BLENDED TEXTILES FOR NICHE MARKET FROM NATURAL FIBRES

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Since the opening up of international trade, textile business the world over has taken new dimensions. India's textile exports to the US and Europe, the two largest markets are reported to be growing. Trends in yarn requirement show increasing demand for finer counts, specially to produce light weight and soft touch fabrics. Although cotton fabrics are the most comfortable, its blends with other fibres are preferred for fulfillment of functional and/or aesthetic requirements that cannot be obtained by using only one type of fibre.

Blended textiles have received increasing commercial acceptance over the years. The production of blended yarns in India has nearly trebled from 207 million kg in 1990-91 to 590 million kg during 2003-04. Blended textiles are finding increasing application in highly diversified fields ranging from apparels to technical textiles. By blending, fabrics of novel types and with special effects can be produced for the niche market. Out of the total blended yarn production, 35% of the yarns contain cotton as one of the constituents.

STUDIES ON BLENDING

In view of the above potential, the Central Institute for Research on Cotton Technology (CIRCOT) has undertaken studies on development and production of blended textiles, particularly with cotton as one component.

Studies on blends of Indian cotton with polyester fibre (1974)

Before 1974, the bulk of the cotton used for blending with polyester in India was imported from Egypt, Sudan and United States. During seventies, a number of Indian varieties of cotton, including hybrids having properties almost at par with some of the imported cottons, were developed by agricultural scientists and were released for commercial cultivation. A study was carried out to assess the blending performance of new varieties of Indian cottons like Sujata, Suvin and PSH with polyester fibre for spinning 80s yarns, and Hybrid 4 and Varalaxmi with polyester for spinning 50s yarns. The quality of yarns was compared with that of yarn produced from blends of imported Giza 45 and Sudan with polyester and found to be at par.

Development of cotton-jute blended products (1977)

The feasibility of producing cotton-jute blends on cotton spinning machinery was examined. Jute fibres of two types, viz. jute caddies and jute staple were used. While jute caddied were blended with short stapled cottons, jute staple fibre was blended with superior ones. Plain woven fabrics with appropriate construction parameters were successfully prepared.

Spinning of blends on rotor machines (1980s)

Even in eighties, when the trials of Indian cottons on open-end rotor spinning machine were under way, some of the progressive textile mills desired a study on the feasibility of spinning blends on the rotor machine. An exploratory study on spinning of various blended yarns was undertaken. Besides, extensive research studies were carried out to optimize fibre quality, process and machine variables for production of good quality rotor spun blended yarns. Basic studies on rotor spun blended yarns were also conducted leading to generation of new information.

Development of cotton-pineapple fibre blended products (1987)

Raw pineapple leaf fibres are coarse and harsh, and are normally used for preparation of fancy articles, such as mats, handbags, brushes etc. A study was conducted to develop yarns and fabrics from cotton-pineapple fibre blends for textile applications.

Blending trials of cotton with specialty polyester fibres (1990s)

Specially fibres, such as hollow polyester fibres, trilobal fibres, microdenier fibres etc. were subjected to spinning trials to judge their suitability for blending with cotton.

Air-jet spinning of Indian cottons and their blends with polyester (1993)

Air-jet spinning system is a new method of producing yarns, and is gaining commercial acceptance, particularly for the production of polyester-cotton blended products. Indian cottons, both in pure form as well as in blends with polyester were subjected to spinning trials in collaboration with M/s Murata Machine Works Ltd, and Kyoto Institute of Textile Technology, Japan. The spinning performance judged in comparison with ring and rotor spinning systems was found to be good.

RECENT STUDIES ON DEVELOPMENT OF NOVEL BLENDED TEXTILES

Of late, CIRCOT has undertaken research work on development of a few uncommon blended textiles.

Blending of cotton with ramie fibres

Many of the natural lingo-cellulosic fibres are considered as low value, useful only for manufacturing industrial yarns and fabrics for packaging. With the increasing concern the world over for ecological preservation, sustainable resources like vegetables fibres originating from plants that are safe, bio-degradable and recyclable have gained importance. Ramie is one such natural lingo-cellulosic bast fibre. Development of appropriate technology for the production and processing of ramie either alone or in blends with cotton can definitely widen the application base of this important natural resource.

Realising the current demand for value-added novel products, CIRCOT in collaboration with the National Institute for Research on Jute and Allied Fibre Technology (NIRJAFT) has developed a technology for utilization of Indian ramie in blends with cotton for production of high quality ring spun knits having desired performance attributes.

Ramie is one of the strongest, lustrous, softer and finer among bast fibres which possesses valuable hygienic properties to a large extent, generally not found in other textile fibres.

Decorticated ramie fibre contains 20-30% gum. It is normally not possible to spin the fibre with this adhering gum, which therefore needs to be removed. Degumming can be done by chemical or biological treatment. The gum content needs to be brought down to at least 8% for good spinnability. Degummed ramie is known for its excellent microbial resistance.

In the present study, ramie fibre was chemically degummed by an improved method developed at NIRJAFT. An optimum degumming treatment was formulated, keeping in mind the effect of gum removal on fibre fineness and bundle tenacity, resulting in highest strength realization in the blended yarn. Spinning optimization trials were carried out by using an improved CIRCOT Microspinning Technique. A blend ratio of 65:35 for cotton: ramie was found to give adequate CSP and hence all the ramie samples were blended with different cottons in the proportion for production of ring yarns. Spinning of coarser to finer counts from 16s to 40s Ne on ring frame was successfully carried out by blending ramie with medium to long staple cottons.

The yarns were knitted on various lab model-knitting machines to produce single jersey, double jersey interlock and terry knits and the knitting performance was found to be satisfactory. The fabrics produced were found to have good absorbency, enhanced air-permeability, lustre and improved wear comfort. Air-permeability of the blended fabric was noted to be higher than that of 100% cotton, indicating the suitability of cotton/ramie blends for apparel fabrics. Higher absorbency of blended fabrics also indicated their better scope for preparation of toweling and other dress materials. With careful bleaching and finishing, it was possible to eliminate plant-related faults from the fabric. Some of the fabrics were converted into quality garments which elicited a favourable response from aspiring entrepreneurs.

Thus, employing a modified chemical degumming method coupled with an improved spinning technique, it is now feasible to produce finer blended yarns from cotton-ramie blends, which otherwise would not be possible with jute or flax spinning systems. Such blending will help development of textiles with better functional properties by combining the positive features of both the fibres. It is to be noted that both the fibres being natural, the products developed from their blends will also be eco-friendly.

Blending Indian short wool and Angora rabbit hair with cotton

In a collaborative project with the Central Sheep and Wool Research Institute (CSWRI), CIRCOT has succeeded in developing a technology for utilization of indigenous short wool and Indian bred Angora rabbit hair in blends with cotton for production of novel fabrics having desirable quality attributes. Being fines and shorter compared to woolen standard, Indian wool fibres cannot be effectively utilized through long staple woolen and worsted spinning systems for manufacturing consumer acceptable textiles.

Indian short wool and cotton blended textiles : One indigenously developed crossbred wool, 'Avivastra' was blended with DCH32 and J 34 cottons and one specialty hair fibre, e.g., 'Angora rabbit hair' bred in India was used along with Suvin and DCH32 cottons.

Based on the optimization experiments carried out, further scale-up blending trials were conducted. For full-scale trials, commercial spinning machines were employed. Avivastra wool can be blended with DCH32 cotton to an extent of 40% maintaining the desired CSP, single yarn tenacity and U% levels for production of 16s and 20s Ne yarns on the ring spinning system and to an extent of 30% for production of 16s yarn on the rotor spinning

system. All the bulk trials proved successful. Various processing and machinery conditions required to be maintained for full-scale spinning of such blends on both the ring and the rotor spinning systems have been identified. Industrial weaving trials were carried out on a powerloom without the need for sizing of the warp yarn. Methods for scouring, bleaching and softening treatment for such blended fabrics have been optimized. Industrial weaving, chemical processing and garment making trials on Avivastra wool and cotton blended yarns were also conducted successfully.

Avivastra wool and cotton blended fabrics were found to possess shrinkage values, pilling grade and optical cover factor within acceptable limits. These fabrics can be tailored without any problem and also possess a soft feel as noted from the Fukurami values determined by sophisticated computerized hand value testing equipment.

Angora rabbit hair and cotton blended fabrics: Angora rabbit hair was blended mainly with Suvin and DCH32 cottons for spinning 40s yarns useful for knitting. It is to be noted that with rabbit hair content up to 30% in the blend, it was possible to spin yarn suitable for waving. The tertiary blend of cotton, rabbit hair and polyester fibres with equal proportions produced knitted fabric having better bursting strength and lower shrinkage parameters. Careful optimization of the process was needed for chemical finishing of Angora rabbit hair and cotton blended delicate fabrics. Industrial knitting trials of Angora rabbit hair and cotton (30:70) blended yarn (30s Ne) was successfully carried out and plain and tuck knits and collar and rib fabrics were produced. After chemical processing of these fabrics, garments like T-shirts have been made. Cotton and Angora rabbit hair blended knitted fabrics soft feel and low-shrink properties suitable for women's innerwear and children wear.

Hitherto, there was no appropriate avenue for utilization of indigenously available short wool and Angora rabbit hairs. Mechanical methods for removal of burrs from wool and guard fibres from Angora rabbit hair has been standardized replacing fully the chemical treatment for removal of burrs. Now, there is no need for chemical treatment for removal of burrs. Machine spinning of Angora rabbit hair and cotton blends with commercial working speeds, so far an unexplored area, has met with success. Processing technology for manufacturing good quality yarns and value-added fabrics, particularly of finer types from these animal fibres in blends with cotton by adopting short staple spinning systems, popularly known as cotton spinning systems has been developed. This technology can be adopted by existing cotton and blended yarn spinning mills requiring product diversification and also by small-scale spinning units.

CONCLUSION

Lifestyle of consumers is now dictated by fashion trend to a considerable extent. Besides, this concept of fashion keeps on changing constantly. Customers are becoming more and more demanding in terms of quality, design etc. They also want newer fabric varieties to choose from. Therefore, a rethinking is needed in the textile production process and the type of textiles to be produced to satisfy the customer's requirement. In this context, it is worthwhile to channelise a part of the production facilities for the manufacture of such unconventional and novel textiles from natural fibres. This will help to create niche market segments enabling textile manufacturers to survive in this fast changing competitive sector.