Sawing patterns and sawing lines for processing young plantation eucalypts

SawTech 2009, Melbourne

Russell Washusen
Principal Research Scientist

Acknowledgements

- Australian Centre for International Agricultural Research
- CRC for Forestry Ltd
- Geoff Bertolini, Trevor Richardson (Whittakers, Western Australia),
- Dianne Tregonning, Keith Reeves (BFT, Victoria)
- Ian Whiteroad, (NST, Tasmania)
- Trevor Innes, Steven Scharapow (FEA, Tasmania)
- John Marshall (CHH, Victoria)
- Ian McDonnell (N. F. McDonnell & Sons, South Australia)
- Glen Davis (D & R Henderson, Victoria)
- John Scott (Veisto South Pacific, New Zealand)
- Kennett Westermark (Veisto Oy, Finland).
Growth stress release with HewSaws

- Features of the HewSaw for growth stress release:
  - Chippers remove wood and produce an accurate sawn face at the top, bottom and sides of the cant.
  - Multisaws coupled with chipper-edging units saw boards and profile the corners of the cant.
  - Board chipper-edgers following the multi-saws complete the profile.

Documented experiments

- Three large experiments completed with the HewSaw R250 and R200 for the ACIAR Project and one for the CRC:
  - Unpruned *E. nitens* with a HewSaw R250 (NF McDonnell & Sons)
  - Unpruned *E. pilularis* with a HewSaw R200 (FEA)
  - Unpruned CCV (spotted gum) with a HewSaw R200 (FEA)
  - Pruned and unpruned *E. nitens* with a HewSaw R250 (CHH)
Material behaviour

• Board end-splitting - inevitable in eucalypts
  • Reductions in board volume loss are possible – associated with increased log length
  • Experiments indicate minor volume loss
• Spring is not value limiting

Bow

• Bow is a common characteristic – also inevitable in eucalypts
• May be acceptable for efficient board handling in softwood mills with engineering modifications

Controlling bow

• The effect of the depth of chipper cuts
  • May assist to manage the severity of bow?
• Reducing log length has similar effect

![Graph showing the relationship between chipper depth and bow in outer boards.](image)
Material behaviour

- Growth stress release can be controlled
  - Bow is the main characteristic effecting processing efficiency
  - Bow is eliminated during drying so has no economic impact as long as boards can be transported efficiently
- But is it economically viable to process young small diameter eucalypts?
CSIROMILL

• A deterministic financial modelling system
• 16 year time series analysis calculates IRR for the mill and mill door prices using information from processing experiments
• 12 modules currently exist
  • They represent different processing technology and are species specific because of drying requirements
• CSIROMILL also incorporates a data base of log quality, product recovery and value for specific saw patterns
• Developed to measure the effects of improvements in log quality and processing efficiencies

ACIAR Research results

• CSIROMILL R200 PLUS module indicated low mill door prices even with the most optimistic log throughput rate.

<table>
<thead>
<tr>
<th>IRR for the sawmill (%)</th>
<th>Annual log intake (m³)</th>
<th>Taxation rate (%)</th>
<th>CCV Mill door price (AUD m⁻³ of log input)</th>
<th>E. pilularis Mill door price (AUD m⁻³ of log input)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>180,000</td>
<td>30</td>
<td>-13</td>
<td>26</td>
</tr>
<tr>
<td>15</td>
<td>180,000</td>
<td>30</td>
<td>-24</td>
<td>13</td>
</tr>
<tr>
<td>20</td>
<td>180,000</td>
<td>30</td>
<td>-35</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>260,000</td>
<td>30</td>
<td>3</td>
<td>42</td>
</tr>
<tr>
<td>15</td>
<td>260,000</td>
<td>30</td>
<td>-5</td>
<td>32</td>
</tr>
<tr>
<td>20</td>
<td>260,000</td>
<td>30</td>
<td>-14</td>
<td>22</td>
</tr>
</tbody>
</table>
Product recovery and quality

• Pith and associated drying related degrade: 42% of total board length affected

Sawing on the HewSaw R250
Sweep – can be a major problem in small logs eg. *E. pilularis*

Definition: eg. maximum sweep of 10%; sweep ≤ 10% of mid diameter in any 2.4 m length.

Modelling effects of improved log quality, altered saw patterns and sawmill efficiency
Log quality

- Product recoveries in pruned eucalypts are predictable
- As log diameter increases the predictability improves.

The species – Corymbia spp.

- Why pruned Corymbia spp
  - It can be back-sawn effectively and is easy to dry.
  - Is adaptable to a wide range of sites free of frosts.
  - It is suitable for flooring and furniture and has good mechanical properties.
  - A very good data base exists that defines log quality, recoveries and product values from pruned logs.
  - Comparisons can be made with the CCV processed at FEA.
### The CSIRO MILL Modules used – contrasting systems

<table>
<thead>
<tr>
<th>Module</th>
<th>System</th>
<th>Annual log intake range (m³) over 2 shifts</th>
</tr>
</thead>
<tbody>
<tr>
<td>WH 30000 AD SG</td>
<td>Reciprocating system with twin and multisaws</td>
<td>40,000-60,000</td>
</tr>
<tr>
<td>SL 250 150000 AD SG</td>
<td>Linear system with three chipping/sawing units in line</td>
<td>250,000-350,000</td>
</tr>
</tbody>
</table>

### The reciprocating system – MEM Tally Twin and Cobra Multimate resaw

- Log scanning and computer optimization
- Automated sawing
- Log turn-down device
- Multisaws
The reciprocating system

Reciprocation of a 35 cm SED log on the twin break-down saw

The linear systems – HewSaw SL250 Trio line
The linear system

Log specifications

Specifications for pruned log Grade 2.

<table>
<thead>
<tr>
<th>Log characteristic</th>
<th>Specification for Grade 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter of defect core</td>
<td>&lt; 15.0 cm</td>
</tr>
<tr>
<td>Log mean diameter</td>
<td>30.1-35.0 cm</td>
</tr>
<tr>
<td>Sweep in 2.4 m length*</td>
<td>&lt;20% of diameter</td>
</tr>
<tr>
<td>End split on log ends</td>
<td>&lt;200% of diameter</td>
</tr>
<tr>
<td>End split maximum width</td>
<td>&lt;2 mm</td>
</tr>
<tr>
<td>Minimum length</td>
<td>2.4 m</td>
</tr>
<tr>
<td>Defective quarters*</td>
<td>0</td>
</tr>
</tbody>
</table>

* As for VicForests grading rules
Sawing strategy

- Can be reproduced by both sawing systems.
- Resawing of wide boards from cuts 2-8 is completed on:
  - The reciprocating system with the Cobra Multimate resaw.
  - The linear system with a multi-saw after drying.

Recovery and product value

<table>
<thead>
<tr>
<th>Recovery (% log vol)</th>
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</thead>
<tbody>
<tr>
<td>All boards</td>
</tr>
<tr>
<td>Standard grade and better</td>
</tr>
<tr>
<td>Wood chips</td>
</tr>
</tbody>
</table>

Wood value AUD per cubic metre of log input

<table>
<thead>
<tr>
<th>Grade 2</th>
<th>Sawn wood ($ m⁻³)</th>
<th>Wood chip ($ m⁻³)</th>
<th>Saw dust ($ m⁻³)</th>
<th>Bark ($ m⁻³)</th>
<th>Total ($ m⁻³)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>266</td>
<td>27</td>
<td>0.5</td>
<td>1</td>
<td>295</td>
</tr>
</tbody>
</table>
Log quality and mill efficiency are both critical to good outcomes.

In comparison the effect of growth stress release appears to be a minor consideration when appropriate saw patterns are applied.