



## CHAPTER V

### CONCLUSIONS AND RECOMMENDATIONS

#### 5.1 Conclusions

As mentioned above, biodiesel has been proved to be a very feasible and effective alternative to non-renewable energy sources. There are quite a number of ongoing projects aiming to improve the efficiency of biodiesel processes such as replacing homogeneous catalysts with heterogeneous catalysts or using the side product (glycerol) as a material in the cosmetic industry to reduce the cost. However, most of the projects are still in the experimental stage. Therefore, computer simulation of these processes is a cost- and safety-effective to carry out the experiments.

This present study has demonstrated how the simulation can be performed by using ICAS and PRO/II software which helped us predict and simulate the biodiesel production process. Due to the uncertainties of the predicted properties throughout the simulation, the computer generated data and the real data obtained from the plant should be checked and compared. This is very important because we have to make sure that the results obtained from the simulated process are similar to those from the real process.

Based on the results from experiments under the main objectives of this present study, the conclusions are as follows:

Firstly, the goal of the project—i.e. obtaining maximum recovery of methyl esters and a 5% saving of the total energy supply (or 400,000 USD a year)—have been successfully achieved. Actually, the direct costs of this plant can be saved further. However, the cost of repairs, manufacturing, setup, etc. incurred exceeds the saved cost. Hence, it is suitable to use for grassroots design.

Secondly, the environmental impact of this project is measured by the total amount of carbon offsetting. The amount of carbon offsetting obtained is about 313 tons of CO<sub>2</sub> per day. Even though this is not a very big number, it causes considerable impact in today's situation amidst the global warming problem.

## 5.2 Recommendations

Since there is still room for improvement and development for the future of design and optimization of a biodiesel refinery from palm oils, the following recommendations would be useful for the future work:

- 1) Collect samples from a biodiesel plant, conduct a survey and measurements of their chemical and physical properties, e.g. vapor pressure, enthalpy, boiling point, viscosity, etc. After that, it is necessary to compare the experimental results with the results obtained from PROII.

- 2) There are a lot of problems occurring with the purification of the distillation column (T-103) because the properties of the stream inlet and outlet this column cannot be determined exactly. Hence, if the samples in this column can be collected and analyzed using the distillation curves from The Petroleum and Petrochemical College Laboratory (Chulalongkorn University, Thailand), accurate design can be derived.