



Riocell's Effluent Treatment System:

One of the Most Complete in the World Pulp Industry

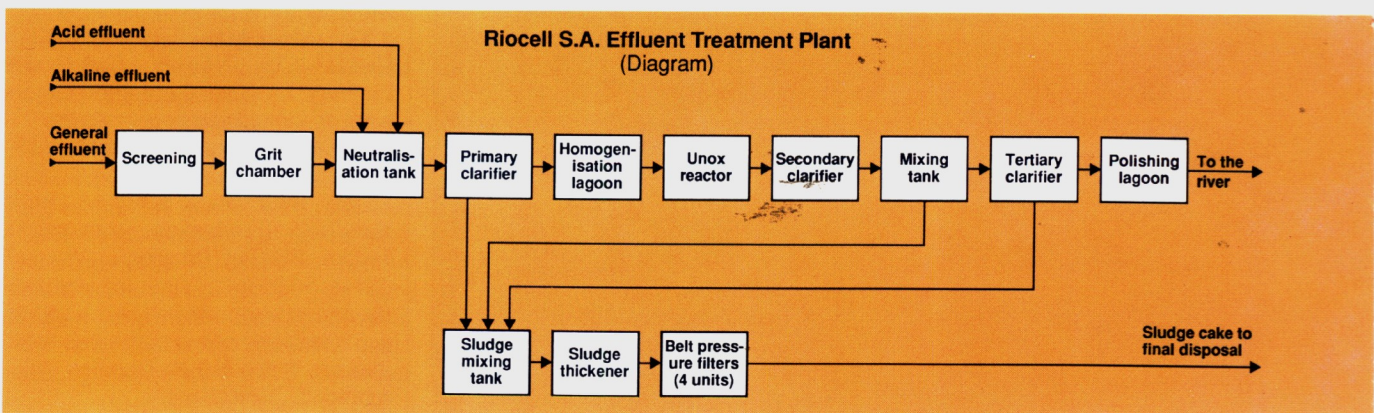
Riocell S.A. (formerly Indústria Celulose Borregaard) is a 16-year-old pulp and paper company located in the state of Rio Grande do Sul, in the southern part of Brazil. The mill was originally designed to produce 720 ADt/d of unbleached kraft pulp or 980 ADt/d of dissolving grade pulp. The wood raw material is 75 % eucalyptus and 25 % acacia. In former days, the unbleached pulp was shipped to Norway to be bleached

there and the bleached market pulp sold mainly to European countries. This eucalyptus market pulp was one of the first introduced in sophisticated markets demanding a high quality.

When the ownership was changed and the links with Norway weakened, a strong urge developed to complete the mill. Nowadays, KIV (Klabin, Iochpe, Votorantin) is the leading owner and BNDESPAR, a state bank still keeps an important shareholding.

The actual daily production is 650 ADt of bleached market pulp, 120 t of printing & writing papers, 160 ADt of unbleached market pulp and 70 ADt of a semi-chemical filler pulp. During dissolving grade runs, the total production drops to 650 ADt/d due to the intrinsic characteristics of the pre-hydrolysis kraft process.

The mill is located near Porto Alegre, a city of 1.2 million inhabi-





tants on the right bank of the *Guaíba river* (pictured) – a kind of ecological heritage of the so-called "gaúcho" people living in the state.

The mill had problems with the environmental authorities and the population before the bleaching project. The company image had been seriously damaged at that time. Thus, special attention was paid to the production process, and the environmental concern became so well-known that today the mill is an example, always remembered when the subject of pollution control is brought up.

The environmental concept is to keep final residues to a minimum, recovering the losses in the mill areas where they are generated. For this, an interesting losses recovery system was installed in 1980. When the bleaching plant started up in 1983, the new waste water treatment plant was ready to receive the effluents,

since it had started operating in 1982. The effluents are treated at a tertiary level using the best available technology, and discharged into the Guaíba river, free from pollution problems.

The effluent treatment system is represented in the flow diagram and briefly described below.

The effluents from the various areas, except the bleaching plant, are collected in underground pipelines and conveyed to the treatment plant by gravity.

The general effluent passes initially through a screening system, a grit chamber, and going finally to a neutralisation tank, which also receives the bleaching effluents. The neutralised effluent is fed to settling units for suspended solids removal. After, it is cooled in heat exchangers to 37-38°C. If abnormal conditions occur, the effluent is sent to an emergency lagoon, and later it is gradually put back into the system. The effluent is then ho-

mogenised in a lagoon with surface aerators and finally pumped to the Unox reactor and secondary clarifiers. The Unox system is an activated sludge system based on the use of oxygen to promote a more effective microorganism growth and action.

The biologically treated effluent is then sent to the tertiary treatment for colour removal, which is achieved by flocculation with aluminum sulphate addition followed by sedimentation. Finally the effluent is neutralised with lime, goes to a polishing lagoon and is then discharged into the Guaíba river through diffusers.

Primary, secondary and tertiary sludge are thickened and dewatered in belt pressure filters.

Since the early days up to now, the company has invested USD 45 million at the mill site in environmental protection systems, 60 % of this being in waste water treatment facilities. The effluent plant required a capital expenditure of USD 20 million and the operational cost is USD 200/1000 m³. The average flow per day is 35 000 m³.

An important research programme to convert the sludge and other mill residues (grits, dregs, fly-ash, etc.) into organic fertiliser is under way. This fertiliser will supply part of the chemical nutrients to the 40 000 ha of forest owned by the company.

*Celso Foelkel,
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The treatment system's overall efficiency is shown in the following:

- BOD ₅	%	98 - 99
- COD removal	%	91
- Suspended solids removal	%	97
- Colour removal	%	90

Treated effluents characteristics are:

- Specific organic load	
kg BOD ₅ /ADt	0,2 - 0,3
kg COD/ADt	5,0 - 5,5
- Suspended solids specific load	
kg SS/ADt	0,4 - 0,5
- Colour specific load	
kg PtCo/ADt	19 - 20.

