CHAPTER V

CONCLUSION

Used lubricating oil was the oil that deteriorated by mainly three ways as follow: a) oxidation of base oil, b) oil additive deterioration, and c) oil contamination. These occurrences due to change in oil compositions and oil properties. The more oil deterioration occurred, the lower in oil quality found. The compositions of used oil were varied considerably from that of virgin lubricating oil and the sources of used oil. The principal source of deterioration during oil usage is the chemical breakdown of additives to produce acid and other undesirable products. Besides, the mismanagement of oil is also a major source of contamination.

Used lubricating oil can be refined by many technologies. For this work, used oil properties were improved by means of two major processes:
a) physical and chemical treatment, and b) catalytic hydrogenation.

The first route of refining process, used oil was treated with acid using 10% by volume sulfuric acid, and subsequently treated with clay. Acid treatment was a process to remove all reactive and unsaturated hydrocarbons and impurities. Acid treatment improves color,decreases viscosity, increases viscosity index, and increases oxidative stability.

After neutralization and washing, the acid treated oil was then treated with clay. The purpose of the clay treatment is to decolorize the oil and remove, carbon, coke, resinous and asphaltic substances, water and suspended matter.

A large portion of coloring matter was removed in the acid treatment process but traces of oil-soluble coloring matter still remain. Clay treatment process was necessary for removing such substances.

In physical and chemical treatment process, it was found to give greatly of waste byproduct disposal problem. This process had more environmental impacts.

Though acid-clay treated oil had desriable properties, but in actual performance, it was necessary to avoid the environmental problems.

From this study, the waste byproduct obtained by acid-clay treating was about 30-40 %.

To avoid the environmental problem by waste byproduct, the used oil was then improved by means of the catalytic hydrogenation process.

Among the catalysts used, $NiO/MoO_3/Al_2O_3$ and $NiO/WO_3/Al_2O_3$ were better in catalytic activities than Raney nickel catalyst. But for the resonable cost of Raney nickel in production, this research studied closely its activity. This work intended with two main effects of this catalyst on hydrogenation of used oil. First route was concentration, and the second one was reaction time. From the experiments, the data show that an optimum condition for the reaction by using Raney nickel catalyst in hydrogenation as is follow:

catalyst concentration	=	4	% by weight
reaction time	=	6	hours

This condition was run under other parameters as follow:

hydrogen partial pressure	=	500	psig
stirring speed	=	550	rpm
reaction temperature	=	350	°C

Some good results may be described as below:

Table 5.1 Some desirable properties of treated oil by using Raney nickel catalyst concentration of 4% run for 6 hours

Properties	Results (range)
API Gravity @ 60°F	29.7-30.0
Color, ASTM	1.5-2.0
Pour Point, °C	(-7.5)-(-8.0)
Viscosity Index	106-111
Oxidation Point, °C	354.5-365.2

From the condition above, it was only specific for improving used industrial lubricating oil. Different types of used lubricating oils were studied individually. It's important to consider the use of re-refined base oils in the production of lubricating oil that requires full life-cycle analysis is required in each market to determine the true picture with regard to environmental impact. The health concerns must be considered if re-refined oils were used.