CHAPTER I
INTRODUCTION

Over the past two centuries, over 90% of the energy used for transportation and industry is derived from petroleum. However, there are two major limitations in using petroleum as an energy source. First, the demand of energy continues to increase each year but petroleum has a limited supply, leads to a shortage in the petroleum supply as a main energy source in the approaching future. Second, petroleum contains sulfur and nitrogen-containing compounds that can cause damage to the environment when it is burned. Therefore, the technology for energy production from renewable sources that produces energy without destroying the environment is required. Several renewable environmentally friendly energy sources i.e. wind, water, sun, biofuel, etc. have been proposed. One of the potential alternative energy source is renewable diesel (bio-alkanes) from the conversion of vegetable oil via a catalytic hydrodeoxygenation reaction. There are a lot of advantages of this reaction over transesterification, including compatibility with the infrastructure of conventional oil refineries, compatibility with engines and fuel standards, lower processing costs, and raw materials flexibility. Also, the obtained products from this reaction have high quality and similar properties to conventional diesel fuel. One of the main benefit is that the process is carbon neutral, which describes fuel production with no net output from carbon in the form of carbon dioxide (CO_2). The released CO_2 from fuel combustion is consumed during the growth of the vegetable that produces the oil. In addition, the NOx, SOx, and particulate matter in the atmosphere are also decreased. Moreover, there are large possible sources of raw material to produce renewable diesel that are commonly be found in Thailand; for example, jatropha, palm oil, and so on.

The main aim of this work is to produce high quality renewable diesel with carbon number in the range of C15-C18 from palm oil which is commonly grown in Thailand. Palm oil was deoxygenated with commercial hydrogenation catalysts i.e. NiMo/γ-Al_2O_3 and Pd/C. In this research, the optimum conditions for the production of renewable diesel was elucidated. Moreover, the product distribution as a function

of equivalent contact time was done to understand the reaction mechanism. Long-term stability of selected catalyst was also investigated.