Water management in the press section—Part II

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Most presses operate under saturated nip conditions with felt moisture content closely related to press loading and suction felt dewatering used primarily as a cleaning device. Under these conditions, the cross-directional felt moisture profile is often assumed to be the direct result of the pressure profile in the previous nip, higher moisture levels corresponding to lower pressures. This should always be confirmed by a secondary indicator as the felt moisture profile is also influenced by such other factors as the uniformity of showering, suction dewatering, incoming sheet moisture, entering basis weight, rewetting from roll surface voids, and so forth. In fact, an unsaturated previous nip can reverse the relationship between specific nip pressure and felt moisture content with higher nip pressures producing wetter areas in the felt.

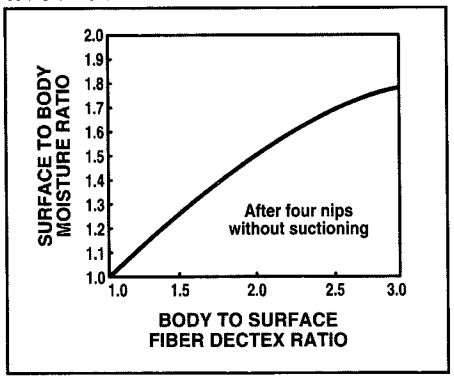
Pickup and blowing

With the exception of some tissue machines, most modern press sections use suction to transfer the sheet from the forming fabric to the pickup felt. However, following the transfer, most high-speed machines depend on surface tension to hold the sheet to the pickup felt. This requires a certain minimum felt moisture content that is a function of the felt surface capillary size. The finer the felt surface, the less felt water is needed for adequate sheet adhesion. Blowing in free-standing presses is controlled by the same mechanism requiring a certain minimum felt moisture content depending on felt surface fineness, press geometry, and other factors. Most blowing-prone positions employ an inside suction turning roll or box, usually at a low-vacuum level of 3–4-in. Hg (10–13.5 kPa). The function of the blow box is similar to that of the suction pickup roll. They are both there to initiate a close sheet-to-felt contact, later to be maintained by a thin layer of interface water. Should this film of water be disturbed, such as by excessive blowbox vacuum, blowing will increase in intensity. There is an optimum blowbox vacuum for each position and felt design at any point in the age or surface condition of the felt.

Felt design

Felt stratification can reduce the amount of felt water needed by making use of capillary forces to hold a high concentration of felt water in the sheet-contacting surface layer. **Figure 1** shows the results of experimentation with batt stratification to produce a moisture gradient in the cross-section of a press felt. In this case, a felt body-to-surface decitex ratio of 2:5 produced a felt surface moisture content

1. Felt moisture ratio



1.65 times that of the body of the felt. These results indicate felt structure to be highly influential in determining the critical moisture level for a given position. For that reason, it is advisable to freeze felt design when setting standards of performance in the press section. Conversely, felt design should be freed when a change in press performance is desired.

The control of felt moisture content is of particular importance in double-felted nips where no suction is available to ensure proper sheet transfer. Press geometry, felt moisture, and relative felt capillaries offer the only means of ensuring good runnability.

Excessive moisture

While running with felts of insufficient moisture content tends to produce runnability problems, excessive felt moisture levels are likely to have an impact on sheet quality. Most shell, shadow, or groove-marking problems are related to excessive felt moisture in the nip. In addition, excessive felt moisture can cause sheet crushing, wet-end breaks, and excessive rewetting as well as press vibration. Again, what is excessive on any given position is felt-design-related and the limits of safety should be established accordingly.

In summary, felt moisture content has a significant influence on press performance and therefore it should be carefully controlled. The optimum operating range is related to paper grade, press section, and felt design. Water-balance studies offer an approach to water management but their weakness of usually unreliable shower volumes should be remembered. For the greatest flexibility in felt design and press section operation, the press nip should be used for sheet dewatering while felt dewatering should be done primarily at the suction box. This requires adequate suction dewatering capacity and multilayer felts of good wear and compaction resistance. TJ

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