CHAPTER I

INTRODUCTION

1.1 Background

Water is normally present in crude oil reservoirs or is injected as steam to enhance oil production. Water and oil can mix while rising through the well and when passing through valves and pumps to form, in most cases, relatively stable dispersions of water droplets in crude oil (w/o), which are usually referred to as oilfield emulsions. Natural surfactants and solids stabilize such emulsions. Asphaltene compounds were found to be one of the main factors contributing to the stability of oilfield emulsions. In addition, waxes (alkanes of high molecular weight) can enhance the stabilization in combination with asphaltenes. Asphaltenes are capable of crosslinking at the water-oil interface, preventing water droplets to coalesce. In other words, asphaltenes act as surface active agents that are situated in the interface between the oil and water surface. Although these water-in-oil emulsions are thermodynamically unstable macroemulsion, they are nevertheless very resistant to coalescence and show a high dynamical stability sometimes over years.

1.2 Problem of Water in Oil Emulsion

The water in crude oil is undesirable because it undermines the commercial value of the crude and the operation of refining equipment. Also, emulsions usually exhibit viscosity significantly higher than those of the crude oil, thus increasing the energy input required for transport in pipelines. For these reasons, the prevention of oilfield emulsions is a problem of technical importance for the petroleum industry. In addition, emulsion breakers are typically specific for site or crude-oil type, which implies that a certain emulsion breaker that has worked for oil A does not necessarily mean that it will equally work for crude B type.

1.3 Solution of Water in Oil Emulsion

Demulsification is a process for disrupting the oil/water emulsions. Methods to induce phase separation in water-in-crude oil emulsions can be classified in three main categories: mechanical, electrical, and chemical. Chemical demulsification consists of the addition of minute amounts of chemical compounds (usually 10-1000 ppm) to enhance phase separation rates. The additions of chemical are for examples demulsifier (emulsion breakers), pH adjustment, and wetting coalescence materials. The demulsifiers, that are mainly macromolecules and industrially synthesized from petroleum chemicals, is the most economically and commonly used in oilfields. The demulsification ability of a demulsifier is mainly controlled by two factors: one is the hydrophilic-hydrophobic ability; the other is the ability to destroy the interfacial film. Most demulsifiers are alkoxylate polymers that are mainly ethoxylated and propoxylated and sometimes both. Commercial polymer formulations are diluted in solvents. The actions of solvents that are dissolved with the polymer do not induce a chemical change in the polymer. Aromatics such as benzene, toluene or xylene can help breaking emulsion by dissolving resin/asphaltenes in the oil phase.

1.4 Significance of Research

The crude oil produced at Lankrabue oilfields in Thailand contains a high fraction of water ranging from 1-99 wt%. To obtain the right specification for refinery, the water containing in crude oil have to be removed to less than 0.5 wt%. At present, the problem is solved by using physical followed by chemical methods. The chemical are commercial chemical demulsifiers supplied by a local manufacturer without disclosing its detailed composition. In this project, we propose to study the demulsification of Lankrabue crude oil by using feasible chemicals such as ionic-, nonionic-surfactants, or block copolymers with different structures dissolved in aromatics like toluene or xylenes. The effect will then be compared to the commercial demulsifier. The crude oil composition will be studied and tested for its effect on the stability of water-in-oil emulsion, especially asphaltene and resin fractions. Lankrabue crude oil was tested for its properties. The demulsification

efficiency was investigated using different chemical demulsifiers and solvents. Selected chemical demulsifiers were tested for investigating the effect of temperature, pH, degree of salinity, and amounts of asphaltene.