Continual modernization puts Östrand in forefront of pulp mills

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New TCF bleaching line will help Swedish mill limit its effluent.

A new ozone bleaching line is nearing completion at SCA's Östrand pulp mill, outside Sundsval, Sweden. Come spring, the testing phase will begin and, for awhile, the mill will have the most modern totally chlorine free (TCF) bleaching line in the world.

Ozone will allow the mill to accomplish two things, explained Peter Sandström, development engineer for the process kraft pulp mill. It can reduce the amount of effluent discharged, and it can produce TCF pulp.

The ozone stage being installed at Östrand is similar to the process used at Union Camp in Franklin, VA; but there are more process stages for bleaching at Östrand, and the mill will produce TCF pulp rather than elemental chlorine free (ECF) pulp.



The Östrand's woodyard

At the beginning of 1994, Östrand had a reported annual capacity of 410,000 tons of pulp: 330,000 tons of bleached kraft pulp and 80,000 tons of chemithermomechanical pulp (CTMP). TCF capacity in the kraft pulp mill will be 350,000 tons/year, of which 90,000 tons/year will be produced from hardwood.

"The mill decided to use a high-consistency ozone stage," Sandström said. "Medium consistency is a little more difficult to work with, requiring greater concentrations of ozone applied under high pressure," he said.

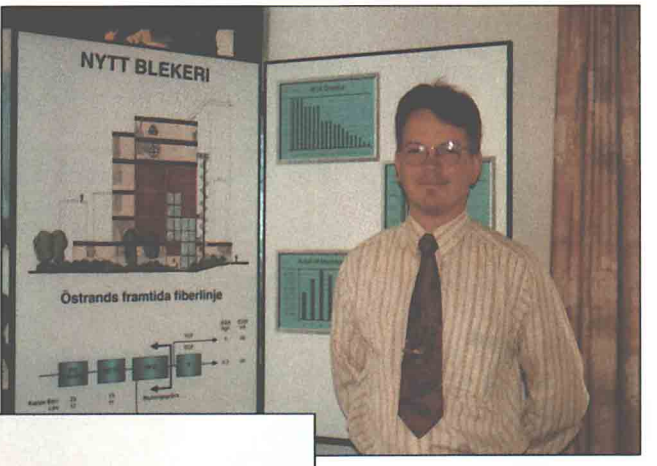
Earlier this year, Sunds Defibrator completed installation of an oxygen stage at the mill. The project equipment included an oxygen reactor, conveyor, pulp discharger, heater, SM mixer, pulp distributer, and discharger. Capacity is 1150 a.d. metric tons/day of softwood pulp or 1250 a.d. metric tons/day of hardwood pulp

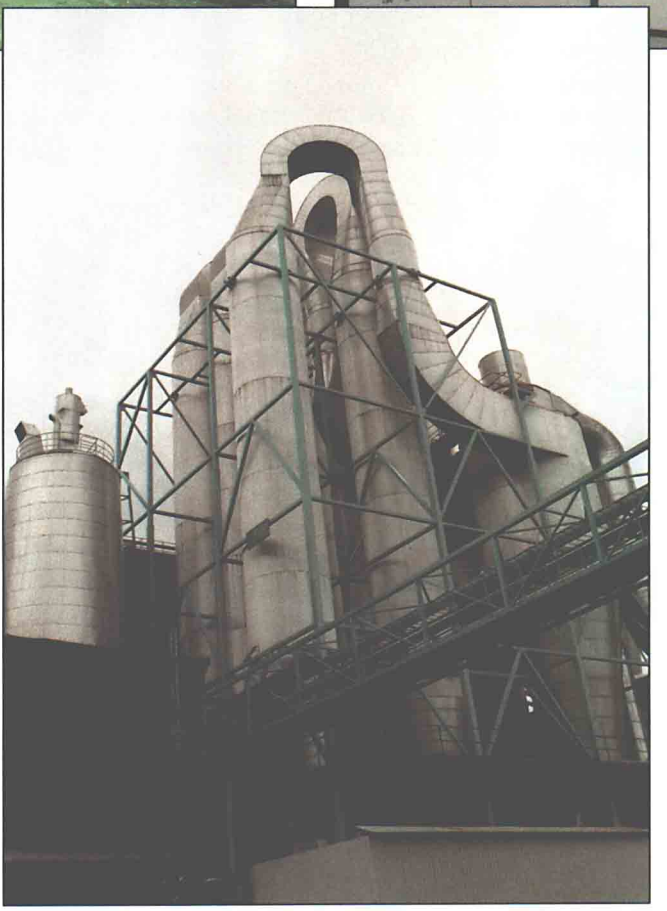
In 1992, the mill rebuilt its digester to isothermal cooking (ITC), "a modified, modified kraft cooking," Sandström said. The modification allows liquor to be taken out from the lower part of the digester. The liquor is then run through a heat exchanger and chemicals can be added before the liquor is returned to the digester. "ITC allows for additional lignin removal in the bottom of the digester and a better temperature balance throughout," Sandström said. "That makes the delignification more selective without degrading the carbohydrates as much as in the high temperature cooking. So you can reach lower kappa numbers without affecting the pulp quality."

The pulp mill's existing washers



Peter Sandström





Drying towers at Östrand

The mill also determined that the oxygen bleaching stage needed to be more selective. In the spring of 1994, the high-consistency unit was changed to a Sunds Defibrator medium-consistency oxygen exchange system. The mill also installed a Kværner pressure diffuser.

"Because the bleaching cycle will be run as closed as possible, it will require very good washing equipment," Sandström added. "The mill has elected to install a new type of wash press developed by Sunds Defibrator," he said.

The investment in TCF bleaching at Östrand comes to roughly SEK 400 million (approximately US$ 54 million at current rates of exchange). "The new bleach plant will be the first fully constructed to facilitate a completely closed-cycle bleaching process," SCA reported. The bleach plant replaces three older plants at the mill.

About a third of the kraft pulp produced by Östrand goes to SCA's nearby Wifsta fine paper mill, another third goes to other SCA mills, and the rest is sold. Most of the inventory is sent to a storage area at the shipping docks instead of being kept at the mill. "The market for TCF pulp, which is particularly strong in the German-speaking countries, has grown more than expected," Sandström said.

Rebuilds kept mill up to standard

"The original Östrand mill was built in the 1930s. Since then it's been modernized and rebuilt several times," Sandström said. From 1980 to 1982, the mill underwent a major rebuilding, at a cost of SEK 1 billion. The project included a new unbleached fiber line and improvements to the bark- and wood-handling areas. In addition, the bleach plants were modernized, a two-vessel vapor phase Kamyr digester was added, and a new recovery boiler was installed. Pulp and steam pipes were installed in 1988 to integrate the pulp mill with Wifsta. That project, plus the installation of a single dryer in 1991 to replace four old machines, accounted for another SEK 600 million investment.

"The mill of the early 1980s was built to environmental standards of the time," Sandström noted. By the end of the decade, when the pulp mill was due to renew its environmental permit, it faced much stricter standards. In negotiations for a new permit with the Swedish environmental authorities, Östrand offered to build an activated sludge system. However, after further discussions with Sunds Defibrator, which has its headquarters nearby,



Fiber line control room

SCA decided to install an ozone bleaching system in order to produce TCF pulp and limit effluent at Östrand.

Consequently, the mill refiled its application for an environmental permit and was given until the summer of 1996 to comply with the provisions of the agreement. The new ozone system comes on line in the spring of 1995.

Sandström anticipates zero AOX with the new system. The mill will work together with Sunds Defibrator to determine how much the system can be closed up. Corrosion probably won't be a problem, but precipitation of chemicals in the fiber line might. "The sodium-sulfur balance is a concern because of tight sulfur emissions limits," he said. Sulfuric acid is used to adjust pH in the ozone sequence.

For now, Östrand has no external treatment for effluent. What may be required by way of treatment to close up the mill is still uncertain, Sandström said. "It's difficult to calculate everything through simulation," he noted. "What we see in the future is the *concept* of the closed mill. You can't have a 100% closed mill," he said. Obviously, you take out the pulp, but the wood used to produce that pulp contains water, metals, and a lot of other components which remain in the system. Plus there are processing chemicals to contend with.

Sandström foresees the need for some treatment of waste liquors, perhaps chemical/biological treatment to clean it or some process to separate out the unwanted chemicals and recycle the process water. But for now the emphasis is to reduce the volume of wastewater.

It's in the wood

A recognized problem in trying to close up the wash water cycle is that metals enter the system with the wood. The trees take in nutrients from the soil. The nutrients (i.e., metals) are later precipitated out in the recovery system as part of the sludge. One approach to the problem is to broadly define "closed cycle." Östrand is looking into mixing sludge with furnace ash and calcium to form a fertilizer. "That way the metals taken from the forest would be returned to the forest to nurture the trees," Sandström explained.

About two-thirds of the wood used at Östrand comes from SCA forests.

Up until about 20 years ago, foresters used to harvest trees in late autumn and into the winter. The logs were left on the ice to float down to mills in the spring. The foresters might then spend late spring and summer farming. That cycle still has some influence on the harvesting practices, as do the traditional summer holidays. The spring thaws can also turn dirt roads to mud, making it impractical to transport logs from harvest areas for several weeks. "Even so, harvesting is conducted more 'on-demand' now," Sandström noted, with less time between felling and delivery.



Sandström at the pulp storage constuction area



[redacted]ned pulp passes through a press on its way to a Fläkt airborne dryer

"Generally speaking, an advantage of producing kraft pulp has been that a mill has more flexibility in the quality of wood it uses. However, pulp mills using ozone can benefit from being a little more selective in the quality of wood they accept," Sandström said.

"For example, Östrand tries to batch wood by average age," he said. What the mill wants to avoid is using two-week-old wood part of the day, then 1-1/2-year-old wood part of the day. Those differences would be noticeable in the chipper and digester, with fluctuations in kappa numbers and lignin content.

"As soon as we started to discuss TCF and closing up, we realized it wasn't just a question of what the bleach plant should look like, but we had to start by making modifications [in the woodyard]," Sandström said. "We have been working with our forestry department, so it is supplying us with more even wood quality," he said.

"We try to keep an even mixture between spruce and pine because they give somewhat different qualities of pulp." At the woodyard, deliveries are sorted into piles of mainly spruce, mainly pine, and mixed. Loaders then try to establish an even mix. Average age influences processability.

Earlier this year, the mill was using a single brown fiber line which alternated between hardwood and softwood—about three days softwood, one day hardwood. The line fed two softwood storage tanks and one hardwood storage tank.

"The old type of bleaching was much more forgiving of such variations than is TCF bleaching," Sandström said. He believes the TCF process developed at Östrand's is an improvement on other TCF systems.

"The most common way to do TCF pulp today is to use only a peroxide stage," Sandström said. "In our case, we will have more bleaching stages and one of them is ozone, which is a delignifying agent. Peroxide is more for bleaching but, if you have variation in incoming kappa number, it's more difficult to maintain brightness levels if you only use peroxide." A delignifier takes some of the variation out, he suggested.

Sandström was reluctant to talk about the exact sequence the mill will use for bleaching, though it will use oxygen, ozone, and peroxide.

"It's not a matter of deciding the letters of the bleaching sequence; you have to have a system and the equipment for it," Sandström said. Similar systems may also differ slightly as a result of using different chemical and equipment suppliers. ■

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