TECHNICAL CIRCULAR No. 209 of 20th July 2014

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| To: | All Surveyors/Auditors |
| Applicable to flag: | All Flags |
| Subject: | **NOx Technical Code** |
| Reference: | MARPOL Annex VI |

NOx Technical Code application

The basic requirements in respect of the control of NOx emissions from both new and existing engines are given in MARPOL 73/78 Annex VI Regulation 13. The detailed means by which compliance, where required, is to be demonstrated is given in the associated NOx Technical Code.

Reference to engines within this application is to be taken as those engines which fall within the scope of Regulation 13 which are:

- all internal combustion reciprocating (diesel) engines over 130 kW installed on ships constructed on or after 01 January 2000; and
- all internal combustion reciprocating (diesel) engines over 130 kW which undergo a major conversion on or after 01 January 2000; and
- all internal combustion reciprocating (diesel) engines over 5,000 kW and per cylinder displacement at or above 90 liters installed on ships constructed on or after 01 January 1990 but prior to 1 January 2000.

Note: MEPC 66 has approved modifications to the NOx Technical Code incorporating the necessary amendments to enable calculation of the NOx emissions of dual fuel (DF) engines operating in gas mode (Resolution MEPC.251 (66)). This is primarily to enable Otto cycle DF engines to be certified to the Tier III limit in gas mode. Furthermore MEPC 66 approved draft amendments to include gas only engines within this definition and Regulation 13 for adoption at MEPC 67, thereby extending the scope of Regulation 13 to include diesel, DF and gas only engines installed on a ship constructed on or after the entry into force of the draft amendments or a gas fuelled additional or non-identical replacement engine installed on or after that date.

Regulation 13 and as such this process instruction does not apply to:

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- engines intended to be used solely in case of emergency such as emergency generators or lifeboat engines*; and
- engines on vessels solely engaged in voyages within waters subject to sovereignty or jurisdiction of the State the flag of which the vessel is entitled to fly, provided there are alternate NOx control measures.

* - Normally an engine will be identified as an Emergency Generator or Fire Pump engine and this should be accepted as such. If a question arises, the cognizant flag state should be contacted. In the absence of flag state policy, it is CONARINA policy that the Code does apply to emergency generator engines used for in port services or similar services reflecting repetitive operation in the vessel mission.

* - Subject to the Administration's decision, engines used on vessels dedicated to an external emergency service, e.g., engines rated 130 kW or more, only serving as fire monitors on Fi-Fi-vessels, are to comply with the NOx requirements unless the engine's fuelling or cooling, or the exhaust system is not an integral part of the ship.

Reference to NOx emissions within this process instruction are to be taken as NOx emissions expressed as the total weighted value in g/kWh for the relevant test cycle unless otherwise described.

MARPOL 73/78 Annex VI entered into force on 19 May 2005. Prior to that compliance was voluntary. It is necessary for ship-owners to be able to demonstrate that engines subject to the requirements of Regulation 13 of that Annex are in compliance.

The approval process for engines in accordance with the NOx Technical Code divides between the approval of the Parent Engine of an Engine Family or Engine Group and the approval of subsequent engines within that Engine Family or Engine Group. In the case of a single engine that engine will be considered as the Parent Engine.

It is recognized that the engine manufacturer is the expert on the engines manufactured but all exchanges should be documented as background for the data in the technical file.

It is the responsibility of each engine licensee to obtain the necessary approvals rather than the engine licensor.

All engines are to be categorized as either Engine Family or Engine Group Members. This applies even in the case of single engines since this categorization affects the requirements of the Technical File in terms of the provision of Onboard NOx Verification Procedures.

Where a particular engine is to represent the Parent Engine for a number of engine types, the engine builder's nomination of the Parent Engine from within that range of engine types is to be approved.

The engine to be tested as the Parent Engine, either from a range of engine types or in the case of a

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single engine type, is to be configured to have the highest expected NOx emission rate. Consequently, the proposed adjustment of that Parent Engine, and in the case of engine group members the extent of the installed modifications – the test engine fit, are to be approved prior to the Parent Engine test.
It may be necessary to perform emission measurements in accordance with the Simplified Measurement Method (NTC 6.3) in instances where that method has not previously been approved as part of the Technical File.

All engines are required to have a Technical File, as defined in the NOx Technical Code, which must include the Onboard NOx Verification Procedure(s) where required.

Series produced engines are categorized as either Engine Family or Engine Group members thereby avoiding the need to repeat the exhaust emission measurements for all engines. In order to utilize this approach, it must be ensured that all Engine Family or Engine Group members will be constructed and adjusted in such a way that the NOx emissions from subsequent engines will be no higher than that of the Parent Engine. In addition, prior to affecting any engine design changes, the possible implications of those changes on the NOx emissions are to be considered and where they do affect that emission rate it is to be ensured that the modified design will be submitted for re-approval. The engine builder will also need to provide information with the engine which will help ensure that only spare parts which correspond to those approved for the particular Engine Group / Engine Family are subsequently obtained and installed for engines included within these requirements.

MARPOL 73/78 Annex VI has entered into force on 19 May 2005. Prior to that, it was not possible to issue EIAPP Certificates.

Within the Code there are many aspects where alternative options to those given may be accepted at the discretion of the Administration, or CONARINA where granted full authority.

The categorization into Engine Family or Engine Group is dependent on the extent to which the engine can be adjusted or modifications applied.

Broadly, Engine Family members are the small, high speed engines whereas Engine Group members are the large, slow speed engines. Particular attention may therefore be necessary to the categorization proposed for medium speed engines. Engines which are categorized as Engine Family Members are not to be subject to any form of modification on or after installation onboard and the range of any accessible adjustable features, individually or in combination, must not be such that they would result in the NOx emissions exceeding those as determined for the Parent Engine test condition. Engines which are categorized as Engine Group members may be subject to modification, as for example during optimization following installation onboard and coupling to the final drive train. In addition, for Engine Group members the degree of adjustment possible can be such that the NOx emission value would exceed that of the Parent Engine test condition unless other concurrent and countervailing adjustments are made.

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As per 4.4.7 of the 2008 Code, in as much an engine part of an engine group are permitted optimization adjustments which can cause their emissions to increase beyond those of the parent engine, the requirements of the NOx Technical Code are more onerous in respect of Engine Group members as compared to Engine Family members. However, due to the test condition parameter requirements (NTC 5.2.1), some engine builders may need to categorize as Engine Group members certain engines which would otherwise generally be considered as Engine Family members.

As per 4.3.10 of the Code, once two or more Administrations have accepted the EIAPP for a parent engine in an engine family all Administrations shall recognize the same.

Only engines which are pre-certified under test bed conditions are eligible to be Engine Family members. Any engine, irrespective of design and the range of adjustable features, where the Parent Engine tests are undertaken onboard can only be categorized as an Engine Group member.

Guidelines for the selection of the Parent Engine are given in the NOx Technical Code; in NTC 4.3.9 for an Engine Family and in NTC 4.4.8 for an Engine Group. As noted in Section 4.3, for an engine to be considered as the Parent Engine for an Engine Family, that engine must be tested on a test bed and not onboard.

Due to the effect of the test cycles and associated weighing factors, the Parent Engine using one cycle may differ from the Parent Engine on another cycle. The Parent Engine should be one that always has the highest expected NOx emissions in terms of the single weighted average value for the relevant test cycle.

The engine builder should justify their selection of the Parent Engine on the basis of data obtained under test conditions comparable with those as given in the NOx Technical Code. However, it is not a requirement that the data was obtained under survey conditions. While this data may be emission test data, in some instances it could also take the form of other measurements, such as temperature or pressure. Particular attention must be taken to ensure that all possible influencing aspects have been assessed.

As with the selection of the Parent Engine, the adjustment and fit of the Parent Engine at the time of the emission test must be such that it is set up in a manner under which one would expect the engine to exhibit the highest NOx emissions.

On the basis of the submitted data, together with any additional requested data deemed necessary, the Technical Office undertaking the review will assess the engine builder's proposals as regards the adjustments and fits that will be applied to the Parent Engine at the time of the Parent Engine emission test. The basic criteria for assessing the Parent Engine adjustments and fit are given in NTC 4.3.9.2 however those criteria should only be taken as a guide. Generally, in order for the Parent Engine to be tested in the condition which will result in the highest NOx emissions, the injection timing will need to be set at the maximum advance in respect of top dead center (TDC) possible and for the engine to be operated at the lowest proposed rated speed. Where an engine is available with different

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ratings (kW/cylinder), the engine builder will need to supply data which demonstrates which rating will give the highest NOx emissions. NOx is formed at high temperature and pressure so any arrangement that increases these parameters may yield more NOx emissions. However, it should be noted that some aspects, such as increased compression ratio, can have the effect of increasing the NOx concentration, but since there is also an increase in power, the overall effect is to decrease NOx emissions in terms of g/kWh.

REFERENCES:

- MARPOL Annex VI

ATTACHMENTS: No.

Kindest Regards,

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