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Volume 66, Issue 3, 2014, Pages 7-13

Experimental studies on the rheological and hydraulic performance of palm based hydraulic fluid (Article)

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Abstract

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Development of environmental friendly hydraulic fluid has a major influence in ecologically benign environment. The use of plant oil as hydraulic fluid would help to minimize hazardous pollution caused by accidental spillage, lower disposal costs of the used fluid and meet the environmental regulations. Hydraulic test rig was built to conduct endurance test where it can be operated continuously with several safety features. This research was conducted to evaluate the rheology elements and hydraulic performance of palm based hydraulic fluid. The palm oil shows decreasing trend in volumetric efficiency as the pressure increase while the mechanical efficiency increases as the pressure increase. Properties and characteristics of palm based hydraulic fluid were evaluated via rheology study. The effect of viscosity with temperature and shear rate was studied. The influence of shear rate and temperature on the variation of viscosity was clearly observed but temperature has more significant influence. Interpretations of rheological models indicate that this palm based hydraulic fluid belongs to pseudo-plastic category. Further analysis was done to fit the experimental data with two models and the findings show that Cross rheological model fits well with the experiment data. The plant oil was used in 1000 hours operation in a hydraulic system built in Universiti Malaysia Terengganu. The overall results suggest the potential substitution of palm oil as hydraulic fluid in marine applications. © 2014 Penerbit UTM Press. All rights reserved.

Author keywords

Hydraulic fluids Mechanical efficiency Palm oil Rheology Volumetric efficiency

ISSN: 01279696

Source Type: Journal

Original language: English

DOI: 10.11113/jt.v66.2686

Document Type: Article

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