CHAPTER I

Introduction

Nowadays, industries are very competitive both in quality and cost of production. Therefore, production process should have high quality and high efficiency. The process should always operate under the designed condition, use little energy, low waste production and meet the required specification of the products. The quality should not be higher or lower than the specification. If the quality is higher, the cost of production will be high. On the contrary, if the quality is lower, the products cannot be sold out. In the real situation, the process will not operate smoothly. All factors do not meet the designed conditions. The process always changes due to disturbance from the external factors and the internal factors. However, not matter what factors cause the change, in case of having deviation or disturbance come in to the process, the effect should be eliminated from the process as soon as possible so that the process will have the least deviation from the designed condition. Moreover, due to the restriction of the environment, safety and operating condition, it is very necessary to have the control system to control the condition and compensate for any deviation occurred.

In general, the production process in all plants do not have single process or have only single unit operation separated from other process but they have several operation units. For example, machines and other equipments that are related and have raw materials, production and energy transferred among the units will work together to change raw materials into production. They try to use production factors efficiently. Therefore, plant means machines or units or equipments operating together to achieve the production purpose. Previously, the control system of the process is designed to control only each individual unit. Then, each unit in the plant will be combined. As a result, there is the interaction between them.

In this research, it will focus on heuristic-based plantwide control procedure applied to Vinyl Acetate process. Vinyl acetate monomer is widely used because it is raw material for the production of polymer and co-polymer in many plants. Vinyl Acetate Process is a complex plant consisting of many unit operations, two recycle stream and energy integration that create disturbance propagation and the complicated

system's dynamic behavior. Therefore, this research will design plantwide control structures of Vinyl Acetate Process and simulate them by using HYSYS simulator in order to study about dynamic behavior and evaluate the performance of the designed structures. An effective designed structure can achieve the control objective to reduce the cost of production and operate the process within safety and environmental constraint.

1.1 Objective of Research

The objectives of this research are:

1. To simulate Vinyl Acetate process both steady state and dynamics condition by using HYSYS simulator.
2. To design plantwide control structures of Vinyl Acetate process.
3. To evaluate dynamic performance of the designed control structures.

1.2 Scope of Research

The scope of this research can be listed as follows:

1. The simulator in this research is HYSYS simulator.
2. The description of Vinyl Acetate process is given by William L. Luyben, Bjorn D. Tyreus, and Micheal L. Luyben (1998).
3. The control structures must be able to achieve Vinyl acetate flow rate and oxygen concentration in gas loop in safety range.

1.3 Contribution of Research

The expected contribution of this research can be listed as follows:

1. Process flowsheet diagram of Vinyl Acetate process has been simulated.
2. The control structures are designed by using plantwide control procedure.
3. The dynamic performance of the designed control structure are compared with an earlier control structure in the same process.

1.4 Procedure Plan

Procedure plans of this research are:

1. Study of plantwide process control theory, Vinyl Acetate Process and concerned information.
2. Simulation of the Vinyl Acetate Process at steady state.
3. Simulation of the Vinyl Acetate Process at dynamic.
4. Design the control structures of Vinyl Acetate Process.
5. Evaluation of the dynamics performance of the control structures.
6. Collection and summarization of simulation results.

This research is divided into five chapters.

Chapter 1 is an introduction to this research. This chapter consists of objective of research, scope of research, contribution of research and procedure plan.

Chapter 2 reviews the history and work concerning to plantwide control and Vinyl Acetate process.

Chapter 3 covers some background information of planwide control fundamentals, planwide control design procedure, equipment sizing and the plantwide control strategy and of Vinyl Acetate process.

Chapter 4 describes the designed control structures and dynamic simulation results and compares with William L. Luyben structures.

Chapter 5 presents the conclusions of this research and makes the recommendations for future work.

This is follow by:

References

Appendix A: Process Stream Data and Equipment Data and process flowsheet diagram of Vinyl Acetate process by Hysys simulation

Appendix B: Sizing Equipment

Appendix C: Choosing the Correct Controller and Controller Tuning Parameter

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