Designing world speed record felts for high speed packaging paper machines

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Above: The Paper Mill Team and Cristini Group Engineers

In March 2010, in Eisenhüttenstadt, the ProPapier Group started up their PM2, the world's biggest and most performing paper machines for the production of brown grades.

The paper machine is a Metso Optipress™ configuration, with a speed of 1900 m/min, designed specifically for the production of Testliner/Wellenstoff from 60 to 125 g/m2 using 100% recycling. The production capacity is 650,000 tons/year.

Since the start up, 67 fabrics have been installed, showing excellent performance

The press section includes two shoe presses, with a max linear pressure of 1300kN/m. Felt width: 11.00m.

START-UP CLOTHING

In May 2009, Cristini Group was chosen as start-up supplier for both the press and dryer section (see Figure 1, right).

The initial decision was to install endless fabrics on both top positions, and seamed fabrics on bottom.

Since the start up, 67 fabrics have been installed, showing excellent performances and seaming easiness (for the seamed versions).

After this stage it has been decided to run 100% endless fabrics, because of the fabric change efficiency reached by the mill crews.

THE PRESS FABRIC DESIGN

The press fabric design must satisfy extreme production requirement, because of the production speed and size. The water volume to dewater was an important challenge for the felt designers. The specifications forecasted a high dewatering in the first nip (75-80% of the total dewatering), and 20-25% on the second nip.

The water flows where designed as indicated in Figure 2.

Because of the press geometry, the top felts where required to dewater mainly at the nip, while the bottom mainly at the suction boxes.

The designer's choice was then orientated toward felts with mono-mono base, with high flow permeability and easy cleaning, with a caliper able to develop, in combination with the batt layers, high compressibility thus high 'nip dewatering'.

Press fabric compressibility is defined as the ratio in between the compressible part (normally batt and porous structures similar to fibres) and the incompressible part (traditionally the base fabric). If the ratio allows the compressible part to saturate hydraulically saturate also the incompressible one, the press fabric gains the most important characteristics of a 'nip dewatering' design.

To obtain a correct compressibility ratio along the whole fabric life, a key role is played by the non-woven, porous structures like Komprex™, behaving like a fine base fabric, but having very high compression elasticity.

Combining these factors, the designer team was able to create for each position, a press fabric matching perfectly each single application requirement.

A typical of DuraFlex™ design, optimised for each position, is composed by a structure indicated in Figure 3 (overleaf).

By fine tuning the batt layering and type of Komprex™ layer, it has been possible to differentiate the behaviour of the top press fabrics (which require high nip dewatering capacity), from the bottom fabrics, which need to dewater at the suction boxes. This difference in

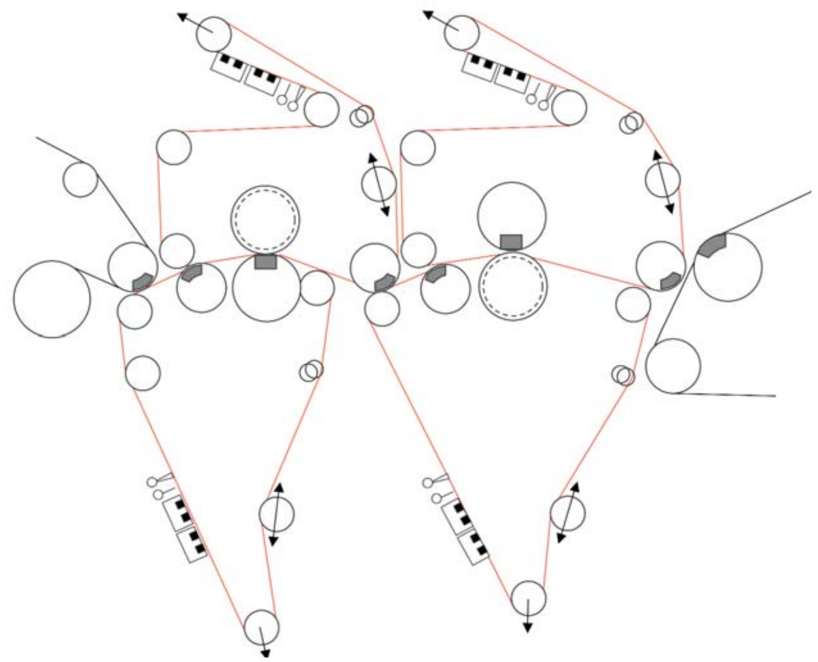

Figure 1. *Press section layout*

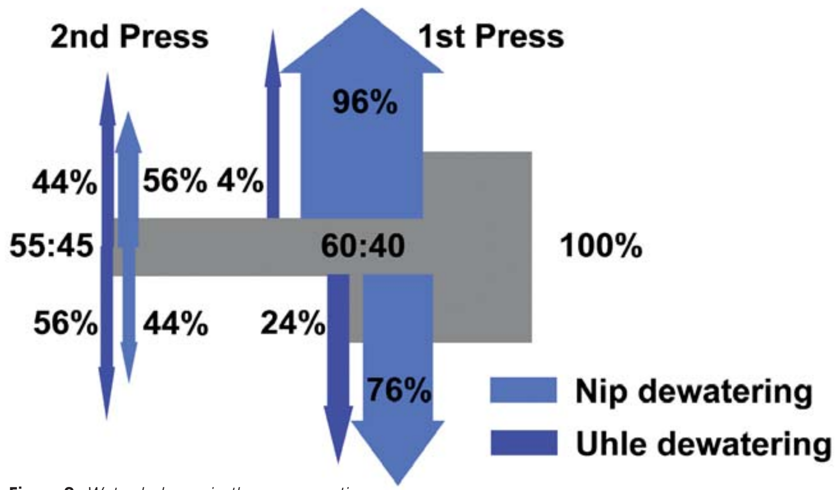

Figure 2. *Water balance in the press section*

felt design takes under consideration the dewatering factors, but especially the machine run ability, which impacts tremendously on its efficiency and productivity.

On the pick-up position it is essential that the fabric surface does not trig 'sheet-stealing' phenomena, with consequent breaks in the size press.

In the bottom position it is capital to obtain a perfect planarity of the paper, not to trig sheet breaks in the second press. The achievement of these results have been obtained with a 'fine tuning' of the fabric structures and porous layers months before the world record speed. Figure 4 shows the void volume gradient of the two concepts. The change in the void volume distribution results into a better efficiency at the nip.

Examining some measurements taken on machine, it is possible to evaluate the dewatering of the various positions, at the moment of the world speed record, on April 14, 2011. The press section, was dewatering, while producing 80gsm, an average of 5800 l/min, an exceptional result.

The dewatering ratio in between the first and second nip was 79% - 21%, in line with the design requirements.

[images] Figure 5 – Dewatering values during the world speed record

Concluding, today's know-how in press fabric design for high speed machines allows a precise prediction of the fabric performance in the different machine conditions.

This important factor permits the production of reliable and repeatable fabrics, which push ahead the limits, reaching higher levels of speed and efficiency.

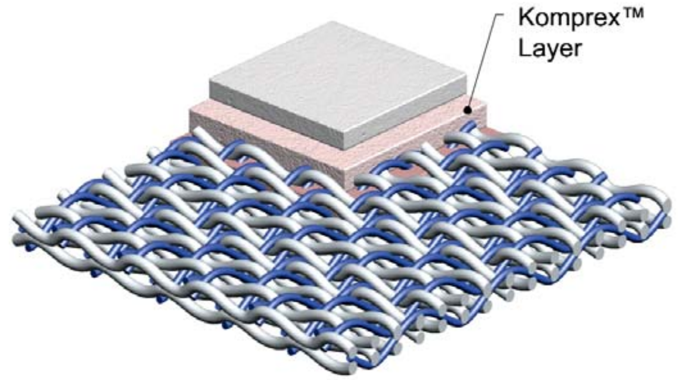

Figure 3. *Structure of a DuraFlex™ press fabric*

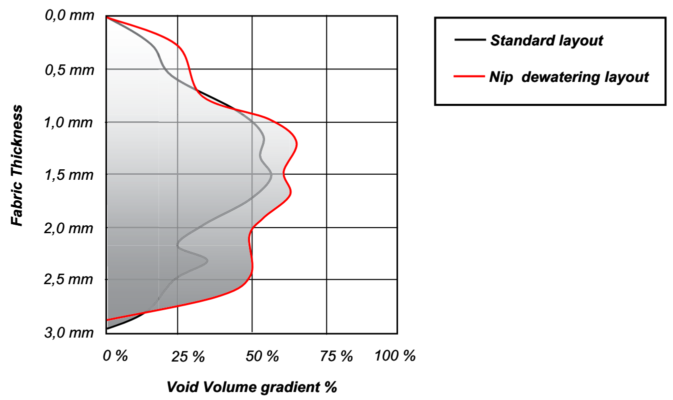

Figure 4. *Dewatering values during the World Speed record*

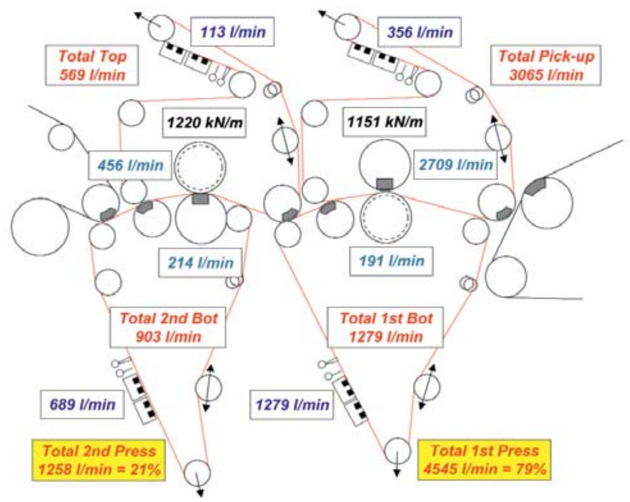

Figure 5. *Dewatering values during the World Speed Record*