CHAPTER I
INTRODUCTION

Oily wastewaters from crude oil tanks and other process equipment in refinery usually undergo primary treatment in an API separator. Sludge from this kind of wastewater treatment is called API separator sludge. Generally, it consists of a mixture of water, sediment and oil. It is considered as one of major wastes that needs to be treated and causes disposal problems for refinery.

There are several methods to manage the API separator sludge such as landfill, incineration and pyrolysis. Landfill requires a vast area and generates greenhouse gases into air and toxic compounds in the leachate into soil and ground water. The economic of incineration is unfavorable, and the technique is not always in the best of energy conservation (Oudenhoven van *et al.*, 1995). Moreover, the gaseous which contains a high amount of toxic materials leads to air pollution problems. Pyrolysis which is a thermal decomposition of organic material in the absence of oxygen is an alternative to eliminate the API separator sludge. For the economic and environmental reasons, the conversion of oily waste to an effective energy sources via pyrolysis is recently appealing (Shie *et al.*, 2003). This process can change the oily sludge which contains a large amount of combustible materials with high heating value into valuable products such as gasoline and fuel oil. Interestingly, the experimental data of the pyrolysis of the API separation sludge suggested that the sludge contains a high amount of light components (Punnarattanakun *et al.*, 2002). It is, then, might be possible to recover the light oil prior to the pyrolysis process. This would result in the reduction of the disposal cost and the volume of the sludge needed to be treated. Chemical treatment is an interesting process which can recover the oil from the sludge before it is pyrolyzed.

The aim of this work was to study the combined process which converts the API separator sludge to the valuable oil. In the chemical treatment, the light components were recovered from the sludge by using two techniques. The first technique used surfactant as a detergent to remove the light components from solid particles in the sludge and destabilized light component droplets by using electrolyte solution. In this part, effect of surfactant type and concentration, temperature and

electrolyte type and concentration were investigated. The other technique involved coagulation and flocculation processes together with flotation technique to separate emulsion from aqueous solution. The effects of coagulant and flocculant concentrations and pH of solution were observed in this part. Both original and treated sludge were then pyrolyzed by using TGA and their pyrolysis behaviors were investigated.