TECHNICAL BULLETIN

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TRI 1016

RANDOM SLUB ROTOR YARN PRODUCTION ON CONVENTIONAL EQUIPMENT

Concept

Spinning mills have long desired a way to produce a 100% cotton novelty rotor yarn with slubs of random size and length using conventional mill machinery without any special attachments. New technology provides a method to create very short and small size slubs, which are not attainable with most electro-mechanical designs due to their inherent limitations and the rotor diameter that controls the minimum slub length. This random slub process can be a cost-effective alternative for producing novelty slub yarns on rotor-spinning machines.

Introduction

Cotton Incorporated developed a process for producing a random slub rotor yarn by using small amounts (10%-25%) of comber noils (0.5 in/12.5mm or less) in the final drawing process (usually two "short cotton" slivers in the creel). The practical count range of yarn from this process is projected to be Ne 20/1 and coarser. The main targets for this yarn include denim, shirting, fashion fabrics for women's wear, and home products.

Fiber Processing Specifications for Producing Random Slub Rotor Yarn

General Procedure

One or two slivers made from comber noil/short staple virgin cotton are introduced into the drawing creel at the finisher drawing step with six to seven ends of "base" cotton or virgin lint (base cotton slivers can be produced in the normal manner). These short fiber slivers produce drafting waves, which later become random thick places (slubs) in the yarn.

Cotton Fiber Selection

The requirements of the yarn count being produced and of the end product are the primary dictating factors in determining the base cotton quality and properties that are most appropriate and economical. However, the size and number of desired slubs may be influenced by the choice of cotton fiber length.

Blending for the Short Cotton Component

A sliver made up of mainly short fiber (blend of noil and short virgin cotton) must be produced. Intimate blending of 50% comber noil (0.5 in/12.5 mm or less) and 50% short virgin cotton (1.0 in/25.4 mm or less) may be achieved by using weigh pans or by controlling the noil percentage in the actual laydown for producing this sliver. A higher or lower percentage of comber noil can be used depending on the desired random-slub effect and carding performance. The comber noil properties should be controlled to avoid inconsistencies in the slub size and frequency.

Opening and Cleaning

Both the base cotton (virgin lint) and the noil/short cotton blend should be separately opened and cleaned through the standard mill machinery; however, it is recommended that the coarse trash cleaner be bypassed to prevent removing the noil from the noil/short cotton blend.

Carding

The noil/short cotton blend should be carded into a predetermined card sliver weight to achieve the desired amount of noil (slub effect) in the yarn and resultant fabric. The selected base cotton can be represented by the standard cotton mill production.

Breaker Draw

The base carded cotton should be drawn into a predetermined sliver weight to achieve the desired amount of base cotton at finisher drawing and in the product. Card sliver made of the noil/short cotton blend should not be drawn before the finisher process of drawing, as it will diminish the desired slub size and frequency in the product.

Finisher Draw

At the finisher process of drawing, noil/short cotton blend card slivers should be blended with virgin cotton base slivers from the breaker drawing process in order to achieve the desired amount of noil (10%-25%) in the yarn. The noil/short cotton blend slivers can be creeled evenly between the base cotton slivers, or segregated, depending on the desired slub effect. Figure 1 shows a random slub web board from the finisher drawing process in which two noil/short cotton ends are next to each other in the middle of the creel. A drawing web sample may be taken to see the effects being produced.

Fiber Processing Recommendations

Slub size and frequency can be altered by the following procedures:

- The percentage of noil in the card sliver fed to the finisher drawing process can be increased (larger slub) or decreased (smaller slub), depending on the desired effect.

- Sliver weights of the noil blend and base cotton can be adjusted to create an almost infinite variety of effects in the yarn.

- The draft distribution on the finisher drawing process can be weighted more on the front draft zone (larger slub) or on the back draft zone (smaller slub), depending on the desired effect.

- Roll settings or nip distances (ratch settings) of the finisher draw can be increased (larger slub) or decreased (smaller slub), depending on the desired effect.

- Finisher drawing speed can have a significant effect on slub size and frequency and will depend largely on the type and configuration of the drawing frame used.

Rotor Spinning

Cotton Incorporated's continuing development on random slub rotor yarns has indicated that combing roll type and speed have a major impact on creating and preserving the slub effect desired.

Combing Roll Specifications:

- Select combing rolls equipped with low density pins or saw teeth that have a less aggressive combing action and good fiber release performance in order to preserve the slub effect in the sliver being fed.

- Combing rolls equipped with wider pin spacing and varying height, enhance the random slub frequency.

- Combing roll speed should be low enough to preserve the slub effect and prevent cotton loading, which can cause yarn breaks.

Rotor Spinning Setup Recommendations:

1. Heavier sliver weight may help to enhance the slub effect in the yarn.

2. A wider feed plate setting to the combing roll or using a long-staple feed plate may enhance the random slub effect.

3. Select the suitable combing roll type and speed to preserve and enhance the random slub effect.

4. Reduce the extraction of noils at the combing roll housing.

5. Reducing spinning air suction, while still maintaining good spinning stability, may enhance the slub effect.

6. Wider groove rotors are recommended for slub yarn production.

7. A slightly smaller faceplate combined with a larger rotor may enhance the slub effect.

8. Fluted navels may enhance the spinning stability of slub yarns.

9. Whirl inserts in the shaft may produce special effect slub yarns.

10. A torque stop doff tube may be implemented to improve slub yarn spinning performance.

11. Adjust twist as necessary to achieve the desired yarn strength and spinning efficiency.

12. Adjust rotor speed to achieve acceptable spinability.

13. If yarn strength is an issue, the lower cost associated with the noil and short cotton may allow the mill to maintain an acceptable overall fiber cost by selecting longer and stronger cotton for the base sliver.

Figures 2 and 3 show a random slub rotor-spun yarn and a woven denim fabric made from the same yarn in the filling.

Conclusion

The random slub procedure can provide a cost effective means for a spinning mill to enter the novelty yarn market. The process provides maximum flexibility with minimum (or no) capital investment.

Figure 1. Random Slub Finisher Draw Web

Figure 2. Yarn Board

Random Slub Effect
Filling Ne 6/1 OE, TM 5.3, 75/25 Cotton/Noil

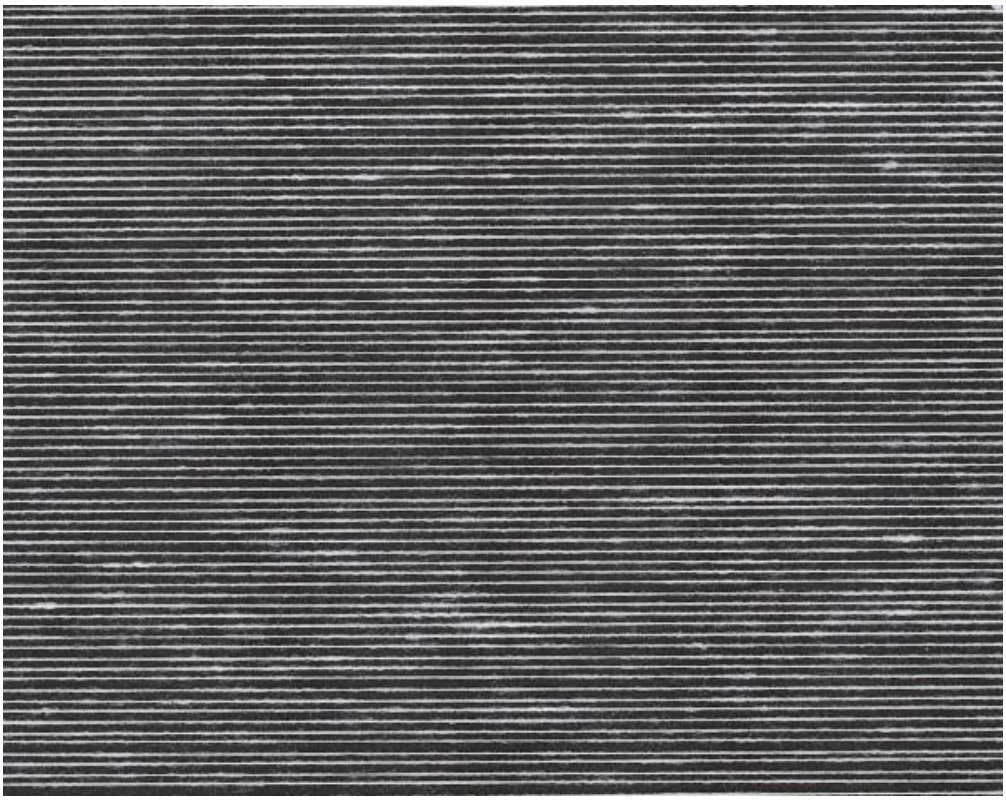
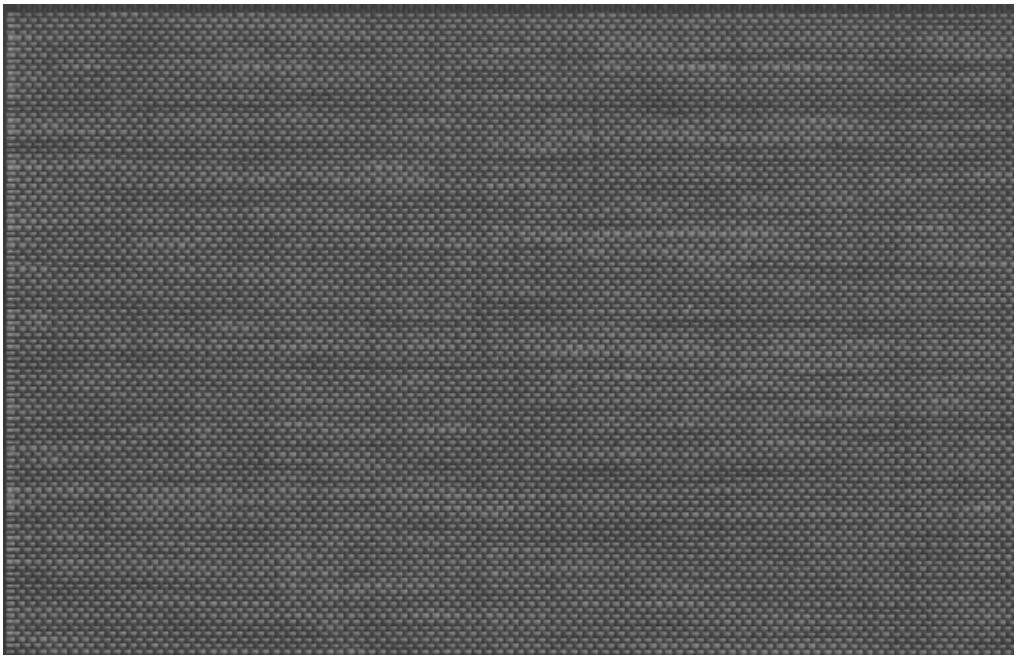


Figure 3. Woven Fabric



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Cotton Incorporated is a research and promotion company representing cotton worldwide. Through research and technical services, our company has the capability to develop, evaluate, and then commercialize the latest technology to benefit cotton.

- Agricultural research leads to improved agronomic practices, pest control and fiber variants with properties required by the most modern textile processes and consumer preferences. Ginning development provides efficient and effective machines for preservation of fiber characteristics. Cottonseed value is enhanced with biotechnology research to improve nutritional qualities and expand the animal food market.
- Research in fiber quality leads to improved fiber testing methodology and seasonal fiber analyses to bring better value both to growers and then mill customers.
- Computerized fiber management techniques result from in-depth fiber processing research.
- Product Development and Implementation operates programs leading to the commercialization of new finishes and improved energy and water conserving dyeing and finishing systems. New cotton fabrics are engineered -- wovens, circular knits, warp knits, and nonwovens -- that meet today's standards for performance.
- Technology Implementation provides comprehensive and customized professional assistance to the cotton industry and its customers -- textile mills and manufacturers.
- A fiber to yarn pilot spinning center allows full exploration of alternative methods of producing yarn for various products from cotton with specific fiber profiles.
- The Company operates its own dyeing and finishing laboratory, knitting laboratory, and a laboratory for physical testing of yarn, fabric, and fiber properties including High Volume Instrument testing capable of measuring micronaire, staple length, strength, uniformity, color, and trash content.

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