CHAPTER I
INTRODUCTION

Natural gas is gas produced at the surface from underground accumulations of widely varying compositions which consists of at least 95% volume of hydrocarbon and the remainder being nitrogen and carbondioxide with sometimes a small proportion of hydrogen sulfide.

Natural gas processing is the process for separating the natural gas to produce many kinds of products, like NGL (Natural Gasoline), Ethane, Propane and LPG (Liquefied Petroleum Gas). It is as complex as complete liquefaction of the total gas stream by cooling to extremely low temperatures. Extraction of heavier gas liquids (butane and heavier) can be achieved by simple compression and moderate cooling of the natural gas stream. The main unit operation used in gas separation plant is distillation unit.

Distillation unit is the energy-intensive unit operation and requires significant capital outlays. By studying the thermodynamics of a distillation column, engineers can qualify the thermodynamic efficiency of the process, identify the regions where energy is utilized, and define the minimum energy consumption targets. Pinch technology is one of the energy optimization method for analyzing the energy usage in refinery and chemical plant process.

Pinch technology is practical for process integration. Process integration is a very important means to improve energy efficiency of industrial and manufacturing processes while minimizing their environmental impact. It was used first time for the Heat Exchanger Networks (HENs) and applied for Distillation Column Design. The process pinch point is the energy optimum point for the process design. The temperature level above this point is the heat sink, and one below this point is the heat source. Based on rigorous thermodynamic principles, Pinch technology will do matching cold streams needed to be heated with hot streams needed to be cooled, causing energy recovery. Thus pinch technology can be used to determine the minimum requirements for both hot and cold utilities; heaters and coolers.

Process simulation software is essential for study of pinch technology. This research work used the PRO/II software as a tool for doing design and simulation.

PRO/II is the cornerstone product of SIMSCI's Process Modeling Solution Suite. The Suite contains process design, analysis, and optimization techniques. PRO/II performs rigorous mass and energy balances for a wide range of chemical processes. PRO/II applications include designing new processes, evaluating alternative plant configuration, modernizing and revamping existing plants, assessing and documenting compliance with environmental regulations, troubleshooting the process and improving plant yields and profitability.

For this study, column targeting, a part of pinch analysis work, will be applied for distillation columns of the gas separation plant unit I including demethanizer, deethanizer and depropanizer, to analyze the heat flow in the column to obtain the energy saving. Natural gas liquids are normally fractionated by vaporizing the lighter products from the heavier products in the following order.

Demethanizer: The first step in the fractionating sequence is to separate the methane, with the methane leaving at overhead and the ethane and heavier components leaving at the bottom of the fractionator.

Deethanizer: The next step in the processing sequence is to separate the ethane, with the ethane leaving at overhead and the propane and heavier components leaving at the bottom of the deethanizer.

Depropanizer: The next fractionation step is the separation of the propane from the butane and heavier components. The propane leave at overhead and the butane and heavier component leave from the bottom of the fractionator and this fractionator has sidedrawn stream for making LPG (Liquefied Petroleum Gas).