



## CHAPTER I INTRODUCTION

Under the high crude oil price situation, biodiesel has been considered to be one of the most promising alternative fuels in Thailand. Biodiesel, short chain alkyl esters, can be made by tranesterification or esterification of vegetable oils or animal fats with methanol or ethanol. Biodiesel properties have many advantages including, biodegradation and non-toxicity and it can be produced from renewable resources. Moreover, biodiesel can be directly used in unmodified diesel-engine vehicles because its properties are quite similar to conventional diesel. Currently, Thailand consumes more than 260,000 liters of biodiesel per day and it tends to continuously increase in the future because of the unstable price of crude oil.

In the production of biodiesel, a large quantity of biodiesel wastewater is generated. This wastewater has a high pH and low nitrogen concentration, and contains high hexane-extracted oil and chemicals which are toxic to living organisms. Thus, biodiesel production plants need a well-planned wastewater management strategy with appropriate technology since there are several factors to be concerned such as cost, safety, and effectiveness. There are many treatment methods available such as incineration, solidification, and landfilling. However, one of the most promising methods is biological treatment because it is safe, versatile, and economical. Moreover, it does not contribute any adverse effects to human health.

It is generally accepted that biological treatment is a cost-effective and environmentally friendly approach for treating oil containing wastes or oil-contaminated sites by using microorganisms. It is a complex process that depends on the nature and amount of oil or hydrocarbons present and environmental conditions. The factors affecting biodegradation performance can be classified into three main types: 1) physical and chemical characteristics of wastewaters (e.g. concentration of the oil or hydrocarbons, viscosity, pH, toxicity, etc.); 2) environmental factors (e.g. temperature, oxygen, etc.); and 3) biological factors (type and concentration of microbes, etc.). In practice, there are various types of reactors can be employed for the biodegradation of high molecular-weight hydrocarbons and oily wastewaters.

These are batch reactors, continuous reactors, sequencing batch reactors, etc. which can be operated aerobically or anaerobically.

In this research, the sequencing batch reactor (SBR) was chosen because it has been widely used for the removal of contaminants or pollutants from wastewater successfully. In addition, it can provide good process stability and importantly high flexibility in the operation. This study focused on the treatment of the dilute biodiesel wastewater obtained from the Bangchak Petroleum Public Company Limited using sequencing batch reactors. The effects of nutrient ratio and COD loading rate on the aerobic biodegradation of the hydrocarbons in the biodiesel wastewater were examined.