CHAPTER I
INTRODUCTION

Energy conservation and environmental care has become more important for the petroleum and petrochemical industry during the energy crisis of the early 1970's. Now, due to the current situation, innovative and efficient ways are needed to improve energy efficiency and reduce emission. Crude distillation unit is an energy-intensive process and has received significant attention for better energy integration in petroleum industry.

In conventional oil refining, crude distillation unit (CDU) is the first step of process separating the crude oil into different fractions depending on the different boiling temperatures as shown in Figure 1.1. The products of the crude oil distillation unit can be either final products or feedstock to other plants for further processing. In the middle decades of 20^{th} century, when some of oil refineries operating today were designed, each refinery was considered to process a certain type of crude. In the last two decades, the raw material fed to the refinery changes frequently the characteristics. This modification is explained by the availability of uncertain crude oil quality on the market and the change in quality of crude from traditional sources. This situation is one of the reasons to revamp CDU, to increase CDU flexibility. Conversely, separation costs should be rapidly reduced, to face the market concern. In crude distillation unit, the crude oil is preheated in two stages before entering the distillation column. The first stage is a heat exchanger network (HEN), where the oil is heated to an intermediate temperature by cooling distillation process streams and recovering the heat from condensers. Afterward, the crude oil enters a furnace to reach the required processing temperature. The more fuel consumed in the furnace, the larger the operating cost (Smith *et al.*, 2003). The primary objective of conventional energy analysis of a CDU is to maximize the yield of heat recovery in HEN. Normally the HEN of crude distillation unit, one of the most complex in oil refinery, need retrofit.

Heat exchanger networks (HENs) have been widely applied in industrial projects over the past decades because they provide significant energy and economic savings. Applications of HEN integration can be divided into two categories are

grassroots and retrofit design. In oil refining, retrofit design are far more common than grassroots applications. Frequently, proper redesign of an existing network can reduce significantly the operating costs in a process. The major objectives of retrofit problems are the reduction of the utility consumption, the full utilization of the existing exchangers and identification of the required structural modifications.

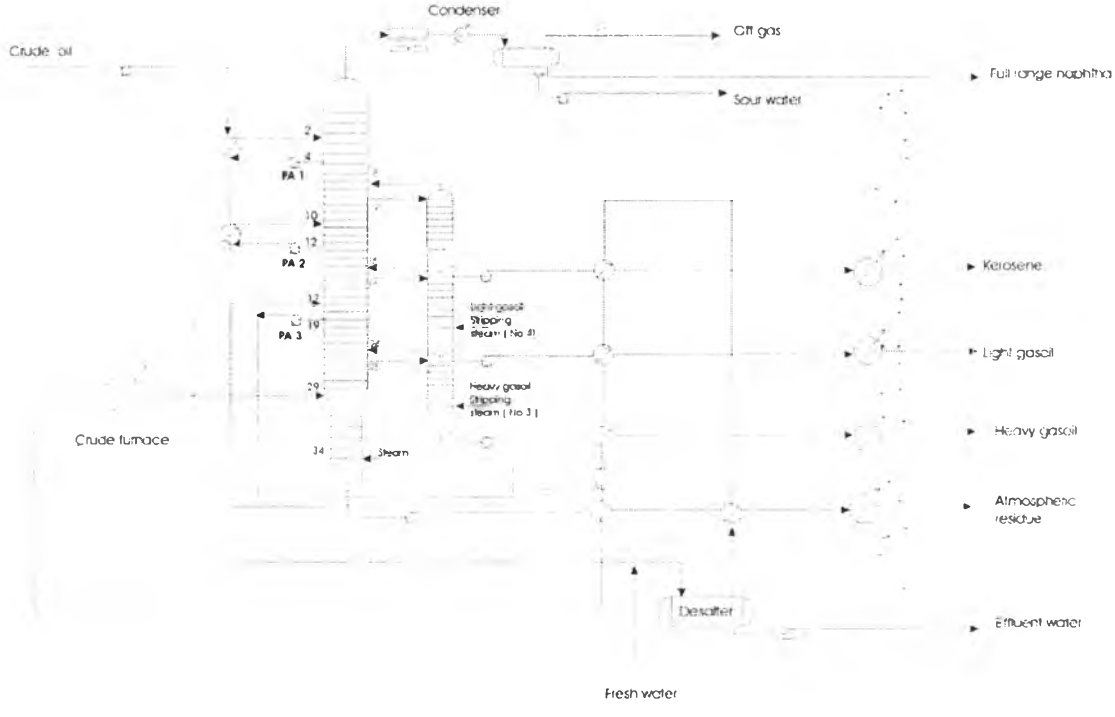

Figure 1.1 Crude distillation Unit (CDU).