1 Introduction

1.1 Motivations and Statement Problem

Hydrocarbon resources are very important regarding the fact that they include about 65% of the world's overall energy resources (Langevin, 2006). Nowadays crude oil is the most important hydrocarbon resource of the world and heavy crudes account for a large fraction of the world's potentially recoverable oil reserves (Chilingar & Yen, 1980) (Langevin, 2006). With the combination of an increase in world energy demand and the decline of conventional oils, heavy crude oils have been presented as a relevant hydrocarbons resource for use in the future (Lanier, 1998). However, heavy crude oils only account for a small portion of the world’s oil production because of their high viscosities, which cause problems in the transportation of these oils via pipelines (Plegue, 1989). Generally, interest for heavy and extra heavy crude oil has been minimal as a result of their high viscosity and composition complexity that make them troublesome and lavish to deliver, transport and refine. Nowadays, Alberta in Canada and Orinoco Belt in Venezuela are good examples of regions producing extra heavy oil. However, an increase in production of heavy and extra heavy crude oil will take place in several regions like the Gulf of Mexico and Northeastern China, as it will be needed over the next two decades to replace the declining production of conventional middle and light oil.

The production of heavy crudes is expected to increase significantly in the near future as low viscosity crudes are depleted (Plegue, 1989). Several alternative transportation methods for heavy crudes have been proposed and employed, including preheating of the crude oil with subsequent heating of the pipeline (Layrisse, 1998) (Saniere, 2004), dilution with lighter crude oils (Iona, 1978), partial upgrading (MacWiliams & Eadie, W, 1993), and injection of a water sheath around the viscous crude. All the above-mentioned methods experience logistic, technical, or economic disadvantages, however. Currently, there are three general approaches for transportation of heavy and extra heavy oil: viscosity reduction, drag minimization and in-situ oil upgrading (Rafael, 2010).

Although it is often mentioned that the field of hydro processing catalysis is mature and there are not much compasses for researcher, the increasing demand of
heavy oil has made hydro processing a challenging task for refiners as well as for researchers (Rana, 2007). Paraffin wax deposition costs the oil industry billions of dollars worldwide for anticipation and remediation. Paraffin precipitation and disposition in crude oil transport streamlines and pipelines is an expanding test for the improvement of profound water subsea hydrocarbon stores. There are a few paraffin wax treatment methods. The most widely recognized removal methods are mechanical heat application utilizing hot oil or electrical heating, application of chemicals (e.g., solvents, pour-point dispersants) and the utilization of microbial products. Crude oil contains paraffin waxes that have a tendency to be separated from oil when the temperature of crude oil falls underneath the wax appearance temperature. With decreasing temperature, the waxes for the most part crystallize as an interlocking system of the sheets, along these lines entangling the staying fluid fuel in enclosure like structures. At the point when the temperature approaches the pour point, the oil may gel totally bringing on the cold flow problems, for example, blockage of flow pipes or production lines. The pour point is the most reduced temperature at which oil will flow openly under its own weight under particular test conditions.

1.2 Research Background

One of the newest pipeline techniques is the transport of viscous crudes as oil-in-water (O/W) emulsions (Lappin & Saur, 1989) (Gregoli, 2006). In this method, by the aid of suitable surfactants, the oil phase becomes dispersed in the water phase and stable oil-in-water emulsions are formed. The result causes a significant reduction in the oil viscosity, i.e. the produced emulsion has a viscosity in a range about 50 – 200 cP, and therefore in the transportation costs and problems. This method can be very effective in the transportation of crude oils with viscosities higher than 1000 cP especially in cold regions. Besides, since water is the continuous phase, crude oil has no contact with the pipe wall and this reduces the pipe corrosion (e.g. in the crudes with high sulfur content) and prevents forming of sediments in pipes (e.g. in the crudes with high asphaltene content) (Poynter & Tirgrina, 1970).

The technical viability of this method was demonstrated in an Indonesia pipeline (Lamb & Simpson, 1963) and in a 20-km-long, 0.203-m-diameter pipeline in
California. In this method, with the aid of suitable surfactants, the oil phase becomes dispersed in the water phase and stable oil-in-water emulsions are formed. The formation of an emulsion causes a significant reduction in the emulsion viscosity; even O/W emulsion might reduce corrosion with a crude oil with high sulphur content; corrosion may also appear with use of an aqueous phase, even with the use of formation water, rich in salts. The produced emulsions have viscosities in the range of approximately 0.05 – 0.2 Pa·s. Because of this reduction in viscosity, the transportation costs and transport-assisted problems are reduced. This method can be very effective in the transportation of crude oils with viscosities higher than 1 Pa·s especially in cold regions. In addition, because water is the continuous phase, crude oil has no contact with the pipe wall, which reduces pipe corrosion for crudes with high sulfur contents and prevents the deposition of sediments in pipes, as is common for crudes with high asphaltene contents (Poynter & Tirgrina, 1970). The possibility of injecting aqueous surfactant solution into a well bore to affect emulsification in the pump or tubing for the production of less viscous O/W emulsions will increase the productivity of a reservoir (R. Simon & Poynter, 1968). The main aims of this research are to investigate the factors affecting both the stabilization and the destabilization of oil in water emulsion of crude oils.

1.3 Objective

The objectives of this research are as follow:

1) To develop a generic but efficient and sustainable oil/water stabilization method.
2) Characterization of o/w emulsions in terms of physico-chemical properties.
3) To investigate the various factors affecting the preparation of a stable crude o/w emulsion.

1.4 Scope

In general, this study is about finding the best stabilizer and destabilizer for the oil-water-emulsion. In order to achieve that, surfactants such as Span 80, Triton X-100, Cocamide DEA, Cocamide MEA and MSDS are used and their reactions or behaviors are studied during the experiments. The concentration of the surfactant varies as well as