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Wood based composites using sawmill waste

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Overview

- Background
- Significance
- Objectives
- Materials and Methodology
- Developed Product – Advantages and Problems
- Summary and Conclusions
- Current Research

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Background

- Particleboards are generally made using custom flaked softwood

Applications

- Furniture
- Kitchen and bathroom cabinets
- Floor boards
- Mobile home decking

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Background cont...

- Particleboard is a well established product and > 60% of total consumption of wood panels.
- World wide demand for particleboard is growing at 3-5% per annum.

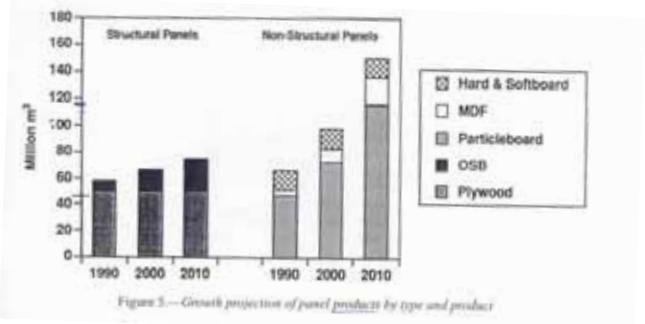

Figure 5 — Growth projection of panel products by type and product

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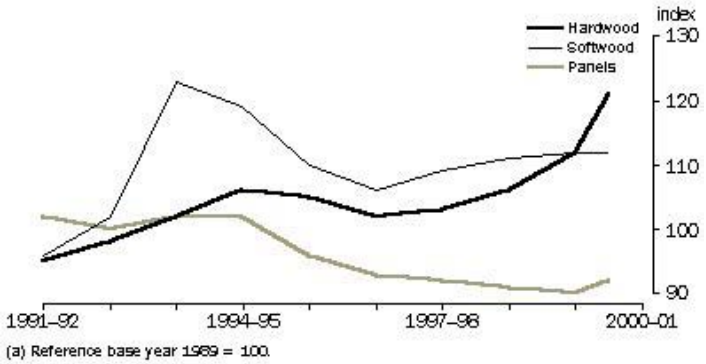
Background cont...

Structural wood prices in Australia

20.23 STRUCTURAL WOOD PRICES, Price indexes(a)



(a) Reference base year 1989 = 100.

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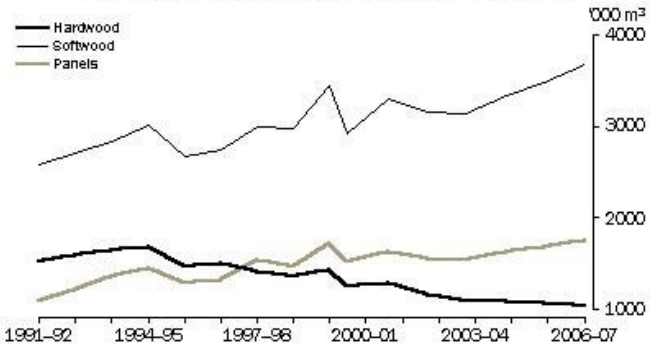
Background cont...

Structural wood consumption in Australia

20.24 STRUCTURAL WOOD CONSUMPTION, Past and projected



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Significance

- Ever decreasing forest and environmental factors significantly influence the need for alternative raw materials for particleboard industry.
- Saw mills in Victoria, Australia, annually produce more than 200, 000 tones of sawdust which has almost zero dollar value as it is.
- Hardwood sawmill residue have not been investigated as a particleboard raw material due to its high density characteristics.

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Objectives

- To develop a new knowledge of the properties of hardwood saw mill residues, processing and service conditions required to utilize them to produce an economically viable product .
- To develop an understanding of effects of process variables ,material variables, and target density on the mechanical properties of a particleboard.

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Expectations

To meet AS/NZS 4266 standard for particleboards

REQUIREMENTS FOR SPECIFIED PHYSICAL AND MECHANICAL PROPERTIES FOR STD GENERAL-PURPOSE PARTICLEBOARDS

Property	Test method AS/NZS	Unit	Nominal thickness range (mm)				
			>5 to 8	>8 to12	>12 to 22	>22 to 33	>33
Bending strength (MOR)	4266.5	MPa	15	13	12	10	9
Internal bond	4266.6	MPa	0.45	0.35	0.3	0.25	0.2
24 h thickness swell	4266.8	%	30	25	20	18	18

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				>5 to 8	>8 to 12	>12 to 22	>22 to 33	>33
Bending strength (MOR)		4266.5	Mpa	15	13	12	10	9
Internal bond		4266.6	Mpa	0.45	0.35	0.3	0.25	0.2
Surface soundness		4266.7	Mpa	—	0,9	0,9	0,9	0,9
24 h thickness swell		4266.8	%	20	18	15	12	12
Option 1	Bending strength after immersion in water at 70°C	4266.10 Method A	Mpa	6	5	4,5	4	3,5
Option 2	Internal bond after cyclic test	4266.11	Mpa	0.28	0.25	0.22	0.18	0.15
	Thickness swell after cyclic test		%	30	17	13	11	9

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Materials and Methodology

Step 1

Step 2

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Materials and Methodology cont..

Molding

Step 3

Cold and Hot Pressing

Step 4

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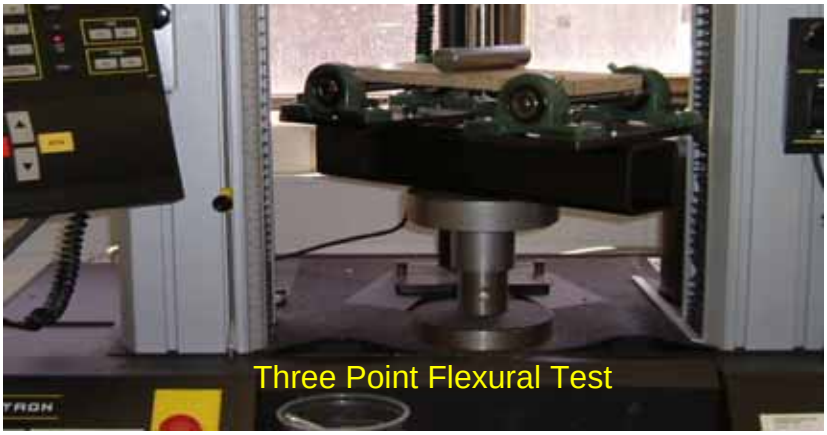
Testing for strength properties



Three Point Flexural Test

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Developed Product - Advantages

- A board product which utilises 100% saw mill residue and complies with AS/NZ standards has been developed.
- The product offers significant environmental benefits to both community and the manufacturers of particleboard.
  - Reduced solid wastes.
  - Replacing a part of softwood flake by sawmill residue.
  - New market for saw mill residue.
  - Cheaper raw material for particleboard industry.

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Developed Product - Problems

- The Resin requirement in the developed product is about 10% higher than that used by softwood board industry.
- The density of the hardwood boards are about 10% higher than that of softwood boards.

Is the obvious and significant environmental benefit sufficient to convince industry to accept this product ?

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Summary and Conclusions

- The method for particleboard production using hardwood sawmill residues is established.
- Significant process variables with respect to board mechanical properties are found.
- Hardwood particleboard can be used as standard general purpose particleboard
  - Ex: Interior furniture, cabinet and shelves

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Current Research

Research is continuing at RMIT to optimise the resin load by mixing custom flaked softwood material with the sawmill waste.

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Acknowledgements

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Thank You!


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Questions
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