VISCOMETRIC PROPERTIES OF PURE AND BLENDED OIL

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To my parents, who toiled for my success.

To my dear, Ting Ting. *I love you!*

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ABSTRACT

The aim of the present work was to study the viscometric properties of natural oil (Super Olein and RBD palm oil) and their blends with hydraulic oil (Shell Tellus 100). This was done by studying the change of dynamic viscosity with respect to the changes of temperature, and shear rate. In addition, providing equations and graphical relationships to predict apparent viscosity of the oils as a function of temperature and shear rate. The pure RBD palm oil, pure Super Olein and their blends with Shell Tellus 100 (25%, 50%, and 75% of RBD palm and Super Olein blended with hydraulic oil) were prepared by weight. Densities were measured three times at 30°C and the average was calculated. Viscosities were measured for each liquid sample in duplicate by using Brookfield DV-1+ viscometer (Stoughton, MA, USA). The oils temperature and shear rate were measured over range of 30–100°C and 3.9-131.6s^{-1}, respectively (except for RBD palm oil with temperature range of 30–200°C). It was found that the viscosity is influenced by temperature and shear rate. Temperature and shear rate dependence of viscosity equations were used and found that original equation was well fitted to experimental data compared to linearized form equation. They exhibit pseudo-plastic behavior (nonNewtonian).This behavior was significant to pure RBD palm oil and having flow behavior index less than one.

ABSTRAK

Eksperimen ini bertujuan untuk mengkaji ciri-ciri viscometrik minyak semulajadi (*Super Olein* dan *RBD*) dan campurannya dengan minyak hidraulik (*Shell Tellus 100*). Ini dilakukan dengan mengkaji perubahan kelikatan dinamik dengan perubahan suhu dan kadar keterikan ricih. Projek ini juga bertujuan menentukan persamaan dan hubungan grafik untuk membuat ramalan kelikatan dinamik bagi minyak tersebut terhadap fungsi suhu dan kadar keterikan ricih. *RBD* tulen, *Super Olein* tulen, dan campurannya dengan *Shell Tellus 100* (25%, 50% dan 75% *RBD* dan *Super Olein* dicampurkan dengan minyak hidraulik) disediakan mengikut jisim. Ketumpatan diukur sebanyak 3 kali pada 30°C dan nilai purata diambil. Kelikatan diukur sebanyak 2 kali terhadap setiap sampel minyak dengan menggunakan *Brookfield DV-I+ viscometer* (*Stoughton, MA, USA*). Suhu dan kadar keterikan ricih semua minyak masing-masing diukur pada julat suhu 30-100°C dan kadar keterikan ricih 3.9-131.6s^{-1}, (kecuali untuk minyak *RBD* dengan julat suhu 30-200°C). Didapati kelikatan dipengaruhi suhu dan dan kadar keterikan ricih. Persamaan asal adalah lebih sesuai daripada persamaan yang telah dilinearkan untuk melakukan regresi. Semua minyak menunjukkan sifat *pseudo-plastic* (*NonNewtonian*). Sifat ini adalah lebih serius terhadap *RBD* tulen dan mempunyai nilai *flow behavior index* kurang daripada satu.