# CHAPTER I

# INTRODUCTION

Due to the rapid growth in the economic and industrial sector in Thailand petroleum products are in a great demand. Thailand has to import crude oil from several foreign countries at a cost of many million baht. To help reduce the trade deficit, the petroleum resource in Thailand must be utilized to the most value. As natural petroleum resources [1,2] are found in several parts of Thailand particularly in Cheingmai (Fang Resource), Kampangpeth (Sirikit Resource), as well as Chaiyapoom province.

Up to 1,000 barrels per day of Fang basin area crude oil is fed into Fang refinery plant. Fang crude oil, which is a typical paraffin base crude, is refined by atmospheric distillation into light oil and residue. The residue is then distillated in the vacuum tower. The products are thus separated into fractions containing light distillate (LD), heavy distillate (HD), and a heavy fuel oil.

Typical of a paraffin base crude, the distilled products from the vacuum tower in Fang refinery have a high wax content. These distillates are used as low quality and commercial value fuel oil. They collect as a solid at room temperature, a property that affects their transportation and their applications. In order to upgrade these oils, this wax must be removed by a suitable process.

Three methods for improving waxy distillates can be formed in the patent literature [3-12]. The first is a dewaxing process by solvent extraction. The deoiled waxes are further purified by physical treatment and chemical

treatment (hydrotreatment process was suitable). The second method utilizes a hydrocracking process. Paraffin waxes are catalytically cracked to small molecules such as gasoline, kerosene, light fuel oils, etc. Nowadays, the most preferred process is hydroisomerization. This process can convert wax to high viscosity index lubricating base oil which helps upgrade lubricating base oil from lube manufacture.

However, until now heavy distillate from Fang is used as stove oil and petroleum wax. Slack waxes are often manufactured to candle or similar products because of their low purity. These applications produce low price products. Conversion of slack waxes into purified wax or lubricating oil or fuel oil are mostly suitable method. In 1993 Supin Tangwiwat [13] studied purification of wax from heavy distillate by deoiling with MEK and decolorizing with various decolorizing agents (Fuller's earth, activated carbon and clay). Waxes from this process had good physical properties; appearance color was qualified.

This thesis was concentrated on upgrading the heavy distillate using a hydrotreatment process, because the hydrotreatment of wax does not produce a lot of waste in the process. The objective of this thesis is to study a process for converting paraffin to a higher value product by first hydrotreating the wax and thereafter hydroisomerizing the hydrotreated wax in the presence of hydrogen on a fluoride doped Pt catalyst [10-12]. The hydroisomerate was dewaxed to produce a premium lubricating base stock. The catalysts which were used in hydrotreating process generally serve a multiplicity of functions [14-16] such as selective cracking, hydrogenation, desulfurization, and denitrogenation. Generally, hydrotreating catalysts are comprised of at least one Group VIB metal and at least one Group VIIIB metal on refractory metal oxide support preferably alumina or material containing alumina. In this study molybdenum oxide and nickel oxide with highly hydrogenation activity, were used as the hydrotreating catalyst.

Objectives and scope of this study

The objective of the study was to transform petroleum wax separated from Fang heavy distillate to higher value products. This study was performed via hydrotreatment of solid petroleum wax at various conditions and followed by hydroisomerization of the hydrotreated waxes with the optimum catalyst in the optimum operating conditions.