1. INTRODUCTION

Heat exchanger networks (HENs) are widely used in many process industries for the purpose of maximizing heat recovery and reducing utility consumption and investment cost. The pressure from increasing energy price and tighter environment limits for process emission continue to provide the fresh perspective for reviewing retrofit project. Previously, HENs system has been well studied in terms of grassroots design. It was focused on the cost (and area) estimation of the additional exchangers required to achieve the new process conditions. Nevertheless, retrofit studies are still actively pursued to further improve energy recovery. It was reported that 70% of the projects conducted in the industry involved process retrofit. There are two main streams of the research regarding heat exchanger network (HEN) retrofit. One is based on thermodynamic analysis, namely Pinch Analysis and another is relied on Mathematical Programming.

Using mathematical programming for HENs retrofit does not require too much expertise and this method can optimize the problem by handling different kinds of constraints simultaneously. HEN retrofit problem is basically a Mixed Integer Non–Linear Programming (MINLP) problem by result of the non–linearity of the area equations and the complexity of many different kinds of the constraint.

Many researches tried to get good solution by solving one single MINLP model and this method has still not yet succeeded. Because of this, the problem is normally simplified as a Mixed Integer Linear (MILP) model by imposing some assumption.

The purpose of this work is to develop a model using GAMS for HENs to optimize utility cost, number of units and investment. GAMS is the main tool for developing model. Stage model by Yee and Grossmann (1990) is applied into source code in GAMS. The whole set of equations were modeled using GAMS and solved by using the linear solver. For a given requirement of utility, the solution provides the additional area required for each exchanger match (and therefore, the total area to be added), as well as the heat transfer coefficients for the new exchangers. The procedure can be repeated for a set of utility loads, and the best retrofit chosen based on the desired goal: payback, investment, etc.