

The Magazine for the Textile Industry

September 2007

### **SIEMENS**

**Innovative Solutions** 

High-tech Fabrics in Trend



Asynchronous motors in Rieter rotor spinning machine

#### Page 8



Exemplary cooperation: Pai Lung and Siemens

### Page 12



POY systems more efficient with Simotion and Sinamics

Page 16

#### spectrum textile 2007

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### Editorial

### Interview

4 Flexible in Every Way RWTH Aachen University, Institute for Textile Technology (ITA), Germany

### Fiber and Yarn

- 6 Optimally Drawn Hangzhou Tung Hsia Textile Machinery Co. Ltd., China
- 7 A Fertile Partnership Marzoli S.p.A., Italy
- 8 Maximum Performance Rieter Ingolstadt Spinnereimaschinen AG, Germany

### Fabric

- **10 Extra-Wide, Extra Fast** Trinca, Italy
- **12** A Win-Win Partnership Pai Lung, Taiwan

#### Non-Woven

- 14 Exact Laying AUTEFA automation GmbH, Germany
- 15 Rolls Galore Bastian Wickeltechnik GmbH, Germany

### Chemical

- **16** Accurately Drawn and Wound Oerlikon Barmag, Germany
- 18 Winged by Success Dietze + Schell Maschinenfabrik GmbH, Germany
- 20 Better Spinning Cordenka GmbH, Germany

### Finishing

- 21 Top Quality Superba S. A., France
- 22 A Generation Change in Drives Benninger Zell GmbH, Germany

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### Dear readers,



**Nehme Moufarrej** Head of Business Development Textile Machine Automation

The textile market is growing rapidly – and with it the technical demands on automation and drive technology as well as machine modularity, short delivery and implementation times are becoming more and more important. This requires end customers, machine manufacturers and their suppliers joining forces even closer to be able to serve the markets better. The field of textile technology is very wide. In addition to the "classic" sector of spinning mills, spinning preparation, textile surface creation and chemical fiber manufacture, fiber composite materials for technical and medical textiles are playing an increasingly important role. Siemens is very aware of the technology requirements in these sectors. With consistent automation and drive solutions for the entire textile production process from manufacture of threads to refining, we offer the machine manufacturer one stop solutions and support them with a comprehensive range of services.

Innovation in motion and drives – that is our motto and the goal we have set for ourselves is to accompany our customers even better and faster on the road to success.

Try us! We bring you safely to your destination.

6. Mon farrey



Easy convertibility and higher quality through axis isolation of drives: the new ring-spinning tester of the ITA

### RWTH Aachen University, Institute for Textile Technology (ITA), Germany

## Flexible in Every Way

Interview with Professor Thomas Gries on the newly developed ring-spinning tester of the ITA and the cooperation with Siemens.

he Institute for Textile Technology (ITA) of the Rheinisch-Westfälische Technische Hochschule (RWTH) Aachen is the leader in developing new modern textiles and textile machines. Competent partners from industry are required for the innovative technical solution concepts. We spoke to Professor Thomas Gries, Head of the ITA, about the advantages of the fruitful cooperation with industry based on the newly developed ring-spinning tester.

### Professor Gries, what new development at the ITA is exemplary of the automation and modernization in the textile industry in your opinion?

**Thomas Gries:** We have developed a ring spinning tester in cooperation with several industrial partners. The process of ring-spinning still accounts for 60 percent of the world's yarn production and features not only a high yarn quality with simple handling but

also a great variability regarding the wide fineness range of the yarns. The disadvantage is a low productivity which results above all from the preprocessing and postprocessing as well as the low production speed. We have developed a ring-spinning tester to further improve the ring-spinning technology. This offers the possibility of simulating today's short staple, long staple and compression spinning processes which enables examination and optimization of the entire technology. In addition to the development and testing of new machine components and yarn products, the ringspinning tester can also be used to test the material properties of the produced yarns.

### What technical challenges did you face in the development of the machine?

**Thomas Gries:** We developed and implemented a completely new drive concept in cooperation with

Siemens with which the tester achieves maximum flexibility and present production speeds were increased. Our spinning tester enables individual process parameters to be isolated and tested for the first time on such a high technological level. In this way individual components can be developed further systematically. The demands on which the specification of a concept is based are, among other things, the setting of the drawing machine angle from 30 to 90 degrees, a delivery speed of more than 40 meters per minute, a spindle speed of more than 30,000 revolutions per minute and eight individually driven spinning stations.

Solutions were developed for this with which the yarn feed, the balloon constriction rings and the ring rail can be moved independently of each other in vertical direction according to set patterns. The tester also has a moving spindle rail to work with stationary yarn guides and a moving spindle rail. A lift drive was necessary for all the named elements. Sixteen separate drives were required altogether: four drives for the bottom rollers in the drawing machine with toothed drive modules by easily disconnectable interfaces so that they can be converted quickly for the different ring-spinning variants. Converters of the Sinamics S type with Drive-Cliq interface are used for this. All modules connected by Drive-Cliq contain an electronic rating plate with which the technical data are loaded automatically into the control group. There is no need to change the drive modules when converting. The modular structure of the tester and the individual drives used therefore enable maximum flexibility regarding the products, the implemented machine parts and the process control.

### What does this project give the customers?

**Thomas Gries:** The special demand was to implement the knowledge gained from the project in series machine manufacture as quickly and as easily as possible and to ensure the integration of as many standard parts as possible. This reduces the material and production costs on the one hand and ensures the comparability of research results with the products from the spinning mills on the other hand.



### » By integrating the modern drive and control technologies, present day and future boundaries of ringspinning were redefined. «

**Professor Thomas Gries** 

belts, three lift drives for the yarn guides with toothed belts, one lift drive for the spindle rail with a ball spindle and eight drives for the spindles with flat belts.

### What drive and control technology do you use in the ring spinning tester?

**Thomas Gries:** The individual drives were designed according to the definition of the movements to be made. All drives were selected with separate control. The Simotion P PC-based motion control system is used for controlling the drives. The spinning tester features different spinning geometries and different speeds above all. It must also enable fast, simple conversion and at the same time remain open for later upgrades and modifications. This is ensured by the modular design. The tester consists of drive and textile modules. The textile modules are connected to the

#### Professor Gries, how would you describe the partnership with Siemens?

**Thomas Gries:** The ITA has been working with Siemens for many years. The goals for the drive and control technology could only be achieved by intensive cooperation in the design and configuration of the ring-spinning tester. By integrating the modern drive and control technologies, present day and future boundaries of ring-spinning were redefined. The demands with regard to flexibility and quality of the process made in advance could therefore be met without restrictions.

Professor Gries, thank you for talking to us.

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### Hangzhou Tung Hsia Textile Machinery Co. Ltd., China

## **Optimally Drawn**

Complete solution with Simotion D for Chinese draw frame: competitive advantages due to best sliver quality even at maximum speed.

he Tung Hsia company in Hangzhou, China has been manufacturing draw frames and carding machines for stable fiber spinning for 20 years. As far as the automation of controlled draw frames is concerned, the company is a pioneer in China because this is not used very widely there.

### Main difficulty sliver regulation

The draw frame is one of five machines in the staple fiber spinning mill. In the spinning process, it is between the card and the ring spinning machine and consists of the elements infeed creel, draw frame and stacker. It draws and bundles the input slivers of cotton fibers or a mixture of cotton and chemical fibers.

The machine bundles four to eight input slivers into one. The bundled sliver leaves the machine at four to fourteen times the speed with which the slivers are input. The main difficulty is to handle this high sliver



Four to eight input slivers are bundled into one

speed at the machine output because the material thickness is measured there and has to be regulated very fast.

### **Uniform drive series**

The speed of the Sinamics drive system is a great advantage here. To improve the material quality the company therefore chose a complete solution based on the Simotion D425 motion control system with Sinamics drives, Simatic Touch Panel and ET 200S I/O devices as well as an 1LA asynchronous motor for the main drive (with encoder) and a 1FK7 servo motor with resolver for sliver regulation.

This enabled the company to implement a regulation with superior technology within a standard solution for the HSD-961AL, DV2-AL machine. The regulated draw frame offers better quality at constant productivity than the unregulated draw frames which are still being built almost exclusively in China. Hou Zheng, the manager of the Electric Automation department at Tung Hsia was "impressed by the functionality of the system, especially in the jog and ramp up mode, in initial demonstrations of the system." Best sliver quality is guaranteed even at top speed. Another advantage: all the parameters of the self-configuring system can be readjusted on the Simatic Touch Panel.

### Successful technology transfer

The application is implemented by the APC (Application Center) for textiles in Chemnitz in cooperation with Siemens China and the customer. Great emphasis is placed on involving the Chinese engineers fully in the project. Siemens in China is therefore able to offer Tung Hsia excellent support after the project as well. As planned, Tung Hsia is well on the way to becoming the leading manufacturer of regulated draw frames in China in cooperation with Siemens.

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Marzoli combing machines process extremely fine material

Marzoli S.p.A., Italy

# **A Fertile Partnership**

Marzoli developed a combing machine according to latest mechatronic aspects in cooperation with Siemens.

he quality of materials play an increasingly important role in the textile industry. The combing process which takes place after the first draw frame has therefore become increasingly important over the years because extremely fine material needs to be processed which must at the same time be very tearproof. In addition to the quality, the productivity of the machines also has to be improved so that they remain competitive on the global market.

### Increased productivity and availability

Marzoli SpA., a company in the Camozzi Group with more than 150 years of experience in machine and plant manufacture for the textile industry, developed a new generation of combing machines, the CM 600N, which can comb all kinds of cotton fibers by simple, integrated mechanical settings. The machine relies consistently on the use of mechatronics. This has led to a decisive improvement in the production capacity and enabled the machine to be adapted to various different requirements while ensuring maximum availability at all times.

The partnership with Siemens had a big hand in this project because this made it possible to implement the new technologies with optimum automation. The machine control runs with the Simotion motion control system which manages all the logical functions as well as the process and motion control section with extreme speed and safety. The applied Simotion D platform is equipped with an infeed/regenerating unit in the Sinamics drive system which ensures an optimum energy balance in the machine. The inputs and outputs use distributed Simatic ET 200S I/O devices which are linked to the Simotion controller via Profibus.

### **Optimum implementation of mechatronics**

The great advantage of this solution is the maximum integration of all the electronic components. In this way, all the functions and parameters of the machine can be checked at any time. A graphic interface of the highest level is required for this. Marzoli therefore uses the Simatic Panel MP 277 Touch with high resolution 10-inch display. This clearly structured user interface enables all machine parameters to be displayed, monitored, entered and changed in such a way that all the functions can always be operated conveniently.

Marzoli is very pleased with the final solution. By optimization of the functionality, best possible design of the motors and mechatronic analyses, the mechanical stress on the machine could be minimized and maximum availability achieved.

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In the now fourth version, the R 40 may be up to 440 spinning positions long

### Rieter Ingolstadt Spinnereimaschinen AG, Germany

### **Maximum Performance**

Specially developed asynchronous motors contribute to the continually growing productivity and availability of the R40 rotor spinning machines.

ith its draw frame and rotor spinning machine products the Rieter Ingolstadt Spinnereimaschinen AG, which belongs to the Textile Systems division of the Rieter group, is successful on all markets. The percentage of exports of the system supplier is approximately 97%. The company is continuously developing the fully automatic R 40 rotor spinning machine to improve the yarn quality, exploit the entire productivity potential and minimize the energy consumption.

### 350 meters per minute

A newly developed cast-on system in the open-end spinning method, for example, allows previously unattained, almost invisible cast-ons which lead to much fewer downtimes and a flawless end product in the further production of the yarn. The current version of the R 40 now has up to 440 spinning positions and reaches delivery speeds of up to 350 meters per minute and rotor speeds of up to 160,000 revolutions per minute.

Siemens, already a system supplier for switchgear for the entire Rieter company and represented with 1FH7 constant voltage generators in the R 40 since 2000, has also made a major contribution to the development since 2005 with the machine's drive motors. Nine standard asynchronous motors of the 1LA5, 1LA7 and 1LA9 series in the power range from 3 to a maximum of 60 kilowatt depending on the powertrain ensure both the feeding of the sliver and the driving of the opening cylinder and the spinning rotors as well

#### **Rotor yarn**

A yarn produced by the open-end spinning method. It is more even and more voluminous than ring yarn but has a lower average breaking strain. Rotor yarns are therefore used where evenness is required and a lower strength is sufficient. This applies for less fine yarns used for example in the clothing sector for jeans, T-shirts or towels.

as the winding on of the finished yarn. In 2006 Siemens supplied Rieter Ingolstadt the entire annual demand for motors for the rotor spinning machines. In rotor spinning, the machine is supplied directly with a draw sliver or card sliver. The sliver is opened into individual fibers by an opening cylinder and conveyed by centrifugal force and a pneumatic fiber transport into a very fast rotating drum with an inward inclined wall, the rotor. The centrifugal force causes the fibers to slip into the collecting groove at the bottom of the rotor's slip wall. There they collect until the yarn thickness is reached and are then pulled off axially through the nozzle in the rotary axis and twisted into a yarn. The yarn is spooled directly onto a cross spool.

### Consistent use of single-motor drives

In the current version of the R 40 the yarn delivery, lay and spool shaft are driven by one frequency converter-operated motor each – developed specially for its purpose – instead of by a motor as in the earlier versions. "In networked drive technology this has the advantages that the speed ratios can be determined freely and accurately by programmable control," Romeo Pohn, Head of Mechanics for rotor product development and responsible for the asynchronous motors explains. "We also save energy because the drives can be operated in the ideal speed range."

The drives can be set flexibly to the production parameters, i.e. to the yarn type and the production speed. Networked drives do not run out uncontrolled in case of voltage interruptions either. The delivery provides the nominal values for all following drives as a master, both for run-out and running up again. The voltage interruption is therefore no longer detectable in the end product of the yarn so that the high quality is retained.

Specialists from the Siemens motor factory in Bad Neustadt have totally redesigned and optimized the motors mechanically and electrically for the R 40 in cooperation with Rieter. "We were looking for a system partner who is very familiar with the spinning process and its requirements and we have found him," says Bernd Bahlmann, Head of Electrical Engineering and Control in the rotor product development. "For example, we only had to set how fast the belt is to run and what tension forces it requires. Siemens then brought in its specific motor know-how and developed the optimum drive for the respective application."

### The challenge of bearing currents

For the design of the drives, the unfavorable environment with its high temperature, heavy fiber flight, high speeds and strong forces acting on the motor shaft presented a special challenge for the motors alone. In addition, problems with the bearing currents resulting from frequency converter operation are also familiar from other applications. "We therefore decided to



Siemens developed and optimized the motors specially for their task in the spinning process – here the drive of the opening cylinder

use hybrid bearings in the larger drive motors of the R 40 which isolate the rotor shaft to the coil and therefore interrupt the current flow," Romeo Pohn says. "This was all the more important because more frequency converters were used in the new R 40 than in earlier versions and thus a greater risk that motors will fail as a result of bearing currents." "Particularly in view of the increased demands, the Siemens quality at a very competitive price convinced us."

Fail safety and long service life of the R 40 drive systems are very important to Rieter and its customers. A system partnership offers advantages. Due to the positive experiences, Rieter is considering ordering other components for its rotor systems from Siemens in a next step.

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### Trinca, Italy

### Extra-Wide, Extra-Fast

Modular automation in a wide-weaving machine permits the fast realization of complex weaving structures

omplex weaving structures made of plastic or plastic-metal combinations are gaining increasing importance in the production of modern process belts. The woven materials are being provided with more and more product properties, such as special surfaces, electrical conductivity, high stability and temperature resistance. These very different requirements can only be mastered using state-of-the-art weaving technology. In many cases, only relatively small production batches are sensible. It is therefore essential to include rapid material and pattern changes in the manufacturing process and to ensure that new machine settings can be made in a short time.

### **Strategic decision**

Tailored process belt woven materials require high precision for the machine movement and a reliably reproducible setting capability of the mechatronic components. GKD in Düren, Germany has therefore decided to contract Trinca, an Italian special weaving machine constructor, to manufacture its process belts for wide-weaving machines.

Trinca uses the powerful Simotion and Sinamics automation components for the implementation of the complex technology functions in an optimized motion model. Together with Siemens and GKD, Trinca has succeeded in further optimizing proven designs by changing to a completely new automation structure. When a new pattern has to be produced, mechanical manipulation is no longer necessary. Instead, the parameters that are stored in the controller are loaded according to the recipe specifications. Another advantage is that the number of different machine types and thus vertical integration is reduced.

### **Complex motion control**

In the weaving process, a great many movements are now derived from the main shaft, e.g. the shaft movement for the binding layout. The new Simotion motion control system focuses on organizing the large number of motion sequences required here. Electrical single drives with synchronized cams can realize any binding change with a mouse-click. Not only does this make mechanical cams superfluous, but binding types beyond the simple upward and downward shaft movement can also be realized. In addition to the benefits of a short setup time, there will also be noticeable savings with regard to the mechanical components.

### Targeting higher productivity

It is no longer possible to increase the productivity of weaving machines in any significant way using mechanical means. Instead, the solution is to replace mechanical components with electrical components.



With innovative motion control technology, Trinca high-tech woven materials can be realized for many applications

For the electrical drive systems, this means that the previously mandatory mechanical motion coordination is now replaced electronically using motion control functionality. From a configuration viewpoint, the machine is divided into individual sections, each of which can contain one or more drives.

### Splitting of the mechanical process sequence

Removing the mechanical functions coupled to the main drive means that these can now be incorporated as technological function blocks in a technology object as required. A precise axis coordination for all functions derived from the machine angle is then created in this technology object.

Warp and weft thread thickness, weaving tension, binding type, etc. are converted into optimized equivalent drive parameters, allowing a change in woven material to be simply executed.

The PC-based Simotion P350 motion control system is used for the axis coordination of 32 single axes. Pattern data is transferred from a CAD system to Simotion using OPC servers. This data is then used to derive the speed setpoints and is made available as cam functions for the Sinamics drives.

So, in accordance with the specified pattern, the binding selection is made using the shaft movement, the warp let-off and material removal are controlled flexibly and the weft insertion is controlled by the machine angle of the main shaft. For example, this allows a complete grab cycle consisting of insertion, thread transfer, completion of the movement and direction reversal to be performed in fewer than 330 milliseconds. The main shaft is configured as a double-sided driven, torque-coupled system to prevent torsion vibrations.

### **High productivity growth**

The introduction of Simotion into the machine controller as well as the individualization of the shaft drives and their technological integration in the drive group have achieved a 50 percent increase in efficiency. For woven material widths up to 7 meter (9 meter is being planned), the weft insertion speed is 100 weft/ minute. The machine processes weft yarns with diameters up to 1.5 millimeter.

Comprehensive mechatronic studies on the machine provided information on which construction details require further improvement to achieve a higher dynamic response and processing speed. By implementing these results, further increases in productivity will be possible in the future.

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spectrum TEXTILE | 2007 11



Pai Lung's circular knitting machine allows the production of fine fabrics with fancy Jacquard patterns

Pai Lung, Taiwan

## A Win-Win Partnership

Jacquard knitting: market success through constant innovation and fast response times.

he Taiwanese company Pai Lung is one of the world's most successful circular knitting machine manufacturers. Their wide, comprehensive range of models which include machines with a diameter of 2 to 60 inches and a gauge of 4 to 44 satisfy even the most exotic customer requirements. James C.C. Wang, President of Pai Lung sees the short response times with which they can react to customer wishes and market demands as an essential factor in the company's success. Constant innovation is, for Wang, an important key to the further expansion of the business. The 490 new patents and 70 new machine models in the last years alone are proof of this. According to James C.C. Wang, the partnership with Siemens developed because as a company driven by innovation and one of the top 3 in its segment, they were on the lookout for partners who were in a similar market position.

### **Completely innovative control system**

Since starting the joint project with Siemens, the company has been able to increase the quality significantly and now equips single, double, striper and transfer Jaguard circular knitting machines with the innovative Sitex complete solution for electronic individual needle selection. The package consists of the Sitex M actuators for needle selection as well as the Sitex PC controller for pattern preparation and control of the piezoceramic actuators. The system is completed by the Sitex S uninterruptible power supply which ensures a controlled shut-down of the system and continued knitting to pattern. Sitex has given an excellent performance under harsh production conditions for years. The system is under continuous development to adapt it to the changing market conditions and customer requirements.



Innovated: the actuator module of Sitex

### **Highlights of Sitex**

- Ultimate oil resistance based on special coating and design
- Bending elements protected by individual cages
- ► Easy individual replacement of bending elements
- User-friendly color touch display with pattern preview
- User interface in Chinese, Korean, English as well as other languages
- Remote access for updates, production control and service



For example, the completely innovative Sitex PC Controller with real time operating system and a large, user friendly color touchscreen offers pattern preview and an extensive online help functions and enables simple and safe operation. In view of the increasing importance of the Asian market, the user interface is available in Chinese Simplified, Chinese Traditional and Korean in addition to other languages, by switching with a button. The President of Pai Lung points out another advantage: "The Siemens Sitex controller is very versatile with regard to the compatibility of pattern formats. This enables us to implement most of the pattern formats used on the market." The patterns can be loaded, as previously, from floppy disk or USB stick; the large internal memory allows a number of patterns to be stored in the controller itself. The remote access via Ethernet or analog telephone cable with USB modem extends the data transmission possibilities for software updates, pattern files or other production data. The remote maintenance is now supported by detailed history files.

### New generation of piezoactuators

The piezoactuators have also been completely innovated. The latest innovations are that every bending element can be changed individually and the outstanding oil resistance based on special coating and design. Additionally every element is protected against mechanical overload and rough handling by a cage. Changing requires no special knowledge. The bending elements are accessible without removing the electronics board and above all no final adjustment is necessary. The interior design of the actuator module has been changed to solve the common problem of damage caused to bending elements and module electronics by aggressive oils. For example, all active parts in the module now have an improved protective coating. In addition, the smaller external dimensions of the module allow higher system numbers on the machine. Finally, the cable concept has also been simplified and the number of variants reduced drastically.

### Successful cooperation

Varied innovations and further developments in Sitex fit the Pai Lung philosophy perfectly and their President is deeply convinced that his company's success is driven by R&D. The success factor of response time is also a common feature. President Wang confirms this: "Siemens not only has a great technical competence but also combines this with short response times. This fits Pai Lung's market image perfectly. For Pai Lung it is a win-win partnership." Therefore, Pai Lung relies on the innovative technologies and support of their globally active partner, Siemens, on their way from a mere machine developer to a solution provider.

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### AUTEFA automation GmbH, Germany

# **Exact Laying**

Proven motion control technology and highly dynamic servo drives form the basis for a scalable, modular solution for non-woven lavers.

> reater laying widths, faster material throughput, and an exact nap lay are the most important requirements for automation systems for non-woven layers. With these aims in mind, AUTEFA with its headquarters in Friedberg and Siemens developed a highly efficient non-woven layer which operates with a consistent product quality. The solution includes all basic functions as standard. Hardware and software can be easily scaled to meet requirements. Simotion D is used in conjunction with WinCC on a Simatic Panel PC. The Sinamics S120 drive system has been combined with 1FT6/1FK7 High dynamic servo motors. Several panel variants are available for the operation. The drive system is linked to the master process control by Ethernet; the machine periphery is linked by a Profibus interface to the controller.

### **Controlled nap lay**

In a non-woven layer, the fiber nap material runs between the feed belt and the cover belt from the traversing upper carriage to the laying carriage until it is laid on a run-out table in zigzag form. The speed ratio of the feed table to the run-out table determines the number of layers and thus the material thickness. With the Simotion solution a precise, fast mo-





... for example in the inside cladding of doors

tion control and correct traversable speed profiles can be implemented. New technological drive profiles can also be preset.

### **Ideal for topliners**

The technology control in the vicinity of the drive with Simotion D increases the non-woven quality with a considerably improved position accuracy. The technological knowledge of the non-woven process has to be considered in the profile control of the nonwoven layer for an optimal product quality. For example, the material shrinks more at the edges than in the middle due to stretching during later solidification of the non-woven. This effect is compensated by the patented AUTEFA profile control. The prerequisite for this precise result is the highly accurate tracing of a laying carriage speed profile, the equally exact edge positioning as well as a fast reversing movement. The specific belt control in relation to the laying carriage and a nap accumulation over the whole laying width while switching from one carriage to another achieves a controlled nap laying throughout the process.

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### Bastian Wickeltechnik GmbH, Germany

### **Rolls Galore**

Rational Winding Technique with Totally Integrated Automation: homogeneous Siemens technology creates machine concepts with higher efficiency and productivity with low personnel deployment. Automatic offline cutting and winding machine BWT 203/306

ore than 30 years of experience have made Bastian Wickeltechnik GmbH the technological leader in the field of winding web materials. The finished rolls for plastic films, papers, laminates, composites or non-wovens are produced ready for sale either in an offline or inline process.

### **Flexible offline**

In offline manufacture the rolls are produced in two steps. First a large roll is produced by a jumbo roll winder which is then fed to a slitter rewinding machine. The various single rolls are then cut ready for sale on this slitter. The advantages of this manufacturing method is its flexibility because the jumbo rolls can first be taken to a store and cut ready for sale later, depending on the order situation. However, the stress on the material is higher because the materials are subjected to another rewinding process at higher rewinding speeds (up to 1,800 meters per minute) after production of a jumbo roll.

### Low-cost and gentle inline

Rolls produced by the inline method in one step feature a special winding: tight on the core with individual taper in tractive force over the diameter. The material is prepared by inline cutting winders with a longitudinal cutting device which can cut widths of 50 millimeters with up to 60 cuts.

The resulting single rolls are wound fully automatically onto common 3-inch cardboard cores up to a roll diameter of 1,500 millimeters. Masterdrives VC Compact Plus ensure an even, tension-free winding. At a production speed of up to 600 meters per minute the individual rolls are separated and placed on an unprepared core without using accumulators. Discharge of the rolls takes place fully automatically as does the loading of a new winding core. The entire system is controlled by a Simatic S7-317 CPU, the distributed periphery is controlled by Simatic ET 200S. The Simatic Multi Panel MP 370 Touch ensures convenient and very clear operation.

In addition to low procurement, maintenance and personnel costs, the great advantage of the inline winding is in the uniform material quality in the manufacturing process.

### Higher yield and flexibility

Bastian has combined both processes in the inline/ offline system to unite flexible storage and cost effectiveness. This can cut the material inline on the jumbo roll winder as well as produce jumbo rolls for the downstream slitter rewinder. Furthermore, large rolls from the store and material produced inline can be converted simultaneously.

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# Accurately Drawn and Wound

Simotion D and Sinamics S120 for POY spinning systems: distributed automation of the spinning units makes the plant layout more flexible.

> ith more than 30,000 spinning units delivered in the last ten years, POY (Pre-Orientated Yarn) systems are the most successful product of Oerlikon Barmag, the world market leader of spinning systems for polyester, nylon and polypropylene.

> In the manufacture of chemical fibers, plastic granulate is first melted in the extruder. Then spinning pumps press the melted material through micro-fine nozzles under extremely high pressure. The individual fibers (filaments) that are produced are bundled into yarns, drawn over godets and wound up by a winder. A highprecision technology is necessary for this because the slightest error cannot be corrected later. Because of the wide variety of applications of the POYs it is often important to be able to respond flexibly to customer requirements with modular, freely configurable spinning units. At the same time, the engineering should take less effort in the individual plant projects.

### Functional units with highspeed accuracy

Up to 48 spinning units for up to 20 yarns each are combined in one POY spinning system at Oerlikon Barmag. Since all the drives of one spinning unit are operated interdependently, the automation design must be homogeneous. The company has developed a concept with Simotion D and Sinamics S120 for controlling its POY machines from the extruder to the winder in which the inverter and controller form a functional unit. This allows stand alone controllers to be used per spinning position and winder, thus making the system layout particularly flexible. Oerlikon Barmag uses converters with powers of up to 300 kilowatt for the extruder, also operated on a Simotion D controller. The pressure in the extruder is therefore regulated with the necessary maximum precision. The spinning pumps driven by variable speed asynchronous motors on inverter modules are supplied with a constant prepressure. The speed accuracy is important here, even at very low speeds just before standstill, because fluctuations in the speed of the spinning pump produce a yarn with varying thickness.

The yarn produced in the spinning nozzles with 15 to 600 dtex is cooled in the so-called blower and a prepariation fluid is applied, so that it can be drawn, wound and further processed. High-precision, speedcontrolled drives are also used for the preparation

### POY yarn

POY yarns are filament yarns, i.e. endlessly spun and wound chemical fibers. The pre-orientated, not yet fully drawn yarns are made by the rapid spinning method and can be run through different operating processes to produce textured fibers such as drawn texture yarn (DTY). Refined in this way, they form the basis for various fashion, sports, functional and home textiles.







Efficiency and quality with up to 20 yarns per spinning unit: POY spinning systems from Oerlikon Barmag

pumps. Then the yarn runs through several godets with variable speed asynchronous motors and is finally wound onto cardboard cores on the ACW (Automatic Craft Winder), which sit on a centrally driven mandrel, the clamping chuck. Since the diameter of the package increases during the winding process, the surface speed of the package must be regulated here. It is measured very accurately by the pressing roller. This once more demonstrates the advantage of the homogeneous automation concept: since everything is contained in one system and all the drive data are accessible, all the axes interact optimally.

### **Application-specific solutions**

The traverse, for which a single converter is also used, lays the yarn. For this procedure, various actual values must be available with a high accuracy on the one hand and a high control quality must be achieved on the other hand. In order to achieve the required precision Oerlikon Barmag has developed applicationspecific solutions in cooperation with the Siemens' development departments.

Profibus operator panels and a tailor-made distributed periphery were developed as hardware components for example. The advantage of the modular single unit design in which an stand alone control concept per spinning position is implemented especially in the winder: all electrical components related to the winder are in a switch cabinet at the winder. As a self contained unit, the winder can be replaced in its entirety thereby increasing availability considerably. There are up to 101 Simotion D units in one POY system networked by Ethernet communicating with the Oerlikon Barmag Guide visualization system. This visualization system was created based on Simatic WinCC and controls the entire data management, statistics and fault history. The controllers can also be networked with the Oerlikon Plant Operation Center (POC).

### **Company-internal engineering**

The aim of the hardware design was to achieve a high protection class of the unit-related electrical installations. This was enabled by using converters based on Sinamics motor modules in cold plate design. Using the Siemens engineering system, the software blocks written by Oerlikon Barmag engineers are locked to protect Barmag's intellectual property. The programmers' work was made much simpler by the fact that only one engineering system (Scout) and one programming language (Structured Text) was required for creating the control software. With the capability to provide remote support via Tele-Service and the extensive diagnostic possibilities of the Scout configuration tool, Oerlikon Barmag was convinced Siemens was the right choice.

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### Dietze + Schell Maschinenfabrik GmbH, Germany

### Winged by Success

Customer-specific drive technology as a cost-optimized solution for machines for winding glass and natural fibers

lass fibers are the ideal material as far as stability and high-load resistance are concerned. They are used for wind power stations, gliders, ship hulls and much more. Dietze + Schell Maschinenfabrik in Coburg is considered one of the leading manufacturers of special winders for glass fibers and has been supplying its high-tech machines worldwide for 50 years.

The DS 10 M winding machine winds high-tech yarns or natural fibers like jute or sisal with 500 to 25,000 Decitex for the manufacture of cylindrical, conical and bi-conical packages with different traverses; at speeds



Thanks to modern glass fiber materials, rotors of windmills withstand the greatest stresses

of up to 1,200 meters per minute depending on the yarn thickness. The winding of such fibers with different requirements for the package structure demands machines with a high degree of technical sophistication which vary according to the desired package structure.

### **Tailor-made**

Together with the machine manufacturer, Siemens developed and produces new drives for the DS 10 M which are optimally adapted to the machine requirements and give the machine manufacturer further concrete competitive advantages besides the technological improvements themselves. These include lower unit costs, lower spare parts stocks, globally available support of the market leader in automation technology and the effective protection of the application software which is available in the frequency converter and cannot be read out.

The solution developed for the DS 10 M consists of customer-specific frequency converters up to 750 W, customer-specific stepper control modules and customer-specific CAN distributors with a data storage of the connected current converters assigned to the installation location. The assembly plates are manufactured as a complete solution at optimum costs in the Siemens combination technology factory in Chemnitz. This saves Dietze + Schell further costs by the simplified order process and the reduced stores stocks as well as the relief on their production capacities during peak periods.

### From project to success in just three months

The changeover from the existing solution with PLC and standard drives to the customer-specific solution from Siemens was a race against time because the Siemens engineers had a development time of only three months from the start of the project to the planned commissioning of the machines. But the risks for Dietze + Schell remained calculable because the platform for the necessary technological functions at Siemens was already in place and available. On top of this, there was the product and solution know-how of the world market leader in automation and drive technology which could be introduced into the project and used to optimize the machine. In a close, trusting cooperation with Dietze + Schell, Siemens succeeded in meeting all the requirements for the application of the machine functionally and under consideration of all prevailing conditions and within the short time available. The result are machines with a high winding flexibility, increased winding speeds and a higher dynamic control which "wind and wind" to the customer's complete satisfaction.

Dietze + Schell is full of praise for the successful alliance between the medium sized company and the large corporation.

The remarkable features of this project are especially the high motivation and commitment of the Siemens departments involved, their understanding of their

partner's technological processes, the short response times and decision processes and the flexible, goaloriented and unbureaucratic cooperation of both parties' project teams.

### Glass fiber winding made easy

Here the customer-specific solution, there the standard devices: in the DS 360 winder series Dietze + Schell also relies on a Siemens solution; this time implemented with components from the extensive standard portfolio. The highly flexible machines wind glass fibers of 68 to 9,600 Decitex as direct rovings at speeds of up to 3,680 meters per minute depending on the package diameter. Up to six packages per spindle can be wound simultaneously as an option. The package structure and the winding quality of the packages have a decisive influence on the quality of the subsequent production steps, for example in the manufacture of fiber-reinforced profiles (pultrusion), roughcast and roof coating reinforcements, textile materials etc. so that mechanical engineering and automation and drive technological know-how have to cooperate closely to meet the end customer's requirements. The homogeneous automation solution of Simatic HMI system, bus system, Simatic controllers, I/O and drives of the Simovert Masterdrives type and servo motors was also developed jointly by Dietze + Schell (machine control) and the Siemens application center for textile machines in Chemnitz (drive technology). The technical quality and reliability of the implemented components, the worldwide service and the high availability of spare parts increase the acceptance of the machines with end customers all over the globe. The successful cooperation is to be continued with other machine types. 

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Cordenka GmbH, Germany

# **Better Spinning**

Retrofit of a spinning machine for tire cord with a complete solution from Siemens.

ayon, a material produced from cellulose, is very popular for reinforcing high-performance tires. One of the leading manufacturers, Cordenka in Obernburg, is therefore expanding its production capacity. With the retrofit of a spinning machine formerly operated with products provided by different manufacturers, Cordenka relied on a complete electrical solution from Siemens. The company not only adapted the machine to an improved production process but also achieved a higher production capacity.

#### **Homogeneous solution**

The machine spins tire cord viscose fibers from dissolved cellulose in a sulfuric acid bath and winds them up for further processing. The corrosive ambient conditions with high concentrations of hydrogen sulfide places high requirements on the reliability of the electrical systems. To boost resilience against corrosive gases, the converters, contacts and metal parts were equipped with protective measures. The heat exchangers in the air conditioning units of the cabinets received a special protective surface.

In the homogeneous drive and automation solution with the Simatic S7-300 controller, the distributed ET 200M I/O and Profibus, 18 Simovert VC Compact Plus Masterdrives replace a central gear with vertical shaft. The retrofit is completed with maintenance-free Siemosyn synchronous motors without sensors for spinning pumps, godets, winders and stacking roller as well as 1 LA standard motors. For the electrical systems, Siemens was awarded the contract for project lead including engineering, commissioning and cabinet construction. Together with using a uniform drive and automation solution, the modernization project could be completed in time.

### Higher capacity, more consistent quality

The use of separate drives introduced by the retrofit reduces the wear-susceptible mechanics, increases the plant availability and simplifies maintenance. The Flexibility increases the versatility and the capacity of the machine. Since the speed specifications per setpoint cascade are kept very accurately and reliably by the drives, the quality of the end product is more consistent. The Active Front End (AFE) infeed and the kinetic buffering (KIB) also ensure that line side voltage dips do not lead to material flaws.

In the configuration of the automation, Siemens prepared a central machine visualization by an HMI station which is to be implemented in a later modernization step. The highly satisfied customer has now contracted Siemens for the modernization of four more machines in which the new Sinamics S120 drive system is used.

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Superba S.A., France

# **Top Quality**

Heat-setting of threads with Simatic: higher productivity, greater safety and easier operation in the new TVP3 generation of machines by innovative automation.

ith more than 1,200 machines worldwide, Superba S.A. is today's market leader in the continuous process for heat-setting of carpet threads. In this process, the thread twist and thread gather are fixed continuously at high temperatures in a saturated steam field. The clamping heads in the inlet and outlet area serve as locks while the material can run in and out without the steam escaping from the tunnel.

### Up to twelve tons a day

The company's new TVP3 heat-setting machines offer an even higher production rate of up to twelve tons per day in a modern design, greater production output and enhanced safety due to its new controlled head concept. Maintenance has also become easier and is less frequently required.

The automatic pressure control by pneumatic heads makes faults and soiling of the hydraulic system a thing of the past. The new proportional head movement controls the transport belt carefully with an exact positioning and therefore contributes to a longer life of the wearable parts of the head and belt. All the operating parameters are saved in recipes. This ensures that a certain type of yarn is always treated identically.

### **Profibus saves wiring costs**

The distributed automation architecture is based on a Simatic S7-315-2DP which processes all the control loops (temperature, pressure, speed, positioning) with as high a precision as the distributed Simatic ET 200S manages the 250 intelligent inputs/outputs. The Simatic controller communicates via a Profibus connection which runs through the entire heat-setting system. Profibus drastically reduced the wiring costs and achieved a high level of control in all inputs and outputs as well as in the connected devices. The numerous switch cabinets can be dispensed with, making the operator's work safer and more accurate.

An efficient Simatic MP 377 touch screen enables effective control of the machine and makes troubleshooting easy. An Ethernet IP camera monitors the machine output on the winder side. Its picture can be incorporated in the MP operating panel, enabeling a higher operation safety.

An efficient SCADA system can also be connected to the machine to create productivity or production calculations and statistics, record all events for the purpose of traceability, display the error frequency or plan preventive maintenance.



Benninger Zell GmbH, Germany

# A Generation Change in Drives

Totally Integrated Automation in impregnating machines for technical fabrics with Sinamics.



Benninger manufactures transport belts for use in the mining industry

Benninger Zell has for years relied on Totally Integrated Automation in impregnating systems for tire cord and other technical fabrics. Now, the world market leader has entered a new generation with the latest Sinamics S120 drive family. The machine manufacturer and the users benefit equally from this. Various manufacturers of transport belts for the mining industry in the U.S. and China have made a start.

Transport belts used in mining transport earth, ore or coal often over hundreds of kilometers and therefore need to be very robust. The belt systems are now wider – 3.2 instead of previously 1.6 meters. This innovation places high demands on the drive system and structural design of the transport belts. The biggest part of the forces has to be absorbed by the "heart" made of textile fabric. The advantage of textile-reinforced belts: they are easier to rejoin after tearing (by splicing) than steel-reinforced variants which has led to them being preferred by users – and to a number of new orders for Benninger Zell.

### Maximum reliability

A must for the consistently high quality of the impregnation and the recipe for success of the company which belongs to the Swiss Benninger AG are absolutely constant tensions, temperatures and times in the impregnation. This ensures the optimal bonding of the rubber or plastic coatings applied to the fabric later even under extreme stress and constant bending. For years, Benninger has been achieving the necessary reliability in the continuous middle section of its machines decoupled from the feeder and discharge by product stores with Siemens control and drive technology. The nominal settings are made by a redundant PC system which communicates with the Simatic S7-400 system controller by Ethernet. This controls several tension mechanisms with driven roller pairs on the Profibus which are adapted to each other so that an exactly defined stretching of the running fabric or constant tensions and jolt-free switching between stretch and tension are ensured.

According to Benninger, the drives must have a high precision speed control and permanently observe synchronization tolerances of 0.1 percent. The company therefore eyes every change to its "running system" critically.

### New drive generation with advantages

On the other hand, Benninger wants to secure its leading market position and innovations are still the best way to do this. Therefore the company has now brought the drive technology up to the state-of-the-art. This is called Sinamics S120 and continues the high control quality of its predecessor Masterdrives without restriction. The Sinamics family is also integrated smoothly into the proven Simatic Step 7 system platform which means a common familiar platform for the configuration/programming and communication and data storage between the controller, HMI and drive level and thus makes much of the work a lot easier, from engineering to (tele)diagnostics.

Benninger has made consistent use of the modularity and scalability of the new Sinamics system and developed a drive concept which will also be valid for future machines because it is easily transferable and modifiable. One CU320 Sinamics control unit each is used for the motors of the machine sections roll-off, process unit and roll-up. The Drive-Cliq digital system interface connects the respectively appropriate components and eliminates all the signal transmission problems which used to occur sporadically with cable lengths of more than 100 meters.

The machine builder also sees an additional advantage in the intensively tested interaction of the Sinamics converters with the implemented standard asynchronous motors from Siemens which therefore worked from the very start – another detail cutting time-tomarket and machine commissioning.

The drive assembly of a typical impregnating machine for transport belts includes nine single drives (DC/AC) with powers of up to 30 kW for the fabric transport, six auxiliary drives (DC/AC) and six fan drives (AC/AC). Added to this are 18 smaller Micromaster 440s for controlling motors for the side guiding via Simatic ET 200 controllers.



The drive concept of the Benninger machine with Sinamics converters

#### Saves space, cost and effort

The modular system structure with independent control units and motor modules in the compact booksize format saves space in the drive cabinet so that smaller, i.e. cheaper standard cabinets can be used in future. The common DC railing saves disconnectors, fuses and copper rails and therefore reduces the assembly and wiring effort considerably. The parameterization of the installed motor modules (available for one or two motors) is saved on the Compact Flash memory card in the control unit and is readily available even in case of maintenance. This keeps downtimes to a minimum and the productivity of the machines usually running around the clock at the maximum level.

Apart from that, the new generation has given Benninger long-term security in the spare parts supply again which is an advantage not to be underestimated for machines with life cycles of up to 30 years and a real purchasing argument for potential customers. Many users prefer the well-known Siemens brand because they are aware of the worldwide availability of spare parts and support.

The changeover to the new drive standard in impregnating machines from Benninger went by without any significant problems in the normal daily routine. In the "hot phase" of the initial commissioning a drive specialist from Siemens supported the company team for two days.

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### **SIEMENS**