

HAIRINESS OF YARN AND COP IN RING SPINNING

1. Appearance

1.1 Yarn hairiness

Basically yarn hairiness is understood to be excessive long and much of hair protruding from the yarn.

1.2 Cop hairiness

Cop hairiness is understood to be, excessive hair protruding from the diameter of a full cop. With cop hairiness, further fibers can be adhered to the protruding fibers which together form the real snouts. A large portion of these snouts fall away during rewinding. This phenomenon takes place sporadically and depends on the fiber characteristics. Yarns with high degree of hairiness (see point 1.1) usually always develop cop hairiness too. However a cop with relatively smooth yarn can also be hairy.

1.3 Scattering

An important characteristic is the scattering of the hairiness within a cop itself, resp. among cops with the same yarn. This leads to big problems in the further processes, so that clear stripiness can occur in fabrics. Yarn hairiness will increase in every further process, all according to fiber, twist, etc. The strongest increase is during the rewinding process (2-5 times). Waxing the yarn (knit) during winding reduces the hairiness considerably.

2. Measuring methods

Besides the traditional black board, the following measuring instruments are known today:

- Shirley Yarn Hairiness Tester
- Toray Tester
- ITV yarn hairiness measuring instruments (Zweigle G 565)
- Uster Tester 3 and Uster Tester 4

These instruments work with different measuring principles partly, and the values cannot be compared.

3. Disturbing factor: hairiness

Hairiness creates problems for following operations:

- Sizing machines (hooked to the sides)
- Warp yarns, warping (dust)
- Rewinding (looking for the yarn end of automatically doffed cops, cop preparation)
- increased yarn tension during rewinding
- Weaving: warp yarns (hooked to the sides, dust) weft insertion particularly with air jet looms.

These problems are not always ascribed only to the hairiness, but more being subjectively made as an attached cause.

4. Causes of hairiness

In most cases, **not only one parameter** is responsible for the hairiness, it can be different ones coming together. That is why counter measures are correspondingly difficult. Often, measures, which lead to reduction of hairiness in some cases, can lead to increase of hairiness in other cases. The reason is because of the different causes (vide also the tables attached).

Hairiness and production neps occur often together, it is a flowing passage from individual hairs to fine neps (entangled fibers). The measuring devices differentiate not between real and production neps (Hattenschwiler/Eb, Quality in Stable Fiber Spinning, Meililand 1987).

5. Remedy

There is no single recipe which can combat all causes successfully. Hairiness is mostly a phenomena with time limit. Possible causes and counter measures to eliminating are suggested and listed in the tables attached. However, **every case must be tackled individually**, and the situation analysed before any measure is to be taken.

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| Type of Hairiness | | | | | |
| Cop hairiness | Yarn hairiness | Possible cause | Reason | Remedy | |
| X | X | Cotton of fiber quality | - Stiffness of fibers - Fibers with hook | - Basically no remedy, vide other points - Occur mostly with time limit. | |
| X | (X) | Antiballoon rings Yarn guides | - Badly centered lead to variable yarn tension - Roughened surface roughens the yarn | - Correct centering - Replacement | |
| X | | Cop diameter | - Protruding fibers of cop are caught by traveller and detached. This function falls off by far | - Cop diameter to be set to min' - ring diameter minus 4 mm. - Snout breaker | |
| X | (X) | Electric statics loading | - Fibers prop up through el. loading (loading direction +/- without significance) | - Increase air humidity - Put up by pass for isolated ring rails | |
| (X) | X | Yarn passage of traveller Traveller form | - Yarn is roughened with narrow yarn passage - Cut yarn passage clamps the yarn and roughens it. This produces neps | - Use traveller with larger yarn passage - Reduce changing cycle of travellers | |
| | X | Yarn tension too high | - Worn out position comes in contact with the yarn and roughens it | - Reduce changing cycle of travellers | |
| X | | Yarn tension too low (hairy mainly on the conical base, conical top usually o.k.) | Traveller weight too low, through wich: - Poor fiber binding at the spinning triangle - Strong friction of the yarn balloon on anti-balloon ring, resp. beating balloon separator - Bad twist transmission to the spinning triangle | - Increase traveller weight, under circumstances select other traveller types | |

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| Type of Hairiness | | | | | | |
| Cop hairiness | Yarn hairiness | Possible cause | Reason | Remedy | | |
| | X | Yarn twist | - Knitting yarns tend to be hairy, poor binding of fibers - Tightly twisted yarns favor propping up of individual fibers | - Regarding yarn twist no remedy possible | | |
| X | X | High speed | - Yarn balloon force increases which increases the friction on anti-balloon ring. The air resistance increases the loosening of individual fibers | - Reduce speed - Increase spinning tension (heavier travellers) | | |
| X | X | Climat, too dry | | - Increase air humidity, take into consideration the lap formation | | |
| X | | Deformed cops | - Effect of the snout breaker falls out | - No remedy possible | | |
| (X) | X | Travellers section | - dr, udr profile: cleaning effect of the f-profile not available - yarn tension with dr/udr profile is lower than with f-profile - f-profile can cause production neps, these can lead to hairiness (rather seldom) | - f-profile - Heavier travellers - dr-profile | | |
| | X | Neps | - Neppiness and hairiness correlate closely, these are infact production neps | - Improve preparation - Prevent production neps, -Check the guiding points of the yarn. Change wire profile of traveller (from f to dr, under circumstances to udr or r) | | |
| X | X | Parallellity of fibers too high | - Not sufficient binding of fibers | | | |
| X | X | Ring centering | - Uneven yarn tension | - Recentering of rings, resp. spindles | | |
| X | X | Ring condition | - Rough gliding surface reduces the braking effect of the traveller, resp. causes unsmooth traveller running | - Replace rings (heavier travellers give improvements only if the ring of the whole spinning frame are evenly worn). Yarn breaks may increase | | |

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| Type of Hairiness | | | | | | |
| Cop hairiness | Yarn hairiness | Possible cause | Reason | Remedy | | |
| X | X | Spinning triangle too wide | - Fibers poorly laid hold of, resp' bound | - Narrower condenser, shift top roller on the deliver cylinder to front, yarn twist brought to the clamping line will be better (care: heavier wear of covers with highly twisted yarns) | | |
| X | X | Stiff fibers | - Not flexible enough tend to cause propping up. Particularly with rayon and certain types of Polyester | - Basically no remedy | | |
| | X | Inadequate preparation | - Proportion of neps, resp. trash proportion too high | - Improve combing effect of card - Additional doubling - Increase degree of combing in combing section | | |