CHAPTER I

Introduction

Cotton fabrics have played the most important part in textile industry for long time ago. But it is well-known that the disadvantage of cotton when compare with synthetic fabric is its poor resiliency. The garments produced from cotton fabrics often crease badly in wear and required long-time ironing after washed. However, with its ideal properties for clothing, cotton still covers nearly a half of the world's fiber consumption (Figure 1.1). As a result, to get good appearance of fabrics, crease resistant finishing is necessary.

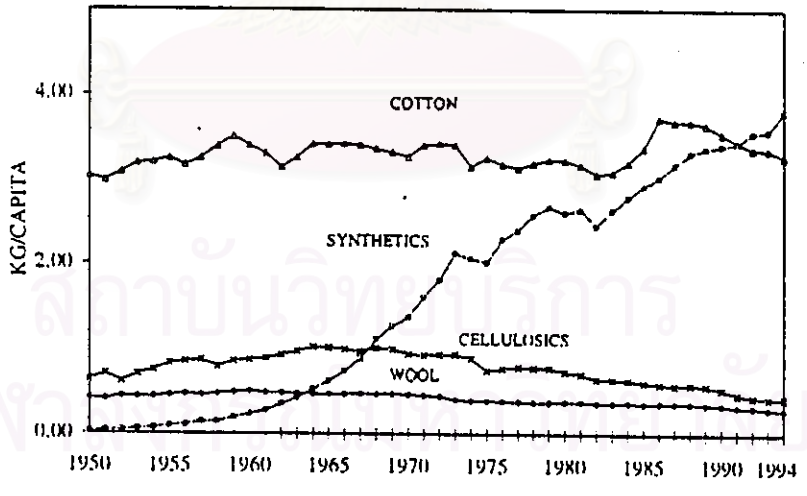

Figure 1.1 Major world fibers per capita consumption (Geerdes, 1996)

The traditional way to make a fiber or fabric crease resistant or crease retentive is by blending with the synthetic thermoplastic, such as polyester fibers.

Even though the blending ratio of 65/35 was widely used, but it was found to be less comfortable in wear because of reduced moisture absorption. As a result, a lot of research were carried out in order to make cotton fabric possess satisfactory resiliency. For this work, 100% cotton fabric was studied with the considerations as follow:

- For developing country like Thailand, the production could not only stand on its mass but its quality, in order to get high value added products, must be considered. For woven fabric, finishing is seemed to be the main process which can impart higher value of textile products by using high technology input.

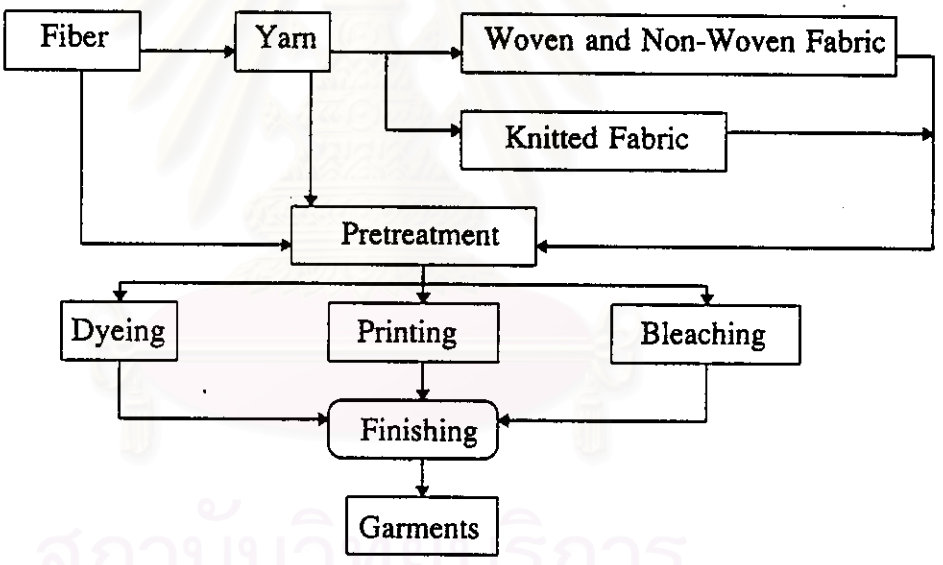

Figure 1.2 Production process in textile industry.

- Nowadays, to enter the world market, a high level of a quality must be ensured not only from the performance aspect but all products are subjected to ecological evaluation. As a result, customers will select the most suitable products not only from their application but also from the ecological viewpoint. In textile

industry, the development of process was focused on chemicals used in order to ensure the consumer its safety and environmental friendly.

- Cost is another important target for both producer and customer. The chemical used in finishing process was expected to be not only high efficiency and safety but it must be at reasonable price too.

The way to make a fiber or fabric crease resistant or crease retentive is by introducing additional linkages between adjacent cellulose molecules in the amorphous regions when the fabric is in the desired shape. This is normally carried out by introducing molecules that contain at least two groups capable of reacting with cellulose in the presence of a suitable catalyst under appropriate conditions. However, this results not only in the desirable effects of improved crease resistance and easier drying properties due to reduced water absorption but also in a serious disadvantage such as a reduction in physical strength, shade change, bad odor, toxicity, etc. Consequently, the properties of finished fabrics must be a compromise between the balance of physical properties and the improved crease recovery.

The chemical agents used for cross-linking cellulose are normally the polymethylol compounds of organic amides, of which formaldehyde and the organic amide are the main starting materials, for examples, urea-formaldehyde resin, melamine-formaldehyde resin, dimethylolethyleneurea (DMEU), etc. Dimethylol dihydroxyethyleneurea (DMDHEU) and its derivatives has been developed and long been used to produce highly effective crease resistant finishing for cotton fabrics. However, the release of formaldehyde during processing and storage of the fabrics has caused the possible human health risk. As a result, the advanced research has

focused on the development of new high-quality, low-cost nonformaldehyde cross-linking agents to replace the conventional finishing agents.

Among the new nonformaldehyde agents, polycarboxylic acids, especially butanetetracarboxylic acid (BTCA) and citric acid (CA), impart a number of advantages over other reagents, such as good resiliency and high strength retention. BTCA, however, has a limit for industry interest as it is very expensive. On the other hand, citric acid is inexpensive (approximately the same cost on a dry basis as DMDHEU), and lack of toxicity. To accelerate the formation of ester cross-links, alkali metal salts of phosphorus-containing inorganic acids are found to date as the most effective curing catalysts.

The main purposes of this thesis are to find out the suitable concentration of citric acid as cross-linking agent, the catalyst and its suitable quantity to be used, and the appropriate condition for finishing of cotton fabrics . The effect of cross-linking agent, catalysts and conditions on crease recovery angle, tensile strength and whiteness of the treated fabrics were studied. Moreover, the presence of ester groups to confirm the cross-linking reaction was identified by FT-IR analysis.