CHAPTER I

INTRODUCTIONS

This chapter introduced the importance and reasons for research, research objective, scope of research, contribution of research, procedure and research framework.

1.1 Importance and reasons for research

There is increasingly growth of industrial competition, product quantity, quality, and cost of productions. Therefore, industrial technology has been developed, improving the product in order to aim the specific conditions and constraints. Many chemical and petrochemical plant consists are several recycle streams, energy integration, and many different unit operations. The implicit assumption of this approach was that the sum of the individual parts could effectively comprise the whole of the plant's control system. Over the last few decades, process-control researchers and practitioners have developed effective control schemes for many of the traditional chemical unit operations.For processes where these unit operations are arranged in series, each downstream unit simply sees the disturbances from its upstream neighbor.

Essentially, the plantwide control problem is how to develop the control loops needed to operate an entire process and achieve its design objectives. Plantwide control is an approach that guides control system design by treating many connected units as a single entity. Then plantwide control is similar to units control in one basic aspect that is, to find what variables should be controlled, measured, and manipulated, and these variables must be linked together in a pattern that serve the plantwide control objective.

Most industrial processes contain a complex with several recycle streams, energy integration, and different unit operations. In the design processes are produced set to a production schedule that will produce what amount, when to production how long. Data from the production schedule are known. Require the production any kind and capable of producing a resource.

Process control researchers have developed many systematic plantwide control is procedures and applied them to typical chemical processes, such as Buckley proposed a control design procedure which large plantwide control problems were divided into two parts: material balance control designed to cope with low-frequency disturbances which effects on the vessel inventory levels and product quality control affected by high-frequency disturbances. For example, Buckley (1964) proposed a control design procedure for the plantwide control problem that consisted of two levels. The first determined the material balance control structure to handle vessel inventories for low-frequency disturbances. The second established the product quality control structure to regulate high-frequency disturbances. However, his procedure provides little guidance concerning three important aspects of a plantwide control strategy. According to Luyben *et, al.* (1997), they are energy management, material recycle, and component balance.

In this study, will design plantwide control structures of MIPA process and simulate them by using commercial process simulator 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 environment constraint and evaluate the performance using integrated absolute error (IAE) of designed structures.

1.2 Research Objectives

To design and evaluate plantwide control structures of MIPA process using new design procedure of William L. Luyben **(2009)**

1.3 Scope of research

The scopes of this research can be listed as follows.

1. Study of the plantwide control structure theory, monoisopropylamine process and the process relevant information.
2. Simulation of monoisopropylamine process at steady state and dynamic modules via commercial process simulator.
3. Study of the new control structures design procedure.
4. Designing of new plantwide structures using Wongsri design procedure (2012).
5. Simulation and evaluation of new plantwide control structures at dynamic and compare with the base case.
6. Analyze of the design and simulation results.
7. Conclusion of the research studied.

1.4 Contribution of Research

The contribution of this research can be listed below:

1. Steady state and dynamic model have been simulated using by commercial process simulator.
2. The new plantwide control structures of the process are designed using new Wongsri's plantwide control structure design procedure.
3. The performance control structures are compared with an earlier control structure in the same process.
4. Analysis of new control structures are designed by Wongsri procedure.

1.5 Research Procedures

Procedure plans of this research are;

1. Study of plantwide control theory and concerned information of the MIPA process.
2. Simulate of the MIPA process both steady state and dynamic condition by using commercial process simulator.

3. Simulate of the reference control structure is obtained from Luyben W.L. (2009).
4. Study the fixture point the theorem (Wongsri, 2012).
5. Design new plantwide control structures followed the fixture plant theorem.
6. Simulate the dynamic of MIPA process with control structures design.
7. Evaluate the dynamic performance of the designed control structures based on the external disturbance loads.
8. Analyze of the design and simulate result.
9. Conclude the thesis.

1.6 Research Framework

This thesis is divided into six parts as follows:

Chapter I: An introduction of research consisting of reasons, objectives, scopes, contributions and procedure of the research.

Chapter II: Review of the earlier researches of plantwide control, control structure design, plantwide control procedure and related researches.

Chapter III: Background information of Luyben's plantwide control theory and plantwide control structure design procedure of Wongsri (2012).

Chapter IV: Description of the Monoisopropylamine process via the commercial process simulator.

Chapter V: Description of the designed control structures, dynamic simulation results and comparison of the control structures with Luyben's structures.

Chapter VI: Conclusion of this research and Recommendations.