Spinning short staple yarns from sliver

by Alan Parker

ARGUMENTS have taken place for many years over the relative merits of spinning short staple yarn from sliver or roving. As sliver-to-yarn systems invariably use a higher draft than a conventional ring spinning machine it is difficult to isolate the draft effect from the twist effect.

There is today an increasing use of processes with sliver to yarn drafting for short staple yarns. A number of projects were undertaken at TMM Research several years ago to expand the self-twist principle from long staple two-fold yarns into:

* short staple two-fold yarns;
* two-fold carpet yarns;
* long staple self-twist roving; and
* short staple self-twist roving.

The key objective of both the long and short staple projects was to use the self-twist rollers and drive assembly of the Repco self-twist spinner. The width restriction thus enforced that both machines had only six input slivers. The slivers were drafted, passed through the self-twist rollers and joined using the well-known self-twist rovings.

The rovings thus formed were packaged using an ingenious derivative of a roving build. Using this packaging method a 14 in. x 7 in. roving bobbin was produced containing up to 3 kg of two ply roving (up to 1.5 kg per strand). The long staple version reached the mill evaluation stage in that a machine with fully automatic doffing operated continuously at a delivery speed of 300 m/min for extended periods in a commercial plant.

Although there were teething problems, the project was discontinued because the likely volume of sales of the long staple version on its own was not considered economically viable for a company of the size of Platt at that time.

The short staple version posed major problems in a number of areas:

* drafting short staple sliver into roving at speeds up to 300 m/min;
* packaging short staple roving densely onto a roving type package at 300 m/min;
* withdrawing this twin strand roving in a ring frame creel; and
* the properties of yarn produced.

Drafting. Particularly on the shorter length cotton fibres, it is difficult to control fibres using an apron drafting system at such high speeds. For technological reasons the front drafting rollers should be as small as possible to allow the tip of the apron to be close to the nip of the front drafting rollers. There are two problems:

(a) A 25 mm diameter roller would need to rotate at about 4000 r/min instead of the 300 or so on a conventional short staple roving machine.

great stress on aprons operating at such high speeds.

Packaging. A twin strand short staple self-twist roving has a no twist zone in which the fibres are not sufficiently long to bridge it. The design of the so-called presser was extremely critical in order to prevent the roving breaking at the no-twist zone and overheating due to the friction of the roving as it runs over the presser at these high speeds.

Roving withdrawal. There are two roving strands on one bobbin and it is necessary to split these while unwinding roving by rotating the roving bobbin in the creel. The procedure is very similar to that used on rubbed roving which is in common use in long staple spinning.

The project was sufficiently encouraging to proceed to a trial on a full length ring frame at J & P Coats spinning yarn for sewing threads. At this trial the commercial difficulties were cruelly highlighted.

There were approximately 500 twin rove bobbins involved in the trial, of which 50% ran with no problems whatsoever, whereas the remainder experienced one of a number of problems:

(a) Over a period of many hours slack would start to appear in one of the two roving strands until eventually the slack roving would join up with the other strand. There would then be one end broken down and one end spinning double count.

(b) A number of rovings broke at the no-twist zone.

There was a balancing act between applying sufficient braking to the roving bobbin to allow satisfactory separation of the two roving strands without causing the roving to break at the no-twist zone.

Repeat trials using shorter length cottons were even less satisfactory.

Yarn properties. From a yarn technological viewpoint there were a number of discoveries deemed to be very relevant to processes now achieving some commercial acceptance:

(a) Yarns from self-twist roving were as much as 10% stronger than from twisted roving.

(b) The yarns from self-twist rovings were always less regular by about 1% Uster.

(c) The yarns from self-twist roving were hairier, which was a major disadvantage for sewing threads.

(d) A periodicity which coincided with the self-twist cycle.

It was decided to establish how much of the difference lay with the lack of twist and how much lay with the self-twist structure itself. By carefully collecting untwisted roving from the front delivery roller of a conventional roving machine, it was confirmed that, except for the periodicity, all other differences were

Control drives for carpet spinners

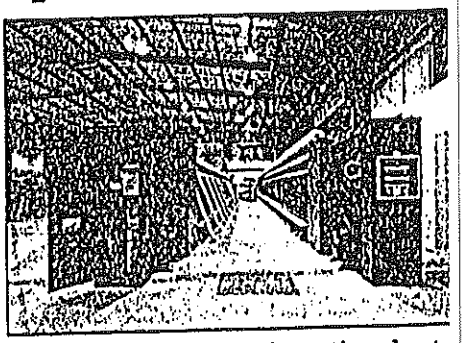
AXMINSTER Carpets spinning division, Buckfast Spinning, is using Mentor digital drives from Control Techniques on its new Houget Duesberg Bosson (HDB) carding and spinning machines. The DC motor drives were fitted by Border Textiles (UK) Ltd, of Cleckheaton and Galashiels, who supplied the Belgian machines.

The special Axminster blend of wools is processed entirely at Buckfast Spinning, from fleece to finished carpet yarn. The company has recently extended into a new production facility and has invested in new machinery including the HDB machines.

Rory Wilson, of Border Textiles, told *Textile Horizons* of his decision to use the Mentor drive on the HDB machine: "The Mentor is a simpler and more cost effective solution than the Belgian drive normally supplied. Reliability is particularly important in the spinning industry where machines may be on 24 hour running."

Herbert Cawthra, production manager at Buckfast Spinning, said: "The HDB spinning machine has been running for about 12 months now and the results so far are excellent. Since we only produce carpet yarn, which is relatively heavy compared with cloth yarns, yarn breaks are not a great problem.

"However, the reliability of the motor and drive are very important. With older



significant amounts of down time due to motor and/or drive failure. We have had no such problems at all with the HDB/Mentor set up."

Features of the HDB Galaxy Card combine to achieve high production speeds with no loss of quality; speed control, via the Mentor, is thus important. The rollers of the carding machine create a gradual build-up of the surface speed of the wool to the main cylinder. Triple-feed rollers straighten and accelerate the fibre through to the first licker-in.

Using a servolap autoleveller, the precise density of fibres being fed into the card is measured and the roller speed is continually updated to ensure that the fibre load on the rollers and the consequent output, is constant: precise speed control by the Mentor is vital to the

associated with the lack of twist in the roving.

Short staple self-twist yarns. It was difficult to produce a sufficiently strong short staple self-twist yarn due to the weakness at the no-twist zone, even with phased no-twist zones. In particular, packaging was very difficult. The experimental yarns that were produced were found to be totally unsuitable for sewing threads.

The two-fold yarn market was considered too small, at that time, without sewing threads to justify further investigation. Today, with an increased use of plied cotton spun yarns used in knitted outerwear, the non-technical market is much larger.

Effect of high draft. It is obviously not satisfactory simply to increase the draft in the tension or primary draft zones of a three-roller apron drafting system, as on short staple ring or roving machines.

However, if the number of pre-draft zones is increased, or more preferably, a drafting system with apron drafting to convert sliver weight to roving weight, followed by apron drafting to convert roving weight to yarn weight, the high draft effect is more of an advantage than a disadvantage. This is because the strand of fibres is more parallel at the intermediate roving weight stage of a high draft system than a twisted roving.

Jet spinning. The Murata air-jet spinning machine for short staple yarns uses a sliver to yarn drafting system as do other similar machines. The increased strength this will give helps to compensate for the loss of strength due to its lack of real twist, compared with a ring spun yarn.

The increased hairiness should reduce the amount of air needed to create the fasciated effect. The poorer regularity caused by drafting untwisted sliver is a contributing factor as to why this process requires high quality input sliver.

Vacuum spinning. Dr Ernst Fehrer AG recently unveiled a new sliver-to-yarn spinning system in which, by an ingenious method, one end of sliver feeds two spinning positions. It was interesting to note that yet again, according to my information, the Ring Dref yarn was stronger, but less regular than ring spun.

Plyfil. Suessen unveiled a new machine at ITMA 87 in Paris called the Plyfil Spin Assembly Winder for both long and short staple yarns. (See article on page 14.)

In this process there is a clear need to find a compromise between the conflicting demands of more jetting to increase the strength of the assembly-wound Plyfil yarn to prevent ratching (causes thin spots) and minimal jetting to allow softer final two-fold yarns. The method and density of packaging are likely to be particularly important in this respect.

Although this process has much to offer in comparison with other non-conventional two-fold yarns I would be surprised if it is able to make much inroad into the technical yarn market, for example sewing threads.

evidence to support the view that yarns spun from untwisted roving (sliver) are stronger but less regular than yarns from twisted roving.

These differences are not sufficiently great to prevent them being undetectable if, for example, the settings in the drafting zone are not optimised for the material being processed.

Because there have been few changes in ring frame drafting systems for many years there is a natural tendency to believe that this technology can be readily applied to a high speed, high draft, drafting system.

The combination of speed, with lack of twist rather than high draft, poses greater problems for the machinery maker to overcome. If the regularity is more than 1% Uster worse than a ring spun yarn, either the settings, or the equipment itself, are not satisfactory for the material being processed.

Before becoming committed to a sliver-to-yarn drafting system for short staple ring spinning, a detailed investigation of yarn hairiness should also be undertaken. Yarn hairiness is now much easier to quantify because of recently introduced measuring equipment, and in future it will be as important a yarn parameter as strength or regularity. □

Ready for Cerifil?

SPEAKING at a meeting in Huddersfield (UK) recently, Piero Bigagli, of S Bigagli & Cie, of Prato (Italy), made reference to the new spinning development Cerifil, for which his company has acquired a licence to manufacture modified spinning machines, writes Peter Lennox-Kerr.

This is a development from the Cerit research centre in Pordenone and the process, particularly suitable for spinning wool, is being marketed through Wool Development International.

Mr Bigagli explained that Cerifil differs from traditional ring spinning in that the ring and traveller have been replaced by a cone-shaped winder, somewhat resembling a cap which is rotated by the yarn itself under centrifugal force.

This cone or winding unit serves two purposes: to delay actual winding of the yarn onto the delivery package, and to act as a balloon limiter.

Yarn delivery speeds may now be substantially increased and when spinning say Nm 12 a speed of 40 m/min is possible, while with semi-worsted yarns the speed may rise to around 70 m/min.

There have been technical hiccups in the development of Cerifil, but it would appear that these have now mostly been solved.