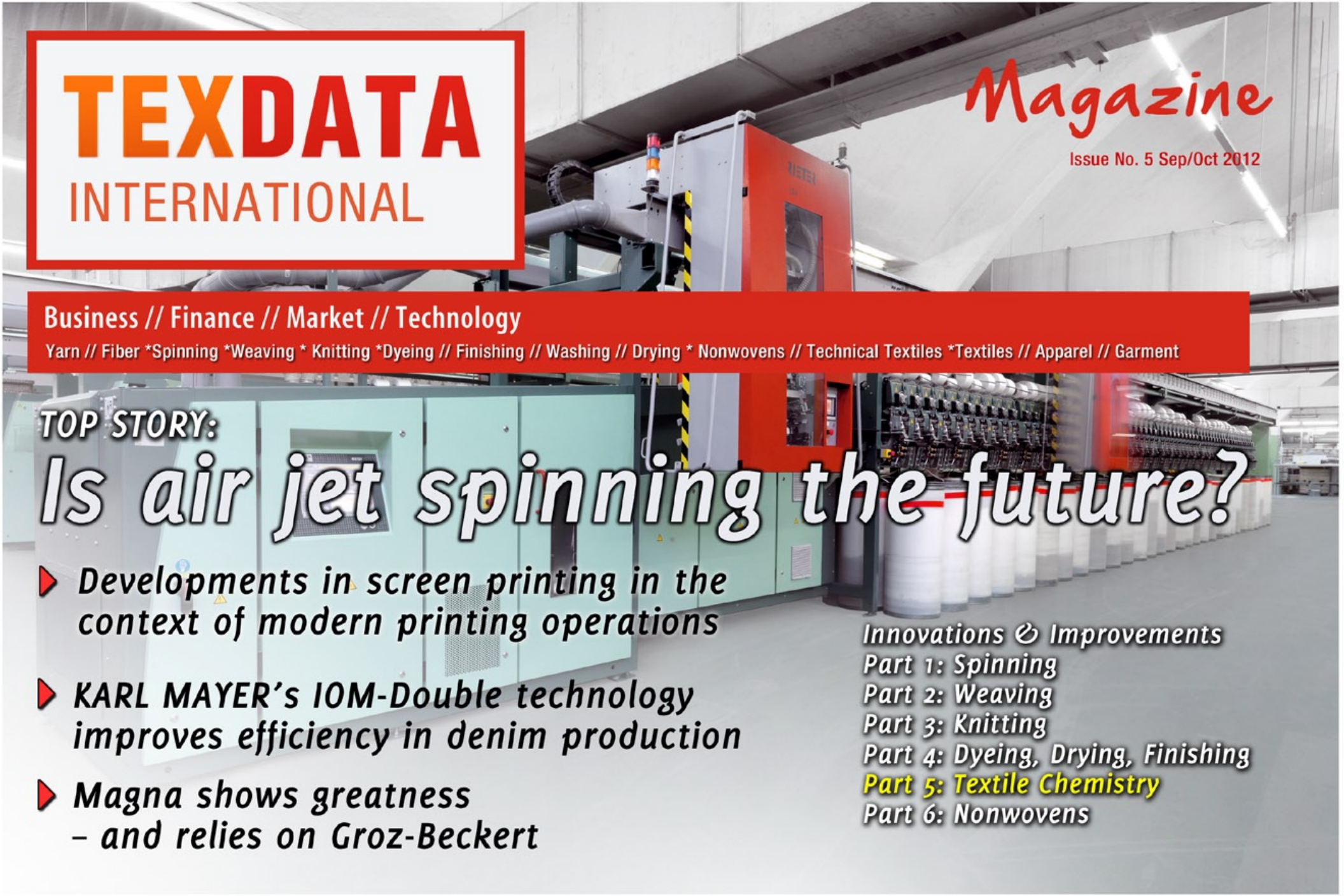

TEXDATA INTERNATIONAL

Magazine

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Business // Finance // Market // Technology

Yarn // Fiber *Spinning *Weaving * Knitting *Dyeing // Finishing // Washing // Drying * Nonwovens // Technical Textiles *Textiles // Apparel // Garment

TOP STORY:

Is air jet spinning the future?

- Developments in screen printing in the context of modern printing operations
- KARL MAYER's IOM-Double technology improves efficiency in denim production
- Magna shows greatness – and relies on Groz-Beckert

Innovations & Improvements
Part 1: Spinning
Part 2: Weaving
Part 3: Knitting
Part 4: Dyeing, Drying, Finishing
Part 5: Textile Chemistry
Part 6: Nonwovens

Content

TOP STORY:

Is air jet spinning the future?

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Dear Reader,

The summer and the holiday season have passed for the Northern hemisphere and we are back in the work routine. Our editorial office immediately noted the continual increase in the number of messages reaching us. This shows us what an optimistic view of the future governs our “old” traditional sector. Much is new; there is action everywhere, many technical innovations, improvements in sustainability, new textile applications and more.

It is not so easy to always possess an overview and understanding of every topic in the value-added chain in the textile industry, as well as screening some topics that are no longer current and as a result no longer up to date. This is exactly what we would like to improve with our magazine and are therefore keen to report extensively and from various perspectives on particular topics in order to offer you, valued readers, an update on technical developments.

Air jet spinning is certainly also such a subject. There is a benefit in the spinning process with the lowest market share that should interest all those in textile production: the high productivity of the process! Utilized properly this productivity leads to improved economic efficiency and reduces yarn costs significantly. There is more to learn from our main topic as we have expanded it by including a short research report which may be of interest to others besides the spinning mills.

In keeping with the scope of our stated aims of improving the quality and variety of information guest articles are on offer in this issue for the first time. Ms. Ulrike Schlenker from Karl Mayer reports on the improved efficiency in denim production with IOM-Double technology, Albrecht Gebhardt from Storck Prints has contributed an article dealing with improvements in print quality and Klaus A. Heinrichs from Monforts gives us three examples of ‘Blue Competence’. Should you also wish to submit a guest article to the magazine please contact me at: oliver.schmidt@texdata.com.

Next in our series on Innovations and Improvements is the subject of textile chemicals.

I wish you all pleasurable reading and as ever look forward to receiving your comments. Please send these to:
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Yours sincerely
Oliver Schmidt

Top story

Is air jet spinning the future?

by Oliver Schmidt

A technology that takes almost 40 years to be utilized by industry after the first patent registration and then achieves just about 1 – 2 % market share in more than 10 years is not exactly a hit, or is it?

We think it is, as for example environmental and market conditions could change to such an extent that even a hardly noticed late starter becomes a boom technology. Let's take for example wind turbines for electricity generation that initially were ridiculed at best. As a result of changes in energy policies many countries underwent rapid technological advance gaining an increasing market share in a very short period of time. Certainly only one example of many that is also found in the textile producing industry. Think about rotor spinning.
Currently a sleeping giant, the wind turbine', could reappear in textile production as a result of changes to the basic conditions and latest enhancements in technology. We are talking about ***air jet spinning.***

It is at any rate the opinion of numerous experts of a process currently still seen as a niche process. These experts met in June this year at the 16th Denkendorf Spinnereikolloquium (spinning colloquium) to present solutions to the most urgent questions facing the industry. Two subjects were particularly in focus: the general challenges of the industry and air jet spinning specifically as a potential response to solving many a problem.

Current and future challenges in the market for the procurement of yarn and consequently also for spinning mills are considered multifaceted and large: energy costs, scarcity of raw materials and increasing demand, cost pressures and volatile but overall increasing raw material prices as well as greater requirements on flexibility and portfolio parallel to declining order lots are only a few that should be mentioned here. (*see TexData Magazine issue 7/8 2012*)

"A spinning process at a production rate of 400 m/min [...], a yarn quality comparable to ring yarn and the flexibility of ring spinning would surely supplant all the currently established spinning processes. "

Jörg Morgner, 2003, Diss., ITV Denkendorf

As yarn happens to be the basis of all textile production, the problems sooner or later are inevitable for the entire textile producing industry.

Four expert speeches dealt specifically with the subject of air jet spinning:

- **The benefit of Vortex Yarn in processing and usage**
  Dr. Tatsumori Matsumoto, Murata Machinery Europe GmbH, Willich - Germany,
  Alexander Hübschmann, Karl L. Hübschmann GmbH, Augsburg - Germany

- **Rieter Air-Jet Spinnning – a decisive component in the textile production chain**
  Dr. Götz Gresser, Maschinenfabrik Rieter AG, Winterthur - Switzerland

- **Status of air jet spinning from the perspective of the spinner**
  Hermann Povel, Hermann Bühler AG, Sennhof - Switzerland

- **Potential of air jet spinning relative to types of fibre**
  Uwe Heitmann, ITV Denkendorf - Germany

Reason enough for us to pursue more closely the subject of air jet spinning and to examine which types and composition of yarn can be successfully used for air jet spinning in the medium and long-term and where there are potential advantages and disadvantages.

In this regard specialists Dr. Goetz Gresser, Uwe Heitmann and Hermann Povel have kindly provided their presentations which we have included in this article. Firstly a short summary that whets the appetite for the analysis: the productivity of air jet spinning is higher than that of other spinning processes and the yarn produced is not only able to keep up with numerous textile usages but even offers advantages for certain yarns and fibres.

Let‘s start from the beginning. In 1957 Konrad Götzfried had already registered a patent for a pneumatic spinning process and over the next 20 years continuously improved and expanded it. His idea of swirling yarn by using air however only found a material industrial use in the MVS (Murata Vortex Spinning) process presented at the OTEMAS by the Japanese company Murata in 1997. After this breakthrough the Swiss Rieter company developed an air spinning chamber and an Rieter Air-Jet Spinnning machine. Since then Rieter has decisively driven the development of this technology ahead on behalf of the mechanical engineering industry and spearheads this technology.

Globally unique – all 4 spinning technologies from one source

Rieter is the leading supplier of equipment in the production of yarn from short-staple fibres and offers as the only manufacturer of textile machinery worldwide its customers complete facilities and systems for all 4 spinning technologies of ring, compact, rotor and air jet spinning (figure 1).

„Air jet spinning has by far the highest productivity“

Uwe Heitmann, ITV Denkendorf

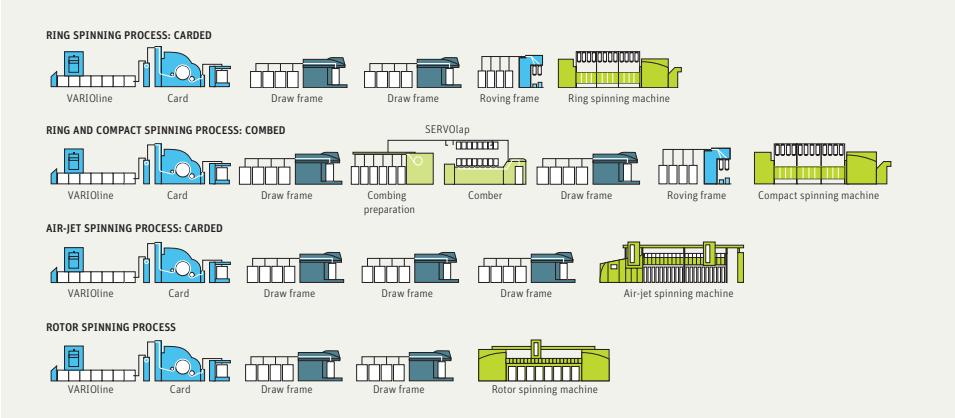

Fig. 1: Rieter 4 spinning technologies - spinning processes - *Source: Rieter*

This especially predestines Rieter to compare each yarn produced with the various spinning processes objectively and to give their customers individual recommendations for the best spinning process and yarn, as the 4 yarn structures are as different as the 4 spinning technologies. The yarn has different qualitative or economic advantages both for further processing and the end user. The knowledge gained from fibre to yarn and of the finished textile product is the basis for innovative machines and a constant yarn quality. The permanent exchange of experience with producers from the entire textile production chain shows the way for the further development of spinning systems, machines and technological elements.

New market orientated solutions are created that improve competitiveness and consequently the success of the customer in the market.
It is not enough to create new yarn structures, it is decisive to have economic or qualitative advantages in further processing and for the end user. (figure 2)

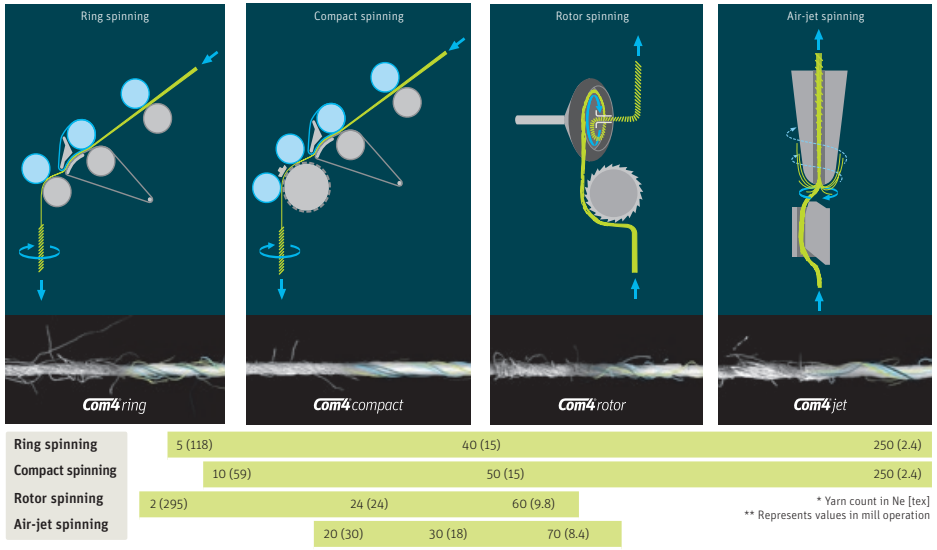

Fig. 2: Rieter 4 spinning technologies - broad spectrum of yarn fineness - *Source: Rieter*

We will initially show in this article the status of industrial production of air spun yarn using the Rieter air jet spinning machine, and then compare yarn produced on these machines with other yarns, preferably ring yarns.

In this respect we draw on the test and trial data from Rieter, Hermann Bühler and ITV Denkendorf. Thereafter we will list the advantages and disadvantages established for the yarns and the air jet production and state some facts concerning the current market and market potential. The following results of the economic study of air jet spinning are very important and certainly quite surprising for many readers. In a supplementary article "*Air Jet Spinning: a research outlook*" we provide a view of the future from a technical perspective based on laboratory tests carried out by ITV Denkendorf that leave a lasting impression of future industrial uses air jet spinning could still offer.

Let's start with the current status of industrial technology and therefore with the Rieter J 20. This new air jet spinning machine was presented by Rieter as one of the main attractions at the ITMA 2011 in Barcelona. Many visitors and customers were amazed at a machine operating at customary speeds with two different materials.

The long-staple cotton wool yarn Ne 50 (12 tex), spun at 380 m/min was processed directly at the trade fair by a knitting machine manufacturer on a circular knitting machine at 45 tours per minute with minimal fibre fly.

It has often been confirmed since then in industrial applications that the Rieter J 20 Air-Jet Spinning machine produces excellent yarn with innovative yarn characteristics at maximum productivity. Economic efficiency rises markedly in the following processing stages as a result of minimal fibre fly.

The J 20 Air-Jet Spinning machine with 120 spin settings and two independently producing sides moreover excels itself by showing high flexibility. The achieved space saving of 35 % is also an enormous advantage of the J 20.

The main points of the machine's concept include simple operation, single drive, high performance drafting system and a unique traversing system.

Reels, band and yarn are controlled simply from a centrally operated position. A constant quality is guaranteed due to the short sliver feeder distances. The 120 individually driven spinning positions can be easily set on the main panel. Consequently efficient maintenance, quick batch changes and an economically efficient machine start up is possible. Moreover energy costs are reduced due to the single drive mechanism for every production stop.

The 4 cylinder drafting system produces yarn quality of the highest standard of up to 450 m/min and does not have to be opened for the tape feed. The unique traversing system for the feed sliver and yarn in the drafting system reduces the wear and tear on the upper rollers and belts and consequently the maintenance and spare part costs.
The traversing system is essentially responsible for the constant yarn quality.

Unique yarn character

The following description is informative for a better understanding of air jet yarn (figure 3).

Fig. 3: Structure of the air jet yarn - *Source: Herrmann Buehler / Povel*

The yarn originates in the production process from right to left.
The fibre tips are parallel in the yarn core at a proportion of ca. 75-80%. The fibre ends are blown with the swirling air around the body of the yarn. This is the ideal proportion, there are variant fibres, where the fibre tips and ends lie in the core of the fibre, and the middle of the fibre forms the mantle, and innumerable other variations.

How the yarn is created is explained by using the example of the Rieter J 20. The yarn formation process has been patented by Rieter.

The centrepiece of the J 20 air jet spinning machine is the spinning chamber. Fine slivers of Ne 0.15 – Ne 0.3 (2 - 4 ktex) are stretched by the 4 cylinders of the high performance drafting system to the fineness of the yarn and orientated. The outfeed roller has a spinning speed at this point of **450 m/min.** Only the fibre ends of a part of the fibre structure are twisted around the parallel core by air pressure through 4 jets in the spinning chamber where the yarn in the middle of the spinning jet is pulled at maximum spinning speed. At least 30 % of the fibres are twisted around the fibre structure and 70 % are parallel in the core of the yarn. (figure 4)

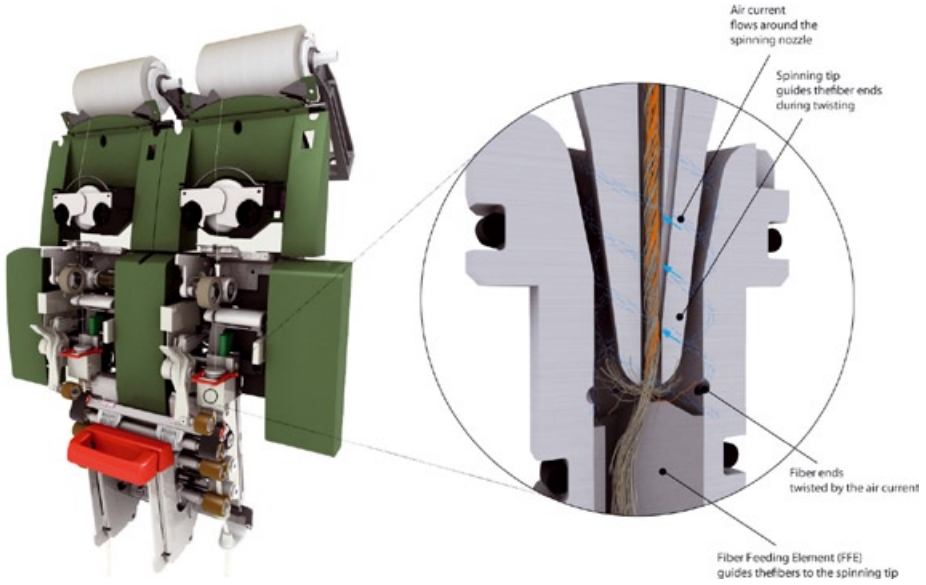

Fig. 4: Yarn formation process, the jet is the centerpiece of COM4jet technology - *Source: Rieter*

"The advantages of air jet spinning for the entire chain of production of yarn from sheet ware to the finished product are enormous. Simultaneously the economic advantages of this technology are convincing"

Dr. Götz Gresser, Maschinenfabrik Rieter AG

Quality for further processing in weaving mills and knitting mills without downtime

Directly after the spinning jet a yarn clearer monitors the yarn quality. The ensuing spooled yarn is therefore checked 100 % for quality. The same applies for the yarn piecing. Each piecing is checked before spooling by a yarn clearer for thickness and diameter and length, and cut where quality is unsatisfactory and the piecing procedure is repeated if required. In this way flawless yarn is wound on the spool. The yarn clearer can be selected with an optical or capacity censor as well as with or without recognition of extraneous fibre.

The single drive enables a progressive fibre and yarn feed via PFF (progressive fibre feed) during the piecing process. The piecing is of excellent quality and is not visible. As a rule values for strength and elongation of 90 % and higher are achieved in comparison to the original yarn. (figure 5)

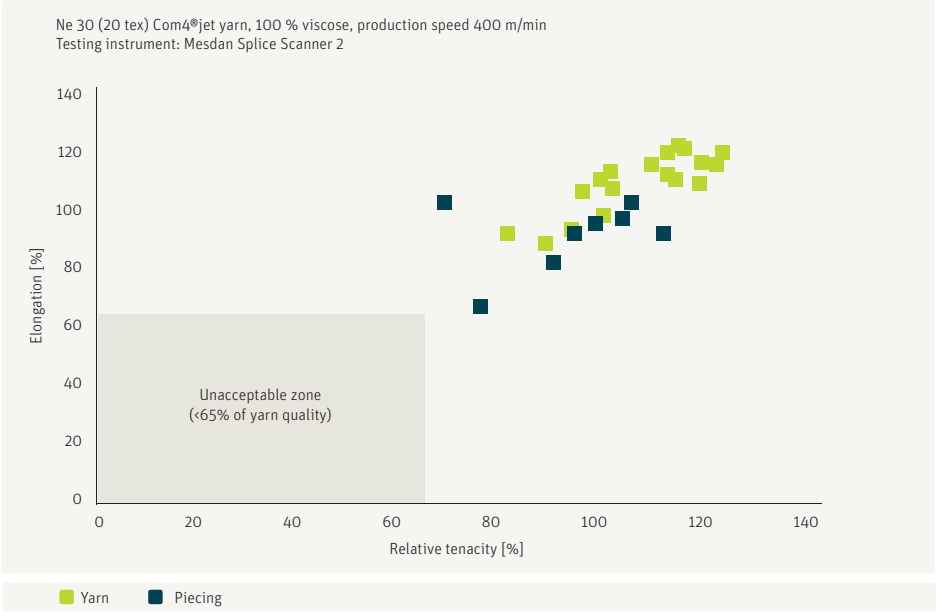

Fig. 5: Yarn-like piecing quality: the piecing has almost the same strength as the yarn without visible differentiation - *Source: Rieter*

Process technology is decisive for performance limits

80 % of the performance of the air jet spinning machine is influenced by the quality of the pre-processing. The speeds, the position of the checkmarks and the warping properties are important parameters for good yarn quality. There should always be checkmarks on the air jet spinning machine and the warping pattern at the draw frame passages should always be low/high/low. The best yarn result and the best run performance are achieved by using this warping pattern.

Trials have shown how card production and therefore the processing speed for viscous yarn Ne 35 (17 tex) influences the yarn quality and the running performance of the machine. The yarn value gets worse with increasing card production. It does however not become so bad that is not acceptable in principle. The clearer cuts per 100 km of spun yarn are decisive here. These increase so strongly at over 65 kg/h that the air jet spinning machine does not achieve any acceptable economic efficiency in the area of over 90 %. An optimal point in respect of yarn quality and running performance needs to be in balance. (figure 6)

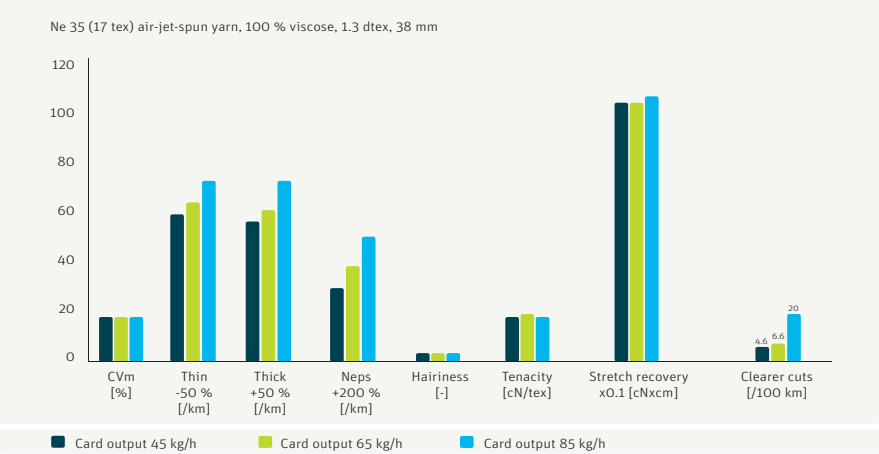

Fig. 6: Optimums between yarn quality and running performance can be achieved - *Source: Rieter*

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Fig. 7: Process comparison between the air jet spinning standard process to the short process - *Source: Rieter*

Rieter recommends 3 draw frame passages for air jet spinning for the carding process, whereby the best yarn qualities are achieved for all yarn parameters. Alternatively to the 3 draw frame passages a short carding process with SB module and a regulating draw frame can be implemented. (figure 7).

Rieter has compared the short process with the recommended process with regard to the yarn quality in an extensive trial. Additionally calculations on viability were carried out based on a spinning project for both processes. In respect of viability the short process offers many advantages.

It not only also has a marked advantage in respect of space requirements, personnel expenditure and installed machinery performance, but also in respect of installed performance for air conditioning and illumination as well as for the expenditure on operational materials and fittings. (figure 8).

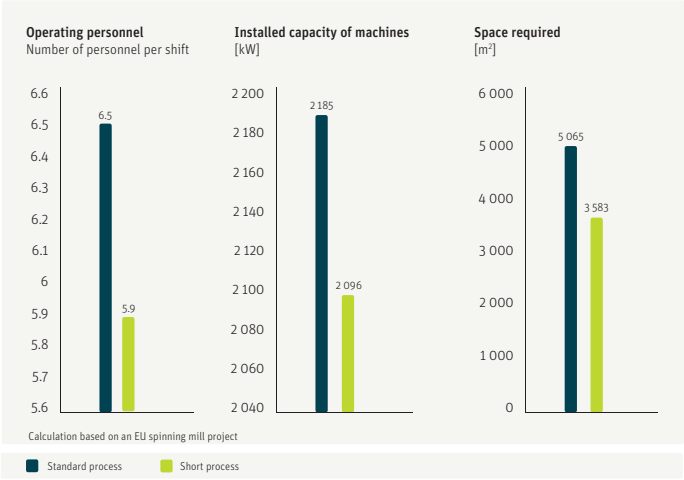


Fig. 8: Cost comparison between the air jet spinning standard process to the short process - *Source: Rieter*

The short process does not however provide the yarn quality of the standard process. (figure 9). In this case it is decisive which yarn quality is to be achieved. The yarn quality could be improved in the short process by the reduction of the card production of 65 kg/h to 45 kg/h, an increase of the doubling of the draft from 6 to 8 times and by the spinning of a coarser yarn fineness Ne 30 (20 tex).

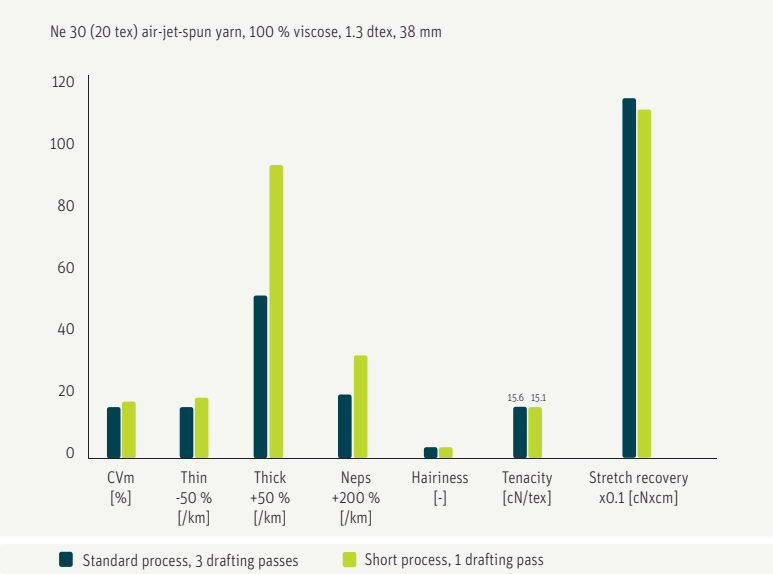


Fig. 9: Quality comparison between the air jet spinning standard process to the short process - *Source: Rieter*

Customer experiences confirm competitiveness

Comparable tests of the Com4®jet yarn produced on the Rieter air jet spinning machine with competitive air jet spinning yarn have shown that the Rieter air jet spinning machine also produces excellent yarn in industrial operation. The strength and elongation of viscose yarn Ne 30 (20 tex) for example are better and the imperfections differ significantly, The Com4®jet yarn showed markedly fewer thin areas, thick areas and lumps as well as better workmanship than the yarn of the customers of the competitor. (figure 10)

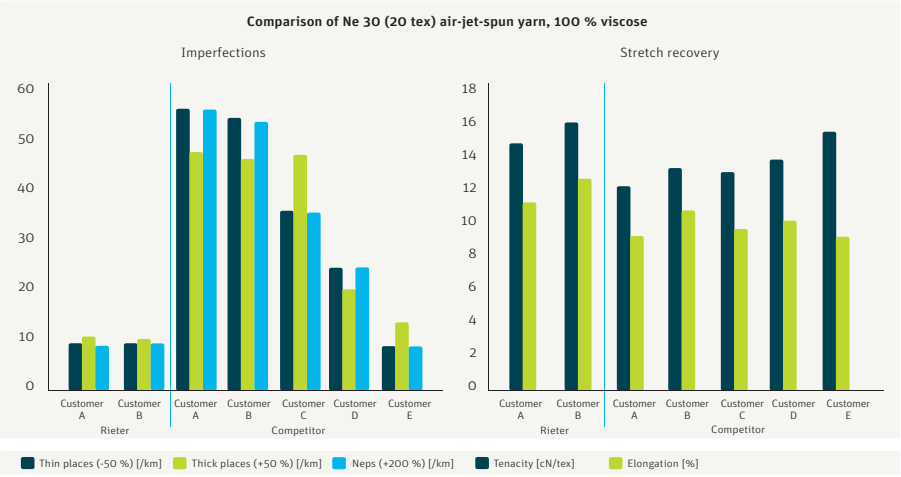


Fig. 10: Rieter Com4®jet yarns are competitive. They impress through quality and are economical to produce - *Source: Rieter*

These comparison tests of the air spun yarn show that the Com4®jet yarn represents the top quality product in the market. This is important to know when we later consider the comparison tests with ring yarn.

Rieter has a record of the experiences of customers in the yarn number field between Ne 20 (30 tex) and Ne 70 (8,5 tex). The applications are mostly in the viscose area, but mixtures and pure cotton have also been successfully produced by yarn manufacturers.
Most of the Com4® jet yarns on the market are to be found in the field Ne 30-50 (12 - 20 tex). Experience shows that the trend is moving towards finer yarns and mixtures as air spun yarn mainly competes against ring yarns. (figure 11)

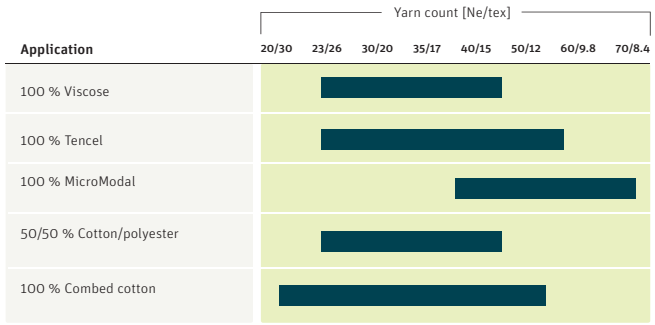


Fig. 11: Use of the Rieter J 20 Air-Jet Spinning technology by customers within the yarn application range for different fibre materials - *Source: Rieter*

Further studies and comparison tests as to the structure and strength of air jet yarn have been conducted by Hermann Bühler AG, Schwitzerland. The company founded in 1812 produces yarn in Switzerland for customers to the highest standards. The company that recently celebrated its 200 year jubilee has already started operating its third Rieter air jet machine.

Hermann Povel, the technical director, reported extensively on the tests at the Denkendorf Spinning Colloquium. The company compared yarn parameters for an Nm 68/1 Micro Modal using ring yarn, siro yarn and air jet yarn. As the yarn producer is currently focused on the knitting process the focus of the study is on Uster Haarigkeit, Zweigle S3 Wert, Staff Test (mg/1000 m), Uster CV [coefficient of variation] % as well as breaking force (cN/tex und CVW [coefficient of variation within] %).

Uster Hairiness & Zweigle S3 value

The Zweigle S3 value represents the number of fibre ends > 3mm. A value lower than S3 for the knitting process is comparable with a very good pilling property. This has been confirmed by Hermann Bühler through diverse tests at various customers with different materials and structures. In the comparable study ring yarn represented the worst results and served therefore as a basis. The hairiness reduces for siro yarn by ca. 15% in comparison to ring yarn. The Zweigle S3 value reduced by ca. 75% leading to a markedly better pilling value in the knit and less fly in the knitting process. The air jet hairiness is reduced by ca. 25 % in comparison to ring yarn, and by as much as 90 % for the S3 value. The comparison of air jet to siro yarn is also impressive. In this case the air jet hairiness reduces by ca. 15% and the S3 value even by 60 %. The comparison of the 3 yarns shows clear advantages for the air jet yarn. (figure 12)

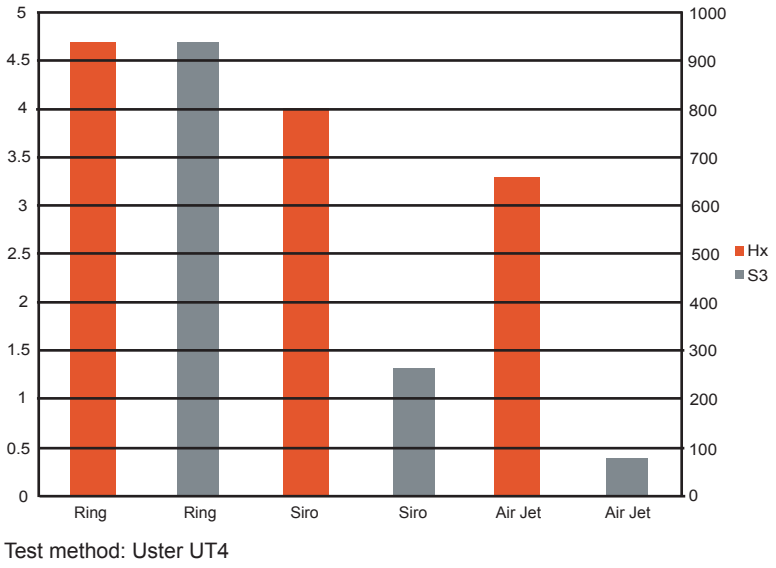


Fig. 12: Uster hairiness and Zweigle S3 / Micro-Modal NM 68/1
- Source: Herrmann Buehler / Povel

Staff test

The Zweigle staff test represents a measured value of the fibre fly expected in further processing. A lower value is sought, as high fibre fly causes diverse knitting defects and increased cleaning outlays at short cleaning intervals. In comparison to ring yarn the staff values for air jet yarns reduce by ca. 2/3. (figure 13) Air jet yarns improves significantly fibre fly in the knitting process and allow in this way an increase in productivity and quality.

Fig. 13: Staff test / 100% Micro-Modal NM 68 / NE 40 (15tex)
- Source: Herrmann Buehler / Povel

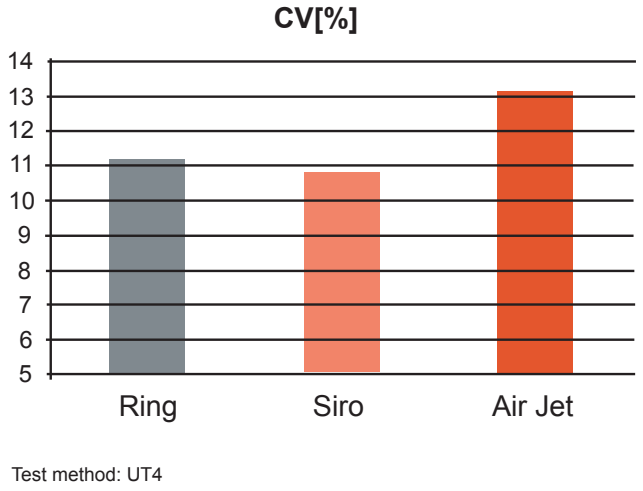


Fig. 14: Coefficient of variation / 100% Micro-Modal NM 68 / NE 40 (15tex)
- Source: Herrmann Buehler / Povel

Uster-CV & goods image

The Uster CV (coefficient of variation in %) is the most important value in the assessment of uniformity. A worsening of the Uster-CV values of air jet in comparison to ring yarn by ca. 15-20% is known. This was confirmed by the test conducted by Hermann Bühler (figure 14). In comparison to ring yarn Hermann Bühler however determined that the non-uniformity in air jet yarn is very regular, which has exactly the opposite effect for finished knitted goods for the consumer. A regular non-uniformity in goods is once again uniform and produces a very pleasant and soothing visual effect. Ring yarn on the other hand represents better values in the Uster CV, but tends to produce a visual effect of the product that is annoying, unsettling and flawed both for ring as well as compact yarn. (figure 15)

Fig. 15: Goods image - *Source: Herrmann Buehler / Povel*

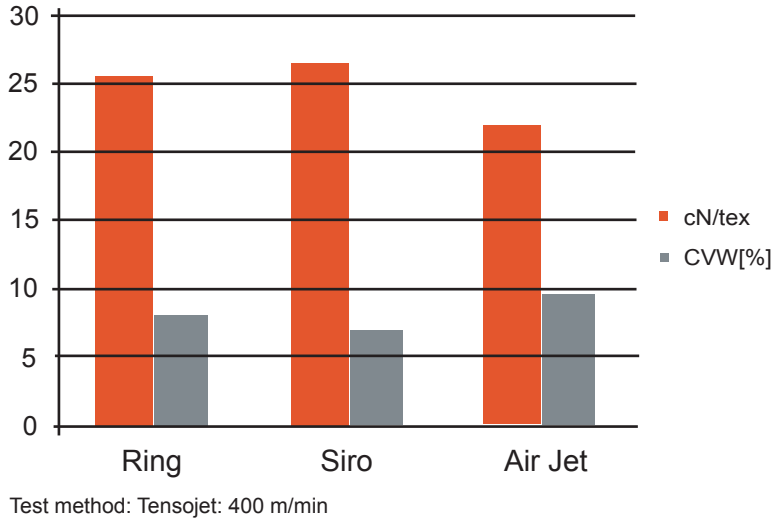


Fig. 16: Breaking force / 100% Micro-Modal NM 68 / NE 40 (15tex) - *Source: Herrmann Buehler / Povel*

Strength

The strength test of the three yarns on the breaking force produced as expected the best value for siro yarn. It achieved a slightly higher strength in comparison to ring yarn through a better pilling property of the individual fibres. Siro yarn, as is well known, has twisting in every shank as well as in the pseudo yarn, so that the fibre front and fibre end are very well connected increasing the use of the fibre substance. The yarn structure of the air jet yarn is not able to produce this high value of strength due to its formation. Air jet yarn achieves current values that are ca. 15 % lower than ring yarn (figure 16).

According to Mr. Povel there are however absolutely no problems to be expected for values determined of over 21 cN/tex in the knitting process in respect of runability.

Final evidence of that was impressively provided for example by the company SANTONI at the ITMA in Barcelona 2011. An air jet yarn Ne 50/ 1 (11,8 tex) made of 100 % ELS (extra long staple) cotton was knitted on the newest ATLAS HS without a problem at a rate of 45 rpm with almost no thread breakage and almost without cleaning outlay under trade fair conditions. [circular knitting machine SANTONI type Atlas SV - HS (=high speed), 30“ diameter, division of 28 gauge (suitable for yarns from Ne 36 to Ne 56 [10- 16 tex]), 88 systems]

Pilling test after 20 washes

Hermann Bühler also compared the pilling properties in diverse tests with customers in their laboratories for knits of ring and air jet yarn. The comparable yarn was also the Nm 68/1 Micro Modal. (figure 17). The result with marked advantages for the air jet yarn is impressive. Ring yarn shows an extremely high pilling property after 20 washes where one can assume that the customer would already have disposed of the piece of clothing before the 20th wash. Air jet yarn on the other hand also showed pilling properties after 20 washes, but was visually clearly better and in the pilling intensity than the ring yarn after the 10th wash. The pilling test therefore showed that by using air jet yarn there is a marked improvement in the product for the end consumer in respect of the product life and the visual effect.

Fig. 17: Pilling test after washing / 100% Micro-Modal NM 68 / NE 40 (15tex)
- Source: Herrmann Buehler / Povel

100 % ELS cotton Nm 85/1

Besides Micro Modal the first production of 100 % ELS cotton Nm 85/1 has started at Hermann Bühler and the yarn produced has also been tested (figure 18). Hermann Povel has established that all the findings determined for Micro Modal also apply to the ELS cotton. In part the differences between the spinning processes are still greater. The Zweigle S3 value for Nm 85/1 in comparison to ring yarn for the air jet reduces by 98%, the staff test is 80% lower. This has more significance as the tests have been set in such a way that the Uster hairiness was not reduced below the value of the compact and siro yarn.

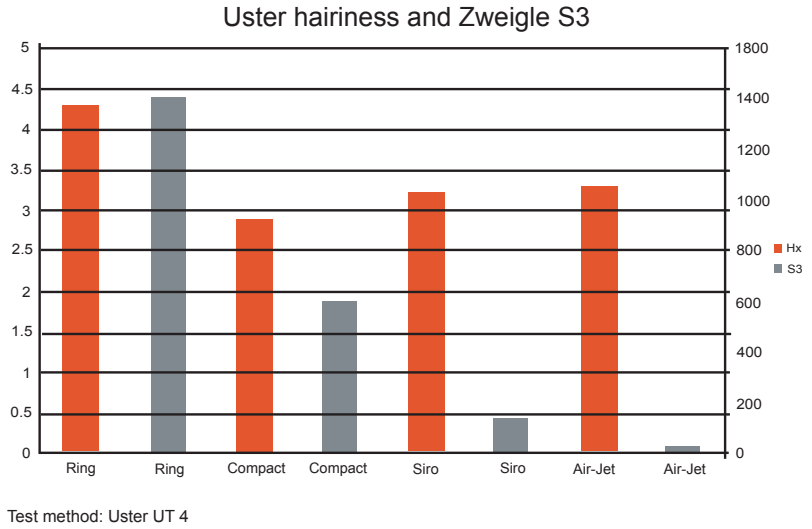


Fig. 18: Uster hairiness and Zweigle S3 / 100% Cotton ELS NE 50/1 (11,8 tex)
- Source: Herrmann Buehler / Povel

Tests at ITV Denkendorf

While the Hermann Bühler tests show above all how very specific yarns differ from each other in air jet and ring spinning, ITV Denkendorf started a project to determine the limits of air spinning in a very fine yarn number area. We would like to briefly present these very interesting results that definitely are to have an effect on the acceptance of air jet spinning in the market.

ITV Denkendorf chose fine fibres in order spin as fine a yarn as possible with acceptable quality up Nm 250, so that as many fibres as possible are part of the cross section. Micro Modal and Tencel with a very fine titer of 0,8 to 1,0 dtex and fibre lengths of 34 to 38 mm were chosen for the study. The total draft should not substantially exceed 300, hence very fine ribbons of 1,8 , 1,5 and 1,23 ktex were produced (figure 19). The tests should also encompass how these staple fibre yarns behave on knitting machines with a very fine spacing of the needles. The yarns were also produced on a Rieter J 20.

Fibres used for the analyses:

- Micro Modal	1,0 dtex / 34 mm
- Micro Modal	1,0 dtex / 38 mm
- Micro Modal Air	0,8 dtex / 34 mm
- Micro Modal Air	0,8 dtex / 38 mm
- Micro Tencel (Lyocell)	0,9 dtex / 34 mm

Total warping relative to the sliver feed

	Yarn fineness				
Sliver feed	Nm 150	Nm 175	Nm 200	Nm 225	Nm 250
1,23 ktex / Nm 0,81	184fold	215fold	246fold	277fold	307fold
1,50 ktex / Nm 0,67	225fold	263fold	300fold	338fold	375fold
1,80 ktex / Nm 0,56	270fold	316fold	360fold	405fold	450fold

Fig. 19: Tested fibres (Finest yarns / IGF 16 674 N)
- Source: ITV Denkendorf / Heitmann

Fibre strength and delivery speeds

iTV Denkendorf succeeded in spinning a yarn Micro Modal yarn to Nm 235. A still higher warp could not be spun. iTV also assumes that presently Nm 235 is only achievable in a laboratory environment and in an industrial conditions stable spinning performances up to Nm 175 exist. Finer numbers would lead to frequent yarn breakages and clearer cuts.

As a first step the strength of the individual yarn numbers was measured based on the delivery speed (figure 20). We have already elaborated on how the strength of air jet spinning is influenced (see above). It is achieved though the wrapping of the fibres and through the numbers and tautness of the wrapping. iTV states that in regard to the strength, that besides the tautness of the wrapping that the angle of deposition of the fibre wrapping also has an influence on the strength which is also a similar form to ring spinning. The swirling air stream that generates the wrapping is relatively constant and independent of the delivery speed. Flatter wrapping angels of the wrapping fibres are produced by increasing delivery. This is comparable with the Alfa with authentically rotating fibres. The strength remains relatively constant in this process and with this raw material across wide areas as opposed to other fibre materials. That means that for these fine fibres the influence of the Alfa does not play a role as with the other fibres.

100% Micro Modal 0,8 dtex / 38 mm

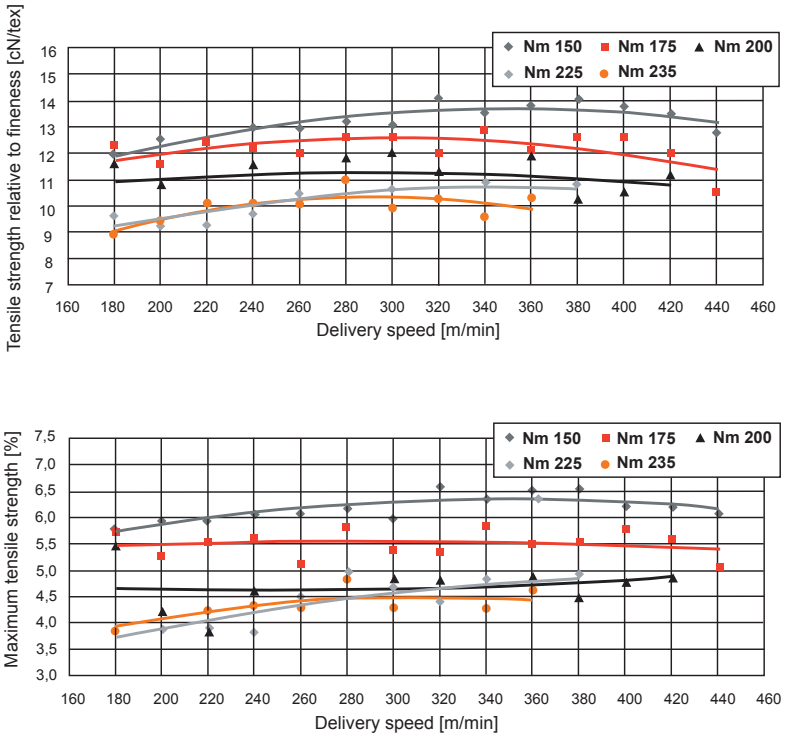


Fig. 20: Spinning of Micro Modal / Nm 150 – Nm 235
- Source: ITV Denkendorf / Heitmann

As is seen in the diagram the strength declines with increasing yarn numbers and that the Nm 235 could no longer be spun at high delivery. It shows furthermore that the elongation is highly constant across the speed range.

Substance exploitation

As a measurement of the quality of the process we can call on the substance exploitation of the fibres in the yarn. (figure 21). A decline in strength is seen also in the substance exploitation. The air spun yarn has an overall lower substance exploitation than ring yarn. This is in the area of just 60 to 50 % depending on the fineness of the yarn.

Utilisation of fibre substance is the strength of the yarn relative to the strength of the fiber.
Utilisation of fibre substance is getting down with rising fineness of the yarn.
Utilisation of fibre substance according to the fineness of the yarn for 100% Micro Modal 0,8 dtex / 38 mm.

Fineness of the yarn	Nm 150	Nm 175	Nm 200
Tensile strength relative to the fineness of the fiber* [cN/tex]	30,3	30,3	30,3
Tensile strength relative to the fineness of the yarn (Tensojet)[cN/tex]	17,8	16,8	15,3
Utilisation of fibre substance [%]	58,7	55,4	50,5

*determined at the draw frame sliver

Fig. 21: Utilisation of fibre substance according to fineness of the yarn
- Source: ITV Denkendorf / Heitmann

Fibres in cross section

The number of fibres is 63 fibres in cross section for yarn number Nm 200, a purely laboratory value and for industrial measurements not relevant in practice. Ca. 70 to 80 fibres in cross section are necessary for a satisfactory running characteristic. (figure 22)

100% Micro Modal 0,8 dtex / 38 mm

Fineness of the yarn	Nm 150	Nm 175	Nm 200
Number of fibres in cross section of the yarn	83	73	63

Fig. 22: Number of fibres in cross section of the yarn according to fineness of the yarn
- Source: ITV Denkendorf / Heitmann

Yarn structure

iTV Denkendorf has determined the parameters of the sheath fibre rotation, the rotation coefficient and the revolution of fibre suns, for example of Tencel fibre (figure 23). The yarns specified were spun at a delivery speed of 260 m/min. The apparent rotation speed of the yarn is determined by establishing the angle of wrapping. For ring and rotor spinning it is the spindle and rotor rotation speed divided by the delivery speed. For the finest number of Nm 235 it corresponds to a sheath fibre rotation of 1800 revolutions/m. The rotation coefficient Alfa is derived from that. The fibre sun revolution figure is derived from the product of the delivery speed and the sheath fibre revolution, i.e. 1800 revolutions. The result is an impressive 468.000 1/min.

There is a variation in the revolution figure of ca. 8 % in the number fields examined, which is ascribed to the fact that the number of fibres wrapped around the fibre core declines. In general, a lower mass of swirling air stream is generated and as a result the fibre sun speed increases.

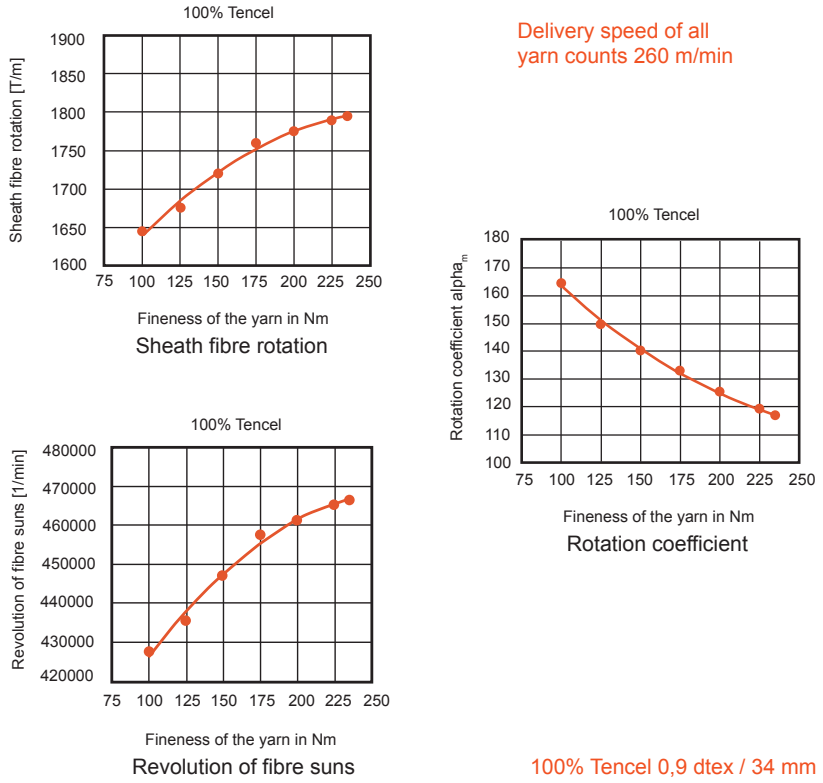


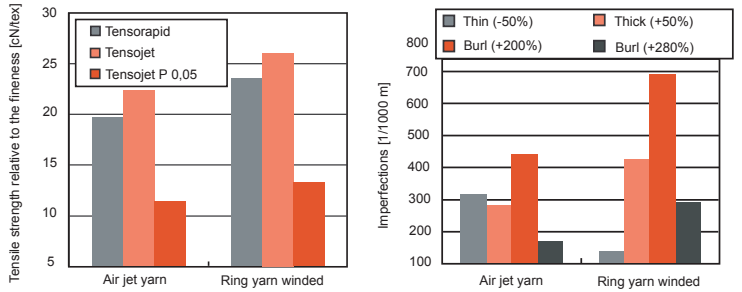
Fig. 23: Analysis of yarn structure Tencel Nm 150 – Nm 235: sheath fibre rotation, rotation coefficient and revolution of fibre suns
- Source: ITV Denkendorf / Heitmann

Comparison air jet and ring yarns

So much for the results of the theoretical parameters of air jet yarn. In practice it is important to know how these yarns behave in comparison to the real twisted yarn, meaning a ring yarn. The table (figure 24) shows the relevant Tenso jet and Tenso rapid strength values. The lower strength of ca. 20 % of the air spun yarns is apparent. The P0.05 value which in this case states that 99,95 % of the yarn has a higher strength than 11cN/tex, indicates a reference value of whether problems are likely to be encountered. When knitting.

The lower IPI values of air spun yarn indicate that the draft process in air spinning, with the high requirements given in respect of the level of the draft and the speed, is considered as very stable. The spinning uniformity is only minimally higher that for ring yarn.

100% Tencel 0,9 dtex / 34 mm, Nm 150



Uster CV %:

17,2% Air Jet Yarn
16,3% conv. Ring Spun Yarn

Fig. 24: Comparison air jet and ring yarns for knitted fabrics
- Source: ITV Denkendorf / Heitmann

Hairiness

The known lower hairiness of air spun yarn was confirmed by the test (figure 25). The lower hairiness causes fewer problems when knitting, but for the end product, where a softer touch is required, this would be a disadvantage. The Micro Modal and Tencel fibre is, due to the titers, a very soft fibre and therefore predestined to be a knitted fabric made of air spun yarn, as to a certain degree, the lower hairiness is balanced out.

100% Tencel 0,9 dtex / 34 mm, Nm 150

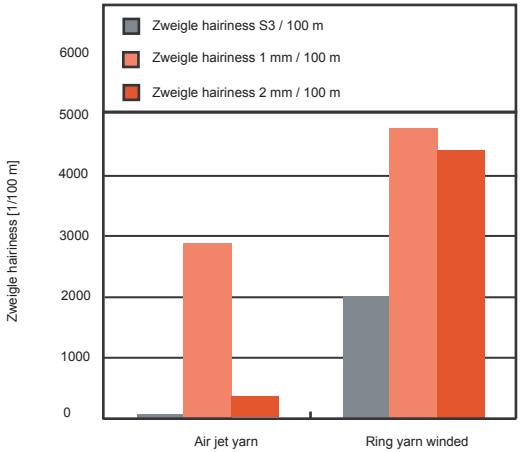


Fig. 25: Comparison air jet and ring yarns for knitted fabrics
- Source: ITV Denkendorf / Heitmann

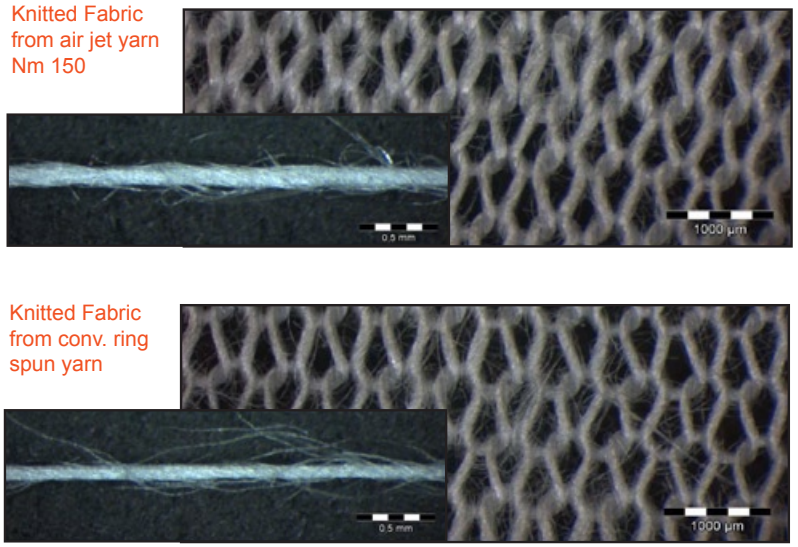


Fig. 26: Analysis of knitted fabrics made from air jet yarn and ring spun yarn
- Source: ITV Denkendorf / Heitmann

Yarn structure and knitted image

How do the yarns and the knitted fabrics look in comparison (figure 26)? The same proportions were selected for the yarn and the knitted fabric for each of the diagrams. It is noticeable that the air spun yarn is not as compact as the ring yarn. The air spun yarn has a greater diameter. The lower hairiness of the yarn and the knitted fabric is also noticeable. The sheath wrapped fibres have an influence on the touch in a similar way to rotor spinning. They prevent shifting of the parallel core fibres, which is why ring yarn in knitted fabrics still has a softer touch. The knitted fabrics shown have been knitted on a knitting machine with a spacing of E40.

Pilling properties

iTVDenkendorf also see marked advantages in the divergent yarn structure when referring to the performance characteristics of the knitted fabrics. The pilling test of the iTV Denkendorf knitted fabrics were conducted prior to and after the finishing and refinement. (figure 27). Air spun yarn is one pilling mark better in general.

100% Tencel 0,9 dtex / 34 mm, Nm 150

Fig. 27: Analysis of knitted fabrics made from air jet yarn and ring spun yarn: Pilling test following Martindale - *Source: ITV Denkendorf / Heitmann*

Properties of divergent materials

Especially interesting is the comparison of the strength values of cellulose fibres with cotton and polyester fibres (figure 28). iTV Denkendorf has standardised the strength values for this purpose. The study shows the special suitability of cellulous fibres in comparison to cotton (black) and polyester (red).

Fineness of the yarn: Nm 50

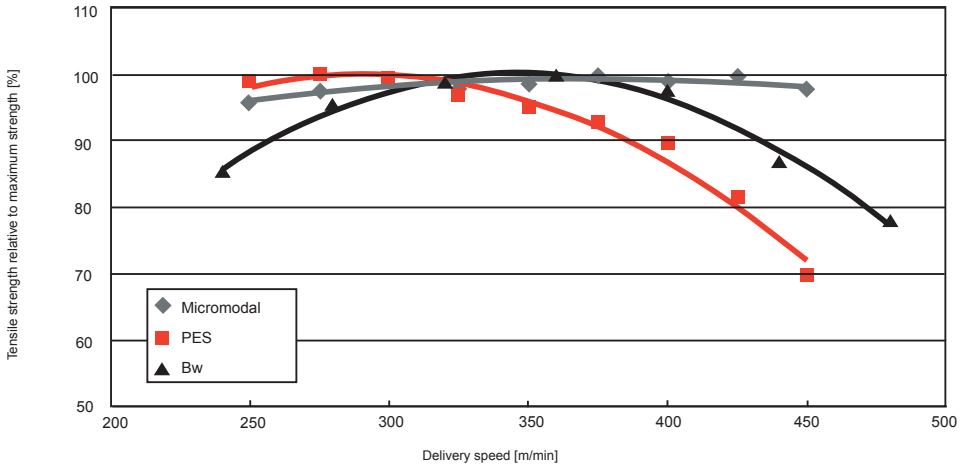


Fig. 28: Strength analysis of air jet yarns made from different kind of fibers (TENSORAPID values) - *Source: ITV Denkendorf / Heitmann*

There is a relatively constant strength with hardly any decrease at higher speeds for the entire speed range of cellulose fibres, but for cotton and even more so for PES there was a marked decrease at the lower and higher revolutions. iTV Denkendorf ascribed this to the divergent bending resistance of the fibres. The Modal fibre is less sensitive to delivery speed and therefore also less sensitive relative to the angle of deposition, which has influence on the strength. The parallel fibres in the core are pressed together stronger for cellulose fibres, which is why the fibre to fibre friction has greater influence than for other fibres.

Interim summary

So much for the analysis of the air jet yarns that are produced in the industry on a Rieter J 20 and the comparisons with ring yarns by means of numerous significant parameters. Both Hermann Bühler and iTV Denkendorf have concluded that air jet yarn performs worse that ring yarn for some parameters, as for example in strength and for others better, as for example in pilling. Perceived disadvantages of the air jet could even be portrayed as advantages, as for higher non-uniformity, however resulting in a higher uniformity of air jet yarn. Other disadvantages are measurable but irrelevant in practice, as for example the lower strength of the air jet yarn for the knitting process is seen as still being sufficient.

Hermann Povel of Hermann Bühler listed in his presentation the following advantages for the knitter in summary:

- Pleasant, uniform visual effect
- Low hairiness
- Improved pilling values
- Less cleaning of the knitting machine, fewer knitting errors
- Ca. 80 % fewer fibre connections (Basis Nm 68/1) in the yarn in comparison to ring yarn
- Reduced running skew in the product in comparison to ring
- Rapid absorption of moisture and dyes

He also pointed out that the studies by Hermann Bühler insist on the knitter, but that air jet yarn is deployed without a problem in applications in the weaving industry in warp and weft.

As a quality and fine yarn spinner Hermann Bühler has also tried to position air jet yarn in relation to fineness and quality. From the view of the company the yarn has potential to cover much of the area occupied by ring and rotor (figure 29) and increasingly improve in the direction of yarn fineness and yarn quality.

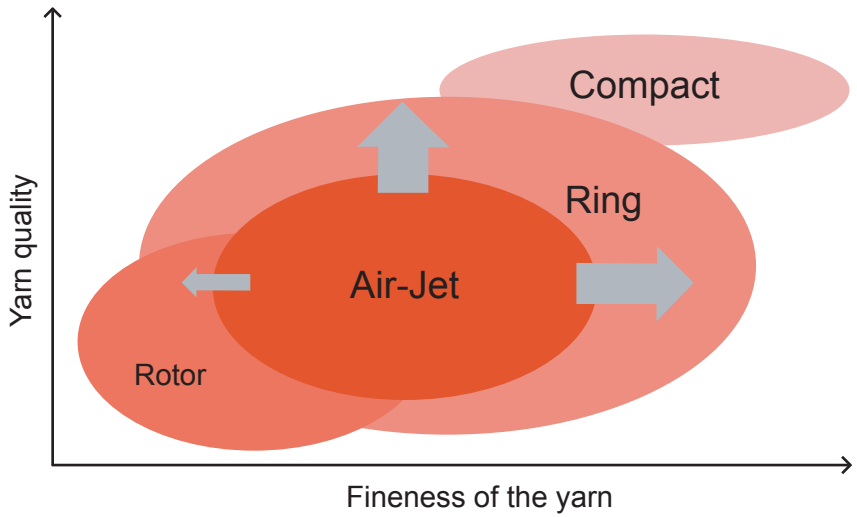


Fig. 29: Positioning of air jet yarn - *Source: Herrmann Buehler / Povel*

Today air jet spinning has a share of 1–2 % of the whole short staple market. Rieter sees the market potential long term between 10–15 %. Air jet spinning will be strongly established in the area of viscose and mixtures as well as continuing to develop in the area of cotton. This process however is more demanding due to the raised level of quality evoked by short and extraneous fibres. It is intended to optimize the processing of polyester and other chemical fibres. The problems here are the deposits of polyester fibres and their avivage on the spinning components that after a short time begin to negatively influence the running performance of the machine. In order to control this, new concepts are needed, as for example regular and automatic cleaning of the spinning components. (figure 30)

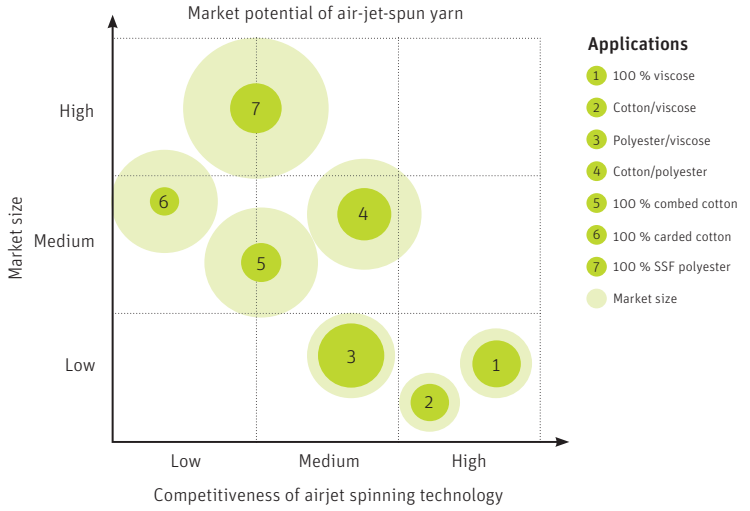


Fig. 30: The suitability of air jet spinning is also dependent on the raw material - *Source: Rieter*

Air jet from the perspective of the spinner

Hermann Povel does not only see advantages in air jet technology for the knitter in his analysis, but also that spinners profit from some advantages in comparison to conventional ring yarn. He lists here:

- **Lower investment costs**
  Despite the infrastructure (compressed air, electricity, air conditioning) the one air jet machine replaces the flyer, the spinning and spooling machine. Only one draw frame passage is in addition.
- **Smaller space requirement**
  comparable production with air jet requires markedly less space, less air conditioning and consequently less investment
- **Wage costs**
  on the basis of higher productivity and the lower outlays in the preparation area wage costs reduce by ca. 60%, dependent on material and average number.

“In the view of Hermann Bühler AG air jet yarn will continue to establish itself in the market and find new fields of application.“

Hermann Povel, Technical director, Hermann Bühler AG

The consumer decides

The most important argument for Rieter for an investment in Rieter air jet spinning machines is the advantage in the end product for the consumer, such as lower pilling, higher stability in washing and softer touch. The yarn characteristics of the latest industrial spinning process are so markedly different to ring, compact and rotor yarns, that they are reflected through the further processing into the end product.
The typical, many fine and well- bound fibres of Com4®jet yarns, smaller than 3 mm, produce the soft effect on the surface of the product desired by the end consumer and are decisive to the touch.

Should the consumer increasingly accept the Com4®jet yarn or even prefer it due to its positive characteristics, then the advantages of air jet spinning will have a positive impact on many processes of the textile value-added chain. A low normal hairiness and the good fibre binding in the body of the yarn reduce dust and fibre fly formation and as a result the cleaning outlay for the production machines. Fibre fly is reduced during further processing and the productivity in the weaving and knitting industry rises.

The typical Com4®jet yarn structure requires a lower intake of sizing / de-sizing agents and dye and thereby providing savings of 5–15 %. Better print contours also result as a higher uniformity and a higher surface density (lower air permeability) is achieved due to the Com4®jet yarn structure.

Sustainability is gaining more significance

Sustainability in the sense of the definition of the Brundtland Commission of the United Nations is today a topic that all companies throughout the textile value-added chain have to face pro-actively. This means for the spinning industry a production at the highest possible energy efficiency. (see *TexDate Magazine issue 1/2 2012*)

When yarn manufacturing costs of the entire spinning industry are compared applying the same production volume then energy values per kg of combed cotton yarn of a fineness of Ne 40 (15 tex) is 20 – 30 % higher for the various ring yarns than for air spun yarn. This is ascribed to the shortened spinning process as no flyer and no spooling machine is required. (figure 31)

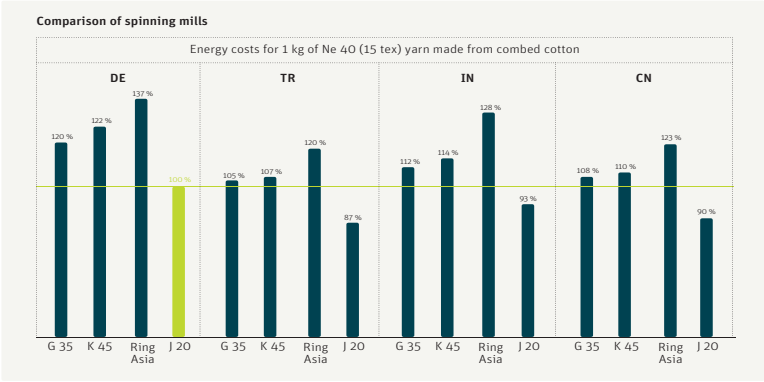


Fig. 31: An air jet spinning mill consumes less energy in the production of yarn than other technologies (in this case Ne 40 [15 tex]) - *Source: Rieter*

Economic efficiency promotes international competition

Energy efficiency and the associated energy costs are an aspect. Below the line only the yarn production costs count however for the spinner. The following example shows that air spun yarns have the lowest yarn production costs not only in Europe but also in other countries. The short spinning process is above all decisive hereby and the resulting lower expenditure on personnel. Air spun yarns are mainly used in ring yarn applications.

Rieter has concluded the following in respect of the economic efficiency: when air spun yarn in Germany, as an example for a high wage country, is assumed to be 100 %, then compliant with our analysis, Com4®jet yarn can replace many of the qualitative applications of ring yarn, then Com4®jet yarns from Germany are competitive with the Asian ring yarns, as the low yarn production costs are supplemented by the advantages of high flexibility, meaning quick delivery with lower logistic costs should the purchaser also work in Europe. Asia is therefore already preparing for the future and also investing in air jet spin technology. (figure 32)

Herrmann Bühler also sees the possibility of spinners benefiting from lower manufacturing costs of air jet yarn, and compensating for the disadvantage of location and providing knitters with an alternative to yarn imports.

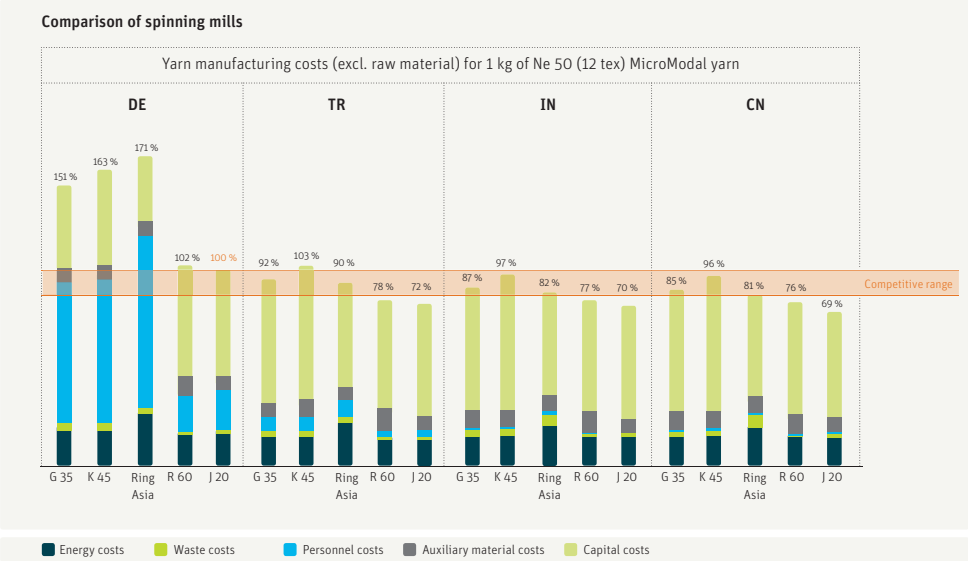


Fig. 32: Yarn production costs compared in different countries - *Source: Rieter*

The company even sees the possibility of completely maintaining the textile chain from spinner through to outfitter. In the view of Hermann Bühler AG air jet yarn will continue to establish itself in the market and find new fields of application.

Summary of the industrial status

Hermann Povel summarizes air jet spinning as follows: “it could be shown, that air jet in comparison to ring, compact and siro yarns offers marked advantages for the knitting industry in productivity and machine run times through very low staff values.

The product is finer and more uniform despite worse measured laboratory values (Uster tester 4) and achieves longer life span due to better pilling values for the end consumer. In comparison to ring yarn there is a reduced tendency of draft skew allowing the usage of S – yarn to be relinquished for certain structures. In the view of Hermann Bühler AG air jet yarn will continue to establish itself in the market and find new fields of application“.

We have little more to add in respect of the yarn as it summarizes the advantages of air jet very well. We would like to use a quote by Jörg Morgner from his dissertation that we put at the beginning of this article: “A spinning process at a production rate of 400 m/min [...], a yarn quality comparable to the ring yarn and the flexibility of ring spinning would surely supplant all the currently established spinning processes”. We consider this point as still not reached by a long way, as the statement is to be challenged, above all in respect of the special quality of compact yarn and the importance today of energy efficiency.

We see however that a great step forward has been taken by the Rieter J 20 Air Jet Spinning Machine and that spinning mills should place the air jet topic right at the top of the agenda. The high economic efficiency of the process and the resulting low yarn manufacturing costs are certainly starting to be coveted by many participants all along the textile value-added chain. In accordance with all analyses on yarn and its manufacture, a breakthrough of air jet yarns in the market is inevitable and market share should rise rapidly.

Spinning mills then need to stake their claims and expand their own portfolio of yarns for the customers.
One thing is certain: market conditions will change. Challenges such as scarcity of raw materials, sustainability and increasing demand for textiles are present. They could once again provide the decisive impulse to a technology.

Air jet spinning: a research outlook

The following article provides interesting results on the research by iTV Denkendorf for anyone who would like to have a deeper insight of the air jet spinning topic.

More information:
www.rieter.com
www.buhleryarn.com
www.itv-denkendorf.de/en/

Air jet spinning: a research outlook

Besides studies of yarn produced on a Rieter J 20 Maschine, ITV Denkendorf has also conducted tests any analysis of yarn within the scope of its research of yarns for uses in industrial production on air jet spinning machines that still lie far in the future. It is though interesting for decision making today and important for establishing the direction of where air jet spinning could still lead. This report is addressed above all to spinning mills in the first instance, but then also to the textile producers in connection with the advantages and disadvantages of the spun yarn. Uwe Heitmann of iTV Denkendorf presented the initial results of three projects to the 16th Denkendorf Spinnereikolloquium (spinning colloquium).

In the foreground of the undertaking was the question concerning which fibres in the air jet spinning process principally allow spinning and at what limits, how the spin testers are to be set up and optimized in order to produce the commensurate yarn sample results. The spun yarn should then be compared with the respective ring and compact yarns to establish whether they are indeed suitable in principle for very specific unusual textile applications.

The studies were therefore intended to produce answers on how flexible the air jet spinning process was and which fibres could be spun considering their inherit characteristics. Specifically the question would be pursued on how large fibre mass, a Nm 7 for example and longer fibres of up to 180 mm behave in the air jet spinning process. However, one step after the other.

The study of the yarn

The study was of abrasion- resistant long staple fibres, carpet yarns and carbon-hybrid yarns (figure 1) in order to provide a certain range for the study as well as having other more unusual yarns. It was most important for the yarn to possess certain textile applications where it was expected air jet yarn and its characteristics would provide for an improvement in the textiles and/or in the economic efficiency of production of the textiles. The three analyses were conducted as cooperative industrial research projects (IGF).

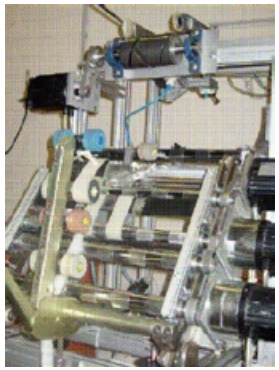
	Short title / IGF - No	Kind of fibre	Fineness of yarn	Fineness of the fibre	Fibre length
1	Finest yarn / IGF 16 674 N	Micro Modal Tencel	Nm 150 – 235	0,8 – 1,0 dtex 8 – 9 µm	34 / 38 mm
2	Abrasion-resis-tant long staple fibres / IGF 15 952 N	Wool Wool/PES Acryl	Nm 24 – 68	3,4 – 6,0 dtex 18 – 24 µm	80 – 150 mm
3	Air-Jet carpet yarns / IGF 16 883 N	PA	Nm 5 – 18	8 – 18 dtex 30 – 40 µm	80 – 180 mm
4	Carbon-hybrid yarns / IGF 17 107 N	Carbon/PA	Nm 2 – 10	Carbon / PA 0,7 / 2,0 dtex 7 / 15 µm	80 – 150 mm

Fig. 1: IGF Projects - *Source: ITV Denkendorf / Heitmann*

Wool and mixtures with PES and acryl with a fibre length of 80 – 150 mm were tested in respect of abrasion-resistant long staple fibres. The question behind this was whether these fibres processed into high quality abrasion-resistant yarns for seat covers for public transport. The second, and currently still ongoing project involves the air jet spinning of carpet yarns, meaning larger fibre mass in the yarn number ranges Nm 5-18(200-55 tex). This project is being conducted by ITV on cooperation with TFI. The third study was conducted for a very exotic application of air jet spinning: the processing of carbon fibres and the mixtures with PA: Such yarns find applications in components of fibre composites in light construction and the technology can also be applied using recycled carbon fibres.

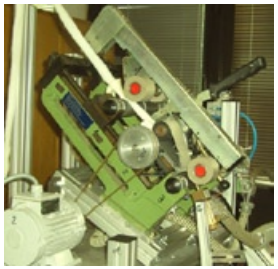
Set up of the spin tester

All three projects were conducted on special spin testers (figure 2). The drafting systems had been modified on account of the processed fibres. Channel rollers were partially used for the long fibres. The pressure on the print rollers needed to be lowered considerably e.g. for carbon.



Wool- / wool/PES yarn

3/4 cylinder drafting system with channel rollers for staple fibre up to 200 mm length



PA-carpet yarn

3 cylinder drafting system with channel rollers for staple fibre up to 320 mm length

Carbon hybrid yarn

3 cylinder drafting system with channel rollers for staple fibre up to 200 mm length

Fig. 2: Spin tester for the production of wool-, wool/PES-,carpet-, carbon- and hybrid yarn - Source: ITV Denkendorf / Heitmann

The three spin testers proceeded as follows: the long staple wool spin tester (left) had a 3 cylinder drafting system and was able to be rebuilt for spinning on a production line of a 4 cylinder drafting system. The flow of material was from bottom to top.

The average fibre length for wool was 80 – 100mm. the 3 cylinder carpet yarn spin tester (middle) for higher fibre mass has a 3 cylinder drafting system with channel rollers and was suitable for staple fibres of up to a maximum length of 320 mm length. PA fibres with a length of 130 – 170 mm were spun in this case. The carbon spin tester (right) with its electronic system protected against the charged fibres also had a 3 cylinder drafting system with channel rollers and was suitable for staple fibres of up to a maximum of 200 mm. the average fibre lengths were 80 – 100mm as was the case with wool.

The spinning nozzles needed to be adjusted in order to conduct the study (figure 3). Especially the length of the fibre guidance component needed to be altered being the component through which the fibres are directed into the zone of the spinning tip and the swirling air stream jets. For this purpose the fibre guidance component for the longer fibres was lengthened at the fibre inlet to 40 – 50 mm instead of ca. 10 mm for a short staple nozzle. The fibre guidance component has a decisive role to play as it determines how the twisting fibres are formed. The number of twisting fibres on the other hand has an effect on strength.

The number of swirling air stream jets needed to be increased and enlarged as well as the diameter of the spinning nozzles for the higher fibre flow rate for carpet yarn.

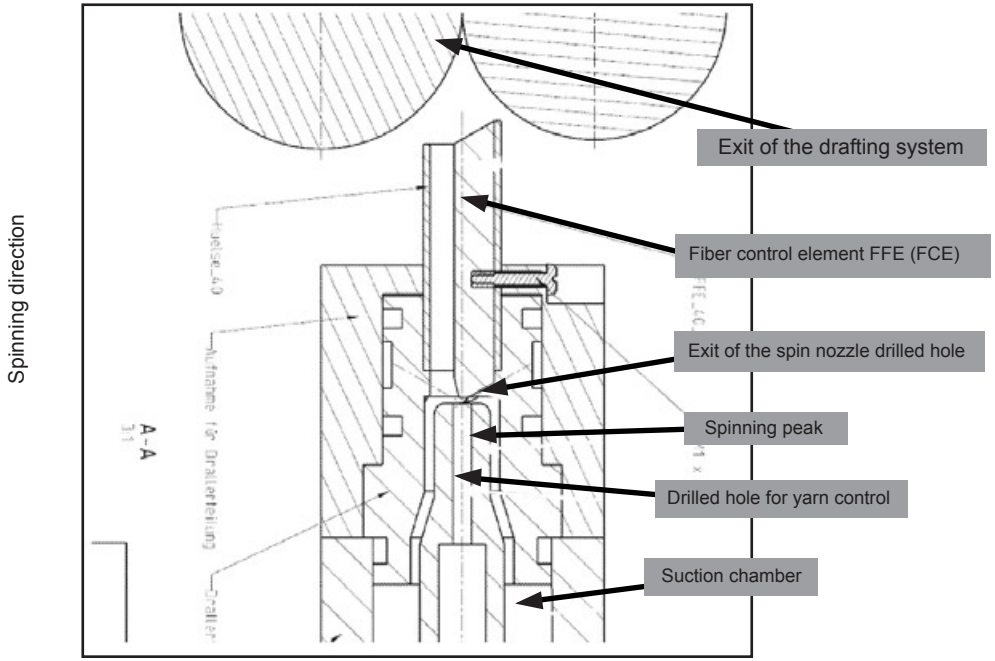


Fig. 3: Air jet carpet yarns / Cut through a spin nozzle, ITV self-build
- Source: ITV Denkendorf / Heitmann

Each type of fibre was spun at an air pressure of 5 bar. Air pressure has a decisive influence on the strength of the fibre. Lower air pressure always results in a decline in strength. The diameter of the spinning tip needs to be adjusted to the fibre mass correspondingly, so a diameter of 2mm was chosen for carpet yarn and carbon fibre. In order to have the higher fibre mass rotate with the titre 11dtex for the carpet yarn a considerably higher airflow was required, which was reflected in the number of swirling air jets.

The carbon hybrid yarn had the lowest fibre fineness at 7 my and 2dtex corresponding to 15 my for PA. At this fineness the air consumption does not need to be increased, leading to a much lower consumption of air per kg of spun yarn at a high volume flow. Fine fibres required a much higher air consumption as a result extremely low production. According to Mr. Heitmann research should be continued.

Yarn results

What does the yarn produced from long fibres look like? Yarns were spun just as successfully from the Finisseur spool as from the 4 cylinder drafting system as from the bands on the 4 cylinder drafting system with wool and its mixtures. Influencing factors on strength were studied, being among others the length of the fibre guidance component, the distance from the spinning tip to the fibre guidance component as well as the geometric arrangement of the jets to the exit from the drafting system.

Finally the yarns were compared for example a yarn Nm30 with ring yarn and compact yarn (figure 4). The strength and elongation of the air spun yarns is as expected in this case lower.

The aim of the project was the development of improved properties for public transport seat covers and in this regard results showed that although yarn strength and elongation were lower than yarns in the comparison, there were clear benefits from the air spun yarns with the lowest staff values, a lower hairiness and a lower curling tendency. Moreover the fundamentally favourable moisture properties of wool were again improved by the structure of the air spun yarn. The transport of moisture proved to be three times higher for this yarn structure than ring yarn.

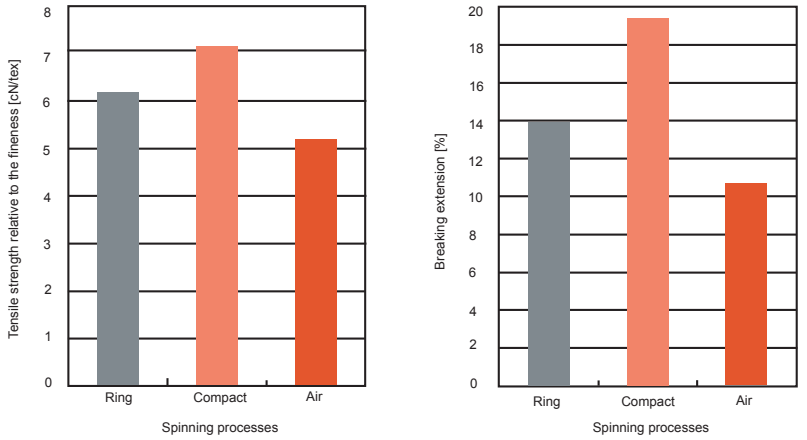


Fig. 4: Comparison of air jet yarn with ring spun yarn and compact yarn 100% wool Nm 30 - *Source: ITV Denkendorf / Heitmann*

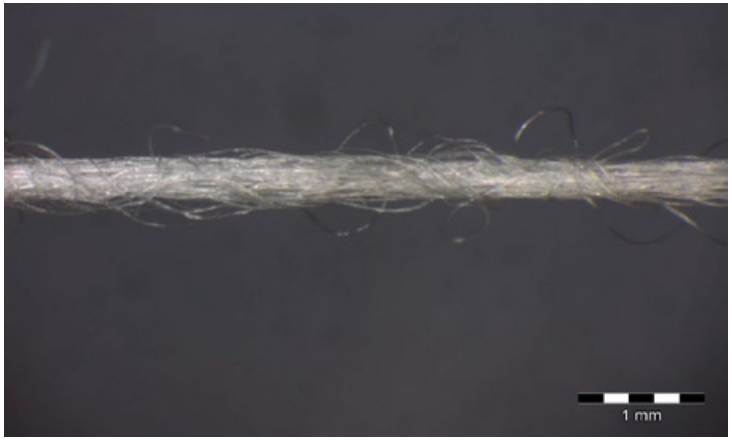


Fig. 5: Air jet yarn 100% wool / Macroscope.view of the yarn structure of air jet yarn - *Source: ITV Denkendorf / Heitmann*

It was noticeable that this yarn structure had a lower proportion of wrapped fibres than for finer yarns, the angle of wrapping is less uniform and the protruding hairs formed loops (figure 5).

In order to understand the processing of carbon fibres a short description of the processing steps follows (figure 6). The carbon fibres were then transformed in a shredding process on a Seydel shredding machine into staple fibres. The advantage here is that a more economic 50k carbon fibre cable could be used as this fibre mass is subsequently drawn to its finished fineness on two drafting passages on the gill box and mixed with the PA fibres to a hybrid composite. The actual spinning process then follows on the air jet spinning tester.

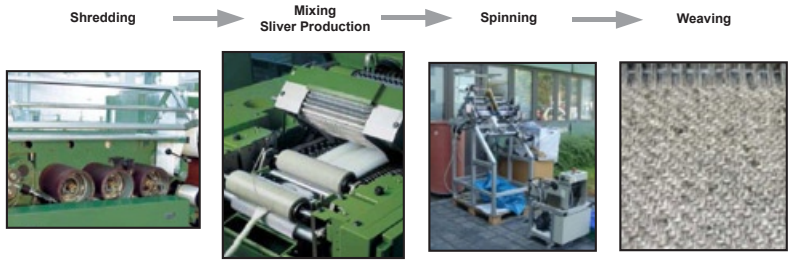


Fig. 6: Processing steps for the spinning of carbon fibres for components of fibre composites - *Source: ITV Denkendorf / Heitmann*

A characteristic of this process is the low transverse strength of the fibre and the abrasive property of the raw material. Mr. Heitmann described a fibre loss of ca. 15 % with this spinning process and also noted that the spinning tips wore out within a short period of time. His result was inconclusive: the very smooth carbon fibres showed very poor spinning properties for 100% carbon. This was markedly better when the PA was used as a carrier fibre. The strength of the hybrid yarn was not very high which was however of no significance due to its later application as a fibre composite component. The strength was however sufficient for the subsequent weaving process. Overall the higher proportions of wrapping fibres help to keep the strength of the fine yarns within a workable range, while the wrapping fibres tended to reduce for the rough fibres, causing a decline in strength. Air jet spinning provides the finer fibres with another big advantage.

Cellulose fibres demonstrated (see article “Is air jet spinning the future?“) that the fibre mass has an influence on the fibre sun rotation. This has the advantage that the delivery speed does not need to be reduced for finer yarn numbers. The finer the fibre, the lower the tensile strength and the higher the fibre sun rotation. Hence the advantage that the delivery speed does not need to be reduced for finer yarn numbers. It is necessary to reduce the delivery and consequently production by a third for ring spinning of fine yarns.

Summary

Mr. Heitmann once again emphasized in regard to the study results that the processes described were for research purposes and that the fibres were used solely to proof that fundamentally the process functions with these fibres. The choice of geometrics for the jets was also based on initial parameters within which the studies were conducted.

In conclusion he drew up the following summary of the observations from the four projects:

- Air jet spinning allows fibres to be spun across a broad spectrum.
- The geometrics of the jets need to be adjusted to the fibre material.
- The air consumption needs to be optimized especially for low fibre masses.
- The strength of the yarns is lower than ring spun yarns due to the yarn structure.
- The yarn structure offers advantageous usage properties.
- Fibres with a lower tensile strength can be spun at higher productivity.
- Most progress has been made in the processing of fine cellulose fibres for fine yarns.
- As there is no need for mechanical components to impart the twist, this process is excellently suited for PES yarns and all yarns with sensitive melting points.

We hope that we have whetted your appetite to find out more after this short excursion into the world of research and have shown you the great potential of air jet spinning, where there are still issues and in which areas results can be expected in the not too distant future.

More information: www.itv-denkendorf.de/en/

Three examples of 'Blue Competence'

by *Klaus A. Heinrichs*
Vice-President, A.Monforts Texilmaschinen,
Mönchengladbach, Germany

„Blue Competence" is an initiative launched by the German Engineering Federation (VDMA) to demonstrate the 'know-how' and it's experience for sustainable solutions.
Key 'points' of the campaign are technologies and products that conserve raw materials, reduce emissions and sustainably to improve the living conditions of people.
Three Monforts' examples show how innovative solutions for the future can look.

WE HAD no hesitation in participating in the VDMA's 'Blue Competence' initiative. Energy management has been one of our primary goals for many years, driving us to develop energy-efficient and resource-conserving solutions.
For many years textile finishing has operated with chemical and thermal processes which, by present-day standards, can have a very severe impact on the environment.

The energy costs are high, and the use of chemicals absolutely essential. But with innovative ranges and intelligent ancillaries, Monforts has succeeded in optimising these processes.
The savings benefits that we have achieved in recent years are in some cases, quite considerable.

Econtrol

During textile dyeing, chemicals are used to fix the dyestuffs on the textiles. Classic processes for the dyeing of cotton textiles, for example, includes 250 grams of salt per litre of treatment fluid. When calculated for three-shift operation, up to 500 t of salt is required annually.
For the dyeing and cleaning process with subsequent washing, a total of around 1545 kg of chemicals are required for dyeing processes. An immense amount of energy is also required for the subsequent drying process.

Together with Dystar, one of the leading producers of dyestuffs, Monforts has developed the Econtrol process for pure cotton textiles. In the process the dyestuff is fixed during and not after drying using a controlled chamber climate with 25% v/v steam; eliminating a complete steaming process. Now, only 20 gm of salt are required per litre. Furthermore, the dyeing result is available after just two minutes and not only after 12 to 24 hours.
For fibre blends (polyester/cotton), Monforts has developed the Econtrol TCA process together with Dystar. It enables polyester and cotton to be dyed simultaneously and not in two process steps as to date.
This is made possible by an innovative dispersion dyestuff that is alkaline-resistant and can be applied at the same time as reactive dyestuffs. When dyeing mixed fabrics, the use of chemicals can be reduced by around 86%, the use of water by 63% and the energy consumption by roughly 50%.

The ECO Applicator

The ECO Applicator is a unit which significantly reduces the initial moisture content before the drying process.
As a rule, the fabric is transported through a trough containing the finishing and dyeing liquor. The term ‘liquor’ is generally used to refer to an aqueous liquid in which textiles are washed, bleached, dyed and impregnated.

The ‘wet’ fabric is then dried by means of a stenter. The drying energy is a major cost factor.

In the ECO Applicator, the liquor is applied very thinly by steel rollers. As a result the new unit achieves a maximum energy yield - because moisture that is not applied to the textile fabric does not later have to be dried.
Savings in heating and electrical energy of up to 65% are possible if the initial moisture content in the textile is reduced from 70 to 40%.

MONFORTS - Finishing line

MONFORTS - ECO Applicator

Energy Tower and ECO Booster

The ‘Energy Tower’ is a stand-alone air/air heat exchanger for heat recovery. Thanks to its design it is a versatile and flexible retrofit module that enables even older ranges to benefit from the principle of heat recovery.
The module draws in the exhaust air from the drying process and returns it via heat exchangers to the range so that the air is preheated to around 90°C and only has to be heated to 150°C. The high drying temperature is therefore reached more quickly and energy costs are reduced.
The Eco Booster HRC can also help to minimise the energy costs when using stenters. By contrast with purely static heat exchanger modules, the new module actually cleans the stenter during operation; eliminating standstill times for maintenance. Only 100 litres of water are used for cleaning.

The Eco Booster permits a computer-controlled adaptation of the heat exchanger performance to the prevailing waste air stream. This optimised efficiency further reduces the process costs.
The Eco Booster runs fully automatically so that the operator has no additional duties to carry out.

MONFORTS - Energy Tower

Energy efficiency remains a challenge

The trendsetting Monforts technology continues to prove itself and recently left a long lasting impression at ITMA Asia. Asian producers have also recognised the 'sign of the times' and the importance of energy efficiency.

Energy efficiency is an important global topic with textile producers faced with the challenge of coming to terms with volatile energy and raw material prices and the ecological demands of retailers and ultimate users.

This is a great boost for the German textile machinery industry as a trendsetter and technology leader, and in particular for Monforts.

More efficient technology may cost more, but the procurement costs account for less than 20% of the life-cycle costs if you take the total costs for energy into consideration.

The payback period for the Monforts technology generally lies in the order of 18 months to two years. Any anyone who recognises that will decide even more quickly for energy-efficient and resource-conserving solutions.

More information:
www.monforts.com

Developments in screen printing in the context of modern printing operations

by ***Albrecht Gebhardt***

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Print quality is a topic in the area of screen printing nowadays more than ever before. The possibilities offered by screen printing have allowed the requirements of designers and consumers to increase.

This article therefore places special emphasis on engraving and printing techniques, as these are used as the essential basis for a good print.

Introduction

In the past few years, inkjet technology has become increasingly important for fashionable textile printing. Due to more capable printers and more cost-efficient processes, inkjet printing is currently experiencing a huge boom and developing into a production process.

This is having a positive effect on conventional rotary screen printing. The new design possibilities are having a positive effect on purchasing behaviour and have also led to a strong upturn in rotary screen printing.

Interfering and overlaid abstract patterns have become fashionable thanks to inkjet printing. In conventional printing, such patterns have to be separated and rastered at great expense and then printed with a high degree of precision. Digitally printed patterns are also transferred and later engraved. This places high demands on the entire process.

Separation method

All of Europe‘s fashionable textile printers work with two methods nowadays, i.e. both digital and conventional. Consequently, the two technologies are not seen as being in competition, but rather as mutually complementing one another.

Fig. 1: Conventional fashion printing, source: MD Gera

It is even common for prints that start life by being digitally printed in smaller quantities to then be engraved and printed conventionally for large follow-up orders for reasons of cost.
Almost all notable fashion printers in Europe now create patterns digitally and only proceed with engraving when orders are received.

This process produces a colour separation and pattern repeat during the creation of a digital print.
The separation traditionally takes place at a contract engraving company and the printer produces the different colour ways. It is clear that this method can lead to difficulties if the printer wishes to print the same pattern both digitally and conventionally. In order to align the print outputs of both methods to one another, it is important to simulate overlays and the dithering of the halftones that are given in the screen printing in the digital printing.

In addition, suitable colour space management is important, as the representable colour spaces in digital and conventional printing differ.

Stork Prints offers the possibility to satisfy these requirements with the modular bestIMAGE software.
This is a piece of CAD/CAM software which, in addition to separating and colourising, also controls engraving or can send calibrated files to a digital printer.

Engraving

The engraving technology is another important element for achieving good print quality in conventional printing. The traditional method of working with film and exposure to light has practically disappeared in Europe. Three technologies are used today. The jet technology sprays liquid wax or ink onto a coated screen. This serves as a mask during exposure and is washed out again during development. This technology can produce good results with halftone engravings, but edge sharpness, which is important for geometrical patterns and contours, suffers from various disadvantages. This above all affects ink systems, as these are applied cold and with low viscosity and therefore tend to bleed. Wax on the other hand is heated to approx. 110°C and cools suddenly when it comes into contact with the screen.

Amongst the digital engraving systems, laser engraving has been around the longest. Here, the lacquer is burnt off a coated and polymerised screen to form a pattern.

Important parameters for the engraving process are the rotation speed of the screens, the power of the laser beam, as well as its focus and cycle frequency, which determine the horizontal and vertical resolution. Engraving can be done in the fast spiral mode or cylindrically for geometric patterns. An important prerequisite for flawless results is the roundness of the screens.

Another established option is laser exposing technology or LEX for short. This uses a laser beam to expose patterns on a coated screen. The extreme perfection of this option offers the best engraving results, as it works with a very weak laser beam, which exhibits the least diffusion. In terms of reproducibility, however, it is much more difficult to use than the laser engraving technology. This is due to the much higher number of process steps. After rounding and coating the screens, they are dried. After that, they are exposed under yellow light with a laser beam. Next, the screens are developed by washing the non-exposed part. Only then is the remaining paint polymerised. This process therefore contains very many parameters that can influence the outcome. Above all, the lacquer plays a big role, as it has to be specifically matched to the wavelength of the exposure beam for optimal results. The diodes that generate the laser beam also gradually lose intensity over time, which makes daily calibration necessary. In addition, the coating thickness, the intensity of the washing, the drying and polymerisation conditions and the downtime between coating and exposure are important. Stork Prints offers all of the products necessary for the process, from lacquers to coaters, polymerisation barriers and developers.

In Western Europe, laser engraving is nevertheless the preferred method. It is reproducible as the lacquer is immediately polymerised after coating. More powerful laser beams are used, and the process is not so dependent on the thickness of the coating. This process also allows coated screens to be held in stock, so that re-engravings can be done at very short notice.
In order to increase productivity, modern laser engraving machines use powerful laser sources.

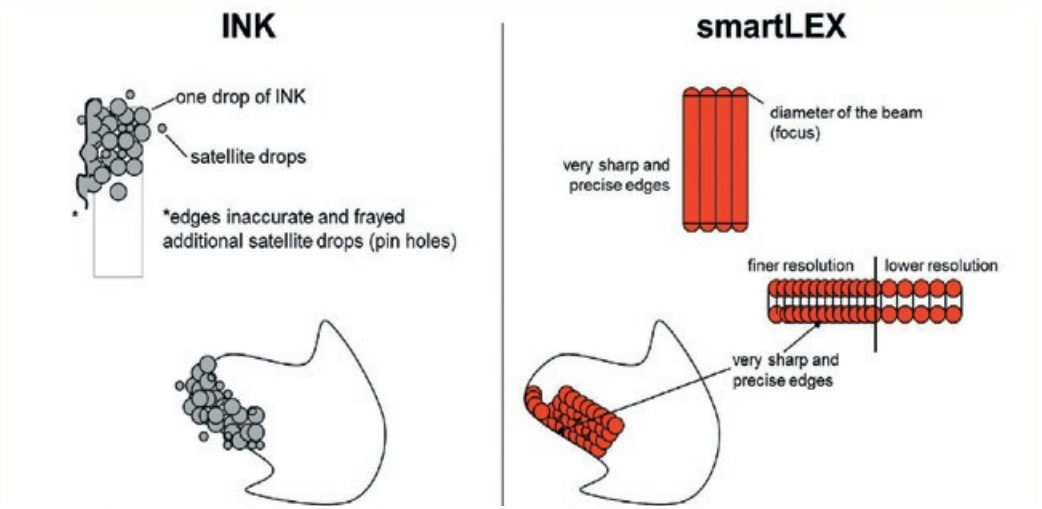

Fig. 2: Comparison of inkjet and laser engraving

For example, a 64 cm repeat screen measuring 1750 mm in width can be engraved with total coverage in about 20 minutes. The laser beam is no longer switched on automatically, but is controlled by a modulator at a frequency of 2 GHz. There is also the possibility of power modulation per engraved pixel.

This allows sharp edges to be produced in the fine line printing process. The laser source can be closed to avoid any permanent consumption of CO2. In conventional CO2 lasers, consumption is sharply reduced by catalytic converters.

Halftone printing

A lively and interesting print is noted for smooth and flowing procedures. In order to present halftones in conventional textile printing, the colour processes must be rastered. The halftone dot pattern should be fine and convey an overall halftone effect, even at close visual range. An important prerequisite for this is the fineness of the screen. In textile printing, the 195 NovaScreen with 16% open screen area has established itself for the finest of printing tasks. Finer screens are feasible (in the graphic area, Stork Prints delivers screens up to 405 mesh), but do not make much sense on a textile surface.

In addition to the screen fineness, it is also important to match engraving and printing to one another.
This is done by determining the correlation between the size of an engraved and a printed halftone dot (it is usual to work with linear halftones in textile printing, whereby the impression of colour is defined by the size of the dots). The flow behaviour of the paste and the capillary force of the substrate make a printed dot appear much bigger that the engraved dot on the screen.
The extent of the size difference also depends on the print settings and the type of screen. The result is that a raster separation is often set lighter in the CAD system during processing in order to obtain the desired result in the final print. The settings are then based on the sure instinct of the operator. Furthermore, engraving companies are often independent busi-

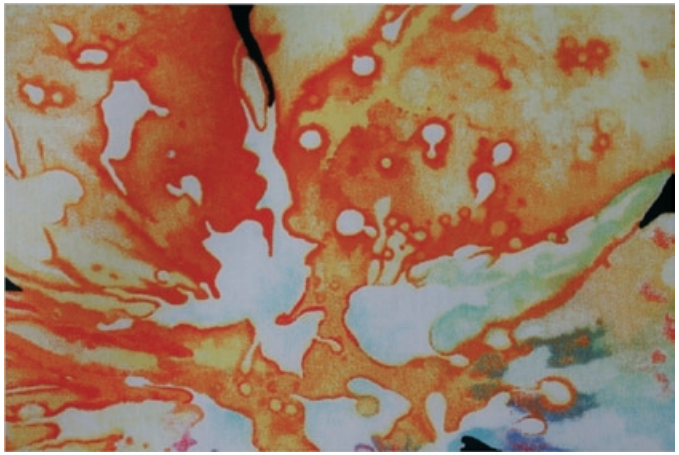

Fig. 3: Floral detail with Penta 125

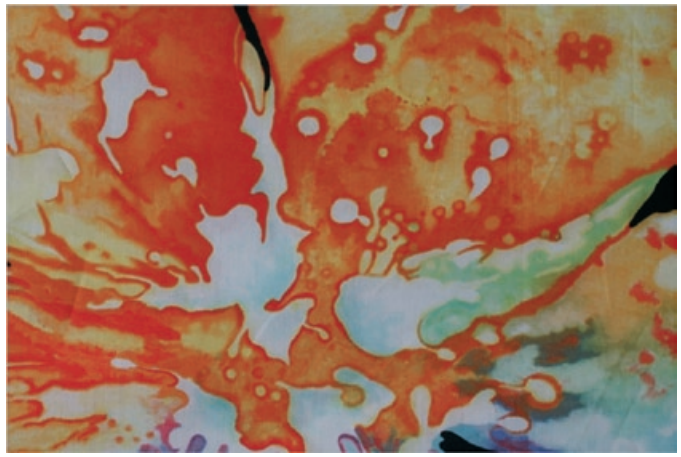

Fig. 4: Floral detail with Nova 195

nesses that work on contract for print shops, therefore making it difficult to define the relationship between engraving and print.
The print process calibration therefore offers itself as a better and more reproducible way to achieve optimum halftone effects.

A print process calibration first involves printing a greyscale, in which the relationship between engraved dot size and colour intensity is linear.
The smallest engraved dot corresponds to colour intensity 0, i.e. the colour of the substrate; the biggest dot size is so big that the screen is completely open and a full tone is printed. Printing this greyscale with lightness steps of 0-100% almost always produces a closed colour area from 40-50% open engraving because the printed dots flow out so wide that they completely cover the substrate.
Using software developed by Stork Prints, each colour intensity can be assigned a raster dot size. This is done in a halftone curve.
This calibration curve can then be used for all subsequent engravings that are printed in the same printing process. The result is that halftones can be printed long, flowingly and evenly graded. In addition, the halftone effects actually expected in the final print can be presented when working on CAD systems.

Halftone calibration is also important for another reason. If one wants, as mentioned at the beginning, to create digital patterns and then print conventionally, a halftone simulation based on this curve can already be used in the digital printing. The result is that it can be easier to adjust the digitally printed pattern in the conventional printing process.

Printing techniques

In the actual printing process, the screen plays a decisive role for the printed result as the carrier of the engraving and as a medium for the controlled delivery of the paste to the substrate. The requirements are high because, as described at the beginning, inkjet printing has set higher standards for print quality.

Screens are mostly described by the mesh number, the open screen area and the wall thickness. However, what is much more decisive for the printed outcome is the hole cross-section and diameter of a screen. That becomes clear when one considers that the paste from neighbouring screen holes should form a closed film for a homogenous covering of the substrate. If the webs between the holes are wide, a large hydrodynamic pressure must be built up in the screen, which causes paste to leak out; i.e. the paste is not exuded from the print form directly in the spandrel between squeegee or roller and screen, but slightly in advance so that it sticks to the outside and is pushed into the substrate as the screen continues to rotate and is squeezed to the side.
The consequence of this is a high degree of penetration into the substrate and poor micro-equality, which is also described as orange peel. It was therefore always the goal to design the web so that the paste can flow out more easily and flow together with the paste of neighbouring screen openings.

The development led to narrow and externally very strongly rounded web forms, which are characteristics of the Nova Screens and the innovative SP screens. Specifically, this means that work can be done with less squeegee pressure or with smaller rollers in order to achieve an even coverage of the substrate. That offers benefits for the printer in several regards. A more even surface pressure can be achieved, which in terms of colour impression is relatively more intensive than a print with penetration. That plays a big role above all with pigment printing, as less paste is used overall and thus fewer binders as well. Modern pigment recipes with good emulsifier systems allow 195 Nova Screens to be processed without problem nowadays. In trials with large batch jobs in Pakistan and Indonesia, a paste saving of 20-30% was substantiated at printers compared to Penta 125 screens for the same, colorimetrically measured colour intensity.

This saving can be traced not only to the web form, but also to the size of the hole openings in the various screen types. Poiseuille's law describes the theoretically expected volume that flows through a pipe of length l and radius r. If the equation is applied to screens, the results arrived at differ from the usual calculations of wall thickness x open screen area, as in this equation the radius is the most important parameter to the power of four. Accordingly, a Nova 195/16% (hole size 52 microns) delivers less at otherwise identical print parameters than a Penta 125/15% (hole size 79 microns) and thus underscores the savings potential for pigment printing.
In reactive printing, by contrast, the aim is often to achieve very strong or complete penetration into the substrate for fashionable qualities.

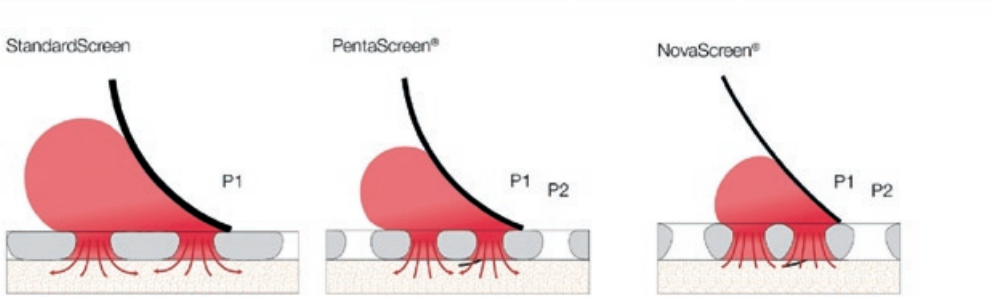

Fig. 5: Evolution of the screens

$$Q = \frac{\mathrm{Pr}^4}{8\eta l}$$

Q= Volume flow (paste quantity)
r= Hole diameter
P= Pressure difference between beginning and end of the pipe (=_/r)
_= Dynamic viscosity
l = Length of the pipe (screen thickness)

Fig. 6: Poiseuille equation1

Here as well, the Nova Screens have established themselves as an industry standard in Western Europe. Large backgrounds or printing methods that need complete penetration are printed with Nova 135, which has a 22% open screen area. Finer separations on voluminous Single Jersey qualities are primarily printed with Nova 165 Mesh, which has a good mix of fineness and permeability with 19% open screen area. In order to enable even greater fineness for the printer here, Stork Prints introduced a 195 Mesh Screen with 19% open screen area at the last ITMA in Barcelona.

In addition, there are new developments for screens intended for the use of effect pigments. These are noted for their very high open screen areas and thicker wall thicknesses.

Moiré

Moiré is a well-known phenomenon in textile printing. It describes the interference between the overlaying structures. If a line halftone is used to present halftones, moiré can form between halftone and screen or between halftone and substrate structure. The effect occurs when the engraved halftone dots fall precisely on the screen holes with regular repetition and are slightly displaced in the gaps in between. This effect occurs above all in the light halftone area, where the engraved halftone dots are smaller. It then produces a light/dark effect that appears in the form of waves or lines.

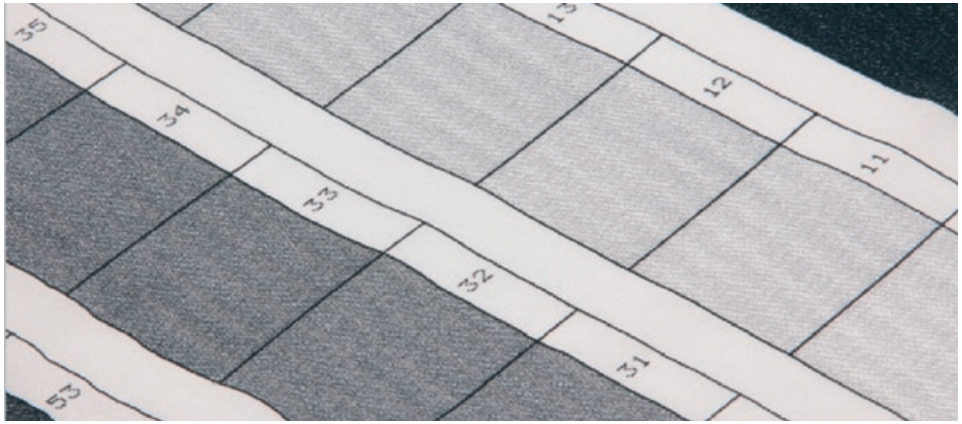

Fig. 7 Moiré

Open substrates such as CV-Georgette or substrates with a subtly marked weft structure such as CV-Javanaise can produce the same effect.
This also occurs with very fine full tone patterns, when, for example, a web or wooden structure is printed as a separation. This frequently produces rosettes, in which a dot is surrounded by a regular circle of dots.

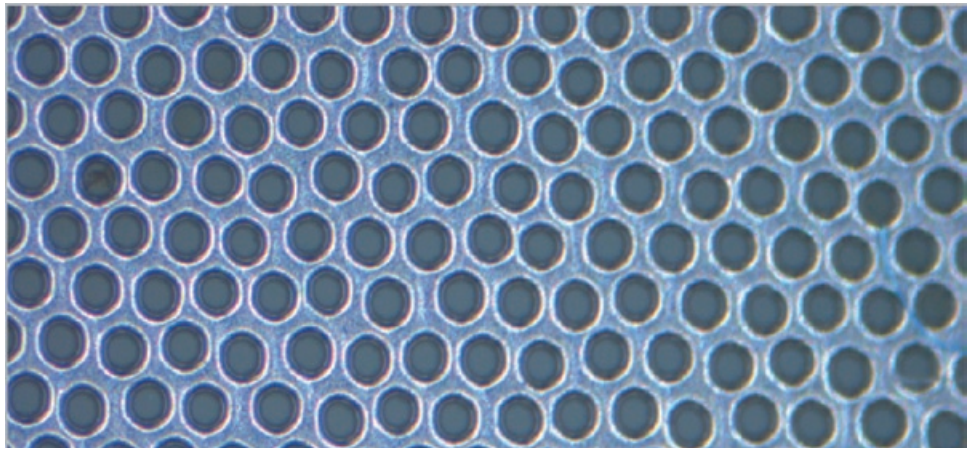

Fig. 8: Random Mesh Screen RM125

In response to this problem, Stork Prints introduced a screen in which the arrangement of the screen holes is slightly disorderly. The holes are no longer in dead straight lines, but slightly offset. This new RM125 (Random Mesh) screen can suppress the problems mentioned above.

More information:
www.spgprints.com

Combined technologies open up more opportunities

KARL MAYER's IOM-Double technology improves efficiency in denim production

by *Ulrike Schlenker*

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In the clothing sector, denim is an indigo blue "evergreen". This tough, twill fabric is normally dyed with C.I. Pigment Blue 66 and C.I. 73000 in the Colour Index, and is produced by processing undyed weft yarns with ring-dyed warp yarns.
Ring dyeing is a characteristic feature of denim production. In the conventional process, the yarns are either processed as a hank (rope) or spread out next to each other (slasher) and only the sheath is dyed. The dye is applied in several treatment stages.

This process, which is still used in traditional denim production, is carried out nowadays using the latest machine technology, and KARL MAYER is the leader in producing the processing machines.

This European manufacturer supplies high-quality, innovative machines that consistently meet the changing challenges of the market and develops both economical and ecologically sound preparatory machines for the weaving sector. KARL MAYER always takes into account the economics and end-uses when working on new innovations. For example, many different, flexible, optional application techniques are integrated into the machines to enable the customer to react flexibly to different market requirements.
The different chemical methods for finishing the yarns, such as a caustic treatment, dyeing and sizing, offer a huge potential for increasing the efficiency by developing synergistic processes and combining processes within the denim processing chain.

PRINCIPLES: the ROPE- and SLASHER-DYEING process

Nowadays, different functions and processing steps are integrated into the weaving preparatory processes to increase quality, flexibility and economic viability. Combining the key processes of dyeing and sizing has proved to be very effective. Depending on the make-up of the yarns, the semi-continuous, open-width dyeing/sizing process, known as the SLASHER-DYEING-Process (Fig. 1), and the discontinuous hank/rope dyeing with subsequent sizing, known as the ROPE-DYEING-Process (Fig. 2) are used in denim production in practice.

The first step in the SLASHER-DYEING-Process involves producing beams by winding 300-700 parallel yarns being fed from packages.

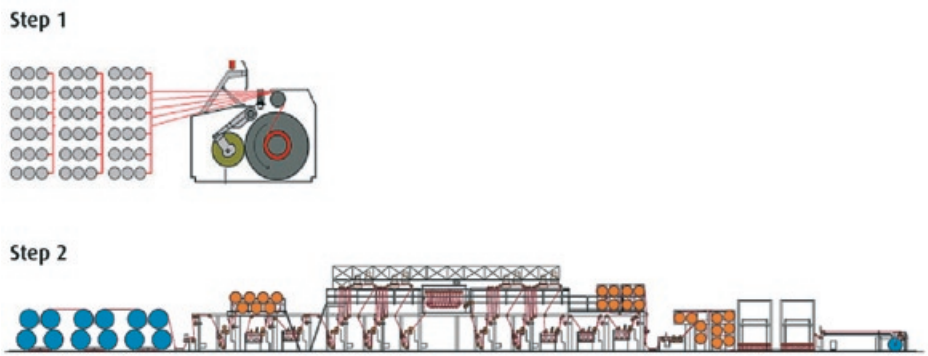


Fig. 1: Processing sequence in SLASHER-DYEING

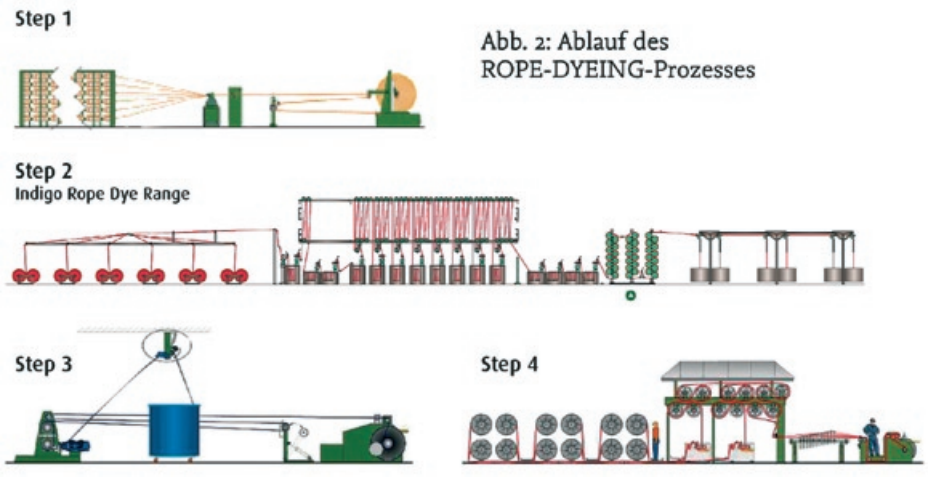


Fig. 2: Processing sequence in ROPE-DYEING

In the next stage, the yarns from 8 to 24 beams are then taken off together under a controlled tension and passed through the dyeing and sizing section. At the end of this process, the yarns are wound together onto a weaving beam.

The ROPE-DYEING-Process also begins with taking the yarns off packages. In the ball warping process, the individual yarns are combined to form a rope, which is then wound onto a yarn carrier known as the ball. The next stage involves dyeing. In this process, 12 to 36 balls are taken off under a controlled tension and fed to the dyeing section as ropes and are subsequently coiled into cans.

The ropes are then opened out and the yarns are wound next to each other onto a beam. From 8 to 24 beams run together under a controlled tension through the sizing machine. The final weaving beam is produced by a beaming/winding process.
Both of these dyeing processes have pros and cons (Fig. 3), but they do offer the potential for optimisation if they are joined together. KARL MAYER successfully faced up to this challenge by developing the IOM-Double technology.

	SLASHER	ROPE
PROS	Continuous process: 1 stage production process from the back beam to the weaving beam	Discontinous process: 3 stages up to production of the weaving beam (dyeing, long chain beamer, sizing)
	Count range Ne 5-50	Produktion capacity 24 ropes - based on dyeing machines processing up to 22 million metres
	Ø production speed 32-35 m/min (per annum)	Color depth up to 5,5%
	Lower energy requirements (optimized drying technology)	Immersion length 9m
	Space requirements	
	Climatic control thanks to temperature-controlled air oxydation	
CONS	Produktion capacity: 9-11 million metres	Limited count range Ne 5-24
	Color depth up to 4,5 %	Dyeing without climatic control
	Immersion length 6m	

Fig. 3: Advantages and disadvantages of the SLASHER- and ROPE-DYEING processes

The IOM-Double combines the two technologies

KARL MAYER's IOM-Double technology is based on the processing sequences of SLASHER-DYEING but has the productivity advantages of ROPE-DYEING.
This innovative machine concept has been used successfully in Turkey in particular for some years. Textile companies benefit from maximum production capacities of up to 22 million dyed metres, i.e. the production equivalent of 24 rope dyeing machines, and at the same time, the energy required for steaming and drying is reduced considerably. This can be reduced by as much as 20%. The economic and ecological benefits are the result of improved heat transfer and reduced energy losses.
The interaction between optimum yarn loading, excellent flow-through patterns and a high dye affinity, together with the specific working width in the dyeing section, also results in an excellent product quality. The process guarantees homogeneous dyeing properties as a function of time, and uniform dyeing across the working width (on the right, in the centre and on the left). The yarns are also transported and wound without becoming entangled.

High production capacities for yarns having counts of Ne 5-40 can be guaranteed by combining KARL MAYER's latest SMR-2-box sizing system with a second, synchronised beam winding unit.

The IOM VARIO DOUBLE application system

The possibilities of maximising the potential performance by using the IOM-Double technique can be exploited even more effectively by using the IOM VARIO DOUBLE application system.

This innovative application system was developed by carrying out detailed, empirical studies of all the SLASHER- and ROPE-dyeing machines available on the market, involving techniques from traditional nitrogen dyeing to reactive dyeing. Analyses carried out on site showed that all the processes take place under the same, specific, usable processing parameters.
In the last few years, the IOM VARIO DOUBLE application system has proved itself well in practice and has become widely established. Nevertheless, the flow patterns and operating principles of this innovative technology have been optimised recently to ensure that it can be used flexibly and for specific processes for maximum efficiency.

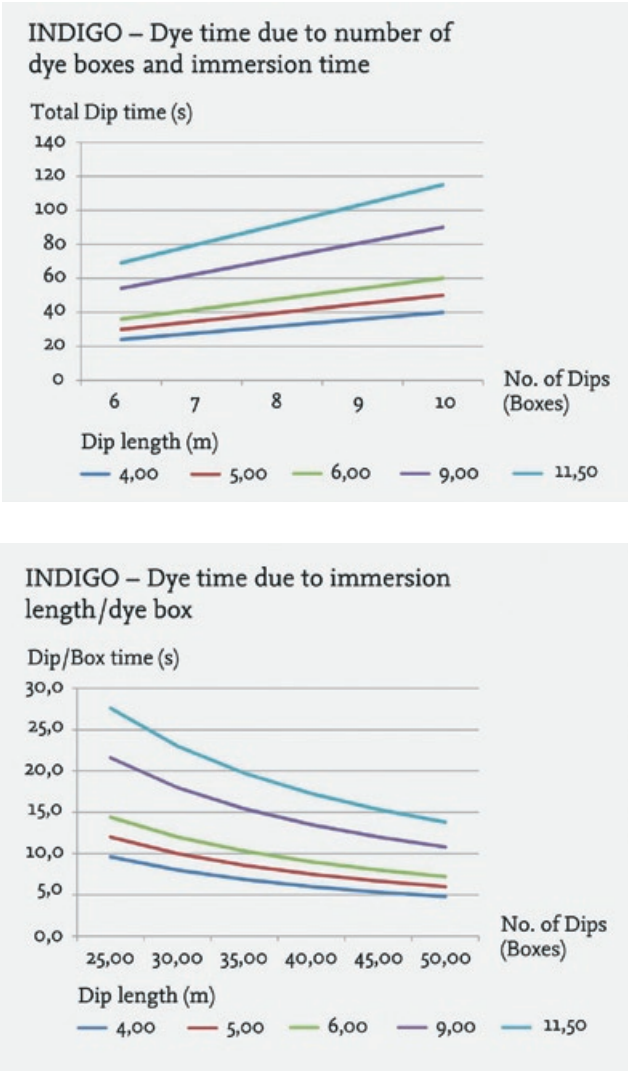


Fig. 4: Dyeing time as a function of the process parameters

In denim production, the IOM VARIO DOUBLE application system with specific immersion lengths of 1.5 m to 11.5 m and the appropriate processing times during pretreatment and dyeing enable indigo dye depths of up to 5.5% to be achieved. Until now, this could only be achieved using ROPE dyeing technology (Fig. 4).

Improved handling, reduced cleaning times, stable liquor baths during machine downtimes, thanks to an integrated system for raising the immersion roller, and reduced chemicals consumption, thanks to efficient liquor exchange at the textile material, round off the package of advantages offered by the IOM VARIO DOUBLE application system.

An indirect heating system is also integrated into this innovative process technology as standard. The energy source can be optionally used as a cooling system and enables a range of dyeing techniques, such as cool indigo and hot reactive, sulphur and indanthrene dyeing, to be carried out flexibly.

The integration of ancillary systems also enables the processing quality to be improved in terms of dye diffusion and penetration, and material transport. These include a steamer, contact and radiation driers, and harmonised squeeze roller pairs operating at 100 kN with roller diameters that have been mathematically optimised. The finely adjusted roller combination guarantees uniform transport of the material, and avoids variations in the circumferential speed at the textile material to produce a yarn assembly that has no crossed yarns.

Summary

A characteristic feature of denim production is that it is still carried out using traditional methods, but this can now be done using highly innovative technical systems. The result of this modernisation is that production can be carried out more efficiently, using fewer resources and more accurately, i.e. with better reproducibility.

For many years, KARL MAYER has been making a name for itself as a pioneer in developing preparatory systems for weaving jeans fabric in particular.

By developing the IOM DOUBLE dyeing and sizing technology, this company has successfully made an effective contribution to increasing economic viability and reducing the environmental impact by combining the technologies in a targeted manner.

Until now, those people in the sector who believed that indigo dyeings of up to 5.5% could only be carried out with reproducible results and at large capacities of approx. 15-20 million metres of dyed fabric per dyeing unit by using a rope dyeing machine, would change their minds if they saw the results of using the IOM DOUBLE in practice.

For more information:
www.karlmayer.com

Magna shows greatness – and relies on Groz-Beckert

Magna is the most diversified automotive supplier in the world, employing more than 102,000 people. The Austro-Canadian company based in Aurora, Ontario was founded in 1957 by Frank Stronach. At the same time the company began with the development and production of deep-formed automotive carpets.

Subcompact cars like the BMW Mini are steadily gaining in popularity.

Lower weight, finer gauges

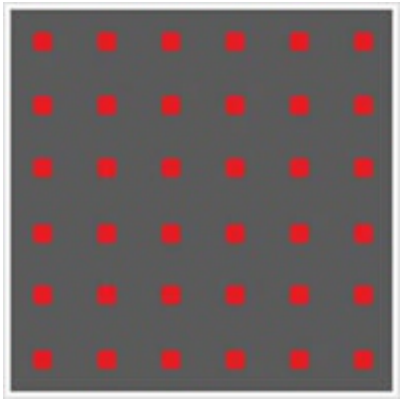
Magna has progressed rapidly with the development of automotive carpets over the past ten years. Once the gauge 1/10“ Cut Pile with weights greater than 400 gsm was the leading standard product, but today, on the initiative of the OEMs, the standards are considerably higher. Higher, in this regard, means reduced weight and finer gauges.

Specifically: weights lower than 300 gsm and gauges of 5/64“. Over the past years Magna has mastered this challenge in cooperation with leading raw-material producers like Colbond and Aquafil, as well as Groz-Beckert. The result of this cooperation is the new automotive carpet class of SMARTTUFT®.

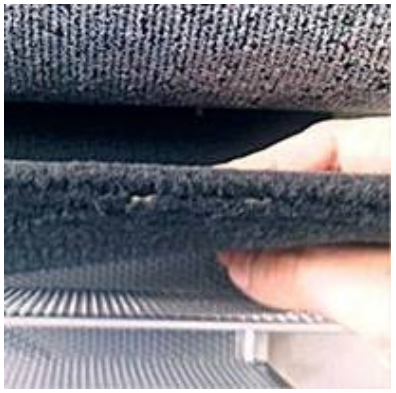
SMARTTUFT® – The benefits at a glance

- Up to 50 percent weight savings in relation to standard tufts – through improved use of the gauges
- Improved quality level – best possible covering power
- No breakage on round areas
- Clean edges
- Increased customer satisfaction – thanks to easy-care handling
- Fully in fashion – especially for smaller cars

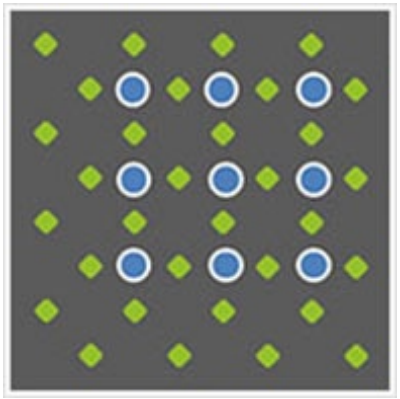
The newly-developed floor carpet class SMARTTUFT® is totally suited to the changed requirements of OEMs. While new vehicle registrations in the midsized car segment are stagnating, compact models such as the VW Golf and Opel Astra – and many other compact and subcompact models - are very much in demand. In 2005 the proportion of compact and subcompact vehicles in relation to new car registrations in Germany still lay at around 20 percent – today it is sharply higher than 25 percent. And in other countries the market share is even higher! In 2011, including trucks and busses, over 80,000,000 automobiles were produced. Since 2009, the biggest producer has been China, where traditional demand has been more in favor of smaller vehicles.



Standard tuft – linear needle arrangement



Standard tuft
• breaks on round areas
• Unattractive



Optimized tufting process
• staggered needle arrangement
• Optimal gauges
• Result: high covering power

Optimized tuft
• No more breakage
• „Line effect“ eliminated
• Clean edges

The Groz-Beckert Tufting System

This increase in popularity has been accompanied by a further development: despite their compact dimensions, many small car models are requiring premium quality where their equipment is concerned. SMARTTUFT® fulfills these requirements, combining excellent material properties with attractive profitability.

Further reduction in floor weights and the optimization of the methods used to achieve this constituted the main focus of the cooperation between Magna, Aquafil, Colbond and Groz-Beckert.

The Groz-Beckert tufting system

Groz-Beckert tufting systems are optimally tailored to the quality requirements for SMARTTUFT®. On the basis of this, worldwide partners in the industry and also leading tufting-machine producers receive tailormade gauge parts: from the patent-protected needle module (pat.-no. EP 0 976 860 A1) and the reed finger module to the newly-developed cut pile modules and tufting knives.

For more information:
www.groz-beckert.com

Innovations & Improvements

Part 5: Textile Chemistry

With our six-piece series Innovations & Improvements we mainly want to give you an overview of the respective status of technology.

In the 5th part of our Innovations and Improvements series textile chemicals is the subject that promise new developments, as there is hardly an area working so focused on material improvements as that of textile chemicals. These developments rely decisively on several factors simultaneously: the mega trend of sustainability with its aspects of energy savings, the reduction of CO2 footprints for individual textiles and above all the preservation of valuable water resources, the stricter guidelines such as REACH, the growing readiness to create and use materials suitable for recycling and finally not forgetting the ambitious plans of the latest Chinese FYP in regard to the protection of the environment.
Let us begin with textile chemicals and by so doing a heavyweight of the industry.

Clariant

The Swiss company **Clariant** had presented 25 new products at the ITMA 2011 in Barcelona under the motto „Performance that innovates – Innovation that performs“, of which many had the goal of improving sustainability in production. For example, new elements for sustainable acid dyes like Nylosan® Brilliant Red S-3R belongs to the presented innovations, which Clariant describes as follows: „**Nylosan® Brilliant Red S-3R** is a novel, high build-up and wetfast acid dyestuff for brilliant neutral red shade on PA and WO. Higher build-up on PA or WO than any dyestuff of similar shade. High wetfastness level, also in dark shades, on PA and on WO, equal or even better then is possible with reactive dyes. Perfect fabric appearance on wool, showing no differentiation between wool root and tip.” Or the **Diresul®** range, sulphur dyes in disperse form with high chlorine fastness. The dyes are suitable for PES/CEL dyeing, **Diresul® D** are specially indicated for workwear articles. Neutral pH dispersed form, suitable for dyeing 100 % CO as well as PES/CEL blends in continuous applications. More advantages are the higly concentrated, sulphide free elements and the high chlorine fastness.

Even more sustainable appears the **Imerol® BLUE liq - Blue Magic Process**, an all-in-one bleaching auxiliary based on the exclusive Singulet Bleaching technology. Imerol® BLUE liq opens new perspectives for the exhaust bleaching.

Clariant announces that the process reduces the water consumption up to 75% in pretreatment (no rinsing needed after the bleaching), but generates extreme absorbency, prerequisite for a perfect dyeing. It reduces the effluents load (COD, BOD, TDS, etc.) and effluents volume, allowing a higher production with the same water treatment capacity. And it is APEO and phosphorus free.

With the **Nuva® N series** the company developed an alternative solution for repellency using C6 fluorocarbon instead of C8 for a wide range of aplications. The Nuva® N products are PFOA-free (below limit of detection). In September 2012 Clariant has increased its capacity to produce this next-generation fluorochemicals at its plant in Gendorf, Germany. With an investment of 8 million euros supporting C6 chemistries, the plant will support new lines of Nuva® products and expand options for customers who are increasingly making the switch from traditional C8 products.

For many years the common chemistry for fire proofing man-made materials was organic halogen based like HBCD or DBDO, but this ingredients are more and more banned by many regulations and countries. The new **Pekoflam®** products of Clariant are halogen free solutions. They strive on addressing today’s ecological challenges and fulfilling even stricter safety regulations.

Pekoflam® contains inorganic phosphorus salts for durable finishing effects and organic phosphinate salts for semi-durable effects. For example **Pekoflam® ECO liq** is a phosphorus/nitrogen compound especially suitable for cotton, but also with good performance on blends with up to 35 % synthetic fiber content. High dry cleaning and wash durability levels can be achieved by thermoset treatments at 180 – 185°C, but appropriate selection of reactive dyes can be necessary to control shade and fastness levels. And **Pekoflam® HFC p** is an organic phosphorus/nitrogen compound with excellent performance on synthetic materials.

The **Foron® S-WF** range of dyes includes three new shades: *Turquoise* for bright greens, *Vermillion* for breight reds and *Atlantic Blue*, a greenish blue dye as a metamerism element.

The new **Foam Eco Care** finishing for cotton fabrics has been described by Clariant as a new benchmark in wrinkle-free finishes. The foam-based application improves fabric quality, cuts down production processes and generates benefits in saving water, energy and time. Because the foam has less wet uptake, the fabric dreid faster using foam and the dwell time can be 25% less than using pad application. While tensile and tear strength are equal to pad apllication, the foam application has much superior flex abrasion.

Clariant sees **Quiospheres®** as one of the most important products they had presented on last ITMA in Barcelona. Quiospheres® is a high strength, high performance effect in cosmetotextiles that generates wellness and well-being to the consumer through state of the art cosmetic microencapsulation that can be applied to any fabric. The product was developed together with **Lipotec SA**, a Spanish company that researches, designs and produces advanced active ingredients and delivery systems for cosmetics. Beside the high quality ingredients, the cosmetic effects are released towards the skin through a unique two-step technology. The first step is the ‘transphere’ of the microcapsules from the fabric and the second step is a proven gradual relesase and ‘transphere’ of the cosmetic ingredients caused by a reaction or actiovity of the natural skin enzymes with the microcapsule shell’s components, allowing the ingredients to be delivered to the skin. Once the product is warn and comes into conatct with the skin, the release of the cosmetic ingredients begins and the feeling of well-being starts, too. The ingredients are long lasting and the fabric has a high wash resistence which leads to the result that the microcapsules remain effective through 20 wash cycles. A real advance in cosmetotextiles.

Sanitized® T 22-27 is a real alternative to products containing triclosan. It stands out through a comprehensive effectiveness against bacteria and fungi. The Swiss SANITIZED produces the product and Clariant distributes it. SANITIZED describes the product as very cost effective. The Sanitized T 22-27 can be directly added when dyeing with dispersions dyes to PES as well as with acidic and metal-complex dyes on PA. It can be applied on package dyers as well as cross-round bobbins or warpers. Also an application in a top dyer is possible. The performance ios excellent and highly wash resistent, which is a real plus particulary with sportswear.

For its **Advanced Denim process** Clariant has been awarded an EU Ecolabel for denim in February 2012. The award is considered one of the highest certifications, acknowledging that all stages in the production of a finished article have met the EU's stringent environmental protocols. Clariant's Advanced Denim technology has simplified the finishing and dyeing of a fabric that accounts for some 14% of global cotton production.

In the conventional denim indigo dyeing process, the fabric passes through a line of 10 to 14 vats, depending on the equipment used. Clariant's Denim-Ox process brings this sequence down to 4, and its Pad/Sizing Ox reduces this further to just 1 vat. Both methods utilize the company's Diresul® RDT dyes, which generate a broader spectrum of shades than usually associated with conventional indigo dyes but without its environmental problems.

The advanced Denim concept is designed to work using mill's existing equipment and inspired the German textile machine manufacturer **Karl Mayer** to cooperate. Both companies have combined their specialist knowledge of denim and have concentrated attention on integrating the convential ring dyeing process. Karl Mayer has revamped and refined ist existing systems and, as a result of work done by the chemical company, is now offering ist **INDIG-O-Matic** machine based on Clariant' s Pad/ Sizing Ox dyeing process.

Coldblack® is a special finishing technology for textiles which reduces heat build-up and provides reliable protection from UV rays. Due to the coldblack® finish, a large part of the infrared heat rays are reflected. When exposed to sunlight, the heat absorption can thus be significantly reduced. When applied to clothing this means that the wearer perspires less, feels better and is capable of greater performance. The coldblack® technology guarantees a minimum UPF 30 protection when applied to any textile* in any color without affecting the look or feel of the product. As a result, textiles with coldblack® can make an effective contribution to protecting against harmful UV rays.

Clariant and Schoeller, a Swiss company specializing in innovative textile technologies, helped US-based sports performance brand Under Armour to develop its latest coldblack® sportswear collection which displays advanced UV protection and reflection. The new collection was launched in March 2012. For the collection some 144 separate coldblack® formulations have been developed until the end of April and will be supplied for ranges that include 100% knitted and woven polyester fabrics, as well as blends with elastane and polyamide, in an extensive range of colors.

In June 2012 Clariant launched the new fluorine-free water repellent **Arkophob® FFR**. The new agent is an exclusive proposition for retailers and brands, bringing together two previously unattainable benefits - fluorine-free chemistry and long-lasting, high water repellence performance. Arkophob FFR offers superior water repellency levels to existing fluorine-free products available on the market and close to C6 fluorochemicals. To recover the water repellency after laundering, an ironing is not necessary. Arkophob FFR can display a wash resistance of more than 20 washes and the product offers better resistance to abrasion and tear. The technological properties of the treated fabric are improved tear strength and ensuring better resistance to abrasion and better sewability.

One of the latest innovations of Clariant is a new service called **ONE WAY**. Clariant announced that acording to Textile Exchange, an estimated six million tons of textile chemicals is used each year, making the environmental impact of textile processing a global issue.

Textile waste occupies nearly five per cent of all landfill space, with one million tons of textiles ending up in landfills every year. ONE WAY will offer mills, brands and retailers a systematic methodology to measure the impact of their textile solutions on the environment, resource and climate based on a three-step process.

Step one is the product selection based on eco-standards requirements. Customers can choose from a wide range of products, developed and pre-tested by the company against more than 15 of the industry's most stringent environmental and consumer safety standards. In step two textile manufacturers can narrow their selection of potential products to the process group that best fits their environmental focus, whether this is CO2 emissions, savings in water or energy or the amount of waste water generated. And step three is the solution selection based on cost & eco-benefits calculations. The calculation tool will allow customers to make an informed decision by delivering the overall cost and performance profile – including dyes, chemicals, water, energy and time – and the impact of each textile solution against key ecological performance indicators, such as chemical oxygen demand, biological oxygen demand, CO2 emissions, energy and water. The calculation software tool will be the cornerstone of the ONE WAY toolbox. It is currently in final testing phase and will be available by January 2013, Clariant says.

More innovative processes and products can be found on the Clariant textile chemistry website at http://www.textiles.clariant.com.

Huntsman

Another leading global provider of high quality dyes and chemicals to the textile and related industries is **Huntsman** from the USA. Huntsman signed the United Nations Global Compact in 2011 and is a member of the Sustainable Apparel Coalition since 2011.

Current information of March 26, 2012 shows how Huntsman brings the vision for more sustainability to life. In a strategic partnership with the textile manufacturer Ramatex from Malaysia the partners want to take the first step and eliminate the discharge of hazardous chemicals in their manufacturing processes. The project shall support the sports item giant Nike in the realization of its roadmap 'Towards Zero Discharge of Hazardous Chemicals'. Nike had promised this in public together with five further large brand name companies as a reaction to the ‚Dirty Laundry-report of the environment organisation Greenpeace in July 2011. Ramatex now takes on this challenge as one of the first textile producing companies together with Huntsman.
Not really new but still innovative is the **AVITERA SE** product line. AVITERA SE dyes help significantly reduce water and energy consumption and CO2 emissions since dyeing and the washing-off process never exceeds 60°C. With only five percent or less unfixed dye needing to be removed, instead of the usual 15 to 30 percent, the number of rinsing baths to obtain the required fastness properties is greatly reduced. This is possible thanks to a higher diffusion speed and a very high fixation rate close to the exhaustion rate. AVITERA SE dyes save time, energy and water in all steps of the dyeing and washing-off process – in total about 50 minutes compared to a conventional dyeing cycle. The clearing additive designed for AVITERA™ SE is **ERIOPON® LT** which is highly efficient and ensures fast removal of the unfixed dyes at 60° C.

Together with **DuPont** from the USA Huntsman has launched **OLEOPHOBOL® CP-U** that delivers maximum performance with minimum environmental footprint for the automotive and upholstery segments. Huntsman and Dupont say that the benefits from OLEOPHOBOL® CP-U are a superior oil and water repellency with high durability and an outstanding soil- and stain-release performance. The result are finishes that help avoid fabric stains, save time, dry quicker and save energy. Fabrics treated with OLEOPHOBOL® CP-U can qualify to carry the **Teflon®** hangtag. With Teflon® fabric protector, fabric durability endures and stains become history.

Huntsman Textile Effects and **HeiQ**, a Swiss high-tech company developing and producing high performance sustainable effects for textiles, have announced a strategic business alliance with the launch of **PURE**. Based on a unique technology, PURE by HeiQ is a high performance silver antimicrobial which harnesses the power of silver to effectively achieve the highest odor reduction efficiency with minimal dosing. This superior technology is applicable at the finishing stage by padding (HeiQ PURE TF) on all fibers and fabric types, except wool.

The technology is engineered with a silver microcomposite which brings long-term protection and freshness to the textile for more than 100 home launderings. The antimicrobial textile effect makes it possible to keep garments odor-free by inhibiting the growth of odor-causing bacteria; a desired consumer benefit in socks, activewear, workwear and many other end-use markets.

http://www.huntsman.com/textile_effects

BASF

BASF offers textile chemical solutions that cater to the entire textile value chain process, which includes pre-treatment, dyeing, printing, finishing and coating. At every step throughout textile processing, BASF gives customers competitive advantages derived from lower water consumption, shorter processing time, carbon emission cut and cost savings.

EU Ecolabels was issued to BASF in October 2011 for a larger number of refining chemicals that meet the special requirements also for textiles for children under 3 years and direct skin contact. In addition BASF offers a formaldehyde-free textile processing system.

Solutions of the BASF for resource saving are for example **Cyclanon® XC-W New**, an after-soaping agent for reactive-dyed cellulose fibers , and **Helizarin® ECOSOFT Printing System**, an eco-efficient pigment printing solution.

A solution for CO2-reduction is for example the BASF **Color Fast Finish**: a one-step-process of pigment dyeing and finishing. The total processing time is considerably shortened compared to the conventional process, reducing energy and water consumption, and thereby carbon dioxide emissions.

BASF **CPB Bleach** forms the foundation for quality, high-performance pretreatment. This process achieves a consistently high degree of whiteness, absence of husks, higher degree of desizing and good fabric absorbency, while saving time and cost. To reach full white or when handling sensitive fabrics, it can be combined with a short hot bleach.

The Soaping Agent **Dekol® Washoff RSA** is a unique soaping agent suitable for all reactive dyed cellulosic substrates. Dekol® Washoff RSA reduces the consumption of water and energy, processing time, and overall process cost, in comparison to the conventional system, thus contributing to resource saving and climate protection.

ECO Printing System is a high quality and eco-friendly printing system, which helps fabrics achieve vivid, delicate printing quality, soft handle and outstanding fastness. It significantly shortens the entire process by reducing the steaming process and complicated washing process with hot and cold water. Thus, it effectively saves water, energy and cost while reducing the impact on the environment during the printing process. In addition, the system offers time-saving, simple and convenient process control method.

Softeners are known to give the extra softness and comfort to textiles, but little attention has been paid to their contribution – adding the unique functionalities such as elasticity, strength, smoothness, and moisture management. These additional functionalities that softeners provide will create additional value for textile mills and their customers. **BASF Softeners (si)** have good performance in elasticity, strength, smoothness, and moisture management.

Textile coatings from BASF offer polyacrylate and polyurethane dispersions and ready-to-use compounds for individual applications. BASF coatings products meet the very highest quality requirements and lead to decisive improvements in the properties and functionality of textiles of natural and synthetic fibers. **BASF Lurapret®** waterborne coatings have less impact on the environment compared to solvent-based coatings. They also contribute to high production efficiency, and thereby saving energy.

http://www.basf.com/textile

DyStar

DyStar from Singapore presented at last ITMA 2011 with **Dianix AM** and **Dianix XSF** new series of their Dianix dyes for polyester dyeing. Dianix AM offer excellent light fastness aimed for the best batch-to-batch reproducibility on PES automotive textiles and Dianix XSF combines superior high wet fastness and good sublimation fastness on polyester and blends, particularly on polyester/elastane blends.

The new **Dianix CW-SF** is a solution for premium workwear and other high-end articles. The new Dianix CW-SF dyes have been developed mainly for continuous application in the pad-dry-thermosol process. Main area of application is workwear and other high-end-articles. Besides continuous processes, all CW-SF dyes can be used in exhaust dyeing as well, e.g. as problem solver for special requirements or shades.

DyStar features the following products from Dianix series on their website: **Dianix Chilli Red SF, Dianix Grey AM-SLR, Dianix Rubine XFS** and **Dianix Yellow Brown S-4R 150%.**
The chemical company also has developed a **silicate-free CPB dyeing** method for selected Levafix CA and Remazol dyes. This technology enables companies to make the CPB process cleaner, faster and cheaper and to improve the quality of the fabrics.

www.dystar.com/

Novozymes

Novozymes from Denmark, the world leader in industrial enzymes, offers a patented, innovative process for denim biowash, **Denimax Core**. The process should ensure excellent denim abrasion with built-in preparation. Denimax Core skips a step to offer shorter processing time at standard temperatures. The Denimax Core process is abrasion with no prewash and rinse. An environmental assessment of the solution confirms that companies can reduce their consumption by up to 50% for water, 50% for heat, and 15% for electricity, resulting in potentially large CO2 savings. The biodegradable enzymes replace chemicals and pumice stones.

www.novozymes.com

Pulcra Chemicals

The German **Pulcra Chemicals** has launched a new AEEA-free softener, matching today's requirements in terms of performance as well of product safety. **BELSOFT® 300** is a nonionic softener for cellulosic fibers and blends. The company says that there is a wide range of benefits, for example a high softness, fullness and suppleness, non yellowing, even at high temperatures and no negative impact on hydrophilic properties. BELSOFT® 300 is compatible with almost all finishing recipes and optical brighteners and stable in acid and alkaline medium.

www.pulcra-chemicals.com/

LJ Specialities

Very interesting seems to be a new finsihing effect, the new **ITOCHANGE WET** by **LJ Specialities** from the UK. ITOCHANGE WET is an water based ink that gives a reversible colour change for opaque white to colourless in the presence of water. And the company brought out a new water absorbent but oil repellent C6 based fluorocarbon finish for stain repellent finishing with the name **ITOGUARD LJC6OR**.

www.lj-specialities.co.uk/

DyeCoo

DyeCoo Textile Systems from the Netherlands has been founded in 2008. DyeCoo is the world's first supplier of industrial CO2 dyeing equipment and also offers it's own range of dyes for CO2 dyeing. The company has signed a strategic partnership with Nike and also works together with other brands like Adidas. A few days ago DyeCoo and Huntsman announed that they are joining forces to develop and grow Supercritical CO2 textile processing technology. The collaboration is set to create more sustainable products which will benefit the industry as a whole.

www.dysecoo.com

CPAC Textile

CPAC Textile from Thailand offers SPX-50, a chemical compound, developed specifically to optimize the fiber dyeing process. One product replaces nearly all auxiliaries, instantly improves productivity and profitability with far less environmental impact. Used in the Pre-bleach, scouring, exhaustion and wash steps for the textile industry. SPX-50 works to remove dirt, resins, fat and excess dye. Auxiliaries replaced with SPX-50 are for example Detergents, Peroxide Stabilizers, Dispersing Agents, Humectants, Anti-breaking Agents,Acid-leveling Agents Reactive-leveling Agents, Finishing Agents, Lubricants, Anti-foaming Agents, Water Softeners and Sequestrants Dye Bath Conditioners, Colloid Protectors and Degreasers. CPAC says, that it works with all types of fiber dye: reactive dyes, direct dyes, acid dyes, disperse dyes and indigo dyes. And SPX-50 is a environment friendly solution and reduces the environmental impact by reducing water usage, energy usage, temperature and of cause chemical usage. The processes can be up to 40% more profitable becuase in the dyeing process SPX-50 reduces the steps, the total processing time, the down time between batch and as a result the labor cost.

www.cpactextile.com/

Tanatex

Tanatex from the Netherlands has updated their product range with a lot of innovative products.

TANA®FIL AC 512 is a spin finish for PA 6 and PA 6.6 greige and dope dyed BCF Yarns. It exhibits low fibre/metal friction and renders uniform dyeing results. It provides static protection, is highly thermostable thus suitable for both heat setting machines in use. It protects the yarn against oxidative yellowing.

For Polypropylene Filament and BCF Yarns Tanatex offers the spin finish **TANA®FIL OC 111**. It provides low fibre/metal friction, static protection and gives a smooth handle, thus rendering excellent processability.

Also for Polypropylene Filament Yarns (BCF + CF) and Tapes is the spin finish **TANA®FIL OC 1003**. It provides low fibre/metal friction, static protection and good yarn cohesion. It gives a medium harsh hand thus rendering excellent processability, leading to high tenacity values. Suitable for the production of artificial grass, can be applied in spinning or beaming. It is not irritating to eyes and skin and FDA listed.

TANASPERSE® OLG-N is a special dyeing auxiliary to prevent the formation of oligomer crystals, based on a novel anionic dispersing system. This fits perfectly in the PES dyeing systems, without the risk normally encountered with certain nonionic systems (retardation). It will drastically minimize the well-known problems of oligomer deposits. These oligomers accumulate in the inner layers of the textile material when dyeing and cause several problems. Adding TANASPERSE® OLG-N to the dyebath prevents these problems.

BAYSCENT® ACAI is the latest addition to the BAYSCENT Aromawellness-range: finishes based on microencapsulated essential oils, which on release reinforce harmony and wellbeing of body, mind and spirit. The capsules release the beneficial essences gradually to ensure maximum effect of the special properties. Acai is the black-purple berrylike fruit of a specie of palm. Acai is notorious for its antioxidants, containing vitamins A, C and E that boost your body's defence system. It is rich in energy giving protein and recommended as a promoter of weight loss. Last but not least, it is said to have a positive effect on one's love life.

A very effective concentrated oil- and water repellent agent is **BAYGARD® UFCN**. It imparts durable oil- and water repellency, shows excellent results on all kind of textile fabrics and maintains a soft hand.

For Coating Tanatex offers an extension of the TANA®COAT series. **TANA®COAT KP** is a medium hard polyester based urethane which has a very high adhesion towards polyester and very good flexibility but rigid enough to give the article a certain stiffness. Therefor it will be applied as a basecoat. It has a relatively low melting range, which makes it suitable to be used for different heatseal applications, like PVC. **TANA®COAT KS** is almost comparable with TANA®COAT KP. It is a little harder and has a dull surface, which makes it suitable to be applied as dull, flexible topcoat with low "writing" effect. It also has a good adhesion towards polyester and PVC. **TANA®COAT RS** is a very rigid, aliphatic polyester based urethane with very high heat resistance (250 °C). This coating will result in a dull surface optic.

Another improvement is **EDOLAN® RF**. It is an aqueous polyurethane dispersion for coating and impregnation of textiles and nonwovens. It is a fully co-solvent free dispersion with high scratch resistance, dry surface with good slip properties and high light fastness and UV resistance. It shows very good hydrolysis resistance and can be diluted with/in water in any ratio. It has good running properties in foulard applications and is crosslinkable with melamine- or isocyanate crosslinkers for further improved performance.

RESPUMIT® 3301 is a new solution for printing. It is an antifoam for aqueous coating pastes and textile printing pastes. Aqueous coating pastes and pigment printing pastes are prone to foam formation. Consequently, foam formation must be suppressed by adding antifoams when pastes are produced. Pastes containing RESPUMIT® 3301 remain free of foam even after long coating or printing processes. This product is very effective in high viscosity coating pastes and is also suitable for the prevention of foam formation in printing pastes for dyestuff printing. It is not suitable for use in aqueous liquors. It shows high efficacy and long-lasting effects.

www.tanatexchemicals.com

There were no further ascertainable innovations in the textile chemical industry within the scope of our research. The producers have per se not sufficiently designated the products as innovative or reworked, so that differentiation is certainly not always easy for us all. Also a number of producers do not publish much, if any, information on new products. CHT Beitlich is for example a producer that so far has not been named. Others are the Taiwan Everlight Chemicals, Schill + Seilacher from Germany and the German Wacker Chemie.

A product portfolio is available on the websites:

http://www.cht.com
http://www.ecic.com/
http://www.schillseilacher.de
http://www.wacker.com

Conclusion

So much for new product developments in the textile chemical industry. Without going into details concerning the individual processes it can be said that the large textile chemical companies are practically in competition to dominate the market for the most environmentally friendly and most sustainable products. We would like to mention, without intending diminishing others, the exemplary commitment by Clariant and Huntsman. It would be desirable to communicate with even more transparency on how the new processes look and which current processes could therefore be superseded. Cooperation between companies, as is already happening for example in SAC, should then in the best case issue mutual results. Individual evaluation and selection tools for planning of processes leading to the sustainable production of textiles are principally welcome, are not however sufficient when they are linked to particular companies. In this case an open system should be set up under a GPL license. Despite this mild criticism the readiness, the advances and the range are extremely presentable and provide textile producers with the best opportunities to design more sustainable processes in order to fulfil the growing demands of the large brands and trading houses. ■

Topics of the next issue 11/12

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Innovations & Improvements

Part 6: Nonwovens / Technical Textiles

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