



## Short Staple Pre-Spinning Machinery at ITMA '03

Wade Carter

N.C. State University, College of Textiles, Extension and Applied Research

Email: wade\_carter@ncsu.edu

### ABSTRACT

Short staple pre-spinning machinery shown at ITMA'03 in Birmingham, England emphasized compact opening lines with integrated multi-functional equipment. New technologies in carding included new machinery design, monitored and controlled waste removal, and a lengthened carding zone. Drawing innovations included a self-optimizing system for setting the break draft and an automatic quick adjustment of roller spacing. No new developments were shown in the short staple lap winding and combing areas. The only interesting feature shown on roving machines was a quick doffing system.

Keywords: Opening/Cleaning/Blending, Carding, Lapping/Combing, Drawing, Roving

### Opening/Cleaning/Blending

There were fewer machines and vendors exhibiting in these process areas than in the previous four ITMA exhibitions. Notably absent were Rieter and Crosrol. Since ITMA'99 Crosrol has gone out of business. Marzoli had a booth at the show but did not exhibit any machinery in this area.

### Trutzschler

Several new developments were introduced by Trutzschler in the opening room area of short staple processing. Major emphases were placed upon equipment allowing for a compact 800 kg/hr opening line, an integrated separator, a more precise removal of foreign fibers, and a waste control measuring system.

### Compact Opening Line

A complete opening line with only four components is now possible. Apart from the

classical tasks of opening, cleaning, and blending, the functions of fire protection, micro-dust removal and foreign fiber separation are now integrated. The implications for short staple yarn producers would be lower space requirement, less exhaust air, lower energy consumption, and lower maintenance and setting expenditure. The four Trutzschler components making up the compact line are as follows:

1. Automatic Bale Opener  
BLENDOMAT BO-A
2. Multi-function Separator SP-MF
3. Integrated Mixer MX-16/CLEANOMAT Cleaner CL-C4
4. Foreign Part Separator SP-F

### Integrated Separator (Multi-function)

Trutzschler offers a modular system for the detection of foreign matter in the raw material. Emphasis is put upon a combination of separating metal particles,

heavy particles and burning material at the beginning of the cleaning line and a specific separation of foreign matter (foreign fibers) at the end of the cleaning line. The SP-MF is designed to be positioned directly after the automatic bale opener. Six functions are housed in one compact machine as illustrated in figure 1.

1. Suction of the bale feeder – at input duct

2. Heavy Particle Separation – at lower left side of machine
3. Air Separation – middle top of machine
4. Fire Protection – spark sensor to detect burning material at top of middle duct
5. Metal Separation – at lower right side of machine
6. Waste Re-feeding – at y-duct above input duct

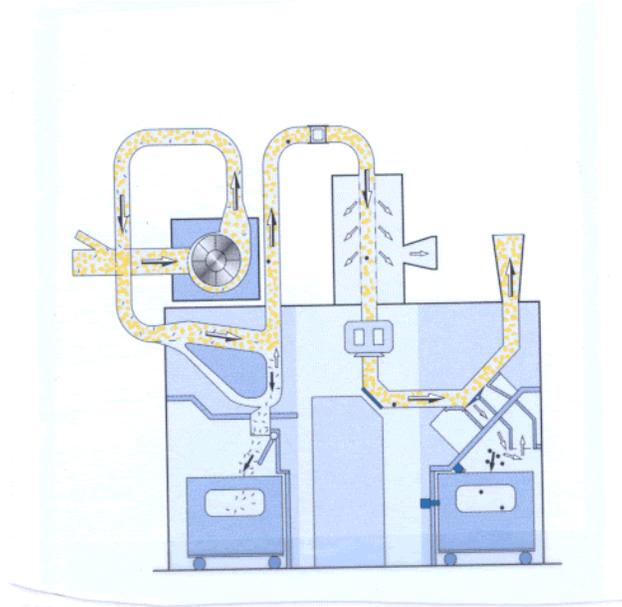


Figure 1. Trutzschler's new multi-function separator SP-MF. (Courtesy of Trutzschler)

### Precise Removal of Foreign Fibers

The foreign matter separator SECUROMAT SP-F produces a fine fiber web on a cotton colored spiked roll. The detection system at the location of the fine web greatly increases the possibility that any foreign fibers will be extracted and not cause expensive complaints in later processing. Two fast color cameras scan the web on the surface of the spiked roll. When a foreign particle is detected, it is blown into a waste

J  
T  
A  
T  
M

suction device by means of a compressed air impulse coming from one to three nozzles out of a total of thirty-two. The foreign matter is thus removed with minimum loss of good fibers. A high reliability of separation takes place since the distance between the place of detection and the separating unit is very short. The dedusting and foreign fiber detection takes place at the end of the opening line where it is most effective due to the high degree of fiber openness at this point.

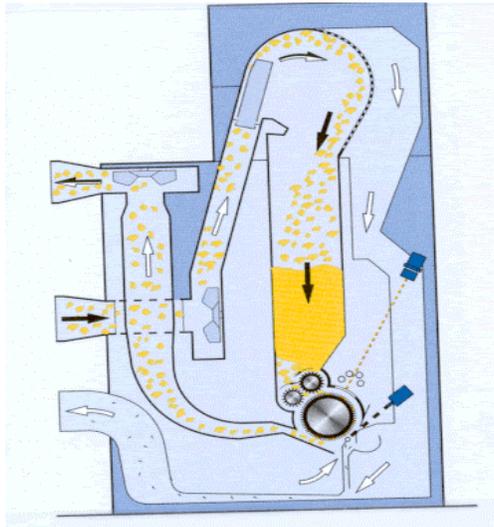


Figure 2. Trutzschler's foreign matter separator SP-F with integrated de-dusting. De-dusting is accomplished at the top of the machine while two cameras scan the opening roll surface at the bottom of the machine to detect foreign particles. (Courtesy of Trutzschler)

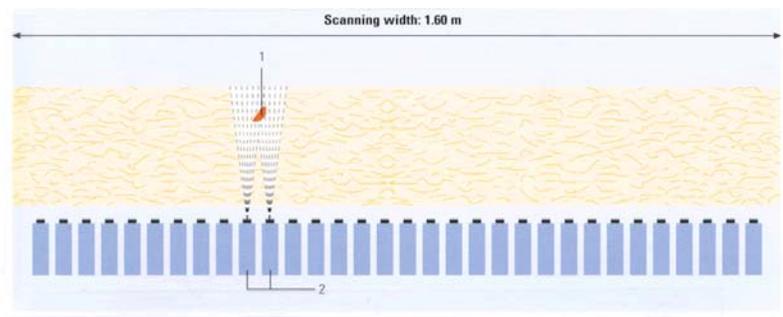


Figure 3. The 32 air nozzles on the foreign matter separator showing how only two or three nozzles blow the foreign particle into a suction device. (Courtesy of Trutzschler)

### Waste Control Measuring System

The pre-cleaner CL-P was displayed using the new waste sensor WASTECONTROL BR-WCT which is an optical measuring system that monitors the share of good fibers in the waste. Using a special optimization software, the deflector blades in the cleaner are adjusted until an optimum cleaning is obtained with as few good fibers as possible in the waste. The optical sensor of the WASTECONTROL is mounted on the front window of the suction

hood. Measuring the good fiber share is carried out at exactly defined points in the suction hood. The system makes a distinction between dark trash particles and light good fibers. The ideal setting of the deflector blades is the compromise between minimum good fiber loss and maximum cleaning. Since, for the most part, US cottons are relatively clean, this control measuring system will be most useful with imported cottons which tend to have a higher trash level.

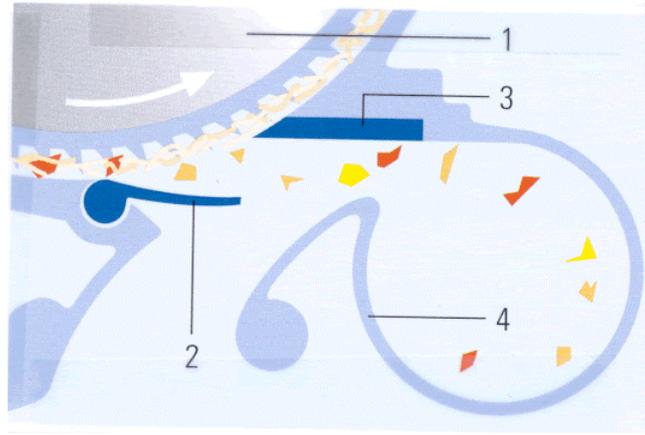


Figure 4. WASTECONTROL system showing cleaning roll (1), deflector blade (2), mote knife (3), and suction hood (4). (Courtesy of Trutzschler)

### Marzoli

Although it was not ready for showing, Marzoli is developing a new, more versatile and productive opening line. It will be designed to handle all types of fibers including cotton, synthetics, shoddy materials, short wool, gin motes, and flax. Due to new innovations, there will be a reduction in the necessary machines compared to past Marzoli opening lines. Introduction of this new equipment is scheduled for sometime in January, 2004.

### Lakshmi Machine Works (LMW)

LMW, located in India, did not exhibit any opening line equipment, but were promoting a card sliver system including a top feeder, cotton cleaner, blending machine, fine opener, and carding machine. The literature on this equipment does not mention any new technologies not already available prior to ITMA '03.

### Carding

As with opening and cleaning machinery, there were also fewer companies exhibiting carding equipment than in previous exhibitions. Trutzschler and Marzoli were the only companies showing carding machines with any new innovations. Notably absent were Rieter and Crosrol.

### Trutzschler

Several new features were seen on the Card TC 03. These new features are listed below along with some detailed information and implications of the technology.

#### New Design and Color Scheme

All the doors on the TC 03 can be completely removed and all areas of the card are easily accessible for visual inspection and maintenance. This can save a tremendous amount of time when dismantling the machine. The new white color and blue highlighting readily stands out compared to previous color schemes.

#### Computer Control with Touch Screen

Using touch screen means that the communication with the machine operator is largely possible with symbols, diagrams or pictures which are independent of the respective language. Thus language differences of associates is not as great a communication problem. In combination with the touch screen it is possible to make only those operating functions available which are necessary or practical in the respective situation. In the case of a malfunction the problematic point is marked. At the same time, a detailed picture or a diagram of the respective fault, with a marking on it, is displayed.

J  
T  
A  
T  
M

## Rectangular Can Delivery

Rectangular can delivery directly from the carding machine can now be done when using the integrated draw frame (IDF). Therefore a process step is eliminated and any associated quality and cost issues. The shortest spinning process is the direct feeding of card slivers to an open end rotor spinning machine.

## Precision Knife Setting System PMS

The knife moves on a circular path around the center of the pinned roll and can be continuously adjusted. Here, the distance of the knife top edge to the pins remains exactly the same in each position. Adjustment only takes a few seconds and can be made while machine is running. Thus mounting and dismounting of different knives is eliminated and an optimum waste composition is more readily adapted.

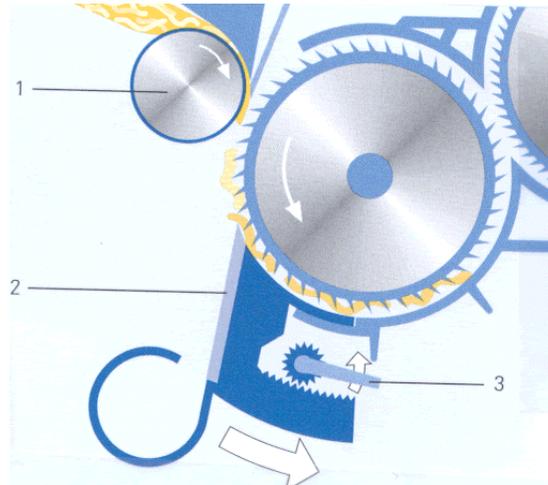


Figure 5. Precision knife setting system PMS showing feed roll (1), adjusting slide which moves with the knife on a circular path (2), and lever (3) for adjusting the knife position in a short time frame. (Courtesy of Trutzschler)

## Modified WEBCLEAN System

The Trutzschler DK 903 card had a 50% active surface around the cylinder. The new TC 03 has 70% active surface. The carding surface goes from 2.17 meters on the DK 903 to 2.82 meters on the TC 03. In the pre and post carding areas of the cylinder 10 elements create better openness, fiber alignment and cleaning. The middle 8 of

T these elements can be changed to adapt to the specific raw material being fed. This  
A could prove very advantageous for open end  
T spinners using lower grade cottons. For  
M special applications such as for man-made  
fibers or fine combed yarns, there are  
specially arranged packages available. This  
offers tremendous flexibility leading to more  
optimum preparation of the fibers prior to  
spinning.

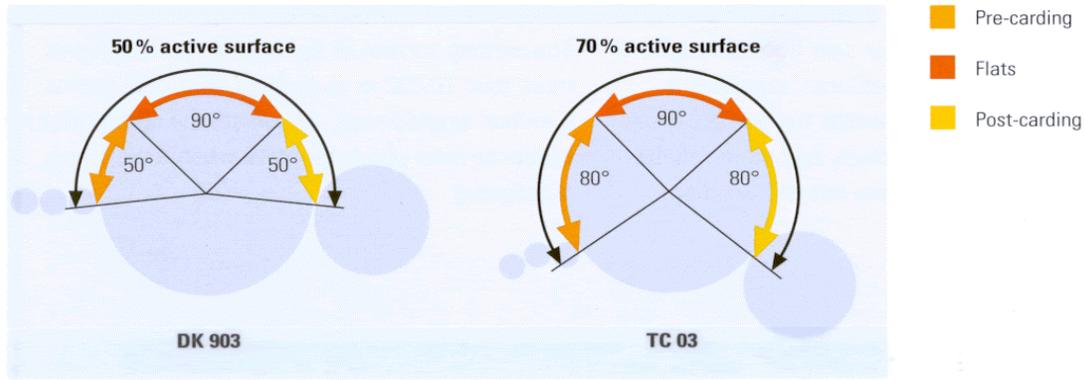


Figure 6. Illustration of additional carding surface on the TC 03 card. (Courtesy of Trutzschler)

### WASTECONTROL TC – WCT

For the first time a card is equipped with a special optimization software. WASTECONTROL is an optical sensor for evaluating the waste quality. It is positioned in front of the inspection window of a suction hood. The system recognizes the share of good fibers in the waste by the

differences in the reflection of the measuring beam. The program adjusts the knife at the first opening roll in the card until an optimum ratio between the totally separated amount of waste and the share of good fibers in the waste is obtained. This feature will help reduce good fiber loss which will be important if cotton fiber prices continue to rise.

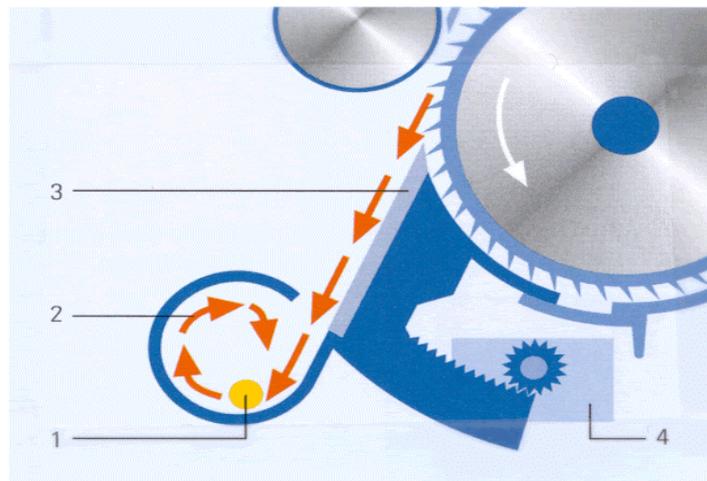


Figure 7. Measuring point (1) in the suction hood of the TC 03. (Courtesy Trutzschler)

### Marzoli

Marzoli exhibited a prototype C601 card with some new features compared to their former card:

1. Above 120 kg/hr production level
2. Newly designed BM600 feeding silo with an autolevelled feeding cylinder to determine the thickness of the material
3. Larger lickerin (350 mm) with a new positioning of the cleaning

knives and relevant carding segments

4. Nine carding segments to produce more intensive pre-carding and a knife to eliminate the waste in this area
5. Six post-carding segments and two suction knives that allow a greater final parallelization of the fibers and the elimination of eventual remaining trash

6. New autolevelling system completely integrated in the new control system of the machine
7. New 3 over 3 drafting unit completely integrated in the machine.

No specific literature was available on the C601 but more details are supposed to be provided sometime in January 2004.

### Lakshmi Machine Works (LMW)

This machinery manufacturer from India exhibited the LC300A card but this machine did not appear to have any new features in comparison to cards exhibited at ITMA'99.

### China Textile Machinery (Group) Co. (CTMC)

This China-based company likewise exhibited a card, the FA232A carding machine. It too did not have any features not seen at ITMA'99.

### Drawing

The only short staple drawing machine shown at ITMA'03 was the Trutzschler TD 03 which can be integrated with carding or be a stand alone unit. Marzoli has a new drawing machine coming out soon but did not show a prototype. Notably absent was Reiter.

### Trutzschler

The new TD 03 has several features not seen on drawing machines at ITMA'99. These are listed below with some explanations and implications for the textile industry.

### AUTODRAFT

For the first time, a self-optimizing function has been integrated into a spinning preparation machine. This concept is a fully automatic self-optimizing system for the break draft. A separate digital servo drive drives the middle bottom roller. When pushing a button, the draw frame moves about the entire possible break draft zone. During this time the draft force is measured and the ideal point is calculated from a huge number of single measurements from about 600 meters of sliver with the time of optimization being about 40 seconds. After approximately one minute, all necessary information is available, the control evaluates it and displays the ideal break draft to the operator. The operator then acknowledges this value and the machine can start producing. Since the level of break draft influences yarn evenness and the number of imperfections, particularly neps in the yarn, this feature offers improved yarn quality. It would be most cost effective to include AUTODRAFT on one drawing machine to get the optimum setting per given raw material and then manually adjust the remaining machines. In a very flexible operation running many different types of fibers AUTODRAFT would need to be installed on each machine.

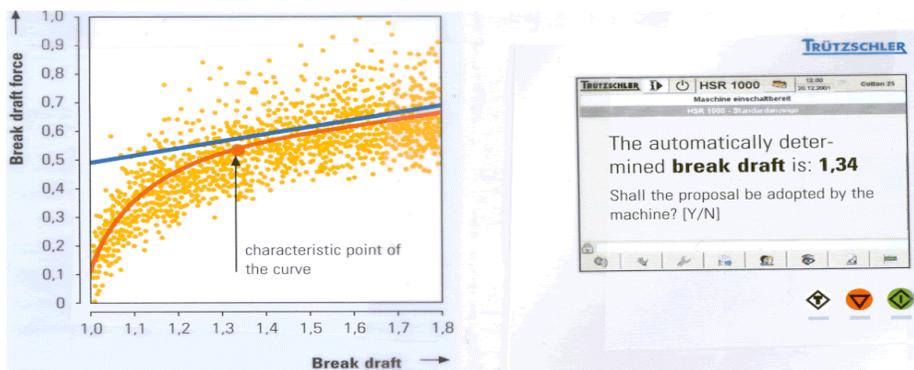


Figure 8. Illustration of the huge number of measurements taken by the AUTODRAFT system and the calculation of the ideal break draft. (Courtesy of Trutzschler)

## **New Drafting Features**

The TD 03 automatically “lifts” the top rollers off of the bottom rollers during stand-still. Thus certain fibers will not be burned or damaged by heat generated by the drafting rollers. A fourth top roll deflects the sliver more in a direct path to the coiler. This promotes more gentle treatment of the sliver and better evenness values.

## **Quick Adjustment of Roller Spacing**

This is made possible because the drafting rollers can be moved very precisely on parallel guides. The nip point distance can be read from a scale. Gauges are no longer used. This allows for more accurate settings that can be repeated from machine to machine. When running different fibers with varying staple lengths this concept could be a real advantage in optimizing settings per given fiber type.

## **Lap Winding and Combing**

There was only one short staple comber displayed at ITMA’03 but no lap winders. Marzoli provided minimal literature on their LW2 lap winder and their CM 500/S comber but no new innovations were seen in the information provided. Notably absent was Rieter.

## **China Textile Machinery Co. (CTMC)**

The company exhibited their F1268 comber running at about 350 nips per minute but no new innovations were observed.

## **Roving**

The only short staple roving machines exhibited at ITMA’03 belonged to Electro-Jet from Barcelona, Spain and the China Textile Machinery (Group) Co. The only notable feature observed on these machines was a quick doffing time of less than 1.5 minutes on the Electro-Jet ADR Rovematic

Automatic Roving Frame. This high speed and the fact that the machine restarts automatically after the doffing without the intervention of any operator allows for a notable reduction of the machine stop time, increasing significantly the production of each roving frame.

## **Peripheral Equipment**

### **Barco SliverWatch**

This detection system is installed in the creel of the first drawing process or lap winder. The purpose is to stop the draw frame or lapper when a contaminated sliver is detected. Thus the operator can eliminate the contamination and avoid it from spreading later through many meters of yarn. Optical sensors will detect foreign fiber in the sliver as long as the color is different from the color of the fiber being run. This system can act as a stop motion and eliminate contact rolls and sliver breakage stop motions. SliverWatch can also be used to monitor heather blends. When not enough black or too much black polyester in the sliver, SliverWatch will stop the draw frame. The system can also detect wrong arrangements of polyester and cotton sliver cans in polyester/cotton blends. SliverWatch can also provide production and quality data and act as a monitoring tool to detect the number of contaminants per 1000 meters of card sliver.

### **Trutzschler LENGTHCONTROL TC – LCT**

This mobile fiber length measuring device can be used directly at the cards and draw frames for fiber lengths up to 60 mm. with no restrictions on fiber type. The device can reduce tedious and costly lab tests and since the measurement is carried out fully automatically, the operator does not have to be a skilled laboratory staff person. In contrast to established devices, the special sensor used can execute the measurements up to 0.2 mm near the clamped ends of the sliver sample. Thus excellent statements about the short fiber content in the sliver can

be supplied. The measuring unit can also supply information concerning fiber hooks and fiber parallelization. This system could benefit manufacturers by allowing a more optimum adjustment of the card. For

example, if a flat is set too close to the cylinder and is adding to the short fiber content, this device could signal this as a problem to be corrected.

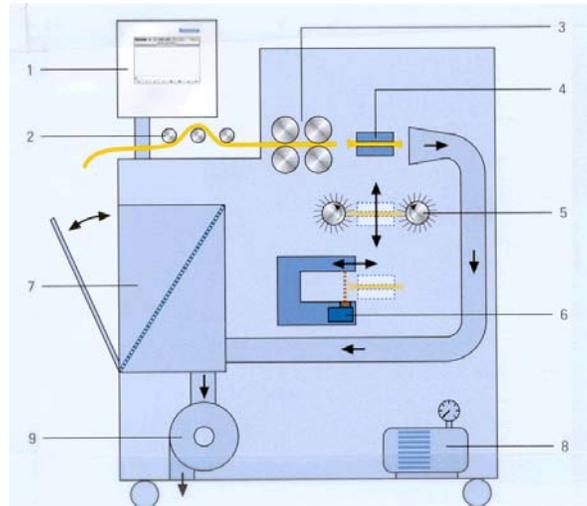


Figure 9. LENGTHCONTROL system showing screen display of results (1), sliver fed (2), drafting system which attenuates the sliver (3), the clamp that clasps the sliver (4), the sample being combed in both directions (5), the camera that measures the fiber sample (6), waste container (7), built-in compressor (8), and a fan to ensure the necessary vacuum air flow (9).  
(Courtesy of Trutzschler)

J  
T  
A  
T  
M