

CHAPTER I INTRODUCTION

Crude units are the first units that process petroleum in any refinery. The objective is to separate the mixture into several fractions like naphtha, kerosene, diesel and gas oil. Crude unit is a highly energy-intensive process which consumes fuel at the equivalent of 2 % of the crude processed. A schematic diagram of an atmospheric crude fractionation unit is shown in Figure 1.1.

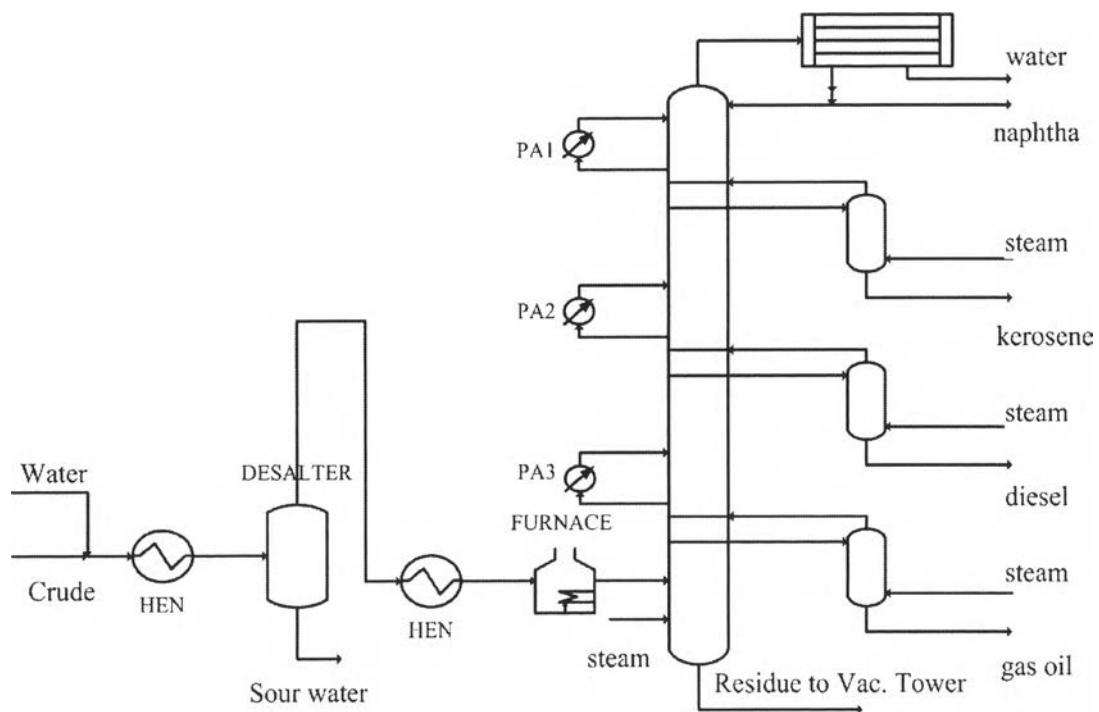


Figure 1.1 Atmospheric crude unit (Bagajewicz and ji, 2001).

Crude oil contains salts which can cause damage to downstream equipment and must be removed. To remove the salts, crude is mixed with water and typically heated to temperatures between 215 °F and 280 °F in a heat exchanger network and allowed to separate salt in the desalter. The desalted crude enters another heat exchanger network and receives heat from hot stream. Both heat exchanger networks make use of the vapors of the main

column condenser, the pump-around circuit streams (PA1, PA2 and PA3), and the products that need to be cooled. Then, the preheated crude enters the furnace, where it is heated to about 644-700 °F. The partially vaporized crude is fed into the feed region which called flash zone of the atmospheric column, where the vapor and liquid separate. The vapor includes all of the components that consist of the products, while the liquid is the residue with a small amount of relatively light components in the range of gas oil. These components are removed from the residue by steam stripping at the bottom of the column. In addition to remove heat more effectively, liquid is withdrawn at various points of the column and cooled down to be sent back at an upper position on the column. Cooling water and sometimes air coolers are used in the heat exchanges PA1, PA2 and PA3, but it is always more advantageous to have these streams release their heat to the crude in the heat exchanger networks (HEN), usually called pre-heating trains. Several different designs and configurations for the heat exchanger network in the conventional crude oil distillation unit are possible.

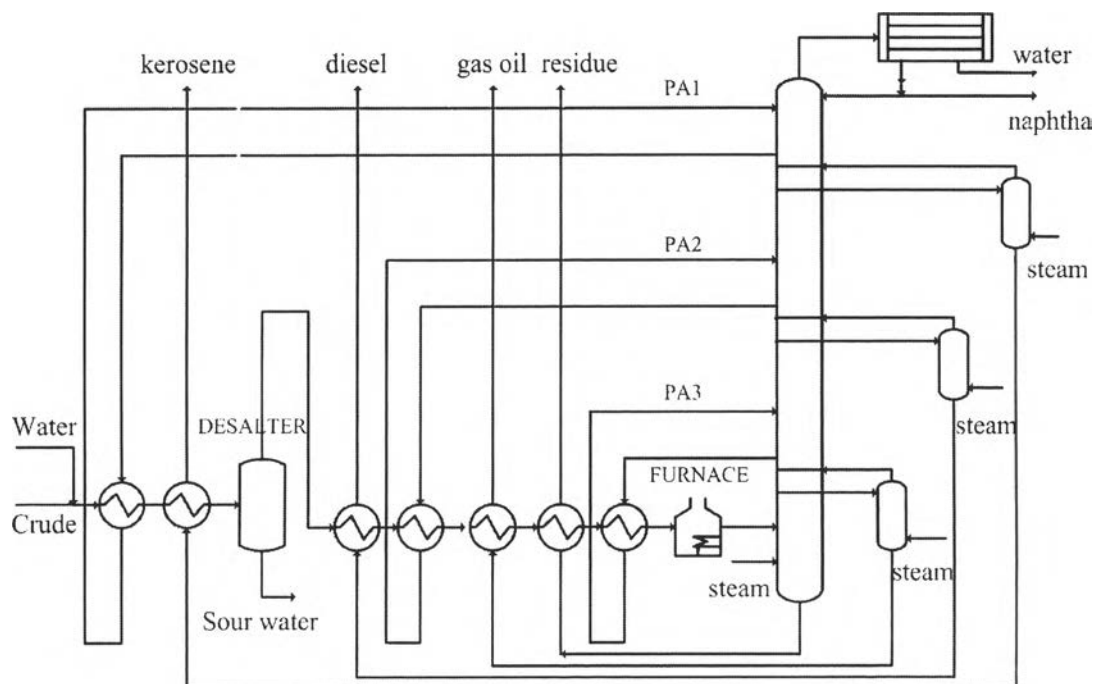


Figure 1.2 Atmospheric crude unit with preheating train.

Figure 1.2 shows one particular instance of a preheating train, not necessarily the best or most recommended one. In addition, in some oil distillation units, gas oil is not produced and instead becomes part of the residue. Such units contain one less side-stripper and one less pump-around than those shown in Figures 1.1 and 1.2. Further, in units in which gas oil is not produced, the diesel may be further separated into light and heavy diesel.