

Effect of additives on lubrication properties of palm oil-based trimethylolpropane ester for hydraulic fluid application

ABSTRACT

Hydraulic fluids are liquids used as the motive medium in hydraulic machinery and equipment. The current interest in protecting the environment has created a demand for vegetable-based and biodegradable hydraulic fluids. However, the lubricating properties of the vegetable-based such as poor oxidative stability and high pour point have hindered their use. In this study, Trimethylolpropane (TMP) Ester or TMPE, which is derived from palm oil-based methyl ester (POME), was used as the base fluid. The objective of this research is to study the lubrication properties of the formulated TMPE (TMPE + 1.0% of Additive A), namely the pour point (PP) test, wear and friction test and filterability test. The pour point obtained from this research was 10°C before applied to the lab-scale hydraulic test rig. This reading is much higher if compared to the commercial hydraulic fluid, which has the pour point of -30°C. Nevertheless, this result was slightly comparable to the unformulated TMPE, 12°C. The wear test shows that at 15 kg load, the WSD was 1.0 mm before application (at 0 hour), with the coefficient of friction (CoF) was 0.04 as compared to the WSD of unformulated oil, 0.46 mm and CoF of 0.04. There is no data available at 15kg load for the commercial hydraulic oil compared. Meanwhile, at 40 kg load, the WSD recorded was 3.24 mm before the application compared to commercial hydraulic oil, 0.36 mm and unformulated oil, 0.64 mm. After 800 hours application, the WSD increase sharply both for 15 kg (1049 mm) and 40 kg (3364 mm). It showed that there were particles built in the formulated oil. This is supported by the filterability study.

Keyword: Filterability; Hydraulic fluid; Lubrication; Palm oil; Pour point; Wear