CHAPTER 1

INTRODUCTION

The first petrochemical complex, consisting of an olefins unit owned by the National Petrochemical Corporation (NPC) and three downstream polyolefin units by Thai Polyethylene Co. (TPE), HMC Polymers Co. (HMC) and Thai Plastic and Chemicals Co. (TPC), began its operation in late 1989. This first complex is a gas-based olefins and polyolefins production units with the capability to produce polyethylene, polypropylene and PVC for domestic consumption (Figure 1-1). Local consumption of all derivatives and resins has been growing further at a very rapid rate.
Continued expansion and growth of the national economy particularly in the industrial sector have encouraged further development of the petrochemical and downstream processing industry. With close and full government support, Thailand is now ambitiously developing her second grass-root petrochemical complex, the aromatic complex started to be in operation in 1992.

The aromatic complex is aromatic based and will produce benzene, toluene, and xylene (BTX) and also associated olefins to be used as raw materials for the production of polystyrene, linear alkylbenzene, polyester and many others as shown in Figure 1-1.

Successful implementation of this second complex will mean that the kingdom can then enjoy a full benefit from the petrochemical industry by having full range of products covering all derivatives of olefins and aromatics to support domestic and

export markets.

Catalyst reforming is a main process in the production of aromatics such as benzene, toluene, and xylenes. The feedstocks, naphthenes-reformer feedstocks, are complex mixtures of paraffins, naphthenes, and aromatics, generally containing from six to ten carbon atoms per molecule. The catalytic reforming processes involve (1) dehydrogenation of naphthenes to aromatics, (2) isomerization of naphthenes and paraffins, (3) dehydrocyclization of paraffins, and (4) hydrocracking of paraffins. The modeling of these reactions have been developed by several authors in recent years in order to gain better understanding of the process involved and also to further explore the benefit of relevant models i.e. design and operation of the catalytic reforming. Most of the studies so far conducted have been carried out in isothermal mode of operation with pure hydrocarbons or with lumped hydrocarbons in adiabatic mode of operation using narrow range of conditions. Thus, the effects of operating conditions on catalytic reforming processes have not been evaluated.

Subsequently, it is desirable to have a model which takes into account different operation conditions and a mixture of C_6 and C_7 hydrocarbons as would be the case of actual operation.

1.1 The Objectives of This Study

The main objectives of this study are therefore to

(1) study and review catalytic reforming, and

(2) develop a mathematical model for the prediction of steady state behavior of the catalytic reforming processes,

(3) compare the simulated results with the experimental results.

1.2 The Scope of This Study

The scope of this thesis study is to cover:

(1) reviews of catalytic reforming,

(2) review modeling of reforming processes,

(3) develop a computer model to predict the steady state behavior of the catalytic reforming,

(4) the computed resulted are compared with experimental and pilot plant data under isothermal and adiabatic operation, and

(5) this study is limited to a system of fixed-bed catalytic reactor with a catalytic system of Pt on alumina type of catalyst. Furthermore the feedstock is a mixture of C_6 and C_7 hydrocarbons.

FIGURE 1-1 DEVELOPMENT OF THE PETROCHEMICAL COMPLEXS IN THAILAND