CHAPTER I

INTRODUCTION

1.1 Background

Typical chemical process industries like oil refineries and petrochemical plants have one common feature, I. E. they all use large amounts of energy. Reducing energy consumption leads to large cost savings and consequently the search for this reduction attracts the attention of engineers throughout the world. Another important character of chemical process industries is the fluctuation in operating conditions. To reduce the energy consumption in heating and cooling, the energy recovery network or heat exchanger network must be devised. The network designs must not only feature the economic optimum but also the resiliency characteristics namely, the ability to cope with fluctuations in operating conditions while still maintaining acceptable performance.

The goal of the process engineering design is to produce a process plant that is optimal with respect to cost and performance. Plant performance involves a broad range of criteria. A good process design must not only exhibition an optimal balance between capital and operating costs, it must also exhibit operability characteristics which will allow economic performance to be realizable in a practical operating environment. Operability considerations involve resiliency, controllability, reliability and safety. Resiliency is concerned with the problem of insuring feasible steady state operation over a variation of operating conditions, whereas controllability is interested in the quality and stability of the dynamic response of the pant. Reliability is involved with the probability of normal operation given that mechanical and failure may occur. Safe is involved with the hazards that are consequences of these failures. Because these operability characteristics are the implicit results of design stage decisions, they must be given direct attention during the design process if the gold of producing a good design is to be achieved.

An optimal design of a process system has been dealt with as a single criterion design problem in which an economic efficiency is considered as the only objective. The economic efficiency has been evaluated by an investment cost and operating cost. However, the performance of a heat exchanger network has to be evaluated by multiple criteria including not only an economic efficiency but also operability, reliability, safety and so on. Since the criteria are not measured in the same units, they cannot simply be added to each other to form a single criterion. Therefore, it is necessary to handle the design problem of a heat exchanger network as a multiple criteria design problem where non-commensurable objectives are considered simultaneously. Furthermore, for most chemical processing systems capital cost and operating cost are conflicting. That is, small operating cost implies large capital or vice versa (for example distillation systems). In view of the enormous changes in energy cost during the last decade, it appears that even the two commensurable subobjectives, capital and operating cost, should be considered separately and thus provide a range of alternative solutions.

This research is introduced the synthesis procedure of a resilient heat exchanger network presented by Wongsri (1990) to design with Hydrodealkylation Process for resiliency networks that can maintain target temperature in condition which have variance in inlet temperature and inlet flow rates. While the received network can applied to designed control structure.

1.2 Research Objective

The objectives of this research are;

1. To study the Hydrodealkylation Process.
2. To design resilient heat exchanger networks for Hydrodealkylation Process in variation of inlet flow rate and inlet temperature condition.

1.3 Scope of Research

The scope of this research can be list as follows;

1. Variation of inlet temperature or variation of inlet flow rate are only specified in range of continuous pinch (Means no pinch jump occur or discontinuous pinch).
2. No phase changes in all streams.
3. The target temperatures of streams are not subjected to changes.
4. Heat capacities of streams are constant.
5. It is assumed that a utility exchanger can handle all variations of heat load.
6. Any heat exchanger will have enough heat transfer area to accommodate increases in heat loads of disturbed process streams.
7. Bypass lines are provided to all heat exchangers as a standard feature to adjust heat loads.

1.4 Contribution of Research

The research contribution can be listed as follows;

1. Resilient networks for Hydrodealkylation Process which can tolerates the disturbance cause by inlet flow rate and inlet temperature.
2. Resilient networks for Hydrodealkylation Process that can be apply for design control structure.

1.5 Activity Plan

The Activity plan can be listed as follows;

1. Study on the past research that involved to heat exchanger network.
2. Collected the information of the Hydrodealkylation (HDA) process.
3. Apply the synthesis procedure of resilient heat exchanger network design to the HDA process.
4. Test the networks and compare with the networks that design by optimization method.
5. Modifying and correcting.
6. Summarized and discussion

1.6 Research Framework

The structure of this report can be listed as follows;

Chapter I Introduction:

This chapter is introduced the background of this research.

Chapter II Literature Review:

This chapter is to review the past research concerned with this research.

Chapter III Theory:

This chapter is remark as the definition and background knowledge that used in this research.

Chapter IV Process And Design:

This chapter is to describe about the synthesis procedure, HDA process alternative and the calculation of resilience index.

Chapter V Result:

This chapter is present all of resilient networks that design and comparing with the networks that design by optimization method.

Chapter VI Conclusions and Recommendation:

This chapter is to summarize and criticize to the networks that design in this research.

This is follow by:

References
Appendix A: Proposed the physical data for design networks.
Appendix B: Proposed the cost estimation.
Appendix C: Proposed the Addition of Propagation.
Appendix D: Proposed the Modify Resilience Index.
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