CHAPTER I
INTRODUCTION

One of the most important roles in many industrial processes is energy consumption as energy cost has a substantial share in the overall production cost and the budget for energy costs rises sharply due to recent high oil prices. A gas separation plant is a capital-intensive industry consuming much energy. Hence, saving and optimizing the energy usage promises to meet the goal of an optimum energy cost and to gain more profitability.

Pinch technology is one of the process integration methods, representing a simple powerful methodology for energy-saving based on thermodynamic principles. This methodology, using the graphical diagrams, can provide the optimum energy needs for any processes. The major objective of pinch technology is using the "Pinch Concept" to achieve energy cost savings by process heat integration with maximizing process-to-process heat recovery and minimizing the external utility loads (e.g., steam, hot oil, cooling water, and refrigerant). This aim is conceptually based on the construction of composite curves, and then specifies the pinch point where ΔT_{min} is observed. Choosing the optimum ΔT_{min} means the optimum starting point in the process design. Moreover, pinch technology combines grand composite curve that is used to determine the minimum requirements for both hot and cold utilities and also to make decisions of appropriate utility placements in a process. Pinch technology is now widely used for heat exchanger network synthesis (HENS) and can also be applied for many applications such as distillation column targeting, stand-alone column modifications, opportunities for combined heat and power (CHP) generation, mass exchanger networks synthesis (MENS), total sites improvement, etc. In the beginning, the technique was applied for grass-roots designs and subsequently it has been extended for retrofit designs including changes for a reduction in utility usage, appropriate structural modifications that are concerned with minimum number of units, heat transfer area and type of units, and reassignment of matches.

The purpose of this research is to apply the effectiveness of pinch technology for optimizing the energy consumption toward the gas separation plant 5 of PTT Public Company Limited (GSP5). This research is divided into three main sections;

retrofit of heat exchanger networks (HENs), distillation column targeting and stand-alone column modifications, and process heat integration, in that order.

Process Description

The GSP5 under study uses natural gas as a feedstock which has a capacity of around 530 MMSCFD. It produces four kinds of products consisting of methane, ethane, propane, liquefied petroleum gas (LPG), and natural gasoline (NGL). The main areas of this work consist of two parts; the distillation columns and the HENs. In the distillation columns part, there are three distillation columns, including the demethanizer, the deethanizer, and the depropanizer. Furthermore, there are thirteen hot streams and six cold streams, with fourteen heat exchange units in the HENs part.

The demethanizer (3503T01) is a cryogenics process and is also aimed at separating methane, with a lighter boiling point, at the top of the column (sales gas), and other heavier components at the bottom of the column.

The deethanizer (3503T02) takes the bottom product from the demethanizer and separates out the ethane at the top of the column. The heavier product will be separated out at the bottom of the column.

The depropanizer (3504T01) is the last column to separate the product, taking the bottom products from the deethanizer as feed. It produces three main products consisting of propane, LPG, and NGL.