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EFFECT OF YARN STRETCH IN SIZING ON LOOM PERFORMANCE

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Abstract

The loom shed efficiency entirely responsible for determination of performance of any textile mill and that is depends on the practices required for preparation of sizing beams. During sizing the stretch in the wet & drying zone are totally responsible for loss in elongation which causes more breaks in weaving. If it is not properly controlled in sizing this parameter will considerably result in to reduction in yarn strength. It can be overcome by maintaining no stretch or negative stretch in wet zone, this stretching zone is lies between saw box zone & first drying cylinder. If the stretch in the zone does not control properly it will considerably increase the warp breaks at loom, it will ultimately result to reduce loom performance.

Introduction

Sizing is often known as a heart of weaving. It is not only provide strength to the yarn but also increase abrasion resistance and increases the weavability of the yarn. Proper sizing practices reduces end breakages at loom which ultimately increases loom performance. There are various sizing parameters which are responsible for maintaining quality of size beam. The machine speed, squeezing roller pressure, viscosity of size paste, temperature of saw box and stretch control are the essential parameters which need to be control during sizing. A size yarn must have good abrasion resistance which clearly reflect by its increase tensile strength with minimum loss of elasticity and required amount of moisture for looming. Weavers beam should not have more number of missing ends, cross ends, lappers and taped ends so that it could unwind smoothly in weaving machine. To increase the strength in abrasion resistance of yarn after sizing depend on a number of factor, namely the recipe of the size mixing. Size preparation, level of size pickup and its degree of penetration into the yarn as well as on the sizing condition. The extensibility of the yarn reduces due to two reason 1) application of size binds the fibre in the yarn major rigidly and reduces the relative slippage at the time of break and 2) even the minimum necessary tension applied during sizing result in a slight that sets in permanently these by reducing the yarn extensibility. Due to the substandard quality of beam it increase the breakage rate at loom shed and causes the electro ration of quality of fabric as well as reduction in loom shed efficiency beam quality is major factor responsible for the improvisation in loom shed efficiency. So, those qualities of weavers beam reflect the quality of weaving preparatory. Quality of beam can be improved by quality parameter, the major parameter affecting on beam quality is stretch.

LITERATURE REVIEW

An electronic stretch controller monitors the yarn stretch on a sizing machine continuously. Whenever the stretch exceeds or goes below pre-set values, a servomotor suitably operates an appropriate PIV drive to increase or decrease the pull of yarn through 'first pulling nip'. During sizing, the yarns are under tension, this result in a slight permanent stretch in the yarn. It leads to a decrease in extensibility or elongation at break of the sized yarn, which leads to more breakage at the loom shed. The greater the yarn stretch, the higher the loss in extensibility of the yarn. If the average extensibility of the sized yarn fall below a certain minimum, the less extensible portions are likely to break during waving. A stretch between the beams and the size box or between the drying cylinders and the loom beams is not as important as stretch which occurs while the yarn is wet when the yarn is stretched dry it will recover most of its original length but when it is over-stretched wet and dried in this stretched conditions the life is taken out of it. An unusually large decrease in elongation is often due to mechanical mix-adjustments in the sizing operation. To obtain certain types of constructions, more stretch than normal will often give better face on the cloth after weaving because of the twill lines. In order to exercise an effective control of stretch. It is necessary to understand the manner in which the yarn undergoes stretch in sizing. Let us consider a multi-cylinder sizing machine with positive drive to the drying cylinders. The warper beams are not positively driven, and therefore, the yarn has to provide the torque for driving the beam. It is in this process that the yarn gets stretched. The portion of the machine in which the yarn is stretched in this way will depend upon the nearest point ahead which grip the yarn and pulls it from the creel and forward to the headstock. Besides this, the yarn can also undergo stretch if between any two positive nips the take up is more than delivery. On most sizing machines the first positive grip on the yarn is provided by the nip of pair of sizing and squeezing rollers. This nip has to pull the yarn and rotate the warper's beam. The next forward positive grip is at the head stock. Ideally speaking, the first grip should be effective enough to provide sufficient torque to rotate the warpers beam in such a case, the grip at the head stock need only serve to pull the yarn over the cylinders since the drying cylinders are positively driven. If this drive is well synchronized with that of the head stock and also with the sizing and squeezing rollers, then there should not be any yarn stretch in the other zones except the creel zone.

The torque to rotate the warp warper's beam in the creel progressively increases as the winding off diameter decreases. Gradually a stage is reached when the grip of the first pulling point the first pair of sizing and squeezing rollers becomes inadequate to withstand or sustain the required pulling force. When this stage is reached, a grip gets established at some other point towards the headstock, so that the warp sheet is kept moving. This shifting of the effective pulling point further towards the head stock, result in extending the stretch zone towards the head stock, subjecting the yarn in the wet zone towards the head stock, subjecting the yarn in the wet and semi-dry state also to stretch. When viewed in this way, one can visualize the possibility of yarn getting stretched between any two drying cylinder is different: it first progressively increases as the yarn gets progressively dried, and after the yarn is well dried it reduces. The difference in wear of Teflon coating between cylinders on same machine, and also between mills, is indicative of the fact that the yarn sheet tends to slip over the drying cylinders and hence undergoes stretch between the drying cylinders also. Actual measurement shows that the overall stretch in the drying zone is normally about 0.5% but can be as high as 1.5%. As is well known that the stretch of yarn in wet condition, as well as during its drying, can result in permanent set of the stretch, and the consequent loss of elongation. This is harmful and should be avoided.

Measurement of yarn stretch in sizing

The stretch on each sizing machines should be measured at the time of starting a new set or at the time of change of the drag roller covering. Modern sizing machines are generally equipped with stretch indicators. On conventional sizing machines, stretch can be conveniently measured with the help of two counters which measure the length of yarn fed and delivered. After taking one reading, the counters measuring the feed and the delivery lengths should be inter charge. Each reading should cover at least 300 meters of yarn length. One pair of readings with proper inter charge of counters is adequate for routine measurement. Electronic stretch controllers/indicators, as discussed below can be used with advantage to monitor stretch level continuously.

This chapter contents the showing of the way for carrying the trials in terms of materials methods. As well as it consist the configuration of machine on which all trials were conducted.

- Study material and sort.
- Observe the various stretch generation area and cause at sizing.
- Measure the current stretch generation at running sort.
- Study the setting and parameter at sizing.
- Observe the loom efficiency and number of brakes at loom for running sort.
- Conduct the test for same sort at sizing to minimize the stretch by making the change in setting and parameter at sizing.
- Observe the end breakage rate loom efficiency.

MATERIAL AND METHODS

Materials:

The study conducted on cotton material of different count as follows,

- count-60^s Ne
- count-32^s Ne

Methods

1) The studies were conducted for the stretch percentage and elongation percentage.
2) At first the unsized and sized yarn elongation has on the beam was measured
3) Further adjustment made for five studies with respective count.
4. Count-60s Ne
   Count -32s Ne
5) Three variables were used for conducting studies on stretch -0.9, 0.6, and 0.4
6) The elongations for above variables were taken and its effect were studied on breakages rate at loom shed

EXPERIMENTAL WORK

Machine selection

This all trials are carried out on the benninger (Ben-sizetech) machine with stretch indicator. The machine parameters were kept constant only changes in the variable carried out as per the plan of work.

Procedure

1. Selection of process variables.
2. Trial of test for yarn stretch elongation before and after sizing.
3. Beam preparation.
4. Beam loading and mounting on loom for end break records.
5. Comparison of beams for further studies.

Practical performance for different variables

The main aim of this project is to reduce the permanent loss of elongation and this can be done by reducing stretch percentage in wet and drying zone by considering other machine parameters constant.

- **Count: 60^S^ Ne**

  For count 60^s^ Ne following parameters were set and changes made on the machine for checking beam performance at loom.

parameter	Stretch %		
	0.9 %	0.6 %	0.4 %
Creel zone	500 N	500 N	500 N
Wet zone	-0.1 %	-0.2 %	-0.3 %
Drying zone	0.7 %	0.6 %	0.6 %
Split zone	2150 N	2150 N	2150 N
Drag roll	2700 N	2700 N	2700N
Pressure roll	2500 N	2500 N	2500 N

Table 1: setting carried for required change for 60s Ne

2) Count: 32^s^ Ne

For count 32^s^ Ne following parameters were set and changes made on the machine for checking beam performance at loom.

parameter	Stretch %		
	0.9 %	0.6 %	0.4 %
Creel zone	500 N	500 N	500 N
Wet zone	-0.1 %	-0.2 %	-0.3 %
Drying zone	0.7 %	0.6 %	0.6 %
Split zone	2550 N	2550 N	2550 N
Drag roll	3200 N	3200 N	3200N
Pressure roll	2700 N	2700 N	2700 N

Table 2: setting carried for required change for 32s Ne

Impact of Setting:

The above trials were made on different counts and changes were in the wet zone and drying zone to find impact of stretch on the quality of size beam and loom performance.

RESULT AND DISCUSSION

Results are based on trials made on the sizing and weaving machine. It consist the test results of sized yarn elongation and their graphical presentation and end breakage study taken in loom shed for analysis of effect of the quality parameter.

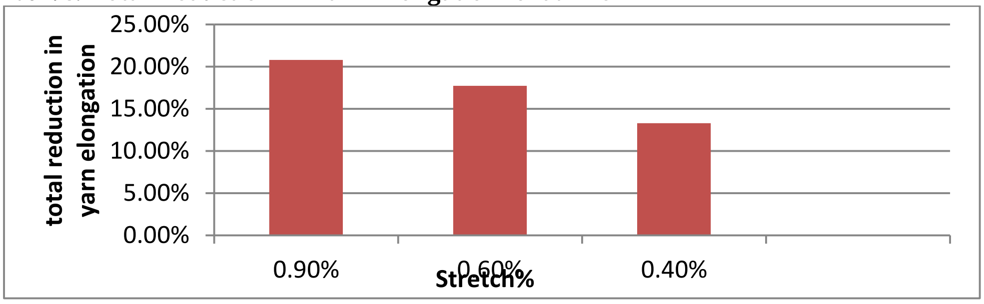
1. Impact of Stretch Percentage on Sized Yarn Elongation:

Yarn Count: 60^s^ Ne

parameter	Stretch %		
	0.9 %	0.6 %	0.4 %
Original yarn elongation	4.49 %	4.49 %	4.49 %
Size yarn elongation	3.51 %	3.64 %	3.8 %
Total reduction in yarn elongation	20.80 %	17.72 %	13.29 %

Table 3: impact of stretch percentage on sized yarn elongation

A. Stretch % Vs. Total Reduction in Yarn Elongation for60^s Ne



Graph 1: stretch % Vs total reduction in yarn elongation

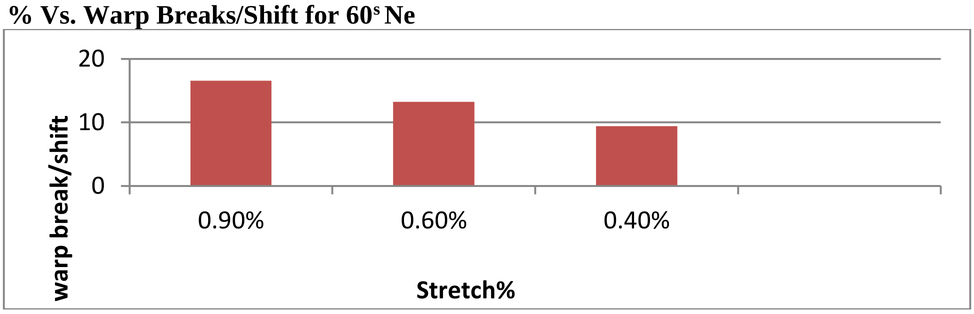
From the above graph it is shown that there is constant reduction in stretch percentage so ultimately there is reduction in yarn elongation. At 0.9% stretch level there is 20.80% elongation in yarn length, whereas yarn elongation were observed in case of 0.4% level of stretch was only 13.29% .

2. Impact of Stretch Percentage on Loom Performance

Stretch%	Breaks/shift	Breakage reduction in %
0.9	16.57	15%
0.6	13.25	20 %
0.4	9.39	43 %

Table 4: impact of stretch percentage on loom performance

B. Stretch % Vs. Warp Breaks/Shift for 60^s Ne



Graph 2: stretch % Vs warp breaks/shift

All three beams of various variables were run separately on the loom and it was found that the beam with 0.4% stretch level shows 9.39 breaks/shift as compare to 0.9% & 0.6% stretch level. It is found that there was considerable reduction in the end breaks rate at loom that is by 43%.

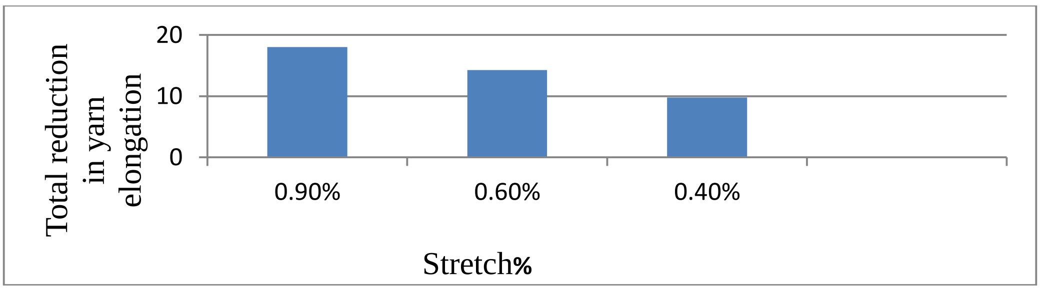
3. Impact of Stretch Percentage on Sized Yarn Elongation:

Yarn count: 32^s Ne

Parameter	Stretch %		
	0.9 %	**0.6 %**	**0.4 %**
Original yarn elongation	4.3 %	4.3 %	4.3 %
Size yarn elongation	3.45 %	3.57 %	3.86 %
Total reduction in yarn elongation	19.76 %	16.97%	10.23 %

Table 5: Impact of stretch percentage on sized yarn elongation

Stretch % Vs Total Reduction in Yarn Elongation for 32^s Ne



Graph 3: Stretch % Vs total reduction in yarn elongation

From the above graph it is shown that there is constant reduction in stretch percentage so ultimately there is reduction in yarn elongation. At 0.9% stretch level there is 19.76% elongation in yarn length, whereas yarn elongation were observed in case of 0.4% level of stretch was observed only 10.23%.

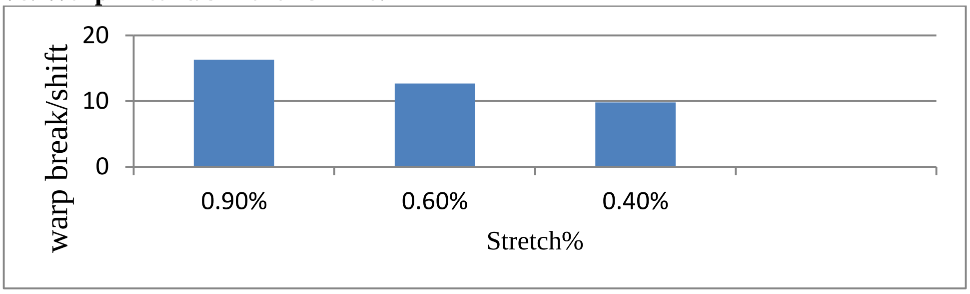
4. Impact of Stretch Percentage on Loom Performance

For 32^s Ne

Stretch%	Breaks/shift	Breakage reduction in %
0.9	16.3	16%
0.6	12.7	22 %
0.4	9.8	39 %

Table 6: impact of stretch percentage on loom performance

Stretch% Vs. Warp Breaks/Shift for 32^s Ne:



Graph 4: stretch % Vs warp breaks/shift

All three beams of various variables were run separately on the loom and it was found that the beam with 0.4% stretch level shows 9.8 breaks/shift as compare to 0.9% & 0.6% stretch level. It was found that there is considerable reduction in the end breaks rate at loom that is by 39%.

CONCLUSION

Loom performance is increased by reducing wet stretch and dry stretch. The three selected variable beams were successfully run on the loom for checking their performance. It is found the beam with 0.4% stretch showed less end breakages for both count i.e 43% and 39% respectively.

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