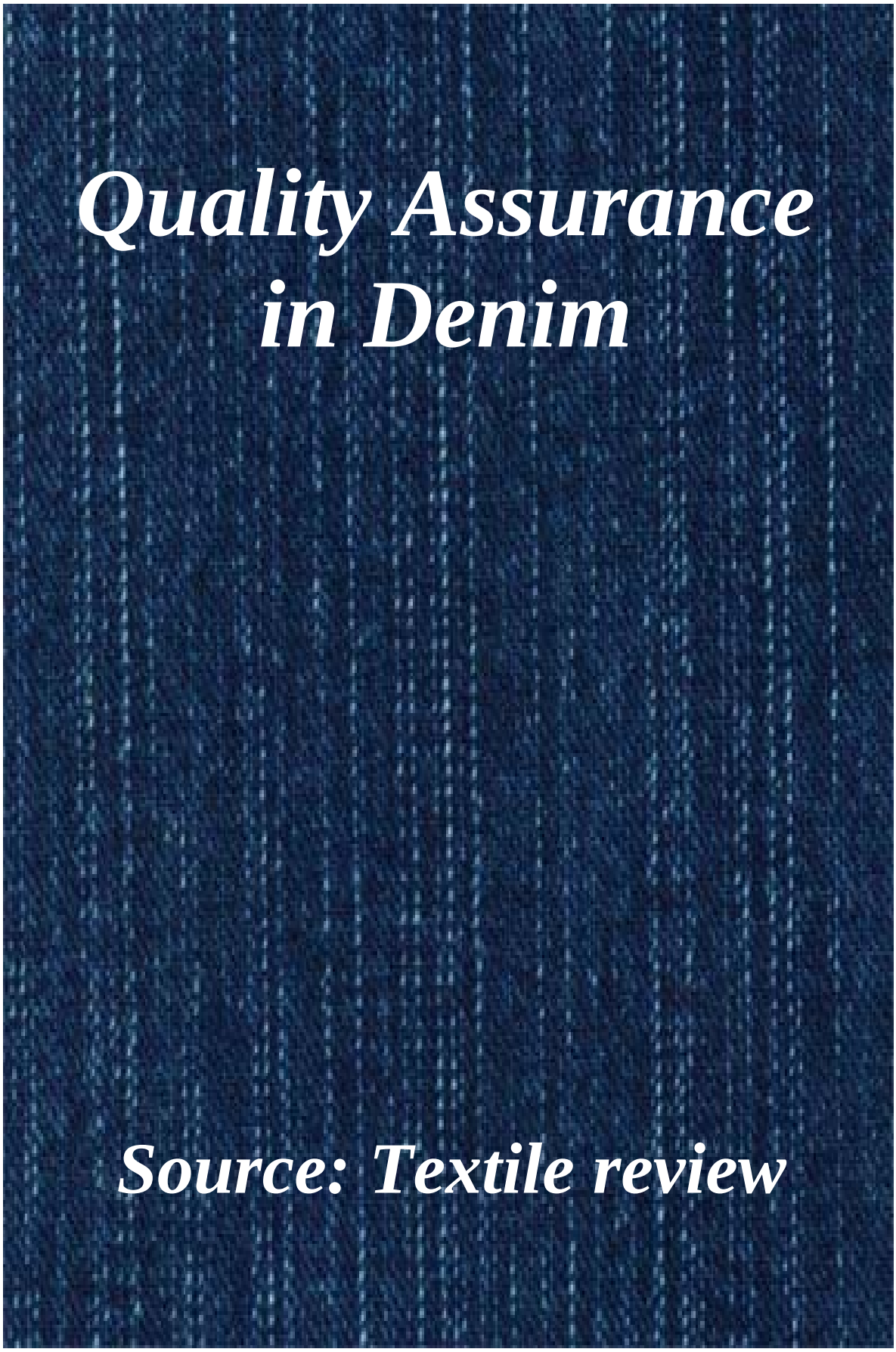

Quality Assurance in Denim

Source: Textile review

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By: Sanjay Vishwakarma

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Denim has gained much popularity that if you look around, you will surely notice somebody wearing denim in your nearby. Now, more than just complementing a rugged style, the denim has become suitable for any occasion. Denim is being worn irrespective of demographic differences. The material denim is synonymous with familiar blue jeans and is denoted by a rugged twill textile that produces the familiar diagonal ribbing. Today, there are around twenty Denim manufacturers in India alone catering to the domestic and export markets. The manufacturing facilities are fast catching up at Bangladesh, Pakistan and Vietnam. Denim today is now available in various shades of blue, black and brown within each there are different effects generated by washing.

As Denim is a competitive market product, there will always be pressure on price and quality. One can gain upper hand in pricing if their manufacturing cost is low. One of the ways of reducing the manufacturing cost is reducing the raw material cost, reducing the production losses and reducing the second's generation.

Quality Assurance in Denim mill can thus significantly help in achieving the above objectives. Academically, Quality Assurance may be defined as "the planned and systematic activities implemented in a system for fulfilling the quality requirements of a product or service." The current paper highlights in brief various check points employed in Denim mill for arresting the non conformities so as to reduce the production losses and quality down gradations.

Technical Specifications

The following guidelines can be followed at each stage starting from raw material selection to dispatch of denim fabrics:

1. Handling of Raw materials in Godown

Basic raw material for denim fabric is yarn. The same is either produced internally or is procured from outside. Following care should be taken for avoiding the damage of packages in go down:

In case of yarns purchased from outside, yarn should be unloaded from truck gently and location of godown should be as near to warping. This will ensure minimum yarn damage due to impact and significantly improve the warping performance due to reduction in cut ends.

In case of In-house yarn, plastic packages are used generally. Car needs to be taken to use undamaged plastic packages only so as to minimize breaks at warping due to worn out packages

2. Approval of raw material

The raw material for composite Denim mill is fibre while for non composite mill it is yarn

only. The raw material should be approved first before consuming for production. Following raw material parameters effect the yarn properties and running performance.

Fibre	Effect on yarn performance /properties
Micronaire/ Denier	Shall affect the yarn strength as well as dye uptake
Length	Shall affect the spinning performance and yarn strength
Strength	Shall affectthe spinning performance and yarn strength
Elongation	Elongation is important because yarn elongation after sizing has considerable influence on weaving efficiency
Short fibre content	Short fibre content shall affect the yarn imperfections, appearance and weight loss due to repeated washing
Yarn	
Count	Affects the fabric weight (OSY). If count is fi ner one has to insert extra picks for getting the desired fabric weight
RKM/CSP	It will affect the warping, dyeing and weaving efficiency
Imperfections	It will affect the working performance as well as appearance of the fabric

For any new supplier/yarn sample it is always better to test the same by running the yarn as weft in the running looms for assessing its performance

Slub yarn approval should be given only after assessing the appearance either on yarn appearance board or by producing the fabric by running the same on the loom along with standard Slub yarn

3. Warping

Warping serves as the acid test for the assessing the yarn quality. Warping performance is considered to be satisfactory if breaks/million metre at 1200 mpm is as under:

Yarn Type	Breaks/million metre
Normal Yarn	Less or equal than 0.4
Slub Yarn	Less or equal than 0.8

Following points should be taken care while warping for getting the lower end breakage rate:

- Damaged package found while mounting should not be creeled
- Tension in the yarn should be adjusted so that yarn sheet is neither slack nor very tight (Norm is 10% of the yarn breaking strength)
- High speed provides necessary tension to the yarn sheet. In case of higher breaks speeds can be reduced to some extent. Drum pressure should be selected based on

the hardness required of the warpers beam
- The warpers beam rims (flanges) should be checked periodically for damage and eccentricity.
- The breakages should be recorded along with the reason like cut ends, breakage from Slub, opening of splice portion so as to take corrective action for next supply

4. Dyeing & Sizing

It has been found that yarn performing very good at warping sometimes create problem at dyeing range due to greater liveliness leading to grouping of yarn. Sometimes yarn performing poorly at warping leads to good running at dyeing. This may be due to elimination of all weak points at warping itself. In addition to performance concerns, shade consistency and centre side variation is also one of the challenges for mills having sheet dyeing ranges. These challenges make dyeing and sizing as very important operations in the Denim manufacturing. Following points should be taken care while dyeing & sizing;

- Alignment of warpers beam in creel should be perfect
- In India most of the milis are using indigo in powder form only. Thus purity, moisture content and tone (reddish/greenish) of indigo powder must be checked before taking in bulk production.
- The parameters like pH & mV of the dye liquor needs to be checked every 30 to 45 minutes. Generally it is kept around 11.5 to 12.0 and 750 ± 30 respectively. In many advanced machines, online checking & display of these parameters is also available
- For shade consistency, yarn should be drawn from every beam for shade evaluation manually as well as by spectrophotometer
- Mills facing Center Side Variation should draw yarns from both the sides and centre from front of the dyeing machine and check for any variation Size add on is generally kept around 8 to 12% depending on yarn count
- Solid content or Rf % is generally kept around 8.5 to 14 % depending on yarn count
- Moisture in sized beam should be around 7 to 8% so as to get better loom performance
- Sized yarn should be tested for checking the increase in strength and loss in Elongation. Generally yarn strength is increased by 25% and yarn elongation is dropped by 20%. In any case yarn elongation of sized yarn should be above 3.0% for better loom efficiency Excellent work practices should be adopted for cutting the lappers and attending breaks in dry splitting zones so as to minimize yarn cross ends/missing ends so as to get better performance in weaving

5. Weaving

Weaving is an operation where first image of denim fabric is realized. On getting perfect beams, the weaving efficiencies generally reaches Y6 to 98% per shift. In general the performance is considered satisfactory till Warp and Weft break level is less than 1.5 breaks/ cmpx. Following points should be taken care while weaving so as to supply defect free material to the next operation.

- Weft yarn should be kept covered with plastics / cardboards so that no fly gets deposited on the packages
- Care should be taken while beam knotting so as to avoid any crossed ends
- High speed air jet looms are commonly used for weaving denim fabrics. Air

pressure should be adjusted perfectly depending on the weft so that weft passes smoothly through the shed without creating defect like furkey

6. Singeing

Singeing is an important operation as it burns the protruding fibres from the fabric surface. Following care needs to be taken while singeing

- Flame quality should be perfect (singeing should be done in blue flame only)
- Flame height should be uniform (4 to 5 inches) and should not vary throughout the width else it will lead to bands in the fabric
- Speed should be optimum (around 70 to 80 mpm) so that effective singeing action is performed

7. Finishing

In denims two types of finishing machines (Foam finish/Wet finish) are found. Both have it's own advantages and disadvantages. Irrespective of the type of finishing machines, following points should be taken care while finishing operation:

- The greige fabric must be tested for knowing the shrinkage & skew potential
- Based on the shrinkage & skew potential, shrinkage & skew is applied so that residual shrinkage in fabric is less than 3.0% and skew movement less than 2.0%
- The fabric entering Sanforiser should be moist (around 12 to 1 5%) in order to get good body. I n absence of moist fabric, the fabric feel is very limpy. Nowadays online moisture meter are also installed in the region for monitoring of same.
- The draft between sanforiser and palmer cylinder should be less than 1.0% so that shrinkage applied is not lost due to stretching
- The finished fabric should be checked for all properties like weight, shrinkage, skew, stiffness, tensile and tear strength before releasing to inspection department

8. Inspection & Packing

Inspection provides the true picture of the fabric quality by informing the main defects for down gradation. Action can be taken in particular department for reducing the value losses. Following steps to be taken in inspection and packing department for getting the right quality product

- Inspection to be done for 100% fabric by any accepted inspection system. In general 4 point inspection system is commonly followed.
- Full width fabric sample of 10" length from every roll is collected for pick checking and shade grouping.
- Full width sample after every 4000m should be sent to laboratory for parameter testing like weight, shrinkage, skew, stiffness, tensile and tear strength
- Paper tube length & quality should be perfect so that fabric doesn't hang from the edges and paper tube doesn't get collapsed during storage or transit
- Each fabric roll is weighed and packed using HOPE woven cloth, shrink wrapping or stretch wrapping Fabric weight (OSY) should be checked from length and weight of the roll before dispatching so as to segregate lower weight rolls if any

9. Washing and shade grouping

Washing and shade grouping is very important activity in Denim mill. Export buyers or very reputed domestic buyers ask for the taper/sequencing report along with the dispatches. Generally buyers ask for the washed swatches along with taper/sequencing reports. The important point is as under:

- The collected 10" sample from every roll is cut into five equal pieces. One piece from all the rolls of the particular order are stitched as blanket along with standard swatch and washed as per the customer recipe or own developed recipe. After washing the swatches are measured on spectrophotometer for shade values and off shade rolls are removed from the dispatches. In case of major shade off, recipe of washing can be changed (if acceptable to customer) and same should be communicated to customer for getting the desired shade as required
- 10 Storing of Rolls Storing in godown is all together a specialized activity. If not done properly all the good work done so far will be no use. In general, care should be taken for following points;
    - Rolls should be stacked horizontally and not vertically. Vertical stacking lead to waviness problem on opening
    - Rolls should be stacked in such a way that it is easy to locate any roll atthe time of dispatch.

10. Dispatch

Dispatch is last activity but certainly but very important. Following care needs to be taken during dispatch operation:

- Care should be taken the approved roll list given by QA is only loaded Loading should be gentle enough so that there are no damage to the packing

Conclusion

From the above it is clear that each and every operation is important and contributes significantly to the quality of the product. One should arrest the non conformity where it happened so that further operation is not affected. This way production loss is minimized and product produced is of superior quality.

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