APPLICATION OF REACTIVE DISTILLATION FOR BIODIESEL PRODUCTION ENHANCEMENT

INTRODUCTION

In recent years, oil price has strongly impact on economics, transportation, services, production costs and life style. In addition, the amount of imported oil of Thailand has increased every year. The energy securities of the country have been solved by saving energy, reducing energy consumption, using renewable energy such as wind energy, thermal energy and biodiesel.

Biodiesel, usually made from vegetable oils or animal fats mixed with alcohol such as methanol, refers to any diesel-equivalent biofuel. Biodiesel, biodegradable and non-toxic, has significantly less emissions than petroleum-based diesel fuel. In Thailand, there are many materials to produce biodiesel such as palm oil, sun flower, coconut and Jatropa. Several techniques for biodiesel production from vegetable oil were investigated such as transesterification, enzyme lipase, super critical fluid extraction, heterogeneous catalysts, pyrolysis. Each technique has both advantages and disadvantages. The transesterification technique is mostly used because of high conversion and low cost production. However, soap occurring in transesterification reaction is reduced the production. For solving this problem, several researches focus on using heterogeneous catalysts instead of acid and base catalysts.

The chemical process industry has rapidly changed because of the demanding of new products, high quality, safe, clean and environmental friendly. The operating at low costs and times are play an important role on successful companies. However, the performance is not straightforward. The success is dependent on coping effectively the process dynamic, designing and control strategy. Hence, the unit operation with multi functions becomes more alternatively. These operations such as reactive distillation will reduce cost and complexity.

The reactive distillation is an operation of which reaction and separation perform in the same unit. There are several advantages such as: (1) it can reduce capital and production

costs by combining two units into one. (2) the reaction conversion can be increased by removal products, (3) the heat duty can be reduced by utilizing the heat of reaction, (4) the limitations of azeotropic mixture can be overcome by reaction, (5) the recycle costs for excess reactant, which is necessary for a conventional reactor to prevent side reactions and chemical equilibrium limitation, can be reduced. Due to all these reasons, many publications dealing with the simulation and experimental evaluation of reactive distillation have rapidly increased. Basically, the biodiesel productions have two important processes; reaction and purifications. Therefore, the aim of this thesis is to develop the reactive distillation model for biodiesel production instead of conventional process.

Objective

To introduce the reactive distillation for biodiesel production

Scope of work

1. To study the biodiesel process of sodium hydroxide catalyst by using reactive distillation.

2. To investigate the important parameters in reactive distillation such as height of reaction zone, height of rectifying, height of stripping, column pressure, reflux ratio and boilup ratio.

3. To design controller for reactive distillation in the biodiesel production

4. The simulation of steady state and dynamic are performed by ASPEN PLUS and ASPEN DYNAMIC 2004.1, respectively.

Expected results

1. The biodiesel production by using reactive distillation

2. The optimum conditions of reactive distillation