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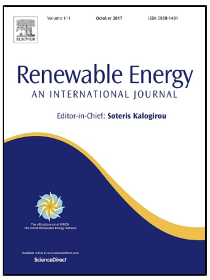


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# High Quality Jatropha Biodiesel (H-FAME) and its Application in a Common Rail Diesel Engine

Manida Tongroon[1,*], Amornpoth Suebwong[1], Mongkon Kananont[1], Jirasak Aunchaisri[1] and Nuwong Chollacoop[1]

[1]National Metal and Materials Technology Center (MTEC), 114 Thailand Science Park, Phahonyothin Rd, Khlong Nueng, Khlong Luang, Pathum Thani, 12120, Thailand

[*]Corresponding Author: Tel. +66 2564 6500 ext. 4742 Fax. +66 2564 6403

E-mail: manidat@mtec.or.th

**Abstract**

Depending on the guarantee from the original equipment manufacturers, the acceptable percentage of biodiesel used in diesel engines is limited. The low oxidation stability of biodiesel is the major challenge limiting its use. Therefore, improving the quality of biodiesel may be a promising approach to increasing the usage amount. In this study, high quality biodiesel from jatropha upgraded by partial hydrogenation of unsaturated fatty acid methyl ester (H-FAME) process, which reduced the polyunsaturated ester molecules, is introduced. The upgraded biodiesel significantly improved the oxidation stability. First, the properties of H-FAME were determined prior to its use in the engine. All properties satisfied the requirements of all biodiesel standards. Biodiesel content could improve the lubricity of petroleum diesel for application in a modern high pressure injection system. Then, the performance and emissions of a common rail diesel engine using 10 % of H-FAME were investigated and compared with the commercial diesel. Finally, engine endurance was assessed by a 50,000 km on-road durability test. The results showed that 10 % of H-FAME slightly decreased engine torque and marginally improved fuel consumption. Exhaust gas emissions including CO, HC, $NO_X$ and smoke decreased. There was no sign of engine deterioration caused by the H-FAME.