

GLYCEROLYSIS OF FREE FATTY ACIDS FOR THE PRODUCTION OF FATTY ACID METHYL ESTER (FAME)

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A solvent-free glycerolysis process has been developed to convert free fatty acids (FFA) into neutral oil using fatty acids distillates from vegetable oil refinery. The process is a catalyst-free reaction and able to achieve 98% conversion of FFA into neutral oil. The neutral oil produced can be transesterified into fatty acid methyl ester (FAME). The main advantage of adopting glycerolysis technology for FAME production is lower chemical input as the process is catalyst-free and glycerine is recycled. Glycerolysis will produce partial glycerides as an intermediate product which could have more applications such as purified monoglycerides and diglycerides fractions.

The only disadvantage of using vegetable oil as starting material for the production of biodiesel is the high input cost. To reduce the biodiesel production cost, less expensive feedstocks that do not compete with food supply and land for food cultivation such as non-edible oils, animal fats, waste food oil and by-products of refining vegetable oils have been widely investigated. Those side-stream materials normally contain high FFA and other impurities. Non-catalyst glycerolysis process reduces the amount of FFA in low grade oils without the use of acid or methanol and made suitable for biodiesel feedstock. However, non-catalyst glycerolysis is normally carried out at above 220°C. Under this condition, impurities such as polymerised and carbonised materials are formed. Thus, a distillation process to remove these impurities after transesterification is important to ensure that the final FAME produced meets the required specifications.

MPOB has developed a direct esterification process to convert FFA into FAME and the technology has been commercialised (Choo *et al.*, 1992; Lau *et al.*, 2009). Glycerolysis can be an option for those who have an existing transesterification process but would like to diversify the choice of feedstock



Figure 1. Fatty acid methyl ester (FAME) produced from palm fatty acid distilled (PFAD) via glycerolysis process.

without adding extra capacity to existing plant. Direct esterification and transesterification system will require handling of both acid and alkaline catalysts, and potentially higher energy demand.

POTENTIAL TAKER

This technology can enhance the feedstock flexibility and provide options for integration of the existing biodiesel plant into a more viable production system.

ECONOMIC ANALYSIS

The cost for integration to existing biodiesel plant depends on the available facilities on-site. The estimated cost for a 200-400 t per day plant ranges from RM 6 million to RM 10 million.



REFERENCES

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