CHAPTER 1 INTRODUCTION

1.1 Background

Rayong Olefins Company Limited or ROC is a petrochemical plant that is a subsidiary of Siam Cement Group (SCG). In manufacturing, the company uses naphtha, LPG and recycled ethane/propane as raw materials to produce several high valuable products from cracking process, which are ethylene (C_2H_4) and propylene (C_3H_6) as main products, and hydrogen, mixed C_4, benzene, toluene and C8+ as by-products. The olefins process consists of four main sections consisting of hot, cold, benzene and toluene separation unit and utility sections, as shown in Figure 1.1.

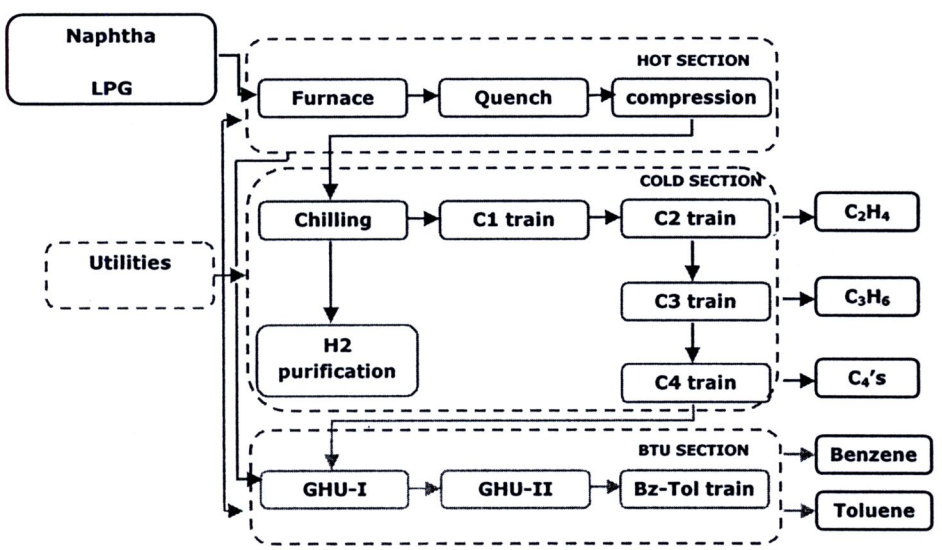

Figure 1.1 The overall process of the ROC plant

In ROC plant, waste and by product streams which contain mixed C_4, benzene, toluene and C8+ as major components are generated from the cracking process. Generally, waste streams will be sent to treat by treatment process in ROC plant while the by product streams will be used for the other processes. Nevertheless, both streams can be recycled by distillation in distillation column in order to recover useful components such as benzene, toluene and C8+ from these streams. These components will be used as a raw material of the other plants in SCG group. Furthermore, recovered components from the waste stream can reduce the amount of imported chemicals from outsources that give the benefit of ROC plant.

Distillation column is one of the most commonly used in thermal separation and has been used for centuries. It is necessary for the olefin plant to separate the interested components such as ethylene and propylene from the others. Moreover, it is used to recover the useful components from the waste and by-product streams which occur from the olefin process. In real plant, the construction of the distillation column not only spends high equipment and operating costs but also has more a risk. Moreover, development the real plant distillation column complicates and consumes huge amount

of energy. Therefore, the pilot distillation column is fabricated for studying the process behavior of the distillation column. Moreover, it is used for studying the possibility of the process before making a decision to fabricate the real plant distillation column.

R&D department, which is located on the R&D building in ROC plant, fabricated the pilot distillation column to use for multipurpose functions. It is designed to test the separation comparing with the real plant distillation column. The others application of the pilot distillation is to prepare sample for the other projects such as n-hexane and isopar projects. However, the column efficiency after the pilot distillation column is fabricated is not well. Therefore, the pilot distillation must be revamped to improve the column efficiency. Nevertheless, the actual column efficiency after the pilot distillation is revamped is unknown that brings to the first motivation of this project. In addition, there are some problems occur when the pilot distillation column is started up and operated. During the pilot distillation column is operated, it hard to predict the output parameters such as temperature, flow rate and composition when the operating conditions which are reflux rate, distillate rate and feed location are changed. Therefore, it is hard to control and scale up the pilot distillation column to the real plant distillation column. Moreover, from the start up operation of the pilot distillation column, it is difficult to find the initial operating conditions and take a long time to reach a steady state. Therefore, this thesis focuses on the improvement for the start-up operation of the pilot distillation column.

1.2 Objectives

1. To develop steady state models for achieving the pack efficiency of the pilot distillation column.
2. To propose the start-up procedure of the pilot distillation column.

1.3 Scope of work

1. Develop and match the steady state model with the pilot test run data using Aspen Plus.
2. Determine the pack efficiency of the pilot distillation column for separating Benzene-Toluene mixture.
3. Study the effects of the operating conditions which are feed location and reflux rate on the output parameters which are product specification, level in reflux drum and sump and the temperature profile of the pilot distillation column using Aspen Dynamics.
4. Propose the start-up procedure of the pilot distillation column.

1.4 Expected Results

1. The pack efficiency of the pilot distillation column.
2. Start-up procedure of the pilot distillation column.