

CHAPTER 5

CONCLUSION

Heavy distillate after being treated with solvent dewaxing, acid-clay treating and catalytic hydrotreating process was found to have better properties both physically and chemically.

Methyl ethyl ketone was selected for separating wax at the temperature of -15°C . The pour point of dewaxed oil was 2°C . This oil was further decolorized with 10 % by volume of sulfuric acid and 30 % by weight of fuller's earth. The color of acid-clay treated oil determined by ASTM D 1500 was equal to 2.

Hydrotreating process was operated in a batch reactor under hydrogen. The used catalyst contained 10 % MoO_3 and 5% NiO on alumina type CS-303 from United Catalyst Inc.,. The pore volume of this support determined by using distilled water was $0.2546 \text{ cm}^3/\text{g}$. The alumina support was impregnated with ammonium molybdate, dried and calcined with air at 450°C for one hours. The calcine molybdenum impregnated support was further impregnated with nickel nitrate hexahydrate, dried and calcined with air at 450°C for one hour.

The amount of molybdenum and nickel were analyzed by Inductively couple plasma and the activity was tested by hydrogenation of standard cyclohexene. The product of cyclohexene

after hydrogenation was characterized by Infrared Spectrophotometer which resulted in the disappearance of the absorption band of C=C bond at 1640 cm^{-1} .

The optimum condition for hydrotreating were 4 % catalyst concentration by weight of oil, at 2.5 hours. The reaction time and temperature were 2.5 hours and $350\text{ }^{\circ}\text{C}$ respectively.

The product of hydrotreated oil had physical and chemical properties as follow: pour point = $2\text{ }^{\circ}\text{C}$, viscosity index = 77, sulfur content = 0.031 %, color = 1.5, aromatic carbon content = 11.07 %, and oxidative compound = 12.91 %.

As mention above, this optimum condition were useful in improving the quality of hydrotreated oils by increasing viscosity index and reducing both aromatic compounds and oxidative compounds.

Up to this point hydrotreated oil could be used as lubricating base oil which could be upgraded to lubricating oil by adding in additives and several grades of other lubricating base oils.

Nevertheless, this research had several limitations including pressure level and type of reactor. To bring the better result, the pressure should be allow to go beyond 529 psig and the batch reactor should be replaced with fluidized bed reactor.