

Slotted approach flow screening

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Traditionally, the approach flow screen has been used as a protection device for the headbox and paper machine. However, in order to optimize paper machine operation and to accommodate the increasing usage of recycled fiber, the approach flow screen will play a more important role in eliminating contaminants.

The standard setup has been to use a perforated basket in this position. Current trends show that a slotted approach flow screen works well for the new role and can be more beneficial than a perforated one. Benefits include cleaner pulp, fewer breaks, better formation, and better protection of headbox and paper machine.

Benefits

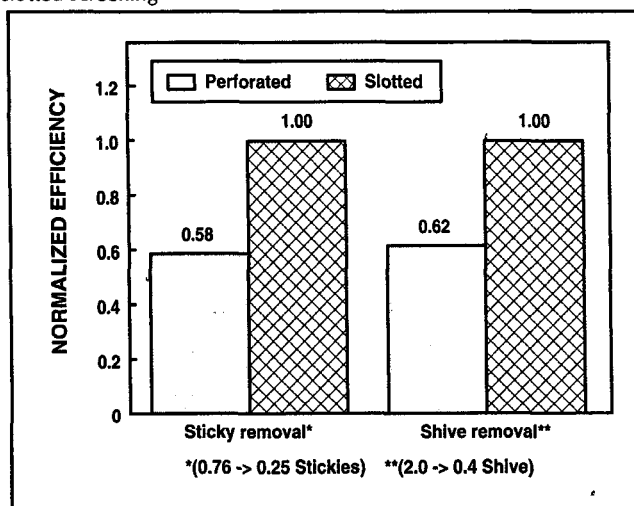
Traditionally, the aperture used in a perforated basket in the approach flow position is between 1.2 mm and 3.0 mm in diameter. In contrast, the aperture used in a slotted basket in an approach flow screen usually ranges from 0.20 mm to 0.50 mm in width. Results of direct comparison (Fig. 1) show that removal efficiency of stickies and shives is 58% for the perforated screen and 62% for the slotted screen.^{1,2}

Similar study on removal of fiber bundles indicates that a 0.25 mm slotted screen can remove 95–98% of fiber bundles from the reject flow of a 1.83-mm perforated screen. These comparisons demonstrate that the use of a slotted approach flow screen will provide cleaner pulp to the paper machine than will a perforated one.

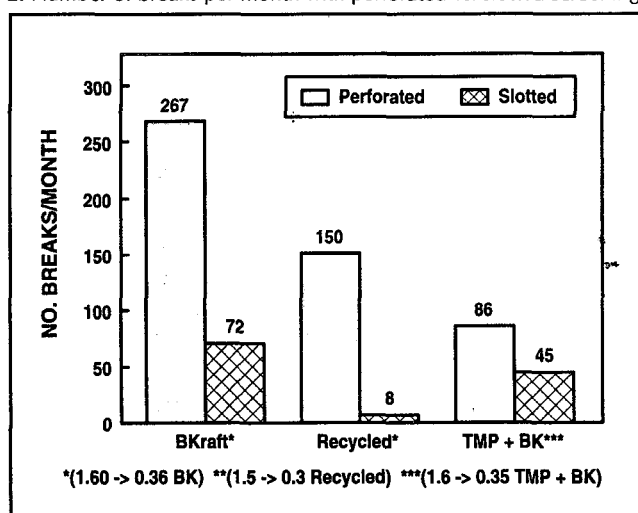
As a result of cleaner pulp on the paper machine, breaks caused by “stress concentration spots” or “weak spots” because of the presence of shives, stickies, or other contaminants, will be reduced. Some results collected from the field are shown in Fig. 2 for different applications.

Because the slotted approach flow screen has better floc removal efficiency, the pulp flow to the headbox will be better dispersed and in a more homogeneous state. Therefore, sheet formation will be better as a result.

1. Normalized removal efficiency comparison between perforated and slotted screening



2. Number of breaks per month with perforated vs. slotted screening



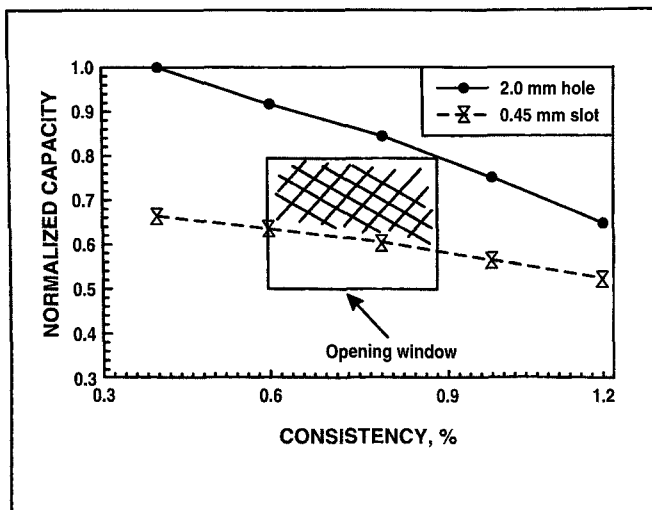
¹Dulude, B., “Improved TMP stock screening at Bowater Mersey,” presented at the 1993 CPPA Spring Meeting.

²Yu, C. J., Internal report—SPC startup, August 1993.

Concerns

No matter what kind of screen is used, paper machine production must be satisfied. In other words, the throughput of an approach flow screen or screens must be high enough to satisfy

3. Normalized capacity perforated vs. slotted (same-size screen)

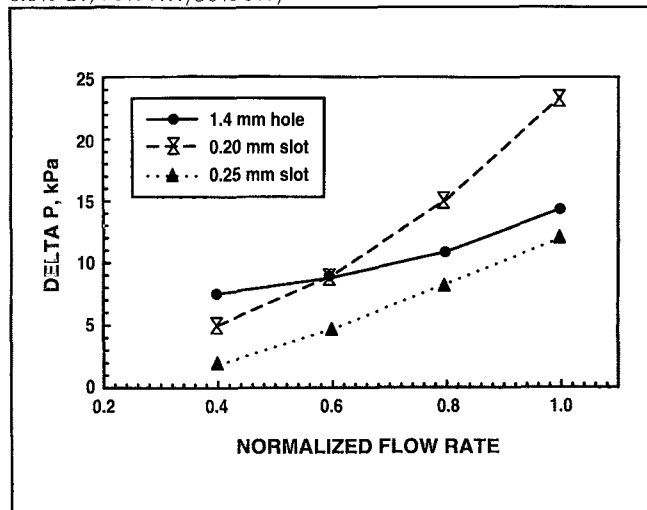


the need of a given paper machine. On the other hand, any downtime will cause loss of production; thus, the runnability of an approach flow screen is also very important. Therefore, any modifications to an approach flow system, capacity, and runnability must be carefully evaluated. In general, for a given size of screen, the normalized capacity (i.e., capacity divided by the capacity of a 2.0-mm perforated basket) versus consistency curves are shown in Fig. 3. It is clear that within the consistency range of 0.6–0.9%, capacity of a 0.45-mm slotted basket is about 30% lower than that of a 2.0-mm perforated basket. If a 0.45-mm slotted basket was used, it will not be able to provide enough flow to satisfy the paper machine when the paper machine is operated in the cross-hatched area. Thus, a bigger screen is needed.

The selection of the slot width is strongly dependent upon the final quality expected. The higher the quality expectation, the smaller the slot width will be. The selection is also dependent upon the furnishes used. Typically, the width of a slot is in the range of 0.2–0.5 mm. No matter what the slot width is, keep in mind that the new approach flow screen must have the capacity to provide the needed flow rate.

In general, the slotted and perforated screens respond differently to changes of operating parameters such as flow and consistency. This is shown in Figs. 3 and 4. Therefore, when changing a perforated approach flow screen to a slotted one, it

4. Normalized capacity vs. Delta P perforated vs. slotted (same screen, 0.6% CY, 70% HW/30% SW)



is very important to understand the possible process parameter's variation (e.g., grade change, furnish change, chemical usage change, etc.) and to select a slotted approach flow screen accordingly.

As mentioned before, because of the reduction in open area of a basket, sometimes a larger screen or more screens are needed to provide the throughput needed for a given paper machine. Therefore, system design (e.g., parallel screening), piping (e.g., size of pipe, angle of piping), reject handling, and pulsation³ and so forth, should be all taken into consideration.

Conclusion

Slotted approach flow screens provide cleaner pulp. As a result, the number of breaks drop dramatically. As the number of breaks decrease, production rates increase—and so do profits. Nonetheless, some important factors such as capacity, runnability, and pulsation should be considered when a perforated approach flow screen is replaced by a slotted one, so the benefit can be assured.

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³Yu, C. J., Silveri, L., and Crossley, B. R., 1993 *TAPPI Engineering Conference Proceedings*, TAPPI PRESS, Atlanta, p. 439.