

Riocell nurtures environmental accomplishments

Pulp and paper mill in southern Brazil has built a "clean" image.

DONALD G. MEADOWS

Environmental concerns have very much influenced operations at Riocell's pulp and paper mill in Guaíba, Brazil. Celso Foelkel, environmental and technical director, refers to it as a "minimal environmental impact mill" that's moving toward becoming a zero impact mill.

But a lot of money, effort, and R&D has gone into the mill over the last 15 years to get it to that point.

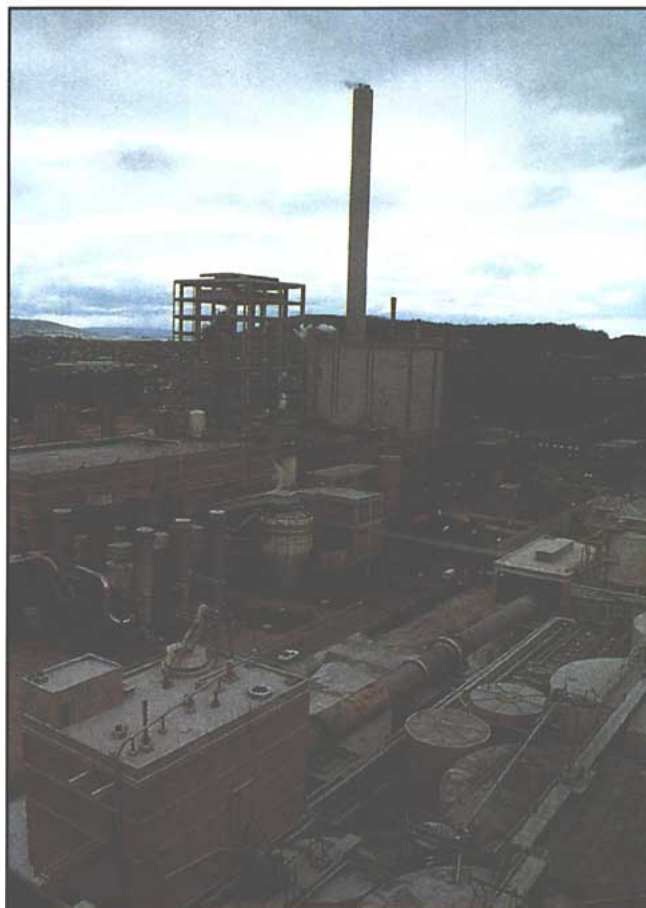
In many cases, Riocell has developed simple methods to reduce or recycle 99.7% of the 15,000 tons/month of solid residue it generates, Foelkel said. Like Champion in Mogi Guaçu, Riocell depends on eucalyptus plantations for its pulpwood. Likewise, it uses composted mill waste to renourish the soil of those plantations, though most of the organic fertilizer produced is sold to local farmers for agricultural use.

About half of the solid residue is converted to agricultural use, especially as organic fertilizers. Sawdust is used as fuel or as bedding for poultry. Another 40% goes to industrial uses such as cement manufacturing. The rest is used as fill for the recovery of mined areas.

Even the garbage from the mill is sorted and 85% is recycled, Foelkel noted.

The mill produces 300,000 a.d. metric tons of paper and dissolving grade pulp per year. More than three-fourths of that is bleached eucalyptus market pulp. The kraft process is followed by oxygen delignification. About 10% of the mill's production goes to making printing and writing papers (38,000 metric tons/year). Virtually all the paper made at Riocell is sold domestically.

The mill was one of the first to use modified continuous cooking (MCC) in its Kamyr digester, Foelkel believes. The digester was specially designed to process paper grades and dissolving grades. So, there is an area for hydrolysis and sections for kraft cooking and high-heat washing. Around 1975, the mill started to cook paper and dissolving grades counter-currently.



A view of the Riocell mill



Bo Fahlin and Celso Foelkel examine printing samples

On several occasions the mill has experimented with extended modified continuous cooking (EMCC). Results with MCC are already so good, with low kappa nos. of 14–16 after the digester for paper grades and kappa nos. 8–10 after oxygen

South America

delignification, that it hasn't yet seemed worth converting to EMCC, Foelkel said. "Besides kappa number reduction, we are evaluating bleachability of both types of pulps," he added.

Riocell uses displacement bleaching technology. A sulfurous acid final washing follows the (DC)ED(EH)D bleaching sequence. The oxygen delignification plant was put into operation in 1990; a chlorine-alkali plant began operation in April 1992.

Emissions are very low. Sulfidity has been reduced to 5% through the use of anthraquinone. AOX is 0.15 kg/t and BOD₅ is 0.35 kg/t.

Riocell is 70% owned by KIV Participações, a holding company formed by Klabin (52%), Iochpe, and Votorantim. The mill itself was originally a Norwegian operation started in 1971 to supply unbleached, unscreened eucalyptus pulp to be bleached in Norway. Other mill projects in Brazil followed, so that industry growth averaged 14% by 1992, with pulp production of 5 million tons/year.



The mill's fourdrinier

Although Brazil is blessed by climate and in having space for industry to grow, there are many problems to contend with, as well. Brazil is far from the main pulp markets and transportation costs are high. Taxes add 37% to the cost of heavy

Beloit Brazil supplies many markets

In the first 10 years since its inauguration in January of 1981, Beloit Industrial Ltda of Campinas, Brazil, built:

- 3 fine paper machines
- 11 tissue machines
- 38 headboxes
- 61 suction rolls
- 24 crown rolls
- 7 barking drums
- 6 chip screens

The company also completed 21 paper machine rebuilds and built various slashers, chippers, and rotating tables.

For the most part, Beloit has gotten out of woodyard equipment manufacturing since going independent from Rauma. Beloit Brazil has more or less specialized in building high-speed tissue machines; three machines, ranging from 112-273 in. at the reel, were under construction at the plant last fall.



TAPPI Study Group views one of 37 CAD workstations

Most recently, drafting tables in the engineering department have been replaced with a CAD system that can link up with other Beloit offices around the world. The plant has also been working toward ISO 9001 certification.



equipment manufactured and sold within Brazil, compared with the cost of the same equipment exported to Mexico.

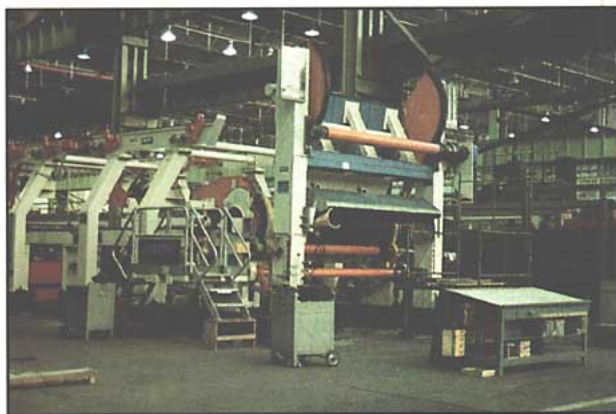
Basic salaries, though much less than in Europe or North America, reflect only a portion of the cost for labor. Since

1988, Brazilian law requires five work shifts, vs. three in Chile. A typical mill employs more people—606 in Riocell's case—and pays additional expenses to the government for education, health, etc. That may figure to 231% more than the base salary. Being a responsible employer, Riocell also pays for services the government neglects to provide. The result is an extra cost of US\$ 30–35 per ton of pulp.

A new concern for the Riocell mill is a move toward placing taxes on the use of natural resources such as water, Foelkel noted. That's prompted the mill to look into going a step beyond tertiary treatment. The "Clean-Rio" process makes use of sand-bed filtration and reverse osmosis. Settling with activated carbon might also work well, he said. Potential reductions could

lower AOX to 0.002 kg/a.d. metric ton, COD to 0.25 kg/a.d. metric ton, and BOD to about 0.1 kg/a.d. metric ton, with 100% color removal, Foelkel said. **FI**

Meadows is editor of Tappi Journal.



Inside Beloit Brazil's manufacturing area

A Brazilian company, Monteiro Aranha, owns 20% of Beloit Brazil, which qualifies it for certain tax advantages as a "national industry." About half the work done at the 240,000-ft² facility is for South American customers. The rest is for mills in the United States, plus Canada, Europe, and even South Africa.



*TAPPI President **Ron Estridge** studies some of Beloit's work.*

The manufacturing area is divided into four bays: a high bay for pre-erection, a general purpose bay, a roll shop, and a separate welding area.

—Donald G. Meadows