

Impact of Stone Wash and Acid Wash on the Physical Properties of Denim

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Abstract: *The aim of this paper is to find out the changes occurs in physical properties of denim when it is subjected to stone and acid wash or to find out the impact of stone and acid wash. 100% cotton twill, weave 2/1, construction 80 × 64 / 10 × 9, indigo dyed denim fabric leg panels as per lab standard recipe are used here to examined. Firstly done desizing as pre-treatment and after treatment was silicon softener. After washing process different samples from both washing are going to express different behaviour on physical properties.*

Keywords: *Stone Wash, Acid Wash, Twill, Denim, Desizing, Softener.*

1. Introduction

Young people as well as older people have now great passion for the denim cloth. Today jeans are available in many colors and designs [1]. Denim is constructed in a twill weave with indigo and white yarns. The blue/indigo yarns are the lengthwise or “warp” threads (parallel to the selvage). The white yarns run across the fabric width (the weft threads). Denim is traditionally woven with 100% cotton yarn; however, today it’s blended with polyester, to control shrinkage and wrinkles, and Lycra to add stretch. Traditionally, indigo denim fabric is deep blue in shade [2]. In the readymade garments industry sector garments washing is a new technology. After making garments from solid color from dyed or pigment printed fabrics, the garments are washed by garments washing, color and outlook of the garments are modified [3]. Denim garment (jeans) washing is known as the widely used finishing treatment that has vast usage in textile sectors because of creating special appearance and making fashionable and wear comfortable garments of the present day world and commonly used. Popularity of garments washing specially on denim garments in the world market has been increasing day by day [4]. Different washing methods can be applied for denim fabric finishing.

Such as bleach wash, stone wash, acid wash, detergent wash, silicon washes etc. [5].

In this research we choose stone and acid wash to analysis the wash influence on physical properties on denim.

2. Material and Methodology

2.1 Materials

100% cotton left hand twill, weave 2/1, construction 80 × 64 / 10 × 9, indigo dyed denim fabric are used to make all samples , GSM-225 is used in this work. Leg panels were made for this experiment. We collected it from CIPL-Epic group.

Detergent (Hostapur, BASF, Germany), Acetic acid (china), desizing agent (Luzyme, BASF, Germany), softener (silicon softener, china), Cryltane DTS 40 (china), Sodium metabisulfite (neutralization agent), KMNO₄ (Acid & PP wash, Bangladesh) were used in this experiment.

Fresh pumice stones (Turkey) of size (2-3 cm) were used for stone wash only.

Thermocol balls of size (2-3 cm) were used for acid wash only.

2.2 Methods

2.2.1 Desizing Treatment

Denim leg panels were desized using desizing agent. And it’s a mandatory pre-treatment before subsequent washing. Desizing agent, detergent and material to liquor ratio 1:20 was used in a small scale front loading industrial washing machine .This treatment was carried out at temperature 60°C for 15 min. After completing the predetermined time the liquor was dropped out. Then treated denim leg panels were rinsed two times.

2.2.2 Stone wash

At first we load the leg panels into the washing machine and load with water maintain the liquor ratio 1:5 then we put the pumic stone into the machine and added some DTS 40 (Cryltane) and run the machine for 30 minutes, this treatment held in room temperature so we don’t need to fix the temperature on this. After that it rinsed two times.

2.2.3 Acid Wash

For acid wash first we made a solution of Acetic Acid [CH₃-COOH] with potassium permanganate (KMnO₄). Thermocol balls are put into the washing machine and diffuse the solution into the machine. This wash is also done in room temperature. We run the machine for 10 min. After two rinse wash we do the neutralization process with sodium Meta bisulfite. Then treated denim leg panels were rinsed two times.

2.2.4 Softener

Softener is used to improve the hand feel of garment. We collect all specimens from the wash we done before and put into the solution where we put silicon softener then we run this treatment for 10 min and completed the treatment with cold rinse wash.

2.2.5 Hydro Extracting and Drying Processes

After completing the stone and acid wash we have 10 leg panels in hour hand, because we made 5 leg panels for each wash. After washing we had to dry for our next process. washed denim leg panels were squeezed to a wet pick-up of 70% at 200 rpm for 3-4 min in laboratory scale hydro-extractor machine (Zanussi,

Roaches International Limited, England), then dried at 75°C for 35-40 min in a steam drier (Opti-Dry, Roaches International Limited, England). Samples were tested after Drying.

2.3 Methods for testing

Conditioned was done in 65% Relative humidity (RH%) and 20°C for 24h before testing according to BS EN 20139 and ASTM D1776.

GSM was calculated for assessing the difference in fabric weight before and after the treatment according to ASTM D 3776.

Samples were evaluated by crock meter to measure color fastness to crocking according to AATCC Test Method 8.

Tearing strength of the samples evaluated by tear testing machine according to ISO-13934-1 standard.

Tensile strength of the samples evaluated by tensile testing machine according to ISO 13937-2 standard.

The dimensional stability (shrinkage %) of the leg panels are assessed according to the ISO 6330 standard.

3. Results and Discussions

3.1 Impact in GSM

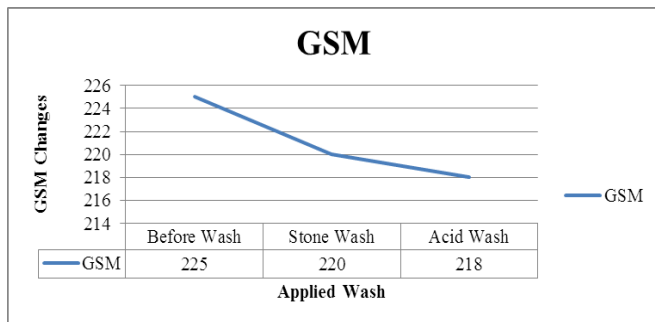


Figure-1: Impact in GSM for washing

Figure-1 Shows the impact of stone and acid wash in GSM. GSM indicates Grams per Square Meter or weight of fabric. GSM of before wash sample was 225 and it decreases upon both Stone wash and Acid wash and values are 220 and 218. That means Samples loss more weight in Acid washing than Stone wash.

3.1.1 Weight loss %

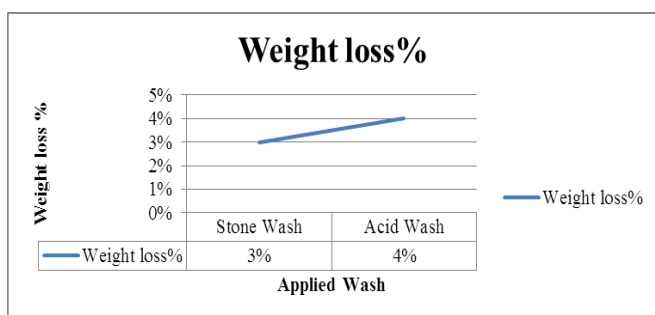


Figure-2: Weight loss % after Washing

As GSM Decreases after washing so, there must be a change in weight loss and the above line chart is showing this. It is 3% for Stone wash and 4% for Acid wash.

3.2 Impact in Tensile Strength

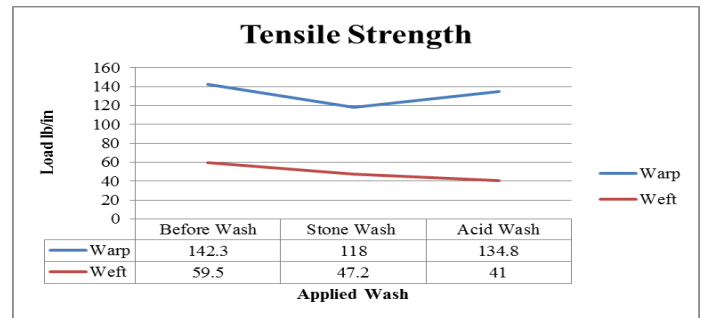


Figure-3: Impact in Tensile strength

Figure-3 represents the changes of tensile strength due to washing. Tensile Strength both warp and weft way decreases after washing and stone wash shows the lowest value than acid wash this may be due to friction between stone and fabric yarns. Warp and weft yarns become weaker due to the friction.

3.3 Impact in Tear Strength

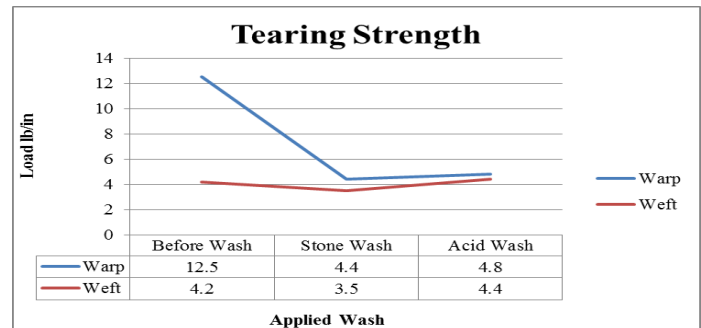


Figure-4: Impact in Tearing Strength

Above chart indicates the changes in tearing strength after washing. Compare to before washed sample tearing strength falling down after washing for both wash in both way (warp and weft).

3.4 Impact in Color fastness to rubbing

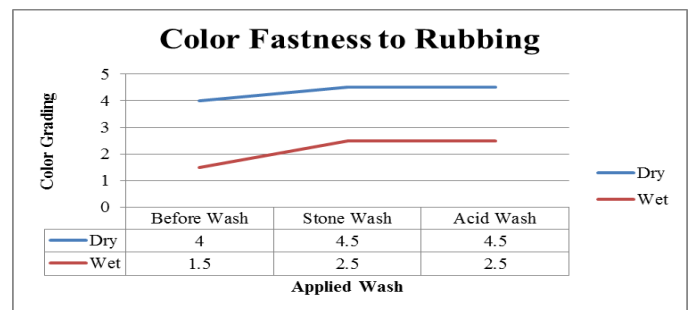


Figure-5: Impact in Color Fastness to Rubbing

From the above line chart we can see that color fastness to rubbing improves after washing and the value is same both for stone & acid wash. We can also washing plays a vital role to improve the rubbing fastness.

3.5 Impact in Shrinkage %

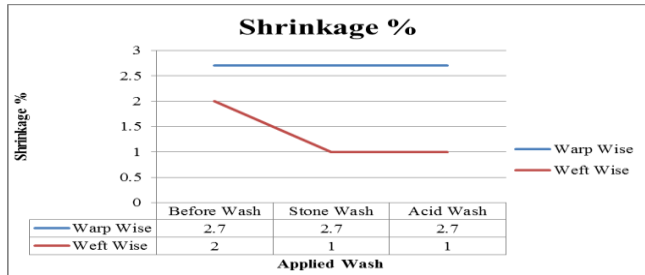


Figure-6: Impact in Shrinkage %

Compare to before wash sample there is no shrinkage occurred in warp way in case of both wash. But weft wise shrinkage is prominent in figure-6 for both wash.

4. Conclusion

We can conclude the research by reviewing the results section that are- i) GSM changes or weight loss occurred after both mentioned wash, ii) Tensile strength decreases in both directions in both wash, iii) Tearing strength also falls after washing for both stone and acid wash, iv) Rubbing fastness improves after washing and v) Shrinkage found in weft wise in both wash.

We had done the entire test in before wash and after wash. Each graph shows the results of before and after wash denim leg panels.

From this study we find out that stone wash and acid wash has a great impact in different physical properties of denim.

5. Acknowledgement

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