UNIVERSITI TEKNOLOGI MARA

THE IMPACT OF METHANOL AND ISO-BUTANOL IN B20 PALM OIL METHYL ESTER (POME) FUEL BLEND TOWARD THE PERFORMANCE AND EMISSION OF COMPRESSED IGNITION (CI) ENGINE

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AUTHOR'S DECLARATION

I declare that the work in this dissertation was carried out following the regulations of Universiti Teknologi MARA. It is original and is the results of my work unless otherwise indicated or acknowledged as referenced work. This dissertation has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

Methanol and Iso-Butanol have the potential to be a clean alternative for conventional fuel used in internal combustion engine. The issue that arises when using biodiesel is that a high biodiesel blend ratio tends to promote more emission as it alters the physicochemical properties which in turn delivers a poor performance. Thus, it requires the investigation of mixing iso-butanol and methanol to study its property in terms of engine performance, physicochemical property, and exhaust emission. This paper aimed to investigate the effect of mixing two alcohol blends such as methanol and iso-butanol operating with palm oil methyl ester (POME) biodiesel blend and how it affected the engine performance. Three essentials properties were measured which included (1) density; (2) cetane number; (3) calorific value and (4) kinematic viscosity. Using BENMA 5GF-M Diesel Generator, a single-cylinder 4 stroke diesel engine emission was analysed using a gas analyser. The fuel property was investigated using 7 different tests which consisted of Palm Oil Methyl Ester (POME) (B20) 90 % biodiesel fuel and 10 % iso-butanol (B90iBu10), 90 % biodiesel fuel and 5 % iso-butanol and 5 % methanol (B90M5iBu5), 90 % biodiesel fuel and 10 % methanol (B90M10), 85 % biodiesel fuel and 8 % iso-butanol and 7 % methanol (B85iM7Bu8), 90 % biodiesel fuel and 5 % iso-butanol and 5 % methanol (B80M10iBu10), base diesel fuel (D100) under different load and speed range of 2000~3000 rpm. The results were tested using the unmodified diesel engine by adding two types of alcohol as the additive which were methanol and iso-butanol. It was shown that biodiesel blends increased the BTE by 8 % while BSFC indicated an opposite reaction by decreasing 9 % under the same condition load and speed in comparison to diesel. Based on the results, exhaust emissions for CO and HC decreased with each variation blend. It was shown to decrease by 40 % and 7 % respectively under the same test condition when compared to B20. Further expectation indicates that NO_x emission increases the estimate around 18 % on high engine load while lower engine load shows an opposite trend; and it was shown to be true with higher load engine being able to provide lower NO_x emission by 27 % difference in comparison to POME. In conclusion, combining iso-butanol and methanol in B20 with a 10 % ratio can display potential results in both exhaust emission and engine performance during engine tests.

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