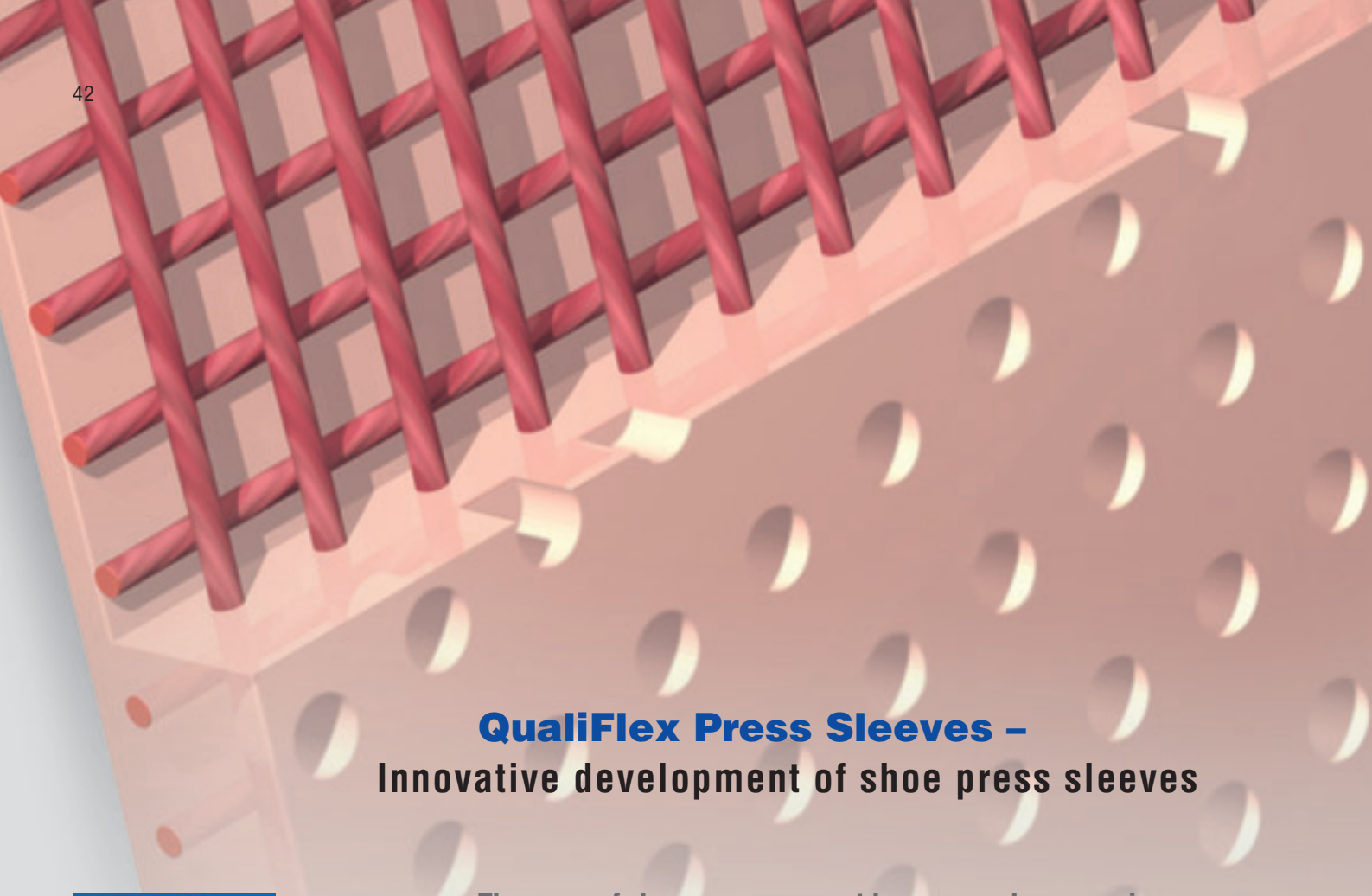


QualiFlex Press Sleeves –
Innovative development of shoe press sleeves

Uwe Matuschczyk

Paper Machines Graphic
uwe.matuschczyk@voith.com

Herbert Reil

Paper Machines Graphic
herbert.reil@voith.com

The users of shoe presses expect long press sleeve service life, enabling planned sleeve changes to be made at pre-determined times. In addition, papermakers are interested in obtaining constant results throughout the service life period. These expectations have been met by Voith's innovative developments.

Over the past few years, the development of the QualiFlex Press sleeve has been significantly influenced by the development of the polyurethane matrix material. The goal was to further increase the service life of the sleeve by reducing the tendency to crack formation. This was accompanied by the improvement in mechanical wear and chemical resistance.

The goal was to achieve, above all, the technological properties such as a high dryness and uniform moisture profiles after the press and this over as long a sleeve service life as possible. This required to find materials with low abrasion values and simultaneously high stability of the groove geometry. Added to this was an optimization of the necessary void volume and the open area.

Below, a comparison is made between three material grades. The QualiFlex Q is our standard type, as it was originally introduced in the market and ultimately is also the reason for the success of QualiFlex Press sleeves. Above all in blind-drilled version, the QualiFlex Q still renders reliable service today in the appropriate application areas. The QualiFlex QX consists of a newly developed polyurethane grade, which has meanwhile proven popular for grooved press sleeves due to its wear strength. With the QualiFlex QV a further development is available which is currently being tried out in practice.

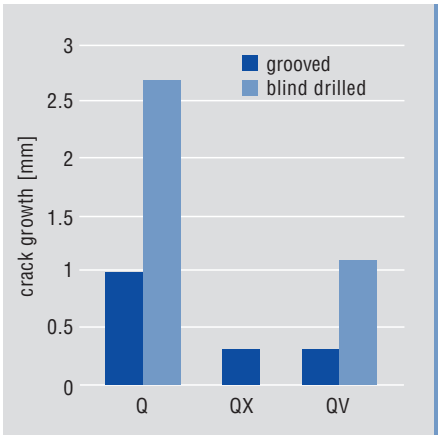
In the laboratory the material properties of the individual PUR grades can be quantified by a series of comparative analyses. Material samples with a small cut

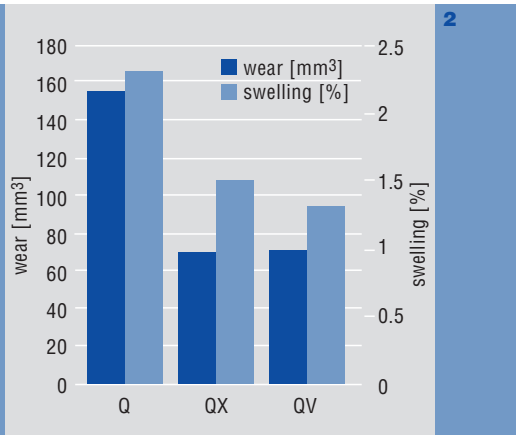
Fig. 1: *Crack growth of different QualiFlex material grades in mm after 1 Million bending changes. QX and QV show 60% - 70% lower crack growth compared to standard Q.*

Fig. 2: *Improved wear resistance through new QualiFlex material grades. QX and QV have a 50% lower abrasion compared to standard Q and 35% less swelling.*

Fig. 3: *Comparison of different materials new/ old on an SC paper machine.*

are tested for bending-change strength in more than one million cycles at a frequency of 7.5 Hz. After that, the crack growth is measured. The results are shown in **Fig. 1**. The difference between the further developed QX and QV sleeves and the standard product Q can clearly be seen. Crack growth is 60 to 70 % less. The QualiFlex QX is available only in a grooved version out of production reasons. The QualiFlex QV however will also be delivered blind drilled.





A further confirmation of the excellent material properties of the new developments is provided by the standardized material tests of abrasion and swelling, see **Fig. 2**. Both the QualiFlex QX and also the QualiFlex QV display a 50 % lower abrasion with at the same time 35 % reduced swelling in the water. This leads to improved chemical resistance accompanied by a higher resistance to wear.

These insights from the development work were in the meantime consequently implemented in results in the marketplace. The comparison of returned samples of press sleeves that have run proves the wear resistance of the QualiFlex in an impressive way. All three representations in **Fig. 3** show the identical groove geometry F12N with 34 % open area and 260 ml/m² void volume.

Fig. 4 shows how, through the use of a QualiFlex Q sleeve in a SC paper machine, the high dryness could be maintained throughout the total sleeve service life. It is quite apparent that the QualiFlex QX ensured constant dewatering over several periods of felt life. At the same time, the QualiFlex Press sleeves constantly reached twice the life of all competitors on this reference machine, resulting in appreciable economic advantages for the producer through reduced shutdown costs.

The influence of a stable groove geometry on the dryness in a paper machine is shown in **Fig. 5**. The dryness with the corresponding, remaining void volumes of the two press sleeves were recorded at the time of the installation and removal. The analysis of the existing data on this paper machine revealed that, due to the extremely low wear of QualiFlex over the entire service life of the press sleeve, a constantly high void volume is available.

F12N Standard PUR
16 Mio. nip passes

F12N
new sleeve

F12N QX
48 Mio. nip passes

3

Fig. 4: *Comparison of dewatering rates, competition – QualiFlex. NipcoFlex – EcoFlow dates.*

Fig. 5: *Influence of the void volume on dryness.*
- *Volume at installation*
- *Volume at removal*
- *Dryness at installation*
- *Dryness at removal*

Fig. 6: *Comparison of groove geometry under load.*

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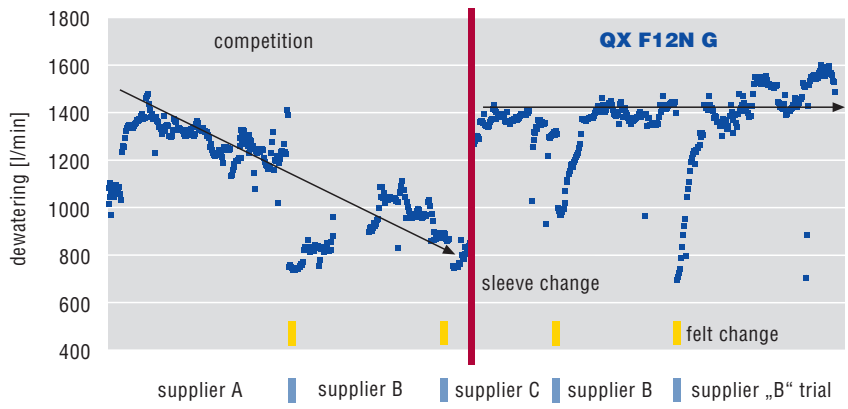

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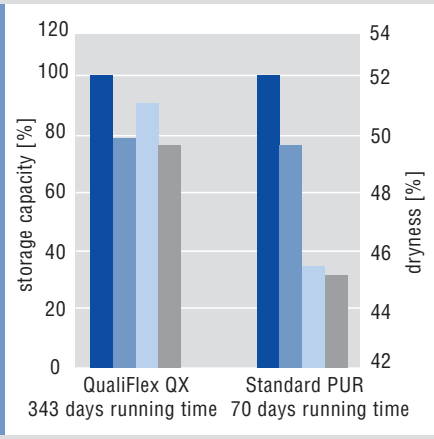

In comparison with press sleeves made of standard PUR, a distinct loss of dryness can be avoided.

It is of course a prerequisite here that the existing void volume in the nip exists even under load. On one hand the material used plays an essential role and on the other hand the selection of a groove geometry which, under load, prevents or at least significantly reduces a collapse of the groove. For this purpose, sleeve samples made of different materials were tested under well-defined conditions in the laboratory. Typical maximum pressures (6 MPa for woodfree grades and 8 MPa for groundwood grades and packaging papers) were simulated and the results compared by image-analysis methods. Fig. 6 shows the resistance of QualiFlex QX, which leads to a 15 % higher open area and 25 % higher residual volume at a maximum pressure of 8 MPa as compared to standard PUR.

The result of these unique sleeve properties are improved CD moisture profiles and constantly high drynesses, which are reflected in higher production rates and lower energy consumption.

Therefore, the QualiFlex will continue to be the most reliable and economical product in the marketplace in the future.

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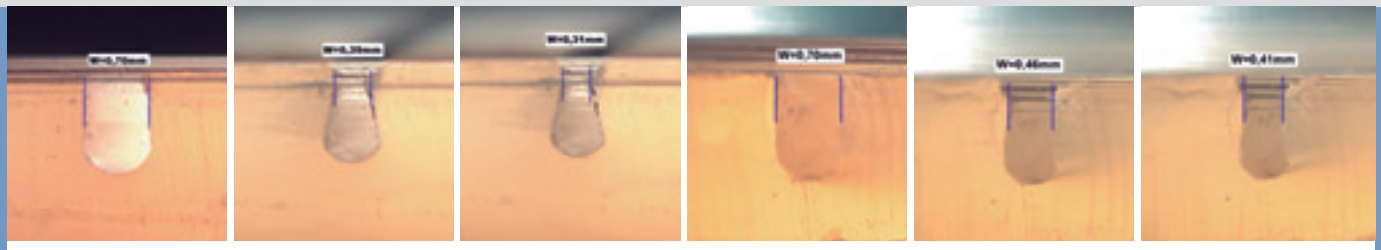

Standard PUR P08M
1.0 mm deep
0 MPa linear load
storage capacity:
275 cm^3/m^2

6 MPa linear load
storage capacity:
184 cm^3/m^2

8 MPa linear load
storage capacity:
165 cm^3/m^2

QX P08M
1.0 mm deep
0 MPa linear load
storage capacity:
275 cm^3/m^2

6 MPa linear load
storage capacity:
210 cm^3/m^2

8 MPa linear load
storage capacity:
192 cm^3/m^2