Effect of different types of washing processes on the strength and weight loss of the Denim fabric

MEMON Hafeezullah, KHOSO Nazakat Ali, WENG BuYing, ZHU Chengyan*

School of Materials and Textiles, Zhejiang Sci-Tech University, Hangzhou 310018, P. R. China

INTRODUCTION

Denim fabric is preferred not only for casual use in the garments, but now even some use it formally in daily routine garments. These denim garments pass through the washing and finishing process. These washing include, bleach wash, enzyme wash and stone wash. The chemical washes are normally used to remove unfixed dyes and other particulate from the surface of fabric [1]. Whereas enzyme wash is used to obtain different looks into the garments. The denim garments being used today are liked with worn look, this worn look is obtained by the rigorous washing. These introductions of the worn looks by rigorous washing lead to the loss of strength of the garments[2]. It is obvious that there will be some loss in terms of the strength of the garments, but till what extent the loss in strength comes into the garments is here to be determined. This project is industrial based project, in which Tensile strength, Tear strength and weight loss (GSM) of garments by using different washing methods being practiced.

EXPERIMENTAL SECTION

Materials: A 100% Cotton 1/3 twill woven fabric having construction 60X56/8X10 with 380g/m², sewn in the form of leg tubes stitched by 100 Tex and fell seam (8.25 SPI) was washed by stone washing (1:2 stone to fabric ratio), enzymic washing (15 g/l), bleach washing (40 g/l) and stone and enzymatic washing (1:1.5 and 10 g/l).

Firstly enzymatic Desizing was done by using dispersing agent: Respers PT (0.5 g/l), Desizing agent: a-amylase (1 g/l) for 15 minutes at 50°C, followed by rinsing (2 min), extracting (450 rpm) and air drying. All washings were done at optimized temperature (45°C) by varying time (20-25-30 min).

Methodology: Treated all denim leg panels were conditioned in 65% RH and 20°C for 24 hour before testing according to ASTM D 1776[3]. In this research the effect of different washes on Mechanical properties - Tensile strength (breaking force) of denim fabric (Warp and Weft wise) was determined by the ASTM D 5034 [4]. Effect of different washes on Seam Strength of Denim fabric was determined seam strength tester according to ASTM D5822 [5]. Effect of different washes on GSM of Denim fabric GSM was calculated according to ASTM D 3776 [6]. All the samples were washed on sampling machine used in industrial applications, in order to get the exact data and results that may match to the practical application of this project. Five samples for each trial were made in order to avoid error and to maximize accuracy of the data. All the experiments were done in Crescent Bahuman Ltd, Faisalabad, Pakistan.

RESULTS AND DISCUSSION

The changes in the fabric weight (GSM) before and after different washes, the Loss of weight was found at maximum by bleach washing, after enzyme and stone more weight loss respectively as compared to enzyme wash. Therefore optimistic results for GSM was achieved by Enzymatic washing. Stone plus Enzymatic washing showed the similar results (slightly lesser) with Enzymatic washing, as compared other washes respectively, as shown in Fig.2.

All washing treatments indicated great influence on the tensile strength, seam strength and weight loss of fabric by increasing time, temperature and stones. It was concluded from this study that, the enzymatic washing have ideal results as compared other washes. Therefore it is found from the above results, that the stone wash, stone plus enzyme wash and chemical wash are not affordable, to fabric mechanical properties. As stone abrasion damages the fabric, as result the fabric GSM, and Tensile strength. Seam performance are also influenced adversely.

CONCLUSION

The changes in Seam strength of denim fabric before and after different washes showed greater Loss of strength was found by bleach washing, after enzyme and stone more weight loss respectively as compared to enzyme wash. Therefore ideal strength and weight were achieved by enzyme washing. Stone plus enzyme washing showed the comparable results as compared to stone and bleach wash respectively, as shown in Fig.3.

REFERENCES


ACKNOWLEDGMENTS

This work was financially supported by the Crescent Bahuman Ltd. Faisalabad, Pakistan.
Denim fabric washing process gives an effect to a specific product colour and appearance which enhance the denim fabric quality. In the washing process various chemical compositions are used with different pH values. These washing steps cause some defects on fibre and fabric surface thus the physical properties of the end product is an issue that should be considered in detailed [1-4]. The research was divided into two parts. The highest weight and tensile strength loss and the worst pilling values were shown in the washing type-4 and 5 respectively. The reason is that in both washing formulas of 4 and 5, hipo-bleaching was used. This bleaching step causes fibre damage thus affects the physical property of the fabrics negatively. Different Types of Denim Wash. After pre-treatment, denim garments may be subjected to different types of wash. Some of the commonly used wash types are: 1. Stone Wash. The degree of the wash-down effect depends upon several factors - the size of the stone, stone ratio, liquor ratio, duration of treatment, garment load, etc. Size. The size of pumice stones available for stone washing vary from 1 cm to 7 cm in diameter. However, increase of the effect becomes insignificant when the washing time exceeds 90 minutes. 2. Acid Wash (Moon Wash). Acid washing or ice washing is usually done by dry tumbling the garments with pumice stones presoaked in an acid solution, such that localised bleaching is effected in a non-uniform sharp blue / white contrast in the garment.