CHAPTER I
INTRODUCTION

The most common problem in petroleum fields is wax deposition. This problem occurs around the world, including Thailand. The wax deposition can occur during its transportation. When wax deposition occurs in storage tanks, the volume of crude oil is reduced due to the remaining on board (ROB). Consequently, the amount of crude oil supplied to the destination becomes less and less. Furthermore, wax can precipitate on surfaces such as pipeline and storage tank. As the crude flows up the well, its pressure drops cause solution gas to liberate. This leads to a fall in temperature increase, an increase in viscosity, and a change in oil composition. In addition, buildup of the solid deposit will reduce the internal diameter and eventually will block the line or well. This problem costs the petroleum industry billions of dollars annually in terms of cost of treatment, reduced production, well shut-in, inefficient use of production capacity, and increased manpower.

The wax present in petroleum crude oil primarily consists of paraffin hydrocarbons (C_{18}-C_{36}) known as paraffin wax and naphthenic hydrocarbons (C_{30}-C_{60}). When the temperature of crude falls below the cloud point or the wax appearance temperature (WAT), the temperature at which the first crystal appears, the wax will form crystals. The crystals formed from paraffin wax are known as macrocrystalline wax. Those formed from napthenes are known as microcrystalline wax. Waxy crude usually consists of light and intermediate hydrocarbons (paraffin, aromatic, napthenic and etc.) and very low concentration of heavy organic compounds (resins, asphaltenes, mercaptans, organometallics, and etc.).

There are several techniques developed to minimize the problems caused by wax crystal deposition or aggregation. First, the simple way to solve the blockage problems is to use mechanical methods, such as pigging and paraffin knife. Second, the problems can be efficiently controlled by insulation and heating of the crude to a temperature above its cloud point. Finally, the easiest way is to use chemical methods to inhibit paraffin deposition. The chemical inhibitors can be divided into three categories: (1) solvents used for dissolving paraffin, (2) wax crystal modifiers that are polymers to inhibit or alter wax crystal growth, and (3) paraffin dispersants

which inhibits the particles from uniting and depositing. In previous study (Numura, 2005 and Malikhow, 2006), suitable wax inhibitors for Thai crude oil in Lankrabue field were investigated. It was found that at different temperatures, different inhibitors are effective. In addition, the efficiency of inhibitors greatly depended on their composition and structure, such as poly (ethylene-co-vinyl acetate) or EVA with varying vinyl acetate contents. According to the results, it was found that EVA with 40% vinyl acetate content at a concentration of 1000 ppm is the most efficient to prevent the wax deposition for a Thai crude oil, Phet crude oil in Lankrabue field.

The purposes of this work are: (a) to investigate suitable wax inhibitors for Phet crude oil in a semi-pilot scale test and (b) to investigate suitable solvent to dissolve wax, the remaining on board (ROB), occurred in semi-pilot scale container. And the scope of this research work covers: (a) the effect of crude oil composition and its characteristics on pour point temperature in order to identify more specifically appropriate amount and type of wax inhibitor needed in a semi-pilot scale test, (b) the effect of type and amount of wax inhibitors on the pour point of Phet crude oil and the remaining on board in a semi-pilot scale test, (c) the effect of amount of solvents (naphtha) to dissolve the remaining on board in a semi-pilot sale test, (d) the economic assessment of using suitable wax inhibitor for wax precipitation prevention compared to conventional wax disposal methods.