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REDUCTION OF GHG EMISSIONS FROM SHIPS

Interpretation of regulation 18.3 of MARPOL Annex VI, related to biofuels

Submitted by IACS

SUMMARY

Executive summary:	This document proposes a draft unified interpretation of regulation 18.3 of MARPOL Annex VI, related to the use of biofuels
Strategic direction, if applicable:	3
Output:	3.2
Action to be taken:	Paragraph 22
Related documents:	MEPC 70/7/2 and MEPC 70/18

Introduction

1 MARPOL Annex VI and the NO_X Technical Code 2008 (NTC), both as amended, provide regulations for the prevention of air pollution from ships and mandatory procedures for the testing, survey and certification of marine diesel engines to ensure they comply with the relevant limiting emission values of NO_X, as specified in regulation 13 of MARPOL Annex VI.

2 MARPOL Annex VI regulation 18 provides requirements for Administrations, fuel suppliers and owners/operators regarding fuel oil availability and quality. Regulation 18.3.2 of MARPOL Annex VI sets requirements for fuel oil derived by methods other than petroleum refining and regulation 18.3.2.2 of MARPOL Annex VI requires that such fuels shall not "… cause an engine to exceed the applicable NO_X emission limit…".

3 IACS notes that concerns with the application of regulation 18.3.2.2 of MARPOL Annex VI were previously raised by IMarEST in their document MEPC 70/7/2. The document highlighted the problems with regulation 18.3.1 of MARPOL Annex VI being applicable to fuel oils derived from petroleum refining and regulation 18.3.2 of MARPOL Annex VI being applicable to fuel oils derived from methods other than petroleum refining. While some biofuels, as currently offered to the marine market, are 100% bio derived, many of these fuels are blends of varying ratios of distillate or residual products from petroleum refining with used cooking oils or other bio derived materials, such as fatty-acid-methyl-esters (FAME) or fatty-acid-ethyl-esters (FAEE), and with a potentially wide range of possible blends.

Therefore, such biofuels do not fit squarely within either of the existing regulations. The paper highlighted the problems of a regulation, that is primarily applicable to the fuel supplier, being responsible for asserting the effects on NO_X compliance by the ship operators use of such biofuels and the difficulties with validating that impact on the original NO_X certification process applied by the engine designer. The paper proposed extending the scope of regulation 18.3.1 of MARPOL Annex VI to cover all fuel oils, irrespective of source material, and the deletion of regulation 18.3.2 of MARPOL Annex VI.

4 Further, the Committee "noted" the proposal from IMarEST and invited Member Governments and international organizations to submit relevant proposals for a new output (MEPC 70/18, paragraph 7.7); however, IACS notes that to date no such proposal has been made. The Committee also noted the information provided by the ISO of an ongoing revision of ISO 8217:2012 related to specifications of marine fuels to include synthetic and renewable fuels. However, this referenced revision of the ISO marine fuel standard (ISO 8217:2017) did not cover the wide scope of biofuels now offered to the marine market, which may include up to 100% biofuel, and only sets specifications for distillate fuels containing up to 7.0% FAME).

5 IACS members are now seeing increased interest in marine biofuels, which cover a wide range of potential sources in addition to FAME, such as straight vegetable oils (SVO), hydrotreated vegetable oils (HVO), glycerol or biomass to liquid (BTL) products, and which can play a significant role in reducing marine fossil derived GHG, SO_X, HC and particulate emissions. While many studies show increased NO_X emissions with the application of biofuels (albeit many of those studies relate to non-marine diesel engines), in this regard, IMO should ensure that existing relevant instruments do not represent a barrier to the development of these new solutions. At the same time, these solutions need to comply with the requirements of the conventions, in particular regarding safety and environmental protection. Therefore, IACS members have identified the need to clarify the application of MARPOL Annex VI and the NTC for biofuels and biofuel blends.

Background and discussion

6 IACS notes that much of the NTC is from the ISO 8178 series of standards, *Reciprocating internal combustion engines – Exhaust emission measurement*, in particular the following parts with the latest revisions from ISO are shown as follows: ISO 8178-1:2020, ISO 8178-4:2020, ISO 8178-5:2015, ISO 8178-6:2018, ISO 8178-7:2015 and ISO 8178-8:2015.

7 As required by regulation 13.9 of MARPOL Annex VI, the NTC shall be used for the reference testing and certification of all marine diesel engines subject to the requirements of regulation 13 of MARPOL Annex VI. The NTC sets the application of specific test cycles from which the NO_X emission value is to be determined in accordance with the provisions of Chapter 5 of the NTC. As part of those provisions for the purposes of certifying the NO_X emissions from an Engine Group/Family, paragraph 5.3.2 of the NTC requires that the parent engine test is undertaken on a DM-grade (distillate) marine fuel in accordance with ISO 8217:2005, if a suitable reference fuel is not available. Furthermore, if a DM-grade is not available, the parent engine emissions testing shall be undertaken on an RM-grade (residual) fuel oil. In all cases, the fuel oil used during the parent engine test is sampled and analysed for use in the calculation of the NO_X emissions. IACS members report that the vast majority of NO_X emission certification measurements are undertaken on DM-grade fuels to ISO 8217.

8 IACS understands that parent engine emissions testing on either DM or RM grade fuels to ISO 8217, *Petroleum Products – Fuels (Class F) – Specifications of Marine Fuels,* validates Engine Group/Family for application on all ISO 8217 fuels for which the engine may

be designed, or is capable, to operate on, even though operation on ISO 8217 specification fuels in service is not mandated. Generally, most biofuels and biofuel blends can be used in NO_X certified marine diesel engines without any changes to the NO_X critical components or settings/operating value limits as given in the engine's approved Technical File. If adjustments to settings are required, these would usually be covered by the flexibility already provided for by the Engine Family/Engine Group concepts in the NTC. The Engine Family concept allows minor adjustments through adjustable features (see paragraph 4.3.6 of the NTC), however in the case of RM-grade fuels, these may typically be applied by engines under the Engine Group concept, where minor adjustments or modifications are allowed after pre-certification or final test bed measurement (paragraph 4.4.7.1 of the NTC) and in particular for onboard adjustments of "…injection timing for compensation of fuel property differences…" (as per example in paragraph 4.4.7.2 of the NTC).

9 As from the outset of the NO_X certification requirements of MARPOL Annex VI, IACS therefore concludes that the certification of engines in accordance with the NTC to the NO_X limits of regulation 13 of MARPOL Annex VI, is applicable to all fuels derived from (or largely from) petroleum products and that are specified in accordance with ISO 8217 and for which the engine is designed, or is capable, to operate on. While based on the steady state, reference testing at test-bed regime, MARPOL Annex VI and the NTC certification regime effectively accepts that the in-service NO_X emissions may vary by a margin depending on the particular fuel grade, properties, ignition quality and fuel bound nitrogen content. This understanding is confirmed by the requirements for application of the simplified measurement method in paragraph 6.3.11.2 of the NTC, where an allowance of 10% may be granted for an onboard test run carried out on an RM-grade fuel to ISO 8217, which would typically have a higher fuel bound nitrogen content. It is noted that this RM-grade allowance is applicable only when the simplified measurement method is not being applied for pre-certification testing on board.

10 However, where the fuel oil to be operated on is derived by methods other than petroleum refining, there is the additional requirement given by regulation 18.3.2.2 of MARPOL Annex VI that the NO_X emission value is not to exceed the applicable limit value. Consequently, this imposes a tighter restriction on a fuel oil derived by methods other than petroleum refining in that the NO_X emission value when operating on that fuel oil is not to exceed the regulation 13 of MARPOL Annex VI limit value, whereas for a petroleum derived fuel oil, the emission value is determined on the basis of a distillate (DM) type fuel oil irrespective of the grade and characteristics, ignition quality or fuel bound nitrogen content as used over the service life of that engine.

11 IACS notes that the ISO 8217:2005 marine fuel standard was amended three times since the 2008 MARPOL Annex VI and NTC amendments, in 2010, 2012 and 2017. Notably the latest ISO 8217:2017 standard introduced biofuel specification categories for distillate marine fuels that include up to 7% FAME products, namely grades DFA, DFZ and DFB.

12 Considering paragraphs 7 to 11 above, IACS understands that fuels complying with the ISO 8217:2005, 2010, 2012 or 2017 standards, including the FAME products, are the acceptable fuel specifications to be used at the parent engine NO_X emissions test, albeit the NTC regulation as written requires testing on an ISO 8217:2005 fuel, or verification of the actual parent engine test fuel to that standard. IACS seeks the Committee's confirmation on this understanding and direction on the need for amendment, or otherwise, of the referenced ISO 8217 standard in paragraph 5.3.2 of NTC.

13 Further to the permittable engine adjustments for fuel quality detailed under paragraph 8 above, engines certified under the Engine Family/Group concept may have sufficient flexibility in the allowable adjustments to enable operation on biofuels with higher concentrations of FAME than specified by the ISO 8217:2017 standard, or biofuels containing

other bio-products or concentrations, and while still keeping engine parameters within the bounds of the approved technical file; so called "drop-in" fuels. For example, the technical file may be based on limiting values of maximum firing pressure (Pmax), which is linked to peak combustion temperatures and hence NO_X formation. It is likely that where such engines using biofuels, or biofuel blends, are operating within the approved bounds of the NO_X Technical File, the impact on NO_X emissions may be small, and may be considered to be within the operational allowances of MARPOL Annex VI and the NTC framework, as outlined in paragraphs 7 to 9 above.

14 IACS notes that regulation 3.2 of MARPOL Annex VI states requirements for undertaking "trials for ship emission reduction and control technology research". While this regulation is intended to provide exemption to "…the minimum number of ships…", this does provide a means for owners/operators and flag Administrations to gather NO_X emissions data from the real-world application of biofuels to those particular marine diesel engines. There are of course many challenges to obtaining accurate emissions, ambient and engine parameters on board, however data collected under regulation 3.2 of MARPOL Annex VI would at least provide some evidence on the impact of NO_X emissions of specified biofuels on those specific engines within the approved Engine Family or Engine Group.

15 IACS notes that regulation 4.1 of MARPOL Annex VI provides the general route for a flag Administration to allow "…alternative fuel oils…" to be used on board as an "equivalent". Given that nowhere in MARPOL Annex VI is the use of only petroleum derived fuel oils mandated, and the breadth of the definition of the term "fuel oil" as given by regulation 2.9 of MARPOL Annex VI, it is not clear to IACS what "…alternative fuel oils…" is intended to cover. IACS understands application of regulation 4.1 of MARPOL Annex VI has been considered for biofuels, albeit "equivalent" to which MARPOL Annex VI requirement is unclear. Where applied, regulation 4.3 of MARPOL Annex VI requires the Administration to take into account any relevant guidelines developed by IMO, however such guidelines are not available. The obligation under regulation 4.4 of MARPOL Annex VI that an Administration shall endeavour to ensure that such "equivalents" do not "…damage its environment, human health, property or resources or those of other states", suggests that the impact on NO_X emissions of using such alternative fuel oils would need to be quantified by measurement, either on board or by representative testing at testbed. IACS notes that the development of specific guidelines to facilitate uniform application of regulation 4 of MARPOL Annex VI "equivalent" for "… alternative fuel oils …" and/or biofuels, would facilitate application of this regulation.

16 In considering the above discussed topics, IACS recognizes that the longer-term approach to resolve the issues with application of MARPOL Annex VI and NTC with respect to biofuels may be best resolved by amendment of the statutory instruments, and the proposal of document MEPC 70/7/2 provides a simple solution to that, albeit lacking concrete supporting NO_X emissions data of the impact of such fuels used in marine diesel engines. Furthermore, the time taken to develop and approve such amendments as new outputs and subsequent amendments to the statutory instruments does not support the immediate climate ambitions of the Organization and application of biofuels that may provide immediate support to that ambition. Therefore, IACS seeks direction from the Committee on the need, and process, for amendments to MARPOL Annex VI and the NTC.

17 Also, in meeting shipping's interest in using biofuels and biofuel blends, and notwithstanding the provisions and uncertainties of regulations 3 and 4 of MARPOL Annex VI "exemption" and "equivalent" routes to applying biofuels in paragraphs 14 and 15 above, IACS considers that there is an urgent need, and benefit, in developing a unified interpretation to regulation 18.3 of MARPOL Annex VI in general and specifically to its paragraph 18.3.2.2, to facilitate harmonized application of MARPOL Annex VI and the NTC with respect to the potential impacts on regulation 13 of MARPOL Annex VI NO_X emissions of using biofuels.

Proposal

18 To address the above points, IACS proposes the following unified interpretation. This interpretation seeks to provide a pragmatic and effective solution that can support the ongoing take up of marine biofuels without providing unnecessary regulatory hurdles, but is also consistent with the above referenced and established certification principles, and in service allowances, of the existing statutory instruments.

"Unified interpretation on regulation 18.3 of MARPOL Annex VI

For application of regulation 18.3 of MARPOL Annex VI, it should be interpreted that:

(a) a fuel oil which is a blend of not more than [30%] by volume of biofuel should meet the requirements of regulation 18.3.1 of MARPOL Annex VI. A fuel oil which is a blend of more than [30%] by volume of biofuel should meet the requirements of regulation 18.3.2 of MARPOL Annex VI. For the purposes of this interpretation, a biofuel is a fuel oil which is derived from biomass and hence includes, but is not limited to, processed used cooking oils, fatty-acid-methyl-esters (FAME) or fatty-acid-ethyl-esters (FAEE), straight vegetable oils (SVO), hydrotreated vegetable oils (HVO), glycerol or other biomass to liquid (BTL) type products. The Product Name, as entered onto the bunker delivery note, should be of sufficient detail to identify whether, and to what extent, a biofuel is blended into the product as supplied.

For application of regulation 18.3.2.2 of MARPOL Annex VI, it should be interpreted that:

(b) a marine diesel engine certified in accordance with the requirements of regulation 13 of MARPOL Annex VI, which can operate on a biofuel or a biofuel blend without changes to its NO_X critical components or settings/operating values outside those as given by that engine's approved Technical File, should be permitted to use such a fuel oil without having to undertake the assessment as given by regulation 18.3.2.2 of MARPOL Annex VI. For the purposes of this interpretation, parent engine emissions tests undertaken on DM or RM grade fuels to the ISO 8217:2005 standard, as required by paragraph 5.3.2 of the NO_X Technical Code, should be valid for all DM or RM grade fuels used in operation, or that the engine may be designed for, or capable of operation on, including those meeting the ISO 8217 standards superseding ISO 8217:2005;

(c) where fuel oils are derived from methods other than petroleum refining, or fuel oil which is a blend of more than [30%] by volume of biofuel and does not fall under (b) of this unified interpretation, or other fuels required to undertake the assessment as given by regulation 18.3.2.2 of MARPOL Annex VI and for which have not been specifically certified in accordance with the regulation 13 limits at test bed for that specific fuel and Engine Group/Family, the following is interpreted as an acceptable route to demonstrate compliance with regulation 18.3.2.2:

(i) the ship's IAPP Certificate may continue to be issued where the overall NO_X emissions performance has been verified to not cause the specified engine to exceed the applicable NO_X emissions limit when burning said fuels using the onboard simplified measurement method in accordance with 6.3 of the NTC 2008, or the direct measurement and monitoring method in accordance with 6.4 of the

NTC 2008, or by reference to relevant test-bed testing. For the purposes of this interpretation and demonstration of compliance with regulation 18.3.2.2 of MARPOL Annex VI, and as applicable to possible deviations when undertaking measurements on board, an allowance of 10% of the applicable limit may be accepted."

19 This draft unified interpretation proposes criteria, which, in the case of a biofuel blend, would be used to determine as to whether regulations 18.3.1 or 18.3.2 of MARPOL Annex VI, and all that then follows, applies. The criterion proposed is 30% by volume, if at or below that value then regulation 18.3.1 of MARPOL Annex VI would apply, if in excess of that value then regulation 18.3.2 of MARPOL Annex VI would apply. This value has been selected based on the indications to date that blends so limited tend not to have a significant impact on NO_X emissions and is in the mid-range of the biofuel blends currently generally available (refer to paragraph (a) of the draft unified interpretation).

20 With reference to paragraphs 12 and 13 above, IACS proposes that a marine diesel engine certified in accordance with the requirements of regulation 13 of MARPOL Annex VI, which can operate on a biofuel or a biofuel blend without changes to its NO_X critical components or settings/operating values outside those as given by that engine's approved Technical File should be permitted to use such a fuel oil without having to undertake the assessment as given by regulation 18.3.2.2 of MARPOL Annex VI, and affirms that Parent Engine emissions tests undertaken on DM or RM grade fuels to the ISO 8217:2005 standard, and as superseded, are valid for all DM or RM grade fuels in operation that the engine may be designed, or is capable, of operating on without being required to repeat the NO_X emissions certification testing or further NO_X emissions validation testing under regulation 18.3.2 of MARPOL Annex VI (please refer to paragraph (b) of the draft unified interpretation).

21 Furthermore, IACS proposes that, where fuel oils are derived from methods other than petroleum refining, or fuel oil which is a blend of more than 30% by volume of biofuel and does not fall under (b) of the draft unified interpretation, or as applicable to other fuels required to undertake the assessment as given by regulation 18.3.2.2 of MARPOL Annex VI and for which have not been specifically certified in accordance with the limits of regulation 13 of MARPOL Annex VI at test bed for that specific fuel and Engine Group/Family, an acceptable route to demonstrate compliance with regulation 18.3.2.2 of MARPOL Annex VI is that the ship's IAPP Certificate may continue to be issued where the overall NO_X emissions performance has been verified to not cause the specified engine to exceed the applicable NO_X emissions limit when burning said fuels using the onboard simplified measurement method in accordance with section 6.3 of the NTC, or the direct measurement and monitoring method in accordance with section 6.4 of the NTC, or by reference to relevant test-bed testing. As applicable to possible deviations when undertaking measurements on board, an allowance of 10% of the applicable limit is proposed (please refer to paragraph (c) of the draft unified interpretation).

Action requested of the Committee

22 The Committee is invited to consider the information provided in this document, in particular the issues raised in paragraph 12 (confirmation of understanding of ISO 8217 and possible need to amend paragraph 5.3.2 of the NTC), paragraph 16 (possible need to amend MARPOL Annex VI and the NTC with respect to the use of biofuels) and paragraph 18 (draft unified interpretation of regulation 18.3 of MARPOL Annex VI), and to take action as appropriate.