

## CHAPTER III

### EXPERIMENTS ON PROPERTIES

To investigate the influence of vegetable oil on properties of neat cutting fluid, the experiments have been carried out to measure viscosity, lubricity, flash point and corrosion properties of mixture of vegetable oil and paraffinic one. The vegetable oils in this investigation consist of palm oil, rice bran oil, soybean oil and coconut oil, which are manufactured in Thailand. The mixtures of vegetable oil and the paraffinic oil for this investigation contain 5%, 10%, 15% and 20% by weight of each vegetable oil. In addition, the same experiments have been carried out for each of selected vegetable oils, the paraffinic oil and commercial lubricity agent for comparison purposes.

#### 3.1 Experiments on Viscosity Property [17]

Kinematic viscosity at 40°C of vegetable oils and the mixture has been measured based on ASTM D445 with viscometer of glass capillary type model, Cannon-Fense Routine viscometer. The viscosity of each mixture has been measured 3 times. Kinematic viscosity at 100°C of vegetable oil had also been measured based on ASTM D445. Viscosity indices of the mixtures has been calculated from viscosity determined at two temperature according to ASTM D2270.

#### 3.2 Experiment on Lubricity Property [17]

Lubricity or anti-wear property of the vegetable oils has been measured with Four-Ball Wear-Tester under load of 40 kg and 1 hour duration on the basis of ASTM D2266. A single ball is rotated in loaded contact with three fixed balls, the lubricant under test being used to lubricate the balls. The diameters of the wear scar on the stationary balls are measured after completion of the test.

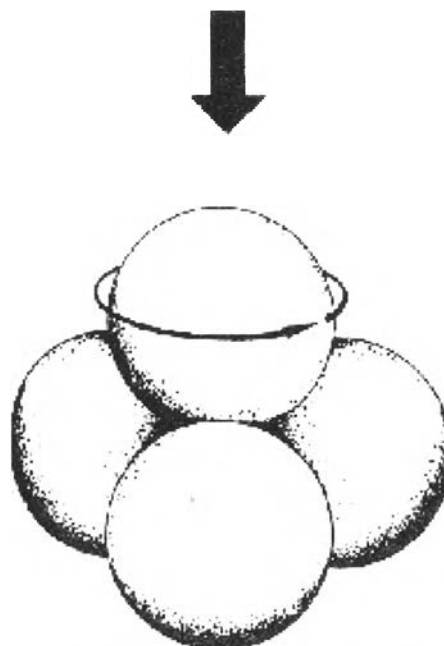


Figure 3.1 Four-ball lubricity test



### 3.3 Experiment on Flash point Property [17]

Flash point of the vegetable oils and the mixtures has been measured based on ASTM D93 by Pensky-Martens Closed-cup Tester. The sample is heated at a slow, constant rate with continual stirring. A small flame is directed in to the cup at regular intervals with simultaneous interruption of stirring. The flash point is the lowest temperature at which application of the test flame cause the vapor above the sample to ignited.

### 3.4 Experiment on Corrosive Property [17]

Corrosive property of the vegetable oils had been measured on copper corrosion by putting a copper strip with 25x 150-mm in a sample of vegetable oils at 100°C for 3 hours according to ASTM D130. The color of the copper strip indicated the classification of the corrosive property as summarized in Table 3.1

Table 3.1 Copper Strip Classifications [17]

classification	Designation	Description
Freshly polished strip	...	
1	slight tarnish	a. Light orange, almost the same as freshly polished strip b. Dark orange
2	moderate tarnish	a. Claret red b. Lavender c. Multicolored with lavender blue or silver, or both, overlaid on claret red d. Silvery e. Brassy or gold
3	dark tarnish	a. Magenta overcast on brassy strip b. Multicolored with red and green showing (peacock), but not gray
4	corrosion	a. Transparent black, dark gray or brown with peacock green barely showing b. Graphite or lusterless black c. Glossy or jet black