Effect of Weaving Preparation on Cotton Fabric

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Abstract

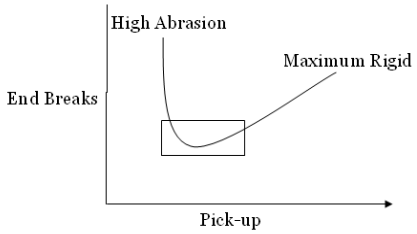
Even though the fabric weaving is nothing but the simple interlacement of warp and weft yarns, this process is much more depends on the type, quality and continuity of the yarn coming from the weaving preparatory machines. There are the departments such as: winding, warping, sizing and drawing-in are the weaving yarn preparation departments which have a significant effect on the quality of fabric to be manufactured on the loom. During deciding the quality of yarn preparation not, only the process parameters on the preparatory machines but also the working methods are to be taken into consideration. The concept of reproducibility is also very much important while processing the different lots on the same machines. In order to stay in the competitive market the weaver has to manufacture the fabric as per the customer's demand and the customer demand is variable with respect to the market, "the manufacturing of the same quality of material as which have been produced earlier is called as reproducibility". This research work deals with the reasons and factors which affects the fabric weaving performance.

Introduction:

Now-a-days every weaver is taking care of the quality of fabric to be manufactured in order to stay in the competitive market. Sizing is the very important weaving preparatory department which has a significant effect on the fabric reproducibility. As one of the most complex steps in fabric production, sizing plays a very important role in the weaving process.

Figure 1

The primary purpose of the sizing process is to obtain the warp threads that can successfully be woven without major damages which occur during the yarn passage through sliding metal parts of the weaving machine. It applies to the improvement of physical and mechanical parameters of warp threads, primarily to increase strength and abrasion resistance and thus to reduce the number of warp breaks to a minimum in order to achieve the maximum efficiency of weaving machines and energy savings. Also, the goal of sizing is to keep the fibers in the yarn in a position where they were before sizing, with minimal yarn deformations during weaving. The success of the weaving process depends on the complexity of several factors including the characteristics of the desired material, the sizing process, the sizing ingredients, yarn properties and methods of manufacturing. Above figure 1 shows the sizing machine used for sizing the warp



material. Sizing gives a protective coating on yarn surface to sustain the friction on loom machine. The sized yarn can reduce the yarn breakages and yarn rupture during the weaving process. Consequently, the fabric quality becomes better and production increases as shown in the following figure 2.

Figure 2

Factors Evaluating the Sizing Quality

1. *Strength:*

The sizing process consists of impregnating the yarn with a particular adhesive which form the surface film on the yarn for improving yarn smoothness & strength.

2. *Elongation:*

Due to sizing the strength of yarn is increases due to plastering of yarn by the size paste but due to which the yarn rigidity increases which leads to decrease in yarn elongation.

3. *Hairiness:*

Sizing is used to apply to the protective coating of size film which presses the protruding fibers in the body of yarn and the yarn hairiness decreases.

M/C parameter & process parameter in sizing affecting the size yarn quality

A. M/C parameters:

- *Speed*: Higher is the machine speed, lesser is the contact time between yarn & size paste so size pickup is lower & vice-versa.
- *Squeezing Pressure*: Higher the squeezing pressure more will be the penetration of the size poster in the yarn so pick-up increases
- *Drying Cylinder temperature*: If size paste temp increases beyond a certain limit then yarn strength decreases due to reduction in yarn moisture content & leads to yarn breakage.
- *Steam temperature*: Steam temperature should be constant throughout the process to avoid the sticking of yarn to roller.

B. Process Parameters:

- *Viscosity of Size Paste*: Higher the viscosity the stickiness of the size paste is higher & therefore higher is the size pick-up
- *Size Paste Temperature*: Temperature of paste should be constant throughout the process to avoid lump formation.
- *Size paste Concentration*: To get uniform size pick-up size paste concentration is important parameter.

Material and Methods:

Following are the methods of determining the size pickup of the yarn.

1. *Beam weight method*

$$\text{Size Pickup \%} = \frac{\text{Sized Weight} - \text{Unsized Weight}}{\text{Unsized Weight}} \text{ X } 100$$

Unsized Weight

= weight of ful warp beam – Weight of empty beam

Sized yarn weight

= Weight of ful sized beam – Weight of empty beam

2. *Laboratory sizing Method*

This method is more accurate from the research point of view, in this testing method very sensitive balance required.

$$\text{Wt of size} = \text{warp wt X size pick up \%}$$

$$\text{Maximum machine speed (mt per min)} = \frac{\text{No of cylinder X 1000 X English count}}{\text{No of ends}}$$

$$\text{Sized yarn count} = \frac{\text{Total ends X warp length (Yards)}}{\text{Sized warp length X 840}}$$

$$\text{Wt of warps inGrms per Mtr} = \frac{\text{No. of Ends X 0.6}}{\text{YarnCount Ne}}$$

During conducting this research study the raw material used is as given in the following table No. 1 the same material is processed through the sizing machine by using the size recipe as given in the following table 1.

Table 1 Raw material and Size recipe

Raw Material

P.O	Count	Yarn Type	Yarn Supplier	Batch No.
387377	60	Pima	Arun Textile	R386947
387379	60	Pima	Arun Textile	R386947
387380	60	Pima	Arun Textile	R386947
387376	60	Pima	Arun Textile	R386947
387378	60	Pima	Arun Textile	R386947
387096	70	Giza	Ambika	R384952
387098	70	Giza	Ambika	R384952
387094	70	Giza	Ambika	R384952
388144	70	Pima	GTN Textile	R378144
388797	70	Pima	Ramco Mills	R386524

Size Recipe

Water	400ltr
M5000	60Kg
Glissofil (Softner)	4Kg
T66 (Binder)	40Kg
MRN	1Kg
R.F.	10%
Viscosity	20Sec
Machine Speed	45mpm
Size Box Level	120mm
Size Box Temperature	90O c
Final Volume	530-550ltr

In order to find out the effect of sizing on the fabric reproducibility the fabric has been manufactured on the loom with the parameters as given in the following table 2.

Table 2 Loom parameters

Loom No.	Loom RPM	Reed Count	Reed Space	Drawing-in Type
47	516	21	168.19	Gaiting
67	533	21	168.19	Gaiting
38	510	19.2	166	Gaiting
70	540	20.6	174.75	Gaiting
64	550	21	172	Gaiting
96	469	21	170	Gaiting
146	450	20.5	175	Gaiting
68	460	21	170	Knotting
17	472	2	180	Gaiting
50	471	22.2	161.3	Gaiting

Results and Conclusion

The yarn material of two different counts such as 60sNe and 70s Ne are processed in the sizing machine and the wrappers beams are of same length i.e. of 1000 mts with 10800 and 10747 total ends for 60sNe and 70s Ne yarn respectively. During processing there are some chances that some of the old recipe is remaining which is mixed with new prepared recipe as given in the following table 3.

Table 3 sizing parameters and loom breaks

Count (Ne)	Total Ends	Sizing Length (mts)	Viscosity Sec	Recipe Detail (Old+New)	Size Pickup	Recipe Used	Loom No.	Loom Efficiency	Warp CMPX	Weft CMPX
70	10747	1000	20	230+560	7.5	217	96	82	6.8	1.8
70	10747	1000	20	250+560	7.5	220	146	82.9	7.5	2
70	10747	1000	19	250+550	7.1	104	68	82.9	10.7	1
70	11713	1000	20	000+600	6	90	17	90.3	4.3	2
70	10720	1000	20	000+310	6	70	50	89.6	3.8	3.6
60	10800	1000	20	230+550	7.5	106	47	80.6	12.6	3.6
60	10800	1000	20	450+560	6.6	87	67	90.7	2.8	5.1
60	10800	1000	20	450+560	6.6	87	38	89.8	3.1	3.7
60	10800	1000	20	450+560	6.6	88	70	90.2	3.3	5.1
60	10800	1000	20	450+560	6.1	116	64	91.5	2.8	4.3

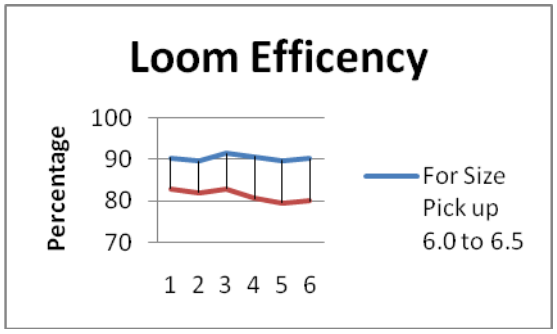


Figure 1

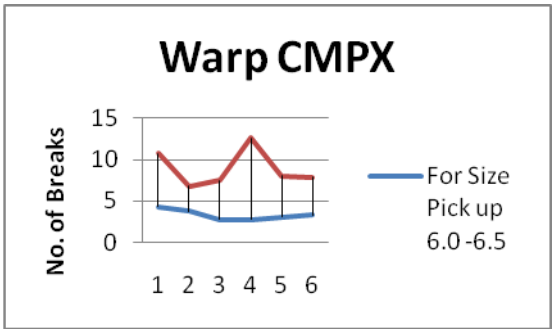


Figure 2

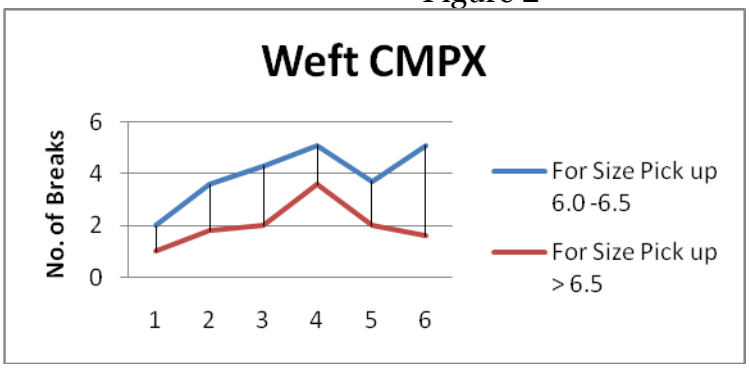


Figure 3

Table 4 Loom Shed Performance w.r.t Size pick up

SR. No.	Efficency		Warp CMPX		Weft CMPX	
	Size Pick up 6.0 -6.5	Size Pick up > 6.5	Size Pick up 6.0 -6.5	Size Pick up > 6.5	Size Pick up 6.0 -6.5	Size Pick up > 6.5
1	90.3	82.9	4.3	10.7	2.0	1.0
2	89.6	82.0	3.8	6.80	3.6	1.8
3	91.5	82.9	2.8	7.50	4.3	2.0
4	90.7	80.6	2.8	12.6	5.1	3.6
5	89.8	79.5	3.1	8.00	3.7	2.0
6	90.2	80.0	3.3	7.90	5.1	1.6
'P' Value	*9.35E-08*		*0.000155*		*0.007719*	

Above figure 3-5 and table 3-4 revels that, for these counts 60s Ne and 70s Ne the optimum size pick-up is 6% to 6.5% if it exceeds the warp breaks are found to be increased which is due to the increase in yarn rigidity leading to reduction in loom shed efficiency.

Here it is found that the weft breaks are reduced by 49% for the higher size pick-up i.e. greater than 6.5% this is due to the reduction in yarn hairiness and increase in yarn stiffness which is suitable of weft insertion.

By the statistical analysis it is found that the 'P' values for efficiency, Warp CMPX and Weft CMPX are 9.35E-08, 0.000155 and 0.007719 respectively for the size pick-up 6.0 to 6.5% and size pick-up greater than 6.5% which are less than 0.05 confirming that there is significant difference between the values of efficiency, Warp CMPX and Weft CMPX of the two different size pick-up groups i.e. 6.0% to 6.5% and > 6.5% as mentioned above.

Conclusions

From this research study it is found that the optimum limit of size pick-up for the above mentioned counts is in between 6.0% to 6.5%.

It is also confirmed that as the size pick-up of the yarn increases the yarn brittleness is also increases which leads to increase in warp breaks by 167%.Here it is found that the weft breaks are reduced by 49% for the higher size pick-up i.e. greater than 6.5% this is due to the reduction in yarn hairiness and increase in yarn stiffness which is suitable of weft insertion.

By the statistical analysis it confirming that there is significant difference between the values of efficiency, Warp CMPX and Weft CMPX of the two different size pick-up groups mentioned above.

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Image Courtesy:

1. evasweaving.wordpress.com

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