# CHAPTER 1

## INTRODUCTION

The petrochemical business is now a key industry in Thailand. It provides a wide range of products which are necessary in our society such as plastics, synthetic fibers, and synthetic rubbers. A pioneer in developing this industry is Thai Plastic and Chemical Public Co., Ltd. (TPC). The company was established in 1966 to produce polyvinylchloride (PVC) by importing all raw materials used in the process. In 1981, the Eastern Seaboard project was set up by the government to help develop this industry.

Petrochemical complex can be categorized into primary petrochemical plants which produce raw materials such as ethylene, propylene and aromatics, and secondary petrochemical plants which produce polyethylene(PE), polypropylene (PP), and polyvinylchloride. In addition, many organic chemicals are produced from this petrochemical industry which are used as raw materials for detergents, surfactants , paints , solvents , glues , and fertilizers (Figure 1-1).

Aromatics are produced mainly from petroleum and coal. The production process of coal-based aromatics are

carbonization, gasification and liquefaction. Whereas the petroleum-based aromatics are produced from catalytic reforming, pyrolysis gasoline and hydrodealkylation (HDA) processes.

Catalytic reforming is a major petroleum process. This process is to upgrade low-octane naphtha (composed of C5 to C12 hydrocarbons) into high-octane gasoline. The process will not change the number of carbon atoms in hydrocarbon molecules. The important high-octane-number hydrocarbons in gasoline (produced from the reforming process) are primarily aromatic hydrocarbons such as benzene, toluene, xylenes and $C_{9+}$ aromatics. Moreover, catalytic reforming is an important process in producing aromatics which are not only premium blending stocks for motor fuel but also important components in producing plastic films , fibers , solvents and adhesives. The reactions in catalytic reforming process from paraffins, cycloparaffins and aromatics in naphtha are hydrocracking, isomerization , dehydrogenation and dehydrocyclization. There are many studies on the modelling of these reactions. These studies are intended to obtain better understanding on the process in order to design reactors or to optimize experimental conditions.

This study is to develop a model for the simulation catalytic reforming using Platinum-Rhenium on alumina catalyst.

## The Objective of This Study

The main objective of this study is to develop a mathematical model to predict behavior of the catalytic reforming process of $C_6$ and $C_7$ hydrocarbons on Platinum-Rhenium/alumina catalyst.

## The Scope of This Study

The scope of this thesis covers;

(1) study of catalytic reforming process.

(2) review of modelling of catalytic reforming process.

(3) development of a mathematical model for catalytic reforming and parameter estimation to predict behavior of catalytic reforming process.

(4) comparison of the results from the model with the experiments from the literature under isothermal operation.

This study is limited to a system of fix-bed catalytic reactor with catalyst system of Platinum-Rhenium on alumina type and the feedstock is $C_6$ or $C_7$ hydrocarbons or their mixture.

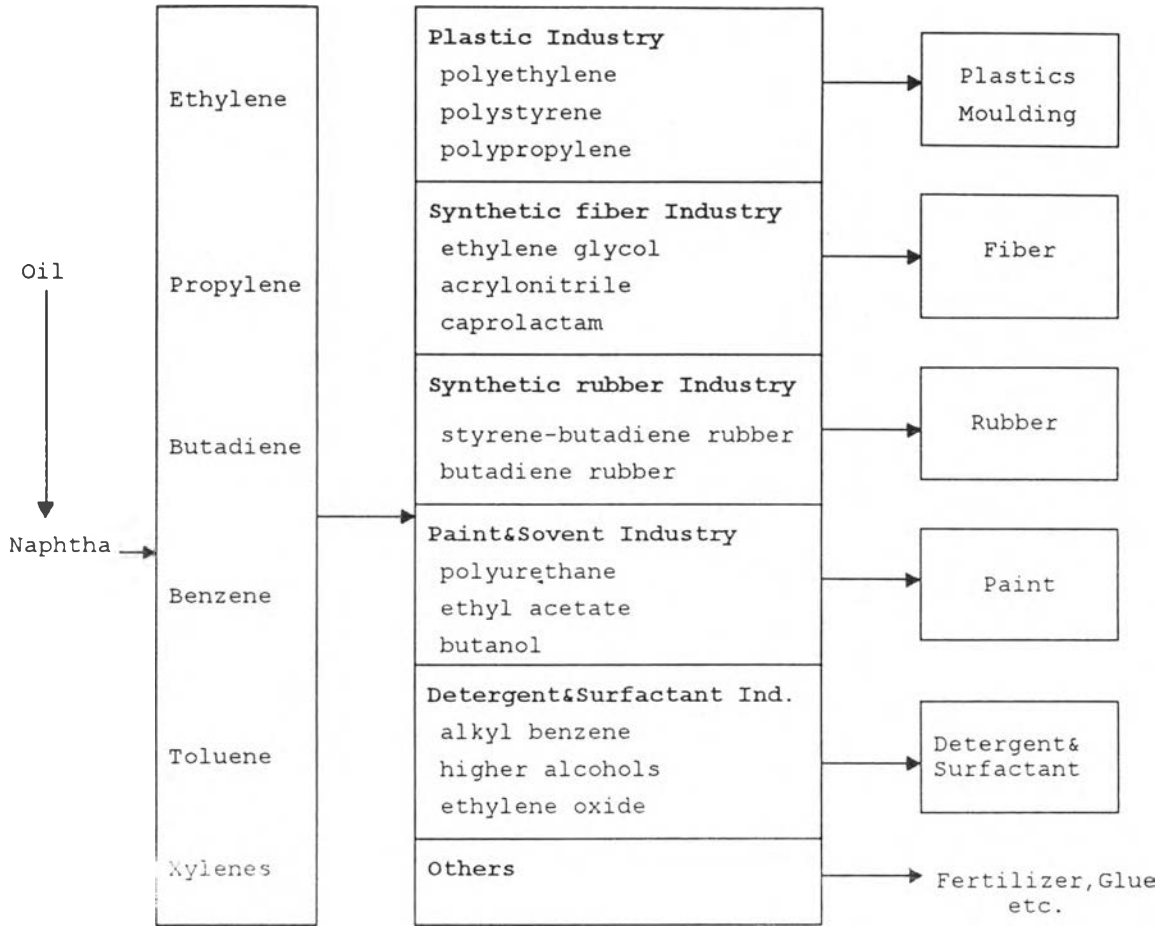


Figure 1-1 Petrochemical products & Petrochemical complex