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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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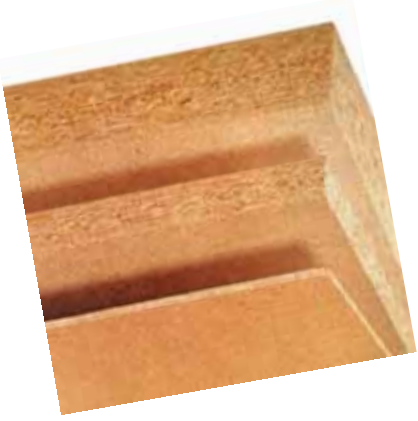
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Background

- ❑ 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.

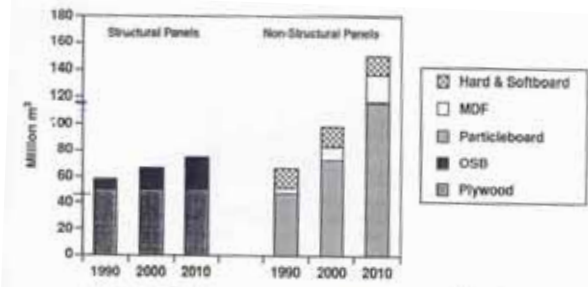
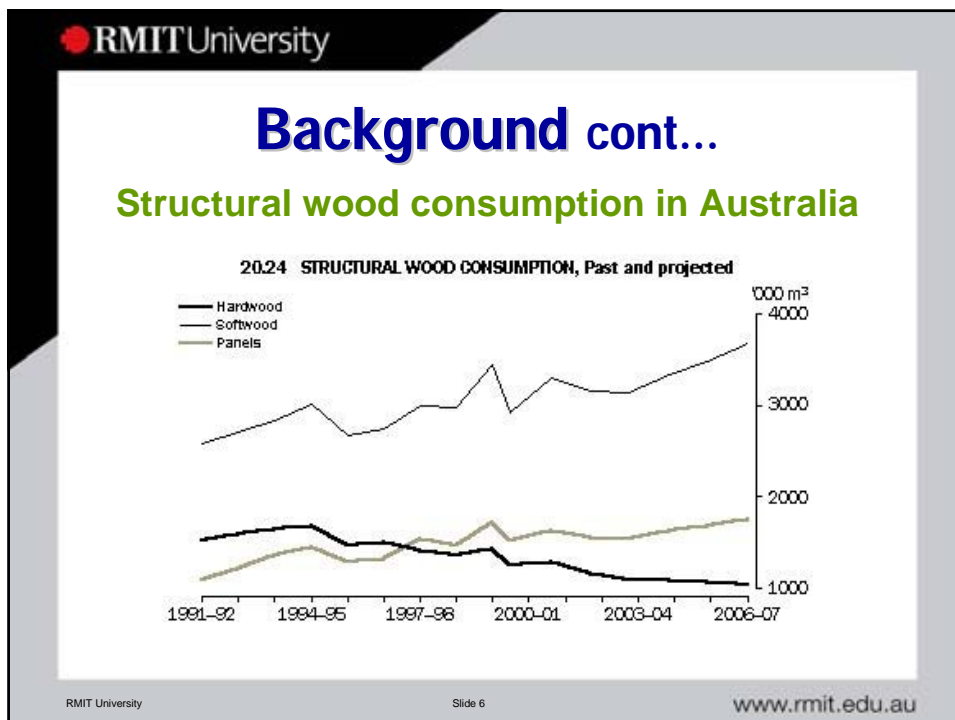
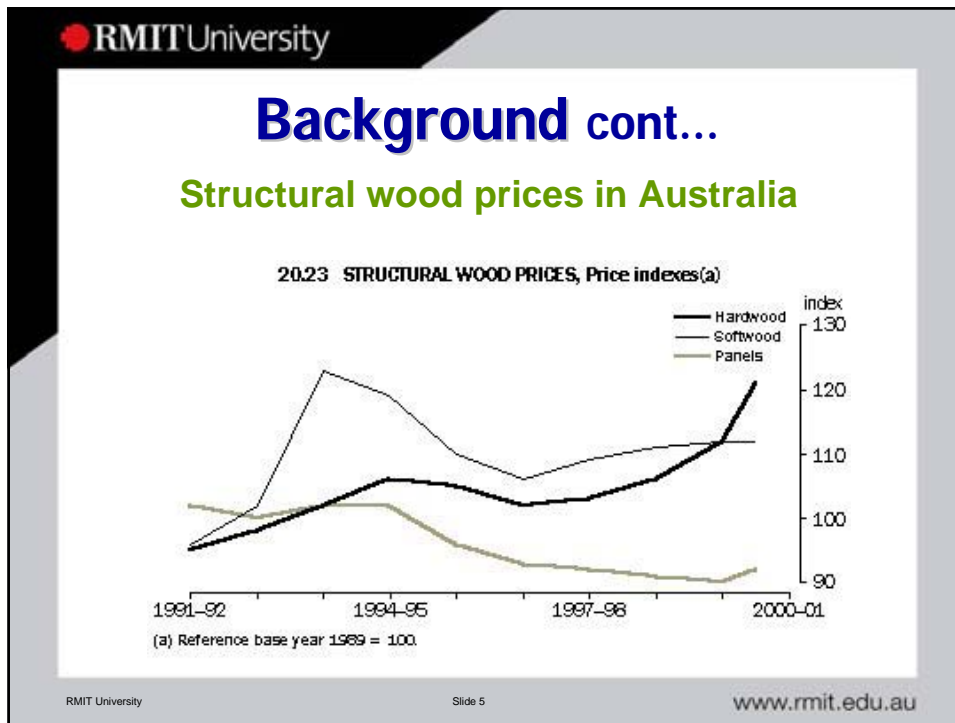



Figure 5.— Growth projection of panel products by type and product

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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 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
24 h thickness swell	4266.8	%	30	25	20	18	18

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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



Hardwood Sawmill Residues

Step 1



Mixing Residues with Resins, Hardener and Water

Step 2

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Materials and Methodology cont..



Molding

Step 3



Cold and Hot Pressing

Step 4

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Detailed description: This slide illustrates two steps of a materials manufacturing process. Step 3, 'Molding', shows a clear plastic tray containing a layer of orange-brown granular material. Step 4, 'Cold and Hot Pressing', shows a mechanical press with a yellow frame and a metal die, used for compacting the material.

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Testing for strength properties



Three Point Flexural Test

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Detailed description: This slide shows a mechanical testing machine performing a three-point flexural test. A cylindrical specimen is supported by two green rollers on a base, with a third roller applying a downward force to its center. The machine has a control panel on the left and a vertical scale on the right.

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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

- A/Prof. Sujeeva Setunge and A/Prof. Margaret Jollands of RMIT University for opening the opportunity.
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Thank You!

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Questions

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The image shows a presentation slide with a white background and a grey border. The slide features the RMIT University logo in the top left corner, consisting of a red dot and the text 'RMIT University'. The main content of the slide is the word 'Questions' in a large, bold, orange font, followed by a large orange question mark. At the bottom of the slide, there is a grey bar containing the text 'RMIT University', 'Slide 19', and the website address 'www.rmit.edu.au'.