

Adapting to better bleach plant control

Botnia Kemi's fiberline uses Elemental Chlorine Free (ECF) bleaching, based on chlorine dioxide. The proven environmental track record and strong market demand demonstrate that ECF is the ideal solution in terms of pollution prevention, resource conservation and product quality. In 2005 Botnia Kemi started a new adaptive control system from Metso Automation, DNABleach, that has improved the controllability of the process, reduced bleaching costs more than 3% and improved pulp quality.

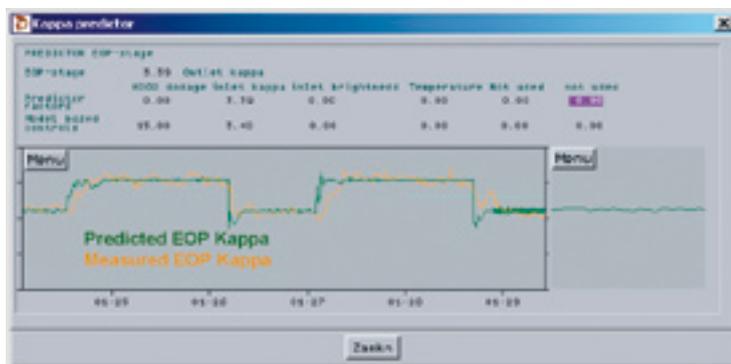
The Botnia Kemi mill produces approximately 560,000 tons of softwood and hardwood pulp annually. Some 75 per cent of the pulp is ECF bleached, the rest remaining unbleached. The pulp is both used in the Kemiart Liners' board mill on site and sold to market pulp customers. The Kemi mill is Metsä-Bornia's largest market pulp mill with about 35% of the production exported. The main market areas are Great ▶

PULP AND PAPER

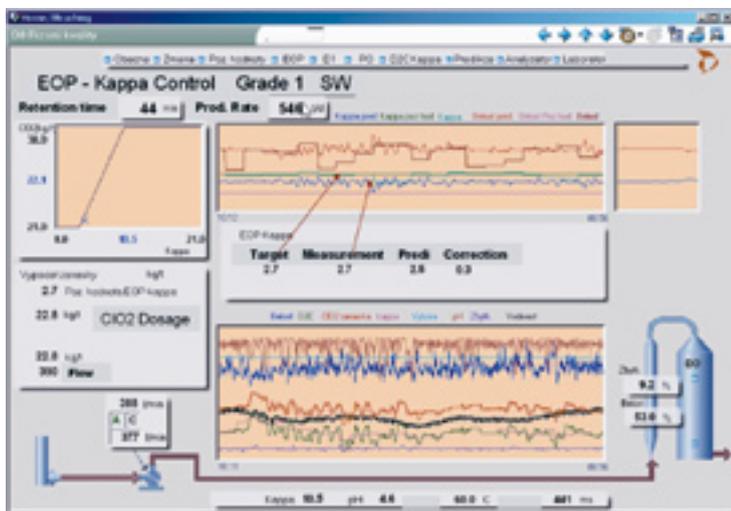
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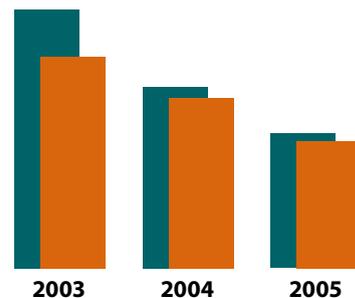
A DNABleach prediction history visualization (screen shot from Metso demonstration system).



Operators have a complete picture of control actions including the predicted bleaching result (screen shot from Metso demonstration system).



Reductions in the average standard deviation of EO Kappa over three years for SW and HW.



blems. He explains: “Wider Kappa swings than normal into the bleach plant always caused problems. This happened during process upsets and in a regular cycle during grade transitions.” The only course of action was to put the control on manual, typically increasing chemical dosages to maintain sufficient final brightness. Running in manual resulted in less than even quality and excessive use of chemical to ensure meeting target levels. If these periods occurred during a shift



Kimmo Pelander, Production Manager, reports between 3 and 4% savings.

► Britain, Germany, Switzerland, and France. Botnia has earned its position as the most efficient pulp manufacturer in Scandinavia.

Even quality

ECF bleaching started in Kemi in 1990 with the building of a new bleaching line from Sunds Defibrator (now part of Metso). Fed by a continuous digester and ox-

xygen delignification, the four stage bleach plant typically runs a two and a half day softwood and one and a half day hardwood cycle. The most important target for pulp production in Kemi is even quality, especially challenging with the short HW/SW cycle. Equally important is the quality of pulp during transitions from one grade to the other. Total transition time from fully hardwood to fully softwood takes one and a half hours and is tracked by a kajaaniFSA automatic fiber length analyzer. The quality of the transition pulp, stored in a 3,000 m² mixed pulp storage tank, has to be high enough to be gradually blended to the main production without problems.

Predictive quality control

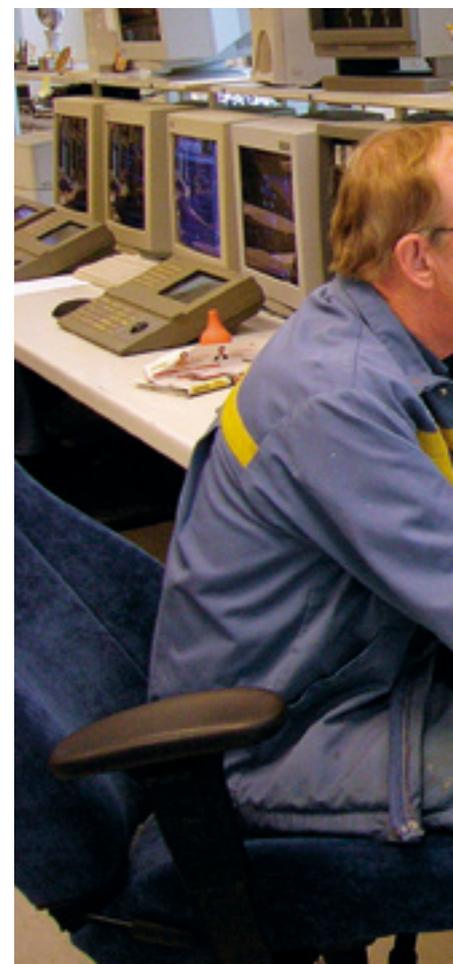
Metso Automation’s DNABleach controls with Kajaani analyzers and sensors are well established in the Kemi mill. The kajaani-CORMECi brightness sensor pro-

vides continuous brightness measurement for dioxide stages and the new kajaaniPOLAROXfi-P utilizes the proven measurement method for peroxide stage quality control with the kajaaniBRITEi analyzer.

The basic idea is that every kilogram of lignin to be oxidized needs the same amount of chemical. The kajaaniBRITEi analyzer tells how much lignin there is and the predictive model calculates the optimum dosage. This also means no excess chemical in the process to damage the cellulose. Viscosity, pulp strength and fiber properties are stable. However, the delignification process is non-linear, becoming more inefficient as chlorine dioxide is increasingly applied and chemical consumption is higher than theoretically it should be.

The challenge

Operation Manager Pekka Kittilä, was well aware of the prob-



change, additional time would be wasted as operators adjusted to conditions and tried to return to automatic control.

The solution

Previous experience with Damatic, and more recently metsoDNA control systems, convinced the mill to commission a new bleaching optimization package from Metso Automation in 2005. The DNableach, adaptive Kappa and brightness control, was already operating in two other Botnia mills on bleached SW with good results and it was hoped that the benefits in Kemi would be even more decisive. Better process stability, improved pulp quality and chemical savings were projected. System commissioning began in August 2005.

Kimmo Pelander, Production Manager, remarked that the start-up went very well, "Two of our operators were actively involved during the project and Metso



Operation Manager Pekka Kittilä shows the kajaaniBRITEi and FSA analyzers.

made great use of their knowledge and experience in getting things right the first time."

Adaptive control

The new control has the ability to learn the dynamics of the process even when running in manual. By continually calculating estimated bleaching stage results, deviations from target EO kappa, D1 or P stage brightness targets are seen and corrected almost before they happen. The adaptive control manipulates the brightness model so

that the difference between measured brightness and estimated is as small as possible.

Savings of 3 to 4%

According to Pelander, "This automation project with Metso Automation was a complete success; we have achieved some 3 to 4% reduction in bleaching cost since start-up. That is a significant amount of money which resulted in a very short payback time."

24-hour automation

The savings have been achieved with a sizable reduction in standard deviation of the final brightness. As Pelander further explains, "Reducing the standard deviation on its own is not enough; you need to have the average in the right place. We are very satisfied with this now. We are running 24 hours a day in automatic with a much more stable process."

Operators in the control room have welcomed the change. The DNableach displays keep them fully informed, presenting not only current process conditions but also trends of recent and estimated future pulp quality at the end of each stage. The system continuously compares the estimated values to target values and controls for the minimum error between the two. During grade change, DNableach continuously tracks transition pulp through the process and carefully controls the chemical charges resulting in even product quality.

Operators now have time to monitor and optimize.

"Where operators had to continuously drive the process before, they now have time to monitor and optimize," says Kittilä, continuing that, "We now save chemicals during grade changes and achieve better quality mixed pulp with the automatic control on all the time." An interesting feature of the operator display is the calculation of cost per ton in Euros as a continual reminder of the effect of chemical usage on profitability. When asked whether he would return to the earlier method of control one operator remarked, "No way, too stressful."

And the future?

Pelander is quite sure that there are still improvements to come. "We are using the best available technology now, but I'm confident that Metso Automation has the expertise to continue the advancement. The drivers will be same, less chemical and lower quality deviations. Our maintenance agreement ensures uptime and the availability of latest developments that we can incorporate into our system. Metso has so much experience of many mills and processes for us to benefit from." Every six months, the Botnia mills have a Fiberline Benchmark Meeting where experiences and know-how are shared. Top of the agenda for these meetings are manufacturing costs, achieving higher production, better quality and the environment. According to Pelander, "Every time we reduce chemical consumption, it is always good for the environment, and in 99% of process improvements, as in this project, we reduce the effluent load." ■

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