CHAPTER I

INTRODUCTION

Glass fiber reinforced plastics are the basis of industrial composites in term of high performance applications in manufacturing industrial products. Such industries grow rapidly domestic and particularly abroad. However, this industry of fabric reinforced plastics in Thailand expands only in quantity. The problem can be located in the point of lacking know how in the production techniques. The situation leads to low standards and interior qualities of product. Research and developments in compounding/fabrication of fiber reinforced plastics must be carried out by the industrial sector and academia as there are still a huge room and opportunities both domestic and abroad for this type of material to expand due to the advantage of labor incentives and the rapidly growing economy in Thailand. By nature, this type of materials can substitute other materials such as metal, glass, etc. In addition, it is light in weight, superior strength and greater durability. The major applications of this material are automobile parts, constructional materials and rough handling transportation parts, etc.

One of the increasingly successful technologies of high volume production and molding large-sized composite parts is sheet molding compound (SMC). A mixture of resin, reinforcement, additives, and curing agents is formed into a doughy, easily-handled sheet. Composite charges cut from the sheets are usually placed into compression molds under the control of flow and pressure to fill up the mold when closing the mold.

1.1 The Purpose of the Investigation

As composites gain larger inroads into structural and automotive applications that confine traditionally to steel, the need for an increased cost competitiveness of the sheet molding compound has become apparent. Specifically, manufacturing costs can be kept to a minimum by reducing a SMC part cycle time. To obtain this reduced cycle time, the entire process is undergoing scrutiny (press opening and closing times, charge-load times, part-demold times, and part-cure times), and much has been accomplished in decreasing the time requirements of the mechanical functions of the process. These improvements have resulted in higher-quality parts as well as reduced manufacturing costs; for example, with the advent of the shorter stroke press, pregel becomes less prevalent since the mold close time is decreased (1).

The method of SMC technique has been improved as

well, in response to the challenge of the approximately 60-second cycle time. Experimental design was now being employed to generate accurate results in SMC process studies, with experiments so structured that the effects of process variables on part quality were identified and isolated. In the study that followed, the designed experiment was used to investigate various catalyst formulations with the objective of reducing the overall cycle time and improving the quality of the polyester SMC part.

1.2 Significance of the Problem

Along with the desire for reduced curing time or shorter cycle times of SMC, it is necessary to make the SMC more competitive with metal and other plastics. Currently, mold-close times are normally from 1.5 to 3.0 minutes, including in-mold coating, with part-to-part times of 2.5 to 4.0 minutes (2). The current goal for SMC processing time today is the 60-90 second cycle time. Therefore, the significance of this research is aimed at the following:

1. Getting more information about the SMC preparation by using the appropriate catalyst.

2. Acquiring processing techniques in decreasing curing time to be in the vicinity of 1 minute as well as a longer storage time and high mechanical strength of the

SMC.

1.3 Objectives

The objectives of this study are as follows :

1. To study the preparation of SMC by using various kinds of catalysts so as to find the suitable conditions in decreasing the processing time of an unsaturated polyester SMC. The study will enable a long storage life time of the SMC and yet it still inherents high mechanical strength.

2. To obtain a guideline for the developments in a manufacturing process of a high quality reinforced material.

1.4 Scope of the Investigation

Various catalysts were first scrutinized to assess the appropriate gel time and shelf life. A designed experiment was then conducted to assess the moldability and part appearance, based on the result of best catalyst system chosen. The necessary procedure to reach the objectives can be done as follows:

1. Literature survey and intensive study of the research work.

2. Study the relationship between the resin system and the appropriate catalyst by determining the following parameters: type and concentrations of the catalyst, storage life of the SMC, and curing time in the mold of the SMC, so as to attain the appropriate condition.

3. Experimentation of an SMC preparation by using the appropriate catalyst.

4. Study the sheet forming process and prepare the specimens from the SMC sheets.

5. Determination of mechanical properties of the SMC.

6. Summarizing the results and preparing the report.