SEAM BEHAVIOUR OF WOVEN APPAREL FA RICS

by

KUSUM CHOPRA

DEPARTMENT OF TEXTILE TECHNOLOGY

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to,

smt. savitri devi,

my dear unforgettable aunt,

remembered with affection.

CERTIFICATE

This is to certify that the thesis entitled "Seam Behaviour of Woven Apparel Fabrics" being submitted by Mrs. Kusum Chopra to the Indian Institute of Technology for the award of the Degree of Doctor of Philosophy, is a record of bonafide research work carried by her under my supervision and guidance.

The results contained in this thesis have not been submitted in part on in full to any other university of Institute for the award of any degree of diploma.

(Dr. P.K. Hari)
Professor
Department of Textile Technology
Indian Institute of Technology Delhi
New Delhi - 110 016

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ABSTRACT

Seam behaviour of apparel fabrics was studied in terms of seam pucker and seam failure. The studies were planned to investigate the contribution of the properties of the fabric and the sewing thread towards the above two major apparel attributes.

Twenty woven fabrics covering a wide range of cover factors (13-24) mass (40 - 152 GSM), fibre (cotton, viscose, polyester and their blends), yarn type (spun and filament) representing shirting and dress materials were used for the present work. All fabrics were plain weave (except one satin weave). The other fabric geometrical parameters like threads, yarn tex, mass and thickness etc. were determined by standard tests. In all, four sewing threads, two each of cotton and polyester (2 and 3 ply), with two different initial modulus were used. The seams were made on the Singer Industrial Lock Stitch Machine (model 1991D200 AA) at a speed of 3000 stitches per min.

The fabrics and the sewing threads were evaluated for the load elongation properties on the Instron Tensile Tester. Low stress bending, shear, tensile and compression behaviour of the fabrics was evaluated on the Kawabata KES instruments. The load compression (thickness behaviour of the fabrics and the seam was studied on the Instron Tensile Tester using a compression cell. From this the thickness strain was calculated to estimate the seam pucker. Scanning electron microscope photographs of a representative fabric seam were examined to study the fabric yarn deformation around the

seam line. Linear single and multiple correlation coefficient of fabric properties with seam pucker were evaluated to determine the important fabric properties which influence pucker. Thickness was found to be the most important single fabric property which gave the highest correlation with seam pucker. Therefore, based on fabric thickness, the fabrics were segregated (thin, medium thickness and thick). It was found that thin fabrics gave high pucker and thick fabrics gave low pucker. The remainder of the fabrics between the thin and thick category had medium seam pucker. It was found that thick fabrics had more compressibility. The tension of the sewing thread was relaxed by lateral compression in the thick fabrics and the longitudinal compression (in plane) was negligible. This was a major factor responsible for low seam pucker. Thick fabrics usually have high fabric cover, and their yarn displacement is minimal. During stitch formation yarn/ thread compression takes place. This aspect also favours low/no puckering. Thin fabrics are affected by the longitudinal compression generated by the release of sewing thread tension. The mechanical properties of the fabric play a dominant role in fabric/yarn movement and thus the extent of pucker. The properties of the yarn and fabric which favoured yarn sliding and yarn rotation gave more pucker. Thin filament fabrics stitched with polyester sewing thread gave low pucker. Other fabrics were not much affected by the type of sewing thread. The extent of pucker in these fabrics depended on thickness and to some extent on fabric mechanical properties.

the sewing thread had broken. Such fabrics were re-examined by using a stronger polyester thread which gave higher seam strength. Usually such fabrics have higher breaking strength. The study reveals that thin filament fabrics give both seam pucker and seam slippage problems. This is mainly because the interyarn movement is easy and is encouraged by longitudinal component of the sewing thread tension. In thick fabrics the longitudinal component of the thread tension is low as part of tension is used in lateral fabric compression. Moreover the interyarn movement in such fabrics is restricted usually due to a higher fabric cover.

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