CHAPTER I
INTRODUCTION

Improving process production and increasing product yields have influenced on more energy usage. Due to rising crude oil price which is the major source of energy in production, process production needs the efficient way of energy usages. The development of heat exchanger networks is the major activity for efficient heat recovery. The preheating train, heat exchanger networks, in the refinery can reduce energy consumption in process. For designing or improving the heat exchanger networks, the most effective way to do that is using process optimization method.

Process optimization method can roughly be divided into two major categories, which are thermodynamic and mathematical methods. Pinch technology widely used in the process industry using the thermodynamic method. The strength of pinch technology is that system information can be presented using simple diagrams like composite and grand composite curves but there are limitation in many phases of Pinch analysis, such as the problem definition phase (hard to handle forbidden matches), the targeting phase (approximations and heuristic rules that fail). These limitations are actually the major motivation for using mathematical programming.

Mathematical programming is a kind of methods for solving constrained optimization problems. The optimization model can de divided into three steps. First of them is the modeling phase, including analysis of problem, constructing the mathematical model and completing input data. The next step is the finding the optimal solution of the model. The last step is the analysis of given results and their implementation. The formulation and solution of major types of mathematical programming problems can be effectively performed with modeling systems such as GAMS (Brooke *et al.,* 1992). GAMS (General Algebraic Modeling System) is a modeling system for optimization that provides an interface with a variety of different algorithms. For retrofitting, GAMS can be used to optimize process to achieve both energy and cost targeting. Model is supplied by the user to GAMS in an input file in the form of the algebraic equations using a higher level language. GAMS then compiles the model and interfaces automatically with the solver. The compiled

model as well as the solution found by the solver is then reported back to the user through an output file.

The objectives of this work can be divided in to three main parts. Firstly, developments of automatic retrofit model from previous work (Vipanurat, Barbaro and Bagajewicz). The retrofit model is used for modifying the existing heat exchanger networks by adding new heat exchanger, increasing area to existing heat exchanger or removing heat exchanger from existing network to find optimum cost in operation the system. Secondly, finding the relation between duty of pump around and steam stripping by keep the total duty of pump around constant. Lastly addition the constraint functions of pump around into the grass-root model to find the best value of pump around flow rate from the candidate values and application this model with different types of crude oil to find the minimize cost heat exchanger network.