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## Alternative to the IMO MARPOL Annex VI Tier III Standard Engine

Notice to all Shipowners, Certifying Authorities, Shipbuilders, Ship repairers, Ship Masters and Surveyors

This notice should be read in conjunction with IMO MARPOL Annex VI, the Merchant Shipping (Prevention of Air Pollution from Ships) Regulations 2008, the EU Non-Road Mobile Machinery Regulation 2016/1628, the Non-Road Mobile Machinery (Type-Approval and Emission of Gaseous and Particulate Pollutants) Regulations 2018 and MGN 646 (M+F) - Engine Emission Standards Applicable to Inland Waterway Vessels.

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### Summary

This Marine Guidance Notice provides guidance concerning the choice of an alternative engine in the event the owner or operator is not able to purchase an IMO MARPOL Annex VI Tier III standard engine.

#### 1. Introduction

1.1 In accordance with MARPOL Annex VI, ships which operate in IMO designed NOx Emission Control Areas are required to have an engine which meets the IMO MARPOL Annex VI Tier III standard. In this Note an IMO MARPOL Annex VI Tier III standard engine is referred as an IMO engine. The IMO standard is implemented by the Merchant Shipping (Prevention of Air Pollution from Ships) Regulations 2008 (“the 2008 Regulations”).



1.2 The Stage V engine is certified in accordance with EU Non-Road Mobile Machinery Regulation 2016/1628 (“the NRMM Regulation”) which is implemented in the UK by the Non-Road Mobile Machinery (Type-Approval and Emission of Gaseous and Particulate Pollutants) Regulations 2018 (SI 2018/764). (“the 2018 Regulations”).

1.3 This Marine Guidance Notice compares these two engine types, explores technical equivalence between them and concludes on an alternative application under Regulation 4 (Equivalents) of the 2008 Regulations:

*4. The Secretary of State may permit any fitting, material, appliance or apparatus to be fitted in a ship as an alternative to that required by these Regulations if that fitting, material, appliance or apparatus is at least as effective as that required by these Regulations.*

1.4 Other than in relation to Regulation 4 of the 2008 Regulations, this guidance is not intended to alter the existing regulatory framework and requirements.

## **2 Equivalence discussion: Emission control parameters, technical specification and survey and inspection regime**

2.1 **Emission Control Parameters** - Stage V applies to engines  $\geq 19$  kW for controlling NO<sub>x</sub>, THC, CO and PM emissions<sup>1</sup>. It additionally controls PN (particulate number) emissions for engine  $\geq 300$  kW (such as for Euro VI trucks). IMO Tier III applies to engines  $> 130$  kW for controlling NO<sub>x</sub> emissions. The level of NO<sub>x</sub> emissions for Stage V and IMO engine  $> 130$  kW are approximately similar.

2.2 **Technical Specification** - Stage V engines are certified in accordance with the NRMM Regulation. The IMO engine is certified in accordance with IMO NO<sub>x</sub> Technical Code 2008 as amended and is required to have a valid Engine International Air Pollution Prevention (EIAPP) Certificate.

2.3 **Survey and Inspection**- The Stage V engine testing and certification requirements are designed to ensure that the engine is in compliance when placed on the market and should remain so for its useful life. There are no periodical inspection requirements mandated by the NRMM Regulation.

.1 A Stage V engine is subject to survey and inspection for engine rating power from 19 kW upwards when installed in a vessel with an EU inland navigation certificate. An IMO engine is subject to survey  $>130$  kW rating power.

.2 A Stage V engine is subject to periodical inspection in accordance with Directive (EU) 2016/1629 (Inland Waterway Directive) and the corresponding European Standard laying down Technical Requirements for Inland Navigation Vessels (“ES-TRIN standards”) when installed in a vessel with an EU inland navigation

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<sup>1</sup> Nitrogen dioxide, total hydrocarbon, carbon monoxide and particulate matter



certificate. A periodical inspection does not apply to Stage V engines installed in vessels operating solely in UK waters because the UK does not apply the ES-TRIN standards to those vessels. IMO engine is subject to periodical survey in accordance with Engine International Air Pollution Prevention (IAPP) Certificate's requirements.

### 3 Additional Information

3.1 Stage V does not necessitate any after-treatment to meet emission limits when the engine power is less than 130 kW. However, Stage V limits for engines from 130 kW to less than 300 kW effectively requires NOx reducing SCR<sup>2</sup> after-treatment, and for engines greater than or equal to 300 kW the limits effectively requires both SCR and particle filters to reduce PM/PN<sup>3</sup> emissions, as part of the after-treatment. To meet IMO Tier III standards, engines of > 130 kW are effectively required to install NOx reducing SCR after treatment equipment.

3.2 A Stage V engine is subject to a more stringent certification procedure than the IMO engine. For example:

.1 emissions must be maintained within 2X the limit when tested at a specific engine speed and load within a defined control area;

.2 there are strict requirements on the base engine emissions control strategy and auxiliary emission control strategy; and

.3 there are anti-tampering requirements.

3.3 Fuel distributors are required to supply only ultra-low sulphur non-road gas oil (max 10 mg/kg = 0.001% sulphur) for use in inland waterway vessels which do not normally operate at sea in accordance with the Motor Fuel (Composition and Content) Regulations 1999 (SI 2010/3035)<sup>4</sup>. Stage V engines and their after-treatment systems can be damaged if operated on fuel with more than 0.001% sulphur. Ships that installed an IMO engine operating domestically from tidal Category C and outward to sea might use fuel up to either 0.10% to 0.50% (could be heavy oil based) sulphur content depending on the area the ship is operating but not in Category A, B and non-tidal C waters.

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<sup>2</sup> Selective Catalytic Reduction

<sup>3</sup> Particle Mass / Particle Number

<sup>4</sup> SI 1999/3017, regulation 5B was inserted by regulation 7 of Motor Fuel (Composition and Content) and Merchant Shipping (Prevention of Air Pollution from Ships) (Amendment) Regulations 2010 (SI 2010/3035)



3.4 Whilst the core engine is the same size for both Stage V and IMO Tier III, the after-treatment size may differ. In order to tolerate the sulphur content in sea-going fuel, the NO<sub>x</sub> reducing SCR after-treatment of an IMO engine may be larger than the NO<sub>x</sub> reducing SCR after-treatment of a Stage V engine, for the same level of NO<sub>x</sub> emissions reduction. However, Stage V engines greater than or equal to 300 kW require particle filters as part of the after-treatment to reduce PM and PN emissions. The chemistry used for these filters can only operate with ultra-low sulphur fuel.

3.5 Inland waterway engines are not designed for the same range of engine power used by seagoing ships. Consequently, they will only be available for a limited range of engine power. The availability of suitable engines in the market at the present time is very limited.

3.6 Engine suppliers and installers are currently required by UK law, under the NRMM Regulation to supply new engines (> 19 kW) for installation in a UK inland waterway vessel that complies with Stage V requirements, unless that engine pre-existed before Stage V commenced (specific limitations apply).

3.7 For engine powers up to 560 kW the NRMM Regulation alternatively permits the use of marinized Euro VI heavy-duty vehicles or Stage V land-based non-road (excavator, tractor, etc) engines for use in inland waterway applications due to the emission limits and test requirements for these engines being even more stringent. The same survey requirements would apply as noted in paragraph 2.3.

## 4 Summary

4.1 Stage V is more stringent with respect to the NO<sub>x</sub> emission limits than IMO Tier III (the details can be found in the NRMM Regulation, ES -TRIN and Regulation 13 of MARPOL Annex VI).

4.2 Stage V engines are subject to more emission species controls than IMO engines.

4.3 The Stage V emission test and IMO pre-certification test regime are similar.

4.4 The survey/inspection process and procedures for in service engine's performance verification requirements for Stage V (under Directive Inland Waterway Directive and the ES-TRIN standards, where applicable) and IMO engine (under the NO<sub>x</sub> Code) is similar to a great degree for meeting fit for purpose function.

4.5 It should be highlighted here that a Stage V engine installed in an inland waterway vessel operating in UK domestic waters is not subject to periodical inspection due to the UK derogation from the Inland Waterway Directive and the ES-TRIN standards (see MSN 1879 Amendment 1).



4.6 It should be noted that Stage V type approval requirements incorporate additional functions such as emissions performance diagnostics and warnings. This is to help ensure in-use functioning of the after-treatment system. These are not the requirements for IMO engine.

## **5 Conclusion on Alternative**

5.1 Based on the above discussion and under the current legislative status, in order not to lower the air pollutants emission standards, a ship that operates in UK Category tidal C, D waters and beyond D, (but for UK domestic voyages only), where the installed engine is required to be an IMO engine but the operator has problem in purchasing such an engine, a Stage V engine could be installed as alternative and must use fuel that does not exceed 0.001% sulphur content irrespective of where it operates.

5.2 It should be noted that an IMO engine is not acceptable as an alternative to a Stage V engine.

5.3 There is no periodical inspection requirement for a ship that has installed a Stage V engine as an alternative to an IMO engine.

## **6 Justification**

6.1 The Stage V engine covers a wider range of air pollutant controls and more stringent emission standards than the IMO Tier III standard.

6.2 For the same rationale as in paragraph 5.1 it can be justified not to apply vice versa.

6.3 The periodical inspection for a Stage V engine after the engine enters into service is not a mandatory requirement under current UK legislation. It is reasonable concession given the more stringent requirements of that standards.

## **7 Further information**

All the obligations in the EU legislation mentioned in this MGN which have effect in the UK prior to 1st January 2021 are retained in UK law, with any necessary modifications, after the end of the EU Exit implementation period. However, the Government, subject to the approval of Parliament, has the discretion to amend the legislation as it sees fit from 1st January 2021 onwards.



## More Information

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Published: December 2020  
Please note that all addresses and  
telephone numbers are correct at time of publishing

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