CHAPTER - VI

SUMMARY AND CONCLUSIONS

Wool and cotton are important natural fibres, and so promotion of natural fibres in recent years is creating consumer's demand not only for all cotton and all wool but for blends of cotton and wool as well. These blends over the past decade have been overshadowed by blends with synthetic fibres.

It is important to improve the performance of wool , cotton and blends. Introducing thermoplasticity by a finish will be similar to blending with thermoplastic synthetic fibre. Acrylic products are thermoplastic in nature. Acrylics when used with a suitable catalytic system can impart some of the desirable properties to natural fibers, like to cotton and wool.

The present study deals with the influence of acrylamide finish on shrink-resistance and other related properties of fabrics.

It was revealed from the review of literature that many researches have dealt with shrinkage of wool and creasing of cotton. The effect of finishes on permanent pressing/pleating was also noted.

There is an increasing interest in acrylic products (including acrylamide) for finishing. Their influence for shrink-resistance of natural fibres has been less studied. Finishing of natural fibre blends has received only moderate attention, this needs to be studied. An attempt has been made in this work to

study the influence of acrylamide polymer finish on shrink-resistance and on other related properties. An attempt is also made to make the finish durable. As shrinkage in wool and creasing and shrinkage in cotton are both the hinderances in wear, the work has been planned to finish them individually and in blend to overcome these draw backs, with the help of acrylamide based finish composition.

The basis of the study was to convert acrylamide monomer into partially linear polymer with a suitable catalytic system. Acrylamide monomer has been used by Jain (6Ø) using glyoxal and hydrogen peroxide, Modi (8Ø) using glyoxal, sodium thiosulphate, ammonium persulphate, and hydrogen peroxide as redox catalytic system. Chaudhary (14) used acrylic acid and epichlorohydrin to bring about an in situ polymerization. Some desirable properties were obtained but with marginal durabilities.

In the present study formaldehyde was used, as it has a similar nature as that of glyoxal. It was used with appropriate redox catalytic system using ammonium persulphate, sodium thiosulphate and hydrogen peroxide. Trichloro acetic acid was found to improve the durability of finish, and was used to provide the acidity needed for the reactions.

The specific objectives of the study were as follows:

1. To study the influence of acrylamide polymer finish on shrink-resistance of the fabrics.
2. To study the influence of acrylamide polymer finish on other related properties of the fabrics. These were,

(a) elastic recovery (b) tensile strength and elongation
(c) tearing strength (d) stiffness (e) wrinkle recovery
(f) appearance rating after wrinkling and ironing.

3. To study the effect of acrylamide polymer finish on the pleat retention of the fabrics.
4. To study the durability of acrylamide polymer finish on the fabrics.
5. To study the application of acrylamide polymer finish for use on pleated garments, in particular.

Three commercially available fabrics were used in this study, namely wool fabric, cotton fabric, and cotswool (wool/cotton -50:50 blend) fabric. Besides these one loom state wool fabric was also used. Thread count, fabric thickness and weight per unit area of the fabrics were determined by standard procedures.

Fabrics were scoured before the aplication of finish. Varying concentrations namely 2.5. 5.0 , 7.5 and 10.0 % of acrylamide finish were used. The conventional pad-dry-cure process was used for the appplication of finish. The properties of treated and untreated fabrics were studied with standard procedures, and analysed with the help of Figures.

CONCLUSIONS

After studying the effect of acrylamide finish on shrink - resistance and related properties of fabrics, the following conclusions were drawn.

1. Acrylamide polymer finish helped to reduce the shrinkage of fabrics. The cumulative effect (i.e. chlorination followed by acrylamide finish) on shrink-resistance was noted, in wool fabric (W_2) and was better as compared to acrylamide finish as a single step.

The improvement in shrink-reistance of wool fabrics can be explained on the basis of the film formation. The chlorination pretreatment (for W_2) helped additional shrinkage control, by allowing the subsequent finish to be uniform over the surface.

In cotton fabric, the acrylamide polymer finish has imparted resistance to shrinkage, thereby giving dimensional stability. This was explained on the basis of the reactions, where in crosslinkages were formed. A reduction in elongation was observed and explain these changes. Acarylamide finish has reduced shrinkage in cotswool fabric too.

2. Acrylamide polymer finish did not affect the elastic recovery of wool and cotswool fabrics so much. It increased the elastic recovery in cotton fabric. This showed that the cross linkages were formed in cotton.

3. Tensile strength was slightly increased or maintained as the original value with the increasing concentration of acrylamide in wool. This was due to the additive effect of polymer finish, which masks the scale structure and bonds adjacent fibres. The strength decreased in cotton with the concentration of finish. The effect was marginally noticed in cotswool. When cellulose chains are crosslinked, there are undesirable restraining forces,

and the stress weakens the fibre. However the film resiliency or brittleness in wool fibre caused elongation to decrease while maintaining the strength.

4. When treated with acrylamide polymer finish a decrease in elongation was noticed in all the fabrics. In wool this was explained as due to the additive polymer finish (binding adjacent fibres together) and this did not allow the fibres to elongate. The reduction in elongation in cotton fabric was due to the crosslinkages which did not allow the fibres to elongate. The cumulative effect (of wool and cotton) however affected the cotswool fabric.

5. Acrylamide polymer finish did not affect the tearing strength so much in wool and cotswool fabrics, but it caused a decrease in cotton fabric.

6. Acrylamide polymer finish increased the stiffness of fabrics with increasing concentration. In wool fabric this was due to the additive polymer treatment, which adds weight to the fabric, so an increase in stiffness was expected. In cotton fabric, the stiffness was due to some of polymerization as superficial finish. (Decrease in stiffness on washing explains this). An increase in stiffness was noted in cotswool fabric also.

7. Acrylamide polymer finish has improved the wrinkle recovery angle marginally at lower concentrations in wool. At higher concentrations the wrinkle recovery angle was maintained at the original level. Acrylamide polymer finish has more effect in cotton as the improvement in wrinkle recovery was noted more.

Warburton (11Ø) stated that in situ polymerization of N-Methylol acrylamide helped to improve the crease recovery angle of cotton fabrics. The acrylamide polymer reactions in this work were with redox catalyst in acidic media by trichloro acetic acid, and were thus similar to crosslinking reaction. A small increase at lower concentrations in wrinkle recovery was noted in cotswool fabric.

8. The influence of acrylamide finish was noted in improving the appearance rating and ease of ironing in all the three fabrics. Acrylamide finish being thermoplastic in nature gave better appearance rating on ironing, as some thermoplasticity was introduced by the redox polymerization of the methylol derivative of the monomer.

9. Acrylamide polymer finish improved the retention of pleats in wool and cotswool during static relase only, while in cotton an improvement was noticed after washing also. After washing retention of pleats in wool and cotswool fabrics was negligible but after drying, in required configuration, the improvement in restoration of pleats was noticed. The cumulative effect (chlorination followed by acrylamide finish) in finish step was noticed better in retention of pleats in wool fabric. The loss of set during washing can be explained as that one-bath process could give only shrink-resistance but not set-stabilization effect. In cotton fabric the improvement in set was explained on the basis of the crosslinking reaction which held the fibres in the required shape.

10. The acrylamide polymer finish was found to be durable on all the fabrics. Durability was noticed more in chlorine pretreated followed by finishing step. In wool and cotswool fabrics in general a slight improvement after washing was noted but at higher concentrations a reduction in wrinkle recovery was noticed in cotton fabric some improvement in wrinkle recovery after washing was noted. This marginal improvement was explained as due to the loss of the surface finish. The loss in stiffness after washing was noted in wool and cotswool fabric as well.

11. Acrylamide finished fabrics when converted into garments, retention of pleats was noted sufficiently high in cotton skirts but not in wool and cotswool skirts.

It was concluded that the acrylamide polymer finish used in this work helped to make the fabrics shrink-resistant without much adverse effect on other useful properties. The finish in general was durable for repeated washings but the pleat retention could not be improved with one bath step in wool fabrics.