New Press Fabric Concept Improves Surface Uniformity, Sheet Dryness

With a surface made of fine batt fiber layered with engineered resin components, new fabric can be an effective tool for improving sheet properties, wear resistance.

— By Eric Arsenault, John Fox, and Hans Ragvald

The surface characteristics of a press fabric are influenced by three main components: batt fiber size, the fiber locking process, and the base cloth components used. By far the greatest impact comes from the batt fiber size. For graphic paper applications, batt fiber size will typically be in the range of 6.7 dtex (fine) to 44 dtex (coarse).

In general, the coarser fibers are used in the intermediate structure while the finer fibers are used on the surface to be in contact with the sheet. The finer fibers will have the greatest influence for providing a high "pressing uniformity" for the press fabric.

To better understand and quantify press fabric surface uniformity, an evaluation method has been developed by Voith Fabrics. The testing method is based on a numerical analysis of compressed contact points of the press fabric. The two values of importance are the ASN (average size number) and the FIN (fiber indentation number).

The finer fibers offer great potential for providing a high uniformity, but they have a negative influence on the wear rate and porosity loss of a press fabric.

Test Results

Figure 1 shows the ASN for four press fabrics having different surface properties—3.3 dtex, 5 dtex, 11 dtex, and 17 dtex.

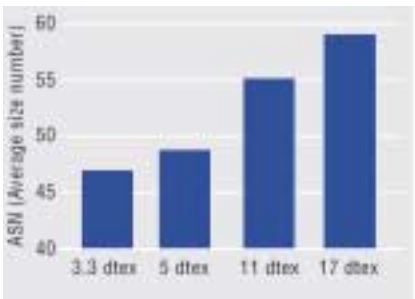


Figure 1. ASN for press fabrics with different surface properties

Figures 2 and 3 compare ASN and FIN values for a "standard" press fabric (having a fine 6.7 dtex surface) with Voith Fabrics' PrintFlex P. The comparisons are made for both new and used fabrics.

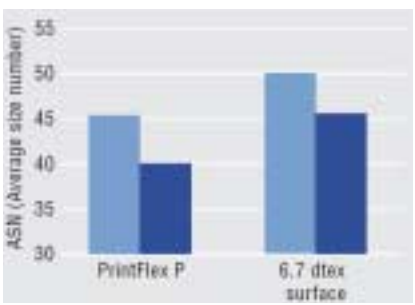


Figure 2: ASN index comparison for press fabrics having different surface properties (light blue new and dark blue after running)

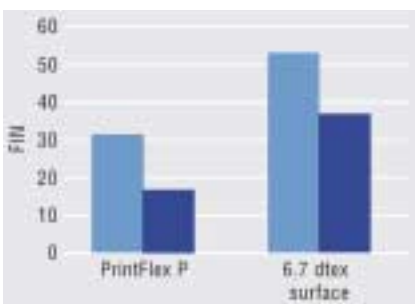


Figure 3: FIN index comparison for press fabrics having different surface properties (light blue new and dark blue after running)

PrintFlex P forms the second stage of Voith Fabrics "four-stage platform" for pressing. It is comprised of a surface made of fine batt fiber layered with engineered resin components. The fabric provides an extremely high degree of pressing uniformity, with excellent wear resistance.

As can be see in the figures above, PrintFlex P has an ASN number almost 10% lower than the "standard" fabric. The FIN index, shows a 40%-plus improvement over the standard fabric surface.

Analysis of the fabric permeabilities showed that PrintFlex P retained more than 33% of its original permeability after use, compared with the standard design. It is important to also note that, despite application of the engineered resin components, the PrintFlex P design was manufactured to the same level of starting permeability as the standard design.

Mechanical abrasion tests have also demonstrated the high wear resistant properties of PrintFlex P. Again, compared with the standard design, the fabric gave almost 10% less weight loss. The benefits of this can be seen from the case study shown in Figure 9.

Dryness/Rewet

Initial evaluations of PrintFlex P were carried out on the VPM4 pilot machine in Heidenheim, Germany,

to investigate the influence of fabric surface properties on sheet dryness and sheet quality. An SC magazine furnish was used for the tests. Three different sets of press fabrics having different surface properties were tested—a "fine" (3.3 dtex), "coarse" (17 dtex), and PrintFlex P.

Dryness values were taken after the second press (see Figure 4). PrintFlex P provided the highest dryness values of more than 55%.

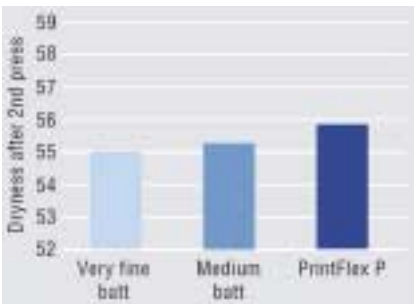


Figure 4. After press dryness results for different batt structures—VPM4

Another important aspect to consider is the permeability of the press fabrics. The PrintFlex P fabric had a permeability of 58 cfm, the "medium batt" fabric had 63 cfm, while the "very fine" fabric had only 18 cfm (see Figure 5).

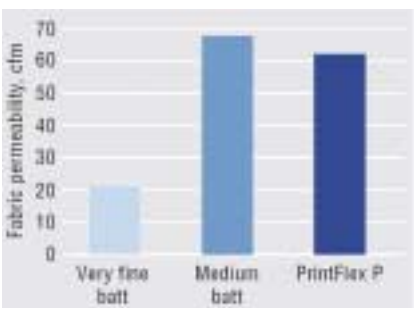


Figure 5. Permeability of press fabrics, New—VPM4

Sheet Quality

Depending on the application, the surface characteristics of a press fabric can have a variable degree of influence on paper properties. In shoe press systems, a long-nip residence time will positively impact dewatering dynamics, but can also generate some negative sheet quality issues. The effect of the press fabric surface properties on paper quality has gained a lot of attention in recent years, especially with single- and tandem-shoe press configurations.

It is also important to investigate the influence of the fabric properties all the way to the end user. Finished paper quality issues, such as missing dots, can often be linked to the surface characteristics of the press fabrics used.

During the pilot machine trials, base and finished sheet properties were evaluated, showing that PrintFlex P gave improved PPS results for both the base and finished paper (see Figures 6 and 7). Results also confirmed the clear correlation between press fabric surface characteristics and paper smoothness.

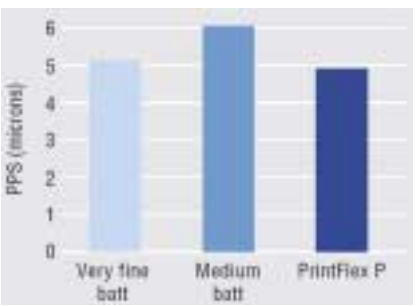


Figure 6. Base paper PPS roughness results—VPM4.

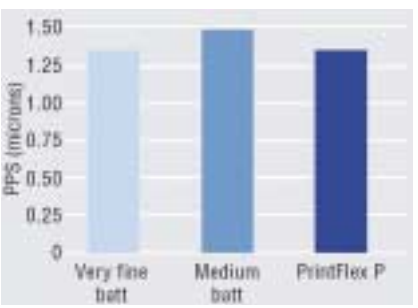


Figure 7. SC Paper PPS roughness results—VPM4

The paper was then submitted for missing dots evaluation (see Figure 8). As expected, the "medium batt" fabric had the highest area of missing dots. PrintFlex P gave an improvement of more than 30% against this, with measurable benefits also seen against the "very fine" fabric.

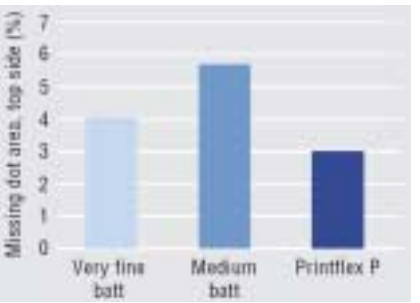


Figure 8. Missing dots (%)—VPM4

Figure 9

Figure 10

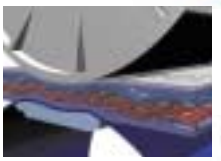


Figure 11

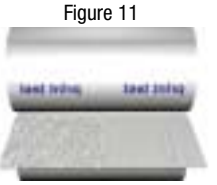
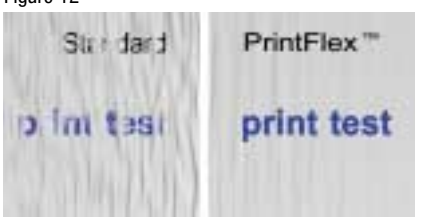


Figure 12



Figures 9-12. From a comparison of standard press fabrics and PrintFlex P (Figure 9), results taken from paper made in commercial trials has confirmed that a reduced fiber impression within the press nip (Figure 10), contributes directly to a smoother sheet surface profile (Figure 11) and a significant improvement in measured printability (Figure 12).

Figure 13 depicts a press fabric with combined Vector and PrintFlex P technologies. ■

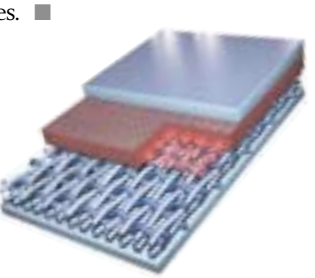


Figure 13. A 3D-rendered drawing of a press fabric incorporating both Vector and PrintFlex P technology

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