Kantarod Chakton 2009: Simulation of Biodiesel Production from Palm Oil by the Conventional and the Reactive Distillation Methods. Master of Engineering (Chemical Engineering), Major Field: Chemical Engineering, Department of Chemical Engineering. Thesis Advisor: Associate Professor Thongchai Srinophakun, Ph.D. 110 pages.

This thesis proposes the simulation, design and control of a biodiesel process by using ASPEN PLUS, ASPEN ICARUS and ASPEN DYNAMICS, respectively. Palm oil as a reactant contains three main fatty acids: palmitic, oleic and linoleic acids. The first step was to add molecular structure from GaussViewW and GAUSSIAN 03W into ASPEN PLUS for estimation of all missing parameters. The biodiesel production was simulated under the conventional and the reactive distillation processes. The purity from conventional process by sodium hydroxide (homogeneous) and strontium oxide (heterogeneous) were 99.45 and 95.21 %. On the other hand, the purity from reactive distillation with strontium oxide (99.87 %) was higher than sodium hydroxide (99.52 %). Then the steady state result was exported to ASPEN DYNAMICS for process control design and to ASPEN ICARUS for equipment design. The control systems design followed the concept of plant-wide control. The flow rate of oil and methanol reactants were varied ± 5 % to check the control performance and resulted in a good response. Total operating costs of the conventional process with two different catalysts (NaOH and SrO) were 1.30 and 0.89 M$/yr while the reactive distillation processes cost 0.90 and 0.88 M$/yr. In conclusion, the operating cost of biodiesel from sodium hydroxide was more expensive than from strontium oxide.

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