CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

As the results presented for example 1 and 2, it is apparent that HEN retrofit design by pinch is still a powerful procedure to do HEN retrofit based on ease and economic of use, as well as the ability to tailor the program to solve a wide range of retrofit problems which extremely depends on the selection of the best network from all possibilities. Moreover, process pinch incorporated the advanced software optimization capabilities of visual basic for application (VBA) program is available that offers an easy way to change all of the parameters that the MILP can, then the methodology is more user-friendly than before.

Despite the fact that the process pinch design method achieved better results, it also had several drawbacks in the determination of the optimum ΔT_{min} (HRAT) step. Because this value is determined prior to the design of the retrofit process, the entire subsequent methodology relies on the accuracy of the assumption that the optimum value was legitimate enough to produce the most economical solution. In addition, process pinch do not explicitly account for the cost of structural changes implemented in the determination of the optimum ΔT_{min} (HRAT) step. If a different ΔT_{min} value is chosen as the optimum value, it may have a significant effect on the design of the network. The exchanger matches above and below the pinch are directly affected by the location of the pinch. Furthermore, the likelihood that the global optimum ΔT_{min} value is the same for the final retrofit design and for the design where equal exchanger area is assumed is low. Moreover, the likelihood is also low that the global optimum design will have the ΔT_{min} value that pinch technology determines based on equal exchanger areas. The optimization of the retrofitted network for pinch technology begins after the "optimum" ΔT_{min} value has already determined. As a result, the ΔT_{min} is not a part of the optimization process. This is a problem because both exchanger area and exchanger duty, the two aspects of a heat exchanger network that are important to retrofitting, are directly affected by the ΔT_{min} values.

However, the MILP allows the user to quickly and easily change parameters that would allow the evaluation of a numerous scenarios. In addition the MILP had several disadvantages compared to the pinch design. First, the MILP requires a background in the basic concepts of mathematical model and then the user need to understand how to apply the concepts to a specific example. Second, the user should understand how to interpret the result from the program which is a complicated process, MILP is not user-friendly.

To conclude, pinch technology no doubt was a pivotal point in heat integration technology and provided a very systematic method to retrofit an existing network. However, as engineering has progressed and emphasis has been placed on improving heat integration technology, pinch technology finds itself not being able to compete with the new technologies created.