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Australian Centre for International Agricultural Research

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Objective 4

Determine the optimum processing parameters & protocols for peeling coconut stems & the properties of the recovered veneer

Rob McGavin

Qld DAF

August 2015

Objective 4 – Peeling Trials

Objective 4 – Determine the optimum processing parameters & protocols for peeling coconut stems & the properties of the recovered veneer

4.1 – Assessing veneer processing parameters for cocoveneer (Trial 1)

4.2 – Calibrating processing parameters at QDAF Salisbury Research Facility (Trial 2)

4.3 – Initial compact experimental peeling trial at TUD, Nasinu, Fiji (Trial 3)

4.4 – Compact commercial peeling trial at VTB, Labasa, Fiji (Trial 4)

4.5 – Broad industrial peeling trial in Fiji at TUD, Nasinu, Fiji (Trial 5)

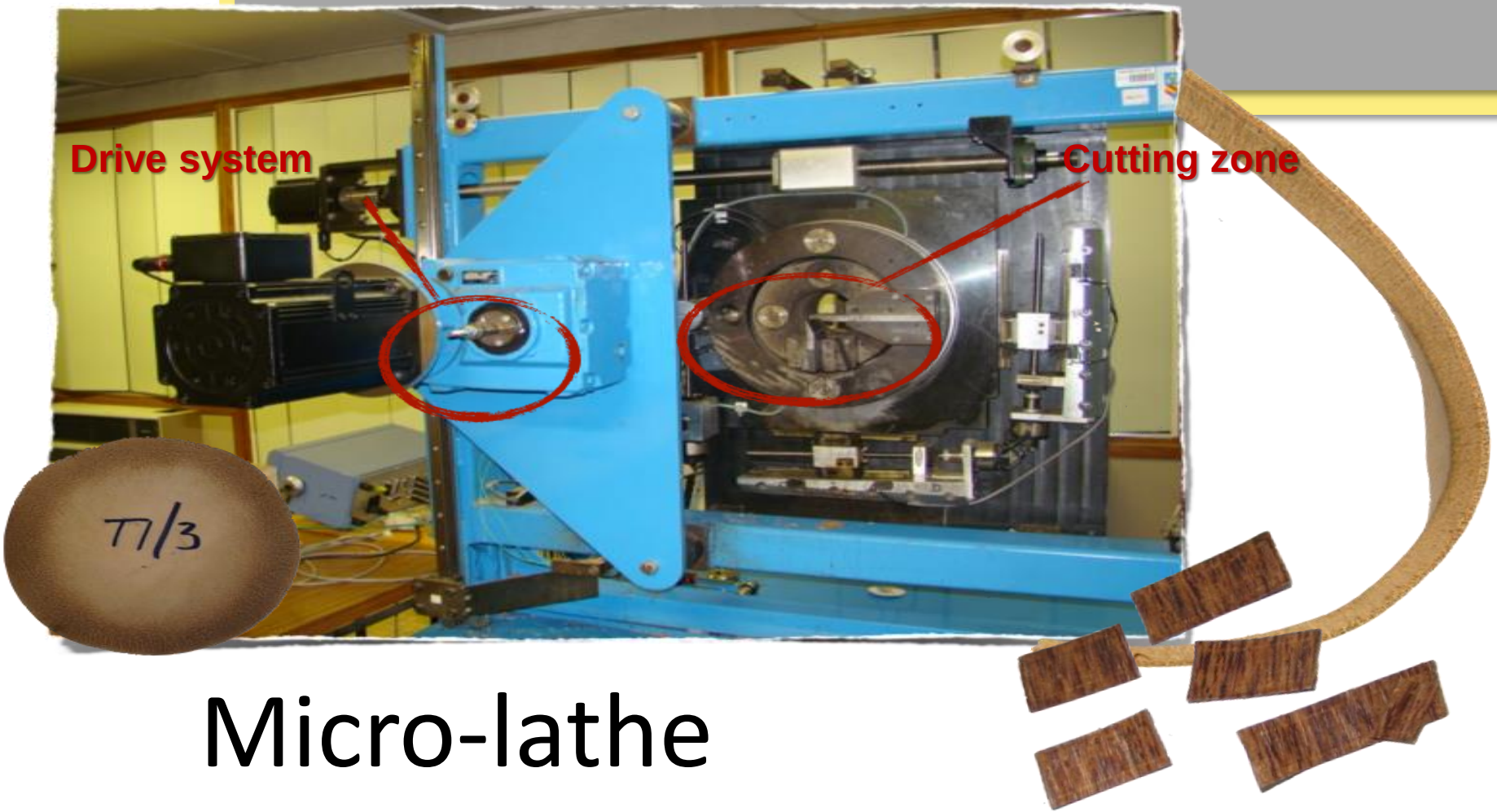
4.6 – Properties and recovery assessment at QDAF Salisbury Research Facility

Objective 4 – Trial 1

4.1 – Assessing veneer processing parameters for cocoveneer

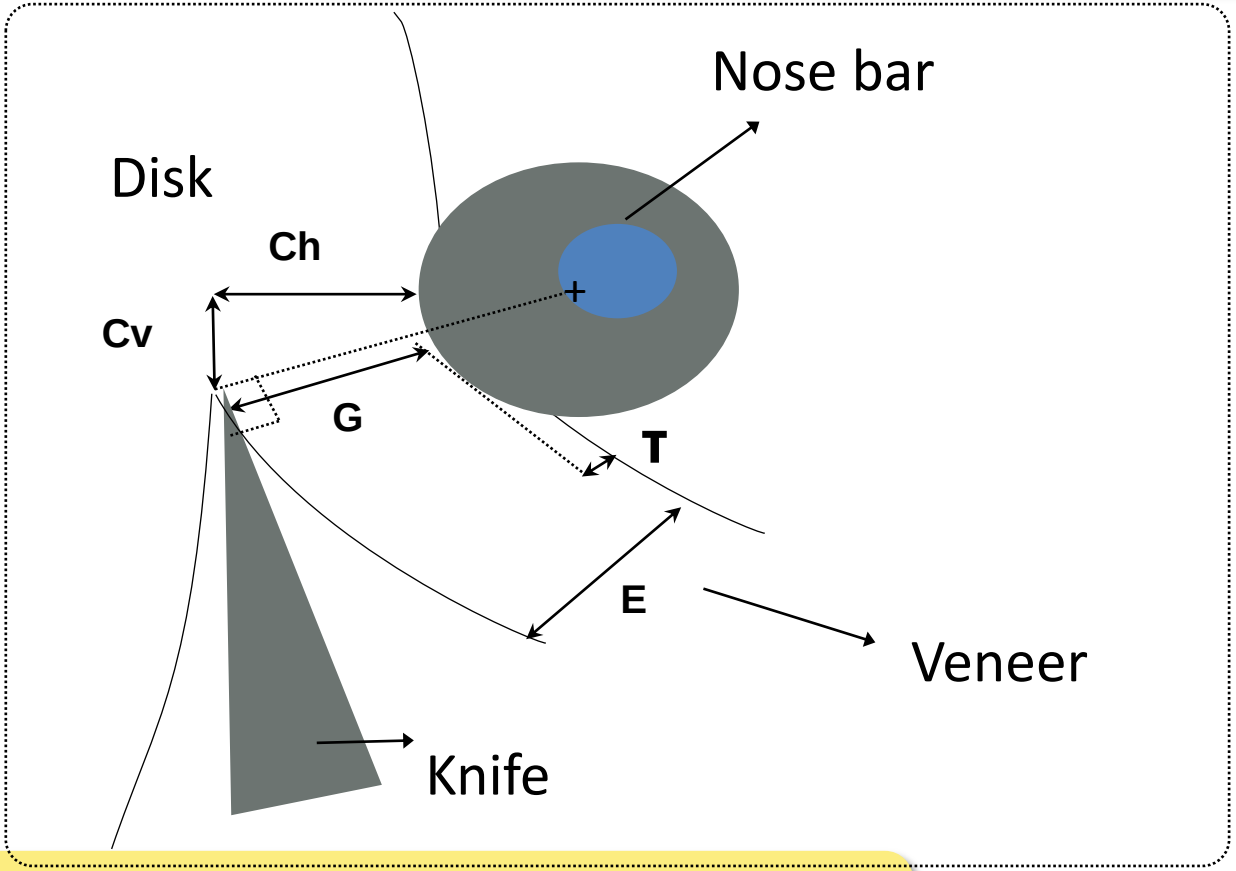
- **LAB SCALE** – determine optimum peeling parameters assessed from disc trials at ENSAM in France

- Micro-lathes used to determine lathe settings and stem pre-conditioning requirements



Micro-lathe

Trial 1 - Range of parameters trialed



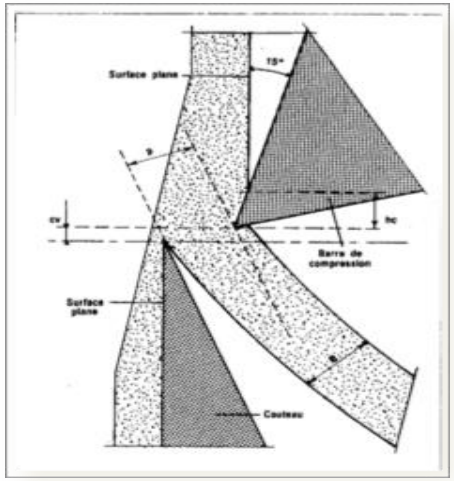
G : Gap between knife and nose bar

E : Veneer Thickness

Ch : Horizontal Gap

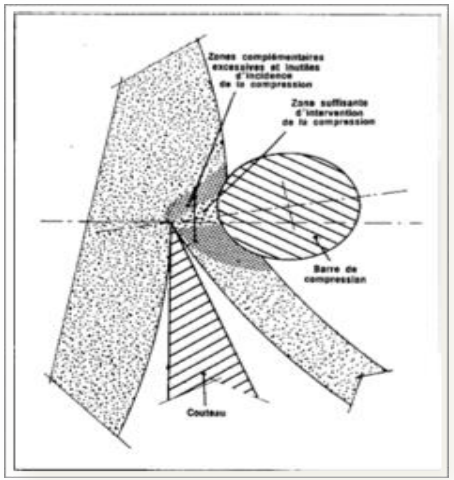
Cv : Vertical Gap

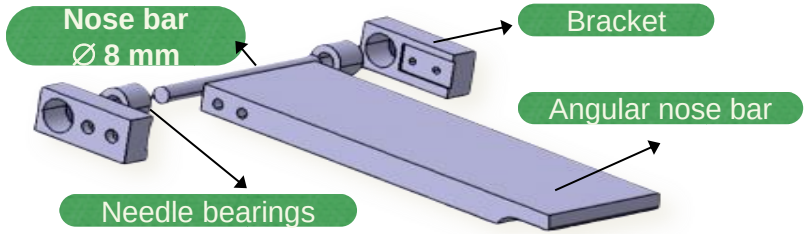
Trial 1 - Range of parameters trialed



Angular

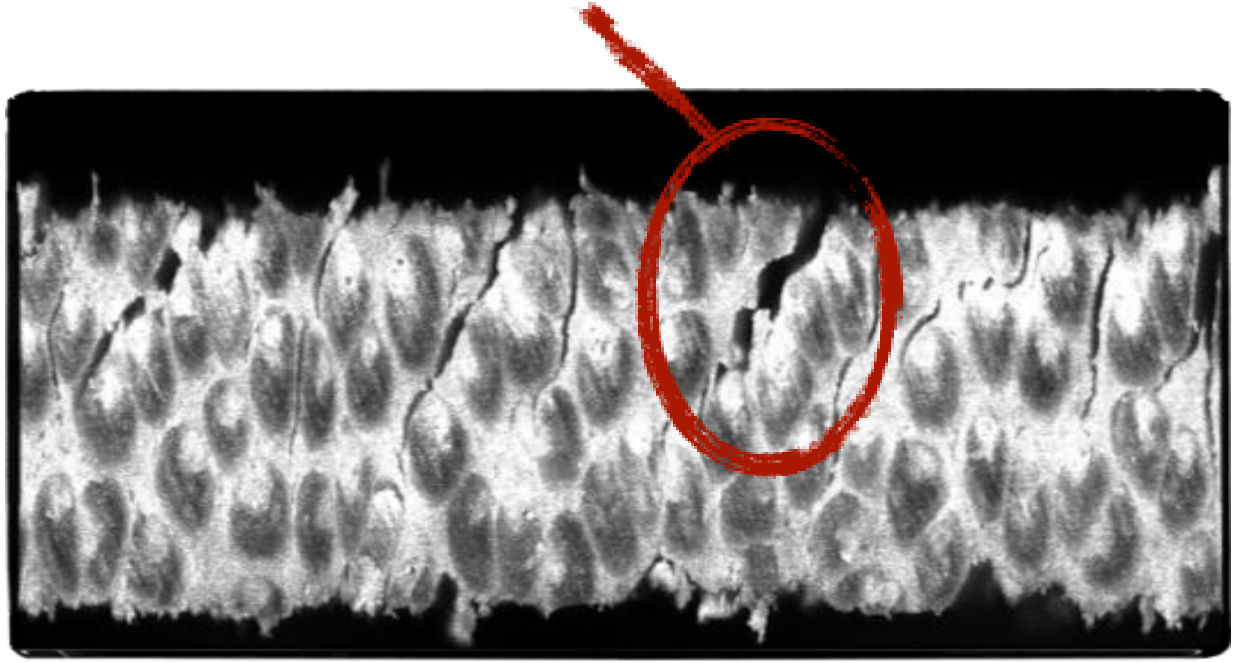
Cylindrical





Trial 1 - Range of parameters trialed

Lathe checks



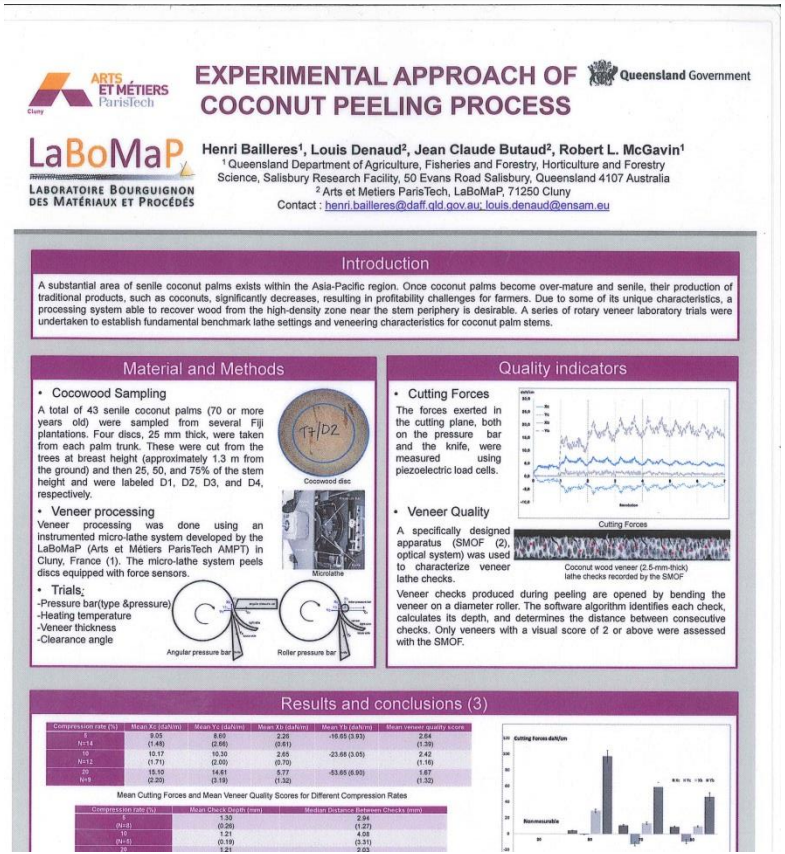
Trial 1 – Completed

PEER-REVIEWED ARTICLE bioresources.com

Experimental Investigation on Rotary Peeling Parameters of High Density Coconut Wood

Henri Bailleres,[a,*] Louis Denaud,[b] Jean-Claude Butaud,[b] and Robert L. McGavin [a]

Substantial quantities of senile coconut palms are present in plantations within the Asia-Pacific region. Once coconut palms become over-mature, their production of traditional products, such as coconuts, significantly decreases, resulting in profitability challenges for farmers. Presently, few profitable markets exist for over-mature, senile coconut palms. Using the coconut palm stem in composite or engineered wood products could, however, provide an attractive alternative. Due to some of its unique characteristics, a processing system able to recover wood from the high-density zone near the stem periphery is desirable. A series of rotary veneer laboratory trials were undertaken to establish fundamental benchmark lathe settings and veneering characteristics for coconut palm stems. Different pressure bar configurations, billet pre-treatment temperatures, and veneer thicknesses were tested, and the resulting cutting forces and veneer quality were assessed. Optimal setting recommendations for peeling coconut wood are provided.



Objective 4 – Trial 2

4.2 – Calibrating processing parameters at QDAF Salisbury Research Facility

- Peeling trials in order to validate and refine parameters established during Trial 1

- Difficulties sourcing suitable coconut billets
  - North Qld billets – low/medium density
  - Fiji high density hollow billets – not successful

- Modified lathe preliminary testing

Trial 2

Trial 3 – TUD

4.3 – Initial compact experimental peeling trial

- Fiji stems processed to verify parameters developed
- Experimental veneer processing equipment at TUD, Nasinu, Fiji
- Preliminary training of TUD staff in equipment operation
- Recovered material shipped to QDAF
  - Veneer quality assessments
  - Veneer compression trial
  - Preliminary product investigation

Trial 3 – TUD

4.3 – Initial compact experimental peeling trial in Fiji

- Lathe performed well
- Some issues with supporting equipment
  - pretreatment chamber: couldn't heat logs hot enough!
- 23 logs (1.5 m^3), 249 veneer sheets
- Around 60% recovery
- Veneer quality negatively impacted by lack of log heating capacity and lack of opportunity to optimise lathe settings
- Quality and volume insufficient for product development
- Additional processing scheduled in June 2015
  - Supporting equipment not prepared
  - Logs weren't available

Objective 4 – Peeling trials

Trial 3 – TUD

- Report completed
  - Includes veneer quality assessments

Department of Agriculture and Fisheries

ACIAR FST/2009/062 Development of advanced veneer and other products from coconut wood to enhance livelihoods in South Pacific communities

DAF Report - Coconut palm stem veneer processing

Trial 3

July 2015

Trial 4 – VTB commercial trial

4.4 – Compact commercial peeling trial in Fiji

- Scale up to commercial production
- Fiji stems processed at VTB production mill at Labasa
- Lathe settings verified
- Processing and handling protocols tested and refined
- Recovered material shipped to QDAF

Trial 4 – VTB commercial trial

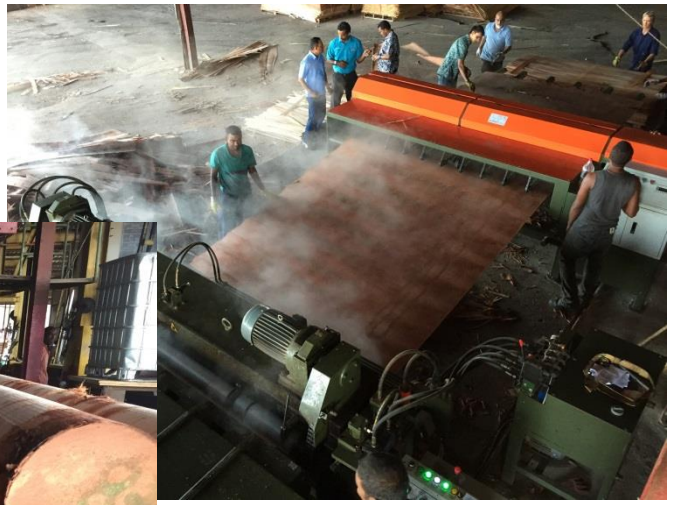
4.4 – Compact commercial peeling trial in Fiji

- Completed in June 2015
- 171, 2500mm billets processed
- About 15 m^3 of veneer
- Demonstrated the challenges of peeling coconut
- Further reinforced the necessity of billet pre-conditioning
- No drying challenges
- Good quantity of suitable quality veneer for product development activities.

Success!!

Trial 4 – VTB commercial trial

Trial 4 – VTB commercial trial



Trial 4 – VTB commercial trial

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4.4 – Compact commercial peeling trial in Fiji

- Veneer scheduled for arrival to DAF Salisbury Research Facility
- Veneer volumes, grade quality etc etc. to follow

Trial 5 – TUD

4.5 – Broad industrial peeling trial in Fiji

- Peeling trial at TUD's using experimental veneer processing facility
- Material characteristics confirmed
- Peeling, handling and grading protocols confirmed
- Recovered veneer shipped to QDAF for product testing

Veneer assessment

4.6 – Properties and recovery assessment

- Recovered veneer quality assessed
- Strength, dimensional stability, gluing characteristics etc to be determined
- Recovery data collected for economic assessment

Veneer assessment

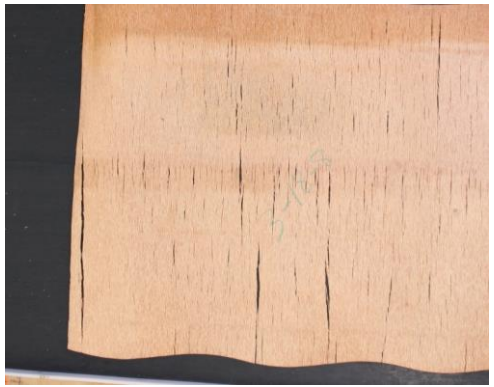
Veneer quality assessment

- Trial 2 produced limited veneer
- Trial 3 produced 249 sheets but quality compromised
  - Recovery – 60% ungraded, graded ?? (quality compromised)
  - Visual quality assessments
  - Properties assessments
  - Pressing characteristics

Veneer assessment

Visual assessments

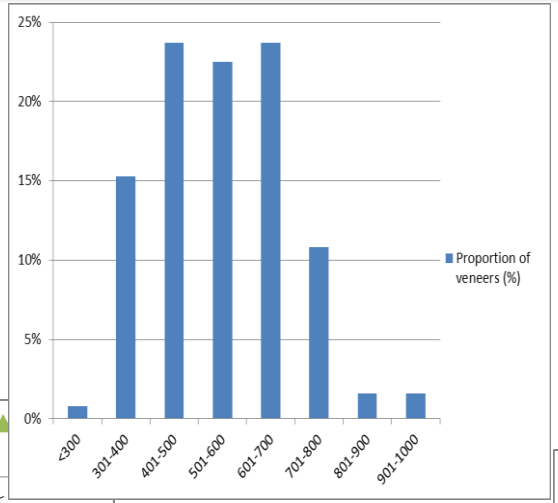
- Colour
- **Roughness**
- **Splits**
- Brittleness
- **Collapse**
- Decay
- Compression
- Wane
- Insects, etc

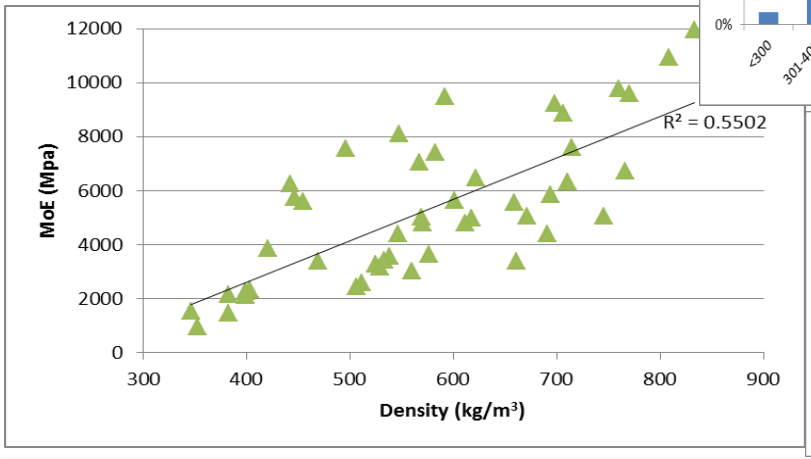


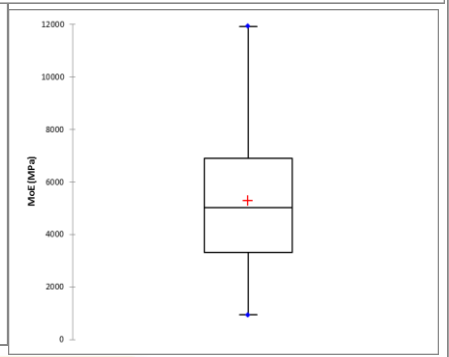
Veneer assessment

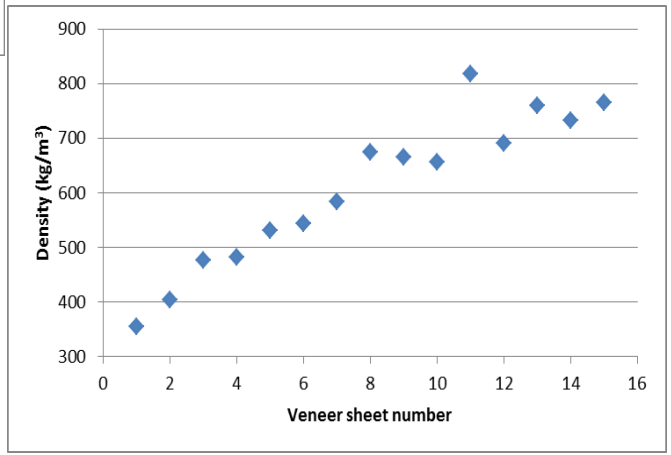
Properties assessments

- Density
- Stiffness (MoE)





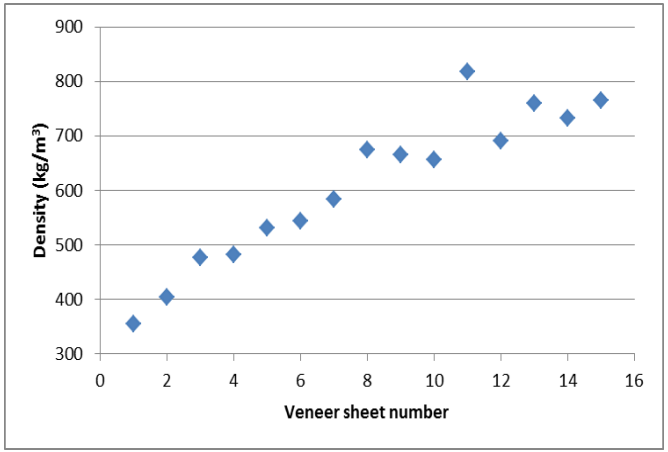


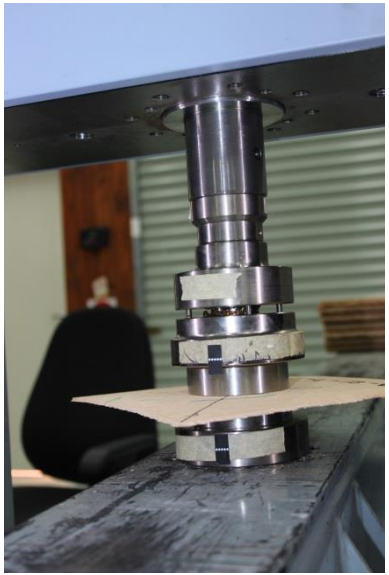


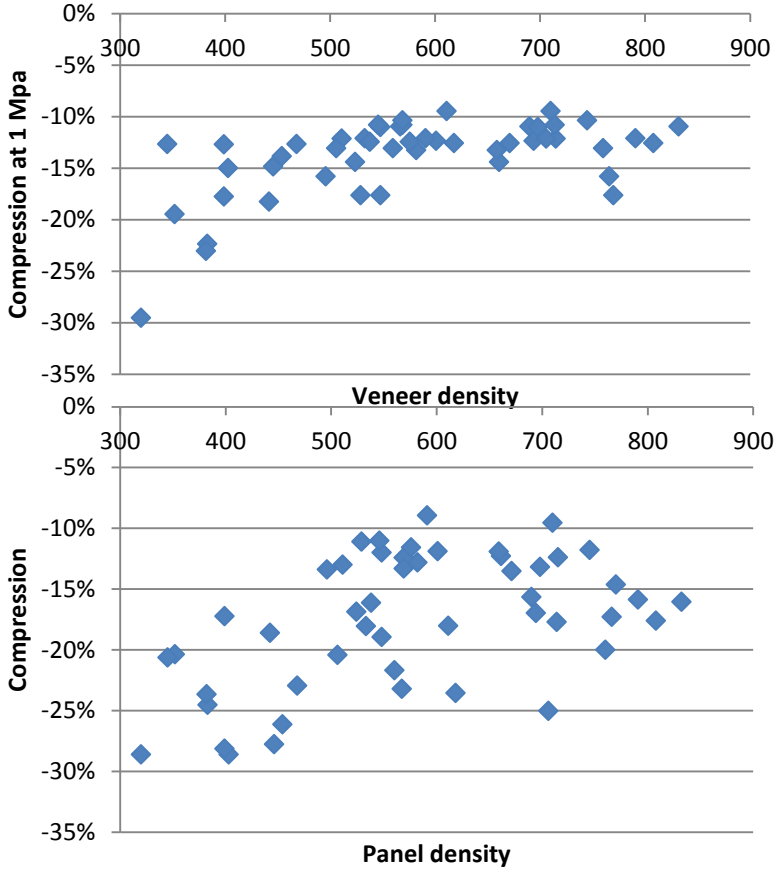
Veneer assessment

Pressing characteristics

- Material behavior
- Influence of temperature and adhesive







Questions

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