Aiming for higher efficiencies on tissue making lines

New fabric, felt and roll cover technology has been introduced to tissue manufacturers by Xerium, as explained by Oliver Baumann, Robert Marchhart and Glen A Harvey

High-performance tissue machines demand high-performance products to enable sustained quality, speeds and drying efficiency. Two recent innovations from Xerium – which embraces the companies Huyck. Wangner, Stowe Woodward, Weavexx and Mont Hope – are delivering these increased performance levels enabling these world-class tissue making machines to run faster and with greater economic efficiency.

Formsoft

On modern tissue machines, the barrier to increased production and improved sheet quality is often the forming zone. Its overall ability to rapidly drain water while simultaneously controlling fibre orientation and fibre distribution in the sheet can dictate the amount and quality of the volume produced. A critical component of the tissue forming zone is the forming fabric which has three major requirements:

• High fibre support (FSI) and uniform cross machine direction (CMD) oriented paper side

Very low basis weights and higher operating speeds require high fibre retention, uniform fibre distribution and improved sheet transfer. To achieve these objectives, the forming fabric surface must have a fine CMD oriented surface to support – and form – the mainly MD-oriented fibres.

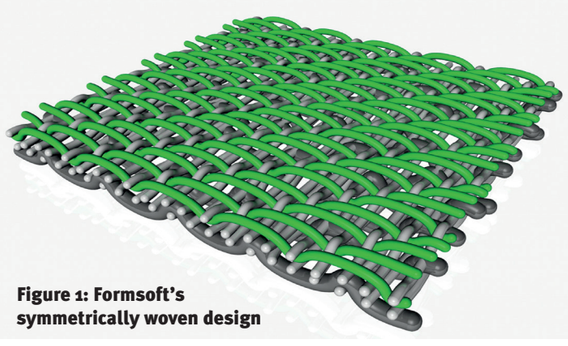

Figure 1: Formsoft's symmetrically woven design

• Straight-through drainage for rapid water removal and no water carry

As production rates increase, drainage times decrease. The sheet side of the forming fabric should determine the amount and the orientation of drainage resistance, while the machine side should be open to allow water to exit easily during sheet formation, and, to minimize shower water flow resistance on the return run.

• Structural stability and wear resistance

Although the paper side of a tissue forming fabric contributes to the structural stability, the machine side of the fabric is primarily responsible for fabric stability and useful life. The goal is to deliver the these properties, while increasing the economic life of the forming fabric.

Forming fabric design must balance the need for fibre retention, drainage and life. This inspired Xerium developers to create Formsoft, a new concept tissue forming fabric specifically engineered to provide high-speed drainage over a short forming length, while retaining exceptionally high fibre support. It features a symmetrically woven design that ensures dimensional stability and uniformity for the life of the fabric (see Figure 1). The top side improves the sheet's tensile strength, formation and hand feel, while the bottom structure provides extended life capacity.

Compared to conventional triple layer designs, Formsoft provides significantly higher FSI (plus 6 per cent at the same Perm), and up to 10 per cent lower fabric caliper. It also provides measurable improvements in production rates, CD basis weight profile, tensile strength (MD and CMD), softness, and formation.

Huyspeed - efficiency for your tissue machine

Due to the rapid adoption of Crescent-former machines in recent years (where the tissue sheet is formed between the forming fabric and the tissue felt), demands placed on tissue felt technology have increased significantly. Modern tissue felts require very high fibre anchorage with uniform surface characteristics. In addition, the modern tissue felt can play a key role in overall machine productivity and energy consumption.

Since the market introduction of Huyspeed, the product line has evolved into an indispensable clothing design for demanding tissue machines.

To provide highest machine efficiency right from the start-up, Xerium developed Huyspeed based on a specially engineered yarn. The resulting construction is characterised by high elasticity in the nip direction providing increased dewatering at the suction press roll. As a consequence, reduced steam consumption at the Yankee cylinder and lower hood temperatures at wet end/dry end are achieved. This leads to the advantage of lower energy consumption and therefore a profitable runnability is provided. In addition the new yarn delivers increased profile uniformity, one of the major requirements of modern and demanding tissue machines.

Advantages summarized into valuable savings and wider operation window

The Huyspeed product line covers the broad application needs of Tissue felts. With both the (1+1) laminated version Huyspeed GU (as in Figure 2) and the special duplex version Huyspeed BD with its very fine top surface, Xerium has developed a design concept to accomplish the market requirements. By providing increased drainage at a lower caliper, the third design of the product family, Huyspeed BE performs with top results on high performance tissue machines. As a result, Huyspeed is now considered a benchmark on tissue machines especially using waste paper and intensive high pressure needle shower.

Due to its increased drainage, Huyspeed BE enables not only reduced cleaning effort but also to reduced pressure with high pressure needle showers. On balance this leads to valuable savings in water consumption. Beyond that the gentle mode of operation delivers improved felt lifecycles.

The major advantage of Huyspeed BE is its wide operation window. This makes it an attractive option for tissue machines operating across a wide grade range.

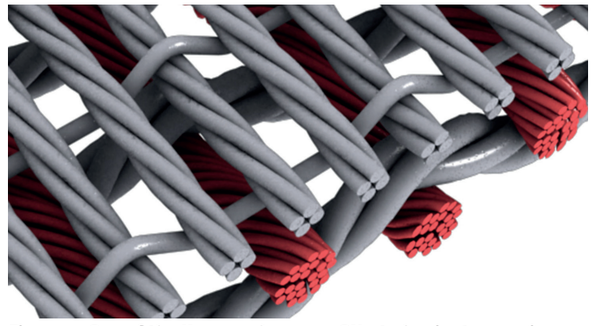

Figure 2: One of the Huyspeed range – GU 1+1 laminates version

Venting opportunities on tissue machines

• Traditional venting in tissue operation

The applications being considered here are the suction pressure roll and pressure roll positions. Roll covers for these positions are designed to generate the proper nip intensity at the maximum load. Traditionally, these covers are specified in the 30 to 45 P&J range since bulk and conformity to the Yankee are key design criteria. Cover compounds must possess good abrasion resistance, crack resistance and hardness stability (to prevent hardening from operating against the hot Yankee dryer).

Historically, the use of venting on these applications was limited by a number of variables. In suction pressure roll positions, venting consisted of suction-through holes only. The through-hole diameter is limited by the hole diameter in the shell so the total open area typically ranges from 16 to 19 per cent. Adding blind drilled holes to the suction pressure roll was not often used. In order to fit blind drilled holes in the suction pattern, relatively small and ineffective holes would be required (0.078-in or 0.085-in diameter). Blind drilled holes would also require the felt to take on more moisture. This is not desired when the suction pressure roll is followed by a pressure roll position, or if the felt conditioning system is not capable of handling the additional moisture.

The use of grooves was restricted due to the fact that soft covers will deform under pressure. The groove height is reduced and the walls will bulge inward under pressure. The narrowing of the groove will restrict the flow of water resulting in the remaining void volume becoming ineffective. The narrowing of the grooves also creates the possibility of pinching the felt in the nip. Common industry guidelines only utilized grooves on roll covers harder than 12 P&J. At 40 P&J, studies have shown that the void volume contributed by the grooves is one half of the initial available void volume.

• Improved technology

Advancements in roll cover and press felt technology have opened the door to increase the utilization of venting in tissue applications. Softer polyurethane covers possessing higher modulus materials offer greater abrasion resistance, better hardness stability and stable hysteretic characteristics. These stable physical properties of the polyurethane covers now make it possible to utilize newer venting patterns to allow increased nip dewatering and decreased energy consumption. Slightly harder 20-30 P&J polyurethane covers develop similar nip intensities as 30 to 45 P&J rubber covers.

Advancements in rubber compounds have also generated more opportunity to utilize venting in softer covers. Superior abrasion resistance combined with low hysteretic characteristics allows 30 to 45 P&J rubber covers to run longer. Rubber covers possess greater chemical resistance and stronger bond strength. The softer material offers optimum conformity to the Yankee surface for improved sheet qualities and drying.

The advancements in polyurethane cover materials now make it possible for grooves to withstand the conditions in the suction pressure roll nip. Adding grooves to a suction pressure roll can improve the nip dewatering in the press. The grooves increase the open area and available void volume in the cover. Void volume generated by grooves is also assisted by vacuum since the grooves intersect the suction through holes. Increased nip dewatering will generate both a drier sheet and felt exiting the nip. The drier sheet requires less external energy to completely dry the sheet and the drier felt now can offer additional void volume in the second press (pressure roll nip).

Xerium has greatly improved rubber cover technology in recent years. New rubber covers can also utilize grooves in suction pressure roll applications. With this engineered grooving technology, 'EnerVent', soft rubber covers can also offer increased nip dewatering. The EnerVent grooves are geometrically incapable of closing. These grooves have greater wall stability and are less affected by groove narrowing in the nip. The result is more effective void volume and greater nip dewatering. The soft rubber covers still maintain excellent bonding strength, chemical resistance and conformity to the Yankee surface. Case studies have documented 10 plus per cent increases in production and substantial reduction in energy usage, including 41 per cent reduction in fuel usage to the hood.

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