CHAPTER I

INTRODUCTION

In natural gas production processes from associated gas, the major methane compound is separated from the mixture which composed of 2-9 carbon-atoms hydrocarbons for avoiding problems occurring in usage and transportation. These separated are collectively called Natural Gas Liquid (NGL), which the C_5 and C_6 hydrocarbons are the major compositions. The C_3 and C_4 hydrocarbons are frequently refered to a Liquefied Petroleum Gas (LPG or LP-gas), and their data are usually reported separately from NGL. In many cold countries NGL is normally added to automobile gasoline to raise its vapor pressure and increase the ease of starting in cold weather, but for tropical countries this way of usage will be caused of the problem occurring in car engine by vapor lock [1].

Since NGL has some properties similarly to light naphtha, nowadays, domestic studies in NGL are aimed at seeking new ways of utilizing it in many industries. The isomerization reaction is one reaction leads to improve the octane number of NGL.

Octane number of any mixture can be increased by increasing branched-chain hydrocarbons, cycloparaffins and aromatics. On the other hand decreasing straight-chain hydrocarbons, increasing the octane number. Octane numbers of various hydrocarbon compounds are presented in Table 1.1.

Table 1.1 Research Octane Numbers of Some Hydrocarbon Compounds

HYDROCARBON	RESEARCH OCTANE NUMBER (RON)
n-Paraffins :	
n-Pentane	61.7
n-Hexane	24.8
n-Heptane	0.0
n-Octane	-19.0
Branched-chain paraffins :	
2-Methylbutane.....(C_5)	92.3
2,2-Dimethylpropane	85.5
2-Methylpentane.....(C_6)	73.4
3-Methylpentane	74.5
2,2-Dimethylbutane	91.8
2,3-Dimethylbutane	100.3
Cycloparaffins :	
Cyclohexane	83.0
Methylcyclopentane	91.3
Methylcyclohexane	74.8
Aromatics :	
Benzene	98.0
Toluene	105.8
m-Xylene	104.0

Source : from reference number [2]

Isomerization reactions on an appropiate catalyst, such as bifunctional catalyst get rearrangement in hydrocarbon structures from straight-chain to branched-chain and aromatic, which are higher octane number products [2-5].

The octane number of aromatic hydrocarbons are much higher than straight-chain paraffins, branched-chain paraffins, and cycloparaffins of the same carbon number, but by their toxic properties, carcinogenic poisons, the permissible maximum concentration on blended-gasoline is limited.

On the other hand, benzene, toluene and the xylenes (BTX) are the aromatic hydrocarbons of most value and widely used as petrochemical feeds. They are important precursors for plastics, such as nylon, polyurethane, polyesters, and alkyd resins. These represent the large scale applications. On the lesser scale, they are precursors for insecticides, weed killers, medicinals, and dyes [1].

The aromatic hydrocarbons are mainly produced by pyrolysis and reforming of petroleum products and coal coking. Nowadays, naphthas are the precursors in catalytic reforming to produce the BTX and the other aromatic hydrocarbons. This research is able to be a way in using NGL in place of naphthas for this purpose.

Objectives and Scope of the Research

The principle objectives of this research were to isomerize Natural Gas Liquid (NGL) and to study the properties of products obtained from the reactions. The scope was to study the isomerization reaction of NGL under various reaction temperatures (370, 400, 420, and 450°C) and different hydrogen pressures (40,60, and 80 psi), and to study the catalyst concentration effects on the reactions. Additionally, octane number of the product from the optimum condition reaction was determined compared to NGL's.