



NorthStandard

Biofuels and FAME cargoes



CARGO

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Introduction

To meet the IMO's target of net-zero GHG emissions by 2050, shipowners are turning to biofuels as a transitional solution. Certain biofuels (like FAME - Fatty Acid Methyl Esters and HVO - Hydrotreated Vegetable Oil) can be blended with or even directly replace marine gas oil (MGO) or very low sulfur fuel oil (VLSFO) - using existing ship engines and infrastructure. However, the use of biofuels as transport fuel onboard or as cargo has introduced several challenges for mariners.

What is biofuel?

Biofuel is used as an eco-replacement for petroleum products. The most common usage is for transportation by land, aviation and shipping.

There are three distinct types of biofuel in common usage today:

1. 'Biodiesel', derived from vegetable oils or animal fats (also known as Fatty Acid Methyl Esters ('FAME') cargoes),
2. 'HVO', Hydrotreated Vegetable Oil also known as Green Diesel and
3. 'Bioethanol', produced by the fermentation of various natural sugar and starch sources.

This article will focus on FAME cargoes and the considerations for their carriage.

Biofuels and MARPOL

In the past, there has been some debate as to which MARPOL Annex biofuels would be governed by, since biofuels contain primarily petroleum products (which fall under the auspices of Annex I) but also biodiesel or bioethanol, which have more in common with the substances governed by MARPOL Annex II.

The IMO has issued guidelines on biofuels. **MSC-MEPC.2/Circ.17** contains Guidelines for the Carriage of Blends of Biofuels and MARPOL Annex I Cargoes and was approved in June 2019. This was supplemented in 2025 with interim guidance supplied within **MEPC.1/Circ.917**. These guidelines

state that for conventional bunker ships, the maximum permitted blend is 30% biofuel by volume with MARPOL Annex I cargoes (petroleum products). When carrying such blends, residues and tank washings must be discharged ashore unless the oil discharge monitoring equipment (ODME) is specifically approved for biofuel blends. Any blend above 30% biofuel falls under MARPOL Annex II and Chapter 17 of the IBC Code.

For cargo ships carrying bulk blends of biofuels and MARPOL Annex I cargoes that are not classified as conventional bunker ships, the limit is lower: they may only carry blends with up to 25% biofuel under MARPOL Annex I. Blends exceeding 25% by volume must comply with Annex II and Chapter 17 of the IBC Code.

Biofuel blends with 1% or less petroleum oil are not considered as blends and are to be shipped in accordance with MARPOL Annex II.

The physical blending on board of biofuels and MARPOL Annex I cargoes during a sea voyage to create new products is prohibited.

The certification for the biofuel blend being shipped should be in compliance with MARPOL Annex II, where appropriate. If the biofuel blend, based on its composition, is shipped in accordance with MARPOL Annex I, no certification is required.

Equipment considerations

To summarise MSC-MEPC.2/Circ.17 (2019 Guidelines on Carriage of Biofuel Blends and MARPOL Annex I Cargoes):

- Blends with $\geq 75\%$ MARPOL Annex I cargo:
- Governed by MARPOL Annex I.
- Require use of an ODME (Oil Discharge Monitoring Equipment) approved by the flag State under Regulation 31 of Annex I.
- If the blend contains $>5\%$ ethyl alcohol, vessels must also carry alcohol-resistant foam.

Blends with $>1\%$ but $<75\%$ MARPOL Annex I cargo:

- Governed by MARPOL Annex II.
- Carriage requirements determined by the IBC Code.

Blends with $\leq 1\%$ MARPOL Annex I cargo:

- Not regarded as "blends."
- Carriage falls under MARPOL Annex II only.

BLENDING ON BOARD: Physical blending of biofuels with MARPOL Annex I cargoes is prohibited at sea (SOLAS VI/5.2). Such blending is only permitted within port limits.

Biofuels and FAME cargoes (cont.)

Carriage considerations

A key issue for crews to consider when engaged in the carriage of FAME cargoes is that of water contamination. FAME cargoes are hygroscopic by nature and, as such, are extremely sensitive to contact with moisture either from physical contact or from the atmosphere. Exposure to small amounts of moisture at any point in the supply chain may result in a FAME cargo exceeding the normal commercial sales limit for moisture content, which is normally fixed at 300mg per kg.

Unlike most conventional diesels, in which any undissolved water present will generally settle out over a period of time, FAME can hold water in suspension up to relatively high levels (above 1,000 mg/kg).

In addition to exceeding the commercial moisture specifications, too much moisture may cause several other negative effects, for example:

- undesirable microbiological growth;
- the formation of fatty acids which may result in corrosive processes;
- a reduction in the overall stability of the substance.
- Poor combustion and fuel filter plugging.

The need to avoid contact with water has a particular relevance to tank cleaning procedures. It is crucial post tank cleaning to ensure that the surfaces of the cargo tanks are thoroughly dried prior to loading any FAME cargo. Crews should also be aware that FAME cargoes can adhere to tank surfaces, and any residues left behind may later cause contamination problems with subsequent cargoes. It is therefore essential that tank cleaning routines are carried out with scrupulous attention to detail, taking into account the specific requirements and characteristics of both the preceding FAME cargo and the following cargo.

Temperature Sensitivity

FAME cargoes are, like many cargoes, susceptible to the effects of degradation when exposed to heat, certain atmospheric conditions and light. Accordingly, careful consideration should be given to the location of the tank that the FAME cargo is to be loaded into since the cargo may be affected by being adjacent to a heated tank.

This sensitivity to temperature may also be manifested when a FAME cargo is exposed to extremes in heat and cold during the course of a voyage. Particular attention should be paid to the issue of temperature when the voyage will take a FAME cargo from warm, moist conditions through to a colder region/port. To avoid issues with the cargo caused by a build-up of waxy-like precipitates, proper heating regimes should be applied.

A similar risk arises when a cargo tank is adjacent to a ballast tank. During ballast exchange, the introduction of colder water can significantly reduce the cargo temperature, potentially causing the biofuel to drop below its Wax Appearance Temperature (WAT).

FOSFA (The Federation of Oils, Seeds and Fats Associations Ltd) has now included FAME products in its published heating recommendations.

Oil Type	Temperature during voyage		Temperature at discharge	
	Min (°C)	Max (°C)	Min (°C)	Max (°C)
FAME from maize/rapeseed/soya/sunflower	Ambient		Ambient	
FAME from coconut/palm/palm kernel/tallow	25	30	30	40

Note: When FAME is blended into fuel oil, the overall properties of the blended fuel changes. It should be stored above its Wax Appearance Temperature (WAT), while also considering its flash point and avoiding excessive heating that could lead to thermal aging of the fuel.

Additives

The use of additives is not typically recommended with biofuels since the effect can be unpredictable and should be considered on a case by case basis.

Conclusion

Biofuels are promoted as a potential means of reducing climate change and helping meet IMO targets for greenhouse gas (GHG) emissions. However, shippers, shipowners, and crew must be fully aware of the safety implications involved in transporting these fuels.

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