

# Innovative calendering technology for technical textiles

The market for technical textiles is growing steadily: Its share of the market volume in the entire textile industry is already around 30%, with individual sectors achieving growth rates of more than 10%. Due to constant innovative developments, the industry not only uses woven fabrics, but also non-wovens, felts, films, and other materials in order to produce modern composite materials. Calendering processes are still indispensable in the finishing of technical textiles and vital to the quality of the final product. Some typical applications that require a calender finish are airbag materials, breathable outdoor wear, filters for industrial and medical applications, parachute silk, sailcloth, tarpaulin fabrics, packaging materials, protective clothing, sunscreens, or emery cloth.

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Andritz K  sters is one of the pioneers in calendering technology for the textile, non-wovens, and paper industries. The company's portfolio for the textile industry combines 3 different deflection-controlled roll systems:

- the (swimming) S-Roll
- the piston-supported HyCon Roll
- and the zone-controlled Xpro Roll presented for the first time at the ITMA 2012 in Barcelona/Spain.

The right system roll is available for each of the final applications for technical or traditional textiles.

## Calender designed for absolute flexibility in production

Besides being operator-friendly, calenders need to provide a high degree of flexibility, reproducibility, and process control. The new teXcal trike calender design (Fig. 1), with patent pending, is a 3-roll calender with an innovative roll arrangement. At the top, the teXcal trike calender has a heated steel roll, with one system roll each arranged symmetrically on either side of it (Fig. 2). The bottom rolls can be fitted with identical or different deflection control systems. Depending on the product, the fabric can be fed through the front nip, the rear nip, or both. The claim to unlimited flexibility is guaranteed by the individual pressure control for the system rolls. Depending on product requirements, different line forces that are infinitely variable up to 400 N/m can be set in both effect nips. The system rolls are often equipped with covers. Due to the innovative roll arrangement,

the elastic covers are exposed to less thermal stress. As a result, the rolls have a much longer life cycle than traditional, vertical roll arrangements.

## Different calendering effects with multi-covering technology

Another advantage of the teXcal trike calender is the multi-covering technology devised by Andritz K  sters. It features fast and easy sleeve change, thus providing for different calendering effects. The sleeve can be changed in the calender simply by attaching a mounting tube at the side of the calender and without having to open the hydraulic system of the system rolls. This reduces tooling times to a minimum. The multi-covering technology is used wherever textile finishers need a particularly high degree of flexibility in production due to their large product port-

folio. Many different calendering effects can be achieved by using different covers. Examples are:

- Basic covering with approx. 92° shore D hardness: high density and smoothness, e.g. for filters, rain protection, spinnakers, parachute silk
- FlexRoll sleeve with approx. 82° shore D hardness, made of polyamide: classic calender effects, such as shine, smoothness, density, e.g. for clothing, home textiles
- Composite sleeve with 65–95° shore A hardness: relief embossing, e.g. for elastic corsetry and swimwear, nonwovens, and wallpaper.

Thanks to the latest manufacturing techniques, an almost infinite number of roll covering properties can be combined and tuned to achieve the desired effect. Experience from the Andritz division "Paper and Non-woven" also contributed to the technology, making it possible to develop new covers.

## Greater productivity due to shorter seam passages

The new teXcal trike calender concept offers another essential advantage especially for textile finishers with small batch sizes and the resulting frequent seam passages: With automatic seam detection, the seam is guided carefully until it is just in front of the first nip. The line force is lowered for the seam passage to a minimum without affecting the second nip. The seam can pass through the pressure-reduced nip. Production at full line

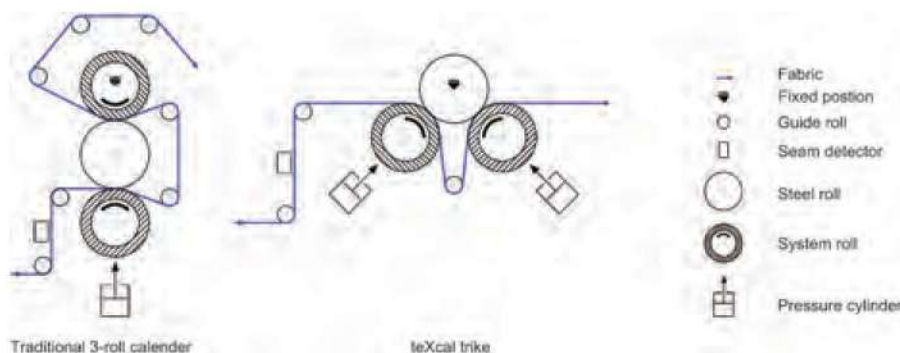
**Fig. 1**  
teXcal trike calender technology for technical textiles (Andritz K  sters)



Fig. 2  
teXcal trike calender – possible fabric passages



Fig. 3  
Comparison of traditional 3-roll calender with teXcal trike



force can be resumed immediately after this. The same procedure takes place when the seam passes through the second nip.

Compared to the traditional 3-roll calender design with vertical roll configuration, the fabric loss at the seam passage in the teXcal trike calender is reduced to a minimum (Fig. 3). Transferred to an annual production scale, this yields a substantial economic advantage. Undefined fabric tension can arise between the two calender nips due to different transport behavior by the elastic covers when line force is applied. This tension can be measured with a load cell. If the fabric tension then rises too high, Nip 1 must convey more fabric, and if the fabric tension is too loose, Nip 2 must convey more fabric. This can be achieved by varying the line forces in relation to one another.

### Variable profile control for sophisticated final products

The technology of the deflection-controlled system roll is vital to the properties of the final product. With the Xpro Roll, Andritz Küsters adapted its own roll technology, which has long been established in the paper industry, to meet the requirements in the production of technical textiles. The deflection control that has been successful for

many years received an additional zone control for the Xpro Roll and thus provides profiling that can be varied without restriction over the entire fabric width.

When the roll nip is closed, the line force can be varied infinitely from a minimum of 50 N/mm to a maximum of 400 N/mm via the individual elements. In addition to the flexible fabric width adjustment, this technology offers precise adjustment to possible material fluctuations, which may require different pressures in order to achieve uniform results. In this way, absolute flatness in the material, for example, can be achieved with the Xpro Roll – in the manufacture of sailcloth in particular, this is an essential requirement in the final product.

The first Xpro Roll in a production plant for sailcloth was installed at Dimension-Polyant in Kempen/Germany, in September 2012.

The Xpro Roll is designed especially for long life cycle. Very good shape accuracy and stability is obtained by using a steel tube to support the cover.

### Process reliability through automation

The Xpro Roll is controlled via the teXmaster system (Fig. 4). This control system developed by Andritz has also been well established in the paper industry for many years

Fig. 4  
Variable profile control with teXmaster system



and was adapted to the needs of textile production. It is a scalable software system with a modular design for use in process automation. The entire control of the calender is handled through this system and offers a broad spectrum of possibilities for recording process data, managing recipes, issuing alarm signals, data analysis, and displaying trends.

Due to their simple configuration, the software modules are adapted to the respective requirements in each case.

Furthermore, the teXmaster system also provides for closed-loop operation for inline quality measurements on the product. Direct analysis of the data obtained is used to control the system rolls.

Closed-loop operation requires a reliable indicator of quality of the final product, for example the air permeability. A measuring instrument installed at the calender outlet could take continuous inline measurements of the calendered fabric. The teXmaster compares the set values with the actual values, and this can be used to correct the system roll control automatically.

From the end of 2012, the Andritz Küsters technical center in Krefeld/Germany will have a teXcal trike calender available for customer trials. With the S-Roll and the Xpro Roll, it can offer the full range of facilities for comprehensive test series. ■