MARYVALE: A GIANT AMONG AUSTRALIA'S PAPER PRODUCERS

DONALD G. MEADOWS

The Maryvale mill

TWO THINGS STAND OUT IN AND AROUND MORWELL, near the pivot point of Victoria. One is the Loy Yang mine and power station, where giant excavators expose seams of brown coal to the open air and plumes of steam rise high above the electrical generators. The other is Australian Paper's Maryvale mill, the country's largest pulp- and paper-making complex.

Thanks to Jeff Landels, Maryvale's general manager, and Alan Eagle, environmental manager, for their help in preparing this article.

NEW PAPER MACHINE WILL ADD TO RECENT IMPROVEMENTS AT GIPPSLAND MILL.

Since it began producing paper in 1940, the complex has grown to include three pulp mills and four paper-making machines, with construction of a fifth machine just starting. The mill operates 24 hours a day, 363 days a

Source	Eucalypt	Pine (from plantations)
State plantations	46,000 m^3 (6%)	81,000 m^3 (12%)
State forests	495,500 m^3 (65%)	0
Private property	50,000 m^3 (7%)	31,000 m^3 (5%)
Amcor plantations	50,000 m^3 (7%)	438,000 m^3 (66%)
Sawmill chips	125,000 m^3 (15%)	116,000 m^3 (17%)
Total:	**766,500 m^3**	**666,000 m^3**

I.Maryvale's pulpwood sources and annual consumption— 1995–1996

year, with 12 shifts producing about 410,000 metric tons of paper per year and nearly an equal amount of salable pulp. Among the main grades produced at Maryvale are kraft linerboard, corrugating medium, copy paper, security paper, and brown bag paper.

Australian Paper, part of the Amcor Paper Group, was formed in 1993 through the merger of Australian Paper Manufacturers (APM) and Associated Pulp and Paper Mills (APPM).Along with the Maryvale mill, AP operates several mills throughout Australia, including the Burnie mill in Tasmania (see the September *TAPPI JOURNAL*, p. 67).

In March, Amcor announced plans to spend A$ 330 million (about US$ 261 million) to expand and upgrade the Maryvale mill.The program includes a US$ 50-million order with Beloit Walmsley for a new fine paper machine and fiber preparation equipment, according to Beloit. Construction was planned to begin this month (October 1996). The machine is expected to begin producing 160,000 metric tons of fine paper in late 1998.

Maryvale will use the 7700-mm-wide machine primarily to produce high-quality offset printing paper (60–100 g/m^2) and copier paper (80 g/m^2). "Key elements of the new machine include a Concept IV-MH headbox with consistency profiling,a Bel Bond High Capacity Former, a Bi Nip Press with third press, and Bel Champ drying in all predrying sections," Beloit reported. The order also includes a metering size press,calender and reel,plus stock and broke refiners for the fiber-preparation area.

Amcor has been Australia's only white paper manufacturer. Its mills produce about 350,000 tons/year, enough to supply about one-third of domestic demand. The new machine,part of an overall A$ 400 million (US$ 316 million) fine-paper expansion program,should allow Amcor to grab an even greater share of the domestic market for white paper.

Australian Paper also claims to be the country's largest recycler of paper in the grades suitable for its mills, though Maryvale is predominantly a virgin fiber mill.

PULPING

Maryvale uses various combinations of eucalypt, pine, and recycled fibers for its pulp. The pulp is processed through either a kraft or neutral sulfite semichemical (NSSC) process.Only the hardwood pulp gets bleached. The mill has the potential to produce 170,000 metric tons/year of pine kraft pulp,160,000 metric tons/year of eucalypt kraft pulp, and 105,000 metric tons/year of NSSC pulp.

Maryvale was the first mill anywhere to successfully kraft pulp eucalypt wood on a commercial basis. About 80% of the mill's eucalypt pulpwood is sawmill residue and low-quality wood from state forests; the rest comes from Amcor plantations (see Table I).Harvesting is conducted in accordance with a legislated Code of Practice. Pine pulpwood comes from company and state plantations. AP's 51,000 hectares of pine and eucalypt plantations have largely been established on marginal and degraded farmland.

Over the past 12–15 years, extensive research on *Pinus radiata* plantations has revealed much about how growing conditions affect pulp quality. The information has allowed foresters to predict the tear strength of pulp from specific trees, even before those trees are cut. Oddly enough, fertile soil tends to produce trees with less tear strength, he said. Slow growth and high stress actually yield better-quality fiber.

Many eucalypt species in Australia have very fibrous bark.It tends to "shrink-wrap"to the cut logs within a day or two, so loggers try to debark the logs at the harvest site as soon as possible. The stripped bark is left in the forest, where it helps elevate the nutrient content of native soils.

Maryvale uses 13 different species of eucalypt. Logs brought to the mill are sorted first by where they grew—in the mountains or the foothills—and then by the assessed age of the stand.

The pine pulp mill was built in the early 1980s. Following a recent screen room upgrade, it can now produce about 600 tons of pulp per day. The fiber line is made up of a two-vessel Kamyr liquid phase digester with high-heat washing, followed by in-line refining, a diffuser washer, screening, and final washing. To make paper, the pine pulp is refined separately and then mixed with eucalypt pulp or recycled paper in controlled proportions,depending on the type of paper being made.

Paper machine No. 4

The Loy Yang power station

The control room

Kraft eucalypt pulp is produced in eight small batch digesters, and most of the output is bleached. The bleach plant, built in 1973,could originally produce 300 a.d.metric tons/day. It has been upgraded to 500 a.d.metric tons/day, but is now washer limited. Target brightness is 88%.

Maryvale uses a (PO,C+D)(EOP)(D) bleaching sequence.There is no intermediate washing between the initial "minioxygen stage"and the chlorination stage. The "mini-O"stage was introduced to compensate for the removal of the final calcium hypochlorite stage in the original sequence. It involves just a few minutes' residence time in the pipeline before storage.As a result,the pulp is very alkaline (about 10.5 pH) as it enters the chlorination mixer. It's also relatively hot (60°C).Despite that,the mill experiences no significant loss of quality across the sequence.

The chlorine dioxide plant operates to capacity, which limits substitution in the first stage to about 30%.

The NSSC batch pulp mill at Maryvale dates back to the mid-1960s.It pulps eucalypt in a Kamyr liquid phase digester equipped with blowline refining.

About 90% of the pulp produced at Maryvale is used at Maryvale.What's left is transported to the group's Fair-

field mill or the Shoalhaven mill. Some even goes to Burnie in Tasmania.

THE PAPER MACHINES

The No.1 paper machine dates back to the mill's beginnings.It was commissioned in 1940 and later upgraded so that it now produces about 65,000 metric tons/year. The machine is used for sack kraft, manila board, bleached base stock for cups,and kraft liner.

The No. 2 paper machine was commissioned in 1956 and has a capacity of about 28,000 metric tons/year. Along with machine-finish (MF) bleached

The pulp mill

interleaving paper and recycle bag paper, PM 2 produces a variety of machine-glazed (MG) papers:kraft; bleached fax base; bleached waxing kraft;insulation base;bag kraft (unbleached, bleached, and high wet strength); processing kraft;and sack kraft (HWS).

The No. 3 paper machine came online in 1972 and was upgraded 10 years ago to produce business papers. Its annual production capacity is about 100,000 metric tons of paper trimmed to a width of 5.1 m. In recent years the mill has worked toward producing copy paper from 100% eucalypt kraft pulp using alkaline sizing on the paper machine and ground calcium carbonate as filler. The machine is equipped with a top wire former. It has two single-nip presses followed by a third press. A Bailey 90 network is used to control the process.

The No.4 paper machine was commissioned in 1977. Full capacity is 225,000 metric tons/year of high-strength kraft liner and semichemical corrugating papers. A new top former was installed on the machine in March,along with a Valmet distributed network control system as part of a A$ 70-million (US$ 55 million) upgrade.

Further improvements included a recovered paper cleaning plant to allow an increase in recycled fiber content in the sheets.Up to this point,the machine had been using virgin fiber for liners.It had,in fact,been the dominant virgin fiber source going into the Australian market,

Shipping containers being loaded

with most other machines using recycled fiber for liner and corrugated grades.

Several other capital improvement projects were completed at the mill in early 1993. Those included a rebuild of recovery boiler No.5,a blow tank rebuild,and an upgrade of PM 3. The boiler rebuild involved some innovative construction techniques.Large sections of the new boiler were prefabricated offsite.The sections were transported to the mill, lowered in place, and welded together. Sections of tubing were also joined during the process. The paper machine upgrade included installation of a Pemco wrapping line, a Voith "Speed Sizer," Valmet CD and grammage control equipment, and an upgrade of the Bailey control system.The new film-applicator size press gives a drier sheet that permits faster running speeds.The three projects were completed on time or ahead of schedule,at or below budget.

Up until February of this year, Maryvale operated its own rail link to a siding 8 km from the mill.The change came about in part because of recent conversions from broad gauge rails—as used at Maryvale—to narrow gauge

Bark is sold as garden mulch.

by national rail services. In response, the mill switched to a rail container system for goods transport. It built a rail container terminal that is linked by computer to transport and rail services and to AP's own order tracking system.

During World War II, steam engines were hooked up to PM 1 for power. Now the mill is between 70–80% power self-sufficient. Four turbines generate about 40 MW of electrical power as they step down steam pressure used in making paper. It draws about 10 MW from the national electrical grid for its power requirements. The mill is looking at cogeneration options, as well.

COMMUNITY RELATIONS

Maryvale's paper mill has been certified to ISO 9002 standards (AS 3902) since 1993 through Standards Australia. The pulp mill was certified in June of 1995. The company's concern for quality is also reflected in its employee work structure. Continuous Improvement Teams find ways to improve processes and reduce costs. They also serve to improve communications and cooperation between work groups. Occupational Health and Safety Committees at the mill emphasize the individual employee's responsibility for personal safety as well as cooperative efforts to maintain high safety standards.

Some of the mill's 900 employees have also formed a novel community relations group. The Maryvale "A" Team serves as volunteer advocates for the mill and the pulp and paper industry. In general, they try to provide balanced information to the community and lobby the government on issues that may affect jobs at the mill. **TJ**

Meadows is editor of TAPPI JOURNAL.

Black swans at home in the mill's settling ponds

Alan Eagle, environmental manager

AUSTRALIAN MILLS FACE NEW ENVIRONMENTAL TARGETS

DONALD G. MEADOWS

The sort of community involvement and lobbying effort employees have undertaken at Australian Paper's Maryvale mill may have helped six or seven years ago when two other companies were hoping to build a large kraft mill at Wesley Vale in Tasmania. The project eventually died because of environmental concerns and public opposition to the way in which planning had been handled.

That experience also led to the Australian government developing "Environmental guidelines for new bleached eucalypt kraft pulp mills." Those guidelines, issued in 1995, will be the benchmark existing mills will need to aim for over the next five years. The guidelines are an update from 1989, based in part on new technical information obtained through the National Pulp Mills Research Program.

Key elements of the guidelines are emission limits, solid waste disposal guidelines, site suitability criteria, and monitoring (see **Table I**). The organochlorines coming from eucalypts are reportedly a little different from those associated with other species. They break down fairly readily, so they pose less of a concern in Australia. "Greenhouse" gases, however, and ozone-depleting chemicals are perhaps more of a concern. **TJ**

1995 ENVIRONMENTAL GUIDELINES

Atmospheric	Limit
Opacity	
Kraft mill recovery furnace	35%
Other furnaces	20%
Rotary lime kiln	10%
Other lime kilns	20%
Particulates	
Recovery furnace @ 12% CO_2	100 mg/m^3
Lime kiln @ 10% O_2	100 mg/m^3
Power boiler @ 12% CO_2	100 mg/m^3
Sulfuric acid mist/sulfur trioxide	200 mg/m^3 (all sources)
Total reduced sulfur (TRS) as H_2S	
Recovery furnace @ 8% O_2	5 mg/m^3 (12-h moving avg.)
Lime kiln @ 10% O_2	10 mg/m^3 (12-h moving avg.)
Oxides of nitrogen (NO_x)	
All sources @ 7% O_2	500 mg/m^3
Hydrogen chloride	400 mg/m^3 (all sources)
Chlorine/chlorine compounds	
per test, as chlorine	200 mg/m^3 (all sources)

(Test method: U.S. Code of Federal Regulations, Title 40, Protection of the Environment—Part 60/Appendix A or equivalent.)

Receiving waters	Limit
Total suspended solids (TSS)	8.0 kg/a.d. ton (24-h composite)
Biochemical oxygen demand (BOD5)	6.0 kg/a.d. ton (1-day max.)
Chemical oxygen demand (COD)	35.7 kg/a.d. ton (1-day max.)
	25.4 kg/a.d. ton (monthly avg.)
Organochlorines (AOX)	1.5 kg/a.d. ton (per test)
	0.3 kg/a.d. ton (yearly moving average)
Dioxins	
In effluents (2,3,7,8-TCDD)	15 ppq
In crustacean hepatopancreas	5 ppt (total toxic equivalents)
Oil and grease	No visible contamination (daily sample)

I. Emission limits for Australian bleached eucalypt kraft mills