

BoostDryer – New higher-performance drying technology for improved paper quality



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Maximizing production is the driving force in today's paper industry. In this connection the dryer section is often a bottleneck for rebuilds due to space restrictions, so that more efficient drying technology is indispensable. Apart from increasing production, optimizing product quality is also a challenge – both with regard to sheet strength and surface finish.

This article presents a new drying technology that meets production maximization requirements both quantitatively and qualitatively. It is ideally suitable for board and packaging paper production, and combines two processes – condensation and press drying – by incorporating a drying cylinder and a pressure hood. The positive effects of press drying have already been demonstrated by a number of studies, and are now proven by this new drying technology.

Apart from explaining the new process, this article also shows how it can be incorporated in the dryer section.

Process

Drying takes place on a specially designed cylinder, whose outer periphery is pressurized by water that also serves for cooling. The water temperature is between 60 and 90 °C.

Water pressure, ranging from 0.5 to 5 bar, is generated in a hood that encloses three quarters of the drying cylinder periphery.

The paper runs directly on the drying cylinder, which is heated by saturated steam at a pressure of 6-12 bar above atmosphere. Contacting the paper on the outside are a fine wire, a coarse mesh wire and a steel belt. The belt, fabrics and paper are held against the heated cylinder surface by water pressure. The same water cools the fabrics and the belt.

Water vapour from the paper condenses in the cooled mesh of the wires and on the surface of the steel belt. The condensate and the very small amount of water vapour remaining in the mesh are transported out of the pressure hood with the fabrics. After leaving the hood, the condensate evaporates.

The BoostDryer process attains far higher drying rates than conventional systems, thanks to the pressure hood, which greatly improves the heat transfer coefficient due to better paper contact with the cylinder surface. Another reason is that the special cylinder design enables more efficient heat flow.

As a further benefit of this drying process, the paper strength is improved by com-

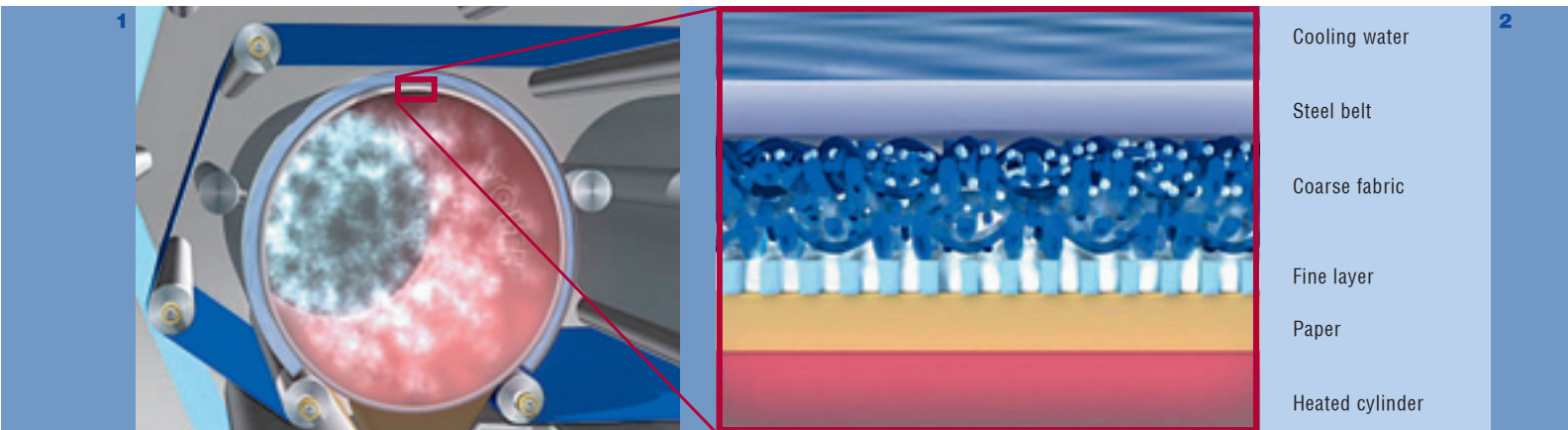
Fig. 1: BoostDryer layout.

Fig. 2: The BoostDryer process.

Fig. 3: Comparison of various drying technologies.

Fig. 4: Static prototype test results.

- Machine dried
- BoostDryer laboratory unit



pression due to pressurizing. By softening the hemicelluloses and lignin, fiber bonding is also improved.

The parameters of the BoostDryer process lie between those of impulse drying and conventional cylinder drying. This means that drying is more gentle than with impulse drying. Fig. 3 compares the surface temperatures of various drying technologies.

With regard to pressure, the contact pressure between the paper and the heated surfaces is no more than 0.07 bar for conventional cylinder dryers, as against 0.5-5.0 bar at the BoostDryer.

The necessary dwell time for the required dryness, in other words the total contact time between the paper and the heated surfaces, is attained in the BoostDryer with only 6-8 dryer cylinders.

Static test results

BoostDryer process simulation trials were first carried out using a static prototype. Paper samples (corrugating medium, 120 g/m²) were laid on a heated plate, and a fine wire, coarse-mesh wire and impermeable belt were placed on top of the sample. The entire package was pressed against the heated plate by a second plate.

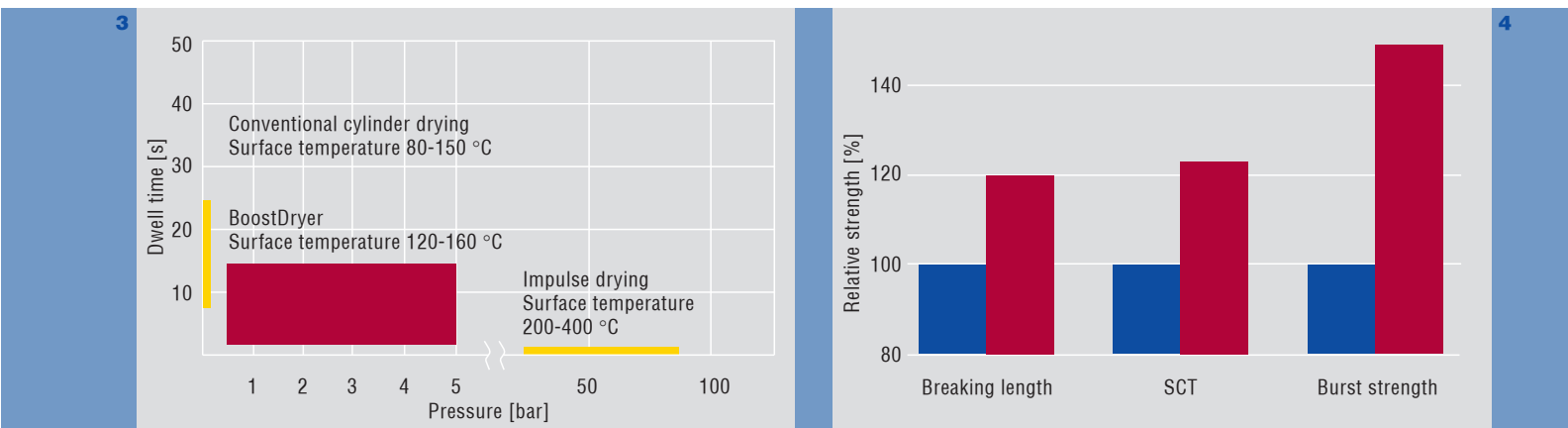


Fig. 5: BoostDryer prototype.

Fig. 6: BoostDryer prototype drying rates.

■ Conventional (Tappi)

■ Latest BoostDryer results (April 2005)

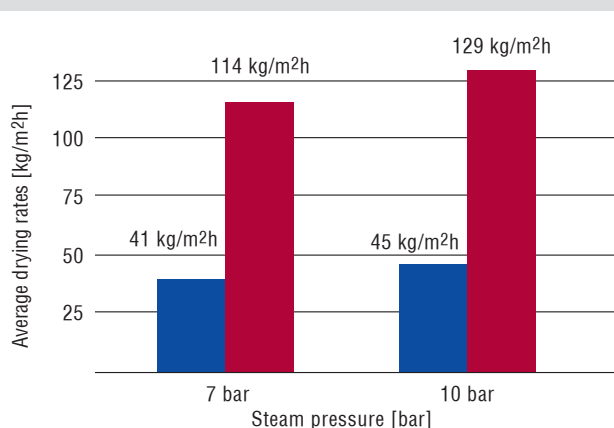


Fig. 4 compares test results on conventionally dried paper samples with those using the BoostDryer process. The breaking length increases by 20%, SCT by 23% and burst strength by as much as 49%.

In view of these promising results, Voith developed a dynamic prototype to evaluate the BoostDryer process during continuous operation.

Dynamic trials

The first prototype (**Fig. 5**) was installed after the press section in the Voith VPM 5 paper machine test facility. An infra-red dryer was also installed, in order to run tests at different ingoing dryness.

Significantly higher drying rates were attained than with conventional drying (**Fig. 6**). In order to compare drying

rates, values are based on the contact surface size.

The results with testliner show an average drying rate of 114 kg/m²h at a steam pressure of 7 bar, and 129 kg/m²h at a steam pressure of 10 bar.

The test parameters were varied as follows:

Basis weight	90-260 g/m ²
Steam pressure	4-10 bar
Hood pressure	0.5-3 bar

Tests were also done with various dwell times, different kind of fabrics and different freeness. The results were astonishing – drying rates of 100-150 kg/m²h at all settings. In other words, the process is not only stable, but also at a very high level. In fact, drying rates lower than 100 kg/m²h hardly seem possible!

Strength characteristics also improved, mainly because of sheet compression due

to the hood pressure, and also the dwell time. The highest strength was attained with complete BoostDryer application after the press section.

The surface temperature also has an influence on sheet strength. Moreover, the sheet side in contact with the cylinder surface is smoothed. The results are similar to those with a Yankee cylinder.

Voith is currently investigating these results in more detail by carrying out extensive trials, prior to a pilot installation in a paper mill.

Future prospects for the BoostDryer

Figs. 7-9 show BoostDryer application possibilities in packaging paper machines according to the current state of technology. Thanks to the high drying rates, a

single BoostDryer unit comprising three cylinders with a diameter of 3 m can replace two conventional dryer groups. This reduces the length of the dry section from 97 m to 87 m.

Voith envisages not only using the BoostDryer for drying alone, but also developing this process for other purposes as well. With adequate strength improvement, it would, for example, be possible to use the BoostDryer instead of a size press. Furthermore, the surface smoothing effect of the BoostDryer may even eliminate the need for calendering.

Due to these benefits, a good deal of the afterdryer section may no longer be required, thereby reducing the overall length of the dryer section to 45 m.

Advantages of the BoostDryer process

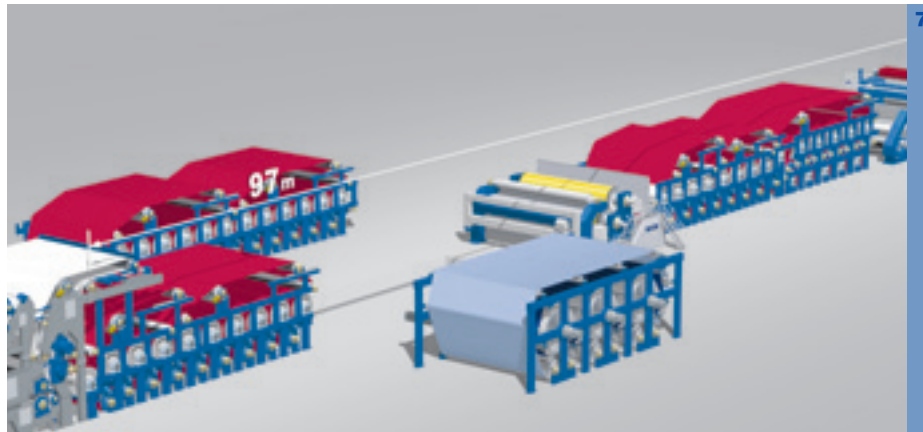
The BoostDryer process enables extremely high drying rates. This reduces space requirements for new machinery, or allows substantial production increases for rebuilds with limited available space.

The paper strength is increased thanks to compression under the hood, and the sheet side contacting the cylinder surface is smoothed. The heating medium is steam, available at low cost in all paper mills.

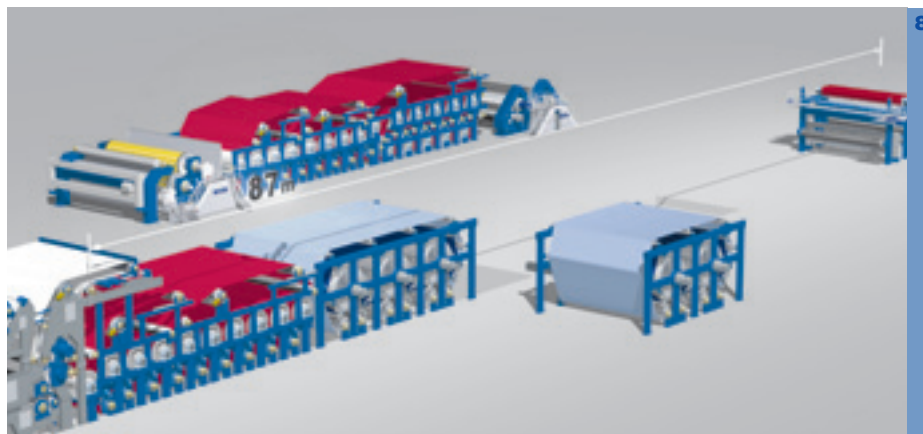
Fig. 7: Replacement of two dryer groups by one BoostDryer unit.

Fig. 8: Given adequate strength and smoothness gain, possible elimination of size press and calender?

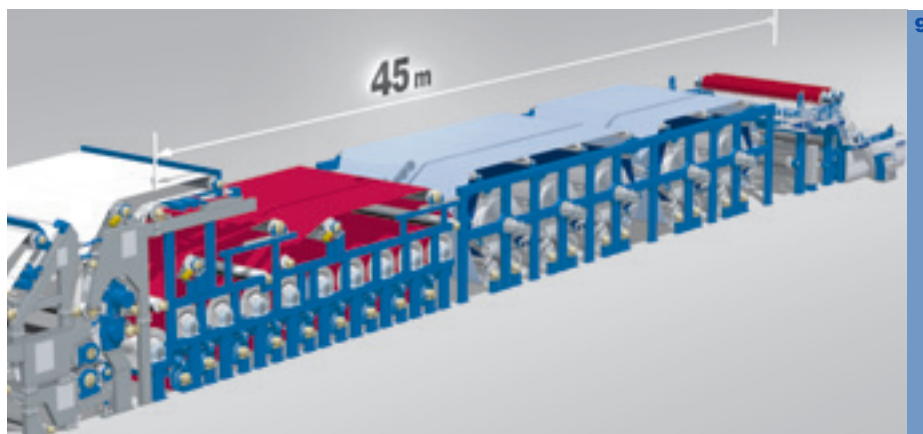
Fig. 9: Significant possible reduction of machine length.



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