

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 gasbased 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_{o} and C_{τ} 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:

3

(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.

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FIGURE 1-1 DEVELOPMENT OF THE PETROCHEMICAL COMPLEXS IN THAILAND

DEVELOPMENT STAGES YEAR	PROJECTS	ESTIMATED INVESTMENT COST (MLES)	RAW MATERIALS	UPSTREAM UNIT	INTERMEDIATE UNIT	DOWNSTREAM UNIT	END USERS FINAL PROCESSORS
PRE DEVELOPMENT STAGE	NATURAL GAS DEVELOPMENT	500	NATURAL GAS -		SALE GAS		EGAT
			IMPORT ETHYLENE			HDPE/LDPE	PLASTIC
			IMPORT SM -			PS	FOCESSORS
1978–1982			IMPORT PTA/DMT	territoria		PET	SPINNER WEAVER GARMENT
STAGE 1	GIS SEPARATION PLANT	350	NATURAL GAS -				COOKING TRANSFORTATIO
	FIRST PEIRCOHMICAL COMPLEX	800	ETHANE PROPANE	EDHNE PROPINE	ETHYLENE	HDPE/ LLDPE	PLASTIC
					PROPYLENE	PVC PP	HODESSOR
<u>STAGE 2</u>	SBOND PEIRODHMICAL	1,500	CONDENSATE _ NGL , NAPHTHA		ETHYLENE	PE PVC	PLASTIC PROCESSOF
	E ST				PROPYLENE		
	คูนย์	วิทเ	เทร้า	c4	PO .	BR	RUBBER AN PLASTIC PROCESSOR
	กาลงา	176	12171	BNZDE	SM Y	ABS	RUBBER AN PLASTIC PROCESSOF
						DETERGENT	CONSUMER PRODUCT
				PARACOLENE	PTA	PET T	SPINNER, WEAVER GARMENT
989-1994				CRIHORALENE	PA	RASTICIZER	PLASTIC PROCESSOR

4