Dr. Anup K. Rakshit
Reliance Industries Limited
Mumbai, India

Harald Schwippl
Rieter Machine Works Ltd.
Winterthur, Switzerland

Processing of Micro Polyester Fibers

Processing characteristics of Recron™ micro polyester fibers on Rieter's ring and compact spinning systems

Processing of Recron™ micro polyester fibers on ring spinning and ComforSpin machines

PREFACE

With the inauguration of the Reliance Fiber Application Centre including a state of the art Rieter spinning process lines specific trials for the customer's benefit can be carried out. This publication has evolved within the scope of the cooperation between Rieter Technology and Reliance Industries for the development of know-how for processing polyester staple fibers on Rieter spinning machinery. Processing of Recron™ microfibers on compact spinning machine – Com4®, as presented below, is one of such development programs.

RECRON™ MICRO POLYESTER FIBERS

The most versatile and widely used fiber is polyester where the maximum number of variations in terms of physical, chemical and geometric properties are possible as compared to other synthetic fibers. Over the years there has been tremendous development of polyester fiber and today it has the largest market share amongst all synthetic fibers. Polyester fiber generally distinguishes itself by the following advantages:

- High melting point
- High breaking strength in dry and wet conditions
- High elongation
- High abrasion resistance
- Resistant to organic and mineral acids
- Good dimensional stability
- Easy to wash

Reliance has set up world class Research & Development facilities for the development of polyester fibers.

This initiative has introduced to India and the world a high quality product range of speciality fibers and yarns under the Recron™ brand. These products possess distinct characteristics that add more value to the ultimate woven or knitted fabric in terms of its look, feel, drape, dye-tone, etc. In addition to various modifications in basic Polyethylene Teraphthalate (PET) polymer, the market trend is moving towards producing finer denier fibers like micro, nano, etc. Reliance Industries Ltd. developed the art of producing very fine denier fibers. For more than ten years it has been producing 1.12 dtex fiber and has now developed 0.9 dtex microfiber.

Excellent fabrics and garments with specific textile characteristics can be produced from the microfibers. These textile characteristics, when compared to those produced from natural fibers, exhibit hardly any differences or with special fiber constructions are today even superior. Thanks to microfiber, characteristics can be created which, for instance, correspond to the advantages of natural silk.

Microfibers being fine and more pliable facilitate compaction mechanism of fiber in compact spinning. A higher number of fibers in the yarn cross-section gives higher yarn strength, good running characteristics and enable the spinning of finer yarns.

ADVANTAGES AND AREAS OF USE OF MICRO FIBERS

This is a very fine staple fiber of 0.9 dtex produced with highly sophisticated plant equipment with precise control of polymer quality and all process parameters. The chief special feature of microfibers is its cotton like soft feel. Among the other features that this finest man-made fiber offers are:

- has fabrics in all weight categories
- is resistant to wrinkling
- offers light weight comfort
- has exceptional drape
- is easy to care for
- gives a soft, silky and buttery hand

APPLICATIONS

The microfiber ultimately ends in sophisticated evening wear, men’s business wear, casual wear and even intimate apparel. High quality shirting, fine T-shirts, sweatshirts, sportswear, kids wear, undergarments, tracksuits, nightwear and lingerie could be manufactured from microfiber. Scarves, handkerchiefs, bed sheets and linen can all begin with the microfiber, which is basically positioned in the highest segment reserved for luxury and exclusive garments.

MICRO POLYESTER FIBERS PROCESSING IN THE STAPLE FIBER SPINNING MILL

Results of the study, carried out in the spinning mill refer to a microfiber of 0.9 dtex with a cutting length of 40 mm. In particular with spinning of microfibers and high cutting lengths, the “pliability of the fiber” is an important criteria. The relationship of the fiber length to the fiber diameter is also described as the slimness degree. The fiber diameter can be determined from round cross-sections as follows:

$$d = 2 \text{ x} \sqrt{\frac{m}{\delta \text{ x } \pi \text{ x } h}}$$

m = Fiber mass [g]
h = Related length [mm]
δ = Fiber density [g/cm^3]

With a fiber density of 1.38 g/cm^3 for polyester fiber, a slimness degree will be approximately 4 400. Such a high slimness degree, as occurs otherwise only in worsted spinning, necessitates very careful and gentle settings in the spinning process in order to counteract the tendency towards fiber entanglement and formation of neps.

In addition, the drafting forces in the spinning process are strongly determined by the number of fibers in the cross-section. With the use of microfibers, there are more fibers in relation to a cross-section than with fibers which have a conventional fiber fineness like 1.2, 1.4 deniers. The drafting forces again have substantial influence on the degree of production at the individual process levels in the spinning process, in particular with the card. For the production of fine yarns, microfibers offer a particular advantage for good spinning performance. A yarn count of approximately 7.4 tex and a fiber count of 0.9 dtex gives with approximately 80 fibers in the cross-section a sufficient number of fibers for a stable running behavior, whereby the spinning boundaries for ring yarns are still not reached.

The Recron™ microfibers exhibit a round cross-section. The fiber-fiber, fiber-metal friction and static generation are fundamentally determined by the spin finish and influence the processing characteristics and finally the yarn quality in the staple fiber spinning mill [Fig. 1]. The amount of the spin finish and its composition is a primary parameter for the friction and static conditions. The spin finish amount should remain constant across the individual process levels. Spin finish deposits within the spinning process interfere with this and can also have negative effects on the spinning ability and yarn quality. Finish coating applied to Recron™ microfiber takes care of these problems.

Recron™ micro polyester fibers

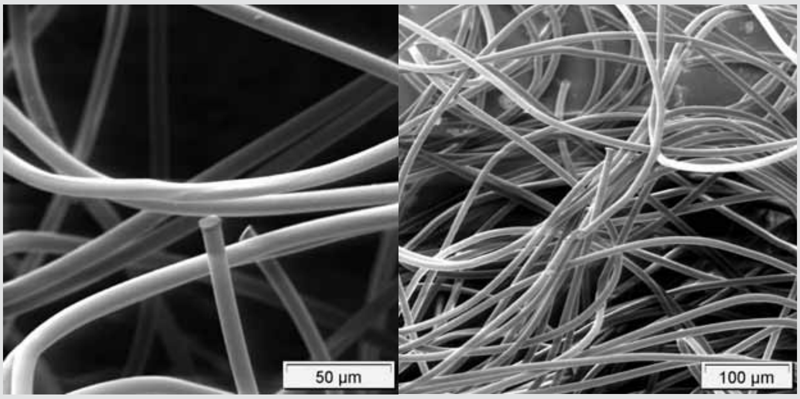

Fig. 1

Fiber specifications

Raw material	Fiber count [dtex (den)]	Fiber length [mm]	Polymer Type
Polyester Recron™	0.9 (0.81)	40	Semi Dull

Fig. 2

CHOICE OF RAW MATERIAL AND EXPERIMENTAL PLAN

Recron™ microfiber of 0.9 dtex and 40 mm cut length was chosen for this study [Fig. 2]. It has a tenacity of 6.8 - 7.0 gpd, elongation of 22 - 24% and a very low level of fiber shrinkage. In the preparation for spinning and spinning mill, the following high performance Rieter spinning machines are used:

1. A 10 UNIfloc
2. B 3/3 mixing opener
3. C 51 card
4. SB-D 10 drawframe
5. RSB-D 30 drawframe
6. F 10 roving frame
7. G 33 ring spinning machine
8. K 44 ComforSpin machine

Spinning plan for ring- and compact system when using 100% polyester microfibers

Machine	Type	Feeding in [tex]	Doubl. [fold]	Draft [fold]	Runout [tex]	Delivery [m/min] [rpm] [kg/h]	
Card	C 51				4 200	20 - 40	
Pre-Drawframe	SB-D 10	4 200	6	6.3 / 8.4	4 000 / 3 000	300 - 500	
Drawframe	RSB-D 30	3 000 / 4 000	6	6.0	3 000 / 4 000	300 - 500	
Roving frame	F 10	3 000 / 4 000	1	7.5 / 7.54	430 / 530	530 - 1 200	α_m 17 + 19.7
Ring conventional and Com4®	G 33 K 44	400 / 530	1	40 / 53	10	16 500	1 080 T/m + 10% less twist with Com4®
Ring conventional and Com4®	G 33 K 44	400 / 530	1	48 / 63	8.4	16 000	1 178 T/m + 10% less twist with Com4®
Ring conventional and Com4®	G 33 K 44	400 / 530	1	54 / 72	7.4	15 500	1 255 T/m + 10% less twist with Com4®

Processing characteristics of fiber preparation

BLOWROOM AND CARD

As the automatical bale opening with the UNIfloc ensures an even and fine fiber opening, only a storage and mixing opener was used for the following process steps. Depending on the type of polyester fiber up to two openings could be necessary for a sufficient opening.

For a technologically expedient fiber preparation, adjustments of the technological elements and the settings are also necessary if the production speed of the card is increased. With regard to the wire for fiber opening on the card, over the years the needle rollers on the Rieter C 51 card have proved very effective in relation to quality and quality constancy. For the whole trial range, a needle roller with 36 points / 2 inch and a needle angle of 58 deg. was used as licker-in on the card.

In order to keep the carding force as low as possible, a cylinder wire as typically used today of 640 points and a 30 deg. working angle was at this stage applied for microfibers. The beginnings of the processing of microfibers on the card showed in the 90's the application of even finer cylinder wires, such as 1 080 points per sq. inch. With time, however, it became apparent that in practice disadvantages often resulted.

The efforts to achieve a highest possible quality by higher point numbers or to keep the number of fibers in the tooth gaps constant against the coarser fibers led to excessive card force. The fibers could only reach the tooth gaps with difficulty because of the high fiber metal friction. This caused the card force to massively rise without an optimal carding being achieved.
By tracing the fiber stress over the individual process stages, it is clear that the highest attention must be paid to the card and therefore represents the greatest challenge to increase performance in the spinning process with minimal fiber stress and good carding quality.

A too coarse wire can, on the other hand, tend towards overloading of the wire. Due to a higher number of fibers between the teeth, in the extreme case the fibers can no longer be delivered from the cylinder wire. Added to this is that with the low single-fiber mass of microfibers, the centrifugal force on the cylinder no longer suffices for a delivery as the centrifugal force reduces linear to the fiber mass.

Consequently, with fiber counts from 0.9 dtex top figures between 640 and 720 per sq. inch and 25 - 30 deg. working angle have proved successful. The optimal wire depends also on the fiber characteristics, the spin finish and the climatic conditions.

The use of 640 points shows with this raw material that the fibers do not allow an optimal delivery from the cylinder to the doffer. It was observed that the relatively fine fiber became fixed in the wire grooves. A higher cylinder revolution to achieve a higher centrifugal force was not chosen in order to maintain of a lowest possible fiber stress.

Setting parameter	Card production 40 kg/h
Needle licker-in rpm	1 430
Cylinder rpm	400
Cylinder wire	Graf R-2530 x 0.6 CS 720 points 30° working angle
Flat wire	Graf PT 43/0
Doffer wire	M 5030 x 0.9 R 340 points 30° working angle

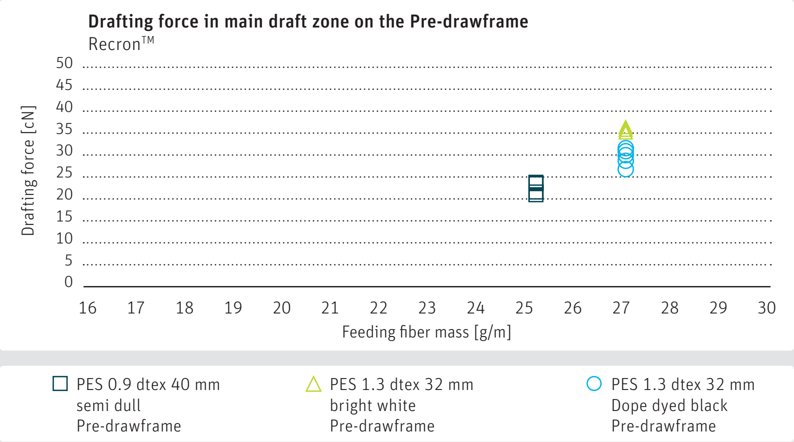

Fig. 3

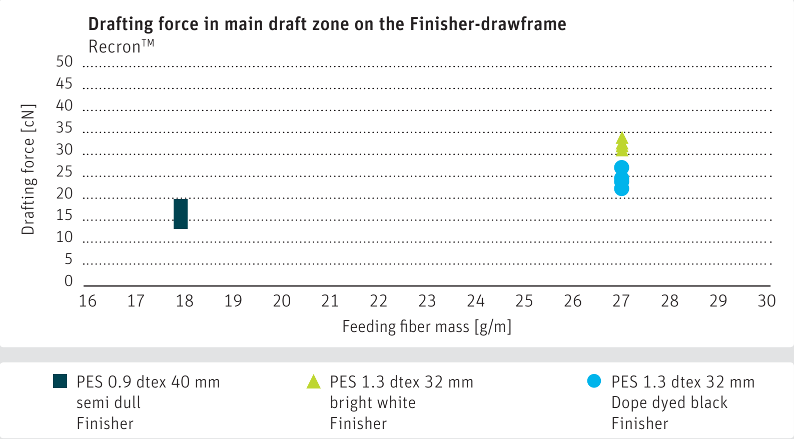

Fig. 4

Therefore, the number of points on the cylinder under otherwise equal conditions was increased to 720 points per square inch. The running characteristics and the fleece quality were subsequently described as very good.

In the fiber strength, the stress of the fiber appears clearly in the carding process. The fibers lose here approximately 8 cN/tex. The reduction in fiber elongation amounts to approximately 4%. The optimal processing climate in the spinning mill rests with 23° Celsius and 62% relative humidity. The card wire and climatic conditions have a great influence on the optimal card forces and the quality. In order to here substantially increase the card production with microfibers, new methods such as the reduction of the fiber volume by increase of the carding working area must be realized. That means the conventional working width of 1 m must be clearly increased.

DRAWFRAME

To determine the processing characteristics, the drafting force in the main drafting field on the first and second drawing passage was measured. The values relate to the respective optimal machine settings and therefore merely relate to the feeding fiber mass. The whole drafting level of the draw frame lay respectively in a scale from 6 - 6.3 fold. To obtain a comparison of the drafting force with microfibers, two further types of polyester fiber were used [Fig. 3+4].

Based on the chosen fiber measurements, no excessively high drafting forces are exhibited with microfibers. The drafting forces on both drawing passages are with 14 to 25 N much smaller than when compared to the two conventional fiber counts and fiber measurements.

Assuming that the drafting force can play a decisive role for an even drafting, the feeding fiber mass in the drafting arrangement could also with Recron™ microfibers quite easily amount to minimum 27 dtex. Further investigations in the area of the drafting development with the processing of microfibers, still need to clarify whether the middle drafting force for an even drafting or the diffusion of the drafting force is the dominating factor.

ROVING FRAME

The twist transmission from the spindle in the spinning triangle is an important criteria on the roving frame. Despite optimal roving twist of α_m 19.7 (530 tex, 27 T/m) for the following ring spinning machine drafting arrangement, attention must be paid to a good twist transmission from the spindle in the spinning triangle on the roving frame. The twist must thereby be optimally transmitted from the spindle to the spinning triangle and may not show any periodically untwisted places between the roving frame crown and delivery cylinder.

To clarify how far a massively smaller roving force with the Recron™ microfibers affects the ring spinning, the fiber mass was additionally reduced to 400 tex and α_m 17 with 27 T/m.

The maximum roving adhesive strength was thereby reduced to a very low value of 760 cN. The twist transmission is strongly influenced by the fiber – metal friction of the particular raw material resp. its spin finish. On this point attention must be paid to the processing of microfibers. The following points achieve a good twist transmission:

- Roving frame quality which causes little fiber – metal friction
- Suitable roving frame attachment crowns
- Suitable climatic conditions

The best climatic conditions for the roving frame could be established at approximately 23 deg. Celsius and a relative humidity of approximately 50%. The roving adhesive strength is a significant factor for the expected drafting performance on the ringspinning machine and influences the quality and its constancy. Use of the Rothshild measuring method allows recording of the roving quality and to a certain extent adjustments to be made for the spinning process.

If the roving adhesive strength, based on the fiber mass and the roving twist, is too great, draft disturbances in the ring spinning machine drafting zone and will occur result in a poor yarn quality. If the roving adhesive strength is not constant during the drafting process, variations in the yarn quality will occur.

END SPINNING SYSTEMS

As end spinning machines the ring system and the compact system were selected. The end spinning positions are compiled in the following overview:

System	**Machine type**	**Description**	**Twist**
Compact system	K 44	Com4® yarn	α_m 108
Compact system	K 44	Com4® yarn	α_m 97
Ring system	G 33	Ring-spun yarn	α_m 108

Yarn results

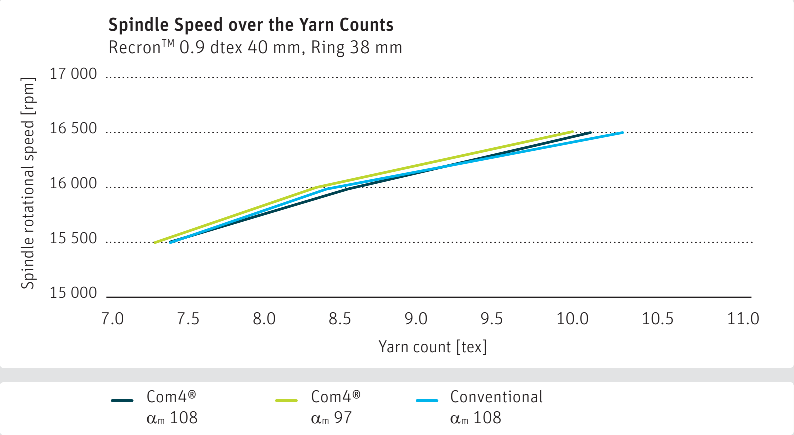

Fig. 5

YARN STRUCTURE

10 tex, 50 fold magnified

Com4®, α_m = 108

Com4®, α_m = 97

Conventional, α_m = 108

Fig. 6

In order to show the influence of both end spinning systems as clearly as possible, a most gentle fiber preparation resp. card performance of 30 kg/h was selected. Consideration was given to stable running characteristics on the ring spinning machine and spindle revolutions between 15 500 and 16 500 rpm with a ring diameter of 38 mm [Fig. 5]. According to yarn structure and yarn count, parameters of the spinning process play a stronger or weaker role in influencing the measurable quality criteria of the yarn. The yarn quality values achieved are, on the one hand, substantially influenced by the yarn structure and yarn count and on the other hand the influence of the fiber preparation varies according to yarn structure and yarn count. To obtain an optical impression of the various yarn structures, the yarn body with a yarn count of 10 tex is magnified 50 times [Fig. 6].

YARN UNEVENNESS

On the compact system a better unevenness of absolute 0.3% to 0.8% according to the capacitive measurement (Uster Tester) is given depending on the yarn count of both roving variations. Thereby, it is already apparent that also with polyester microfibers the fiber compaction has a positive influence on the fiber orientation. The yarn twist reduction from α_m 108 to α_m 97 on the compact system shows no negative influence on the unevenness [Fig. 7+8].

The roving count 530 tex α_m 19.7 shows, against those with 400 tex α_m 17, a worsening of absolute 0.4% primarily with ring systems and fine yarn count.

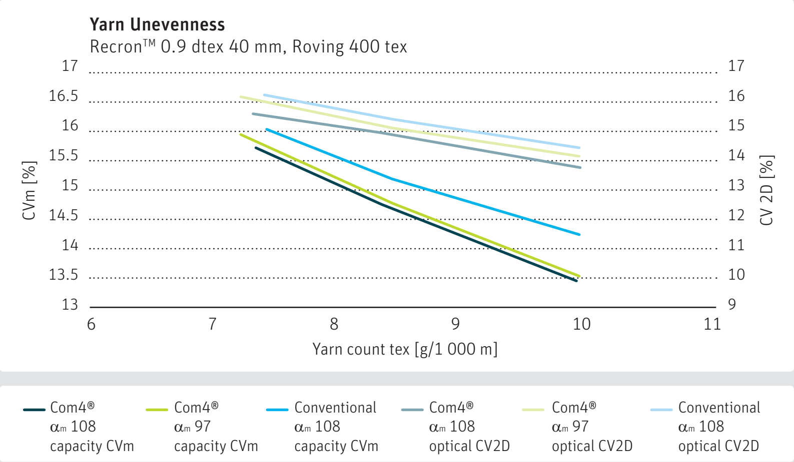
Yarn Unevenness
Recron™ 0.9 dtex 40 mm, Roving 400 tex
CVm [%]
17
16.5
16
15.5
15
14.5
14
13.5
13
CV 2D [%]
17
16
15
14
13
12
11
10
9
6
7
8
9
10
11
Yarn count tex [g/1 000 m]
Com4® α_m 108 capacity CVm
Com4® α_m 97 capacity CVm
Conventional α_m 108 capacity CVm
Com4® α_m 108 optical CV2D
Com4® α_m 97 optical CV2D
Conventional α_m 108 optical CV2D

Fig. 7

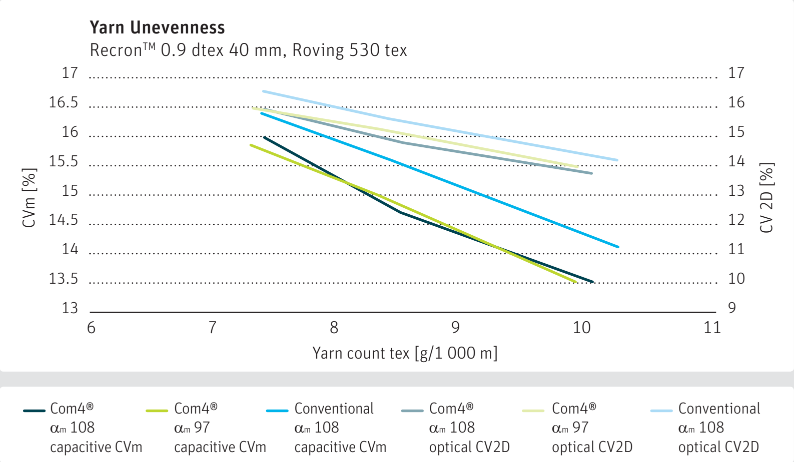
Yarn Unevenness
Recron™ 0.9 dtex 40 mm, Roving 530 tex
CVm [%]
17
16.5
16
15.5
15
14.5
14
13.5
13
CV 2D [%]
17
16
15
14
13
12
11
10
9
6
7
8
9
10
11
Yarn count tex [g/1 000 m]
Com4® α_m 108 capacitive CVm
Com4® α_m 97 capacitive CVm
Conventional α_m 108 capacitive CVm
Com4® α_m 108 optical CV2D
Com4® α_m 97 optical CV2D
Conventional α_m 108 optical CV2D

Fig. 8

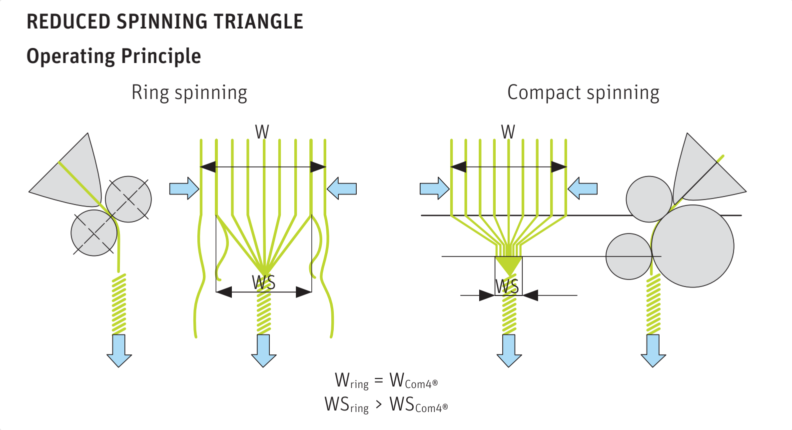

Fig. 9

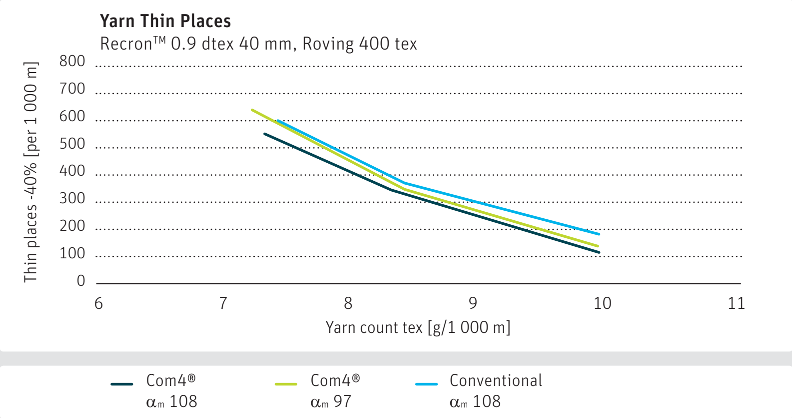

Fig. 10

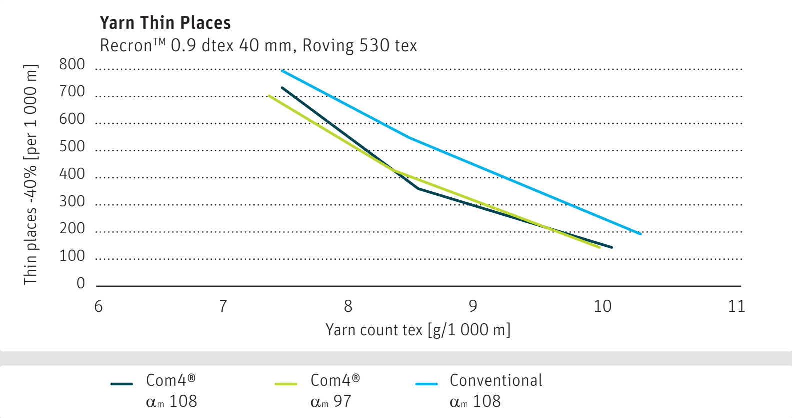

Fig. 11

This means that according to the end spinning system with approximately 6 000 fibers in the cross-section in combination with a α_m 19.7, slight quality losses must already be reckoned with. Consequently, in the case of highest quality requirements, the number of fibers in the cross-section or the twist factor must be reduced. The tendencies are confirmed by the variation coefficient of the yarn diameter on the optical measuring module of the Uster Tester. The optical unevenness, in addition to the capacitive unevenness, makes the influence of the yarn twist visible. A reduction of the yarn twist factor from α_m 108 to α_m 97 results in a minimally higher variation of the yarn diameter resp. the optical yarn unevenness of approximately 0.2%.

An improvement in the unevenness of Com4® yarn is attributed to the improved fiber bonding on the spinning triangle. A better bonding of the outer fibers in the yarn core favorably affects the evenness, even with this raw material. Further, the improved unevenness shows a positive effect on the imperfection (IPI) values through a better fiber bonding. Missing or less bonded fibers in the yarn body lead to higher thin and thick place values. In the extreme case, sporadically or inadequately bonded fibers “short thick places” also exhibit more neps in the yarn.

The differences in the yarn unevenness with the same fiber sample between both spinning systems is therefore not founded in an improved drafting performance from one to the other ring spinning machine drafting system or the drafting performance on the end spinning machine but in an improved fiber bonding in the spinning triangle resulting from the compaction.

Due to the aerodynamic compaction of the fibers on the perforated cylinder, the spinning triangle is reduced to a minimum [Fig. 9].

YARN IMPERFECTIONS

As expected, the thin places in the yarn were reduced due to the compact system. On both rovings, according to the yarn count and taking into consideration the distribution, approximately 8% - 20% fewer thin places resulted. This result can be explained, as also mentioned with the unevenness, by a better fiber bonding on the spinning triangle. Here, the unevenness as well as the IPI values have a direct connection.

Roving with a much lower drafting force of approximately max. 760 cN (400 tex + α_m 17) also results in a reduction of up to 20% of the thin place values in comparison to roving with a higher drafting force of approximately max. 1 650 cN (530 tex + α_m 19.7). To achieve lowest thin place values, the fiber number should next be reduced from 6 000 fibers in the cross-section or the twist factor of α_m 19.7 somewhat lowered. It can be recorded that the quality influence of the roving composition in this yarn count area was as big as with the end spinning systems. This means the negative influence of the roving can be equalized by the positive influence of the end spinning system [Fig. 10+11].

In the thick places, clearly improved values of up to 20% as with conventional ring yarn also result from the compact system. Further, with the production of the Com4® with the coarser roving (drafting power max. 1 650 cN with 530 tex + α_m 19.7) as compared to the “softer roving” no negative influence was registered on the thick places.

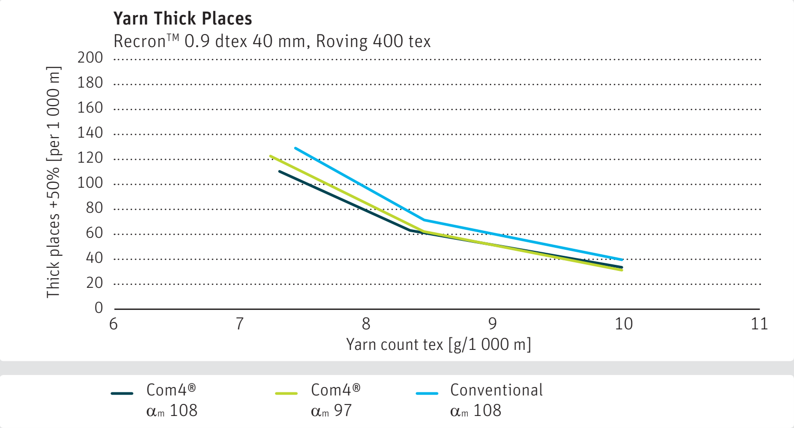

Fig. 12

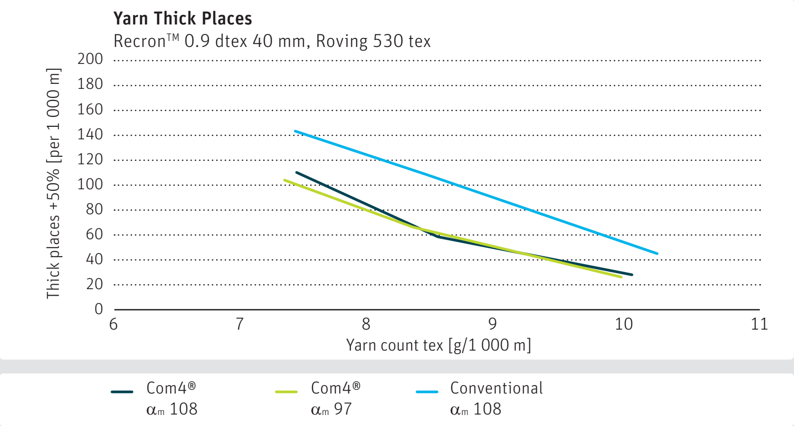

Fig. 13

This means that the ring system reacts more sensitively to the roving characteristics with the processing of microfibers than the compact system. The conventional ring-spun yarn under the application of the “softer roving” has at least 10% fewer thick places. From this can be deduced that to achieve lowest values on the ring system, the number of 6 000 fibers in the cross-section or the twist factor of α_m 19.7 must be somewhat reduced [Fig. 12+13].

Between the end spinning systems, no differences in the neps are apparent taking into account the distribution. By processing of the coarser roving of 530 tex, the nep values were even better than those achieved with the soft roving. The greater roving mass results in a higher draft on the ringspinning machine, which positively affects the number of neps.

With regard to the yarn imperfections, it has been shown that with a constant feed in the ring spinning process, the unevenness resp. thin places, followed by the thick places, represent the critical factor. This means the compact system with a good “draft behavior” and a good “fiber bonding in the spinning triangle”, adds to these criteria interesting possibilities for the final product.

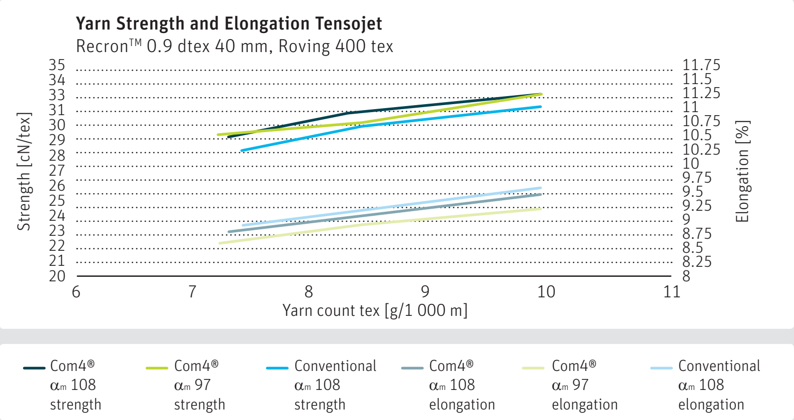

Fig. 14

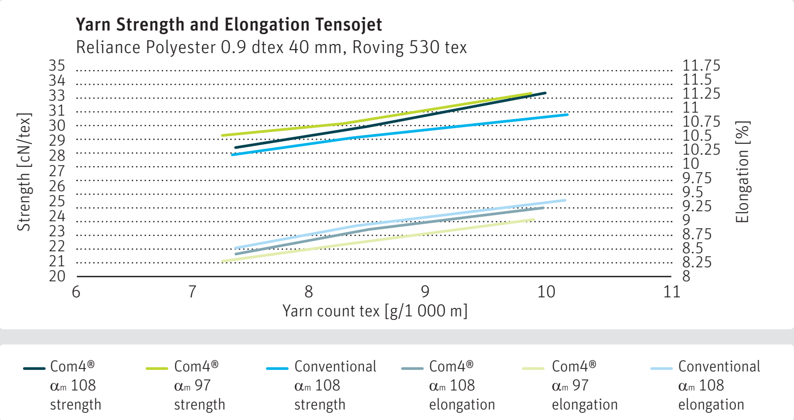

Fig. 15

YARN STRENGTH AND ELONGATION

Despite the relatively high yarn strength which occurs from a greater number of fibers in the yarn cross-section when processing microfibers in comparison to coarser yarn count with the same yarn count, a strength increase of approximately 1 cN/tex of the particular yarn counts through the better fiber bonding on the compact system is, however, apparent. The elongation here is inevitably reduced due to the high strength values. The elongation difference between the two spinning systems can consequently be explained that by a very good fiber alignment and fiber bonding in the yarn thread, the fibers can assimilate fewer length changes in the fiber formation.

A lowering of the yarn twist by 10% on the Com4® shows no reduction of the average strength. With regard to the average strength, the twist factor of α_m 108 to α_m 97 could therefore be lowered which equals a production increase of the end spinning machine. On the ring system, a strength increase of approximately 0.7 cN/tex from the coarser roving (530 tex + α_m 19.7) to the very soft roving (400 tex + α_m 17) could be recorded. With the compact system, the strength increase which results from the softer roving lies at approximately 0.5 cN/tex.

It can be seen that the yarn strength and elongation when using microfibers already reacts negatively to the respective roving characteristics of 530 tex. However, it can be still be described as satisfactory [Fig. 14+15].

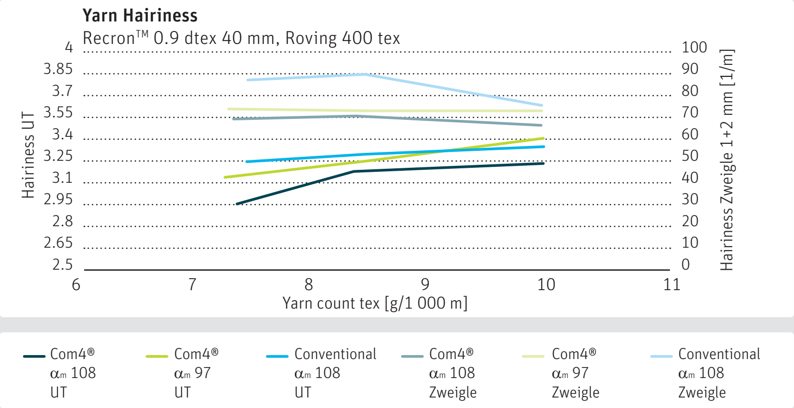

Fig. 16

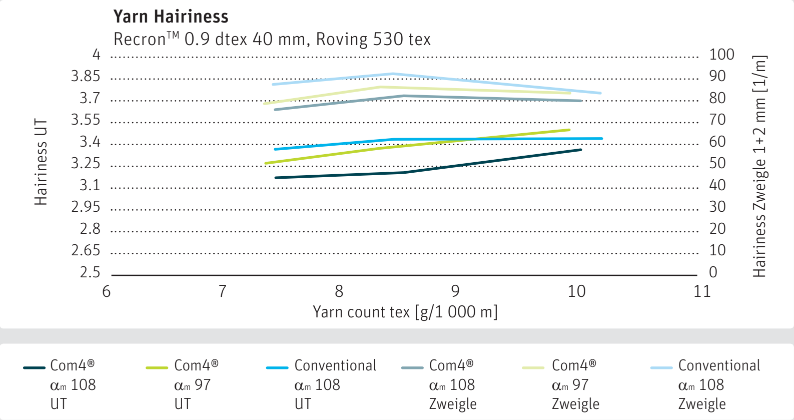

Fig. 17

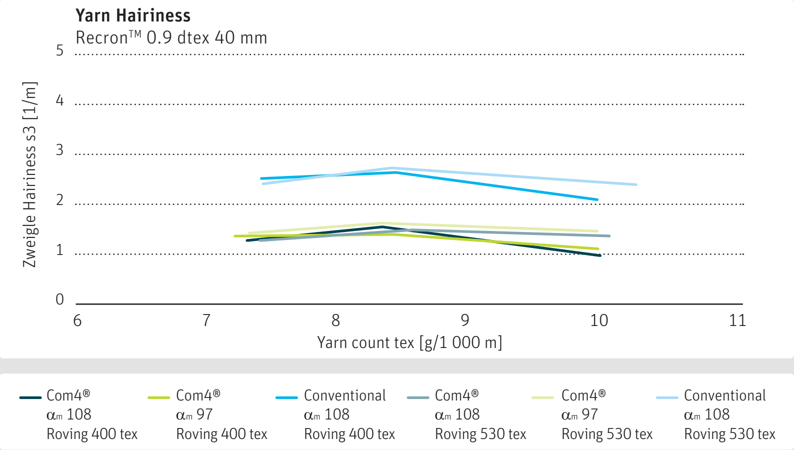

Fig. 18

HAIRINESS AND ABRASION

The low hairiness of the yarn resulting with the compact system is clearly observed with Recron™ micropolyester compared to the ring system, measured according to Uster (UT) and Zweigle 1 + 2 mm. With increasing yarn numbers, the differences are smaller but are still obviously lower on the Com4® depending on the yarn count when compared to conventional yarn. The coarser roving with 530 tex has a clearly negative influence on yarn hairiness [Fig. 16+17].

By observing the long hairs of more than 3 mm according to Zweigle, one ascertains a very low absolute figure. Based on the low absolute figures, a statement seems inappropriate even when a clear trend in favor of the compact system is obvious [Fig. 18].

Ideally, no dependence of the Com4® yarn on the yarn number resp. no increase in hairiness with increasing yarn numbers is shown. This means that the raw material in the yarn number area tested can be well compacted. With the yarn winding and in the subsequent winding process, a lower hairiness also has a positive effect on the nep values through lower fiber suspension.

The yarn abrasion of ring yarns continues to be an indirect measurement for the yarn hairiness. Between the yarn hairiness and the pilling behavior, experience has shown that generally a good correlation exists. High hairiness values lead to a higher unwanted pilling behavior. Using the Staff tester, a measuring speed of 50 m/min over a time span of 10 minutes was recorded. By observation of the yarn abrasion per yarn weight unit, the abrasion amount with yarns which become coarser must inevitably reduce logarithmically as the abrasion relates to the yarn weight and a smaller reference length results. As the influence of the yarn length on the abrasion is higher by far than the influence on the yarn diameter, the reference length “abrasion in mg per 1000 m yarn” was selected for this reason.

Under the criteria of the yarn reference length, the abrasion values between the positions as well as with the S 3 hairiness show too low absolute numerical values, so that under this quality criteria no explicit differences between the spinning systems of the yarn twist and the roving characteristic are visible.

Reutlinger Webtester

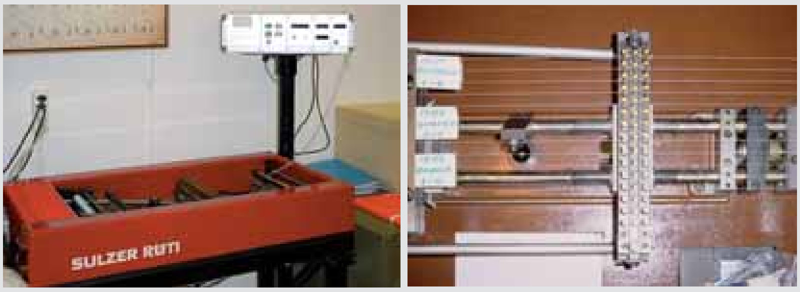

Fig. 19

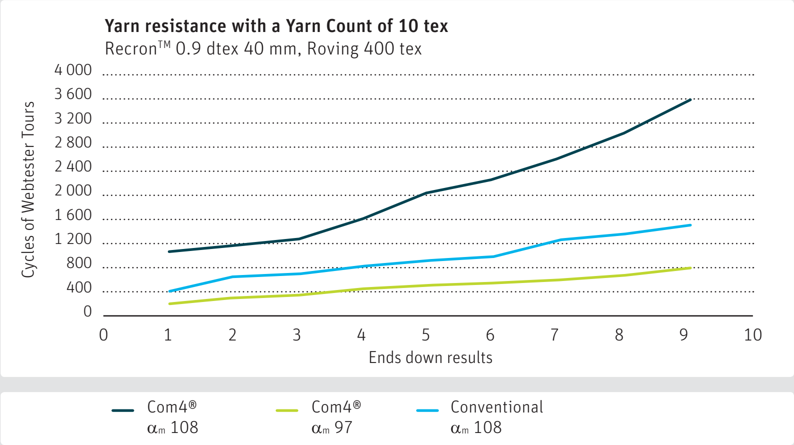

Fig. 20

YARN RESISTANCE VERSUS MECHANICAL INFLUENCE

Along with the mentioned yarn criteria, the abrasion resistance in the downstream process and the usage characteristics in the textile fabric is an important criteria. For this purpose, the delaying tendency with particular cycles of webtester tours was examined using the Reutlinger Webtester. With the assistance of this measuring method, the resistance of the most important stress on the warp threads in weaving can be simulated. At this point, the measuring values should be applied as criteria for the precision of the fiber bonding in the yarn. Here, the presumption is that an abrasion resistant yarn not only shows advantages in the weaving process but in all further processing stages up to the textile fabric [Fig. 19].

When comparing yarns with the same twist factor of α_m 108 it is evident that the Com4® yarn displays a much higher number of abrasion revolutions before a thread break occurs. The sagging of the yarn overstressed from cycles was already counted as yarn break [Fig. 20].

This means the end spinning system can have a greater influence on the abrasion resistance than the yarn twist. This finding is remarkable and shows what potential can also exist with polyester microfiber in the yarn structure with constant yarn twist.

In addition, the surface roughness was also visually observed after the respective maximum number of cycles.

YARN RESISTANCE

Com4®
α_m 108, 3 550 cycles

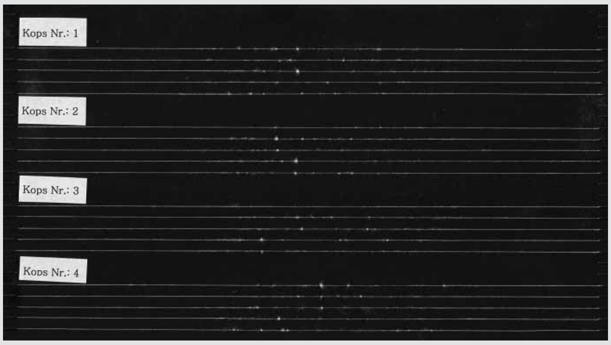

Fig. 21

Com4®
α_m 97, 775 cycles

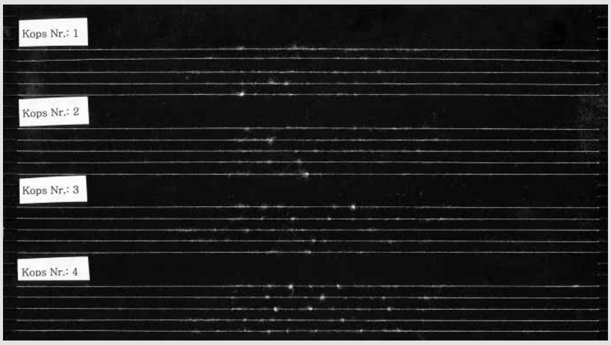

Fig. 22

Conventional
α_m 108, 1 500 cycles

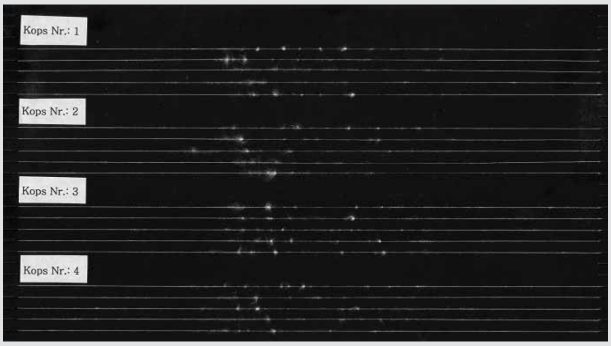

Fig. 23

With the example of a 10 tex yarn, the pictures clearly show the advantages of a yarn structure where the outer fibers are better bound to the yarn body. Next to the very great influence of the yarn twist, a good binding of the outer fibers in the yarn body exerts a clear advantage on the yarn resistance. That means the combination of a yarn twist of α_m 108 with a good binding of outer fibers leads to an excellent yarn resistance with the Recron™ microfibers. A lower resistance tendency is advantageous for the subsequent winding process up to the following downstream process in the values of the textile fabrics. Conditional upon the greater fiber surface with microfibers, pilling has always been a big theme especially in the past. The improved fiber binding with the compact system will also here have a positive effect [Fig.21 - 23].

Summary

In the context of the co-operation relationship between Rieter and Reliance, the spinning characteristics of a Recron™ microfiber on compact spinning technology up to the yarn with regard to their spinning behavior and the yarn quality are demonstrated.

The yarn usage of synthetic staple fiber increased enormously. The polyester staple fiber production alone amounts today to approximately 13 million tons per year. Within the polyester staple fiber, the microfiber has also gained a lot of importance over the years.

When considering the fiber stress over the individual process stages, it is clear that the highest attention must be paid to the card and therefore represents the greatest challenge to increase performance in the spinning process with minimal fiber stress and good carding quality.

With increasing card production, a somewhat lower roving force and a higher variation of the roving force through the carding process can be ascertained.

Experience has shown that polyester represents the greatest challenge with regard to a controlled fiber feed in the compact technology on the end spinning machine. Clear advantages with the application of the end spinning technology Com4® could, however, be demonstrated.

The compact system shows also with the Recron™ microfibers used distinct advantages in the thin and thick places of the yarn thanks to the better fiber binding. The preliminary process from the card to the speed frame roving significantly influences the compacting results. Despite the relatively high yarn strength resulting from the relatively high number of fibers in the cross-section, the average value strength could, however, be noticeably increased. The physically positive yarn characteristics become very clearly apparent in the yarn resistance.

Rieter Machine Works Ltd.
Klosterstrasse 20
CH-8406 Winterthur
T +41 52 208 7171
F +41 52 208 8320
sales.sys@rieter.com
parts.sys@rieter.com
www.rieter.com

Rieter India Private Ltd.
Gat No. 768/2, Village Wing,
Shindewadi-Bhor Road,
Taluka Khandala, District Satara
IN-Maharashtra 412 801
T +91 2169 304141
F +91 2169 304226
www.rieterindia.com

Rieter Textile Systems (Shanghai) Ltd.
12/F, New Town Centre
No. 83 Loushanguan Road
CN-Shanghai 200336
T +86 21 6236 8013
F +86 21 6236 8012
www.rieterchina.com

2243en-v1 1500-1003-42 Printed in CZ