

## CHAPTER V

### CONCLUSIONS AND RECOMENDATIONS

#### 5.1 CONCLUSIONS

The measured properties of selected vegetable oils; i.e. palm, rice bran, soy bean and coconut oils, as well as the mixtures of them can be concluded as follow:

1. Kinematic viscosities of all vegetable oils are in the range of 32-40 cSt at 40°C. While the kinematic viscosity range is reduced to 5.9-8.4 cSt at 100°C.

2. Kinematic viscosity of coconut oil is the lowest one in comparison among selected vegetable oils. While that others are about 40 cSt at 40°C and 8 cSt at 100°C

3. Viscosity index of coconut oil is just about 130, while that of other vegetable oils are higher than 180. Kinematic viscosity of a mixture of a vegetable oil in the paraffinic petroleum can be estimated directly by the mixing rule of Kendoll and Monroe, modified as  $V_M = (xV_A^{13} + (1-x)V_0^{13})^3$

4. The wear of coconut oil is the highest value at about 2 mm among selected vegetable oils and as same as the synthetic ester. While that of others are close to one another about 0.69-0.88 mm. The wear property of all selected vegetable oils is almost inversely proportional to their kinematic viscosities.

5. The flash point of coconut oil is slightly lower than 200°C and is also lower than that of the paraffinic petroleum oil. While that of other vegetable oils and synthetic ester are higher than of the petroleum oil.

6. The flash point of a mixture of a vegetable oil in the paraffinic petroleum oil is quite proportion to the logarithmic of the reciprocal of the mass fraction of the vegetable oil in the mixture. The relationship between the reciprocal of the flash point and the

logarithmic of the reciprocal of the mass fraction of the vegetable oil in the mixture is almost linear.

7. The corrosion properties of all selected vegetable oil are class 1a.

## 5.2 RECOMMENDATIONS

In order to achieve practically empirical mixing rules for lubricity and flash point of the mixtures, additional experiments for the wear scar diameters of the mixtures and for flash point with other fraction of vegetable oils, as well as other vegetable oils, have to be carried out. In addition other essential properties of cutting fluids, such as thermal properties pour point, color, fire point, have to be measured with a wide range of mixing fraction to investigate the effects on the performance of cutting oils and develop empirical mixing rule for these properties.

