

New techniques in liner and fluting production



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Stock Preparation

Higher product quality demands on the one hand and lower furnish qualities on the other hand require specialist fine tuning of the stock preparation sub-systems pulping, high consistency cleaning, screening and process water management into a more efficient overall system concept.

Market developments for packaging grades over the past few years have been aimed at cost savings, basis weight reduction and quality enhancement. With new production techniques for these grades, there is a growing demand for packaging grades with lower basis weights. For example, the basis weight of fluting has dropped in recent years from 130-140 g/m² to 100-115 g/m². In future, this trend will continue to well below 90 g/m², as shown by production lines currently under construction. The only way of compensating for the associated loss in production tonnage is to increase paper machine speeds. Here we should

remember that the speeds of some of the paper machines recently ordered are well over 1000 m/min, even up to 1500 m/min.

With the new technologies for fluting production and even higher paper machine speeds expected in the future, the demands on stock preparation systems such as product quality and the reduction in specific water consumption and additive costs also need to be increased to ensure reliable paper machine operation.

By selecting appropriate stock preparation system modules – such as pulping, screening and thickening – the necessary high-grade stock quality can be ensured. Another module important for high product quality is the water, sludge and rejects (WSR) system.

State of technology today

Pulping

The pulping system of a modern stock preparation line for packaging grades

Fig. 1: TwinPulp LC pulping system – higher pulping capacity

Features:

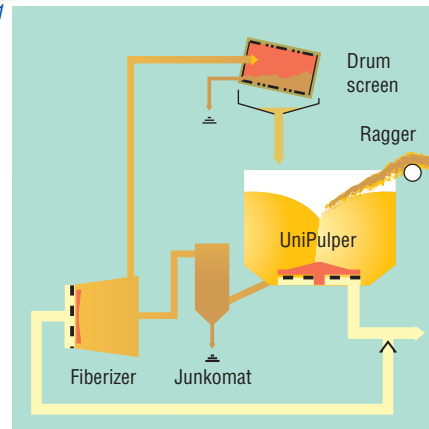
- Higher pulping capacity
- Secondary pulper provides deflaking potential
- Efficient heavies and coarse rejects removal
- Fibre-free rejects from Junkomat and drum screen.

consists of low consistency (LC) pulper, Junkomat, TwinPulp continuous pulper detrashing system, and ragger (Fig.1). Contaminants liable to stringing such as foil strips, strings and wires are removed by the ragger rope. The Junkomat removes coarse heavies which would otherwise cause serious wear or other severe mechanical damage in the secondary pulper (Fiberizer) of the TwinPulp System. In the TwinPulp System a partial flow continuously taken from the pulper is deflaked, the accepts being fed forward and large area light rejects are washed out in the drum screen. The rejects from the drum screen are virtually free of fibres, thus saving rejects dumping and freight charges as well as minimizing fibre losses.

Many stock preparation lines today have already been retrofitted with the TwinPulp detrashing system. It has been found that by using two secondary pulpers (Fiberizers) in parallel, the capacity of the primary pulper for the furnishes generally used in Central Europe can be boosted 20-25% by feeding the secondary pulper accepts forward. A further advantage of this machine configuration is that the stock is subjected to a specific pulping energy of up to 30 kWh/t, thus reducing flake content after pulping to < 12%.

Heavies removal

Efficient heavies removal is ensured today by the Protector System. This pro-



ducts downstream screening stages from abrasive heavies (Fig.2).

The 2-stage Protector System consists of HC cleaners with continuous heavies removal in the first stage, and LC cleaners with intermittent heavies removal in the second stage. HC cleaning is undertaken at about 4.5% stock consistency, with rejects continuously dumped in the sedimentation tank and diluted to about 1.5%. This ensures highly efficient separation of fibres and heavies in the following LC cleaners.

The advantage of the Protector System is that significantly higher removal efficiency is achieved thanks to the continuous heavies removal in the first stage, compared with single stage HC cleaning and intermittent rejects removal.

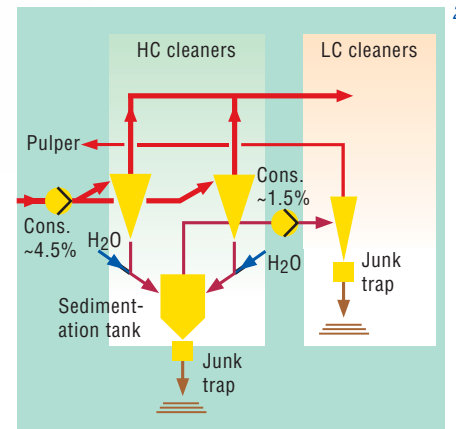
Coarse screening (holes)

The coarse screening stage for packaging

Fig. 2: Heavies removal with the Protector System – Protection of downstream screening stages from abrasive heavies

Features:

- 2-stage cleaner system
- Continuous rejects removal from HC cleaners
- Efficient heavies removal in second stage using LC cleaning.



papers comprises 3-stage hole screening (Fig.3).

For the first two stages disk screens (Fibersorter) with 2.4-2.6 mm hole diameter are used. Disk screens are particularly well suited for these positions, since apart from good screening efficiency, they have a high deflaking potential. Flake content is reduced in the first two stages from 12% in the inlet to 2.5-2.9% in the accepts.

For the final screening stage in lines with a relatively high production rate, Combisorters are used. The machine is a combination of disk and basket screen. Flake content in the Combisorter accepts is about 5.9%, so that by feeding forward the accepts of all screening stages, flake content in the intermediate storage chest is about 3%. Another advantage of the Combisorter is that with inlet stock consistencies of 2-3%, rejects consistencies of 25-30% can be reached.

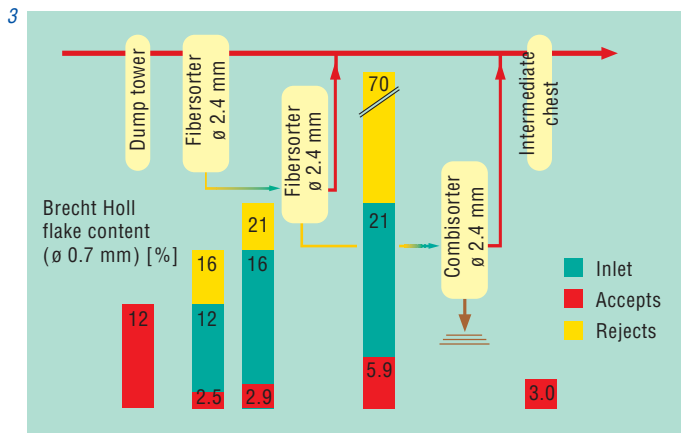


Fig. 3: Low flake level after hole screening.

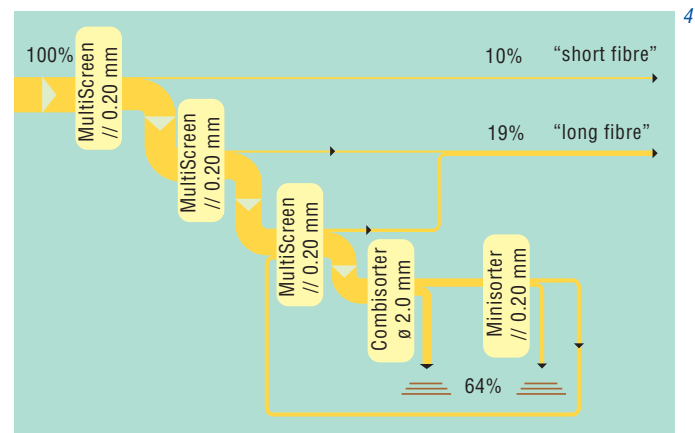


Fig. 4: Relative stickies area flow in slotted screening – stickies size reduction 7%.

Fine screening

The fine screening module mainly comprises 3 to 4 stage LC slot screening (Fig.4). In new plants, slot screening with slot widths of about 0.2 mm is used in stock preparation. For an optimum concept with multi-layer headboxes, it is better to generate the various stock qualities required (short and long fibre) in the slot screening stage.

Balancing the stickies area flow is undertaken here in fine screening. The stickies area flow in the inlet to the first screening stage is taken as 100%, with the accepts (short fibre fraction) showing a 10% content. The accepts of the second and third screening stages make up the long fibre fraction and contain about 19% of stickies area. The third stage rejects form the inlet to the final stage, comprising an A/B arrangement of Combisorter and Minisorter. Here, about 64% of stickies area is removed. The final stage ac-

cepts have the highest stickies area flow at about 15%. For this reason this flow is not fed forward, but partially returned to ahead of the third stage. Stickies size reduction in fine screening as a whole, particularly in the final stage, is about 7%.

Fig. 5 shows the flake mass flow, with 100% taken for the inlet to the first stage. Flake content in the first stage accepts (short fibre fraction) is about 7%, and about 15% in the second and third stage accepts (long fibre fraction). About 32% of flake content is removed in the final stage (A/B layout), so that flake content in the Minisorter accepts is about 13%. The accepts are partially returned to ahead of the third stage, thus recovering valuable long fibres. The high deflaking potential (flake size reduction) of 35% with the Combisorter, and the rejects removal at this machine, mean the Minisorter final stage is efficiently protected against a high flake content. Flake

size reduction in fine screening as a whole is about 46%, relative to flake mass flow in the first stage inlet. This machine configuration therefore results in gentle screening without breaking down contaminants, but at the same time it provides a high deflaking effect.

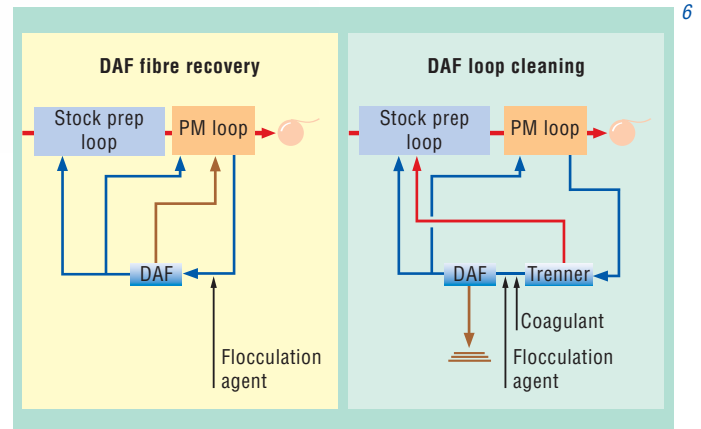
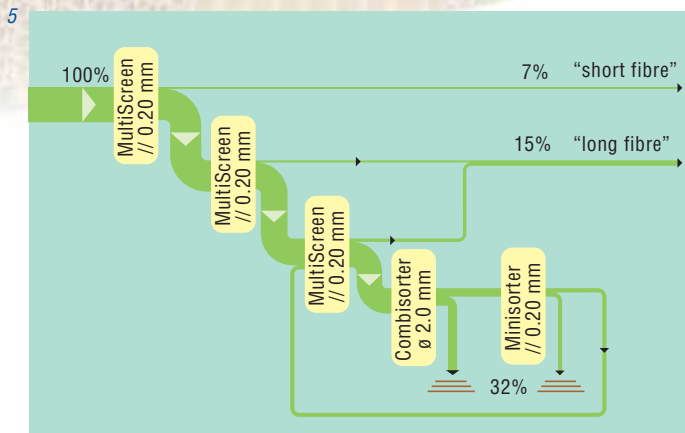
WSR system

The process water system is closely linked with stock preparation. Various process water qualities are generated, and various water qualities are required for paper production, from pulping water to high-pressure shower water.

One of the simplest but most important measures for ensuring efficient process water management is the countercurrent principle. Fresh water for each production line is added in the PM loop only. Effluent is drawn off from the first (stock preparation) loop and fed to the clarification plant. The entire stock flow from

Fig. 5: Relative flake mass flow in slotted screening – flake size reduction 46%.

Fig. 6: Use of Deltapurge microflotation (DAF) and Trenner for fibre recovery and loop cleaning.



pulper to paper machine is in the opposite direction to the water flow. This largely avoids a build-up of dissolved or colloidal contaminants in the PM loop, which, apart from causing deposits on paper machine components (e.g. wires, felts etc.), also has a negative effect on chemical/physical processes.

Microflotation systems have already been used successfully for fibre recovery in the PM loop (Fig. 6). Solids in the white-water are flocculated using a flocculation agent, and then returned to the production line. With the increasing closure of water loops, and the associated reduction of specific fresh water and effluent quantities, a build-up of colloidal contaminants can be detected in the PM loop.

The machine combination of Trenner screen and Deltapurge microflotation (DAF) is an effective and flexible way of counteracting this trend. Whitewater is

first fed to the Trenner spray filtration unit, where the suspension is sprayed on to a special screen. Usable fibres (coarse fraction) are retained on the screen for direct return to stock preparation. Fines, ash and colloidal contaminants pass through the screen and are sent to the microflotation stage.

If microflotation is used for loop cleaning, a precipitation or coagulation agent is required as well as a flocculation agent. Apart from solids, the colloids are also agglomerated by this means and removed by microflotation. This flotote must, however, be removed from the process. The advantage of this machine combination is that the papermaker can react flexibly to fluctuations in recovered paper qualities with their different fines, ash and contaminant contents. He can also use this system without coagulation agent for stock recovery, returning the flotote back to the process, or he can re-

move ash, fines and, by using suitable agents, also colloidal contaminants from the system without losing valuable fibres.

MET system

After explaining the more important individual system modules required for stock preparation, as well as the main components of the WSR system, Fig. 7 shows all subsystems integrated into a Most Efficient Technology (MET) system for packaging grades. The objective of this MET system, as indicated by its name, is to achieve precisely the required product quality for optimum efficiency in overall plant operation, yet with minimum investment and operating costs.

The furnish is slushed in the TwinPulp System, and the various rejects removed as early as possible by the ragger, Junkomat and drum screen. Further cleaning stages are the Protector System for re-

