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Survey on present and future development of emission limits by shipping diesel engines on sea-, offshore- and coastal areas of the Baltic Sea

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1. Collection of actual and future limits of pollutant emissions by shipping traffic in the Baltic Sea region

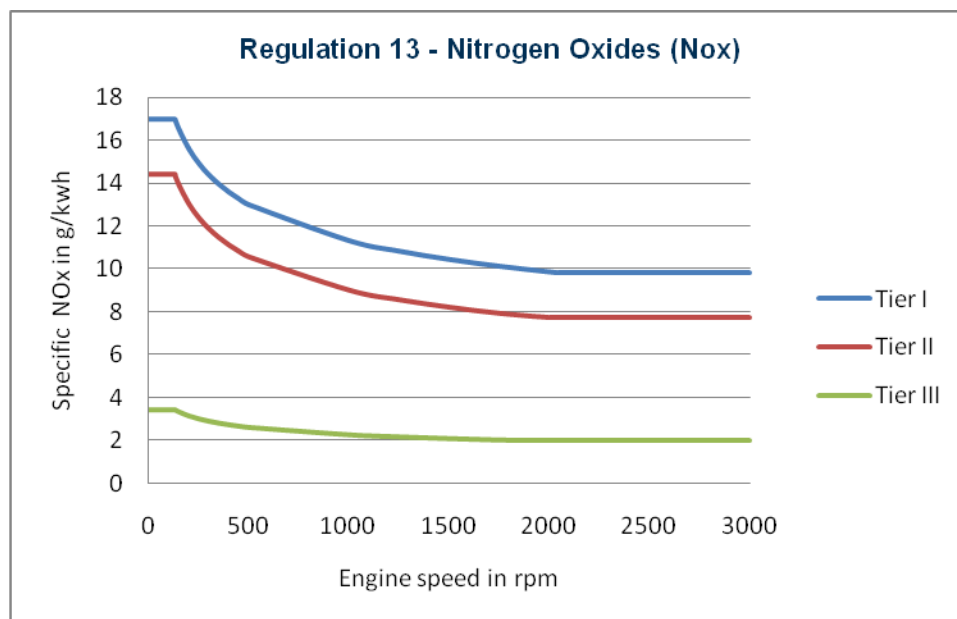
Pollutant emissions for marine diesel engines which are operating in the Baltic Sea region, result from the decisions of the International Maritime Organisation (IMO) and the UNO, defined in MARPOL 73/78 Annex VI.

Based on these international binding decisions, the NO_x emission rates depend on:

- the size of the engine and thus, the power output while operating (engine speed) and
- the date of the ships' keel-laying resp. the installation date of the engine.

Depending on these facts engines are classified to Tier (steps) I, II or III. Additionally, they are differentiated whether the operation of the ship with diesel engine is in the free maritime environment (global) or in a special operating area, the emissions control area - ECA.

For the operation area of the PlasTEP project it is obligatory that in Northern Europe the Baltic Sea, the North Sea including the English Channel belong to these emissions control areas. Therefore, the requirements for the PlasTEP project are the highest world-wide. The following graph illustrates the allowable NO_x emission from diesel engines (NO_x Regulation):



Remarks:

- Tier I: Current IMO NO_x emission level
- Tier II: Approximately – 2,5 g/kwh (approx. -15 % to -22 %) reduction compared to Tier I. (achievable by Engine Internal Measures)
- Tier III: 80 % reduction from Tier I. Applicable in regional ECAs. Exhaust Gas After-treatment. Outside the ECAs Tier II limits are applicable.



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These limits are valid for ship diesel engines with an engine speed of more than 130 rpm, which are built in ships with the following keel-laying data:

- Tier I: 01.01.2000 – 01.01.2011 global,
- Tier II: since 01.01.2011 global,
- Tier III: as from 01.01.2016 while operating in ECAs.

At the same time the International Organization for Standardization developed regulation standards for the measurement of exhaust gas emissions from combustion engines – ISO 8178 – 1ff.

Details and exemptions of MARPOL 73/78 Annex VI can be taken from the Germanic Lloyd (GL): "Prevention of Air Pollution from Ships - Revised MARPOL Annex VI and NOx Technical Code 2008". / 1 /

For these standards, acc. to Mr T. Mundt from GL / Environmental Research, Head of Group Environmental Services, a further decrease of the NOx – values at the current situation is not in sight. Due to the long life cycles of ships the binding limits in shipping need to be applied first. The implementation of these values will begin for new ships that are keel-laid in 2016. / 2 /

The same view shows the protocol of the 61st meeting of the Marine Environment Protection Committee (MEPC) of the IMO 27.09.2010 - 01.10.2010. /3 / The MEPC is the decision making committee for the definition of limits.

New is the decision of the member states of the IMO which revises the regulations MARPOL 73/ 78 Annex VI concerning the emission of sulphur resp. SOx. The content of sulphur/ SOx in exhaust gases depends in contrast to NOx not on the engine process but on the sulphur content of the used fuel. That is why this sulphur content is limited. Here is a difference between global use (open sea) and use in sulphur emission control area (SECA).

Based on currently allowed sulphur content at heavy fuel operation up to 4,5 % the limit is:

- As from 2012 to 3,5 %,
- As from 2020 to 0,5 %.

For SECA the current limit of 1% is valid, as from 2015 the value of 0,1 %.

The compliance of NOx limits through ship and diesel engines for Tier III is mainly technical ensured. For Tier III solutions are being processed through process control of inner engine processes and/ or exhaust gas after-treatment processes. Here, the compliance of Tier III at engines has been proved for individual cases but from today's point of view the compliance of sulphur limits is only realisable through a rigorous switch of the fuels quality up to the direction of diesel fuel; or if applicable up to using natural gas/ methane (liquefied natural gas – LNG).

The estimation of consequences regarding costs and technical changes in ship arrangements are not finished yet.

q.v. survey " Die weitere Reduzierung des Schwefelgehaltes in Schiffsbrennstoffen von 0,1 % in Nord - und Ostsee im Jahr 2015: Folgen für Schifffahrt in diesem Fahrtgebiet - Endbericht" of the Institute of Shipping Economics and Logistics Bremen, September 2004. / 4 /



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2. Estimation for the development of limits for the shipping traffic on sea-, offshore- and coastal areas and the role of international and national organisations

The European Commission/ area of environment-air- traffic emphasises that the EU-strategy as well as the corresponding EU regulations are based on the IMO MARPOL 73/ 78 Annex VI. / 5 /

The European Environment Agency (EEA) expect the compliance of the IMO regulations from all operators.

The Federal Ministry for the Environment, Nature Conservation and Nuclear Safety have similar demands as well as the Ministry of Food, Agriculture and Consumer Production. / 6 /

In Mecklenburg-Vorpommern the Ministry of Economics, Labour and Tourism declares also that regulations of the MARPOL are applied and that no special offshore regulations exist. / 7 /

The Ministry of Agriculture, the Environment and Consumer Protection states something similar. / 8 /

The shipping and port authority/ the port captain of the Hanseatic City Rostock refers on the one hand to the IMO regulations and on the other hand to the alliance of European port cities which was initiated from the Senate of the Hanseatic City of Hamburg. This alliance basically includes ports that are visited by cruise ships. Its objective is to enforce the alliance ports resp. cities to equip moorings for cruise ships with supply facilities for E-Energy and gas. By this auxiliary machines on board of the ships do not need to run while port lay times and exhaust gas and noise emissions will be minimised.

Within the European framework intergovernmental organizations and networks are working to ensure successful Baltic Sea environmental policy. Some are for example:

- Baltic Sea Action Summit
- Baltic Sea Forum e.V. - Pro Baltica
- Baltic Sea States Subregional Cooperation (BSSSC)
- Baltic Environmental Information Dissemination System (BEIDS)
- HELCOM - Helsinki Commission/ Baltic Marine Environmental Commission with "HELCOM Ministerial Declaration on the implementation of the HELCOM Baltic Sea Action Plan, Moscow, 20. May 2010"; supported by the project "Clean Baltic Sea Shipping" to decrease air pollution through ships in the Baltic Sea / 9 /

The requirements of all these organisations and networks are based on the regulations of the IMO. There are no severer requirements but the cooperation for enforcement of the regulations is being supported. The International Council on Combustion engines CIMAC provides some working material through their work group „Diesel Emission“. Their statement is clearly defined to maintain the regulations of MARPOL 73/ 78 Annex VI for diesel engine industry and shipping. The method of using non thermal plasma (NTP) for reducing NOx is explained among others in the CIMAC elaboration. / 10 /



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3. Summary

The limits of diesel emissions in IMO MARPOL 73/ 78 Annex VI are the foundation for limits worldwide and will be for a long time.

Many organisations, networks etc. in the Baltic region work to realise the IMO regulations, but they do not work for new regulations.

It may be that in addition to NO_x emission control areas (NECA) and sulphur emission control areas (SECA) port cities might call for zero emission in their harbors.

Special regulations in the view of control areas for offshore are not in sight.

4. Literature

- / 1 / Germanic Lloyd Customer info: "Prevention of Air Pollution from Ships - Revised MARPOL Annex VI and NO_x Technical Code 2008"; 34 pages – available at http://www.gl-group.com/pdf/RevisedMARPOL_AnnexVI.pdf.
- / 2 / Mail from GL/ Environmental Research/ T. Mundt, Head of Group Environmental Services, 19.01.2011.
- / 3 / IMO - MEPC 61 (27.09. - 01.10.2010) – available at <http://www.rina.org.uk/article855.html>.
- / 4 / Survey of the Institute of Shipping Economics and Logistics (ISL) Bremen: „Die weitere Reduzierung des Schwefelgehalts in Schiffsbrennstoffen auf 0,1 % in Nord - und Ostsee im Jahr 2015: Folgen für die Schifffahrt in diesen Fahrtgebieten"; Bremen, Sept.2010 – available at <http://www.isl.org/projects/2411seca/index.php?lang=de>.
- / 5 / Europäische Kommission/ Umwelt-Luft-Verkehr EU - Politik für Emissionen von Schiffen
- / 6 / Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit - Meeresumweltschutz
- / 7 / Mail from the Ministry of Economics, Labour and Tourism of Mecklenburg - Vorpommern from the 22.12.2010.
- / 8 / Letter from the Ministry of Agriculture, the Environment and Consumer Protection from the 12.01.2011.
- / 9 / HELCOM Ministerial Declaration Baltic Marine Environmental Protection Commission, 18 pages, available at http://www.bmu.de/files/pdfs/allgemein/application/pdf/helcom_declaration_en_bf.pdf
- /10/ CIMAC Working Group 5 - Diesel emissions - Guide to Exhaust Emission Control Options, 41 pages, available at http://www.cimac.com/cimac_cms/uploads/explorer/Working%20groups/Guide_to_EEC_Options_Sep99.pdf