

BIOFUEL

Considering for shipping use



KOREAN REGISTER
R&D Division





What you need to know for using BIOFUEL

The International Maritime Organization (IMO) has limited the sulfur content of fuel oil used on ships less than 0.5%, beginning January 1, 2020, as decided by the Marine Environment Protection Committee's (MEPC) 70th session in 2016. Moreover, at the MEPC's 72nd session in 2018, the Initial IMO Strategy on Reduction of GHG Emissions from Ships was adopted with targets for the level and time of GHG emission reductions (reduce total annual GHG emissions by at least 50%, compared to the 2008 level, by 2050). As such, the IMO is expected to strengthen atmospheric environmental regulations gradually, and international shipping company shall continuously find solutions to meet the new regulation standards. Energy sources like hydrogen and electricity that are free of not only sulfur but also carbon could be considered to eventually fulfill the environmental targets. However, it is currently difficult to apply such energy sources to maritime industry, and it is necessary to gradually change fuel sources. Biofuel is the leading transitional fuel. Biofuel produced from biomass, such as grain or wood, is suitable for adjusting to both the sulfur and GHG regulations. Moreover, it has the advantage of being used without the need for modification of the engine since it can be mixed with existing fossil fuels. It is necessary to consider the following points when thinking of using biofuel as the next alternative fuel.

1. SOLAS II-2/4.2, IGF Code – Flash point

Biofuel produced from biomass has a wide range of flashpoints depending on the raw materials, processing, and mixing ratios. SOLAS II-2/4.2 specifies that ships must use fuels with a flashpoint above 60°C. As an exception, ships using petroleum fuel oil with a low flashpoint must fulfill the requirements of the IGF Code (The International Code of Safety for Ships using gas or other low-flashpoint fuels) according to SOLAS II-1/57.

1) Low-flashpoint fuels (below 60°C)

Methyl alcohol and ethyl alcohol can be considered for the case of low-flashpoint fuels. These fuels can be made from biomass, and ships using such fuels must comply with the IGF Code. However, the IGF Code currently states specifications only for natural gas and will update the specifications for other low flashpoint fuels in the future. The Sub-Committee on Carriage of Cargoes and Containers, 6th session (CCC 6) held in September 2019 finalized the criteria for methyl/ethyl alcohol and is expected to distribute the interim guidelines this year.

2) Other fuels (60°C or higher)

Other biofuels include bio heavy oil and biodiesel. These fuels are considered first because they are known to have similar properties as existing marine fuels.

- Bio heavy oil is produced using low-cost raw materials such as animal fats and palm oil residues. It has been widely used in domestic thermal power plants in Korea, since March 2019, because of its properties that are similar to bunker C oil. The bio heavy oil used in thermal power plants conforms to the SOLAS II-2/4.2 standards since its flashpoint criterion is 70°C or higher (Notice on Quality Standards for Alternative Fuels, The republic of Korea).
- Biodiesel is widely used for means of ground transportation already and has properties similar to diesel. However, since the domestic quality standards specify a flashpoint of 40°C or higher for biodiesel fuel oils (BD20) and conventional diesel (for automobiles and ships), care must be taken to adhere to the relevant regulations in shipping using biodiesel purchased in Korea. ISO 8217, the international standard for ship fuels, specifies that the flashpoint for all ship fuel oils, except for DMX grades, must be higher than 60°C, as with SOLAS, and it is necessary to emphasize the flashpoint criteria in the purchase contract.

2. MARPOL Annex VI – NOx, SOx, BDN

1) Chapter III Reg. 13 – Nitrogen Oxide (NOx)

Ships with over 130 kW power, except for those used solely for emergency purposes, must comply with NOx emission regulations according to the ship building date. The Classification society measures NOx emissions to check for compliance with regards to this regulation, and the fuel used for the measurement is conventional DM or RM. However, since biofuel is a highly oxygenated substance and can emit more NOx through combustion, it is necessary to review the convention provisions with the Class if a ship is determined to exceed the existing NOx emission limit due to biofuel use after the certificate has been issued.

2) Chapter III Reg. 14 – SOx

Although it may differ according to the mixing ratio of conventional fossil fuel and biofuel, biofuel is basically known as a substance with very low or no sulfur content. Therefore, a ship can use biofuel to effectively meet the 2020 global sulfur cap and be acceptable in SOx Emission Control Areas (ECAs).

3) Chapter III Reg. 18.5 – Bunker Delivery Note (BDN)

According to the Regulation 18.5 of MARPOL Annex VI, fuel oil supplier must provide the BDN to the ship. Furthermore, the BDN must include the statement “the fuel oil supplied is in conformity with Regulation 18.3” from the fuel supplier. Regulation 18.3 includes the following NOx emission compliance matters:

18.3.2.2: The use of the fuel shall not result in exceeding the NOx emission criteria as stated in Regulation 13.

Therefore, the fuel oil supplier has an obligation to certify that the biofuel supplied meets the above criteria.

3. IMO DCS & EU MRV – GHG Emission

1) MARPOL Annex VI Reg.22A :

Ships over 5,000 GT and which are operated for international navigation shall submit a IMO DCS report. At the same time, the fuel user must be aware of the carbon dioxide conversion factor (C_f) of the fuel. Although existing fuel types can be listed according to their category (MEPC.Res. 245(66) 2.1), the fuel oil supplier must provide the C_f value and supporting documents for new fuel types, such as biofuel, to the authority or RO.

2) Regulation (EU) 2015/757 :

Ships over 5,000 GT that are subject to the EU MRV report must also submit the C_f value of the fuel types that are not in the existing categories to the verifying body.

4. ISO 8217:2017 – Specifications of marine fuels

ISO 8217 is a commercial standard, separate from international conventions, used for contracting fuel oil supply agreements between suppliers and users. This standard is divided into distillates (7 types) and residuals (11 types). The 2017 version (6th edition) added the DF grade to the distillate category to allow up to 7% v/v FAME (fatty acid methyl ester) in the fuel. Moreover, it limits the mixing of FAME, as shown below, to all DM grade and RM grade fuels, not including DMX grade fuels.

- There is no deliberate blending of FAME into the fuel.
- Only a limited level (de minimis, 0.5% v/v) of FAME is permitted.

These criteria show that ISO 8217:2017 allows the use of biofuels only for the DF grade of the distillate fuel type and limits the content to 7% v/v. Users are encouraged to purchase fuels within these criteria, and even if they have to use biofuels exceeding the FAME standards, purchase fuels that meet other parameters as much as possible to minimize the impact on the engine.

5. Use of Bio Heavy Oil

In particular, bio heavy oils, among the types of biofuel, are known to have similar properties as residual marine oil used by ships and it is known as an alternative fuel that is applicable immediately. Since domestic laws(korea) do not limit the use of bio heavy oil used by ships, shipping companies can use bio heavy oil as needed. However, the kinematic viscosity of bio heavy oil according to the domestic quality standards is 15 – 80 mm²/s, and this is the value for the RMA-RMD grade in ISO 8217 standard. Moreover, since certain quality items, such as the total acid number (TAN), may differ significantly from existing fuel types, additional measures may be needed for it to be applied to ship fuel systems. Therefore, it is necessary to discuss the compatibility of bio heavy oils for marine fuel systems with engine manufacturers before applying it to ships.



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