ECF results please Gruvön mill

Oxygen prebleaching, peroxide, and extensive washing yield 90-brightness softwood pulp at integrated mill.

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Even in Sweden, where the move to totally chlorine free (TCF) bleaching has been so pronounced, there are many mills that have found it enough to convert to elemental chlorine free (ECF) processes. One such example is Stora Billerud's Gruvön mill in central Sweden.

For the year 1993, the integrated mill at Gruvön had a manufacturing capacity of 90,000 tons of market pulp. Production capacity also included 230,000 tons/year of fluting and 160,000 tons/year of white top liner for corrugating, 80,000 tons/year of sack paper, and 40,000 tons/year of MG kraft paper, according to Peter Kinell, the mill's pulp production director.

In 1972, Gruvön became the first mill in Sweden and the second in the world (after SAPPI) to install a full-scale oxygen stage, Kinell said.

Early on—probably too early—Gruvön had also tried using hydrogen peroxide to brighten pulp, Kinell noted. With it came the problems of manganese and pH and sulfur dioxide and so on, he said. The TCF pulp only reached 60 brightness, so in 1983 the mill switched to chlorine with oxygen prebleaching to fully bleach the pulp. When peroxide was first tried, the mill didn't realize the importance of washing, Kinell added. All the white water was mixed together in a common system for the mill, he said. The mill reintroduced peroxide to softwood bleaching in 1990 when it began producing ECF pulp, with better results.

The softwood line

In 1990 the mill also changed from high-consistency to medium-consistency (MC) oxygen prebleaching. The change to MC reduced chemical consumption, as did the installation of modern mixers for the ClO_2 stages, said Inga Cornéer, pulp mill production manager. Chemical costs are down about 30%, she estimated, even though the chemicals used (peroxide and chlorine dioxide) are more expensive.

The new processes are actually easier to control, Kinell said. With chlorine gas, the mill sometimes used too much, sometimes not enough. Pulp qualities are now more consistent with ECF bleaching, he said, while pulp strength has remained about the same.

"It's very important to use new technology to keep old mills alive," Cornéer said. For Gruvön, the use of mixers and washers has been particularly beneficial, she noted. After the digester the softwood line branches into two. Each branch of the pulp line requires the same number of steps, she added. "If you cheat, the pollutants will go back into the other lines," she said. Presses on the final stages of both the hardwood and

View of the mill

softwood lines act as liquor locks. Those are preceded by pressure diffusers, with deckers before those.

The bleach plant releases about 12 m^3 of water for every ton of pulp produced. Water consumption is about one-third of what it was 10 years ago when the bleach plant started, Cornéer said. Treatment doesn't require defoamers, either. Secondary treatment also has very little foam. In the past, the mill also had to adjust the pH of treated water by adding lime, but not any more, because the ECF effluent is less acidic than chlorination effluent, she said.

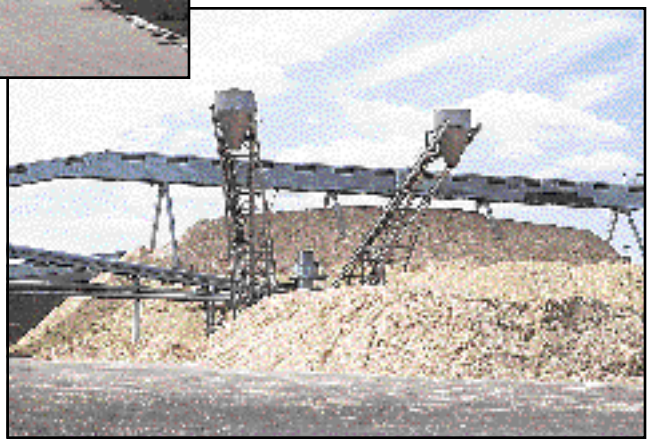
Over the years, the mill has steadily reduced the amount of AOX discharged in its water and tried to close up the white water system as much as possible. In 1985 the AOX level was 3.6 kg/ton of pulp after external treatment, Cornéer noted. For 1990 it was down to 1.52 kg/ton, then 0.55 kg/ton in 1991, 0.21 kg/ton in 1992, and less than 0.15 kg/ton in 1993.

Gruvön routes fiber-containing waste water to a settling basin for primary treatment. Accepted fibers are used to produce fluting; rejected fibers are sent to the landfill. An aerated lagoon with a five-day retention provides secondary treatment for the waste water and bleach plant effluent. Finally, the water is discharged to the lake. Water for use in the mill processes is also drawn from the lake, not far from the discharge site, Cornéer said.

The mill operates separate hardwood and softwood pulp lines. Of about 2.2 million m^3 of wood consumed each year, about 36% is hardwood, primarily birch. About two-thirds of the softwood used is spruce and one-third is pine.

Hardwood chips are transported by belt conveyor to a Kamyr digester. The chips are heated by steam for a two-hour cook. Washing progresses from a Kamyr pressure diffuser to disc knotters, a wash filter, wash presses, screens, and a decker. Drilled and slotted screen plates are used for primary screening. "The secondary and tertiary screens are cascade connected to ensure low loss of good fibers to the reject treatment in a refiner," the company reports.

In the hardwood line, wash filters also separate the D0-EP-D1 bleaching stages. Pulp is bleached to 88 ISO brightness. The hardwood line has an operating capacity of 250 tons/day. All pulp produced in the hardwood line is used at the mill.



Chip piles at Gruvön

The softwood pulp line

The softwood line has a capacity of 1100 tons/day. Chips are presteamed in two feed lines that lead to the impregnation vessel. Cooking chemicals and chips are combined in the vessel and held there at 120–130°C for 30 minutes. The chips are then transferred to the digester where they cook for 1-1/2 hours at 160–165°C. Cooking liquor is extracted and replaced by washing liquor. After two hours of washing in the digester, the chips pass on to diffuser washers and then the screen room. Drilled and slotted screens are used for primary screening.

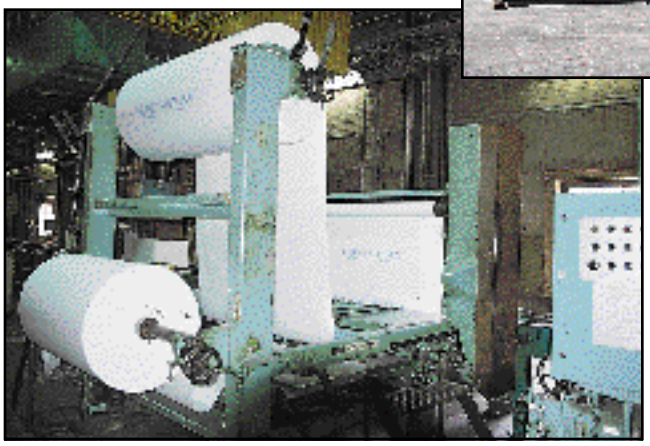
"By double screening a shive-free unbleached pulp is obtained," Stora reports. "This eliminates the need for shive bleaching and thus reduces the consumption of bleaching chemicals."

After deckering, unbleached pulp is either routed to the paper mill or the bleach plant. An oxygen bleaching stage precedes the final bleaching sequence.

During oxygen prebleaching a small amount of magnesium sulfate is added as an inhibitor to the oxygen and caustic soda. The pulp is then washed in a pressure diffuser, followed by a wash press. The water from the wash press is routed to the previous washing stages and then to the evaporation plant.

The final phase of softwood bleaching uses a five stage, D0-EOP-D1-EP-D2 sequence. Each stage takes the pulp through a steam mixer, a chemical mixer, a bleaching tower, and a washer. A post-bleaching

Loading finished goods



Gruvön's white kraft paper

pass through centrifugal cleaners removes any dirt, bark, or impurities that may have entered the system. About half of the softwood pulp—bleached to 90 ISO brightness—is used at Gruvön. The rest is flash dried and sold as market pulp. Most of that goes to other Stora mills in Western Europe.

Two flash dryer lines unite at a bale press and packing line. Pulp is wet-pressed to 50% solids before fluffing in drying towers. Further drying in cyclones brings the dry solids content to 90%.

NCCS pulping and the paper mill

Gruvön also operates a 720 tons/day neutral sulfite semichemical (NSSC) pulp line. The hardwood pulp from that line is used to produce corrugating medium. Chips are processed in a Kamyr continuous digester which includes a countercurrent washing zone. The pulp is then defibrated in double-disc refiners. It continues on through wash presses and conical screw presses. Reclaimed fibers (15%) from kraft screening and primary treatment are mixed with the pulp before it is formed into fluting on a fourdrinier machine. The formed sheet passes through two presses and a 59-cylinder dryer section. Maximum trim on the winder is 6.7 m.

Gruvön's paper mill is equipped with five paper machines and a coating machine. All but one of the paper machines have machine calenders. One of the fourdriniers is configured with a Bel Bond top wire, another has two Inverform units and a Yankee cylinder as part of the drying section, a third uses high-consistency beating. The other two machines are configured with Yankee dryers, including a six-cylinder pre-dryer on one of the machines. Capacity ranges from 12,000–85,000 tons/year, with trimmed widths ranging from 4.3–5.2 m. The coater can treat one or both sides of the sheet. Infrared or steam-heating can be used to dry the coated paper, which then passes through a soft-nip calender.

***Meadows is editor of* Tappi Journal.**