



CHAPTER I INTRODUCTION

The crude oil price has been increasing rapidly in recent years from USD 17/bbl mark in 1995 to more than USD 100/bbl currently. In January 2008, it hit a record of USD 101/bbl, and has been fluctuating slightly around the USD 94/bbl mark.

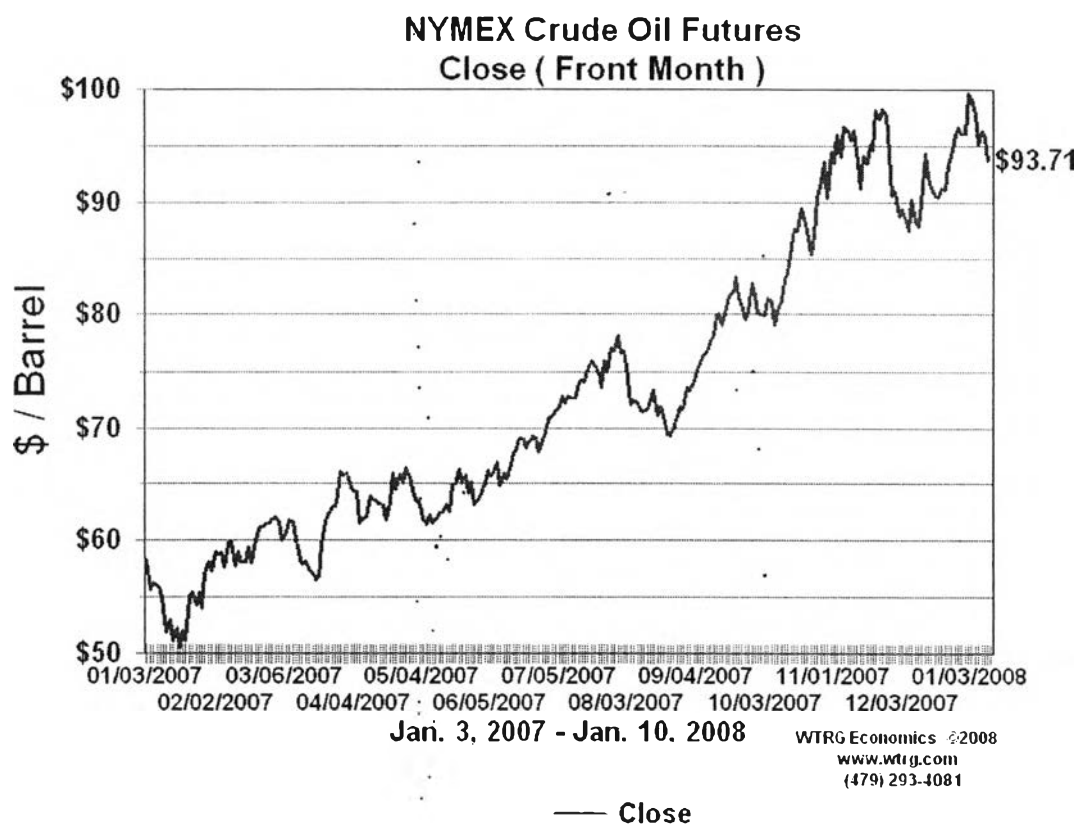


Figure 1.1 Development of oil price.

(Source: Crude Oil Futures Prices - NYMEX)

In an effort to tackle the increasing demand in oil consumption and the ill-effects of pollution due to the emission of CO_x and NO_x, many organizations worldwide have been searching for alternative fuels to oil and have made some significant achievements over the years. There are many alternatives proposed such as solar, hydro, tidal, geothermal, wind, and biomass; and among them, biodiesel fuel, which is a type of biomass derived from triglycerides of vegetable oils and

animal fats, presents a promising alternative to substitute petroleum-based diesel fuels.

The figure below shows the fraction of renewable energy sources in 2005:

World Renewable Energy 2005

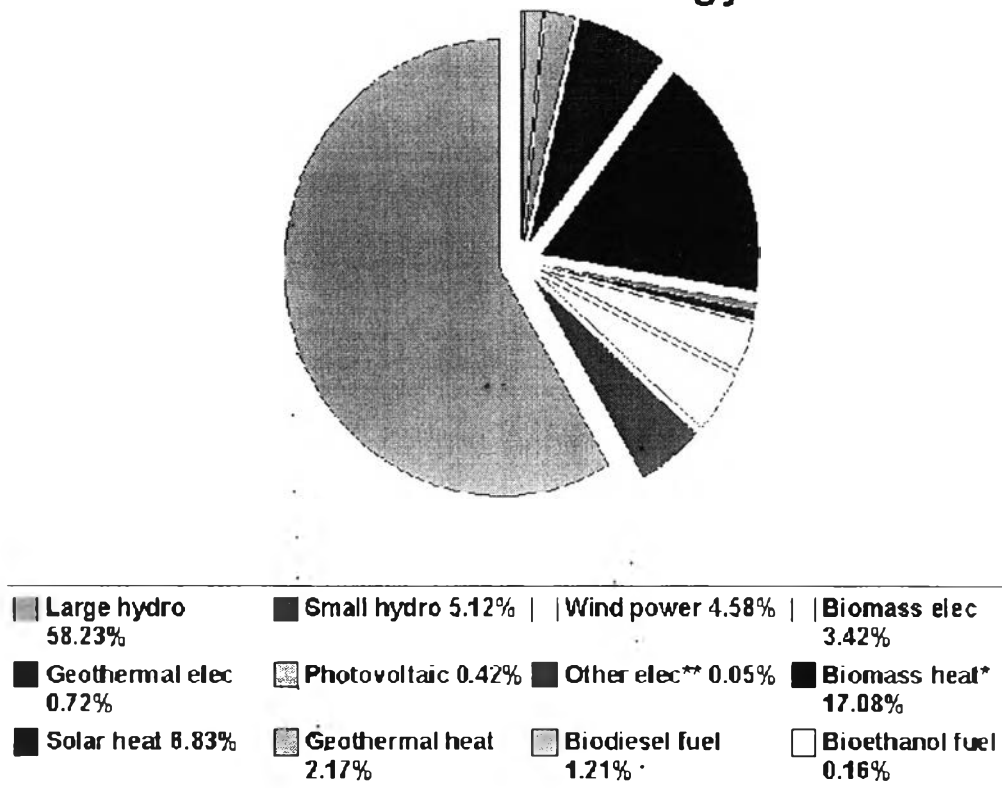


Figure 1.2 World Renewable Energy 2005 (Source: Wikipedia).

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

Our project has demonstrated how the simulation can be performed by using ICAS and PRO/II software which help us predict and simulate biodiesel process. Due to the uncertainty of the predicted properties, through out the simulation, the

computer generated data must be checked and compared with the real data obtained from the plant. This is very important because the results obtained from simulated process must be similar to that from the real process.

This thesis aims to optimize product recovery, energy usage, and pollution control of the biodiesel plant, Veerasuwan Co., Ltd (Thailand), a new plant that produces biodiesel from stearin palm oil. The biodiesel production process for this plant does not use water for washing, but uses settling tanks and vacuum distillation for separation and purification instead. The plant started its operation on 19 April 2007.

Its design was mostly based on experiments, in which the properties of the process components were not known clearly. Hence, the current operation of the plant is not satisfied and the specifications of the recovery, energy consumption are not optimal. In order to simulate this current process, ICAS software can be used to analyze the operational data of each unit to find the sensitive point. The results then can be combined with PRO/II software in order to derive an optimization of the operation of the plant. The purpose of this research is to improve the efficiency of plant.