

Improving efficiency with Primoselect forming fabric technology

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INTRODUCTION

Up until 2008, the main quality driver for European papermakers was formation, and its improvement. This in turn led manufacturers of paper machine clothing (PMC) to focus upon the development of increasingly finer sheet supporting binder (SSB) forming fabrics at the expense of life. Recent adverse economic conditions have led to a change in priorities; today's papermaker must be able to make paper in the most economic manner possible, and have a forming fabric that is fit for purpose. Given the limitations of traditional SSBs there is a limit on how easily PMC suppliers can match these requirements; the time is therefore ripe for a new approach. Heimbach has taken up this challenge and has introduced a new family of products that eliminate the inherent issues associated with SSB forming fabrics, allowing a fine structure for formation to be maintained whilst providing the opportunity to put some of the life back into the fabric, without increasing the caliper. The brand name for this new family is "Primoselect"; initially, the product was developed for the high-speed graphical market but it is now being expanded to cover the full spectrum of grades, including packaging and tissue.

FORMING FABRIC REQUIREMENTS

Every forming fabric is required to fulfil a number of functions on the paper machine. Thus, the successive development from single and double layers through to SSBs, has been driven by the need for finer paper side surfaces accompanied by equal or, ideally, longer life. While the resulting changes have been extremely

beneficial in terms of paper quality and life potential, the papermaker has had to accept certain limitations. For example, SSBs can be damaged during installation, and in some cases can suffer from "internal abrasion" which was never an issue with 2 or 2½ layers. This phenomenon is becoming increasingly problematic on certain paper grades with increasing filler content over the last few years. As a consequence, reduced life expectancy caused by internal abrasion is tending to become a real problem for both customers and clothing suppliers alike.

The requirements for forming fabric performance continue to be adjusted as the economics of papermaking come under further pressure. The cost of furnish is becoming more expensive while its quality is declining; simultaneously, filler volumes and the cost of power and steam have increased – all of which present tough challenges to the papermaker. With a view to supporting the customer in dealing with these developments, Heimbach's Primoselect gives the customer options to provide a step change towards the target they require, whether it is machine efficiency, energy, dryness or runability.

The Primoselect structure creates a fabric with exceptionally high drainage capacity and ultra-thin caliper. The paperside provides a very fine and low marking sheet-forming surface with high open area, whilst the robust machine side affords dimensional stability and long fabric lifetime. A comparison of Primoselect with a standard SSB forming fabric is the best way to explain how these advantages

are achieved. The SSB typically uses a pair of binding yarns in the CMD direction to tie the paper side surface to the machine side surface. This then creates quite an open plane in the centre of the fabric, increasing the caliper and allowing movement between the layers. With Primoselect, this is all changed: there are no pairs of binding yarns as all yarns can potentially bind the layers, thus eliminating the void and allowing the MD and CMD yarns to be offset. In turn, this reduces the caliper (down to as low as 0.50mm) and locks all yarns in place. These fabrics are then stable and provide an exceptionally high degree of drainage. This is unique in the market and is patent-protected in Europe and other major regions.

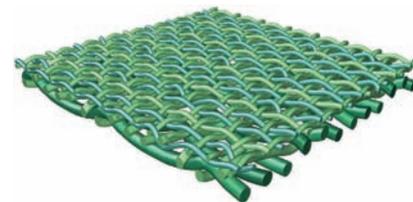


Figure 1. 3 Dimensional Model used for CFD analysis

In the development of Primoselect, modern computational fluid dynamics (CFD) techniques have been used. This technique provides an insight into the drainage characteristics and allows comparison with the existing product line to be made early in the development process, rather than relying on the paper machine telling us how the fabric will dewater. With this tool, a cut can be taken through the wire at any place and the flow variation can be monitored with the aim of creating a completely even and controlled drainage path through the wire.

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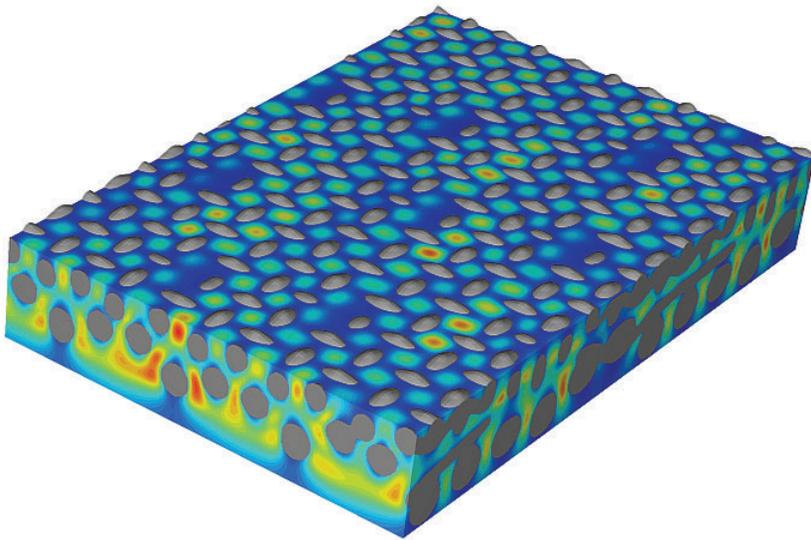


Figure 2. Computer Model of the Flow Velocity Distribution through a Forming Fabric - The colours represent the predicted speed of water flow through the fabric: from dark blue (slow), through light blue / green / yellow, and finally red (fast)

Efficiency:

A few years ago, a fabric with a 30% open area (the percentage of openness on the paper side) was considered to be quite normal. As machines increased in speed, the need for faster drainage pushed the requirement for a more open fabric with higher support characteristics. As Primoselect replaces a pair of binding yarns with just one

yarn, the open area can be raised to above 40%, significantly increasing the to drainage capability of the fabric, whilst the offset placing of the yarns ensures an extremely clean and dry running fabric. We have seen unparalleled cleanliness on high speed gap formers - as illustrated in the photo below - something every wet end operator would certainly be happy to see.



Figure 3. Primoselect high speed gap former cleanliness

Dryness:

With its thin caliper and high dewatering capability, Primoselect can deliver high sheet dryness into the press, contributing to the ever important machine efficiency by reducing the potential for paper breaks. This is especially useful on older machines where any improvement in dryness translates directly into the speed and output of the machine.

Energy:

Whilst considered the norm for a papermaker to run the forming section to provide the driest sheet into the press, this is not always the case. Given today's focus on energy costs, the high drainage afforded by Primoselect can also be used in a different way: By maintaining (rather than improving) dryness, it becomes possible to optimise vacuum levels in the forming section, reduce drive-load and create substantial energy savings. At the same time, wear on the forming fabric is reduced, helping to prolong its life.

Runability:

When thinking about runability we are effectively talking about ensuring the machine makes paper for longer. If it is possible to make an extremely thin product like Primoselect, then it is also possible to substitute slightly larger yarn sizes to provide a higher wear volume on the machine-side of the fabric. If we take a modern, high-speed wide gap former, making graphical paper as an example (where a typical wearing yarn would be 0.25mm), the normal fabric life is 30 to 40 days, with shutdowns planned for once per month. Using the unique Primoselect pattern we are able to use a 0.27mm yarn and provide the ability to extend the life further. You can see from the caliper analysis of the used fabric that the last fabric removed after 30 days

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was less than half worn – potentially enabling the customer to use the fabric through to the next shutdown. This doubling of life is not normal, but an improvement of more than 20% is achievable on many machines.

A reduced number of shutdowns leads to a win-win situation for the customer and fabric supplier.

In another example, from an SC machine where filler levels are high, it is normal to have an SSB style fabric affected by internal abrasion. At its worst, this phenomenon severely reduces the fabric life; at best, it limits the drainage characteristics. Either way, being able to eliminate this is a positive move for any machine operator.

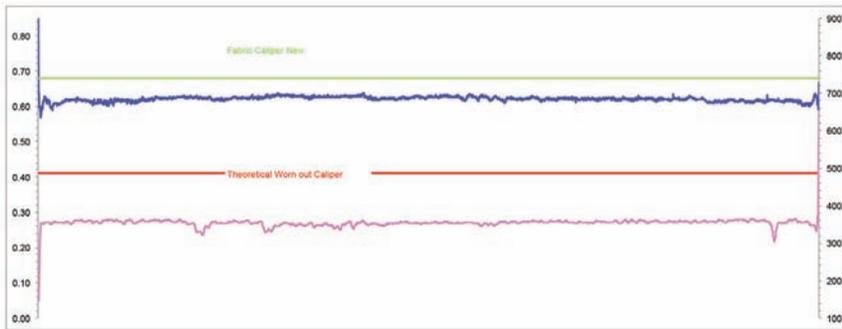


Figure 4. Full width used sample analysis - caliper (blue, mm) and air permeability (magenta, cfm)

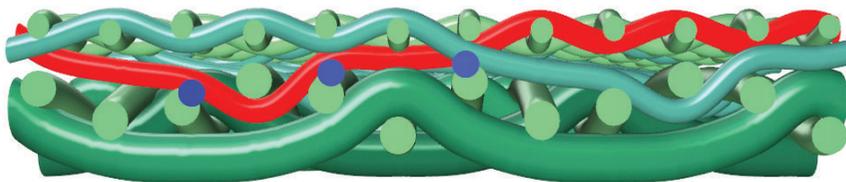


Figure 5. Typical SSB in high filler applications



Figure 6. SSB with serious internal abrasion



Figure 7. Primoselect on SC machine after a normal run – binder yarn is not abraded

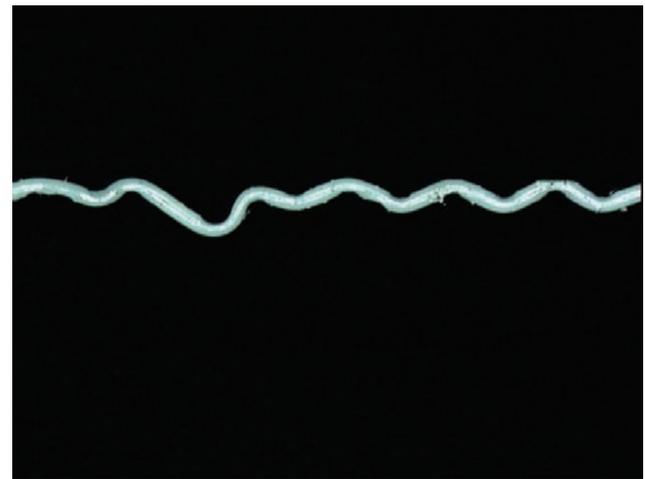


Figure 8. Primoselect - No internal abrasion using smaller diameters on high speed SC former where fabrics typically have this problem

SUMMARY

Since then, the concept of Primoselect has been applied across most graphical paper grades and major graphical high speed machine concepts. Heimbach have seen benefits in SC, newsprint and fine paper, and are now extending the concept to the packaging and tissue markets... watch this space! Having first fully understood the requirement, Heimbach then works together with the customer to select the best design that can fulfil their requirement.

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