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WORK PROGRAMME OF THE COMMITTEE AND SUBSIDIARY BODIES

New output proposal to revise the 2017 SCR Guidelines, as amended

Submitted by Marshall Islands, Panama, Singapore, United Arab Emirates and IACS

SUMMARY

Executive summary:	This document proposes a revision of the *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* (resolution MEPC.291(71) as amended by resolution MEPC.313(74)) (the 2017 SCR Guidelines, as amended) to improve their clarity and enable a uniform implementation
Strategic direction, if applicable:	1 and 6
Output:	Not applicable
Action to be taken:	Paragraph 22
Related documents:	None

Introduction

1 This document is submitted in accordance with the provisions of the *Organization and method of work of the Maritime Safety Committee and the Marine Environmental Protection Committee and their subsidiary bodies* (MSC-MEPC.1/Circ.5/Rev.2) on the submission of proposals for new outputs and proposes to revise the 2017 SCR Guidelines, as amended.

Background

2 The co-sponsors, in applying the *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* (resolution MEPC.291(71)), as amended by resolution MEPC.313(74) (the 2017 SCR Guidelines, as amended), have identified provisions which may need clarification in order to facilitate their global and uniform implementation. Based on this understanding and to assist the consideration of the proposal for a new output, as well as to facilitate future work, annex 1 to this document contains proposed amendments.

IMO's objectives

3 The main goal of the proposal is to remove any ambiguity and ensure consistent application of the provisions of paragraphs 3.2.8.1, 3.2.8.2.3, 3.2.8.3, 3.2.11 and 3.2.12 of the 2017 SCR Guidelines, as amended. This clearly lies within the IMO strategic directions SD 1 "Improve implementation" and SD 6 "Ensure regulatory effectiveness".

Need

4 The co-sponsors consider that the provisions of paragraphs 3.2.8.1, 3.2.8.2.3, 3.2.8.3, 3.2.11 and 3.2.12 of the 2017 SCR Guidelines, as amended, require further clarification in order to facilitate their global and consistent implementation.

Analysis of the issues

Paragraph 3.2.8.1 of the 2017 SCR Guidelines, as amended

5 Paragraph 3.2.8.1 of the 2017 SCR Guidelines, as amended, refers to a NO_X measurement device installed on board and used as a means supplementing a feedback or a feed forward reductant control strategy, and states that it should be acceptable as the means of monitoring catalyst block condition/degradation.

6 The properties of the NO_X measurement device are however not addressed, and, therefore, it is unclear as to:

.1 what type of device is acceptable and, in particular, if it is to be in compliance with appendix III of the NO_X Technical Code 2008 (NTC 2008);

.2 the applicable tolerances in respect of limit values; and

.3 the kind of alarms to be provided in case of non-compliance.

7 The co-sponsors are of the view that:

.1 a NO_X measurement device which is used for an SCR system internal control process, incorporated in an SCR feedback or feed forward reductant control system, is not required to be in compliance with appendix III of the NTC 2008, if the suitability of this NO_X measurement device had been proven by the corresponding parent engine test; this NO_X measurement device is also acceptable as a means of monitoring catalyst condition/degradation;

.2 the suitability should be verified by comparing the emission data of the NO_X measurement device with the results of an analyser complying with paragraph 3.4 of appendix III of the NTC 2008. The values obtained by the NO_X measurement device should not differ by more than ±5% from the readings of the analyser during the parent engine test;

.3 the applicant should specify the accuracy of the NO_X measurement device based on a defined calibration procedure and/or exchange requirements for the device;

.4 the catalyst block exchange criteria should ensure permanent compliance with the applicable NO_X emission limit for the relevant engine type, engine

group or engine family, as applicable. However, depending on the proposed onboard verification procedure for assessment of catalyst NO_X reduction efficiency, allowances may be given according to paragraph 6.3.11.1 of chapter 6 of the NTC 2008 or paragraph 7.5 of the 2017 SCR Guidelines, as amended;

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

.6 for systems generating alarms or failure codes in case of non-compliance, but not giving access to the actual measured NO_X 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. Application of the feedback system with the alarms or failure codes is considered as fulfilling the requirements of paragraph 2.3.6 of the NTC 2008.

Paragraph 3.2.8.2.3 of the 2017 SCR Guidelines, as amended

8 Paragraph 3.2.8.2.3 of the 2017 SCR Guidelines, as amended, requires the applicant to give guidance on how to assess catalyst NO_X reduction efficiency based on periodical spot checks or monitoring as specified by the applicant, if applicable, but does not clarify:

.1 if the spot check after installation is required in cases when the applicant does not define the spot check as a method of assessing the catalyst NO_X reduction efficiency;

.2 if the spot check after installation is to be witnessed by the Administration; or

.3 the details to be supplied by the applicant concerning the spot checks.

9 The co-sponsors are of the view that:

.1 spot checks after installation should be performed on board the vessel after installation of the complete "engine with SCR" system only in cases where they are specified as a method to assess catalyst NO_X reduction efficiency by the applicant. In this case, the record of the test, including information on compliance of NO_X measurement device and its calibration record, shall be available for the initial survey. Spot checks do not need to be witnessed by the Administration;

.2 in cases where spot checks are required, the checks are to be performed at least at 75% of the rated power; and

.3 the guidance on how to assess catalyst NO_X reduction efficiency should include at least the following items:

.1 procedure for spot checks:

.1 preparation of calibration gas, if applicable;

.2 details of NO_X measurement device including calibration requirements;

.3 test condition (e.g. power and speed setting ranges as well as other applicable engine and SCR settings);

.4 data to be recorded; it is recommended to include a test report template in the Technical File;

.5 sampling probe position(s) for NO_X measurement; and

.6 time duration for "engine with SCR" stabilization and the NO_X emission measurement; and

.2 criteria to assess catalyst NO_X reduction efficiency. In cases where spot checks are conducted following the procedure specified in section 7 of the 2017 SCR Guidelines, as amended, the criteria specified in paragraph 7.5 of the 2017 SCR Guidelines, as amended, should be applied. Otherwise, the criteria should be determined based on applicable NO_X 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 to paragraph 6.3.11.1 of the NTC 2008, or paragraph 7.5 of the 2017 SCR Guidelines, as amended.

Paragraph 3.2.8.3 of the 2017 SCR Guidelines, as amended

10 Paragraph 3.2.8.3 of the 2017 SCR Guidelines, as amended, allows other strategies on monitoring the catalyst condition/degradation, subject to the approval of the Administration, however does not clarify the criteria to be used to evaluate those alternative strategies.

11 The co-sponsors are of the view that 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.

Paragraph 3.2.11 of the 2017 SCR Guidelines, as amended

12 In cases of engine systems fitted with SCR and the parameter check method established as onboard verification procedure, paragraph 3.2.11 of the 2017 SCR Guidelines, as amended, specifies to take into account the requirements in paragraph 2.3.6 (measuring the consumption of substances) and guidance given in paragraph 2 of appendix VII of the NTC 2008 (spot NO_X measurements) when assessing the adequacy of a proposed procedure with analysers meeting or exceeding the requirements of appendix III of the NTC 2008.

13 The co-sponsors are of the view that:

.1 The spot check may be taken as onboard measurement of the NO_X reduction rate in accordance with section 7 of the 2017 SCR Guidelines, as amended; alternatively, systems using a feed forward reductant control strategy may be fitted with NO_X monitoring devices for the purposes of monitoring catalyst condition and SCR performance. Instrumentation used for spot checks, or alternatively monitoring, is to meet the requirements of appendix III of the NTC 2008.

.2 In the context of spot check measurements, other systems or analysers may be accepted if they yield equivalent results according to paragraph 5.4.2 of the NTC 2008 or under the considerations made in paragraph 7 above.

.3 For systems using feed forward reductant controls without NO_X monitoring, the applicant is to provide details of the relationship between engine load and reductant consumption and the means of checking that reductant flow is appropriate. The Technical File is to include proposals for maintaining records of reductant consumption and also reductant composition and quality. Records of reductant composition and quality may be based on delivery notes where these delivery notes include reductant concentration and quality parameters.

.4 Reductant delivery notes may also be accepted for the purposes of verifying that the system has been operated using reductant. In such cases, the reductant delivery notes are to be made available at annual, intermediate and renewal surveys. Where it is proposed to produce aqueous reductant on board, then the recording system is to consider records of feedstock deliveries and quality.

Paragraph 3.2.12 of the 2017 SCR Guidelines, as amended

14 Paragraph 3.2.12 of the 2017 SCR Guidelines, as amended, states that the Technical File should include any other parameter specified by the applicant, however, does not require the applicant to specify other parameter known to affect NO_X emissions. The co-sponsors propose to include the provision for the applicant to specify any other parameter that may, to their knowledge, affect the NO_X emissions.

15 The co-sponsors propose that considerations given in paragraphs 5 to 14 above are reflected as amendments to the 2017 SCR Guidelines, as amended. Should the Committee agree to the proposed new output, annex 1 to this document offers respective changes with a view to facilitating the work of the PPR Sub-Committee.

Analysis of implications

16 No costs to the maritime industry are anticipated. The intention is to amend the pertinent provisions to make them clearer. The administrative burden to the Organization and to the Member States is anticipated to be minimal. The completed checklist for identifying administrative requirements and burdens is set out as annex 2 to this document.

Benefits

17 It is anticipated that clearer provisions of the 2017 SCR Guidelines, as amended, would lead to their more efficient and consistent application.

Industry standards

18 No other industry standards address the specific concerns.

Output

19 The following new output to update paragraphs 3.2.8.1, 3.2.8.2.3, 3.2.8.3, 3.2.11 and 3.2.12 of the 2017 SCR Guidelines, as amended, to clarify the application of requirements related to the Technical File and onboard NO_X verification procedures, is proposed:

"Amendments to the *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* (resolution MEPC.291(71), as amended by resolution MEPC.313(74))".

Human element

20 The completed checklist for considering human element issues contained in MSC-MEPC.7/Circ.1 is set out in annex 3 to this document. As the proposal is to clarify existing requirements only, no impact on the human element is anticipated.

Urgency

21 It is proposed that the output should be included in the Committee's biennial agenda (2022 to 2023), with the output being placed on the agenda of the PPR Sub-Committee with one session needed to complete the item.

Action requested of the Committee

22 The Committee is invited to consider the foregoing, in particular the proposals in paragraphs 19 and 21, and take action as appropriate.

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ANNEX 1

DRAFT AMENDMENTS TO THE 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 (RESOLUTION MEPC.291(71), AS AMENDED BY RESOLUTION MEPC.313(74)

The following specific proposals are offered to facilitate future work:*

Paragraph 3.2.8.1

".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 NO_X measurement device, this is acceptable as a means of monitoring catalyst condition/degradation. A NO_X measurement device, incorporated in an SCR feedback or feed forward reductant control system, should not be required to be in compliance with appendix III of the NTC 2008 if the suitability of this NO_X measurement device is proven by the corresponding Parent Engine test. The suitability should be verified by comparing the emission data of the NO_X measurement device with the results of an analyser complying with paragraph 3.4 of appendix III of the NTC 2008. The values obtained by the NO_X measurement device should not differ by more than ±5% from the readings of the analyser during the parent engine test. The applicant should specify the accuracy of the NO_X measurement device based on a defined calibration procedure and/or exchange requirements for the device. The exchange criteria of catalyst blocks against the reading of the NO_X measurement device is to be specified by the applicant as well as the maintenance, service, and calibration requirements for the NO_X measurement device;".

Paragraph 3.2.8.2.3

".3 guidance on how to assess catalyst NO_X 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 spot checks after installation of the complete "engine with SCR" system should be required to be performed on board only in cases where they are specified as a method of assessing catalyst NO_X reduction efficiency by the applicant. In this case t~~T~~he 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. In cases where spot checks are required, the checks should be performed at least at 75% of the rated power, and the guidance on how to assess catalyst NO_X reduction efficiency should include the following items:

.1 procedure for spot checks;

.1 preparation of calibration gas, if applicable;

* Tracked changes are indicated using "strikeout" for deleted text and "grey shading" to highlight all modifications and new insertions, including deleted text.

.2 details of NO_X measurement device including calibration requirements;

.3 test condition (e.g. power and speed setting ranges as well as other applicable engine and SCR settings);

.4 data to be recorded; it is recommended to include a test report template in the Technical File;

.5 sampling probe position(s) for NO_X measurement; and

.6 time duration for "engine with SCR" stabilization and the NO_X emission measurement; and

.2 criteria to assess catalyst NO_X reduction efficiency. In case where the spot checks are conducted following the procedure specified in section 7 of these Guidelines, the criteria specified in paragraph 7.5 should be applied. Otherwise, the criteria should be determined based on applicable NO_X emission limits corresponding to the rated engine speed of the subject engine, and the allowances given in paragraph 6.3.11.1 of the NTC 2008 or those in paragraph 7.5 of these Guidelines; and".

Paragraph 3.2.8.3

".3 other strategies on monitoring the catalyst condition/degradation are subject to the approval of the Administration, subject to the entire SCR chamber with all catalyst blocks installed being addressed. Testing of single catalyst blocks after removing them from the SCR chamber should not be considered as representative for the entire SCR system;".

Paragraph 3.2.11

".11 parameter check method as the verification procedure: with regard to the application of the parameter check method, requirements given in paragraph 2.3.6 and guidance given in paragraph 2 of appendix VII of the NTC 2008 should be taken into account in assessing the adequacy of a proposed procedure with analysers meeting or exceeding the requirements of appendix III of the NTC 2008.~~; and~~ Spot check may be taken as an onboard measurement of the NO_X reduction rate in accordance with section 7 of these Guidelines; alternatively, systems using a feed forward reductant control strategy may be fitted with NO_X monitoring devices for the purposes of monitoring catalyst condition and SCR performance. Instrumentation used for spot checks, or alternatively monitoring, should meet the requirements of appendix III of the NTC 2008, but other systems or analysers may be accepted if they yield equivalent results (see paragraph 5.4.2 of the NTC 2008) or the suitability of this system or analyser is proven by the corresponding parent engine test according to paragraph 3.2.8.1 of these Guidelines. For systems using feed forward reductant controls without NO_X monitoring, the applicant should provide details of the relationship between engine load and reductant consumption and the means of checking that reductant flow is appropriate. The Technical File should include proposals for maintaining records of reductant consumption and also reductant composition and quality. Records of reductant composition and quality may be based on delivery notes where these delivery notes include reductant concentration and quality parameters. Reductant delivery notes may also be accepted for the purposes of verifying that the system has been operated using reductant. In such cases, the

reductant delivery notes should be made available at annual, intermediate and renewal surveys. Where it is proposed to produce aqueous reductant on board, the recording system should consider records of feedstock deliveries and quality;".

Paragraph 3.2.12

".12 any other parameter(s) ~~specified by the applicant~~ known by the applicant as affecting NO_X emissions and not included within the scope of paragraphs 3.2.1 to 3.2.11 of these Guidelines."

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ANNEX 2

CHECKLIST FOR IDENTIFYING ADMINISTRATIVE REQUIREMENTS

This checklist should be used when preparing the analysis of implications required in submissions of proposals for inclusion of outputs. For the purpose of this analysis, the term "administrative requirement" is defined in accordance with resolution A.1043(27), as an obligation arising from a mandatory IMO instrument to provide or retain information or data.

Instructions:

(A) If the answer to any of the questions below is **YES**, the Member State proposing an output should provide supporting details on whether the requirements are likely to involve start-up and/or ongoing costs. The Member State should also give a brief description of the requirement and, if possible, provide recommendations for further work, e.g. would it be possible to combine the activity with an existing requirement?

(B) If the proposal for the output does not contain such an activity, answer **NR** (Not required).

(C) For any administrative requirement, full consideration should be given to electronic means of fulfilling the requirement in order to alleviate administrative burdens.

1. Notification and reporting? Reporting certain events before or after the event has taken place, e.g. notification of voyage, statistical reporting for IMO Members	**NR** ☑	Yes □ Start-up □ Ongoing
Description of administrative requirement(s) and method of fulfilling it: (if the answer is yes)		
2. Record keeping? Keeping statutory documents up to date, e.g. records of accidents, records of cargo, records of inspections, records of education	**NR** ☑	Yes □ Start-up □ Ongoing
Description of administrative requirement(s) and method of fulfilling it: (if the answer is yes)		
3. Publication and documentation? Producing documents for third parties, e.g. warning signs, registration displays, publication of results of testing	**NR** ☑	Yes □ Start-up □ Ongoing
Description of administrative requirement(s) and method of fulfilling it: (if the answer is yes)		
4. Permits or applications? Applying for and maintaining permission to operate, e.g. certificates, classification society costs	**NR** ☑	Yes □ Start-up □ Ongoing
Description of administrative requirement(s) and method of fulfilling it: (if the answer is yes)		
5. Other identified requirements?	**NR** ☑	Yes □ Start-up □ Ongoing
Description of administrative requirement(s) and method of fulfilling it: (if the answer is yes)		

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ANNEX 3

CHECKLIST FOR CONSIDERING HUMAN ELEMENT ISSUES BY IMO BODIES

Instructions: If the answer to any of the questions below is: (A) **YES**, the preparing body should provide supporting details and/or recommendation for further work. (B) **NO**, the preparing body should make proper justification as to why human element issues were not considered. (C) **NA** (Not Applicable) – the preparing body should make proper justification as to why human element issues were not considered applicable.	
Subject being assessed: (e.g. resolution, instrument, circular being considered) *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* (resolution MEPC.291(71), as amended by resolution MEPC.313(74))	
Responsible body: (e.g. Committee, Sub-Committee, Working Group, Correspondence Group, Member State) Marine Environment Protection Committee and the PPR Sub-Committee	
1. Was the human element considered during development or amendment process related to this subject?	❑Yes ❑No ☑NA
2. Has input from seafarers or their proxies been solicited?	❑Yes ❑No ☑NA
3. Are the solutions proposed for the subject in agreement with existing instruments? (Identify instruments considered in comments section)	❑Yes ❑No ☑NA
4. Have human element solutions been made as an alternative and/or in conjunction with technical solutions?	❑Yes ❑No ☑NA
5. Has human element guidance on the application and/or implementation of the proposed solution been provided for the following:	
• Administrations?	❑Yes ❑No ☑NA
• Shipowners/managers?	❑Yes ❑No ☑NA
• Seafarers?	❑Yes ❑No ☑NA
• Surveyors?	❑Yes ❑No ☑NA
6. At some point, before final adoption, has the solution been reviewed or considered by a relevant IMO body with relevant human element expertise?	❑Yes ❑No ☑NA
7. Does the solution address safeguards to avoid single person errors?	❑Yes ❑No ☑NA
8. Does the solution address safeguards to avoid organizational errors?	❑Yes ❑No ☑NA
9. If the proposal is to be directed at seafarers, is the information in a form that can be presented to and is easily understood by the seafarer?	❑Yes ❑No ☑NA
10. Have human element experts been consulted in development of the solution?	❑Yes ❑No ☑NA
11. **HUMAN ELEMENT**: **Has the proposal been assessed against each of the factors below?**	

❑ CREWING. The number of qualified personnel required and available to safely operate, maintain, support, and provide training for system.	❑Yes ❑No ☑NA
❑ PERSONNEL. The necessary knowledge, skills, abilities, and experience levels that are needed to properly perform job tasks.	❑Yes ❑No ☑NA
❑ TRAINING. The process and tools by which personnel acquire or improve the necessary knowledge, skills, and abilities to achieve desired job/task performance.	❑Yes ❑No ☑NA
❑ OCCUPATIONAL HEALTH AND SAFETY. The management systems, programmes, procedures, policies, training, documentation, equipment, etc. to properly manage risks.	❑Yes ❑No ☑NA
❑ WORKING ENVIRONMENT. Conditions that are necessary to sustain the safety, health, and comfort of those on working on board, such as noise, vibration, lighting, climate, and other factors that affect crew endurance, fatigue, alertness and morale.	❑Yes ❑No ☑NA
❑ HUMAN SURVIVABILITY. System features that reduce the risk of illness, injury, or death in a catastrophic event such as fire, explosion, spill, collision, flooding, or intentional attack. The assessment should consider desired human performance in emergency situations for detection, response, evacuation, survival and rescue and the interface with emergency procedures, systems, facilities and equipment.	❑Yes ❑No ☑NA
❑ HUMAN FACTORS ENGINEERING. Human-system interface to be consistent with the physical, cognitive, and sensory abilities of the user population.	❑Yes ❑No ☑NA
Comments: (1) Justification if answers are NO or Not Applicable. (2) Recommendations for additional human element assessment needed. (3) Key risk management strategies employed. (4) Other comments. (5) Supporting documentation. Human element is not considered further as the proposal is to clarify existing requirements only.	