Timber Advisory Notes

Department of Conservation and Land Management

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UTILISATION OF *Pinus pinaster*

Introduction

The maritime pine (*Pinus pinaster*) occurs naturally in a range of geographic areas or provenances around the Mediterranean Sea. For this reason it was recognised as early as 1916 that the species had potential in Western Australia, with its Mediterranean climate. A paper by Hopkins and Butcher in the first edition of the CALMScience Journal in December 1993 gives a detailed description of the geographic races. However, for the purposes of this Information Sheet it is sufficient to discuss the major areas which provided the seed sources for the *P. pinaster* grown in Western Australia i.e. the Landes provenance from South-west France and the Leirian material from Portugal.

The Forests Department had carried out an extensive tree-breeding program with the species, and had achieved considerable improvements in the quality of the trees being planted. This program was supplemented by intensive silvicultural treatments which have further improved wood quality. Most of the *P. pinaster* forests have been grown at wide spacing to reduce the amount of water used by the trees on one of Perth's main water supplies, the Gnangara Mound. Consequently, with the additional space available to each tree, branches can grow unacceptably large unless the trees are pruned. An extensive pruning program was therefore carried out since the 1960s to improve the wood quality because large branches produce large knots in the sawn timber. Clear wood is produced by the trees after pruning, and therefore wood quality is improved.

The Department of CALM continued this research from its formation in 1985. The pedigreed *P. pinaster* is now available for planting of private areas as well as in Departmental plantations, and is particularly suitable for the areas north of Perth with their low rainfall and comparatively poor soils. The area planted to *P. pinaster* is approximately 27 500 ha, and in 1994 about 800 ha were established.

This Information Sheet is intended to provide information on the wood properties of the species, and on past, current and potential future uses.

Physical and Mechanical Properties

Early CSIRO research on the shrinkage and density of Western Australian-grown *P pinaster* estimated air-dry density of about 595 kg/m^3, compared with 485 to 590 kg/m^3 for *P. radiata*. A 1982 assessment of density and mechanical properties of the species in Western Australia reported mean air-dry density of 560 kg/m^3 (range 475 to 650 kg/m^3) over a range of provenances, with trees ranging from 15 to 44-years-old.

The strength properties of seasoned timber of Western Australian-grown *P. pinaster* in the above study (including the 15-year-old trees) are given in the Table below, with the comparable figures for *P. radiata* (minimum age 25 years), and jarrah (*E. marginata*). With timber from similarly aged trees, *P. pinaster* should have an advantage. The mean figures are used as the basis for stress-grading.

Species	Modulus of Rupture (MPa)	Modulus of Elasticity (MPa)	Maximum Crushing Strength (MPa)
P. pinaster (25 yrs+)	95.5	14 800	54.0
P. pinaster (15 yrs)	73.0	9 300	38.2
P. pinaster(Mean)	82.6	11 680	45.1
P. radiata	87.0	11 480	48.3
E. marginata	112	12 970	61.0

CSIRO reported mean tangential shrinkage of 5.0 per cent, and mean radial shrinkage of 3.0 per cent for *P. pinaster.*

Sawmilling

Previous sawmilling was based on the older resource from unselected seed sources, and consequently it was of lower quality than the pedigreed resource, improved by tree-breeding, which is now available. Sawmillers working with logs from the older *P. pinaster* trees commented that lower feed speeds through the saw were necessary than used for *P radiata*, because *P. pinaster* had higher density timber which was more abrasive on saws. Dead knots in *P. pinaster* had caused problems, and recoveries were slightly lower because more docking of defects was required. In addition, the slightly more yellow timber of *P. pinaster* was considered less desirable than the whiter timber of *P. radiata*, and because of the above reasons costs were therefore slightly higher for milling *P. pinaster.*

The major problem with the old growth logs was the high proportion of bark-encased knots because of inadequate pruning, and regular occurrences of resin veins and pockets. With structural grades, the higher resin content of *P. pinaster* compared with *P. radiata* has not been a problem, and it was appearance grades that were affected.

The timber resource that is currently available is of considerably higher quality. For example, only pedigreed *P pinaster* has been planted since 1974, and as discussed previously, the extensive pruning program and other silvicultural treatments since the early 1960s have resulted in improved wood quality. The limited sawmilling to date of this pedigreed resource has confirmed the improved quality.

In 1995/6, 37 000 m^3 of *P. pinaster* sawlogs were harvested from State plantations, as well as 2600 m^3 of pine rounds for preservative treatment and 89 000 m^3 of industrial wood logs.

Timber Drying

The Department has assessed high temperature drying of *P. pinaster*, and found that the species behaves similarly to *P. radiata* when using standard pine drying schedules in high temperature kilns. High temperature drying means that the kiln is operating at more than 100^{0}C.

Any sawn timber that was to be air-dried would need to be dipped in anti-sapstain chemicals such as 'Hylite' or Koppers' 'NP1' to prevent sapstaining. However, air-drying is not generally recommended because heart-in timber i.e. within 50 mm of the pith, is susceptible to twist when dried slowly

Grading of Structural Timber

Strength testing of W.A.-grown *P. pinaster* resulted in a strength group of SD6 being allocated for seasoned timber of the species. This strength group is the same as that for *P. radiata*, because the average values for *P. pinaster* were reduced by including a high proportion of young trees. The data indicated that P. pinaster would be stronger than P. radiata of the same age. However, there are definite practical advantages in visually stress grading the two species together. This would be done using AS 2858-1986 'Timber - Softwood - Visually stress-graded for structural purposes'.

Until the last few years, milling structural timber was the major use of *P. pinaster*. Visual stress grading would not give *P. pinaster* any advantage over *P. radiata*, because both species have the same strength group, and the same size limits for defects apply for a particular stress grade. Proof grading or mechanical stress grading should result in a larger proportion of higher stress grade timber from *P. pinaster* when similar aged material is graded. In recent years there has been a trend to in-grade testing, as described in AS/NZ 4063-1992, published by Standards Australia. Briefly, the strength properties of a particular population within the species are assessed, and used to develop suitable grading criteria. However, an extensive testing program would be required to establish rules for *P. pinaster*.

Other Sawn Timber

The species has been used for mining timber in Europe and North Africa, but has little potential for this purpose in Australia.

In South Australia, top or crown logs of *P. pinaster* have been sawn for lining boards. While tight intergrown knots were the general rule, there is the possibility of them checking slightly. The heavy branches at the base of the green crown were considered a problem by South Australian sawmillers. Mouldings would be a limited market, because of the lower hardness of pines compared with hardwood species, and the need to finger-joint. Flooring timbers could be produced which would be suitable with floor coverings provided that the knots were tight, and *P. pinaster* would be harder than *P. radiata*.

Manufacture of pallets is an alternative use, and as the packaging market is growing, *P. pinaster* has considerable potential.

In furniture manufacture, although there had been some comment about reduced screwholding ability in pieces with high resin content, there would be no problems with the clear wood produced after trees were pruned. This defect-free material should have an advantage in strength over *P. radiata* of the same age and ring width.

Preservation

The South African experience has been that *P. pinaster* is easier to treat with waterborne preservatives such as copper-chrome-arsenic (CCA), or with oilborne preservatives such as creosote, than is *P. radiata.*

Panel Products

The major use of residue material is now as medium density fibreboard (MDF), which is manufactured by Wesfi at its Kewdale plant.

Pruned logs are definitely suitable for appearance grades of plywood or similar products. Structural plywood usage is increasing, and the occasional bark-encased knots such as occurred in the Landes resource of *P. pinaster* becomes less important than in appearance grades of plywood.

Particleboard from *P. pinaster* logs is a higher strength, higher density product than that produced from *P. radiata.* The Wesfi plant at Dardanup has made specific requests for *P. pinaster* at times, generally to provide for the export market. The two pine species are kept separate in the manufacturing process.

Poles

The major testing of strength properties of *P. pinaster* poles was in South Africa. The SEC has tested a small sample locally, but extensive testing would be required to provide data for design stress calculation. The species can be easily preservative-treated, usually with copper-chrome-arsenic (CCA), and would be less susceptible to attack by soft rot or higher fungi than hardwoods are. The taper of the stem tends to be small, which could be a disadvantage from the aesthetic viewpoint.

Sleepers

The South African experience was that treated pine sleepers performed better than treated hardwood, including jarrah. *P. pinaster* was considered to give better results than *P. radiata,* because of more effective treatment with more sapwood and better penetration by preservatives.

Two piece dowelled sleepers of *P. pinaster, P. radiata* and jarrah regrowth, treated with furnace oil/creosote, were tested in the early 1980s in a joint Westrail/Forests Department trial, and gave good results. Dowelling has been used successfully in North America.

Although sleepers of *P. radiata* pressure-treated with creosote/furnace oil have performed well in South Australia and Victoria, it is presumed that there is limited scope for treated pine sleepers with the increasing use of concrete sleepers.

Pulp and Paper

P. pinaster has been shown to have satisfactory pulping characteristics. For example, the species has been used extensively as pulpwood for manufacturing kraft paper in the Landes area of France. In Australia, pulping trials of South Australian grown *P. pinaster* and *P. radiata* showed that both species produced satisfactory pulps, with *P. pinaster* producing inferior pulp except in the neutral sulphite semi-chemical process. Future shortages of long-fibred pulp have been forecast in the overall world supply, but it is unlikely that Western Australia could produce the quantities required as well as the volume required for MDF and glue-laminated products.

Residues

The species has been widely used for energy production, including charcoal. Production of naval stores, including resin and turpentine, have been traditional uses in the natural distribution in Europe, but this type of use is unlikely in Western Australia. The bark has been used for horticultural purposes.

Summary

In general, *P. pinaster* is a very satisfactory species for general utilisation, particularly for MDF and structural use. It is essential that the local industry is aware of the significant differences between old growth *P. pinaster* (Landes and Leirian provenances) and the pedigreed material which is given superior silvicultural treatment and will provide the future resource. Mechanical grading of *P. pinaster* should give it an advantage over *P. radiata.*

Softwood poles are an option for the future, because of the problems of fungal attack in hardwoods. New preservatives may be developed which will reduce the incidence of fungal attack in hardwoods, but the hardwood pole resource is dwindling. Softwood poles are easy to treat with preservative.

The use of *P. pinaster* for panel products has continued to increase, and MDF presumably being the major product.

General reading

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