CHAPTER 1

INTRODUCTION

1.1 Background of problem

Nowadays, many companies in Thailand are forced to export their products because of the dramatic decrease in domestic demand for the products. The company XYZ ,which is in this situation, produces melamine compound supplied to its customers who manufacture melamineware such as dishes, cups, bowls and so on.

The company is facing the problem of export that is a specification of its melamine compound, which is the curing time of melamine compound, can not meet its foreign customer requirement. Because the variation of the curing time, which is the period of time to set shape in moulds of the customers' process, is too wide for the customers' process.

The variation of melamine compound's curing time of the company's process is very much because the process is out of control, resulting from the use of unsuitable conditions of factors at the reactor of the process.

The factors, which involve the change in volume of sodium hydroxide (NaOH) affecting the curing time, at the reactor are the acid-base indicator (pH) of melamine crystal, formalin, and water in each formula called F/M ratio.

1.2 Statement of problem

The company's process is out of control for the curing time of melamine compound, mainly resulting from unsuitable conditions of factors in reactor, which are the acid-base indicator (pH) of melamine crystal, formalin, and water, F/M ratio, and volume of sodium hydroxide(NaOH), in each production lot in the process.

1.3 Objectives

To determine the suitable conditions of melamine crystal pH, formalin pH, water pH, F/M ratio, and volume of sodium hydroxide(NaOH) for the reactor of the melamine compound process.

1.4 Scope of Research

1.4.1 Only a melamine compound type for export of the company will be studied.

1.4.2. Some constraints are specified for doing the experimental design as follows.

- The pH of melamine crystal is in the range of 8.0 to 9.5.
- The pH of formalin in the storage tank is in the range of 4.5 to 4.8.
- The volume of sodium hydroxide(NaOH) will be used for reacting between the melamine crystal and formalin to reach pH 8.8-9.0 of work-in-process after completing reaction.

- The F/M ratios, which are molar ratios of formalin to melamine crystal, are around 2.0.
- The pH of pulp is in the range of 6.5 to 7.5.
- The volume of curing agent type 1 is 7.0 liters a batch used in the process.
- The quantity of curing agent type 2 is 550 grams a ton of natural compound.

1.4.3. The method of design of experiment with the level of significance of 0.05 for the four factors, which are F/M ratio, pH of melamine crystal, pH of formalin, and pH of water, and a response, which is the curing time, will be employed to find the suitable conditions.

1.5 Expected Results

The suitable conditions of melamine crystal pH, formalin pH, water pH, F/M ratio, and volume of sodium hydroxide(NaOH) to control the reactor process of the company's melamine compound process.

1.6 Methodology

1.6.1 Problem Identification

The problem was identified by interviewing a production manager of the company and investigating the past data. As the result of the identification, the company's melamine compound process is out of control.

1.6.2 Literature Surveys

The concepts of quality control, statistical process control, and design of experiment, including many theses involving these concepts were studied to solve the problem.

1.6.3 Studying Factors Affecting Curing Time

The factors in the company's melamine compound process were studied, the controllable factors in the process mainly affect the curing time of melamine compound are as follows.

Volume of NaOH.

Volume of curing agent type 1 .

Quantity of curing agent type 2 .

As the result of the study, a cause of the problem that was found is the expansion of pH of melamine crystal from 8.7-9.5 to 8.0-9.5, leading to the changes in using volume of NaOH, consequently the changes in volume of curing agent type 1 and quantity of curing agent type 2. Therefore, the four factors, which are melamine crystal pH, formalin pH, water pH, and F/M ratio, involving the change in the volume of NaOH at the reactor, were selected for performing the designed experiments.

1.6.4 Designing Experiment

The four experiments that are designed are the factor screening experiments, the preliminary experiment, the experiment for finding suitable conditions, and the confirmation experiment.

1.6.5 Performing Experiment

The four designed experiments will be performed according to the procedure and plans.

1.6.6 Data Analysis

The analysis of variance and other analytical techniques will be employed to the results of the four experiments.

1.6.7 Conclusions and Recommendations

The suitable conditions as the final results of the analyses will be concluded, and some limitations and recommendations will be given.