CHAPTER V

CONCLUSION

This study concentrated on the hydroisomerization of wax, obtained from Fang heavy distillate, to higher value products such as purified wax and/or lubricating base oil. The process was divided into three steps comprising solvent deoiling of crude wax, followed by hydrodesulfurization and hydroisomerization (Figure 5.1). The process was performed according to the following details.

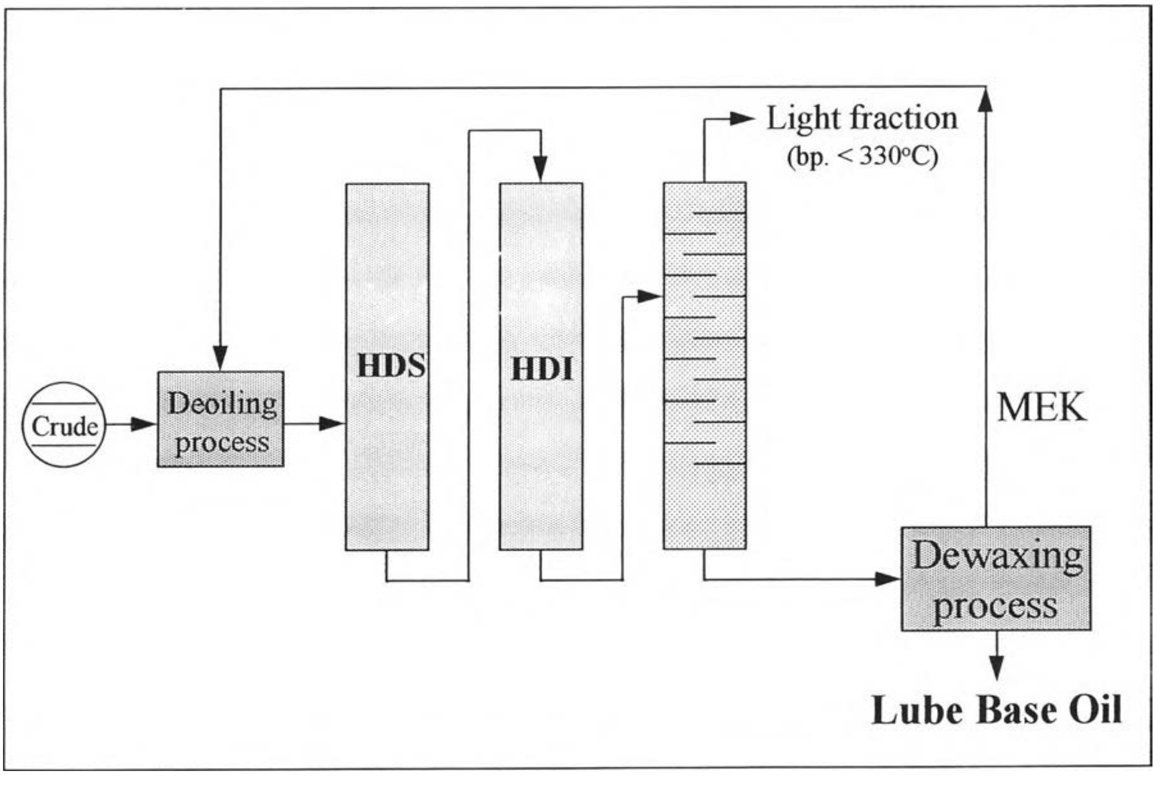

Figure 5.1 Hydroisomerization process of wax from Fang heavy distillate

The first step included deoiling wax by MEK solvent separation at 0 °C. After removing the MEK from the slack wax from this step, its color was brown (5.5, determined by ASTM D1500). The melting point of slack wax was 51.5 °C, and the carbon distribution includes C_{17}-C_{38} *n*-alkanes with the major components being C_{21}-C_{34}.

The second step was to subject the slack wax to hydrodesulfurization in order to reduce the sulfur content. The hydrodesulfurization reaction was operated in a batch reactor with a prepared catalyst containing 10 % Mo, 5 % Co, and 5 % Ni on alumina support. When the reaction was operated at optimum condition (catalyst concentration of 0.5 % by weight of wax, reaction temperature of 400 °C, hydrogen pressure of 600 psig, and reaction time of 8 hours) the sulfur content of the treated wax was less than 0.001 %wt. The results from this study showed that the prepared catalyst is the best for the hydrodesulfurization process.

The color of hydrodesulfurized slack wax was 1.0-1.5. Hydrodesulfurized slack wax contained: light fraction (boiling range below 330°C), 25.2 %wt; lube base, 7.8 %wt; lube oil residue, 18.4 %wt; and treated wax, 48.6 %wt. The viscosity index of base oil from hydrodesulfurized slack wax was 70. Color of hydrotreated wax, after deoiling, was white.

The last step was to subject the desulfurized wax to hydroisomerization, using a catalyst containing 0.3 %Pt and 0.5 % fluoride on an alumina support, to produce highly purified wax and lubricating base oil. This reaction was operated for 12 hours, under hydrogen pressure of 600 psig, catalyst concentration of 6 %wt of wax, and at reaction temperature of 300 °C to produce the value added product.

The waxes from this process have excellent properties such as low sulfur content, low aromatic content, and good color (>+17 by Saybolt method). The products from this process comprised 39.2 %wt of purified wax, 24.8 %wt of light fraction (boiling point below 330 °C), 15.4 %wt of lube base oil, and 20.6 %wt of lube fraction residue. The viscosity index of lube base produced from this process was 85. This purified wax product is of food grade and can be utilized in several food use applications-packaging paper and coating fruits.

This process can produce a product with good characteristics white. its only waste, hydrogen sulfide, can be oxidized completely to sulfur by oxidizing agent. Thus, The process will not contribute to pollution. This process is more advantage than other waxes purification process, especially acid-clay treatment process.

Recommend further study

From this study, there were several limitations of the experimental conditions. First of all, the pressure reactor used in this experiment was a batch type reactor with the working pressure of 2000 psig and reaction temperature of 400 °C. Therefore, the pressure and temperature of the reaction could not go beyond these limits. If the pressure and reaction temperature could go beyond these limits, it was likely that we could see more isomerization of waxes. Secondly, a continuous reactor should be implemented in order to understand more of the reaction under continuous condition which should be useful in scale up later process. Thirdly, different catalyst types should be investigated to select the best one.