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SPINNING MACHINES AT ITMA '03

William Oxenham, Professor/Associate Dean of Academic Programs
North Carolina State University, Raleigh, NC

ABSTRACT

The paper reviews new developments in spinning machinery as judged from the exhibits at the recent ('03) ITMA. There were few surprises and the offerings were mainly improvements in existing technologies. The most notable features were the introduction of a new rotor machine by Savio, the new Murata vortex spinning machine, and novel approaches to compact spinning.

Keywords: Self-Twist Spinning, Fasciated Yarns, Compact Spinning

INTRODUCTION

The charge of reviewing developments in spinning equipment, at a machinery show, where several of the major players were absent, could be viewed as a daunting task. This however proved not to be true since greater emphasis could be placed on the limited offerings of those manufacturers that elected to exhibit. There were notable developments from several machinery makers but perhaps the most noticeable feature was the general change in color of the offerings of the major spinning machinery, from the traditional blue/green to much lighter shades of grey/cream with highlights in bolder colors. An additional feature was that the exhibitors only showed a small selection of their range of potential offerings, and these tended to be the newer developments. The following review is constructed according to technology and includes systems for both long and short staple.

RING SPINNING

In recent years the major development in ring spinning has been the introduction and promotion of "compact spinning". This technology promises yarns with a more consolidated structure and this in turn can offer:

- Less hairy yarns, which yield products with lower pilling propensity. Additionally the lower hairiness is claimed to yield benefits in preparation and fabric formation, including the possible elimination of sizing, singeing and waxing. This can also result in improved print quality.
- Stronger yarns, yielding fewer breaks during spinning and subsequent processes.
- The possibility of utilizing lower twist (and hence higher production speeds) to achieve "normal" yarn strength.
- Softer yarns and fabrics.

Unfortunately the benefits may be mutually exclusive, thus if softer yarns are required then this would require the lower twist and associated higher production but the hairiness benefits may not be realized.

While this system is claimed to have gained acceptance in Europe and Asia it has had very limited success in he USA. The major players in this area are Rieter with the Com4 system, Zinser with CompACT^3, Suessen with Elite and more recently Marzoli with Olfil. Unfortunately the first three elected not to exhibit at ITMA 2003 and Marzoli restricted their exhibit to a carding machine.

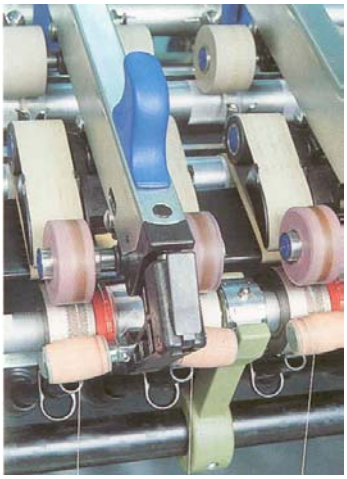

Figure 1

There were however several new entries into this area with very different approaches to achieving a more compact structure.

Cognetex exhibited their Com4Wool which is a long staple adaptation of the Rieter Com4 system. The major changes made are to accommodate much longer fibers and this is achieved by utilizing angled balloon rollers as the front rollers in the compacting zone, **Figure 1**. The "usual" benefits for compact yarn are claimed for this system, however the major potential advantages are associated with the impact of these in subsequent processing. One particular claim is that it may be possible to replace a normal folded warp yarns with a single Com4Wool yarns. An additional "cover" mounted over the sieve roller, termed the "air conveyor", may be used for certain fiber types. This is recommended for use when processing cashmere but claimed to be unnecessary for wool. An additional feature of the exhibition machine was the incorporation of a **Fani** end break detection system plus roving stop motion.

Officine Gaudino also showed a long staple spinning machine (Model FP 03) with the mechanical compacting system (MCS). This is an unusual system since it does not require the additional suction system that is needed in other compact spinning machines. The MCS system, **Figure 2**, consists of an additional smooth bottom front roller and an angled top roller. These rollers run at a slightly slower speed than the front drafting rollers and this "negative" draft, coupled with the offset top roll, creates false twist which compacts the drafted strand as it issues from the compacting zone. This system can be incorporated into new machines or retrofitted to existing machines and is claimed to be easily added or taken off the spinning frame. The interesting feature about this system compared to its competitors was that the cost of the compact spinning option was about 20% higher than the standard machine (whereas 200% to 250% was given for other machinery makers offerings).

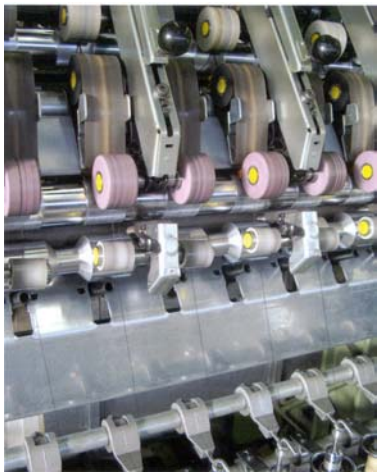

Figure 2

A totally different approach to reducing the hairiness of ring spun yarn was being promoted by the **Woolmark Company** with Solospun. This system, which is retrofitted to existing machinery, was shown at a previous ITMA. It uses a small additional multi-grooved "plastic" roller, **Figure 3**, to deliberately spread and separate the strand issuing from the drafting rollers into a series of smaller strands which each are consolidated by twist running into the yarn formation zone. While this system is presently restricted to long staple fibers there are initiatives to determine its applicability to short staple processing.

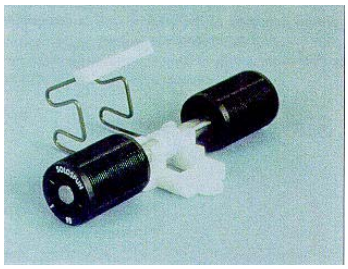

Figure 3

The only short staple ring frame with compact spinning was the LR6AX exhibited by **LMW.** This Magnetic Compacting system, developed

by Hans Stahlecker (RoCoS) replaces the normal top front roller with a pair of smaller rollers between which is a condenser. The condenser is held against the bottom front drafting roller by means of a magnet **Figure 4**. This is a seemingly simple approach to reducing the width of the strand of drafted fibers but carries a cost penalty of 2-2$^1/_2$ time the price of a standard machine and the use of very small rollers can be considered a potential problem area with regard to both fiber lapping and serviceability.

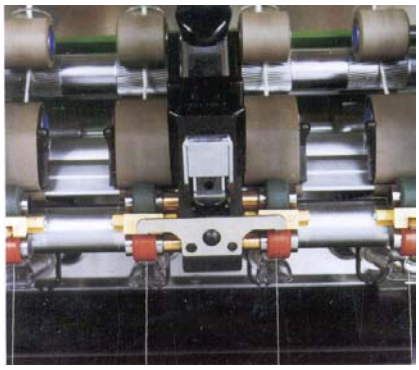

Figure 4

While under a totally different classification of spinning technology it was interesting to note that **Fehrer** exhibited a DREF 3000 friction spinning machine in which the drafting system creating the core component utilized a compacting roller, (which was of course the forerunner of the Com4 system). This approach is claimed to yield a stronger core and thus a higher tenacity in the resultant yarn.

SELF TWIST SPINNING

Self twist spinning has been around since the 70's with Repco, Selfil and a return to SelTwist Spinning. While the system never gained wide acceptance it developed a niche market in Europe for the production of high bulk acrylic yarns. There were several "in house" modifications applied over the years and these were associated with trying to accommodate sliver feed rather than roving and facilitating easier relaxation of the yarns after spinning. These evolutionary concepts have all been combined into one unit marketed as the Macart Spinning Systems S300. In this system slivers (up to 12 g/m) are fed through a pre-draft unit which is placed before the normal drafting unit, incorporated in the ST spinner. The main body of the ST spinner looks identical to a Repco system, (with one double apron drafting system for all strands and reciprocating twisting rollers) but has no in-built winding unit. The yarns are instead fed to a continuous relaxation unit before being wound onto a take-up package **Figure 5.** In an illustrated installation 15 S300 units were linked to one 60 spindle automatic winder.

Figure 5

The Gilbos Air Twist system operates on the same self twist principle, but in this case the process is applied to combining filament yarns to resemble a multifold twisted yarn. The alternating twist is applied by means of air jets (Heberlein "detorque jets") and the no twist region is reinforced by an intermingling process. The timing of the various functions and other processing parameters is controlled by a PC. The system has found use in the area of carpet yarns but other areas of applications are being pursued.

ROTOR SPINNING

The new Savio FlexiRotorS 300 **(Figure 6)** is the first venture of this Italian company into high

speed spinning, utilizing the twin-disc bearing system that has been adopted by the other major players in this area. The politics behind the machine were almost as interesting as the technology since the new frame is based around a Suessen SCS spinning box (as is Rieter's) and the machine was being described as "essentially an updated R40". The major improvements claimed for this machine are:

Figure 6

- Straighter threadline;
- 2 Independent sides – machine at exhibition was shown spinning Ne 30 using a 28mm rotor at 150,000rpm on one side and Ne 6 using a 40mm rotor at 85,000 on the other side.
- Up to 320 positions

	MVS 851	MVS 861
Spindles	72	80
Speed (m/min)	300-400	240-450
Length (mm)	21,368	20,807
Height (mm)	1,500	1,378
Power (Kw)	30.2	26.3
Air (@ 0.5 Mpa)	80 L/min	55L/min
Winder	Parallel	0 – 5°57

Table 1 Comparison of MVS 851 and MVS 861

- Flexible use of up to 4 doffing and piecing trolleys,
- Electronic Threadguide Drive, and Electronic Package Building that enable flexibility of package size and denser packages to be produced (up to 6kg).
- Possible to change from cylindrical to conical packages (up to 2°) using an adapter.
- Wireless communication and control, using palmtop PC, (**Figure 7).**

FASCIATED YARN

Perhaps the displays arousing the greatest attention in the spinning area were both associated with fasciated yarns and while the offerings were very different in their maturity and product range the underlying principles of yarn formation were the same.

Murata's Vortex Spinner 861 represents a significant refinement of their previous machine with regard to footprint and energy consumption, as can be seen from **Table 1**

Figure 7

The immediately observable differences in the new machine is that it seems to be more compact and because of the lower profile this translates into more user friendly. The second feature which stands out is the so called "Tension Ruler", which functions like a yarn accumulator between the take up roller and the winding unit. This elegant unit not only enables higher speeds and the potential of 5° 57 cones, but also does so with reduced energy when compared to earlier machines.
Additional features of the new machine are the improved yarn clearer, with foreign fiber detection MSC-F; new waxing unit with alarm system; an automatic waste fiber extracting

system. The machine offers the potential to spin core yarns (including spandex) and effect yarns can be created by utilizing appropriate feed yarns. The current restriction on the system is the range of yarn counts that can be successfully spun and a significant market potential would be available if it were possible to process coarser yarns, however there were reports of major sales of this machine at the exhibition.

Figure 8

The second machine in this technology, which aroused considerable interest from visitors to ITMA, was the Uniplex system developed by DuPont and manufactured by SSM, and shown as a 3 position unit at the exhibition (**Figure 8)**. This system is radically different from other staple spinning systems since the feedstock is filament yarn, which is drawn and stretch broken (**Figure 9)**, and the resultant yarn structure is held together by wrapper fibers produced by an air jet. The modularly constructed machine, which is available with up to 48 positions (16 x 3 position modules), is claimed to be capable of processing a wide range of filament types and blends and the production speed is currently limited by jet design to about 350m/min, however the other components will run up to 700 m/min.

There has been significant work carried out in optimizing the processing parameters to yield the desired fiber length distribution without creating a discontinuity in the fiber flow. Data seems to indicate that the fiber length produced is about 10 inches and there is information comparing Uniplex, ring and rotor yarn and fabric properties, however each of these technologies utilizes a different fiber length. At the present time the machine must be regarded as a development unit for rapid prototyping and/or

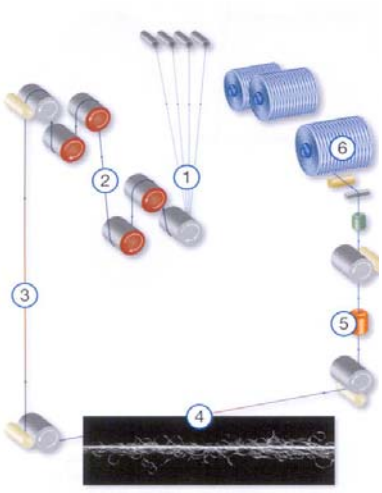

Figure 9

niche markets but this may change as larger machines become available and more independent information is available about product properties.

OTHER COMPONENTS

There were several vendors exhibiting sensing and detection units for mounting on spinning and winding machines. Foreign fiber detection continues to arouse a lot of interest and while there are approaches applied earlier in the processing (blowroom, drawframe) there were also several units for the spinner/winder. Both **Loepfe** and **Barco** had units available with the latter claiming to be able to sense the total length of a foreign fiber and not just the portion on the yarn surface. This as achieved by utilizing multiple sensors which were shown mounted on an exit tube for a rotor spinning machine (**figure 10**).

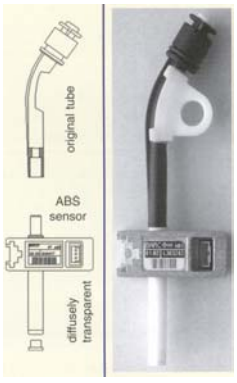

Figure 10

Yarn setting systems were also shown and while units such as the **Resch** Sewimatic utilize steam

to set the twist, the **Fehrer** Yarn Puncher uses mechanical forces to lock the structure together. This is claimed to be suitable for consolidating coarse multiply yarns; combining different yarns; attaching yarns to substrates; and preventing peel backing in core spun yarns.

New models of winding machines were shown along with developments in wet splicing for two fold yarns. There were also a large number of exhibitors showing machinery for creating "fancy" yarns. The technologies used ranged from ring frames, modifications to rotor frames, hollow spindle systems, and variations on very small tubular knitting machines. Machines for making "twisted chenille" were also seemingly numerous.

Several companies exhibited twisting machines with a lot of interest being aroused by the **MTS** system for "four for one" twisting. While there have been previous disclosures of such systems this was claimed to be the first commercially available system in operation. The system obviously needs development and refinement but it was intriguing to see the concept brought to realization.

CONCLUSIONS

The absence of Rieter (with Suessen) and the Saurer Group (Schlafhorst, Volkman, and Barmag) from the "spinning arena" obviously had a direct negative impact on ITMA 03. Not only did this limit the range of manufacturers available to visitors but it was apparent that was a spin off effect that several of those companies which did exhibit, limited the machinery shown. There was very little which could be regarded as "new" and some of the potential developments, such as centrifugal spinning, which were present at the last ITMA seemed to have floundered. It appeared that there was a change in the manufacturing base for textile machinery with, for example, Turkish manufacturers offering several different machines.

In terms of evolution of the spinning industry it seems clear that:

- While there is interest in compact spinning its area of application may be restricted and the economics of the process are worrying.
- The move by Savio into high speed rotor spinning increases the competition in this area where the USA has until recently been a major customer.
- Vortex spinning continues to improve and while the jet spun yarn market was almost exclusively USA recent sales of MVS machines indicate that this will change.
- There will be a market for machines creating products for niche areas.