Screening

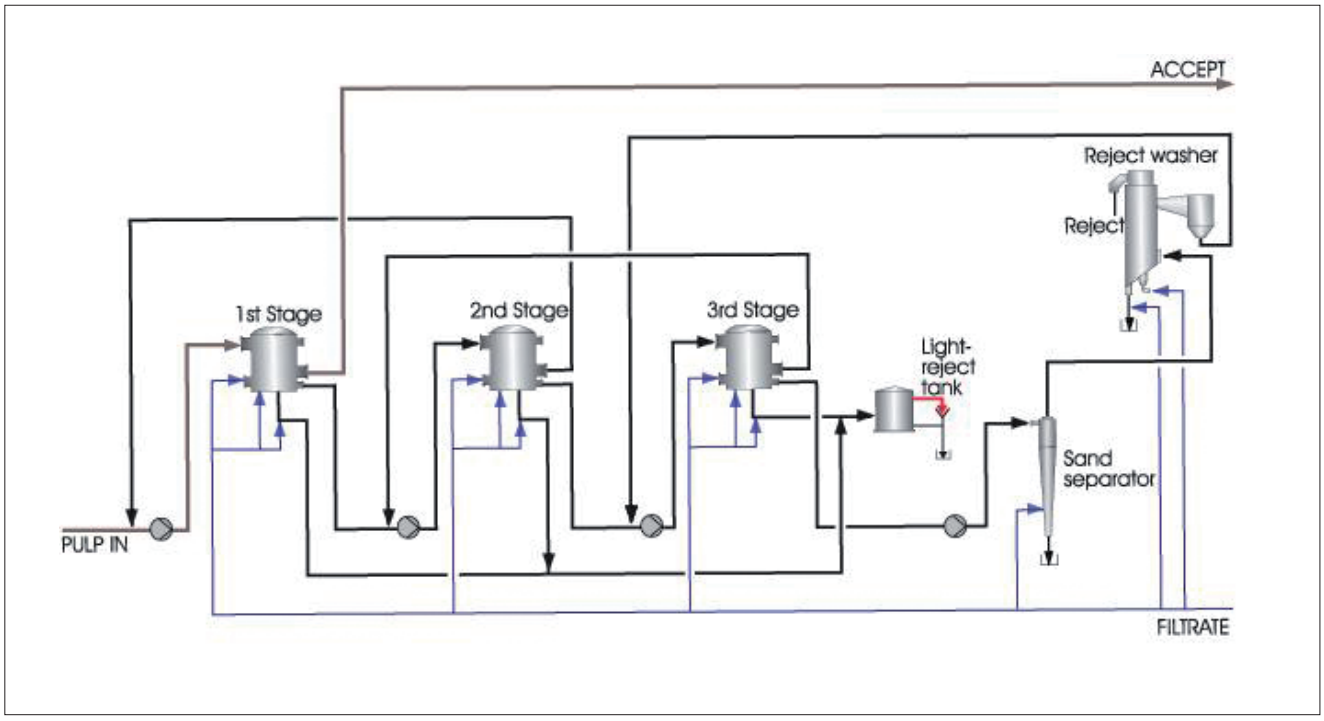

Fig. 1. An example layout of screening and reject handling

Introduction

Pulp from cooking always contains some unwanted solid material. Some of the chips may not have been fiberized properly, and some of the fibrous material may not be completely in the form of individual fibers. Also contaminants other than wood may enter cooking with chips. Such are e.g. bark, sand, rocks and tramp metal.

Impurities have negative effect on end product quality and they may damage the process equipment and cause runnability problems. All such solids contaminants have to be removed from pulp. Some contaminants can be separated from pulp on screens. Contaminants that are similar or smaller than fibers may be removed by differences in density.

The process

The main purpose of the pulp screening process is to separate harmful impurities from pulp with minimal fiber loss and acceptable cost level. Screening system can also include reject treatment to process impurities into usable form. Screening may also be used for pulp fractionation, which means that the pulp is split into fiber classes, which differ in their average properties, e.g. in fiber length or cell wall thickness.

Separation based on the particle size or shape is done mechanically by screen plates, whereas gravimetric or centrifugal force field is needed for weight-based particle separation. Separation of impurities made with pressure screens and centrifugal cleaners divides the feed pulp into two fractions: accept (impurity-free, clean fraction) and reject (impurity-rich unclean fraction). Accepted pulp fraction passes through the device and the rejected pulp fraction is removed from the device for further processing.

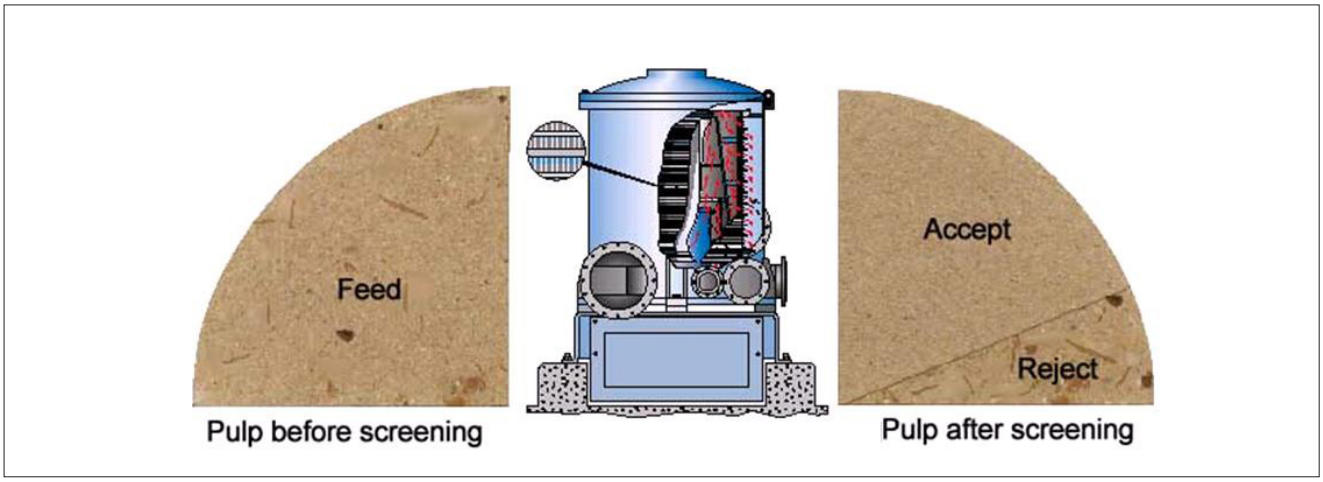

Fig. 2. Principle of screening in a pressure screen

In a screen accepted pulp fraction passes through the screen plate due to pressure difference over the screen plate, but bigger impurities tend to remain on the screen plate. In order to get fibers to pass screen apertures, fiber flocs must be dispersed with rotor before single fibers can go through the screen apertures. The reject must also be removed from the surface of the screen plate so that the screen plate would not plug and prevent screening. Figure 2 shows a typical screen and the principle of screening.

Centrifugal cleaner in itself is a cone-shaped tube, in which tangentially fed stock is forced into centrifugal movement. A vortex is created and in its centre there's an air core. In vortex, the particles are separated according to their specific weight and shape. Light particles remain near the vortex and flow into accept, whereas heavy particles are driven to the walls of the tube and collected into reject. In brown stock, screening centrifugal cleaners, i.e. hydrocyclones, are nowadays only used as sand separators. Centrifugal cleaning principle is in the figure 3.

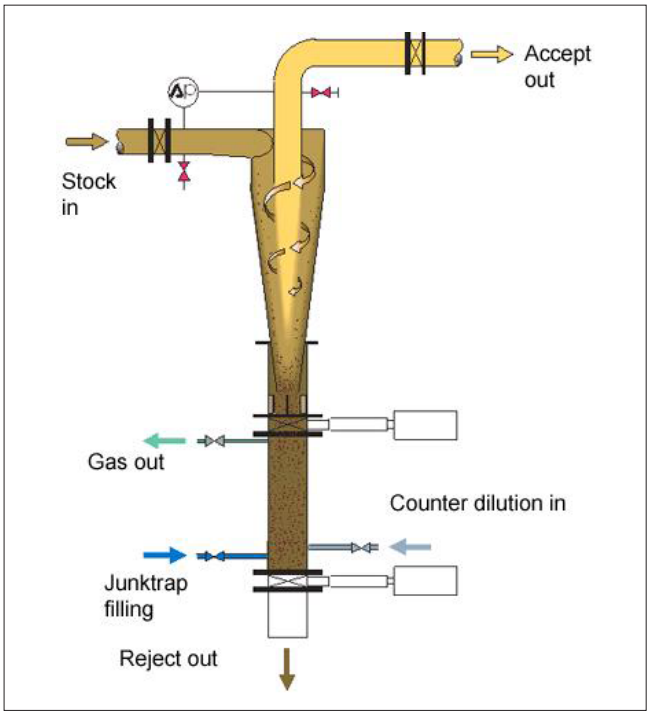

Fig. 3. Centrifugal cleaner and its operational principle

Valves

Most of the valves in the brown stock screening are standard segment valves. If pulp contains lots of impurities in the screening section, usually ball valves are used instead of segment valves. For example in recycling even ceramic ball valves can be used because of the higher resistance for wearing. Ball valves are also used in some part of the application if higher tightness is needed. For example discharge valve from discharge tank (figure 4, valve 2) is usually either knife gate or ball valve. Also main line blow-off valves are ball valves (figure 4, valves 6, 7 and 14). Figure 4 shows the most important valves in the brown stock screening section. Valve selections are in the table 1.

M-series pocket feeder is used as a junktrap valve in centrifugal cleaners. Sometimes junktraps are also implemented with two ball or segment valves instead of pocket feeder, whereupon junktrap capacity increases and valves don't have to operate that often. Limit switch or SwitchGuard is used along with a junktrap valve.

Table 1. Valves in the brown stock screening

Number	Valve type	E.g.
1	segment	REJA...AS
2	knife gate or ball valve	D2CA...AAS
3	segment	RAA....AS
4	segment	RAA....AS
5	segment	RAA....AS
6	ball	M1KA...AP
7	ball	M1KA...AP
8	segment	RAA....AS
9	segment	RAA....AS
10	segment	RAA....AS
11	segment	RAA....AS
12	segment	REJA....AS
13	segment	RAA....AS
14	ball	M1KA...AP

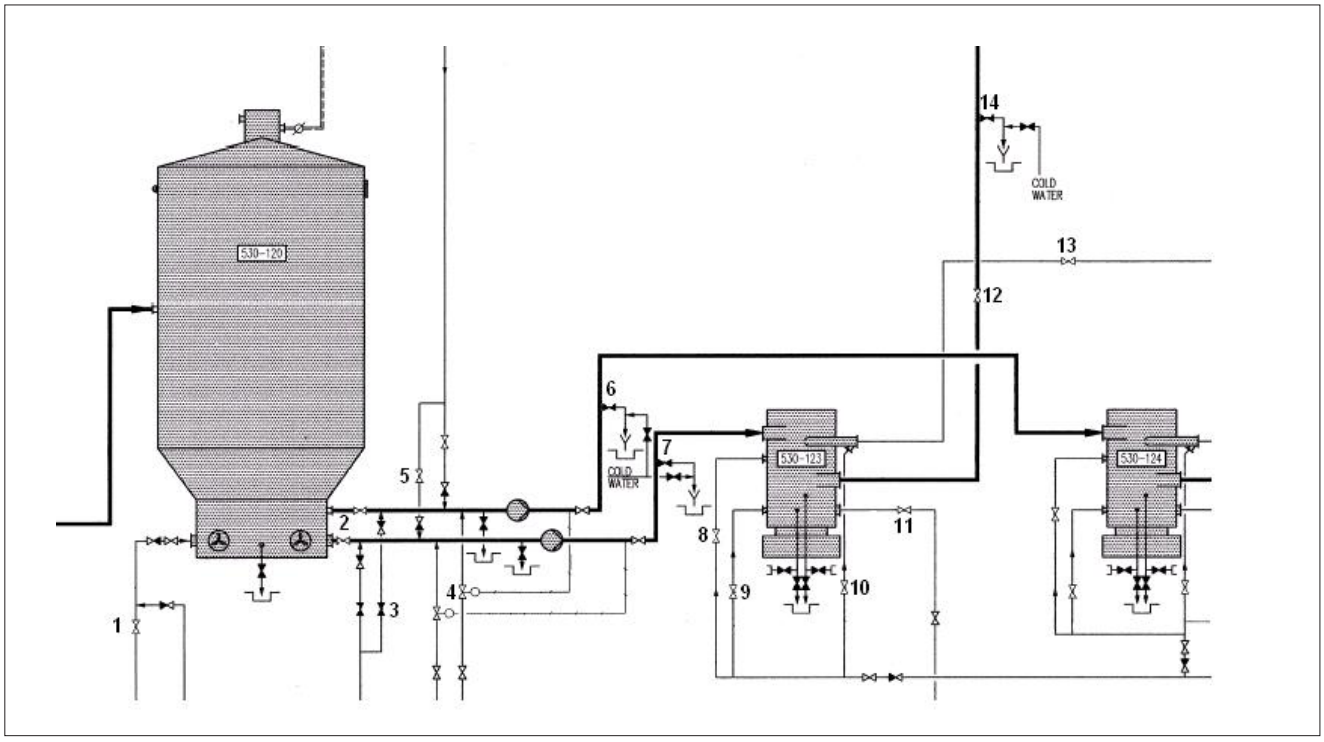

Fig. 4. Typical valves in the screening section

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