducibility of the test results would be highly questionable. We do not believe that the provisions as given by 40 CFR 1065 address the specific issues in testing large volume 2- and 4-stroke engines or could readily be applied to them.

In particular we are concerned about:

- the engine size and consequently the positioning of the measurement equipment, particularly the dilution tunnel
- the dilution ratio and its fuel sulphur dependent influence on the PM result
- the lack of procedures for engines with more than one turbocharger. For certification of large engines today, up to 4 individual measurement points are used, as the outlets from each of the turbochargers exits the test bed individually

² Chapter VI. A. (1) (c) and VI.A.(3)

³ Chapter VI. A. (4) and (5)

⁴ Revised NOx Technical Code 2008, Chapter 2.1.2

⁵ Chapter VI. A. (1) (e)

HC and CO Emission Limits

EPA proposes HC and CO emission limits of 2.0 and 5.0 g/kWh, respectively.⁶

Euromot is concerned about misalignments with IMO regulations concerning (a) the introduction of CO and HC limits at all and (b) the scope of the NPRM which substantially goes beyond IMO by including "CI engines regardless of the fuel type".⁷ Consequently, where IMO addresses CI engines operating on liquid or dual fuel only,⁸ the NPRM also targets gas fuelled engines.

Moreover, we consider the proposed HC limit values as not achievable for gas fuelled engines as the NPRM definition of hydrocarbons also includes less ozone-forming methane and ethane. If any proposal for HC were to be considered, it should be in line with the approach taken earlier by EPA⁹ as well as in its recently promulgated NSPS standards for stationary SI engines,¹⁰ where the assessment of hydrocarbons were based upon the a definition of VOC.

Fuel Standards: 1000 ppm Sulphur Limit

EPA proposes a 1000 ppm fuel Sulphur limit for Cat.3 engine powered vessels inside an US ECA including fuel sales and production. Furthermore it is proposed that only 15 ppm S fuel will be sold for Cat.1 and Cat.2 engines,¹¹ however, a permanent exemption will be granted to vessels primarily operating outside US waters where only compliance with Tier 3 US EPA marine regulations would need to be demonstrated.¹²

Since EPA is allowing scrubbers as an alternative to low sulphur fuel in ECA, EPA should also allow the production, accommodation, selling and bunkering fuels exceeding 1000 ppm sulphur to be used inside the ECA areas exclusively in ships equipped with exhaust gas cleaning systems i.e. scrubbers.

Additionally, we seek clarification on the following issues concerning Cat.1 and Cat.2 engines:

- Will Cat.1 and Cat.2 engines onboard Cat. 3 vessels, permitted to operate on 1000 ppm S fuel, yet be subject to certification with 15 ppm S fuel
- Are Cat.1 and Cat.2 engines and aftertreatment systems envisaged to be compatible with 1000 ppm S fuel
- Will Cat.1 and Cat.2 engines operating on 1000 ppm S fuel need to comply with Cat.3 emission limits
- Will Cat.1 and Cat.2 engines operating outside US waters on potentially unspecified >>15 ppm S fuel be able to comply with the proposed exemption, i.e. EPA's Tier 3 marine standard

Fuel Standards: Elimination of 500 ppm Sulphur Fuel

EPA proposes to eliminate the 500 ppm LM (locomotive/marine) Diesel fuel standard.¹³

⁶ Chapter III. B. (3)

⁷ Chapter IV.D.(1)(a)

⁸ Revised MARPOL Annex VI, Regulation 2 (14)

⁹ EPA420-R-05-015 of December 2005, " Conversion Factors for Hydrocarbon Emission Components

¹⁰ Federal Register /Vol.73, No.13/January 16, 2008, Standards of Performance for Stationary Spark Ignition Internal Combustion Engines and National Emission Standards for Hazardous Air Pollutants for Reciprocating Internal Combustion Engines

¹¹ Chapter IV. A.

¹² Chapter VI. C. (1)

¹³ Chapter IV. D. (1)

Due to environmental reasons Euromot does not see any need for actively phasing out the 500 ppm fuel quality. Cat.3 engines can operate on 500 ppm as well as on 1000 ppm sulphur fuels.

Scope of the NPRM

Concerning the scope and potential implementation dates EPA refers to various definitions of engines such as “any new marine Diesel engine”,¹⁴ “new marine engine”,¹⁵ “freshly manufactured (i.e. new) Category 3 engines”¹⁶ and also to the model year of the engines.¹⁷

Euromot wants to seek clarification on these expression and whether they are still in line with the definitions as given by the current US EPA regulations for Cat.3 engines.¹⁸ Furthermore, we are concerned about the misalignment of the EPA proposals with the IMO Revised MARPOL Annex VI (where the implementation date of emission limits is based upon the keel laying date of a vessel) and any misinterpretation and confusion that might arise from using totally different concepts at US EPA and IMO.

Use of Exhaust Gas Scrubbers for NOx reduction

EPA states that they “would not consider an exhaust gas scrubber to be an acceptable control strategy for reducing NOx emissions.”¹⁹

Euromot disagrees with that overall assessment and regards an exhaust gas scrubber a viable option for a future emission control strategy as it is offering a 10-15% NOx reduction potential that could help saving substantial amounts of urea. EPA’s negative assessment is apparently not the scrubber technology or its NOx reducing potential but concerns on potentially harmful discharge water components, which in our opinion is only an issue for open-loop systems. Therefore we propose to amend the above mentioned statement as follows: “We would not consider an exhaust gas scrubber to be an acceptable control strategy for reducing NOx emissions in case it would add to nitrogen loading of the water to a higher level than what is accepted by the IMO Washwater Criteria”.²⁰

Applicability of Parts 1065 and 1068 Provisions for Certification and Compliance Testing

EPA proposes to apply testing and measurement procedures according to Parts 1065 and 1068.²¹ Although it will be permitted “to submit data collected using the test equipment and procedures specified in the NOX Technical Code, manufacturers would be liable with respect to any test results from 1065 testing.”²²

As stated above, Euromot does not believe that the provisions as given by 40 CFR 1065 address the specific issues in testing large volume 2- and 4-stroke engines or could readily be applied to them.

¹⁴ Chapter III. A.

¹⁵ Chapter IX. C. (1)

¹⁶ Chapter III. B.

¹⁷ Chapter VI., preamble

¹⁸ See Chapters II.C.1. and 2. “What is a new Marine Diesel Engine?” in Control of Emissions From New Marine Compression-Ignition Engines at or Above 30 Liters Per Cylinder, Federal Register / Vol. 68, No. 40 / Feb 28, 2003, pp. 9758

¹⁹ Chapter V.C. (2) (b)

²⁰ IMO Resolution MEPC 170(57)

²¹ Chapter VI.

²² Chapter VI.A.(1)(a)

We furthermore want to seek clarification on the liability clause proposed to be applicable in cases testing was conducted according to the IMO Revised NO_x Technical Code 2008. It will facilitate uncertainty amongst engine manufacturers on the validity of test results created by following the IMO procedures. Thus, Euromot proposes to fully recognise results and data gathered by the IMO test procedures and consider them an unrestricted alternative to the corresponding US EPA regulations.

Definition of Ambient Conditions

EPA proposes to “specify broader temperature ranges to represent a wider range of normal in-use operation.”²³

Euromot objects introducing boundary conditions that are not harmonised with IMO regulations. We do not see a need for further flexibility on ambient conditions in order to seemingly better reflect later in-use conditions. As stated above Euromot proposes to fully recognise IMO test procedures.

Test Fuel Specifications

EPA proposes to specify test fuels to contain 800-2500 ppm Sulphur.²⁴

As PM limits are not proposed to be introduced, Euromot questions the need to specify upper and lower Sulphur limits of a test fuel. We propose to fully align with the IMO regulations,²⁵ where a suitable test fuel oil is requested to be selected from either DM or RM grades (according to ISO 8217:2005) and an analysis of the fuel parameters needs to be conducted.

Furthermore, we are concerned on the financial burden for manufacturers as we consider especially requesting a lower fuel Sulphur limit as highly unusual and anticipate substantial costs and administrative efforts arising for obtaining the quality proposed by EPA.

Demonstrate Compliance During Sea Trials

EPA proposes that “every new Tier 2 or later Category 3 engine be tested during the vessel’s sea trial to show compliance with the applicable NO_x standard.”²⁶

Euromot rejects this proposal as we consider it a re-certification of the engine. Operating under all load points at sea will be a time-consuming and financially burdensome requirement without significantly enhancing certainty on the certification process. We anticipate that, on the average, more than one day would have to be spent additionally at sea, at an estimated 200.000 Euro per day.

However, we accept the need to demonstrate compliance during on-board verification and propose to implement methods as given by the IMO Technical File and the onboard NO_x verification procedure.²⁷

²³ Chapter VI.A.

²⁴ Chapter VI.A.(1)(b)

²⁵ Revised NO_x Technical Code 2008, Chapter 5.3

²⁶ Chapter VI.A.(1)(d)

²⁷ Revised NO_x Technical Code 2008, Chapter 2.1.2, Chapter 2.4

Mode Caps

EPA proposes to cap NOx emissions "for any applicable duty-cycle test modes with power greater than 10 percent maximum engine power" at 150% of the applicable NOx standard. Euromot asks EPA to clarify that such mode cap applies only in the context of Tier III compliance, in line with the Revised MARPOL Annex VI and the Revised NOx Technical Code 2008 provisions.

Exemption for Replacement Engines

EPA proposes "to not allow [the Part 1042.615] exemption" in case of premature engine failure.²⁸

Euromot rejects this proposal, as we do not see appropriate justification from EPA in just saying "we do not believe this practice is either common or necessary". The reasons that have resulted in implementing exemptions according to 1042.615 are perfectly applicable for Cat.3 engines, including different space and weight requirements, incompatibility of components or replacement of individual engines in a multi-engine configuration.

EIAPP Certificates

EPA proposes "that each engine installed or intended to be installed on a U.S.-flagged vessel have an EIAPP before it is introduced into U.S. commerce."²⁹

First of all, we want to seek clarification on the term "U.S. commerce". It is not apparent to us in which context the term is used in this paragraph.

Secondly, Euromot objects this proposal as it does not reflect the real-world situation under which engines are supplied into the marine markets. Typically engines are sold prior to them getting commissioned for specific applications, such as onboard seagoing vessels, i.e. following the EPA proposal would require the engine manufacturers to obtain an EIAPP just in case their customers might designate later on a particular engine for a seagoing application. Implementing such a requirement would put significant administrative and financial burden on engine manufacturers without adding any environmental benefit.

Frankfurt/Main, 24 September 2009

Dr Peter Scherm
General Manager

²⁸ Chapter VI.A.(7)

²⁹ Chapter VI.B. (1)