CHAPTER I
INTRODUCTION

1.1 Introduction

The design of heat exchanger networks (HENs) presents an important role in picture of the economic priorities by enhancement of energy recovery. Existing and new processes need to be considered for improvements on energy recovery systems. The optimization method is applied for designing HENs. The methods can be considered for two major approaches. First, thermodynamic approach uses pinch technology (PT) to develop the industrial standard. The PT approach has been the industrial favorite on account of its present simplicity and its numerous successes. The other approach is based on the mathematical programming (MP) technique.

The first significant contribution was a linear programming (LP) transshipment model for energy targeting by Papoulias and Grossmann (1983).The minimum-units problem was formulated by them as a mixed integer linear programming(MILP)model. Floudas et al.(1986)have presented a nonlinear programming (NLP)model for generating an optimum network. An NLP model for simultaneous optimization of energy and area targets as well as a mixed integer NLP (MILP) model for (Yee and Grossmann, 1990; Yee et al., 1990a, 1990b). Mathematical programming techniques are a class of methods for solving constrained optimization. Its can be separated into three steps. First, the modeling phase that includes the problem analysis, building the mathematical model and putting data to complete it. Second, the optimal solution of the model is found. The last step analysis the results from model and implementation.

The important presentation performed by MP is retrofitting HENs (Ciric and Floudas, 1990b, 1990c; Yee and Grossmann, 1991), which presents a more difficult challenge to mathematical programming method than grassroots design. Pinch technology identifies bottlenecks in the network limiting energy recovery. Structural changes can then be made to overcome the bottlenecks. The structural changes are resequencing (change of location of an existing exchanger on the same streams), repiping (change of location allowing the streams to change), adding a new exchanger or introducing a stream split. The user chooses one of these options and the program finds the best structural modifications. The structural modifications are taken one at a time, keeping the designer under full control and leading to retrofit with the minimum number of modifications.The formulation and solution of major types of mathematical programming can be performed with modeling systems like GAMS (Brooke et al., 1992)

The General Algebraic Modeling System (GAMS) is specifically designed for modeling linear, nonlinear and mixed integer optimization problems .The system is especially useful with large and complex problems. GAMS are available for use on personal computers, workstations, mainframes and supercomputer. In retrofit case GAMS can be used to optimize process to enhance both energy and cost targeting .The model is designed to program by user in the form of algebraic equation which is higher level language. GAMS compile the model and interfaces automatically with the solver. The model is compiled to get a solution and it is reported to the user with output file.

The purpose of this research work is to develop some constraint functions in relocation part and apply constraint function in the retrofitting of heat exchanger net work and applies the program by using data from the refinery.

The objective of this work can be divided in to two main parts. Firstly, to study retrofit with/without relocation .to design/ retrofit heat exchanger network model for crude refinery. Secondly, finding the best network (one heat exchanger network) for handling different crude types.