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Department of Conservation
and Land Management

Wood Utilisation Research Centre

DRYING OF VALWOOD® BOARDS IN A VENEER DRYER

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March 1991
W.U.R.C. Technical Report No. 25

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SUMMARY

A commercial veneer dryer was used to dry 11 mm thick boards from four different species - jarrah (*Eucalyptus marginata* Donn ex Sm.), karri (*E. diversicolor* F. Muell.), marri (*E. calophylla* R. Br. ex Lindl.) and Tasmanian blue gum (*E. globulus* Labill. subsp. *globulus*). Two different drying schedules were assessed in drying to fibre saturation point (f.s.p.). Continuous passes of 7 min each resulted in unacceptable degrade by checking, after three passes. However, allowing a 30 min cooling period between passes resulted in only limited checking in drying to f.s.p. Marri was the first species to reach the estimated target weight required for f.s.p., followed by Tasmanian blue gum, jarrah and karri. Subsequent dressing and docking after drying to final moisture content of 8 per cent revealed unacceptable internal checking and discolouration.

INTRODUCTION

VALWOOD®is the registered name of a process and the products from the process, developed at the Department of Conservation and Land Management's Wood Utilisation Research Centre (W.U.R.C.). The process was developed for small diameter (150 mm minimum diameter under bark) and short (900 mm minimum length) logs from managed regrowth eucalypt (*Eucalyptus* spp. L'Herit.) forests, and can be applied to other species. The logs are converted into thin boards dried to below 8 per cent moisture content and then dressed. Edge- and face-laminated dimensioned panels are made from these boards for subsequent manufacturing into high value furniture, craft wood, or structural products.

Development of the process at the W.U.R.C. confirmed that conventional drying of thin boards in bundles using strip sticks between layers of boards to permit air circulation was very labour intensive, and a more efficient method was needed.

A previous study had shown that VALWOOD® boards from jarrah (*E. marginata* Donn ex Sm.) could be dried to below fibre saturation point (f.s.p.) in ten days in ambient summer conditions, with little degrade occurring due to drying (Mathews - unpublished data). These results suggested that an alternative was a continuous drying system which could improve production efficiency and achieve acceptable drying to below the 8 per cent minimum moisture content level recommended for glue-laminated joints (Newby 1991).

In this pilot study, a commercial veneer dryer was used to dry boards from four different eucalypt species. Two drying schedules were assessed in drying to below f.s.p. in the shortest possible time, without causing degrade which would reduce the quality of the end product.

METHODS

Board Preparation

Approximately 20 boards were prepared from logs of each of four species of regrowth eucalypts:

Jarrah
Karri (*E. diversicolor* F. Muell.)
Marri (*E. calophylla* R. Br. ex Lindl.)
Tasmanian blue gum (*E. globulus* Labill. subsp. *globulus*).

Logs previously stored in water spray stockpiles were live sawn (sap-to-sap) to 11 mm thickness, which was the maximum capable of being fed into the commercial veneer dryer made available for the trial.

Initial moisture contents were estimated from one board from each species using the oven-dried method (Standards Association of Australia 1972). The residual sample boards were then weighed to allow calculation of drying rate at any subsequent time.

All boards were block stacked into separate bundles for each species, then wrapped in plastic to prevent excessive drying during transportation to the drying facilities.

Drying

A commercial veneer dryer and staff were made available by a major timber producer. The dryer was operated at 150-170°C, with feed control settings at the slowest speed. The first schedule used 32 jarrah boards fed manually into the dryer for a planned 10 consecutive cycles of approximately seven minutes each.

The second schedule (using10 boards from each of the four species) included a cooling period of up to 30 minutes at the end of each cycle. The boards were strip stacked to permit air circulation for cooling and further drying between each cycle in this schedule.

Prior to each cycle in both schedules, residual sample boards were reweighed to

Prior to each cycle in both schedules, residual sample boards were reweighed to monitor the drying progress.

The drying cycles extended over a two day shift period, completing five cycles on the first day. After overnight cooling, drying cycles were resumed with sample boards being withdrawn as the moisture contents approached the calculated f.s.p. target weights, and of four cycles were completed on the second day.

At the completion of the veneer drying trials the boards were block stacked, plastic wrapped and transported back to the W.U.R.C. for further monitoring, final drying and evaluation.

RESULTS AND DISCUSSION

Results of the first drying schedule (involving 10 continuous passes of the 32 jarrah boards) were discouraging. Degrade in the form of serious surface and end checking was observed in 53 per cent of the dried boards, occurring mostly in predominantly backsawn boards. Some checking and severe collapse was observed on boards after the second cycle, indicating that the drying conditions were too severe.

Results of the second schedule, in which 10 boards from each of the four species were dried with a cooling period of up to 30 minutes between passes, were more promising. Inspection of the boards showed only limited surface checking.

Weighing of the residual sample boards provided a guide to the progressive moisture loss during drying. Results of the calculated moisture content of one sample board from each species showed that the first species to reach the calculated target weights for f.s.p. was marri, followed in order by Tasmanian blue gum, jarrah, and karri (Fig. 1). This result indicated that the species with higher initial moisture contents dried faster than those with lower initial moisture levels.

The drying curves (Fig. 1) for the four species are typical of other hardwood drying research trials where initial drying is rapid and slows as fibre saturation point is approached. Progressively less moisture was extracted with each cycle of drying and cooling.

Comparing the moisture losses confirmed the variable drying rates between species, and demonstrated the slowing of drying rates as f.s.p. is approached. The veneer drying system could be adapted for the VALWOOD® process if it is capable of uniformly drying to the recommended 6-8 per cent moisture content which is necessary for stability of laminated panels (Newby 1991).

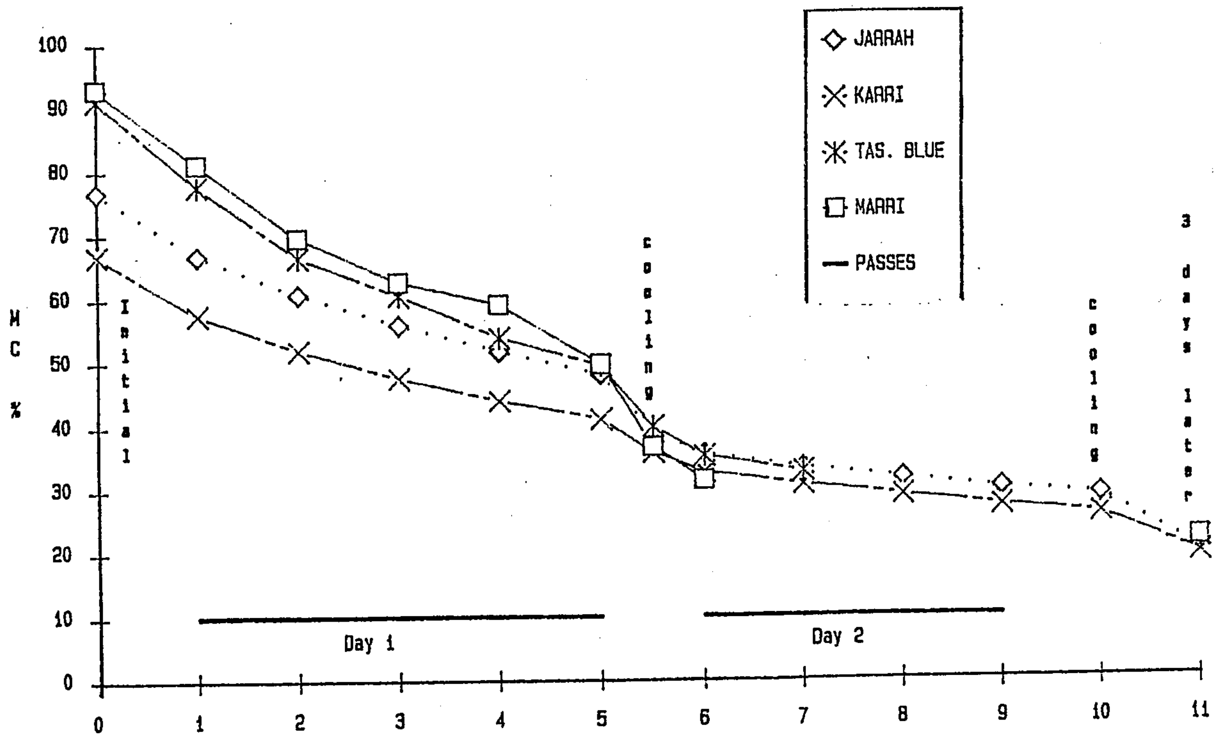

Figure 1

Drying curves of 11 mm thick sample boards of four different regrowth species dried in a commercial veneer dryer

Extrapolating the drying curve towards the 6-8 per cent range indicates a substantially increased number of cycles would be required. This aspect alone indicated that the schedules used in this trial are impracticable for a commercial VALWOOD® process.

The 11 mm boards dried to f.s.p. in this trial were dried to 8 per cent M.C., but subsequent dressing and docking revealed unacceptable degrade in the form of internal checking and patchy discolouration, although this method of drying is not detrimental for drying veneers of up to 1.5 mm with two passes. Jarrah, the most desirable species, was particularly affected. The karri had cupping and severe surface checks, the Tasmanian blue gum had some surface checks, collapse and internal checking, and marri had only minor surface checking.

Wood temperatures during drying probably exceeded 90°C before f.s.p. was reached, causing cell collapse which resulted in surface and internal checking, and leaching of extractives which resulted in the patchy discolouration. The drying extremes experienced in a veneer dryer system would therefore appear inappropriate for drying VALWOOD® boards in the thicknesses required.

The Department of CALM's experience with drying conventional thicknesses of solid wood for furniture indicates that regrowth timber is more likely to degrade than mature timber. In addition, research results indicate that as the thickness of regrowth timber is doubled, the drying time is approximately quadrupled, even with optimum schedules.

Results from the present trial suggested that a schedule with a compromise between the slower, more labour-intensive conventional drying systems, and the faster, more efficient continuous veneer dryer system, is the best current option for drying boards for the VALWOOD® process.

ACKNOWLEDGEMENTS

The author thanks Mr J. Ferguson of Bunnings Forest Products Pty Ltd for the use of the veneer dryer, and the staff of the veneer production section at Welshpool for their assistance.

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