

TECHNICAL NOTE

To: To whom it may concern
From: Danfoss IXA
Date: 25-11-2022
Copy: N/A
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Subject: MES 1001 MARPOL vs. SCR spot check

The MES 1001 MARPOL emission sensor holds a special certificate of compliance which states that the sensor's measurement technology is equivalent to the reference technology mentioned in NOx Technical Code. The MES 1001 uses UV DOAS (Ultraviolet Differential Optical Absorption Spectroscopy) as technology whereas the reference technology is defined to be CLD (Chemiluminescent Detector). The standard however allows other technologies to be used if they are proven to be equivalent and that this has been witnessed by a class society. Please refer to the following:

5.4.1 The emission of gaseous components by the engine submitted for testing shall be measured by methods described in appendix 3 of this Code which describe the recommended analytical systems for the gaseous emissions.

5.4.2 Other systems or analysers may, subject to the approval of the Administration, be accepted if they yield equivalent results to that of the equipment referenced in 5.4.1. In establishing equivalency it shall be demonstrated that the proposed alternative systems or analysers would, as qualified by using recognized national or international standards, yield equivalent results when used to measure marinediesel engine exhaust emission concentrations in terms of the requirements referenced in 5.4.1.

5.4.3 For introduction of a new system the determination of equivalency shall be based upon the calculation of repeatability and reproducibility, as described in ISO 5725-1 and ISO 5725-2, or any other comparable recognized standard.

Section from NOx Technical Code 2008

The MES 1001 MARPOL is suitable for monitoring the condition/degradation of the SCR. The MEPC.291(71) section 3.2.8.3.2 states that SCRs must be checked for any potential degradation at least every 12 months in case the SCR, engine, and NOx sensor is not approved together by a parent engine test. This check is also referred to as "spot check". The MPC 112 from IACS is a supporting document to the MEPC and recommends how to carry out the yearly spot checks.

Instead of using a third party to check the SCR system the MES 1001 MARPOL can be installed as an alternative. This way the spot check device is permanently installed and provides continuous measurements of both NOx and NH3. The MPC 112 refers to MEPC.291(71) section 7 which clearly states that the sensor used for spot checks must follow the NOx Technical Code. As the MES 1001 MARPOL holds a certificate of compliance with respect to measurement technology the sensor can be used without further approvals.

Please note the importance of the party responsible for the Technical File has included a description of how to perform the spot check. If a permanently installed sensor is used for spot check (like just described above with the MES 1001 MARPOL) it must be ensured that the sensor can be utilized according to the Technical File. Failing to follow the description in the Technical File will be considered a non-conformance (e.g. if the permanently installed sensor uses another position than specified).

Please consult our sales department for the benefits of using the MES 1001 MARPOL as permanently installed spot check device.

On the following pages the MPC 112 is added for reference.

Yours sincerely

A handwritten signature in black ink, appearing to read "Allan Skouboe".

Allan Skouboe
CTO, Chief Technical Officer

MPC 112 – November 2019

MPC112

MPC 112 2017 Guidelines Addressing Additional Aspects of the NO_x Technical Code 2008 with regard to Particular Requirements related to Marine Diesel Engines fitted with Selective Catalytic Reduction (SCR) Systems

(Nov 2015)
(Rev.1
Nov 2019)

(Resolution MEPC. 291(71), Paragraph 3.2.8)

MEPC.291(71), Paragraph 3.2.8 reads:

3.2 Technical File and on board NOX verification procedures

In addition to the information supplied in paragraph 3.1.3 of these Guidelines and items in section 2.4 of the NTC 2008, engine systems fitted with SCR should include the following information in Technical File:

.8 factors related to the deterioration rate of SCR performance, e.g. exchange condition for SCR catalyst blocks and recommended exchange time of SCR catalyst blocks:

.1 where a feedback or a feed forward reductant control strategy is incorporated with a NOX measurement device, this is acceptable as a means of monitoring catalyst condition/degradation. The exchange criteria of catalyst blocks against the reading of the NOX measurement device is to be specified by the applicant as well as the maintenance, service, and calibration requirements for the NOX measurement device;

.2 where a feed forward reductant control strategy is adopted without a NOX measurement device, the application is to provide the details of:

.1 the expected deterioration curve under expected operating conditions or the life of catalyst under expected operating conditions;

.2 factors which can influence catalyst NOX reduction efficiency; and

.3 guidance on how to assess catalyst NOX reduction efficiency based on periodical spot checks or monitoring as specified by the applicant, if applicable; records are to be kept for inspection during annual, intermediate and renewal surveys. The frequency of periodical spot checks is to be defined by the applicant considering the expected deterioration of the catalyst. The frequency for spot-checks should be at least after installation and once every 12 months; and

.3 other strategies on monitoring the catalyst condition/degradation are subject to the approval of the Administration;

Note:

1. This Unified Interpretation is to be uniformly implemented by IACS Societies not later than 1 July 2016.
2. Rev.1 of this Unified Interpretation is to be uniformly implemented by IACS Societies from 1 July 2020.

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Interpretation

For application of 3.2.8.1:

1. A NOx measurement device, incorporated in a SCR feedback or feed forward reductant control system, is not required to be in compliance with appendix III of NOx Technical Code if the suitability of this NOx measurement device had been proven by the corresponding Parent Engine test.

The suitability shall be verified by comparing the emission data of the NOx measurement device with the results of an analyzer complying with 3.4, Appendix III of NTC2008. The values obtained by the NOx measurement device shall not differ by more than $\pm 5\%$ from the readings of the analyzer during the parent engine test.

The applicant shall specify the accuracy of the NOx measurement device based on a defined calibration procedure and/or exchange requirements for the device.

2. Irrespective of the reductant control strategy, the criteria for catalyst block exchange are to be specified by the applicant. The criteria shall ensure permanent compliance with the applicable NOx emission limit for the relevant Engine type, Engine Group or Engine Family, as applicable.

Depending on the proposed onboard verification procedure for assessment of catalyst NOx reduction efficiency, allowances may be given according to NTC2008, 6.3.11.1 or Resolution MEPC.291(71) Section 7.5.

3. In case where feedback system is applied as a means of monitoring catalyst condition degradation, generating alarms or failure codes in case of non-compliance is to be provided and to be specified in the Technical File.

For systems generating alarms or failure codes in case of non-compliance without access to the measured NOx values, the applicant is to provide details, not necessarily in the Technical File but at least in supportive documentation for approval, about the alarm strategy, failure codes and calculation algorithm. From the view point of the purpose of achieving NOx compliance, application of the feedback system with the alarms or failure codes is considered as fulfilling the requirements of NTC2008 2.3.6 (a means of monitoring the consumption of substances).

For application of 3.2.8.2.3:

The spot checks after installation shall be performed on board the vessel after installation of the complete Engine+SCR system in cases where they are specified as a method of assess catalyst NOx reduction efficiency by the applicant. In this case the record of this test including information on compliance of NOx measurement device and its calibration record shall be available for the initial survey. The spot checks do not need to be witnessed by the Administration.

In cases where spot checks are required, the checks are to be performed at least at 75% of the rated power.

The guidance on how to assess catalyst NOx reduction efficiency shall include, but not be limited to, the following items:

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- a) Procedure for spot checks
- Preparation of calibration gas, if applicable
 - Details of NOx measurement device including calibration requirements.
 - Test condition (e.g. power and speed setting ranges as well as other applicable engine and SCR settings)
 - Data to be recorded. It is recommended to include a test report template in the Technical File.
 - Sampling probe position(s) for NOx measurement.
 - Time duration for engine+SCR stabilisation and the NOx emission measurement

b) Criteria to assess catalyst NOx reduction efficiency

In case where the spot checks are conducted following the procedure specified in resolution MEPC.291(71) Section 7, the criteria specified in 7.5 of the resolution MEPC.291(71) shall be applied.

Otherwise, the criteria shall be determined based on applicable NOx emission limits corresponding to the rated engine speed of the subject engine rather than the parent engine emission value. Also, allowance of the criteria may be given according NTC2008, 6.3.11.1 or Resolution MEPC.291 (71) Section 7.5.

For application of 3.2.8.3:

Other monitoring strategies may only be accepted if the entire SCR chamber with all catalyst blocks installed is covered. Testing of single catalyst blocks after removing them from the SCR chamber is not considered as representative for the entire SCR system.

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