



## Chapter V

### Conclusions and Recommendations

#### Conclusions

The following conclusion are drawn from the study:

1. The operating conditions of catalytic hydrotreatment affected properties of the product oils. ASTM color, sulfur content, viscosity, flash point and acidity decreased while viscosity index increased with increasing temperatures or decreasing LHSV.
2. CoMo/Al<sub>2</sub>O<sub>3</sub> catalyst produced the product oils which had the best ASTM color, acidity and viscosity index. NiMo/Al<sub>2</sub>O<sub>3</sub> catalyst produced the product oils which had the lowest sulfur content while NiW/Al<sub>2</sub>O<sub>3</sub> catalyst produced the product oils which had the best viscosity and flash point.
3. CoMo/Al<sub>2</sub>O<sub>3</sub> catalyst is superior in their hydrotreating activity to NiMo/Al<sub>2</sub>O<sub>3</sub> and NiW/Al<sub>2</sub>O<sub>3</sub> catalyst.
4. Comparison of product oils properties with base lube oil specification showed that quality of the product oils was comparable with base lube oil at suitable operating condition.

5. Suitable catalyst in this study was CoMo/Al<sub>2</sub>O<sub>3</sub> and suitable operating conditions for this catalyst were a temperature of 350°C, a pressure of 5.51 MPa and a liquid space velocity of 0.5 hr<sup>-1</sup>.

### Recommendations

Recommendation for future studies and research are as follows.

1. A similar study should be conducted at different operating pressure to study the effect of pressure on catalytic hydrotreatment of used lubricating oil.

2. Other properties of product oils such as oxygen content, nitrogen content should be analyzed to explain reaction which occurred in hydrotreating used lubricating oil.