

MARPOL ANNEX VI – BIOFUELS AS MARINE FUELS

This Regulatory News provides background information and guidance for the use of biofuels for both Class and Statutory requirements.

INTRODUCTION

With new regulations aimed at reducing air pollutants and greenhouse gases (GHGs), there is increased interest in alternative fuels. Zero and low carbon fuels such as hydrogen and ammonia, and biofuels with negligible sulfur can lower particulate matter (PM), gaseous and carbon emissions. MARPOL Annex VI has dealt with the use of biofuels by fuel oil quality regulations under Regulation 18.3.2, while the [ISO standard 8217 “Petroleum products – Fuels \(class F\) – Specifications of marine fuels”](#) was modified in 2017 to widen tolerance for use of biofuels in existing and new fuel oil grades.

CLASS AND STATUTORY REQUIREMENTS

Safety – SOLAS Flash Point

Liquid biofuels, or biofuel blends, intended as “drop-in” fuels to replace conventional residual or distillate fuel oils are to meet the SOLAS requirement for a flashpoint of not less than 60°C.

Safety – ISM Requirements

The IMO International Safety Management Code (ISM Code) provides an international standard for the safe management and operation of ships and to prevent pollution. With respect to biofuels, the fuel supplier’s fuel specifications, Bunker Delivery Note (BDN), SDS sheets, equipment manufacturer’s recommendations, and industry stakeholder guidelines provide the basis for operators to undertake their ISM Code obligations. While there are some risks to equipment and operation with certain biofuels, the ‘drop-in’ nature and similarity to conventional residual or distillate fuels makes application relatively simple.

KEY NOTES

- Applicable Vessel Types: All
- Required Actions: Attention to Class and Statutory requirements
- References:
 - MARPOL Annex VI Regulation 18.3
 - Marine Vessels Rules 4-2-1
 - MEPC.1/Circ.795/Rev.6
 - MEPC.1/Circ.878
 - ISO 8217:2017

CHEMICAL COMPOSITION	FAME	HVO	DIESEL
Density at 20° C (kg/m ³)	885	780	825
Lower Heating Value (LHV) (MJ/kg)	37.1	44.1	43.1
Viscosity at 20° C (mm ² /s)	7.5	3.0 (at 40° C)	5.0
Surface Tension (N/m)	0.026	-	0.028
Cetane Number (CN)	56	80-99	40-50
Stoichiometric Air/Fuel Ratio	12.5	-	15
Oxygen Content (% vol.)	-11	0	0
Aromatics Content (% vol.)	-	0	-30
Sulfur Content (ppm)	-	0	< 3.5

Environment – MARPOL Annex VI NOx Implications

IMO fuel oil quality requirements of MARPOL Annex VI regulation 18 classify fuel oils into two main categories:

1. Regulation 18.3.1.1 addresses blends of hydrocarbons from petroleum refining,
2. Regulation 18.3.2 addresses fuel oil derived by methods other than petroleum refining.

Within the latter, Regulation 18.3.2.2 indicates that such fuel is not to cause an engine to exceed the applicable NOx emission limit. Biofuels may be considered to fall under either category since they may be a blend of bioderived product with conventional petroleum derived sources or be solely bioderived.

There have been ongoing discussions within the industry and in the IMO on how Regulation 18.3.2 should be applied to biofuels. The outcome of these discussions is a revision 6 of [MEPC.1/Circ.795 “Unified Interpretations to MARPOL Annex VI”](#) approved by the [Marine Environment Protection Committee, at its seventy-eighth session \(MEPC78\)](#) which now provides a Unified Interpretation (UI) on the application of biofuels to marine engines and, in many cases, allows the use of biofuels without the need to validate the NOx impacts.

Class Requirements

All machinery and equipment intended to consume marine fuel oils are to be designed to burn all intended fuels and meet ABS’ Class requirements. However, biofuels or “biodiesels” are still liquid fuels and therefore are not a type defining parameter (please refer to ABS [Marine Vessels Rules 4-2-1/13.5.2 and Table 4 “Type Defining Parameter”](#)) of an internal combustion engine. Furthermore, not all internal combustion engines are designed for the wide variety of residual and distillate marine fuels that are available for marine application.

The suitability of the engines to burn all marine fuels is also demonstrated through the engine designer internal testing, which forms part of the manufacturer’s MARPOL Annex VI Technical File Stage A type testing. Engine type tests (and NOx certification testing) is typically undertaken on distillate grade marine fuels, and this is acceptable for all liquid fuels, under the type defining parameters, that an engine may operate on in service.

The suitability of a particular engine design to burn biofuels should be confirmed by the engine designer, who will typically issue generic guidance or provide specific acceptance of a particular biofuel. Makers have issued service letters or operational guidelines for biofuels.

Where engines are intended for burning residual fuel oils, or other special fuel oils, which may be interpreted as applicable to biofuels, then the suitability for that is to be demonstrated during shipboard trials as per [Marine Vessels Rules 4-2-1/13.9.6](#).



GUIDANCE FOR OPERATORS

Statutory NOx:

1. **Operation on distillate biofuels containing up to 7% FAME:** The grades detailed by [ISO 8217:2017](#) – is permitted and would not require NOx recertification or any onboard NOx emissions measurements to be undertaken for engines already certified to Regulation 13.
2. **For blends between 7-30% (inclusive) biofuel:** Assessment of NOx impacts is not required under the provisions of [MEPC.1/Circ.795/Rev.6](#).
3. **For blends of more than 30% of biofuel:** If biofuel can be burnt without changes to the NOx critical components or settings, assessment of NOx impacts is also not required. Operators are to clarify whether they intend to:
 - a. undertake emissions trials under MARPOL Annex VI regulation 3.2,

- b. apply for use of the biofuel as an 'Equivalent' under Annex VI regulation 4, or
- c. apply the unified interpretation by [MEPC.1/Circ.795/Rev.6](#).

Dialogue with the flag Administration will be required for application under regulations 3.2 or 4 and further guidance on this process can be provided by the local ABS office.

Most marine 2-stroke slow speed engines and larger 4-stroke medium speed engines, which are designed for a broad range of distillate and residual marine fuels, can already accommodate a wide variation in fuel quality and have the span of NOx performance criteria associated with the engines' adjustable features defined in the NOx Technical File. These engines are likely able to burn biofuels without any changes to the NOx critical components or settings. In these cases, confirmation from the NOx Technical File compiler or engine designer is to be obtained.

Statutory Safety:

1. The owner/operator should develop an implementation plan, or similar, for the use of biofuels and change-over requirements in their Safety Management System. The plan need not be submitted for approval but may be treated as part of the ISM-SMS documentation in place. Unless detailed requirements are published by IMO, the 2020 guidance under [MEPC.1/Circ.878](#) may be used as a template for developing biofuel implementation plan.

Classification:

1. **For blends between 7-30% and blends more than 30% of biofuel**, a confirmation from the OEM should be submitted to ABS on the suitability of the engines to burn the proposed biofuels and that they have no objection and/or applicable conditions to the biofuel use. Any limitations or requirements for application on board are to be followed.
2. **For blends of more than 30% of biofuel**, specifications of the proposed biofuel(s), engines intended to run the fuels, and, as applicable, trial testing dates, are to be submitted. The fuel specification may include a lab test providing the fuel parameters demonstrating compliance with IMO's flashpoint and sulfur content requirements under SOLAS and MARPOL.
 - a. Risk assessment showing that risk control measures are in place in case of engine failure or fuel related issues. Any changes to the ship fuel oil system require submission of plans for review.
 - b. If the assessment results that the fuel is considered "special fuel", as per [MVR 4-2-1/13.9.6](#) then on board verification during trials should be undertaken; otherwise trials can be omitted at the discretion of ABS.
 - c. Upon satisfactory review of the submitted information, ABS will issue a letter indicating acceptance for Class purposes and/or the conditions/limitations to the proposed testing with copy to the responsible Survey office, and if applicable, indicating that shipboard suitability tests are to be demonstrated to an attending Surveyor.



Onboard verification:

When there is a need for demonstration of the use of a biofuel on board with ship trials, ABS Surveyors will verify the following as applicable along with any comments from ABS Engineering or the ship's Flag Administration:

1. Any changes to fuel systems or engines have been completed in accordance with the approved plans.
2. Crew are familiar with the fuels and any required fuel changeover procedures or guidance (e.g., implementation plans) are available and implemented
3. Available fuel analysis reports or BDNs, SDSs will be checked for compliance with the expected biofuel specification.
4. The satisfactory change-over and operation of the engine(s) on the biofuels.

5. Flag approval, comments and any guidance are to be obtained as appropriate.
6. The survey report shall include confirmation of the above items with applicable statement observation.

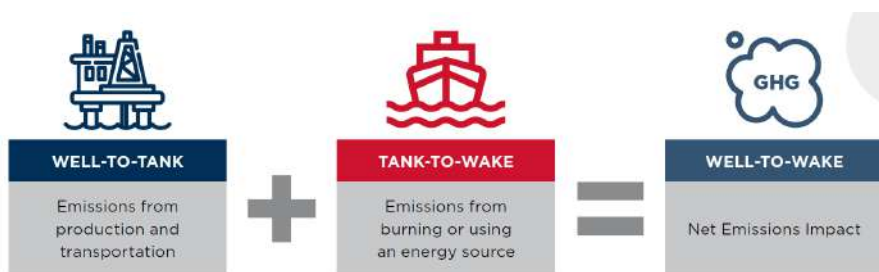
GHG EMISSION FACTORS FOR BIOFUELS

When produced from renewable biomass such as plant fibers and other materials, biofuels have the potential to offset the carbon footprint of a vessel due to the CO₂ absorption of the plant feedstock, which can help counterbalance the combustion emissions. However, the total carbon reduction potential of different biofuels clearly depends on their source feedstock, production pathways and fugitive emissions, such as GHG slip during production or transportation.

IMO DCS and Attained Carbon Intensity Indicator (CII):

Both [Resolution MEPC.346\(78\) - 2022 SEEMP Development Guidelines](#) (paragraph 7.3) and [Resolution MEPC.352\(78\) – G1 CII Guidelines](#) (paragraph 4.1) provide that in case the type of the fuel oil used is not covered by the guidelines, the carbon conversion factor should be obtained from the fuel oil supplier supported by documentary evidence.

Furthermore, the under-development draft Lifecycle GHG and Carbon Intensity Guidelines for marine fuels ([ISWG-GHG 11/2/3](#)) provide that for a fuel mix of various sources (e.g. by blending 20% biodiesel into MGO) the Source Factor (SF) should be calculated as the weighted average of the mass of the various blended stocks. Each blended stock should be accompanied with a Fuel Lifecycle Label (FLL). The SF determines if the Tank to Wake (TtW) CO₂ emissions should be accounted for in the IMO GHG inventory for international shipping (SF = 1) or not (SF = 0) and should be multiplied with the CO₂ emission factor (CF) for the specific fuel. The SF for biogenic products, under specific provisions can be zero (SF = 0).



EU MRV:

European Commission [Delegated Regulation \(EU\) 2016/2071](#) provides that appropriate emission factors shall be applied for biofuels, alternative non-fossil fuels and other fuels for which no default values are specified. Furthermore, the upcoming [FuelEU Maritime Regulation](#) also states that the emission factors of biofuels shall be determined according to the methodologies set out in Annex V, part C of the [RED II Directive 2018/2001](#) on the promotion of the use of energy from renewable sources. Regarding the TtW emissions, RED II Directive states that emissions of the fuel in use, shall be taken to be zero for biofuels and bioliquids.

Since IMO DCS and EU MRV schemes, both consider only the TtW emissions, a proposed method to calculate the applicable carbon factor for biofuels blends (based on the weighted average of the various blended stocks), may be communicated for acceptance by the EU MRV verifier and the ship's Flag Administration or R.O. Upon acceptance, the EU MRV Plan and the SEEMP Part II can be amended accordingly.

GENERAL INFORMATION

For general information on marine fuels, see the following ABS publications with links:

- [ABS Marine Fuel Oil Advisory](#)
- [ABS Whitepaper on Biofuels as a Marine Fuel](#)

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