CHAPTER I
INTRODUCTION

Oil refineries can cause oil spills which are a major menace to the environment as they severely damage the surrounding ecosystem. Every year, oily sludge is generated in huge quantities by oil refineries. It contains hydrophobic substances which mainly are petroleum hydrocarbons, water, and suspended solid. Hydrocarbon compounds present in oil sludge are aliphatic, aromatic, and polycyclic hydrocarbon which have toxic, mutagenic and carcinogenic properties. Oil refineries need a well-planed oily sludge management strategy to manage oil sludge but many factors such as cost, safety, and effectiveness are concerned for their treatment and disposal. Incineration, the oldest waste treatment technology to manage the oil sludge, uses very high temperatures to burn waste materials. However, this method is increasingly by considered is not appropriate because of the tight regulations of the sludge treatment and disposal of hazardous waste. Biological treatment is the alternative way because it is save, versatile and economical for oil sludge treatment and this method is non hazardous to human health.

Biodegradation is cost-effective, environmentally friendly treatment for oily contaminated sites by the use of microorganisms. Bioremediation has become a major method employed in the restoration of oil-polluted environments, and attempts to accelerate the natural hydrocarbon degradation rates by overcoming factors that limit bacterial hydrocarbon degrading activities. Biodegradation of petroleum hydrocarbons is a complex process that depends on the nature and amount of oil or hydrocarbon present. The factors affecting the biodegradation are nutrients, pH value, oxygen, toxicity, concentration and bioavailability of the contaminants, physical and chemical characteristics in the environment and solubility of the hydrocarbons, etc. The hydrocarbons present in oil sludges are insoluble in the aqueous phase and hence are not available to hydrophilic microorganisms when subjected to biodegradation. It requires special mechanisms to facilitate the uptake of hydrocarbons such as alkanes by microorganisms. High molecular weight hydrocarbons can solubilize more in the aqueous phase by physical means such as an addition of surface active agents or surfactants. Degradation of high molecular

weight hydrocarbons has been studied in oil-aqueous environments, in organic solvent, or by the addition of microbial surfactants using various types of reactors.

In this aspect, the sequencing batch reactor (SBR) is a widely used in biological p rocesses for removal of contaminants or pollutions from wastewater based on metabolism of specialized bacteria. Sequencing batch process provides good productivity and stability in the biodegradation including flexibility in the operation.

This thesis focused on the study of the surfactant-enhanced biodegradation of the oil sludge from the Bangchak Peroleum Public Company Limited and the effects of oil loading rate, cycle number and the concentration of nonionic surfactants (Tween 80) on the bioavailability and biodegradation of hydrocarbons in the oil sludge. The experiments were carried out in the sequencing-batch reactor under various operating conditions.