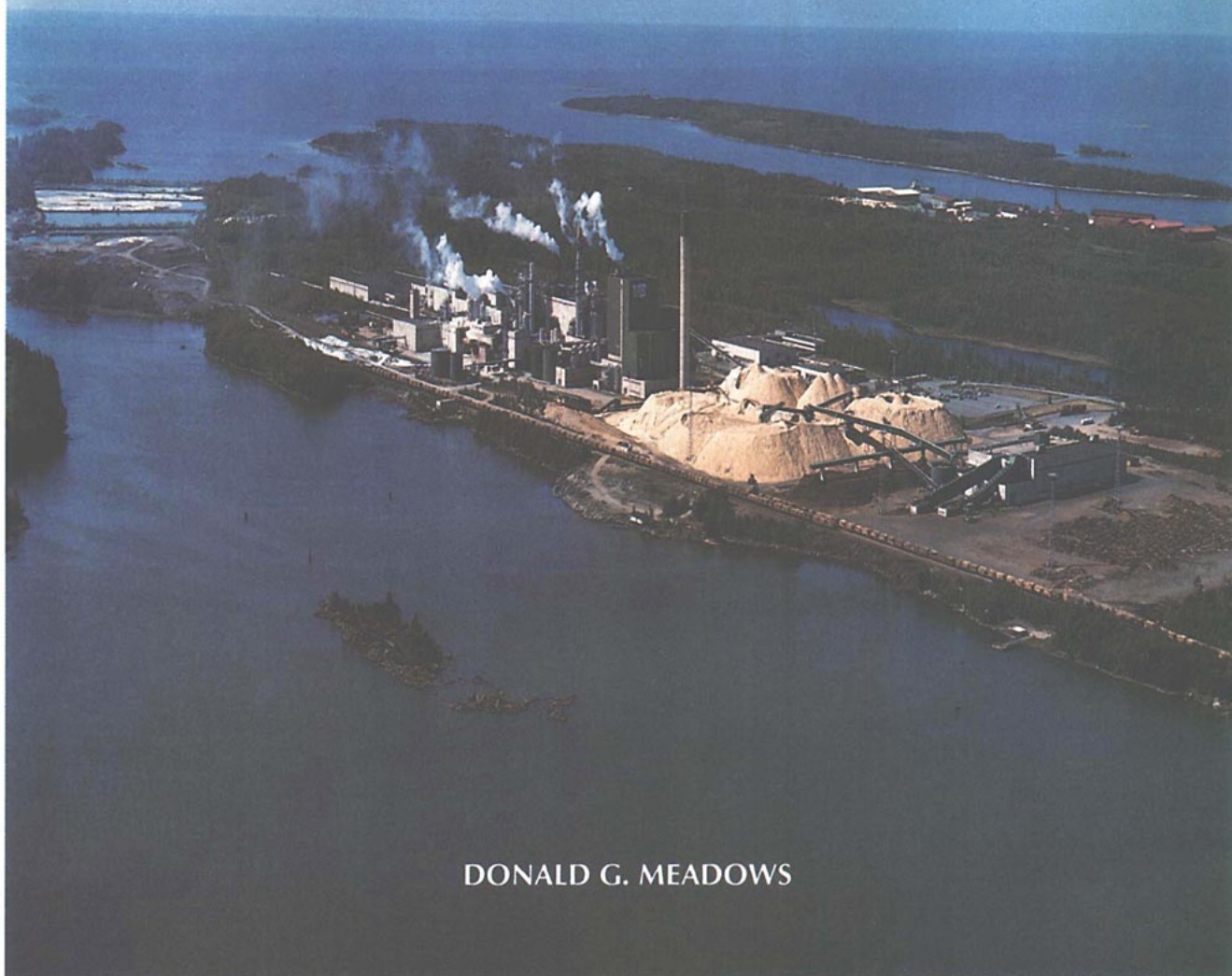


TCF a step toward TEF for Finnish mills

*Adding ozone for TCF bleaching brings Metsä-Botnia's Kaskinen pulp mills
a step closer to closing their wastewater cycle.*



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Botnia's Kaskinen pulp mill in Finland

Scandinavian ECF/TCF mills



A lab technician checks pulp quality.

As in Sweden, it was an awareness of environmental concerns that drove Finland's Metsä-Botnia to begin eliminating chlorine from its pulp bleaching processes. And it was the German-speaking markets that have helped fuel that move.

"In the markets, Metsä-Botnia's concern for environmental issues is an extremely competitive factor," said Managing Director Juhani Yli-Paavola.

Metsä-Botnia is 47% owned by United Paper Mills (UPM), 30.4% by Metsä-Serla, and 22.6% by Metsäliitto (the Finnish Forest Owners Association). The company operates the Kaskinen and Kemi sulfate pulp mills and the Kemi board mill in Finland. The two mills have a combined capacity of 0.95 million tons/year, to which 0.5 million tons/year of totally chlorine free (TCF) pulp will be added when Metsä-Rauma's pulp mill is completed. Rauma is designed to be a closed cycle mill. Production of pine pulp will start there in 1996.

Metsä-Rauma's owners, Metsä-Serla and United Paper Mills (UPM), also operate pulp mills in Äänekoski and Joutseno, which together produce 0.8 million tons/year of pulp.

The Kaskinen sulfate pulp mill began production in 1977. From 1988–92, Metsä-Botnia spent FIM 1.5 billion (roughly US\$ 300 million) on improvements to its Kaskinen and Kemi pulp mills. That allowed the gradual elimination of elemental chlorine bleaching at the mills, beginning in 1991.

The modernization at Kaskinen resulted in a switch to dry debarking to reduce water use and a more efficient three-stage pulp washing process. The mill added oxygen delignification, with two-stage diffuser washing followed by open washing before a five-stage final bleach.

Kaskinen began producing TCF pine and birch pulp in September 1991, using oxygen, enzymes, and hydrogen peroxide for bleaching. The process yielded hardwood pulp with a brightness of 86–87 ISO and softwood pulp of 82–83 ISO brightness. In December 1992, company managers decided to install ozone bleaching at Kaskinen, said Kosti Kukkonen, mill



Kosti Kukkonen, Kaskinen's mill director

director. Research for the project cost about US\$ 3 million, he said. With ozone bleaching, the mill anticipated being able to produce 88 ISO brightness pulp.

The medium-consistency ozone bleaching line at Kaskinen was designed with a capacity of 1450 tons/day. Ozonia Ltd. manufactured the 300 kg/h ozone-generating equipment for the mill, A. Ahlstrom supplied the mixing and bleaching stage equipment, and Sunds Defibrator furnished the reactor and equipment for a second oxidizing stage. Polargas operates and maintains the ozone generating plant for the mill.

The first real test of the chlorine-free pulp produced at Kaskinen was at Metsä-Serla's Kirjaniemi paper mill. Although brightness was a little lower and pulp consumption a little

higher from the initial batches, there were no problems producing SC and LWC magazine papers from the pulp, the company reported.

Metsä-Botnia noted the following effects after several months of operating the ozone bleaching sequence at Kaskinen:

- Higher pulp brightness—89% ISO for softwood, 90% ISO for hardwood
- Better brightness stability
- Easier beating (vs. ECF pulp)
- Slight viscosity decrease
- Equivalent strength potential
- Reduced wastewater
- Lower chemical costs.

The Kaskinen mill has already exceeded its initial brightness targets for softwood and birch pulps, Kukkonen said. "The brightness levels now achieved correspond to fully bleached TCF grades," he noted.

Between 40% and 50% of the pulped produced at Kaskinen during 1994 was TCF. Kukkonen envisions a steady increase in TCF production, with ECF peaking by the end of the decade. Kukkonen anticipates pulp production will reach 420,000 tons/year in 1995, compared to 250,000 tons/year when the mill started in 1977.

About two-thirds of Kaskinen's pulp production is sold domestically, mostly to share-holding companies. The rest is exported to about 20 countries, primarily Germany, France,

the United Kingdom, and Italy. Kaskinen's TCF pulp is sold as BotniaPlus, Kemi's as KemiPlus.

The chlorine dioxide bleaching process Kaskinen has used included two oxygen bleaching stages, an ozone stage, a hydrogen peroxide stage, chlorine dioxide stages, and extra washing.

Metsä-Botnia sees Kaskinen's ozone bleaching plant as "a significant step toward a closed water recycling system." Over the course of 10 years, the mill has already reduced its wastewater load (COD, BOD, AOX) by 50–90%. Wastewater reduction at the new mill is expected to reach 90%.

Kukkonen believes the ozone bleaching process will make it easier to control corrosion problems in a closed cycle mill. There, of course, still will be the problem of dealing with trace elements from the wood, such as phosphorous, iron, and manganese.

Absolute zero discharge is impossible, Kukkonen said, but he foresees considerable reductions over the next five years. Instead of discharging 40–50 m³ of process water per ton of bleached pulp, only 10–15 m³ will be used at Rauma when that mill starts up, he said. After five years, the discharge should be less than 5 m³/ton of pulp.

The Rauma facility will be Finland's largest single line pulp mill. It will consume about 3 million m³ of timber annually. The mill is designed to use ozone and hydrogen peroxide for bleaching. Part of the pulp produced there, as well as 30–40% of the excess energy (steam and electrical), will be delivered to UPM (Rauma-Repola) a short distance away. ■

Meadows is editor of Tappi Journal.