CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

A new MILP formulation for both design and retrofit of heat exchanger networks was presented. The model is very robust and capable of handling rigorously large networks such as those of crude distillation units. For the retrofit of heat exchanger networks, a new MILP formulation takes into account of the retrofit options involving modification of the existing structure and new exchanger placement.

First part of this work covered about the new design for heat exchanger network. The results show that the MILP model provides an optimal network structure for complex hot and cold process streams. For second part, we considered about heat exchanger networks retrofit. We used crude distillation unit as the case study and the retrofit solution can achieve 24.06% annual cost savings or 1.65 M$/yr with two new exchanger units and three additional shells. In addition, we also compared the MILP model performance with another approach called Hypertargets. Our MILP approach suggests using two new smaller exchangers but consumes higher utility. However, MILP can also get more saving than Hypertargets strategy around 1.91% total cost saving or 118 k$/yr. At the end of this work, we proposed the additional topics for the heat exchanger networks retrofit such as position of new exchanger and exchanger relocation. We can conclude that a new exchanger should be installed in parallel in order to get more benefit network. In special conditions, we can boost up total cost reduction with relocation strategy.

From this study, it is suggested that the heat exchanger network being investigated should be simplified in model assumption, non-isothermal mixing, stream splitting and allowed/forbidden matches. This will enable the user to stay in control of the optimization, by being able to understand the results.

In general, mathematical models have the advantage of finding optimal solutions. But the major difficulty in this proposed algorithm is to guarantee the network feasibility in the case where there is not proper in the number of interval. We commonly use higher interval number of hot process streams than one of cold process streams, because this will give more heat transfer possibility. In contrast, lower interval number of hot stream than cold stream would come with less heat transfer room. However, larger number of temperature intervals for hot stream will bring the model become complicate and difficult to find a feasible solution.