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# Comparative Analysis of Warp Yarn Sizing Impact on Ring Spun Yarn with OE Yarn

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***Abstract*: The ring, and rotor systems all produce yarn with completely distinct structures and characteristics. Regarding its technical and financial viability, every spinning system has unique advantages and drawbacks. A 20s count, 60:40 cotton: polyester blend is produced using the following process parameters (i.e., Break draft, Main draft, cradle length setting, RH value, hank from carding to speed frame, Tension, TPI, Tapper angle, Doffing length, in the spinning methods of Ring, and Rotor. This area produces yarns of medium to poor quality that are used to create heavy fabrics like twill, denim, chino, and dungarees. As opposed to ring spinning, which produces coarse yarns with a cotton count range of 5 to 40, open-end rotor spinning has a greater production rate. The textile created by rotor spinning has the spectrum of yarn counts for open end spinning it is constrained. In the procedure of open-end spinning, coarser count can be spun. The cloth with open ends has a fuzzy hand feel. The fabric made from open end yarn suffers from bad wear resistance as well. lower strength, water absorption, pilling resistance, wash resistance, and fine printing compared to the ring spun yarn The rotor yarn is porous and has a larger circumference than rings. Poor tensile strength is present in the yarn being spun in the open-end spinning procedure. Since open end yarn uses a greater twist multiplier, it has a low degree of softness. The goal for our project is to size the above produced both yarns and examining and comparing the textile properties of the ring and rotor (CSP,U% elongation, breaking point, imperfection, hairiness, etc.) is the project's main objective. We looked at how yarn's qualities change as a result of a shift in procedure. We are identifying the various characteristics of produced yarn and its use in this endeavor.**

***Keywords*: Ring spinning, rotor spinning, sizing, textile, wear resistance, twist multiplier, yarn parameters.**

## 1. Introduction

"Ring spun" refers to the process of continuously twisting of roving to yarn by using ring and traveler. Most yarns made from staple fibers are ring spun yarns. The twist that provides the final entanglement is built up from the outside to the inside.

Although a high-quality ring yarn first appears to be as uniform as a filament, closer microscopic examination would reveal a uniform helical arrangement of fibers.

The fibre bundle travels through the drafting mechanism and yarn take-up on the cop in the ring spinning frame. The drafting arrangement, thread guide, balloon control band, and traveller are all components of this route. These components are positioned in relation to one another at different angles and distances. The spinning geometry includes all of these lengths, inclinations, and angles.

OE - When the rotor revolves at a very high speed, a centrifugal force gets generated. This centrifugal force causes the fibers to collect in the groove of the rotor. Rotor yarns are less irregular than the ring spun yarn because of multiple doubling or back doubling of fibers in the rotor groove and ultimate thickness of rotor spun yarn is made up of many thin layers of fibers. Moreover, rotor spun yarns, being made from sliver and with opening roller.

It is a more recent method of yarn formation compared to Ring Spinning. The production rate of rotor spinning is 6–8 times higher than that of ring spinning.

After warping, the weaving procedure is prepared by the sizing. It is a very crucial and important procedure of preparation. The sizing procedure is the method of coating the surface of the yarn with a thin layer of adhesive and binder to increase the weavablity of the yarn. It is necessary for using single-ply spun yarn to weave the cloth.

The effectiveness of the sizing procedure has a direct impact on the quality of the fabric that will be woven as well as the performance of the loom. The core of weaving, according to the populace, is sizing. The warp sheet is submerged in the adhesive and binder paste during this process, and then the warp is correctly squeezed to remove the excess adhesive. The warp has now cured, and the ends have been cut apart. On the weaver's beam, the warp strands are currently wound.

After being sized, warp thread gains in tensile strength. The yarn's hairiness is also lessened. Warp yarn is passed while being under moderate tension during the sizing procedure. As a result of this tension, the fabric stretches a little bit and lengthens after the size is shrunk. This is a drawback to the scaling procedure. To enhance different yarn properties, the sizing procedure employs a wide variety of sizing agents. This procedure is executed exactly and with care. There are numerous sewing challenges that lead to improper and poor sizing. Problems can also arise from excessive size.

## 2. Materials and Methods

The cotton and polyester blends of both ring and OE yarns are taken then it sized by following materials like

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carboxymethyl cellulose (CMC), polyvinyl alcohol (PVA), polyvinyl chloride, maize flour, barely, tamarind seed powder, potato starch, gum, etc. and its properties are analyzed.

Ring yarn: (Count 20s Ne, T.M = 4.5 & Blend ratio 60/40)

Rotor yarn: (Count 20s Ne, T.M = 4.5 & Blend ratio 60/40)

Sizing paste: the size paste is cotted in the above yarn (250ml – 350ml)

### *A. Ring Yarn*

Fig. 1. Ring yarn

Cotton strands are twisted and thinned to create a very fine, sturdy, and soft rope, which is then used to produce ring spun yarn. The majority of staple fibre textiles are ring spun yarns. From the outside to the inside, the twist that creates the ultimate entanglement is constructed. A closer microscopic inspection would show a uniform helical arrangement of fibres at the surface, despite the fact that a high-quality ring yarn initially appears to be as uniform as a filament. The twist that provides the final entanglement is built up from the outside to the inside. Although a high-quality ring yarn first appears to be as uniform as a filament, closer microscopic examination would reveal a uniform helical arrangement of fibers.

The fibre bundle travels through the drafting mechanism and yarn take-up on the cop in the ring spinning frame. The drafting arrangement, thread guide, balloon control band, and traveler are all components of this route.

Spinning techniques have a significant influence on the properties of denim fabrics. Whenever better tensile and tear strength is required, it is better to use ring-spun yarns, while if the requirement is better abrasion resistance and pilling resistance with high air permeability.

Rotor spun strands are also renowned for being a little more extensible, fuller, softer, and hairless. The primary drawback is that rotor spun yarns are less resilient than ring spun yarns; their maximum tenacity is at least 10% to 30%, and in some instances up to 40%, lower.

### *B. Rotor Yarn*

In comparison to Ring Spinning, Rotor Spinning is a more modern technique for creating yarn. This type of open-end spinning does not require package rotation to incorporate the twist into the yarn. enabling faster twisting at a comparatively low power expense. A steady supply of fibres is supplied from delivery rollers off a drafting system or from an opening unit during rotor spinning.

Fig. 2. Rotor yarn

The fibres are deposited in the groove of the rotor as a continuous ring after being drawn down a delivery line. The rotor groove's fibre layer is peeled off, and the resulting yarn is wrapped onto a package. The ratio of the rotor's rotational speed determines the twist in the fabric. The entry roller combs and individualizes the sliver as it enters the machine.

The fibres are then introduced into the rotor, where they are evenly dispersed by air current and centrifugal force along the groove. The rotor's spinning action twists the fibres together, and the yarn is constantly drawn out of the rotor's center. After being checked for flaws, the finished yarn is wound onto containers. Rotor spinning produces yarn at 6–8 times the rate of ring spinning, and it is much less expensive to make because the machines are supplied directly by silver and the yarn is wound onto packages ready for use in fabric formation.

*Sizing:*

Fig. 3. Sizing powder

Sizing is a complementary operation carried out on warps formed by spun yarns with insufficient tenacity or by continuous filament yarns with zero twists. In general, when sizing is necessary, the yarn beam is warped; therefore, all beams corresponding to the beams are fed, as soon as warping is completed, to the sizing machine where they are assembled. Sizing consists of impregnating the yarn with particular substances that form on the yarn surface a film to improve yarn smoothness and tenacity during the subsequent weaving stage.

The unravelled warp from the warping beams is impregnated with size, dried, the ends are separated, and the beaming is done. Additionally, the warp is marked for cutting into pieces of a specific length during the sizing procedure. The framework and drive, the size box and immersion and squeezing rollers, the headstock, the drying section where the extra moisture is removed from the size and pressed warp ends, and the creel for accommodating the warping beams are the major components

of a sizing machine. There is also a specific device included for extra treatment, such as emulsifying and waxing the sized warp, as well as automatic instruments for inspecting the sizing procedure.

Table 1
Result

| Yarn Parameters | Ring Spinning | Rotor Spinning |
|---|---|---|
| Count | 20 s Ne | 20 s Ne |
| CSP | 2000 | 1750 |
| Hairiness | 6.0 | 5.2 |
| SD of Hairiness | 1.5 | 1.2 |
| Thin Places | Nil | 1 |
| Thick Places | 18 | 24 |
| Neps | 28 | 234 |
| Total imperfections | 46 | 259 |
| Elongation (5%) | 5.7 | 3.6 |
| U % | 8.1 | 10.5 |

## 3. Conclusion

Sizing gives the sized yarn more strength, allowing it to endure the tension of the weaving. The sizing makes the sized yarn more uniform and smoother by helping to bond the surface-protruding fibres. The yarn's resilience to abrasion is also improved by sizing. The purpose of the sizing process is to create warp weavability. This succinct explanation relates to a fairly involved procedure to achieve the intended outcomes.

The fact that mistakes in warp sizing can have disastrous effects on the weaving room, the finishing section, and ultimately the finished product, is a very important point to make. The yarn body should adhere to protruding strands (decrease hairiness) tying fibres together to fix them in the yarn core, preventing disruption of protruding fibres. Applying a size film to the yarn body's diameter (protection of the yarn) strengthening weak areas. Strengthening dense areas (with a modest variation). To lessen the creation of electrostatic charges on synthetic or blended yarns. Therefore, it can be used for bedsheets, bedspread and for blankets and quilts.

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