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ANY OTHER BUSINESS

Experience with the certification of engine/SCR-systems under MARPOL Annex VI

Submitted by IACS

SUMMARY

Executive summary:	This document provides information on the experience of IACS members with respect to the certification of engine/SCR-systems under MARPOL Annex VI
Strategic direction, if applicable:	1
Output:	None
Action to be taken:	Paragraph 25
Related documents:	PPR 6/19, PPR 6/19/1 and PPR 6/20

Background

1 Since the entry into force of the Tier III standard for NO_X emissions from diesel engines, which are applicable to ships built on or after 1 January 2016 operating within the North American emission control area and the United States Caribbean sea emission control area, IACS members have gained experience in certifying engines equipped with Selective Catalytic Reduction (SCR) systems on behalf of Member States, and in applying the SCR Guidelines (resolutions MEPC.291(71) or MEPC.198(62)).

2 Norway and EUROMOT, in documents PPR 6/19 and PPR 6/19/1 respectively, provided information on their experience and views on emissions from engines fitted with SCR systems.

3 Having considered documents PPR 6/19 and PPR 6/19/1, the Sub-Committee invited Member States and international organizations to report their experiences with the operation of engine/SCR-systems certified under MARPOL Annex VI under the agenda item on "Any other business" (document PPR 6/20, paragraph 19.3).

4 In response to the above invitation, IACS provides the following comments and observations based on the experiences of its members with the certification of engine/SCR systems.

Discussion

Single applicant

5 In accordance with paragraph 2.2.5 of the 2008 NO_X Technical Code (2008 NTC), when a NO_X reducing device is to be included within the Engine International Air Pollution Prevention (EIAPP) certification it is to be recognized as a component of the engine. Also, as per the *2017 Guidelines addressing additional aspects to 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)) (SCR Guidelines), the applicant for certification is the entity responsible for the complete engine system fitted with the SCR.

6 However, there are cases where an entity, which is separate from the engine manufacturer, may incorporate an SCR in an engine previously certified as compliant to the Tier I or Tier II standards. In this context, there are difficulties in applying the 'single applicant' approach when the engine and SCR are from different manufacturers. The main difficulties regarding this issue are:

.1 As the SCR system is to be considered as a component of the engine, a separate certification of the engine and the SCR system is not possible. Therefore, the applicant has to apply for a certification comprising of one certificate, covering both Tier II and Tier III limit values, as well as of one Technical File, covering both the engine and the SCR system.

.2 Takeover of responsibility with respect to the approved engine settings and components to achieve a correct engine performance by an applicant that is not the engine manufacturer.

.3 Use of the content of the original Tier II Technical File for the new combined Tier II and Tier III Technical File by an applicant that is not the engine manufacturer (noting the intellectual property of the engine manufacturer).

.4 In the context of an engine group or family, how to ensure an effective control of the Conformity of Production for the engine and SCR system by an applicant that is not the engine manufacturer, especially with respect to approved drawings of components and/or spare part delivery for the engine.

.5 Regarding the Form of the EIAPP Certificate (see paragraph 2.2.10 of the 2008 NTC), there is no specific item to input SCR related information in cases when the SCR is fitted with an engine. Normally it's difficult to find whether the engine is fitted, or not fitted, with an SCR without referring to the approved NO_X Technical File.

7 IACS members have encountered particular difficulties with regard to the single applicant certification issues discussed above in the application of SCR retrofits to existing engines. Furthermore, there may be a need to amend the allowable engine backpressures, as defined in the Technical File, and/or apply changes to the approved turbocharger components for the purposes of turbocharger re-matching, or changes to other relevant engine settings.

8 IACS members are experienced in considering amendments to established engine

groups, families and Technical Files in accordance with MARPOL Annex VI and the 2008 NTC. However, as highlighted in the comments above, the particular issue of intellectual property, expertise regarding the base engine components, and what measures may be required to demonstrate the effect on NO_X emissions of any changes in engine settings or performance (as a result of the installation of the SCR equipment) remain challenges in terms of facilitating consistent implementation of the SCR-related provisions.

SCR spot check

9 Appendix VII.2 of the 2008 NTC, regarding application of the parameter check method to SCR systems, indicates that optional NO_X measurement (periodical spot checks or monitoring) for engines fitted with SCRs without feedback control is "useful" to show that the SCR efficiency still corresponds to the state at the time of certification.

10 Further guidance on factors related to the deterioration rate of SCR performance and SCR monitoring or spot checks is given in paragraph 3.2.8 of the SCR Guidelines (resolution MEPC.291(71)). Specifically, paragraph 3.2.8.2.3 of the SCR Guidelines states that the spot check frequency, in instances when a feed forward reductant control strategy is adopted without a NO_X measurement device, are to be "defined by the applicant" and should be undertaken "at least after installation and once every 12 months". These provisions are applicable regardless of whether Scheme A or Scheme B of the SCR Guidelines is applied.

11 IACS members note that, in general, the requirements and procedures for spot checks are not well described and are, in places, contradictory.

12 IACS understands that the deterioration of SCR efficiency varies significantly between SCR designs as well as the operating conditions, including time in service, fuel type, fuel sulphur content, reductant control, exhaust temperature, etc. Accordingly, experience in estimating catalyst life in marine applications is still limited.

13 IACS members have experienced a number of difficulties with application of these provisions and in determining what are considered acceptable NO_X measurement and spot check arrangements. The main difficulties regarding this issue are:

.1 Experience shows that some applicants for certification do not have a clear understanding whether their SCR system has a feed forward or feedback control system. As this has a direct impact on the Technical File content, NO_X measurement equipment available onboard and the Onboard NO_X Verification Procedure (OBNVP), clear guidance would facilitate consistent application of the relevant provisions.

.2 It is unclear why a spot check needs to be undertaken at the initial survey when the catalyst is new and the intent of the spot check requirement is to confirm catalyst through life efficiency. IACS members understand that the spot check should be undertaken once every 12 months after entry into service.

.3 IACS members understand that, in the absence of direct measurement and monitoring systems meeting the requirements of Appendix III of the 2008 NTC, portable equipment provided for the use of the crew would be typical. Alternatively, an operator may contract a third party to undertake these measurements. For the sake of practicality of performance spot checks, it may be appropriate to consider the acceptability of other NO_X measurement principles than Chemiluminescent Detectors (CLD).

.4 While paragraph 3.2.8.2.3 of the SCR Guidelines indicates that "records are to be kept for inspection during annual, intermediate and renewal surveys", which implies that the spot check measurements do not need to be witnessed by the attending surveyor responsible for survey under Annex VI, IACS members find that there is confusion on this issue within the industry. IACS members understand that the SCR spot check would not need to be witnessed by a surveyor. It is frequently done while the ship is in service and prior to initiation of the appropriate statutory survey. The surveyor will examine the records and, if satisfied, undertake the survey. If the measurements are carried out by installed equipment, at the surveyor's discretion, equipment and calibration records may be verified; while, if the checking is done by a third party, a review of the third-party report would be undertaken by the surveyor.

.5 IACS members understand that the "NO_X monitoring", as referred to in the parameter check of SCR systems, refers to the collection of data from installed NO_X emissions monitoring systems, NO_X control sensors or spot checks, as may be proposed by the applicant. However, industry would benefit from guidance on what are considered acceptable arrangements and what data is required to be collected to confirm SCR efficiency. Such guidance could include:

.1 frequency of measurements, load points (range) to be monitored, compliance criteria (allowable events of exceeding the NO_X limit value), reporting of monitoring results, generating alarms, etc.;

.2 NO_X measurement methods and devices that may be accepted (in particular, requirements for the acceptance of other measurement principles than CLD); and

.3 clarification that the allowable range of any readings or values, which determine the degradation-based exchange criteria of SCR material, shall not lead to an exceedance of the applicable emission limits.

14 Taking account of the above comments regarding spot checks and NO_X measurements, and in view of the difficulties with applying the parameter check method to SCR systems in general, the Sub-Committee is invited to consider a way of validating SCR in-service compliance.

Auxiliary control devices

15 Auxiliary Control Devices (ACDs) are referenced in regulation 13.9 and defined in regulation 2.4 of MARPOL Annex VI as an "a system, function or control strategy installed on a marine diesel engine that is used to protect the engine and/or its ancillary equipment against operating conditions that could result in damage or failure, or that is used to facilitate the starting of the engine. An auxiliary control device may also be a strategy or measure that has been satisfactorily demonstrated not to be a defeat device".

16 IACS notes that the *Guidance on the application of regulation 13 of MARPOL Annex VI Tier III requirements to dual fuel and gas-fuelled engines* (MEPC.1/Circ.854) provides guidance on the application of regulation 13 of MARPOL Annex VI to dual fuel and gas-fuelled engines. In particular, paragraph 9 of the Annex to the circular indicates that ACDs can cover engine situations, such as starting and stopping, low load operation

and manoeuvring and reversing operation. These ACDs should be disclosed at the time of engine Tier III certification and denoted in the engine's NO_X Technical File.

17 IACS considers that a similar circular to MEPC.1/Circ.854 (or amendment of MARPOL Annex VI, the 2008 NTC and/or the SCR Guidelines as appropriate) for exhaust emission control devices and systems, such as SCR and Exhaust Gas Recirculation (EGR) systems, would facilitate consistent implementation of regulation 13 of MARPOL Annex VI. In particular, requirements or guidelines could be developed that address under what conditions (e.g. engine load, ambient conditions, operational ranges) an ACD is, or is not, permitted.

Urea storage and handling

18 The Sub-Committee is invited to note that an international standard for marine urea NO_X reduction agent (AUS 40) was published by ISO in 2014 (ISO 18611-3:2014), which addresses quality requirements, test methods and, under Part 3, handling, transportation and storage issues. Part 3 of the standard indicates that an ambient storage temperature above 35 to 40°C, which can be the case in propulsion machinery spaces, can degrade the shelf life of the reductant.

19 The Sub-Committee is also invited to note that IACS first published its Unified Requirement (UR) M77 on "Storage and use of SCR reductants" in September 2016. This UR has recently been updated by Rev.1, which is applicable from 1 January 2021.

20 IACS suggests that the Sub-Committee notes these references and encourages Members States, ship designers, shipyards, operators, owners and other stakeholders to consider referring to, and using, these texts to facilitate consistent design, arrangements and practices for the handling, transport, storage and use of SCR reductants.

Soot blowing

21 Many marine SCR system designs incorporate equipment to undertake routine cleaning of the SCR catalysts by the use of compressed air soot blowing systems. IACS members have received a number of enquiries requesting clarification that the soot blowing process can be considered as an essential preventative maintenance activity for which the blown soot is considered as "other similar discharge essential to the operation of a ship". IACS understands that a similar understanding has previously been reached within the Organization regarding boiler/economizer blowdown maintenance.

Engine group/Engine family criteria

22 For engine family/groups equipped with SCR systems, IACS members have observed a tendency that manufacturers try to include a wide range of variations regarding the SCR system into one engine family or group. Examples are:

.1 feed forward and feedback control strategy;

.2 optional NO_X monitoring or different systems and sensors for monitoring and/or control;

.3 different types of catalyst blocks to cope with different fuel types;

.4 different shapes of SCR chamber casings; and

.5 optional choice of an SCR bypass arrangement.

23 Accordingly, IACS members consider that additional SCR related criteria for the selection of an engine family (paragraph 4.3.8.2 of the 2008 NTC) and/or engine group (paragraph 4.4.6.2 of the 2008 NTC) could be developed to facilitate consistent implementation.

Onboard confirmation test (Scheme B)

24 Paragraph 7.3 of the SCR Guidelines states that tests should be conducted at 25%, 50% and 75% load irrespective of the test cycle. However, there is no provision that tests be conducted in accordance with each test cycle. Accordingly, IACS members consider that if the engine is included in a group to which multiple test cycles are applied, it is unclear whether separate on-board confirmation tests due to different cycles are required.

Action requested of the Sub-Committee

25 The Sub-Committee is invited to consider the foregoing information and comments, and take action as appropriate.