

## **Effects of additives on oxidation characteristics of palm oil-based trimethylolpropane ester in hydraulics applications**

### **ABSTRACT**

Hydraulic fluids represent one of the most important groups of industrial lubricants. Increasing attention to environmental issues drives the lubricant industry to choose vegetable-based hydraulic fluids which are biodegradable as compared to mineral-based fluids. However, the lubricating properties of vegetable oil, such as poor oxidative stability and high pour point, have hindered their use. In this study, trimethylolpropane ester, which was derived from palm-based methyl ester, was used as the base hydraulic fluid. The purpose of the study was to determine the optimum formulation for palm oil-based synthetic lubricants by using suitable additives that can improve the oxidative stability and viscosity in accordance with the standard regulations for hydraulic fluid applications. The oxidative stability of the oil was evaluated by total acid number (TAN) and viscosity tests. In general, base oil without additive began to degrade after 200 h. The formulated oil, on the other hand, was quite stable even after 800 h of operation. The best formulation was obtained using 1.0% of either additive A or additive B. Both TAN and viscosity values were found to increase with increasing heating temperature. Meanwhile, the results have also shown that additive A performs better than additive B. After 800 h of exposure, the final TAN value for the formulated oil was only at 0.32 as compared to 4.88 mg KOH/g for the oil without additive. However, the kinematic viscosity of the oil at 40 and 100 °C was almost unchanged as compared to the oil without additive.

**Keyword:** Hydraulic fluid; Lubricant; Oxidative stability; Palm oil; Viscosity