

## Experimental Investigation on Biodiesel-Ethanol-Diesel Blends Operating With a Diesel Engine

Mat Yasin, M.H.<sup>a</sup>, Mamat, R.<sup>a</sup>, Leman, A.M.<sup>b</sup>, Khalid, A.<sup>b</sup>, Tamaldin, N.<sup>c</sup>

<sup>a</sup> Faculty of Mechanical Engineering, Universiti Malaysia Pahang, Malaysia

<sup>b</sup> Universiti Tun Hussein Onn Malaysia, Malaysia

<sup>c</sup> Universiti Teknikal Malaysia Melaka, Malaysia

### ABSTRACT

Biodiesel is an alternative, decomposable and biological-processed fuel that has similar characteristics with mineral diesel which can be used directly into diesel engines. However, biodiesel has its drawbacks which are more density and viscosity compared to mineral diesel. Alcohol additives implementation such as ethanol could reduce significantly the density and viscosity of the biodiesel. In this study, biodiesel (20%)-ethanol (5%)-diesel (75%), biodiesel (20%)-methanol (10%)-diesel (70%), biodiesel (20%)-ethanol (15%)-diesel (65%), biodiesel (20%)-ethanol (20%)-diesel (60%) and standard mineral diesel as a baseline fuel are tested in a Mitsubishi 4D68 diesel engine. Those test fuels are investigated under the same operating conditions at three different engine loads; 20%, 40% and 60% at a constant engine speed of 2500 rpm to determine the engine performance, combustion and emission of the diesel engine. Overall, biodiesel-ethanol-diesel blends show higher brake specific fuel consumption than mineral diesel especially at higher ethanol concentration. As ethanol proportions in blends increase, CO emissions increase, while NO emissions are reduced. Also, biodiesel-ethanol blend with 5% ethanol is more effective than other biodiesel-ethanol blends for reducing CO emissions and improve the combustion.

**KEYWORDS :** Biodiesel blend; Combustion; Diesel engine; Emission; Ethanol; Performance

**DOI:** [10.4028/www.scientific.net/AMM.465-466.221](https://doi.org/10.4028/www.scientific.net/AMM.465-466.221)