Production of international quality yarn

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Received 30 April 1992

The production of international quality yarn is somewhat an uphill task for most of the spinners of Indian textile industry. The yarn export of this industry—with an installed capacity of about 26.59 million spindles, which is nearly 17% of world’s installed ring spindles—accounts for only 4% of the total export market. This paper attempts to clear some of the myths entertained by the spinners and highlights the methodology to be adopted to produce international quality yarn.

Keywords: Ring spinning, Yarn quality

1 Introduction

As far as the Indian textile industry is concerned, the production of international quality yarn is considered to be somewhat an uphill task and only very few mills can produce such type of yarn. In fact, this is reflected in the performance of this industry on the export front. With an installed capacity of about 26.59 million spindles, accounting for nearly 17% of the world’s installed ring spindles, the Indian textile industry’s share was less than 4% of the total export yarn market in the year 1989. The perception that most of the Indian mills can’t produce international quality yarns with ring spinning technology is a myth; even an average spinning mill—by quality standards—produces ‘once in a while’ international quality yarn which is just by accident, rather than by design. In this case, all the ingredients those constitute a very good quality are merged by chance; it is not by a systematic planned combination. Unless and until most of the factors those go into the making of a good quality yarn are combined in a systematic manner, the international quality will always elude the spinner. This paper broadly deals with the methodology to be adopted to not only produce but also to maintain the international quality using ring spinning technology.

2 What is International Quality?

Most of the spinners are under the impression that international quality means that all the yarn quality specifications should be either equal to or better than Uster 25% values and they try very hard to attain the level by going for a good quality raw material at a higher cost and/or sacrificing the productivity at critical stages in the production line. As mentioned in the Uster Statistics—“A yarn whose mean values, for all the quality characteristics, lie below the 25% line/value of Uster Statistics is seldom encountered, and if so, it must refer to a yarn spun from an extremely expensive and special raw material. Even then it is questionable whether manufacture can be undertaken at economic spinning speeds. Practical experience has shown that a yarn need not necessarily be perfect in terms of all the various yarn characteristics”—it is not advisable to meet the statistics for all quality parameters. What is more important is the buyer’s specifications.

2.1 Specifications of Buyer

Often in export market, the foreign buyers specify the quality requirement levels. Generally, the following parameters are specified:

- Lea count and CV%
- RKM and CV%
- U% with imperfections
- ASTM appearance grade
- TPI

Besides the above, the buyers specify whether yarn should necessarily be electronically cleared and spliced; in case of doubled yarns, whether it should be twisted on two-for-one twisters; occasionally, some buyers specify the total objectionable faults as measured by Classimat.
2.2 Intrinsic Quality Requirements

Meeting the specifications is one part of yarn quality. The other part, which is much more important, is the performance of the yarn on the buyer’s machinery and the ultimate quality of his end product. The yarn should withstand the various operating parameters and processing conditions and produce a defect free product. Therefore, the spinner should be aware of the end use of the yarn which he is supplying to his customer and the conditions in which these yarns will be used. Accordingly, he has to engineer the yarn to meet those requirements imposed by the end use besides meeting the specifications. The ultimate index of yarn quality is the customer’s satisfaction rather than yarn specifications.

The spinning industry mainly exports cotton yarns meant for hosiery and blended spun yarns for weaving purposes. The yarns are generally run at very high speeds on sophisticated machinery, particularly in European countries. Translating the buyer’s requirements into meaningful controllable parameters is the first and foremost task of the spinner. For both hosiery and weaving yarns, the objectionable faults as measured by yarn fault classifying system should be minimum; generally, up to 2 objectionable faults per 100 km are tolerated. The count CV should be minimum, particularly for hosiery yarns. The yarns meant for weaving should have adequate strength and elongation.

3 Yarn Quality Evaluation

In many mills the yarns are evaluated for the various quality characteristics like count and strength and their variabilities, U% and imperfections, yarn appearance grade, etc. at ring frame stage. Only few mills evaluate the yarns at the cone stage. In fact, a study conducted on inter-firm comparison of quality of cottons, yarns and fabrics revealed that most of the yarn faults present in cones are created in the post-spinning operations. It further points out that in most of the mills the post-spinning operations are neglected both in terms of house-keeping/maintenance and renovation/modernization. In case of yarns spun from man-made fibres and their blends, the neps and yarn faults tend to increase during winding, the extent of increase being dependent upon the blend and winding parameters. All these things lead to a situation wherein the spinner is not even aware of the quality of yarn supplied to the user.

From the above sections and from the view point of yarn user, the following quality evaluation is suggested at the post-spinning operations.

(i) Each and every cone should be checked physically for its proper wind, package density, contamination, etc.
(ii) Rewinding test should be carried out at high speeds, particularly for export yarns as these are warped at high speeds, more than 1000 m/min. The rewinding breaks should be at the most 1 per lakh metre. Atleast 10 lakh metres should be evaluated.
(iii) The final yarn should be tested on a fault classifying system in a routine manner. The objectionable faults should be less than 2 per lakh metre.
(iv) The quality of all splicers/knotters should be checked atleast once in a week.
(v) The cone weight variation should be minimized. A realistic target could be within ±50 g.

4 Raw Material

To a large extent, the average quality of yarns is decided by the raw material quality. Therefore, raw material selection assumes considerable importance not only from quality point of view but also from cost point of view as the cost of raw material accounts for more than 60% of yarn cost. The following aspects are to be considered as far as raw material is concerned.

4.1 Quality of Cotton

Depending upon the count to be spun and the end use, the right type of cotton should be selected. Generally, there is a tendency on the part of Indian spinners to underspin the cotton, particularly for export market. It has been reported that the minimum fibre quality index (FQI) values of cottons used to spin export yarns are higher than those of cottons used to spin yarns for domestic market. Further, the maximum values for export yarns are higher by as much as 25-90% in different counts. Such underspinning is resorted to achieve high tenacity and good evenness characteristics. However, both things do not take place simultaneously. Mere use of rich mixings can adversely affect yarn imperfections. In a controlled study it was observed that the imperfections increased by more than 100% and the total class faults increased by 150% when the FQI was made rich by about 12% and the mixing costly by 8%. In another study on the performance of Indian yarn in relation to the requirements of the customer it was observed that the major deficiencies were in U% and yarn appearance, and in strength values the yarns were far superior to the requirement. This clearly indicates that the Indian spinners attach too much of importance to yarn strength without realizing that
strength alone is not the only criterion for a good quality product, and in that process they adversely affect other quality characteristics. The selection of cotton, therefore, should aim at optimizing the yarn quality.

4.2 Mixing Practices

Having selected the cotton varieties, these must be effectively utilized. The following steps are suggested for the same.
(i) It is preferable to restrict the number of cotton varieties in the mixing to a maximum of two. From the viewpoint of uniform dyeing it is desirable to stick to one cotton only.
(ii) It is better to keep at least 6 months stock of cotton. This will help to ensure uniform mixing lay-down over a period of time.
(iii) For each mixing, the maximum number of bales possible from a maximum number of lots should be accommodated so as to ensure uniform mixing quality.
(iv) For fine count mixings, it is advisable to remove full seeds, seed coat fragments and other big foreign particles.

4.3 Testing

With the availability of High Volume Instruments for fibre testing equipment, one is in a position to test each and every bale. Based upon the test results, the bales can be segregated and then mixed appropriately so as to ensure uniform mixing quality.
(i) Use stack mixing of cotton.
(ii) Stack the laps in row manner and creel them in column manner.
(iii) Stack the bales in such a manner that all the cards are equally represented.
(iv) Use block creeling at drawframe, speedframe and ring frame.

5 Systems and Practices

The difference between the mills producing and not producing international quality yarns lies in their systems and practices. Some of the practices followed in the export-oriented mills are given below:

5.1 Material Identification

As export yarns have to be supplied in the natural form, no tinting can be used. Where different mixings/counts are run, the material has to be properly identified. The following systems are suggested for identification:
(i) Blow room lap rod tips coloured either by colour or by colour tapes.
(ii) Different coloured card/draw frame cans depending upon mixing/count.
(iii) Roving and ring bobbins of different colours.
(iv) Cones with either different colours or stickers or colour tips.

5.2 Processing

During processing, maximum efforts should be made to make the material more uniform. The following steps are suggested:
(i) Use stack mixing of cotton.
(ii) Stack the laps in row manner and creel them in column manner.
(iii) Arrange the card cans at the draw frame creel so that all the cards are equally represented.
(iv) Use block creeling at draw frame, speed frame and ring frame.

5.3 Work Practices

Most of the faults observed in final yarns are by and large contributed by the poor work practices followed by workers. To ensure a good yarn quality, the following work practices should be strictly enforced:
(i) Over-end piecing at ring frame should never be allowed.
(ii) The ring frame as well as roving creel piecings should be totally discouraged.
(iii) In draw frame the creel piecings should be done carefully so as to ensure that it does not result in a long thick place.
(iv) Workers should be made clearly aware of the implications of a poor quality.
(v) A continuous training scheme should be there for workers wherein each worker is retrained at least once in six months.

6 Quality Assurance

A better overall average yarn quality need not necessarily assure a defect-free product, often many quality complaints stem from one or two packages. The problem could be a soft package, mixed up yarns, improperly wound cone, neppy yarn, irregular yarn, etc. In this context, physical checking of each and every package as outlined in Section 3 assumes considerable importance. Besides this, a good system
of machinery audit ensures that such type of defective material is not at all produced at the first instance. With the introduction of on-line quality monitoring systems such as on-line fault classification, cone data, ring data, sliver data, etc., the spinner is in a position to check 100% of the material produced; these systems enable to locate the faulty package/position/material with minimum effort.

References