EliTe® CompactSet Update

ProFiL® Rotors – Natural Progression

SpinBox SC-R for RIETER
EliTwist® – Two-Ply Compact Yarn
TrashAdapter SC/SQ SpinBox
SC/SQ SpinBox Benefits
ELECTRO-JET Roving Frame

Mill Reports
- ANATEKS, Turkey
- GADOON, Pakistan
Day/Accotex – Soft Cots
NOVIBRA Spindle HP-S 68

...again a step ahead...
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Front Cover:
EliTwist® EliTube with
V-Shaped Suction Slots
Dear Customers,

SUESSEN’s goal is the continuous improvement of our products and services. We are aiming to be your preferred supplier of conversions and components also in future.

In this edition of our SPINNOVATION magazine No.19 you will find a lot of information, showing you our continuous efforts on R & D. As most of our customers know, our innovative products are based on a longstanding close cooperation in compact spinning and rotor spinning between SUESSEN, and WST, Wilhelm Stahlecker GmbH, which has been even improved after the restructuring of our company. We are convinced that the close exchange between WST’s researchers and our specialists will guarantee also in future innovative solutions for our customers.

The trend to use a greater variety of fibres with larger variations is challenging the manufacturers of spinning elements. At the same time, customers require lower energy consumption. As an example of our answers to these trends we are proud to present to you in this issue our new ProFil® Rotor family.

We wish you good reading!

Sincerely yours,

Erich Casanova  
Managing Director

Peter Stahlecker  
Managing Director

**SUESSEN’s Vision**

- Be the global Technology Component and Conversion Supplier to the yarn manufacturing industries in ring spinning and open-end rotor spinning
- Create added value for our customers through reliability, productivity and quality
- Ensure a sustainable and profitable growth
**EliTe® CompactSet – The Third Generation**

**Dr. Norbert Brunk, Technical Director Ring Spinning, SUESSEN**

Based on practical experience acquired with the EliTe® CompactSet of series I and II in various countries and most different applications, SUESSEN and the Research Centre Wilhelm Stahlecker GmbH have worked systematically and consistently on the further technological development of the components. In this respect, the feedback of our customers was of great value and contributed considerably to a quick optimization of this new spinning method.

Introducing new methods like EliTe® Spinning on an industrial scale under global conditions would be doomed to fail right from the start without the direct participation of customers in most different markets who are prepared to take a risk. Only the fruitful combination of customer experience, specific market conditions and know-how of the designing company or supplier is crowned with success.

Apart from reduction of maintenance and further improvement of yarn quality, the development aimed at breaking into new markets by designing alternative applications. It is a well-known fact that EliTe® outclasses all compact spinning systems presently offered with respect to flexibility and versatility, so that it has been obvious to use these advantages for creating new and very interesting application variants.

Already from October 2003 orders will be accepted for all variants of the EliTe® CompactSet of the third generation listed below.

Some technical details should help to illustrate the different variants:

**EliTe® CompactSet-S for Short-Staple Fibres**

The EliTe® CompactSet-S is suitable for all fibres processed with cotton spinning methods. The major commercial yarn count range at present covers Ne 6 to Ne 140.

The EliTop is encapsulated (Fig. 1, closed and open EliTop) to ensure that no fly or dust gets on the gears. The lattice aprons have special anti-waste properties which significantly reduce fibre adhesion and increase the operating life further (Fig. 2).

<table>
<thead>
<tr>
<th><strong>EliTe® CompactSet-S</strong> for short-staple fibres, cotton, synthetics and blends</th>
<th><strong>EliTe® CompactSet-L</strong> for long-staple fibres wool, synthetics and blends</th>
</tr>
</thead>
<tbody>
<tr>
<td>EliTe® CompactSet-S</td>
<td>single yarn</td>
</tr>
<tr>
<td>EliCore® S</td>
<td>core yarn</td>
</tr>
<tr>
<td>EliTwist® S</td>
<td>two-component yarn</td>
</tr>
<tr>
<td>EliCoreTwist® S</td>
<td>two-component yarn + filament core yarn</td>
</tr>
<tr>
<td>EliCore® L</td>
<td></td>
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<tr>
<td>EliTwist® L</td>
<td></td>
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<tr>
<td>EliCoreTwist® L</td>
<td></td>
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</tbody>
</table>
The Eli Tubes are offered with two different suction slot designs (Fig. 3a to c). Slots with a straight design all through (Fig. 3b) are specified for processing combed cotton and synthetic fibres. Slots with a delta at the top (Fig. 3c) are used for carded cotton.

**EliTe®CompactSet-L for Long-Staple Fibres**

The EliTe®CompactSet-L has been designed to process long-staple wool and synthetic fibres into yarn counts up to Nm 80. The special EliTop is also encapsulated, but it differs from the EliTop for short-staple fibres by the geometrical dimensions and transmissions (Fig. 4, closed and open).

The structure of the lattice apron has been adapted to the special requirements of long-staple fibres and the spin-finish used in this respect. The EliTube position differs from the short-staple design and suits the special conditions of long-staple spinning.

**EliCore®S and EliCore®L**

Both for short- and long-staple fibres we have developed a special core-yarn device to feed a filament at the EliTop delivery roller. Core yarns with a condensed fibre sheath have excellent properties and are clearly superior to conventional core yarns, above all in the downstream process.

The filament tension can be infinitely set by an inverter. Sensors control the filament feed and display possible interruptions. The feed rollers, positively driven by the top rollers, can be set individually and therefore ensure the concentric filament feed to the condensed fibre strand. The special feature of these rollers is a patented indentation. Its base reaches under the feeding groove. This design enables the operators to cut off filament lap-ups without damaging the groove surface (Fig. 5).
EliTwist® S and EliTwist® L

Owing to the high condensation of the fibres it is possible by means of two slots arranged like a V on the EliTube to bring two fibre strands closely together, which have been drafted before separately, and to unite them after the delivery roller clamping point in a small twisting triangle. Please refer to the article on page 17 for details on the great advantages of this two-ply compact yarn. EliTwist® can easily be retrofitted to already installed EliTe® CompactSets.

EliCoreTwist® S and EliCoreTwist® L

In addition to the two fibre strands, one or more filaments can be fed by the core yarn device described above, to produce very smooth special yarns. A very interesting feature is feeding a filament in the centre of the twisting triangle. The perfect covering of the core offers many interesting aspects compared with conventional core yarn production and the manufacture of twisted yarns from core yarns.

During development great importance has been attached to the fact that all new components are compatible with all EliTe® CompactSets already delivered.

In all the aforesaid variants, the central shaft for negative pressure is started and stopped by means of an adjustable ramp, which allows soft start without jerks. Start-up slip is therefore considerably reduced and operating life of the fan driving belts is increased.

A monitoring system to display breaks of the fan driving belts is offered optionally (Fig. 6). It ensures that no uncompacted yarn is wound on the cops. Each belt is controlled by its own sensor. If the belt breaks, a red light burns at the endstock of the ring spinning frame.

We are now in a position to equip the types of ring spinning frames listed below with the EliTe® CompactSet. Other machine types are being prepared. If you intend to modernize your machines, which may not be part of our list, please contact the SUESSEN agency in your country or the sales department.

### Machine types that can be retrofitted

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Machine type</th>
<th>Spindle gauge</th>
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<td>RIETER</td>
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<td></td>
<td>G 5/2</td>
<td>70/75</td>
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<tr>
<td></td>
<td>G 5/11</td>
<td>70/75</td>
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<td></td>
<td>G 30</td>
<td>70</td>
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<tr>
<td>LAKSHMI</td>
<td>G 5/1</td>
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</tr>
<tr>
<td></td>
<td>LR 6 S</td>
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<td>Marzoli/Dongtai</td>
<td>DTM 129</td>
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<tr>
<td>Zinser</td>
<td>319 SL short-staple</td>
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<td></td>
<td>319/L-worsted (LSL)</td>
<td>75/82.5</td>
</tr>
<tr>
<td>Toyota</td>
<td>RY 5</td>
<td>70/75</td>
</tr>
<tr>
<td></td>
<td>RY 5 HV</td>
<td>75</td>
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<td></td>
<td>RX 220</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>RX 240</td>
<td>70</td>
</tr>
</tbody>
</table>

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Fig. 6
SUESSEN SpinBox SC-R: The Powerful Heart of RIETER’s Highly Successful Open-End Machine R 40

Peter Stahlecker, Managing Director, SUESSEN

SUESSEN has been involved in Open-End Spinning almost from the very beginning. During a long and successful collaboration with Schlafhorst, SUESSEN designed and manufactured all SpinBoxes SE7, SE8, SE9 and SE10 ever used in Schlafhorst Autocoro machines, a grand total of over 2.7 Mio SpinBoxes. This makes SUESSEN the most successful manufacturer of high speed OE SpinBoxes by far.

SUESSEN continued to develop and improve its SpinBox, even after the collaboration with SCHLAFHORST ended. The result were the Compact SpinBoxes SC1 and SC2, which have been used successfully in the modernization of existing SE8/9 machines. In every mill trial, this SpinBox outperformed its competitor.

After RIETER and SUESSEN ‘joined hands’, the SpinBox SC was further refined and improved, finally resulting in the SC-R. This SpinBox is used in RIETER’s innovative Open-End rotor spinning machine R 40. While the author could say a lot about the advantages of the R 40 over its competitor, constraints of space require him to focus on the features and advantages of the SpinBox SC-R.

A view of the R 40, where the SC-R boxes are used is shown in Fig. 1. A close up of the SpinBox SC-R is shown in Fig. 2. Some of the salient features of the SC-R, can clearly be seen:

- It is an open design. Fly cannot hide behind covers, and can be removed by the robot or the operator easily. It is well known that there is a close correlation between IPI values and fly accumulation.

- A photo eye allows the piecing up robot to align itself precisely and contact free to the SpinBox SC-R, thus assuring efficient piecings.

- There are two levers visible on the left. Both are operated by the robot. One serves to brake the rotor, the other one, when activated, increases the pressure on the rotor belt; the rotor will accelerate faster. This allows to reduce the pressure during operation, and this saves a lot of energy.

A very important feature for achieving excellent yarn results is the undivided fibre channel (see Fig. 3). The fibre...
channel is converging towards the rotor, hence the air speed in it increases continuously from the entrance (at the opening roller) to the exit at the rotor (there is a speed gradient in the fibre channel). This increase in speed will stretch the fibres, so they will arrive at the rotor not balled up, but nicely elongated. This is most important to achieve good yarn strength.

In previous box designs, the fibre channel had to be divided, for reasons I do not have the space to go into. This created air turbulence at the point of division. The turbulence precisely counteracted the speed gradient, by balling up the fibres.

For the SC-R, the undivided fibre channel has been further optimized using FE methods to calculate the air speeds in the channel. The BYPASS has been mentioned before. In Fig. 4, the principle can be explained easily:

On conventional spinboxes, all the air, which moves through the fibre channel, is sucked in through the trash chute. The air flow / air speed in the fibre channel should be high, so the fibres detach easily from the opening roller at the point of detachment. Also, the gradient stretching the fibres should be large, again, this requires high air flow.

However, as the name implies, the trash, seed coats etc., is extracted at the chute. The centrifugal force is acting on the compact trash particles, forcing them out. However, the air entering through the trash chute is trying to suck them back in.

Hence there are two requirements, which seemingly are contradictory:

- high air flow
- high trash extraction

SUESSEN solved this by developing the BYPASS. This is simply an adjustable second opening for the air. When the BYPASS is opened, less air will flow through the trash chute, hence the trash removal is effective. With the BYPASS closed, less trash will be extracted, but also less loss of good fibres.

Normally, we only recommend the settings open, semi-closed, closed. So, for the first time, the amount of trash being extracted can be adjusted by the mill, without affecting other parameters.

The Fixed Fibre Beard Support is important for uniform combing of the fibre beard. In conventional design, feed table and fibre beard support are one unit. The feed table is spring loaded, and moves up/down, to accommodate variations in sliver weight, etc. In conventional designs, these motions are par force followed by the fibre beard support, hence the point of combing is never fixed in space. Variations in the combing process, and consequently in the yarn are there. With the Fixed Fibre Beard Support of the SC-R, this cannot happen, the combing process is uniform.

Historically, OE spinboxes were designed with cotton in mind. Man-made fibres played a lesser role, at most a few spinning components were adapted. SUESSEN has been the first (and to date the only one) to realize that man-made fibres differ in many aspects from cotton, and not only the spinning components, but the air flow in the box must be optimized for man-made fibres.

- Man-made fibre contain no trash, hence trash extraction is not a big issue.
- Man-made fibres are more flexible than cotton, hence they do not easily detach at the point of detachment. The dreaded “merry-go-round” fibres are the consequence.

In Fig. 5, the two major adaptations may be seen.

The air volume $Q_1$ at the point of detachment must be large, to facilitate detachment of the fibres. Conventionally, all this is sucked through the exit of the fibre channel ($Q_1 = Q_3$). This cross-section, however, should be very small, to deposit the fibres accurately on the wall of the rotor. Again, SUESSEN was able to solve this contradiction by adding the SpeedPass. This is simply a second opening on the fibre channel, to suck more air through it, $Q_4$ is added.

The fibres of course cannot follow the sharp turn, as they are much, much more massive than air, and are deposited on the rotor wall, as before.
Comparing Fig. 4 to Fig. 5, you see that the wall of the opening roller housing is diverging away from the opening roller in Fig. 5. The result is a cross-section resembling the wing of an airplane (airfoil). As is known, this shape causes a difference in pressure between bottom and top part of the wing: An airplane hangs in the air, as the popular saying goes.

In our case, also a pressure gradient is created, sucking the fibres out of the teeth of the opening roller, and thus facilitating the detachment.

When SUESSEN designed the Compact SpinBox family with undivided fibre channel, we paid attention to smaller details, also. By way of example, look at Fig. 6.

With the SC-R, the gear driving the feed shaft always remains engaged into the worm shaft. With the competition, it disengages every time, one opens the box. As the worm shaft keeps on turning, there is a chance to damage the plastic gear, when closing the box of the competition.

While this might be a small point, why do it wrong, if it can be done correctly without adding cost?

An important issue in rotor spinning is the quality of the piecer. SpinBox and piecer must work "hand in glove". Let us compare the methods employed by the R 40, vs. its competitor, Fig. 7.

The competition pieces up, while the rotor accelerates. They measure the speed of the rotor, and estimate the acceleration curve. However, due to tolerances in any measurement, the actual curve of acceleration will be different.

Let us say, they want to piece up starting at speed "s1". They calculate time "a" for the piecing to begin. However, due to tolerances, the actual rotor speed could be "s2" or "s3". Let us further assume that due to mechanical tolerances in the robot, instead of time "a", the robot only starts at time "a*".
Then the rotor speed could even be "s4", instead of the desired "s1". By comparison, the R 40 pieces up at constant rotor speed. The rotor accelerates to a preset (high) speed. Then the rotor is held at this speed, while piecing takes place. After piecing is finished, the rotor accelerates to its final speed. It is clear that this way, small tolerances do not affect the piecing process at all.

It is also clear that the piecings will be better and much more uniform, if done at a constant speed. As it is easier to piece up at constant speed, it is obvious that the robot of the R 40 needs fewer second trials than the competition. This can have dramatic effects on the efficiency of the machine. This method also allows to piece up at higher rotor speeds. The higher centrifugal forces acting on the piecing as it is pulled out of the rotor groove act as a "built-in strength tester": A weak piecing will fail now, not during subsequent processing.

**SUMMARY**

The SpinBox SC-R incorporates all the experience, SUESSEN has gained over many years, as the world's largest and most innovative manufacturer of OE SpinBoxes.
EliTe® CompactSet – The Key to More Efficiency in Ring Spinning

Dr. Norbert Brunk, Technical Director Ring Spinning, SUESSEN

Since ring spinning has gained supremacy over the little productive mule spinning process, ring yarn has been the measure of all things in yarn production as regards yarn structure and utilization of fibre substance.

Even a few years ago, most experts would not have agreed that it would be possible to increase utilization of fibre substance beyond this level. Many publications of that time substantiate this opinion. The ring spinning frame which – for the time being – had performed its last genuine step of development by an automatic link to the winder, seemed to be finally exhausted in respect of yarn quality and even production.

When the idea of a drafting system followed by a compacting zone materialized with all technical details, all sceptics could be set right once again. Today, after only about four years since the introduction of compact spinning on an industrial scale, approx. 650,000 spindles world-wide are running with the EliTe® Compact-Set. The standards for spinning superior yarn owing to the further improved utilization of fibre substance have been significantly raised.

Compact spinning is not – as repeatedly “prognosticated” in the beginning – a short-lived fashion exclusively for the production of fine single yarns for weaving. Compact yarns are used in almost all yarn sectors, count ranges and applications. The improved utilization of fibre substance offers the possibility of using fibres with a shorter staple length, lower degree of combing and coarser fineness in many applications.

Already today, those spinning mills not having adopted compact spinning, experience the disadvantages in comparison with their competitors. The various aspects and possibilities of quality improvement and advantages in the downstream process offered by compact spinning have been given full treatment, so that we need not elaborate here.

It is rather interesting that one feature of compacting is increasingly gaining importance, which in the beginning was given little consideration by customers. They now take deliberately advantage of the better utilization of fibre substance and the resulting significantly improved spinning stability, which offer a potential of yarn twist reduction and consequently production increase on the ring spinning frame. This option is particularly interesting in the range of medium and coarse yarn counts. Some of our customers could achieve considerable production increase of 10% and more. This astonishing progress in ring spinning performance would not have been considered possible only a few years ago. In many cases the final result of optimization, apart from production increase, is a yarn whose quality level is far above conventionally spun ring yarn.

Restrictions in traveller speed, which existed in the beginning of compact spinning, are a matter of the past. Compact spinning encouraged the leading manufacturers of spinning rings and ring travellers to develop products, which soon enabled spinning mills to apply the same traveller speeds as in conventional ring spinning. So the possible reduction in yarn twist can be fully used for production increase.

Consequently, customers become increasingly aware that EliTe® Spinning does not only offer quality improvement, but also production increase. This fact will give an additional impetus to a further extension of this spinning method. It enables not only spinners of quality yarns, but also spinners of coarser yarns or yarns from inferior raw material to draw custom-tailored benefit from the EliTe® Spinning Process.
The diagram shows the benefit range of the EliTe®CompactSet (red zone). This range is the product of the two vectors for quality improvement and production increase.

It is up to each customer to find his optimum by asking the following basic questions, which should preferably be clearly answered ahead of an investment:

- Is the intended investment meant to improve the properties of subsequent processing or to develop new textile products?
- Is main emphasis laid on better raw material exploitation?
- Should the advantage of better utilization of fibre substance be used for production increase?

There seems to be a trend that the so-called quality spinners with high raw material costs give preference to the ordinate of the diagram, whereas producers of coarser yarns clearly opt for production increase. We can take it for granted that spinning mills, being great experimenters, will soon explore the new possibilities in ring spinning offered by the EliTe®CompactSet.

It has been confirmed once again that in the last analysis the utilization of fibre substance is one of the decisive criteria of a spinning process. Better utilization of fibre substance means - apart from better yarn quality - better spinning stability, which as a rule has a direct influence on possible take-off or delivery speed.

The rates of increase made possible by the EliTe®CompactSet in ring spinning, as regards both yarn quality and yarn production per spindle, will give a fresh impetus to the ring spinning process as a whole.
ProFiL® Rotors by SUESSEN – The Natural Progression of Spinning Rotors

Peter Stahlecker, Managing Director SUESSEN

SUESSEN is proud to present its new and complete line of Open-End spinning rotors to our customers (Fig. 1 and 2)!

They carry the name ProFiL® Rotors, and offer important advantages over the older and competitive designs. The purpose of this article is to outline some of the more important aspects.

1. Technological Aspects

For the most part, we have kept the inside contours, and concentrated on the aspects listed below. Therefore, the new names will sound familiar to our established customers.

With some rotors, we did some ‘internal’ fine tuning so to speak, and as a consequence, we were able to increase the technologically recommended rotor speed!

2. Improved Mechanical Design, using FEM Methods.

Fig 3a, b, c show, what we mean by this. Fig. 3a shows the distribution and the magnitude of the stress of a conventional T 247 rotor running at 80,000 rpm. The area of maximum stress in the inner wall.

Fig. 3b shows that in order to reduce the energy consumption one cannot simply reduce the outer diameter of the rotor. The picture shows that now the area of maximum stress is in the rotor groove - certainly the least desirable area.

Fig. 3c shows the stress in the ProFiL® Rotor. It is clearly visible that due to FEM based geometric optimization work the maximum stress is less compared to the previous two pictures (no more red areas), and it is not located in the rotor groove, but spread out safely over the sliding walls.

<table>
<thead>
<tr>
<th>Conventional Rotors</th>
<th>ProFiL® Rotors Series 9</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>for SpinBox SC, SQ, SE 9, SE 10, SE 11</td>
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<tr>
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<th>groove diameter</th>
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</table>

Changes in groove diameter and/or index – groove diameter in mm – * rpm limited by machine

Fig. 1

13

SPINNOVATION No. 19
Why is this important to our customers?

- Areas with high stress are more prone to wear. Therefore, the maximum stress must not be in the rotor groove.
- High stress causes higher deflection. Figures 4a, b show that the deflection is 25% less with the ProFil® Rotor compared to conventional designs. The geometric shape of the inside contour of the rotor cup is very important! As deflection alters this geometric shape, it is undesirable.

### 3. Energy Consumption

This is a wide field, where lots of sensible - and less sensible - things have been said and written. The power consumption of an OE SpinBox depends principally of the following:

- The energy consumed in the TwinDisc tires.
- The rotor shaft "digs" into the rubber of the tire. The deeper it digs in, the more energy is dissipated (it is like driving your car with the tires not fully inflated – you will use more gas. This is exactly the same effect!). This effect depends primarily on the softness of the covering plastic, and on the pressure the drive belt exerts on the rotor shaft. We have said before, that the SUESSEN family of SC and SQ SpinBoxes, and the SUESSEN TwinDisc tires are the best in this respect. This is not the place to repeat those arguments.
- The energy consumed, every time a rotor is started.

Contrary to popular belief, this does not depend on the weight of the rotor,
but on its moment of inertia relative to the axis of rotation. The moment of inertia depends on the spatial distribution of the mass. This is defined as
\[ J = \int r(x)^2 p(x) \, dx. \]

The energy needed to accelerate a rotor to its final speed is
\[ E = \frac{1}{2} J \omega^2 \] where
\[ \omega = 2 \pi \frac{v}{60}, \text{ and } \] \[ v = \text{(Final Rotor Speed in rpm) / 60} \]

Easy calculations show that even under extreme conditions, this energy is totally negligible compared to the total power consumption (<1/1,000 of total consumption). Still, the moment of inertia of the ProFiL® Rotors is lower than that of conventional or most competitive designs. While it plays no role here, it will be of some importance later.

- **The Air Resistance**
  As the rotor turns, there is friction between the rotor and the surrounding air. Under some assumptions, the breaking moment of this friction may be calculated to be
  \[ M_b = 2 \pi K^* r(x)^4 (1 + r'(x))^{1/2} \, dx, \]
  where \( K \) is a constant containing viscosity, etc., and \( r(x) \) describes the outside contour of the rotor, see Fig. 5. The main assumption in the formula is that the friction depends on the square of the surface speed of the rotor. This assumption might not be strictly correct, but is the generally accepted assumption in such situations.

Now, it is not so easy to evaluate formula (1), however, most CAD systems offer a function to evaluate
\[ M' = |r(x) (1 + r'(x))^{1/2} \, dx, \]
and also
\[ r_s = M'/ |(1 + r'(x))^{1/2} \, dx, \]
Therefore, we approximated (2) by
\[ M_b \approx 2 \pi K^* (r S)^3 M' \] When we compare conventional rotors to the new, we find that the ProFiL® Rotors use up to 14% less frictional energy (Fig. 6).

- **Friction of the Thrust Bearing**
  This is very minimal and can be shown to be less than 1.0 Watt. This might well be higher in case of magnetic thrust bearings. This is so, because any out-

<table>
<thead>
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<th>Index</th>
<th>ProFiL® Rotor</th>
<th>Relative Energy Consumption</th>
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<td>G 830/G 930</td>
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<td>U 846/U 946</td>
<td>93.3%</td>
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of-centre position of the rotor shaft relative to the magnetic bearing will turn the system into an eddy current brake.

- Energy to securely push the Rotor against the Thrust Bearing.

It is very easy to show that this consumes less than about 5.0 Watt.

4. Brake Pads will last Longer, Rotors will Stop earlier

I mentioned above that the ProFil® Rotors have a smaller moment of inertia compared to conventional rotors, Fig. 7. The reduction is between 6% to 30%!! While this has no measurable impact on the energy consumption, it does affect the life time of the brake pads! It seems clear that the wear of the brake pads is related to the amount of energy, they must dissipate into heat. This energy is directly proportional to the moment of inertia $J$, see equation (1).

The brake pads will correspondingly last longer with the new ProFil® Rotors. The lower moment of inertia also results in the rotors coming to a complete stop earlier (this is so, because the brake pads apply a constant braking moment onto the rotor shaft). The rotors are sure to be stopped, when the cleaning head comes to clean them.

5. Reliable Piecing

As we can see in Fig. 8, conventional rotors have a 'hump' near the center. This hump might occasionally prevent the yarn to reach the rotor groove, when piecing takes place. This will result in a failed piecing up attempt.

As the moment of inertia is lower with ProFil® Rotors, the rotors will accelerate faster (This is so, because the drive belt essentially applies a constant moment onto the rotor shaft.) The piecer robot of the Autocoro machines has a time frame of 1.7 sec to 3.5 sec in which the rotor must have reached the piecing up speed. If the rotor does not reach this speed within the time frame given, the robot cannot piece up.

ProFil® Rotors will be accelerated reliably to the piecing up speed within this time frame, hence more reliable performance of the robot.

SUMMARY

It is the sum of the advantages, which make the ProFil® Rotor a true and important innovation for our customers.

- Reliable piecing-up to improve machine efficiency and so customer benefit
- Reduced wear on brake pads
- Lower energy consumption
- Higher mechanical speeds possible – thus improving operational safety
- In some cases higher technological speed possible – thus improving productivity
1. Preliminary Remarks

The elimination of the spinning triangle by incorporating a condensing zone after the drafting system has opened up new interesting prospects to ring spinning. While the first attempts of the new compacting methods were restricted in practice to fine weaving yarns of combed cotton, there is now hardly any important yarn sector which has not been infiltrated by compact yarns. The EliTe® Process with its unsurpassed flexibility has played an essential role in this development.

The purpose of this article is to present another variant developed for this process, which allows the very efficient production of a two-ply compact yarn for superior demands directly on the ring spinning frame. EliTwist® even improves the utilization of fibre substance further. This fact and the attractive structure of such yarns simultaneously offer new aspects for the production of core yarns and special-purpose yarns.

2. Production of Two-Ply Yarn on the Ring Spinning Frame

In order to spin two-ply yarn directly on the ring spinning frame, two fibre strands drafted parallel at a relatively large distance must be combined in a twisting point after passing the front roller pair of the drafting system. The speciality of such yarns is that the direction of twist in both legs is the same as in the resulting two-ply yarn. Well-known processes are SiroSPUN® and DUOSPUN®. From the twisting point, the twist spreads out in both yarn legs, each of which forms a long spinning triangle at the front roller pair of the drafting system due to the high yarn tension on the one hand and to the low twist on the other hand (Fig. 1).

The dimension of the twisting triangle depends on the distance of the twisting point Z from the nip point of the front roller pair and the distance A of the two emerging fibre strands. Point Z is the closer to the nip point, the lower is the spinning tension and the closer is the distance A of the two fibre strands. It is obvious that only a very small twisting triangle allows a high spinning stability.

The number of turns per metre produced in the two yarn legs up to the nip point is about 20% lower than the twist of the yarn after the twisting point. In other words, the twist coefficient of the two yarn legs is only about half as high as in the final two-ply yarn.

In this respect, detailed theoretical and experimental investigation has been made.

Fibre loss at the drafting system exit is very high due to the very low twist in the two yarn legs. There is also a risk that if one strand breaks, only one...
component runs onto the bobbin. Even with yarn detectors at the twisting triangle, conventional methods of producing two-fold like yarn are therefore not able to achieve the high spindle speeds in short-staple spinning usual today.

3. Principle of the EliTwist® Method

The patented EliTwist® Process allows to reduce the twisting triangle to a degree that the restrictions mentioned under item 2 are eliminated. This is realized by the two fibre strands first passing a condensing zone. During condensing, both components get closer and reach a minimum distance by means of two suction slots in the condensing zone in a V-shaped arrangement (Fig. 2). Owing to condensing, the two components - after leaving the condensing zone - do not form spinning triangles. Consequently, no fibres are sticking out, spreading up to the other yarn component or not being embedded in the yarn.

The twist, running into the two yarn legs from the twisting point, need not overcome any resistance and easily reaches the clamping line. As a result, the two fibre strands can be led very closely and the twisting point has a very small distance from the clamping line of the front roller pair. In short-staple spinning, this distance is only between 4 and 5 mm, depending on the spinning tension. Fig. 3 shows the geometrical conditions at the twisting triangle of a Siro yarn compared with EliTwist®. Both yarns have the same count and analogous yarn and spinning parameters. The substantial fibre fly of the conventional Siro yarn can clearly be seen, whereas in EliTwist® all fibres are safely embedded. This difference is also visible, when fibre loss at the suction tubes is measured (Fig. 4). In reality, fibre loss in conventional spin-twisting is even much higher, because the experiment shown in Fig. 4 could not take into account the fibre dust in the ambient air.

The EliTwist® Process produces yarn with a novel structure combining all advantages of condensing and doubling. Yarn surface and appearance of EliTwist® are comparable to a single compact yarn. If possible at all, its surface is even more clearly structured and closed. However, as the twist in the two yarn legs is identical, EliTwist® has more snarling tendency. Fig. 5 shows a comparison of EliTwist®, conventional two-ply yarn, conventional
Siro yarn, EliTe®Two-Ply Yarn and EliTe®Single Yarn.

For industrial practice an essential advantage of EliTwist® over all conventional spin-twisting methods is that no detection devices are required for the twisting triangle. In case of a short-term material interruption at one of the two components, the broken component will piece up automatically due to the prevailing geometrical conditions.

A refined variant of this method offers the possibility of feeding a filament in the centre of the twisting triangle, i.e. directly at the twisting point. This allows a perfect covering of the yarn core (Fig. 6). But it is also possible to feed additional threads parallel to one or both yarn legs.

4. Spinning Results

The running properties are excellent. There is no difference or even restriction in comparison with EliTe® Single Yarn as regards possible traveller speeds.

Two test series were realized with long-staple cotton, comparing EliTwist® with twisted yarns and with singles yarns.

Test Series A: Comparison of

- EliTwist® Ne 60/2 and Ne 100/2 with 2-for-1 twisted ring yarn Ne 60/2 and Ne 100/2
- 2-for-1 twisted EliTe®Yarn Ne 60/2 and Ne 100/2
- Siro Ne 60/2 and Ne 100/2

Test Series B: Comparison of

- EliTwist® Ne 60/2 and ring yarn Ne 30 and EliTe®Yarn Ne 30

The most important results are summarized here:

The twist coefficient of all yarn types was in the range $\alpha_e = 4.6$ to $3.3$. The clear superiority of EliTwist® in all important yarn parameters is confirmed. When comparing the twisted yarns, it soon became obvious that Siro-spun yarns cannot be produced any more with a twist coefficient $\alpha_e$ lower than 3.95. The spinning of one yarn Ne 100/2 with $\alpha_e = 4.3$ even had to be discontinued (Figs. 7 and 8). In this respect, EliTwist® properties are similar to conventionally twisted ring-spun or EliTe®Yarn. The extremely
good utilization of fibre substance of the EliTwist® Process offers clear advantages in yarn strength all through the tested yarn twist range, and they are even clearer the finer the yarn count.

This advantage is reflected by all yarn strength parameters like work capacity, elongation, minimum breaking load and breaking load variation.

When comparing hairiness, EliTwist® generally has better values (Fig. 9). To demonstrate how dramatically hairiness is improved, the diagram shows - apart from USTER hairiness - the S3 parameters according to ZWEIGLE.

Since the appearance of EliTwist® resembles to a single compact yarn, test series B compared EliTwist® with some corresponding singles yarns. In this comparison, the EliTwist® advantages in all yarn parameters are even more striking. In addition to improved yarn strength and hairiness parameters, the doubling effect has an additional positive effect. This is particularly visible in improved USTER irregularity (Fig. 14) and imperfection values (Fig. 15), which should not be neglected.

5. Essential Characteristics of EliTwist® and Economic Considerations

The utilization of fibre substance achievable with EliTwist® is unrivalled by any other spinning process presently offered. Outstanding characteristics are:

- Very smooth structure, closed yarn surface, circular yarn cross-section
- High regularity
- Considerably reduced fibre loss at the drafting system front roller pair
- Extremely low hairiness, especially of long fibres (S3, > 3 mm)
- High breaking load and elongation, maximum work capacity
- Very high yarn slippage and abrasion resistance
- Very low pilling tendency
- Low twist coefficients
- Unrestricted traveller speeds
• Manufacturing costs reduced up to about 50% compared with conventional twisted yarn
• Saving or even elimination of sizing agent in most applications
• No restrictions in splicing

Compared with the standard EliTe® Spinning Process, expenditure for top roller cot buffing is half as much with EliTwist®, because the yarn quantity per buffing cycle is doubled. Due to its special properties, EliTwist® is particularly suitable for being processed on highly productive air-jet weaving machines.

As regards two-ply core yarn, production can also be considerably increased and the filament percentage be reduced. The filament fed in the centre of the twisting triangle is perfectly covered by the two yarn legs. Undesired “naked points” are avoided, and consequently higher spindle speeds are possible.

6. Summary and Prospects

EliTwist® has succeeded in further improving the excellent textile and physical characteristics of compact yarn already known. The very economic application of this spinning process on existing ring spinning frames with the EliTe® CompactSet underlines once again the high flexibility of the EliTe® Process. Furthermore, EliTwist® offers the possibility of producing numerous other interesting yarn designs and special-purpose yarns for most different applications. By means of the special SUESSEN Core Yarn Device EliCore®, filaments can be fed in the centre of the twisting triangle or parallel to one or both yarn legs to create interesting effects (Fig. 16). The technological potential is immense. We are well prepared to break another new interesting ground side by side with our customers.

Orders for EliTe® CompactSet to produce short- and long-staple EliTwist® can be sent to our sales department as from October 2003.

Literature
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2/ F.Dinkelmann, H.Herdtle, Melliand Textilberichte7/1982,475-479
TrashAdapter – Innovation for SUESSEN SpinBox SC and SQ

Michael Basting, Product Manager Premium Parts, SUESSEN

Since industrial production of yarns on Open-End Rotor Spinning Machines started, the application range has been continuously extended with regard to yarn counts, structure and raw material.

While many purposes can only be achieved by modifying the machine design or adjusting the spinning accessories applied, the spinner depends on his own wealth of ideas when testing alternative raw material.

Many of our customers are in a position to repeatedly introduce new products into the market by blending their fibres most creatively or adding regenerated fibres, and consequently acquire their own manufacturing know-how and open up new markets.

Exemplary for such creative raw material are blends of linen and cotton, pure blends of regenerated fibres, blends with regenerated wool fibres or slub yarns by adding regenerated fibres of most different opening degrees. This list could be continued infinitely and only depends on the creativity of the spinner.

However, many spinners are soon confronted with the following problem: Exactly those fibres or fibre blends are extracted by the opening roller, which are desired in the new yarn. A common solution in practice is to increase the spinning vacuum and reduce the opening roller speed to avoid such...
extraction. But at the same time, extraction of dirt particles is also avoided. Furthermore, such a detailed adjustment of the machine setting can hardly be reproduced.

For such special applications, our customers can take advantage of the new TrashAdapter (Fig. 1).

The TrashAdapter serves as an additional fibre guiding component, because it reduces the opening of the trash extraction chute.

- Fibres that should remain in the spinning process are guided in a controlled manner.
- An undesired extraction of short fibres (e.g. combing noils), fibre bundles (slubs) and fibres with high specific weight is avoided.
- The percentage of blended fibres specified in the sliver is maintained in the yarn.

The TrashAdapter is engaged at the side wall of the opening unit. So it serves as an extension of the side wall at the enveloping circle diameter of the opening roller, what is synonymous with a reduction of the trash extraction chute opening.

Fibres with a high specific weight, which in standard applications (without adapter) would be extracted by the opening roller after fibre beard opening, undergo an additional guidance by the TrashAdapter and remain
in the spinning process. (Fig. 2) The contraction of the extraction chute opening by the adapter alone would significantly increase the spinning vacuum in this area and simultaneously reduce trash extraction. Dirt particles, which would be extracted in standard applications without adapter, would remain in the yarn due to the higher air-flow and consequently accumulate in the rotor groove and cause yarn breaks. In conventional SpinBoxes, this problem can only be solved by reducing the spinning vacuum, but at the same time this would disturb the entire air balance in the SpinBox. The resulting vacuum loss at the entrance of the fibre channel prevents the fibres from being safely transferred from the opening roller to the fibre channel. Inferior yarn quality due to recirculating fibres is the result.

Only the patented BYPASS in the SUESSEN SpinBoxes SC and SQ ensures an undisturbed air balance in the SpinBox when applying the TrashAdapters. The spinning vacuum of the machine must not be changed. By setting the BYPASS, low air velocity at the trash extraction chute can be combined with maximum air velocity in the fibre channel.

- Harmful dirt particles are reliably extracted by the opening roller.
- Safe fibre transfer from the opening roller to the fibre channel is ensured.
- Insufficient adjustment of the spinning vacuum to determine the degree of trash extraction

In order to avoid the extraction of blended fibres, the spinning vacuum should be increased, while on the contrary it should be reduced to ensure extraction of undesired trash. Conventional retainer plates at best permit to find a compromise setting, which is time-consuming and can hardly be reproduced later for the repeated production of such yarn.

**SUMMARY:**

In view of the search for new markets and market niches, rotor spinning mills intensify their efforts in developing new yarns and applications. In this respect, the raw material sector is most profitable, promising quick benefit. But very soon, spinners reach the technical limits of applying and blending most different fibre types, combing noils and regenerated fibres, set by the given air balance of conventional SpinBoxes. The SUESSEN TrashAdapter, combined with SUESSEN SpinBoxes SC and SQ, is an optimized system for controlled processing of “special fibres” into special yarns.
ELECTRO-JET bets for a new Roving Frame

Mireia Rovira, Electro-Jet – Sales Manager (left)
Ester Rovira, Electro-Jet – Technical Manager (right)

Electro-Jet, the well-known Spanish textile machinery manufacturer, has already been marketing for several months a new automatic roving frame, that is revolutionising the market in this field. With several units already working both in Spain and abroad, this new machine, completely manufactured by Electro-Jet, is capable of realising the doffing in a time inferior to 1.5 min. Besides this fast doffing, it is important to highlight that this roving frame starts automatically after the doffing, without the need of any operator intervention. This allows a notable reduction of the machine stop time, increasing significantly this way the production of every roving frame.

With regards to the technical characteristics, it is important to indicate that the flyers format allows to choose between 16” x 6” or 16” x 7”. The activation of the flyers and the drafting is realised by means of servomotors and driver, and only the count adjustment must be realised by means of gears changing. The controls both at the feeding sliver and at the superior or inferior roving breakage are realised by light barrier. Individual electro-mechanical sensors can also be optionally applied.

Fig. 1 ▼
The communication between the operator and the machine is realized by means of PC and touch screen, using a clear and easy dialogue in windows basis. This allows to regulate among other parameters, the roving metres on the bobbin, the space between turns, the roving tension, the torsion's change, the shifts counter, ...

A special feature of the drafting system is the SUESSEN Top Weighting Arm HP-A 410 (Fig. 1), designed for cotton roving frames with 3-roller and 4-roller double apron drafting systems with condensing zone. It is applicable for processing cotton, man-made fibres and blends up to 60 mm fibre length.

This Electro-Jet roving frame is available from a minimum of 32 spindles to a maximum of 160 spindles, having this last one a length of 24 metres. Although several of these machines have already been purchased by different spinning mills, ADR ROVEMATIC roving frame will be officially introduced in the next ITMA show in Birmingham. This machine is also available with semiautomatic doffing system. Electro-Jet will be present in this show, in Hall 3 Stand SP3-7A. Besides this new ADR ROVEMATIC, that is the name of the roving frame manufactured by Electro-Jet, in its stand this company will also exhibit several models of travelling cleaners, different applications of bobbins, cones and cans transport, and boxes and cones palletising, fields in which the company is a world-wide market leader.
MILL REPORT:
ANATEKS, Malatya, Turkey

Kaan Atsu, Area Sales Manager SUESSEN / Çengiz Kopar, TEMAS

Interview with Mr. Mehmet Bayrak, Technical Support Manager (Technical-Sales) from ANATEKS.

In 2001, ANATEKS purchased their first 8 SUESSEN SQ 8-B1 Modernization Sets for their Autocoro rotor spinning machines. In 2003, they ordered another 3 SQ 8-B1 Modernization Packages. All installations are equipped with Premium Parts spinning components. The active president of the management committee, Mr. Mahmut Çalış, and his family have been busy within the textile sector since 1930. In 1973 the company started to become an association. The production and marketing functions joined together under the name of ANATEKS GRUP in 2000.

The group constituted itself from 4 companies and 10 factories:
- Anateks Anadolu Tekstil Fabrikalari A.Ş.
- Malatya İplik Sanayi ve Tic. A.Ş.
- İpas Malatya İplik ve Dokuma Fabrikalari A.Ş.
- Anateks Pazarlama İç ve Dış Tic. A.Ş. in Istanbul

All are established and located in Malatya.

Today ANATEKS operates 205,000 ring spindles, 10,000 Open-End rotors, 1,152 twisting spindles, 118 knitting machines and has the capacity to dye 8,000 kg yarn per day with a total of 2,000 employees.

Mr. Mehmet Bayrak, Technical Support Manager, ANATEKS

The main products are:
- greige yarns (carded, Open-End, slub yarn, elastic core yarn, EliTe® Compact Yarn)
- yarns of synthetic fibre blends (polyester, acrylic, viscose, linen, wool)
- mélange yarns (cotton-polyester, 100% cotton-mélange),
- dyed yarns (cotton-cotton, acrylic)
- multicolor yarns
- twisted yarns
- circular knitting fabrics (12-32 pus)

SPINNOVATION:
Mr. Bayrak, please be so kind as to explain to us the procedure of decision finding to purchase the SUESSEN SQ 8-B1 modernization?

Mr. Bayrak:
First of all - we decided to increase the existing production and to improve the quality of the yarn production at the same time. As our machine equipment is well maintained, our decision making focused more or less from the beginning on a modernization solution instead of new machinery. With SUESSEN we met a company which...
Mr. Çengiz Kopar / TEMAS, Mr. Onder Dincer / Assistant to Mr. Bayrak contributed a mass of technical and technological know-how and supported us in finding the most valuable solution for our company. Besides this contribution, the long time of technological leadership in Open-End rotor spinning gave us the confidence and made us choose SUESSEN and their competent modernization solutions.

SPINNOVATION:
What are the main benefits and profits for ANATEKS with the SpinBox SQ 8-B1 modernized machines?

Mr. Bayrak:
First of all we achieved the high increase in production on all the modernized machines and with all our yarn products as predicted by SUESSEN. Meanwhile, we record, although with the higher production, improvements in yarn quality values, the clearer cuts and end-breaks decreased to all-time minimum values. Also the periodically cleaning intervals of the machines have been prolonged. In view of these benefits, everyone will realize the profits.

SPINNOVATION:
What do you think are the most important features of the modernization that guarantee your success?

Mr. Bayrak:
Compared to the conventional feed table, the fixed fibre beard support and sliver feed are completely separated in the new design. The feed table has only the task to press the sliver against the feed roller whereas the fixed fibre beard support guides the fibres. Therefore the fibres are opened more parallel and homogeneously, and trash extraction is improved. The BYPASS, adjustable to the amount of trash and waste in the sliver, prevents the waste from returning into the system again.

SPINNOVATION:
Any other special features you want to emphasize?

Mr. Bayrak:
Here I want to mention two things: The SUESSEN Premium Parts spinning components are of excellent quality, providing us with a very good yarn quality together with a long operating life at the highest quality level. Nothing less we expected from the Technology Leader. Further I have to underline the very good erection work executed by SUESSEN’s certificated service company Bilgin and the technological support from the SUESSEN employees.

SPINNOVATION:
Do you have any further projects in your schedule?

Mr. Bayrak:
As our company is open for any changes, we are open for any innovation. We are determined to continue the good relation with SUESSEN and will gladly check all developments and innovations of SUESSEN in our group companies.

SPINNOVATION:
It was a pleasure talking to you. Thank you very much for spending your valuable time on us.
MILL REPORT: Gadoon Textile Mills

Ioannis Spiridopoulos, Vice President Sales, SUESSEN

Interview with Mr. Sohail Tabba, Chief Executive Officer of Gadoon Textile Mills

Mr. Khalid Rashid, General Manager Gadoon Textile Mills Ltd. Unit-3.

Gadoon Textile Mills and Fazal Textile Mills are both part of one of the oldest and most prominent trading houses in Pakistan, Yunus Brothers.

The Group has 245,000 Spindles, 750 Looms and 214 Air-Jet Looms with state-of-the-art processing and stitching.

Gadoon Textile Mills itself is a blue-chip Public Limited Company paying out an average dividend of 49% over the last 5 years!

SPINNOVATION: Mr. Tabba, Mr. Rashid, please give us some information about the types of yarn you produce at Gadoon Textile Mills?

Mr. Tabba:
We at Gadoon Textile Mills have specialized in high-end yarns. We are the pioneers of Compact Yarn in Pakistan with the 15 FIOMAX EliTe® Compact Ring Spinning Machines we installed in 2000. Further we added 11 EliTe® CompactSets on existing ring spinning machines, giving us a total capacity of over 23,000 spindles with SUESSEN EliTe®Compact Technology. In addition we produce high-quality core-spun yarns and also have air-jet spinning.

Mr. Rashid:
In the GTML-3 plant we are spinning combed weaving yarns Ne 40/1 and 20/1.

SPINNOVATION: What are the main benefits of EliTe® Compact Yarns for your customers?

Mr. Tabba:
With the high-speed and efficiency driven technology today in warping and weaving, compact yarn is the right solution at the right time. Our customers are able to improve their loom efficiencies by 4 to 5 % (!), so you can imagine the benefit to their bottom lines!

SPINNOVATION: What do you regard as the main commercial benefits you draw from spinning EliTe® Compact Yarn?

Mr. Tabba:
As we look to the huge opportunities of 2005 with the abolition of quotas under the WTO agreement we believe that optimum efficiency and high quality is the name of the game. It has been proven that the efficiency on compact yarns is far better than conventional yarns and they also give us a marketing edge allowing us to service the high-end markets.

Mr. Rashid:
Here we record many advantages that are to our benefit and to the benefit of our customers:
- the yarn strength has improved by 2 RKM
- the hairiness is reduced by 1 point in Uster H, which is very important in warping and weaving
Yarn Irregularity and IPI values have improved

EliTe® Compact Yarn spun at low twist gives a special soft feeling and handle

Production increase up to 20% gain in ops.

EliTe® CompactSet increases the spinability of our fibres. Counts finer than 40/1 (weaving yarn combed) with Pakistani Cotton (short cotton) is possible.

Higher efficiency in warping and sizing

Pilling is reduced although singeing process may be eliminated

Fly generation is fantastically reduced in the spinning department (as 85% of fly originate from spinning triangle), as well as in warping, knitting, weaving

Ends-down rate far better than in ring spinning

I could talk about the benefits in the fabrics itself but that would take too long for the moment...

SPINNOVATION:
How do you see the future of Compact Yarns?

Mr. Tabba:
The future is extremely promising.

Mr. Rashid:
Compact Spinning is the future of yarn spinning. We would like to see the EliTe® Compact Spinning System even further developed and improved.

SPINNOVATION No. 19

GADOON TEXTILE MILLS LTD. UNIT-3

COMPARISON RESULTS OF 40/1 CM CONVENTIONAL & 40/1 CM EliTe® COMPACT

<table>
<thead>
<tr>
<th>TECHNICAL SPECIFICATION ARE AS UNDER...</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMPARISON RESULTS OF 40/1 CM CONVENTIONAL &amp; 40/1 CM EliTe® COMPACT</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NOM.COUNT</th>
<th>40/1 CM W NORMAL</th>
<th>40/1 CM W EliTe® COMPACT</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>COUNT</td>
<td>40,20</td>
<td>40,20</td>
<td></td>
</tr>
<tr>
<td>CV%</td>
<td>1,30</td>
<td>1,40</td>
<td>INCREASE</td>
</tr>
<tr>
<td>STR</td>
<td>64,25</td>
<td>72,00</td>
<td></td>
</tr>
<tr>
<td>C.L.S.P</td>
<td>2583</td>
<td>2894</td>
<td>IMPROVED</td>
</tr>
<tr>
<td>U%</td>
<td>10,60</td>
<td>10,50</td>
<td>IMPROVED</td>
</tr>
<tr>
<td>THIN PLACES</td>
<td>6</td>
<td>3</td>
<td>IMPROVED</td>
</tr>
<tr>
<td>THICK PLACES</td>
<td>30</td>
<td>26</td>
<td>IMPROVED</td>
</tr>
<tr>
<td>NEPS</td>
<td>85</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>TOTAL I.P.I</td>
<td>121</td>
<td>109</td>
<td>IMPROVED</td>
</tr>
<tr>
<td>HAIRINESS</td>
<td>5,05</td>
<td>4,05</td>
<td>IMPROVED</td>
</tr>
<tr>
<td>S.Y.S</td>
<td>265</td>
<td>295</td>
<td>IMPROVED</td>
</tr>
<tr>
<td>R.K.M</td>
<td>17,95</td>
<td>19,50</td>
<td>IMPROVED</td>
</tr>
<tr>
<td>ELONGATION%</td>
<td>5,40</td>
<td>5,30</td>
<td></td>
</tr>
<tr>
<td>TPI</td>
<td>28,45</td>
<td>25,05</td>
<td></td>
</tr>
<tr>
<td>COTTON TYPE</td>
<td>PAKISTANI</td>
<td>PAKISTANI</td>
<td></td>
</tr>
<tr>
<td>STAPLE LENGTH</td>
<td>1.10 INCH</td>
<td>1.10 INCH</td>
<td></td>
</tr>
<tr>
<td>RING CUP TYPE</td>
<td>CHINA</td>
<td>BRACKER (TITAN)</td>
<td></td>
</tr>
<tr>
<td>RING CUP DIA</td>
<td>38 mm</td>
<td>40 mm</td>
<td></td>
</tr>
<tr>
<td>RING FRAME TYPE</td>
<td>FA-502</td>
<td>EIM-12KA</td>
<td></td>
</tr>
<tr>
<td>SPINDLE SPEED</td>
<td>19300</td>
<td>21000</td>
<td></td>
</tr>
<tr>
<td>OPS (PRODUCTION)</td>
<td>4,00</td>
<td>5,00</td>
<td></td>
</tr>
<tr>
<td>TREVELLE TYPE</td>
<td>C1 hd/KM 11/0</td>
<td>ELI F 8/0 BRACKER</td>
<td></td>
</tr>
</tbody>
</table>

GENERAL MANAGER
Compact Yarn and Warping – New Concepts

Ahmed Iftikhar, Technical Director Gadoon Textile Mills

A very important issue concerning EliTe® Compact Yarn is the improved warping performance due to its increased strength.

Normally, when a yarn has an increased strength, the performance of this yarn in warping is ultimately increased, too. But this concept is no more valid now, especially in case of compact yarn. It is a well-known fact that even with low twist, compact yarns have an up to 20% higher strength than normal ring-spun yarns.

This misconception may divert spinners’ attention to reduce twist below the limit, which is definitely required for certain fibre lengths to achieve a certain elongation of yarn. Because even with a slightly good strength, the performance of compact yarn on weaving machines is almost the same as normal ring-spun yarn (in any case performance on loom is always excellent). We can understand this by the following experiments.

**Experiment A**

<table>
<thead>
<tr>
<th></th>
<th>conventional ring-spun yarn</th>
<th>EliTe® Compact Yarn</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cotton length</td>
<td>28 mm</td>
<td>28 mm</td>
</tr>
<tr>
<td>Count (NEC)</td>
<td>40/1</td>
<td>40/1</td>
</tr>
<tr>
<td>T.M</td>
<td>4.30</td>
<td>3.80</td>
</tr>
<tr>
<td>TPI</td>
<td>27.20</td>
<td>24.03</td>
</tr>
<tr>
<td>Strength (Lbs)</td>
<td>60.00</td>
<td>65.00</td>
</tr>
<tr>
<td>CLSP</td>
<td>2400</td>
<td>2600</td>
</tr>
<tr>
<td>RKM</td>
<td>15.36</td>
<td>16.64</td>
</tr>
<tr>
<td>Warping Breakage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>per Million Metres</td>
<td>0.70</td>
<td>0.70</td>
</tr>
</tbody>
</table>

This experiment shows no difference in warping performance between conventional ring-spun yarn and compact yarn. EliTe® Yarn even has much better strength.

**Experiment B**

<table>
<thead>
<tr>
<th></th>
<th>conventional ring-spun yarn</th>
<th>conventional ring-spun yarn</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cotton length</td>
<td>28 mm</td>
<td>32 mm</td>
</tr>
<tr>
<td>Count (Nec)</td>
<td>40/1</td>
<td>40/1</td>
</tr>
<tr>
<td>T.M</td>
<td>4.30</td>
<td>3.60</td>
</tr>
<tr>
<td>TPI</td>
<td>27.20</td>
<td>22.77</td>
</tr>
<tr>
<td>Strength (Lbs)</td>
<td>60.00</td>
<td>65.00</td>
</tr>
<tr>
<td>CLSP</td>
<td>2400</td>
<td>2600</td>
</tr>
<tr>
<td>RKM</td>
<td>15.36</td>
<td>16.64</td>
</tr>
<tr>
<td>Warping Breakage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>per Million Metres</td>
<td>0.70</td>
<td>0.90</td>
</tr>
</tbody>
</table>

In this experiment both yarns are normal ring spun. One yarn with long fibre length and with very low twist multiplier, has a higher strength value, but performance in warping is inferior.
Both experiments prove this ideology that strength is not the only parameter to improve performance in warping. The most important factor to improve warping performance is twist, because a certain amount of yarn twist – depending on the given fibre lengths – is definitely required to hold the fibre bundle and to bear warping force.

Now the question arises regarding the benefits of yarn production on spinning frames, applying low twist philosophy.

Its answer is that a production benefit is indeed achieved if twist is lower than that of normal ring-spun yarn, but this difference in twist (T.M) should not be based on yarn strength. It must be at the limit, as a certain amount of twist is required in any case, to bear warping tension and force.

So ideally twist in compact yarn should be 8% less than that of normal ring yarn. This 8% lower twist plus increase in spindle speed (compared with normal ring yarn) will provide a production advantage.

Another important feature is the performance on loom after sizing. Even with a low performance in warping, the same yarn will perform much much better than normal ring-spun yarn, so that loom efficiency is increased by about 4-5% with compact yarn. This is owing to low hairiness and slightly lower twist than that of conventional ring-spun yarn.

In conventional yarn, all fibres of the yarn including hairs (short and long) are covered with a film of sizing material.

These hairs, and especially long hairs, are part of the yarn, but have no contribution to loom working, and furthermore these hairs disturb the shedding process on a loom, and are one of the reasons for warp breaks on loom.

EliTe®Yarn has no such long hairs, which allows a good sizing of the yarn and also provides a perfect shedding process on the loom.

As a result of all these advantages, not only loom efficiency is very good, but also the quality of the fabric, almost free from loom start mark, due to less loom stops.
Spinning mills undertake extreme efforts to produce yarns at most favourable prices, in order to hold their ground on the global textile market. Successful companies achieve this goal in a different manner:

- Application of a large number of highly productive machines to keep fixed costs at a low level relative to the quantity of yarn produced.
- Application of low-priced raw material.
- Opening-up of market niches to avoid cost pressure.
- Careful selection of location with respect to wages, tax, energy costs, infrastructure, etc..

Usually, location is only considered when a new factory is built. But the cost structure, which may be more favourable at first sight, can change later as a result of changing conditions.

For existing production sites these location-related cost structures are a given fact and cannot be influenced. But a spinning mill is in a position to take influence on the other aforesaid factors, i.e. production increase, raw material costs, market niches.

In this respect, the OE rotor spinner directly depends on one prerequisite: the quality of the SpinBox

The SpinBox singularizes and clears the fibres and gives them a parallel orientation on their way to the rotor, and this is of decisive influence for the yarn quality produced.

Experience with the modernization of more than 650 machines (SE 7, SE 8, SE 9) with SC-M and SQ SpinBoxes confirms for each individual case a substantial quality improvement with simultaneously reduced ends-down rate. It permits an average production increase of up to 25% (in some cases even up to 40%) without reducing the standard quality. Even after the production increase with SC-M or SQ, the ends-down rate is still lower than with the former machine prior to modernization.

This quality improvement achieved by modernization permits as a further option to process less cost-intensive raw material, maintaining production speed. One of our clients, for example, blends his standard cotton sliver with up to 25% of combing noils. The yarn quality achieved corresponds to that of his standard cotton blend processed on the unmodernized machine. In this case, too, the ends-down rate is lower on the modernized machines - additionally increasing machine efficiency.

The graph of Fig. 2 shows the customer benefit with an SC-M or SQ modernization with identical raw material:

- The red point stands for yarn quality and production on the existing, not modernized machine.
- The blue and green points show the possible customer benefit by modernization with the SC-M or SQ SpinBox, depending on how the customer wants to apply his equipment.
Fig. 2 shows the customer benefit with invariable production and adaptation of raw material:

The red point again stands for yarn quality and production on the existing, not modernized machine.

The blue and green points refer to possible customer benefit:
Blue means improved yarn quality with constant production and unchanged raw material, green means constant yarn quality with considerably reduced raw material costs. The line between blue and green shows the possible compromise between quality improvement and cost saving.

How do SUESSEN SpinBoxes meet this requirement?
The mass of fibres fed must be better singularized, better cleared, better parallelized and better controlled than with standard SE 7, SE 8 and SE 9 SpinBoxes.

The Fixed Fibre Beard Support (Fig. 4) encloses a big sector around the circumference of the opening roller and therefore ensures constant opening and clearing of the sliver by the open-
The SE feed table, on the contrary, reacts to smallest variations in mass of the fed sliver and supports the fibre beard only in a very small area. The feed table distance varies, and therefore the fibre beard is not permanently within the working range of the opening roller, and can even leave it below the feed table. As a result, fibre singularization and clearing effect are worse.

The **BYPASS** (Fig. 5) in addition provides the possibility of extracting light dirt particles without disturbing the air balance in the SpinBox. The additional air intake into the SC-M and SQ SpinBox permits to reduce the quantity of air streaming in through the trash extraction chute without affecting the vacuum at the fibre channel. Owing to the reduced air velocity, light trash can be extracted and does not reach the rotor. The rotor groove is less contaminated and yarn quality is more homogeneous over a longer period at a reduced ends-down rate.

Influencing trash extraction at SE SpinBoxes in such a way requires the reduction of the spinning vacuum. A significant disadvantage in this respect is that the vacuum in the fibre channel is also reduced and reliable fibre detachment from the opening roller is no more ensured. As a result, the recirculating fibres are embedded in the yarn as thick places.

The **Labyrinth Seal and covered flanges** (Fig. 6 and 7) of the opening roller eliminate disturbing air-turbulence in the SC-M and SQ opening housing. The mass of fibres is transported by a uniform airflow in the SpinBox and receives optimum orientation. As the opening roller is no more covered, dirt accumulation and consequently maintenance are reduced.

The smaller cross-section of the SC-M/SQ **fibre channel** (Fig. 8) produces a higher air velocity. The orientation of fibres during their transport to the rotor is additionally improved compared with SE SpinBoxes. This results in a higher yarn strength and regularity.

Flexibility in producing special-purpose yarns is ensured by the **TrashAdapter** (Fig. 9).

Additional spinning accessories like the TrashAdapter for the SUESSEN SC-M and SQ SpinBoxes permit to control special fibres in the spinning process. The TrashAdapter serves as a further fibre guide by reducing the cross-section of the trash extraction chute. It prevents extraction of such
special fibres usually extracted by the opening roller. For example, linen/cotton blends, pure blends of regenerated fibres, blends with regenerated wool fibres or slub yarns produced by adding regenerated fibres of various opening degrees.

In combination with the BYPASS, the safe extraction of trash particles is still ensured (please refer to the article on page 23 “TrashAdapter”). Particularly important in spinning coarse yarns and yarns of special fibre blends is the installation of the SweepCat trash elimination channel. The significantly deeper trash channel and quick trash removal by the wiper prevent already extracted trash particles, dust and fibre fragments from being sucked back into the spinning process and deteriorating yarn quality or causing end-breaks (for more details see page 41). The SweepCat is standard part of SC-M and SQ modernization packages.

**SUMMARY**
Optimization in fibre singularization, trash extraction and air balance in SC-M and SQ SpinBoxes permits to improve yarn quality and offers spinning mills two options:

- Production can be increased after modernization, until the “standard yarn quality” is reached by natural, production-related quality decrease. Experience has taught us that production increase can be up to 25%. Consequently, the percentage of fixed costs per kg of yarn produced is reduced.
- Without production increase, low-priced raw material of an inferior quality permits to achieve the same yarn quality as with unmodernized machines, thus ensuring a direct cost saving.
- Furthermore, SUESSEN Open End modernization packages with special spinning accessories like the TrashAdapter make SpinBoxes more flexible for conquering new market niches.
Using and Handling Soft Cots

Werner P. Lauhus,
ATPG Textile Products Group GmbH, Münster, Germany

High-quality yarn presents a decisive competitive advantage. Spinning mills, machine manufacturers and producers of aprons, cots and other accessories are constantly on the search for further product improvements. Our current contribution to improved yarn quality since the year 2000 has been the introduction of the improved soft spinning cots: J463 modified (63 ShA) and J470 (70 ShA), as well as the very recent J466 (67 ShA). These cot qualities have been adopted as the industrial standard by machine manufacturers for front rollers in both ring-frame and compact spinning machines.

The last four years sales figures show that soft cot qualities have sustained a dramatic rise in market share in each market segment. Apart from that, the last decade has seen the completion of a universal trend towards softer spinning cots: in 1990, 80% of all cots were hard (78-83 ShA), the trend has moved towards soft cots (63-68 ShA) and medium-hard cots (70-75 ShA) with a market share of around 70% in 2002.

Throughout the world, many spinning mills have switched from competitor products to J463 modified and J466 or J470 for both 100% cotton and blended yarns. Reaching the best possible yarn values (CV%, thin places and thick places, hairiness) requires the use of a soft cot of the highest quality; however, the success of a soft cot in textile applications is also largely dependent on handling and maintenance – our J463, J466 and J470 cots do not need surface treatment such as ultraviolet or acid treatment after polishing. In fact, these surface treatments are aggressive and may damage the spinning cot, which will lead to deterioration in yarn values over the course of time.

For a soft cot to deliver its characteristic good spinning quality, it has to have a defined surface roughness. We recommend aiming at a target roughness of 0.8-1.0 μm Ra. Also, the following general guidelines should be observed, regardless of grinding machine type:

- The grinding wheel should be properly maintained and serviced. We recommend that the wheel be diamond-polished after grinding of about 1500 rollers. In addition, the wheel should be cleaned either with compressed air or a soft metal brush every 15 minutes.
- The cot surface should be clean, free of dust as well free of grinder cuts.
- At every grinding, 0.3 mm of the diameter of the cot should be ground off for a fresh rubber layer on the cot surface.
- We recommend grinding intervals of two to three months for soft and medium-hard cots, whereas hard cots should be ground every four to five months depending on application.
- The lower grinding limit for spinning cots with a nominal inner diameter of 19 mm is 26.5 mm in diameter. If the rubber wall is thinner, especially soft cots lose their fibre guiding characteristics since the effective hardness of the cot below this diameter increases exponentially with the decreasing outer diameter, until the soft cot finally loses its application advantage.
- A regularly calibrated measuring instrument should be used to check the roughness. Roughness should be measured at three different places on the cot surface, and the result averaged.

The grinding machine types used differ mainly in the grinding principle (wheel porosity and granulation, narrow stone and wide stone principle), degree of automation (manual, semi-automatic, fully automatic) and drive (electrical, hydraulic or pneumatic). The grinding principle is the most technologically important factor. First of all, narrow stone machines (e.g. System Day International and Yamatokoei) are distinguished from wide stone machines (e.g. Wolters, Berkol), so the specific properties of each machine type should be considered. The state of the grinding stone is critically important in both grinding systems. Also, the total contact and grinding times above may also have to be adjusted if a different stone specification is used.

In the Wolters system, the machine should be set at 1 sec/0.1 mm material removal in order to reach a complete...
Accotex® – The Leaders Choice
In Compact Spinning

Accotex cots & aprons for improved yarn quality in all spinning applications.

formerly known as Armstrong – is a brand name of DAY International Inc.

For an Accotex contact in your country, please visit our web site www.Accotex.com
The following table shows some important criteria using the example of grinding a soft Accotex J463 spinning cot:

<table>
<thead>
<tr>
<th></th>
<th>Wide stone</th>
<th>Narrow stone</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Wolters</td>
<td>Berkol</td>
</tr>
<tr>
<td>Grindstone granulation</td>
<td>120</td>
<td>80</td>
</tr>
<tr>
<td>Grindstone porosity</td>
<td>10</td>
<td>14</td>
</tr>
<tr>
<td>Grinding time</td>
<td>3 sec</td>
<td>–</td>
</tr>
<tr>
<td>Polishing time</td>
<td>5 sec</td>
<td>–</td>
</tr>
<tr>
<td>Total grinding/contact time</td>
<td>8 sec</td>
<td>10 sec</td>
</tr>
</tbody>
</table>

grinding depth of 0.3 mm while keeping to the shortest grinding time required. When using the Berkol system, the resulting total grinding time to be set is additionally highly dependent on the hydraulic movement system: on the one hand, the hydraulic system is subject to a clear start-up phase due to the viscosity and temperature dependence of the hydraulic oil selected, and on the other hand, experience has shown that hydraulic movement characteristics are highly dependent on individual movement characteristics in every machine, even in machines of the same model.

Especially regarding servicing aspect, it is worth mentioning that high-performance spinning cots do not involve any over-head costs.

Comparing grinding times with those reached using various competitor products, up to 20 sec can be added to the complete grinding time in certain cases, also depending on the grinding principle. Assuming a lifetime of three years (12 grinding cycles) for a cot with a 30 mm outer diameter and a full labour and material cost of €15, savings of €0.25 or €0.50 per spinning cot throughout the three years are possible due to the reduced grinding times of 10 sec or 20 sec per axle.

This makes it clear how much the purchase price for a high-performance spinning cot with significantly better grinding properties can be recovered just by reducing the staffing costs per cot. Thus, a spinning company with 30,000 ring spindles can reduce its labour time requirement at the spinning machines by 21 to 42 shifts.

Both approaches should not be ignored when purchasing high-performance spinning cots.
SweepCat – Modernization of Trash Elimination for Autocoro Machines

Michael Basting, Product Manager Premium Parts, SUESSEN

The extraction of dirt and fibre particles on Open-End Rotor Spinning Machines has great influence on yarn quality and spinning stability. Dirt particles embedded in the OE yarn disturb the downstream process, and contaminated rotor grooves in any case produce inferior yarn quality or even end-breaks in the spinning process.

All through the numerous generations of SUESSEN SpinBoxes, clearing of the fibre material has been improved again and again. Apart from other influences, improved trash extraction ensures high yarn quality and production increase and enables spinners to process highly contaminated raw material at acceptable delivery speeds.

This continuously improved fibre beard clearing must go hand in hand with an optimization of the units removing these extracted trash particles. When spinning coarse yarns and/or processing very dirty raw material, many spinners are faced with the problem that the trash removal units cannot fulfill their task. Trash already extracted accumulates and is again sucked into the spinning process, causing yarn breaks or at least rather contaminated yarn.

Efficiency loss, inferior yarn quality and short maintenance intervals are the result.

The conventional trash evacuation system by means of textured tape and channel with a small cross-section on Autocoro spinning machines with SE 7 to SE 10 SpinBox generations presents two well-known problems:

- The channel dimensions are too small to catch the masses of trash.
  - Dirt accumulates and is condensed. Friction at the channel side walls and transportation on the textured tape cause the trash deposits to pile up to so-called “trash rolls”. These deposits can reach the air flow of the trash chute of the SpinBox and parts of them can be sucked back into the SpinBox. As a rule, end-breaks are the result, at least however a high contamination of the yarn, with a subsequent loss in efficiency and yarn quality.
Time-consuming maintenance of the textured tapes evacuating the dirt particles. The rough textured surface attracts many trash particles which are only insufficiently removed by the tape cleaning device. This even intensifies the formation of the above-described trash deposits with the inevitable consequences. Short cleaning intervals are required and reduce the annual efficiency further.

SUESSEN was already aware of this problem when developing the modernization packages with the Compact SpinBox SC and has now adapted the proven trash evacuation system SweepCat to its modernization packages with the Quality SpinBox SQ 9:

- Stainless steel channel with smooth surface and maximum cross-section (Fig. 1)
- Removal of extracted dirt particles with the SweepCat wiper, driven by individual motors and steel tapes (Fig. 2)
- Trash elimination at both ends of the channel into vacuum ducts with monitoring

The new SweepCat evacuation system is included in the SUESSEN SQ 9 package for partial modernization, and will soon also be available for SQ 7 and SQ 8. Exclusively for Autocoro Rotor Spinning Machines SE 9, the new SweepCat will be offered as an autonomous unit without an SC or SQ SpinBox. The big cross-section and smooth surface of the channel prevent dirt accumulation. Trash particles lie quiet and deep under the corresponding spinning positions, out of reach of the air flow of the trash chute opening, and are safely transported by the SweepCat wiper to the suction unit, to be quickly evacuated.

Additional features of the SweepCat system:
- Permanent monitoring of the vacuum at the suction units and of the SweepCat wiper movement. If suction or wipers are blocked by some sort of obstacle, a signal lamp shines and unnecessary control is avoided.
- The rotation of the auxiliary shaft is monitored (on machines with mechanical yarn detector). In case of a standstill of the auxiliary shaft due to technical trouble (winding head drive or mechanical yarn detector), the machine is stopped. Subsequent overfeeding of a rotor after an end-break and, as a consequence, fire risk are prevented.

**SUMMARY**
The new SweepCat system represents a solution to trash evacuation, which simultaneously improves quality and increases production. Efficiency loss and inferior yarn quality due to trash particles already extracted, but sucked back into the spinning process and embedded in the yarn are excluded. Extended maintenance intervals and online monitoring increase the annual machine efficiency.
EliTe® Compact Yarns on Air-Jet Weaving Machines

Peter Stahlecker, Managing Director, SUESSEN

Extract from a discussion of M/s. Peter Dornier, Managing Director of Lindauer Dornier GmbH, Lindau, Germany, and Peter Stahlecker, Managing Director of Spindelfabrik Suessen GmbH, Suessen, Germany.

...Compact yarns are a revolutionary innovation for air-jet looms, comparable with the introduction of the Autocorner for shuttleless weaving machines...

...Compact yarns will contribute to further enhance the market share of air-jet looms, to the detriment of gripper loom and projectile weaving machines...

...Compact yarns are a revolutionary innovation for air-jet looms, comparable with the introduction of the Autocorner for shuttleless weaving machines...

...The design of an air-jet loom is simpler and less complicated than a gripper loom, and so is less demanding as regards maintenance and service; in addition, its spare part requirement is reduced...

...Compact Yarns permit substantial savings in sizing agent. Customers who use sizing simply for reducing tangling and not for increasing yarn strength, can practically do without it...

...M/s. Dornier think that Compact Yarns will give a fresh impetus to air-jet weaving machines...

Gassing (Singeing) of Yarn means Burning Money

Peter Stahlecker, Managing Director, SUESSEN

Gassing, also called singeing, is a popular process to reduce the hairiness of yarns.

Basically, the yarn is pulled through an open flame at high speed. As the protruding hairs offer the highest ratio of surface to mass, they are ignited the easiest, and burnt off. After singeing, the yarn is generally rewound again, to remove the ash residues on the yarn. Due to the high speed, and generally low operating cost, people sometimes consider gassing a low cost process. Nothing could be further from the truth!

Gassing generally burns off 5 - 8% of the mass. However, this mass reduction is not only fiber as some still say, but finished yarn, having gone through all processes in the mill.

Example: you are gassing 1,000 kg of an Ne 47/1, at 6.5%. This means, you will only be able to sell 935 kg of an Ne 50/1.

You have just burnt up and therefore lost 65 kg of a perfectly good and sellable Ne 47/1.

People do not look at it this way, because gassing is simply necessary to achieve a certain level of quality. Today, with the availability of EliTe® Compact Yarn, gassing is often not needed any more.

Instead of spinning Ne 47/1 (in our example), our customers spin Ne 50/1 to begin with. They sell the 65 kg of Ne 50/1, instead of burning it. It seems, the economics are crystal clear.

In addition to reducing the hairiness, EliTe® Compact Yarn offers further advantages, such as

- increased break strength
- increased elongation
- high luster

Spinners using a gassing process at present must ask themselves, if EliTe® Compact Yarn might not be the better solution for them.
Without energy loss, a ring spindle once accelerated to its operating speed, would continue to rotate on and on. Friction forces and air resistance as a result of the rotation, however, exercise a braking moment and lead to loss of energy.

If a spindle is to retain its level of speed, this power loss has to be compensated by an additional input of energy.

The total power required by a ring spindle has to include the energy loss, which automatically arises when the necessary power has to be transferred from the power supply line via the electrical drive, the shaft transmissions and the belt drive to the spindle.

The efficiency of the mechanical power transmission is improved by reducing wharve diameters. Wharve diameters below 18.5 mm, however, are more likely to lead to unfavourable conditions, making it necessary to use a higher belt tension in order to guarantee a transfer of torque without slippage (see Fig. 1).

In other words, with wharve diameters below 18.5 mm the efficiency of power transmission deteriorates. Therefore smaller neck bearings and, consequently smaller wharve diameters have a negative effect on power consumption.

Fig. 2 shows the energy balance for a spindle in dependence of spindle speed for a yarn count of Ne 40 (twist multiplier 4.3), a tube length of 180 mm and a ring diameter of 38 mm. Tube length and ring diameter have a significant influence on the overall power consumption. This, however, must not lead to neglecting the power consumption of the spindle bearing system.
The spindle upper part is rigidly supported by the neck bearing and elastically by the radial footstep bearing. The radial movements are hydraulically dampened.

While the neck bearing is designed as an antifriction bearing, the footstep bearing is constructed as a hydrodynamic plain bearing. Both bearings have to be dimensioned in such a manner that a satisfactory operating life is achieved at highest speeds and acting loads. In line with this is the energetic optimization.

Large bearings are capable to carry high loads, but they are rather limited in terms of speed and, in addition, they have a higher power consumption.

### 1. Power Consumption of the Neck Bearing

The power consumption of a roller bearing depends on the following parameters:

- speed
- mean diameter of the bearing
- viscosity of the lubricant
- radial load on the bearing

The neck bearing is radially subjected to the belt contact pressure. In addition to this static force, there are also dynamic forces acting as a result of the rotating spindle.

They increase with increasing speed, but depend to a large extent on the quiet running of the spindle. Vibrating spindles create higher reactionary forces in the neck bearings. Extremely bad running spindles produce bearing loads of such a high magnitude that they lead to excessive overloads on the neck bearing and finally to its breakdown.

The noise level of NOVIBRA’s HP-S 68 and HP-S 68/3 spindles is well known. Correspondingly lower are the forces acting on the neck bearing of these spindles (Fig. 3). In this respect a special position is held by the NASA bearing system. The almost constant for-
2. Power Consumption of the Footstep Bearing

2.1 Radial Bearing

The radial bearing of the NOVIBRA HP-S 68 spindle is a hydrodynamic plain bearing, in which the rotating shaft is floating on a film of oil. The floating effect begins only at a certain starting speed. If the hydrodynamic bearing is operated, however, considerably in excess of this speed, the oil film acts like a brake. Power consumption in this case becomes very high.

The energy consumption of a hydrodynamic plain bearing depends on the following factors:

- oil viscosity
- bearing geometry (see Fig. 5)
  - bearing width B
  - bearing diameter D
  - shaft diameter d
- radial load
- heat dissipation

The interrelationships in a hydrodynamic plain bearing are complex. The power consumption of the bearing cannot be expressed in a generally understandable formula. Apart from the given oil viscosity and spindle speeds, the power consumption of a spindle bearing is predominantly influenced by the diameter of the bearing. The footstep bearing diameter of the HP-S 68 has been reduced from 4.5 mm to 3.0 mm in the HP-S 68/3. The resulting reduction in power consumption is clearly demonstrated in Fig. 6.

The energy consumption of a spindle bearing is greatly influenced by the viscosity of the spindle oil used. An excessive amount of oil in the bearing or a bearing filled with oil of a higher viscosity will consume correspondingly more energy. The specified spindle oils have a correspondingly low viscosity. Oil qualities having a still lower viscosity are difficult to obtain. Therefore, spindle bearings are designed to suit the world-wide available spindle oils.

aces on the neck bearing throughout the range of spindle speed are the result of the elastically supported neck bearing.

The power consumption \( P \) of the neck bearing can, with sufficiently exact approximation, be expressed as \( P \propto Dm \times F \times n \).

Fig. 4 shows the power consumption of neck bearings of various designs.

It can be seen that the NASA bearing system, on account of the low radial loads, offers distinct advantages.
2.2 Axial Bearings

The HP-S 68 Spindle Upper Part is supported by a plain disc. Its shaft end is formed into a spheroid tip. Consequently, the shaft touches the disc only at one point, which coincides with the axis of rotation. Frictional forces, which could exert a braking moment are thus not acting in the axial bearing of the HP-S 68 - at least not in the first approximation. The axial bearing of the HP-S 68 does therefore not consume any power.

3. Spindle Damping

As a result of unbalance the footstep bearing is subjected to radial excursions. When this happens, the oil spool will be deformed in such a manner that the oil is forced from the narrowing interspaces into the widening gaps. The narrow gaps form a throttle resistance, which acts in opposite direction to the oil flow. The hydraulic damping is the more effective, the closer, the longer and wider the gap in the oil spool and the higher the velocity of the oil is.

Pumping the oil to and fro improves the running performance of the spindle, but at the same time it destroys energy. The amount of energy, introduced into the damping system increases with the radial excursion of the footstep bearing. The damping system of a perfectly running spindle consumes thus less power.

4. Rotation of the Spindle Shaft in Oil

A spindle shaft rotates in oil. On its surface it is dragging oil and brings it in rotation too. The rotating oil column will be resisted by the oil which is not in rotation. The oil is acting like a brake on the spindle shaft, which converts rotational energy into heat energy. The energy loss depends on the surface speed of the spindle shaft. In the energy balance of a spindle bearing this loss is very insignificant.
The magnitude of the braking moment acting on the spindle is determined, apart from the spindle speed, by the parameters mentioned in Tab. 1.

Fig. 7 shows the distribution of power consumption of a NASA HP-S 68/3 Spindle Bearing. The neck bearing size of the HP-S 68 spindle provides an excellent compromise between mechanical robustness and energy consumption.

With wharve diameters below 18.5 mm the efficiency of power transmission deteriorates. The disadvantage of a reduced load capacity of neck bearings, which are smaller than 6.8 mm is therefore not compensated by advantages in power consumption saving. Apart from a not insignificant noise reduction of the NASA Bearing, this design offers also energetic advantages.

A decisive step towards a significant reduction in power has been made with the introduction of NOVIBRA’s HP-S 68/3 Spindle Bearing. In comparison with the 4.5 mm Footstep Bearing, the 3.0 mm Footstep Design offers a general reduction in power consumption of 2 Watt, which on the basis of a one year operation time is equivalent to a cost saving of approximately 1 USD per spindle, which more than justifies the difficult and more expensive manufacture of the 3.0 mm Footstep Bearing.

Fig. 8 shows the power consumption of HP-S 68 Spindles over the complete speed range.

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**Type of Influence**  | **Magnitude of Influence**  | **Dependence**
--- | --- | ---
Air resistance  | Yarn balloon  | Length, diameter, type of yarn
Yarn cop surface  |  | Length, diameter, type of yarn, traveller weight
Frictional loads  | Traveller  | Ring diameter, cross-section of ring, type of yarn, spinning speed, traveller geometry
Neck bearing  |  | Bearing geometry, diameter, bearing loads, oil viscosity
Footstep bearing  |  | Bearing geometry, diameter, oil viscosity
Damping system  |  | Noise level of the spindle, unbalance, oil viscosity
Rotation of the spindle shaft in oil  |  | Shaft diameter, oil viscosity

**Tab. 1**

**SUMMARY**

The magnitude of the braking moment acting on the spindle is determined, apart from the spindle speed, by the parameters mentioned in Tab. 1.
leading in spindle technology

NASA HP-S 68/3
and HP-S 68/3

the only 100% inhouse spindle maker

Novibra GmbH, Postfach 1249, DE-73074 Seussen, Germany, Phone +49 7162 15-0, Fax -49 7162 15-326, e-mail sales@novibra.com
Cotton Inc. Study concerning effect of varying short fibre content on the resultant yarn

Cotton Inc., the research and marketing company of the US cotton growers, released a comprehensive study on this subject. Conventional ring spinning and compact ring spinning (SUESSEN EliTe Compact Spinning System) were compared.

The results show that with EliTe® Compact Spinning a high level of short fibres can be tolerated. The tenacity of an EliTe® Yarn spun from 80/20 & cotton/comber noil is still as high as the tenacity of a combed conventional yarn.

The hairiness of the same EliTe® Yarn is still 10% better than the hairiness of the combed conventional yarn (as measured by USTER).

Furthermore the Cotton Inc. published the paper: "An EliTe Alternative for Higher Quality – Lower Cost Ring Spun Yarns". Cotton Inc. states, that "...through common sense, our experience and some other factors, we concluded that the Suessen Elite® compact ring spinning system offered the best operational design..."

For more information, please contact SUESSEN or Cotton Inc. directly at www.cottoninc.com.

EliTe® CompactSet-S for the Toyota RY5

After the successful operation at 3 months, SUESSEN has released the EliTe®CompactSet-S package for the Toyota RY5 ring spinning machine for serial production. M/S. Mahmood Textile Mills in Multan/Pakistan were the first to purchase this new package. In the meantime some other companies have also placed orders for the conversion of their Toyota RY 5 machines. Pakistan is the country where mills are most interested in converting this type of machine.

SUESSEN will participate in ShanghaiTex 2003...

…from December 10 to 13. The stand is located in Hall 2, Booth A22. On 50 sqm, the company will exhibit already established products as EliTe®CompactSet, HP ComponentSet, SpinBox SC/SQ Modernization for Autocoro and Premium Parts Spinning Components, as well as all Innovations of the year 2003, including EliTwist®, EliCore®, EliCoreTwist®, ProFil® Rotor, TrashAdapter, SQ SweepCat and more...

SUESSEN considers Shanghaitex the most important exhibition in 2003. The company will be represented by members of the Management, the Sales Department, the Technical Department and the Agency.

EliTe® CompactSet Sales in Asia

SUESSEN has received a number of orders and enquiries for EliTe® CompactSet-S (for short-staple fibres) EliTe®CompactSet-L (for long-staple fibres) from the Asian Market.

The largest installation of EliTe® CompactSet-L in the Asia started successfully only recently. The customer already considers extending his plant in 2004. In one of the next SPINNOVATION issues we will present this successful installation in a mill report.

SUESSEN Customer Seminars

To introduce all SUESSEN Innovations 2003 to the market, SUESSEN has already organized a number of Seminar Days in Turkey, Pakistan and China. These Seminars will be held from October to December 2003. Seminars in other key-markets e.g. India are in preparation. The customers will be informed in due time by the local SUESSEN agencies.
Compact Spinning

Eli Twist®
Two-Ply Yarn directly from the ring spinning machine with compact spinning technology

Eli Core®
Core Yarn Device for Eli Te® Compact Set

Eli Core Twist®
Two-Ply Core Yarn directly from the ring spinning machine with compact spinning technology

OE Rotor Spinning

Pro Fil® Rotors
Natural progression of spinning rotors

Trash Adapter
Adapter for Spin Boxes SC and SQ for processing regenerated fibres, blends of linen and blends of synthetics with regenerated wool fibres, as well as slub yarns

SQ Sweep Cat
Optimized trash extraction channel for rotor spinning machines modernized with Quality Spin Box SQ and Autocoro SE 9 machines

...again a step ahead...

See you at Shanghai Tex 2003
December 10 – 13
Hall 2, Booth 2 A 55
--- SPIN INNOVATION ---
THE MAGAZINE FOR SPINNING MILLS

EliTe
CompactSet
Update
Pro
FiL
Q
Rotors –
Natural Progression

SpinBox SC-R for RIETER
EliTwist
Q
–
Two-Ply Compact Yarn
TrashAdapter SC/SQ SpinBox

SC/SQ SpinBox Benefits

ELECTRO-JET Roving Frame

Mill Reports
– ANATEKS, Turkey
– GADOON, Pakistan
Day/Accotex – Soft Cots

NOVIBRA Spindle HP-S 68

...again a step ahead...