Investigation of Grey Fabric Mechanical Property Changes Due to Desizing and Scouring Process

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Abstract:
This research paper made for the analysis of grey fabric mechanical property changes in desized and scoured woven fabric by varying the threads per inch of fabric using same yarn count. The samples are desized and scoured for testing and they were used for further analysis. The different test are conducted to analysis the impacts on fabric geometrical construction and their physical properties. The fabric properties depends on the constructional parameters, methodology and machine conditions. Various parameters such as tensile strength and elongation has been discussed. These results are made to predict the values. The size paste in warp yarns are removed in desizing and unsized weft yarns are also has an impact during desizing. It was found that the tensile strength of the samples is higher in grey stage than in desizing and scouring and the elongation of the fabric is increased in further processing stages.

Key words: Cotton fabric, Construction, Desizing, Scouring, Tensile Strength & Elongation,

I. INTRODUCTION
This study shows the investigation of grey fabric mechanical property changes due to desizing and scouring process. This attempt has been made to study the effect of warp and weft direction of yarn, ends per inch and picks per inch on weaving performance and fabric properties and this will be helpful for controlling the effect of fabric before processing by the count, EPI and PPI, Better understand of weaving process, manufacturing fabric more efficiently and to predict the variation in technical properties in the fabric from technical and technology point of view. [4] Fabric is made up of textile material by fibers and yarns to form a thin or thick sheet. The fabric or cloth is like a sheet material made up of interlacement or interlocking or nonwovens. The woven fabric is produced by the interlacement of two set of yarns called warp yarn from longitudinal way and weft yarn from transverse way. By varying the interlacements it is possible to produce different designs like plain, twill, satin etc... Threads per inch and yarn count are some of the most important parameters that affect both weaving performance and fabric property.[11] Experimental studies were conducted by weaving fabrics with three different picks per inch (PPI) and weft counts. The study shows that weaving performance is affected by the too high cover factor. Cover factor was calculated by dividing the threads/inch by the square root of the English cotton count and end breakage was taken as an indication of weaving performance. It was observed that when the count as well as threads/inch of one series of yarn changes the crimp% i.e. the consumption of both series of yarns are affected. It was also observed that, as expected, when the threads/inch increases the fabric strength also increases but at higher threads/inch the gain in strength is relatively more.[5]

II. RESEARCH METHODOLOGY
In this study, cotton fabric is taken at grey stage and it is desized and scoured. The samples are tested to analyze the effect of tensile properties in desized and scoured woven fabrics throughout the study. The samples of two plain weave having different threads per inch with same yarn count of 40s ring spun yarn is taken in both warp and weft directions. The different temperature of 60ºc is maintained for desizing and 90ºc for scouring process..

2.1 MATERIALS
The sample which is available at grey stage of 40s ring spun yarn count is used for this experiment. The fabric construction at grey stage is determined and further test were conducted. Hydrochloric acid (Hcl) and TRO( wetting agent) is used for desizing process to remove the sizing material present in grey fabric. NaOH, Na2CO3 is used for scouring process which removes all natural impurities. Thus the fabric is prepared at these stages by using these materials.

2.2 GREY PROCESS
The fabric is unprocessed or unfinished which is not dyed, bleached or processed is called grey fabric. Samples made in this study are woven as per the required threads per inch having 170 and 182of using same ring spun yarn count 40s. The fabric is woven in plain weave structure. As per requirement, Sample 1 having EPI of 85, PPI of 85 and the total threads per inch of 170 is designed weaved. Sample 2 having EPI of 90, PPI of 92 and total a thread per inch of 182 is made and tests are made to analyze geometrical construction and effect on physical properties.

2.3 DESIZING
The desizing process is carried on grey fabric, to removal the size material in the fabric. Here two different samples are taken to process the fabric in the bath. As per standard recipe the desired process is carried out respectively. First, the two different samples at grey stage are taken and it is weighed. The hydrochloric acid (HCL) is used to hydrolyze the starch present in fabric. TRO (Wetting agent) is used to wet the material inside the bath. The amount of HCL and TRO is taken as per the
weight of the fabric which is calculated. The bath is prepared containing 1% of HCl and 0.5% of TRO with liquor ratio 1:20 in which 1g of fabric 20 ml of water to be taken. The temperature of 60ºC is maintained and the process is continued for 1hr in the bath. Now the sample 1 and 2 can be proceed for further testing and reading are noted. The weight loss percentage of sample 1 and sample 2 in desizing is 11.01% and 9.27%.

2.3 SCOURING
The scouring process is carried out for the removal of natural impurities present in the fabric such as waxes, fat, oil, gum and other substances. As per standard method, the scouring process is made. The sodium hydroxide (NaOH) is used to clean the loosening fragments in fabric. The Sodium carbonate (Na2CO3) and TRO (Wetting agent) is used inside the bath. The amount of NaOH, Na2CO3 and TRO is taken as per the weight of the fabric which is calculated. The bath is prepared containing 4% of NaOH, 2% Na2CO3 and 0.5% of TRO with liquor ratio 1:20 in which 1g of fabric 20 ml of water to be taken. The temperature of 90ºC is maintained and the process is continued for 2hr in the bath. The weight loss percentage of sample 1 and sample 2 during scouring is 0.8% and 1.2%.

III. RESULT AND DISCUSSION

3.1 Effect on tensile strength
The tensile strength is the measure of maximum force the fabric can bear or elongates before it breaks. It has been seen that the strength of two different samples in grey stage is higher than desizing and scouring. This may be due to the size paste and other substance present in the fabric before processing. The test is conducted on both warp and weft direction of the sample in each stage of process.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Sample 1 (Kgf)</th>
<th>Sample 2 (Kgf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grey Sample</td>
<td>33.2</td>
<td>30</td>
</tr>
<tr>
<td>Desized sample</td>
<td>25.6</td>
<td>24.4</td>
</tr>
<tr>
<td>Scoured sample</td>
<td>24.1</td>
<td>23</td>
</tr>
</tbody>
</table>

3.2 Effect of Elongation
The elongation of fabric is taken in each stage and the fabric elongation is noted. In warp direction the sample 1 has less in grey stage and the elongation increases by 46.85% after scouring process and in weft direction, the elongation increased by 27.43% and the performance of sample 2 has higher elongation 50% in warp and 85.19% in weft direction after scouring process. This graph shows sample 1 has higher elongation in both warp and weft direction.
3.3 Effect of crimp

The warp and weft yarns are interlaced in fabric they follow a wavy path. This waviness of yarn is called as crimp. The fibers take from the fabric of good quality have high crimp level and the fiber crimp plays an important role in yarn compressibility, extensibility and improves fabric quality.[22

Table 3. Crimp values of different samples

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Sample 1 (Warp Crimp in cm)</th>
<th>Sample 1 (Weft Crimp in cm)</th>
<th>Sample 2 (Warp Crimp in cm)</th>
<th>Sample 2 (Weft Crimp in cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grey Sample</td>
<td>10.5</td>
<td>11</td>
<td>10.5</td>
<td>11.3</td>
</tr>
<tr>
<td>Desized sample</td>
<td>10.3</td>
<td>11.2</td>
<td>10.4</td>
<td>11.1</td>
</tr>
<tr>
<td>Scoured sample</td>
<td>10.4</td>
<td>11</td>
<td>10.4</td>
<td>10.8</td>
</tr>
</tbody>
</table>

IV. CONCLUSION

In this research we have analyzed the tensile strength and elongation of two woven fabric. The two samples are taken in grey stage of same weave structure (plain) and same warp and weft yarn counts by varying the fabric construction such as EPI, PPI & TC. They are used for further processed such as desizing and scouring. The Tensile strength and Elongation has been tested on each stage. The samples in grey stage which we have taken for this analysis has higher tensile strength while comparing to desizing and scouring. At the mean time tensile strength of the fabric is decreased and elongation of the fabric is increased from grey stage to desizing and scouring. After processing it is observed that the percentage difference of tensile strength decreases in sample 1, warp way is 22.29% and weft way is 15.33% and in sample 2, warp way is 24.08 and weft way 28.05 and elongation increases in sample 1 and 2 in warp way is 34.27% and 40.58%, in weft way is 20% and 29.63% from grey to desizing process. Since the size paste is applied in warp yarns, the unsized weft yarn has an impact while desizing. At the stage of desizing it is noted that huge difference in strength in both warp and weft way respectively. The crimp value is also analyzed for both the samples. The crimp value for sample 1 in warp and weft way is 0.95% and 1.8%. For sample 2, 0.95% and 1.77%.increases in both warp and weft way are observed after processing. The crimp % is higher in weft direction than in warp direction, higher the crimp results in higher elongation. The effect of geometrical construction of the fabric may occur while processing and it can be balanced through finishing process. Finally, it was found that the tensile strength of the samples is higher in grey stage than in desizing and scouring and the elongation of the fabric is increased in further processing stages.

V. REFERENCE


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