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Editorial

Renewable and Sustainable Green Diesel (D100) for Achieving Net Zero Emission in Indonesia Transportation Sector

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Abstract

Because of the significant demand for fuels in the transportation sector in Indonesia, as well as concerns about energy security and global warming, renewable, sustainable, and alternative energy sources such as biofuels are required to replace petroleum-based fuels. Promoting the production of green diesel from crude palm oil (CPO) using palm fatty acid distillate (PFAD) as its byproduct will make the overall process more efficient and environmentally friendly in Indonesia. As a result, CPO-based diesel production will be a green and high-value sector. By replacing fossil diesel with green diesel, a sustainable energy source can be assured without further depleting current fossil fuels, leading to cleaner and greener energy in the future and meeting the net-zero aim by 2060.

Keywords: Green diesel, D100, Net zero emission, Renewable fuel

In Indonesia, high demand for fuels in the transportation sector and the concern regarding the energy security and global warming, renewable, sustainable, and alternative energy sources such as biofuels are necessary to replace petroleum-based fuels [1]. Biodiesel, also known as FAME (fatty acid methyl ester), is one of the only commercially available biofuels in Indonesia currently that is typically produced from palm oil and used as a substitution for diesel fuel [2]. However, regular biodiesel may have a high oxygen content, poor stability [3], [4] and different fatty acid ester compounds compared with petroleum-derived-diesel [5].

Despite being commercially used in Indonesia's transportation sector at a blending ratio of 30 percent (B30) since the year 2020, the use of regular biodiesels for diesel engines still has some significant hurdles that need to be overcome especially if a higher blending ratio is intended. Therefore, the better quality of biofuels, such as green diesel, is getting more interest [6]. From engine and exhaust after-treatment technology perspectives, green diesel has been recognized as the most favorable biofuel due to its higher heating value, energy density, cetane number, and quality like petroleum-based diesel. For Indonesia, promoting the production of green diesel from crude palm oil (CPO) with palm fatty acid distillate (PFAD) as its residue will make the overall process more efficient and greener [7]. This will make CPO-based diesel production a green and high-value industry.

Green Diesel may be used as a partial solution or combination with any percentage of petroleum-based diesel, without altering the fuel injection system or vehicle fuel tank design (flexible fuel). For Pick-Up and Heavy-Duty vehicles where electrification is still very challenging, Green Diesel will play a major role in achieving net-zero emission by 2060 as declared by the Indonesian Government during the COP26 event in 2021. It was reported that green diesel with enhanced fuel properties in comparison with biodiesel where it exhibits higher oxidation stability, heating value, cetane number, and thermal stability with a longer

storage period [8]. To judge the suitability and compatibility of biodiesel for various commercial applications that replace fossil diesel, a deep understanding of the physicochemical properties of different biodiesels is required.

To further improve carbon intensity of renewable diesel, green diesel can be also produced from organic waste oils/animal fats, without competing with edible feedstock such as CPO. Indonesia also needs to intensify the utilization of underutilized lignocelluloses including fruits and vegetables serve as a prospective green diesel generation source for the future prosperity of the biofuel industry and society. Parts of underutilized crops such as rapeseed, switchgrass, Camelina sativa, cashew nutshell, etc are potential to be utilized as green diesel feedstocks with their high oil content which are much favorable to provide a vast option for green diesel feedstocks [9]. The underutilized crops are processed to obtain their corresponding oil or triglycerides prior subjected to hydro processing or upgrading in obtaining green diesel as the final product. Therefore, the final form of feedstock to be converted into green diesel often is liquid oil.

To commercialize green diesel, the techno-economic assessment is required to perform in fully understand the technical and economic difficulties for green diesel production massively in Indonesia. If only utilize CPO as the main feedstock, then sufficient support needs to be provided by the government in helping transition both government and non-government organizations to shift the major energy source from non-renewable energy to green diesel production. With the replacement of fossil diesel by green diesel, a sustainable energy source can be secured without further depleting the current fossil fuels and lead to cleaner and greener energy in the future and achieving net-zero target in 2060.

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