ADVANCING ENHANCED WOOD MANUFACTURING INDUSTRIES IN LAOS AND AUSTRALIA

PML Easbeam Study Tour

Written by Adam Redman, Benoit Belleville and Tony Dakin - October 2019
This publication has been compiled by Dr Adam Redman of Department of Agriculture and Fisheries

© State of Queensland, 2019

The Queensland Government supports and encourages the dissemination and exchange of its information. The copyright in this publication is licensed under a Creative Commons Attribution 4.0 International (CC BY 4.0) licence.

Under this licence you are free, without having to seek our permission, to use this publication in accordance with the licence terms.

You must keep intact the copyright notice and attribute the State of Queensland as the source of the publication.

Note: Some content in this publication may have different licence terms as indicated.

For more information on this licence, visit https://creativecommons.org/licenses/by/4.0/.

The information contained herein is subject to change without notice. The Queensland Government shall not be liable for technical or other errors or omissions contained herein. The reader/user accepts all risks and responsibility for losses, damages, costs and other consequences resulting directly or indirectly from using this information.
# Contents

- **INTRODUCTION** .................................................................................................................. 1
- **ITINERARY AND PARTICIPANTS** ................................................................................... 1
- **TOUR DETAILS** ................................................................................................................ 3
  - **DAY 1 – 21 OCTOBER 2019** .......................................................................................... 3
    - Glue-bond testing training ............................................................................................... 3
    - Introduction to microscopy .............................................................................................. 3
    - Mechanical testing training ........................................................................................... 4
  - **DAY 2 – 22 OCTOBER 2019** .......................................................................................... 5
    - University of Queensland .............................................................................................. 5
    - Multinail Company ........................................................................................................ 5
    - Engineered Wood Products Association Australasia (EWPA) ...................................... 6
  - **DAY 3 – 23 OCTOBER 2019** .......................................................................................... 6
    - Durability training .......................................................................................................... 6
    - Workplace health and safety training ............................................................................ 7
  - **DAY 4 – 24 OCTOBER 2019** .......................................................................................... 8
    - Plywood production ....................................................................................................... 8
  - **DAY 5 – 25 OCTOBER 2019** .......................................................................................... 9
    - Austral Plywoods .......................................................................................................... 9
    - TrussCorp ....................................................................................................................... 10
    - Bunnings Warehouse, Oxley .......................................................................................... 11
    - 25 King Street Brisbane .................................................................................................. 11
  - **DAY 6 – 28 OCTOBER 2019** .......................................................................................... 12
    - Library at the Dock ........................................................................................................ 12
    - Vicbeam ........................................................................................................................ 13
  - **DAY 7 – 29 OCTOBER 2019** .......................................................................................... 13
    - Holmesglen .................................................................................................................... 13
    - Melb Uni MSD ................................................................................................................. 14
- **OUTCOMES** .................................................................................................................... 15
- **ACKNOWLEDGEMENTS** .................................................................................................. 17
- **REFERENCES** .................................................................................................................. 17
Introduction

This study tour was undertaken as a component of VALTIP 3 Activity 3.2 of Objective 3 (Develop and conduct formal and informal training programs for industry) in the ACIAR co-funded aid project FST/2016/151 Advancing enhanced wood manufacturing industries in Laos and Australia. The aim of this Study tour was to expose the new project partner PML Easbeam Company to engineered wood product manufacturing, potential markets and industries operating in Australia. The PML Easbeam company is a subsidiary of the PML company and was established in July 2019. The PML Company was successful in tendering for the construction of an add-on facility at the National University of Laos to contain equipment for veneer-based product production research. Subsequently, as an established construction company, the company saw the potential and were interested in engineered wood products made from wood veneer, in particular laminated veneer lumber (LVL) structural beams. At the point of writing this report, PML Easbeam is in the process of setting up an LVL plant in Vientiane to manufacture LVL beams using certified, plantation eucalyptus material for domestic and international markets. The PML Easbeam Company financed the study tour themselves.

The expected mid to long-term outcome of this exposure is to facilitate the uptake of veneer-based processing and product development in Laos PDR.

Previous research conducted during ACIAR co-funded aid project: FST/2008/039 Enhancement of veneer products from acacia and eucalypt plantations in Vietnam and Australia, identified spindleless-lathes as the most likely evolutionary technology to improve the productivity of processing small plantation-logs in Lao PDR. The veneer processing sector in Vietnam is well established and involves 4,200 wood processing and trading enterprises and in the order of thousands of household businesses employing over 300,000 labourers operating in over 300 traditional wood-processing villages (To and Quang, 2012). During surveys of small rural areas of Northern Vietnam, Ozarska et al. (2015) identified that exporters of peeled veneer to China and India cannot meet the demand of these countries. Therefore, this undersupply could provide potential export markets of processed veneer from small plantation-logs currently growing in Lao PDR.

Itinerary and Participants

A list of study tour participants is provided in Table 1. Participants consisted of PML Easbeam representatives as well as researchers from the University of Melbourne and the Queensland Government Department of Agriculture and Fisheries.

The tour itinerary is provided in Table 2. The tour occurred over 1 week from 21 October to 29 October 2019.
Table 1. Study tour participants

<table>
<thead>
<tr>
<th>No</th>
<th>Name</th>
<th>Organization</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mr. Siviengphet Phommalath</td>
<td>PML Easbeam</td>
<td>CEO</td>
</tr>
<tr>
<td>2</td>
<td>Mr. Outhith Sayavong</td>
<td>PML Easbeam</td>
<td>Production manager</td>
</tr>
<tr>
<td>3</td>
<td>Mr. Thitphasone Phengsouvanh</td>
<td>PML Easbeam</td>
<td>Marketing and sales</td>
</tr>
<tr>
<td>4</td>
<td>Mr. Bounneuang Phaophasit</td>
<td>PML Easbeam</td>
<td>Transport and logistics</td>
</tr>
<tr>
<td>5</td>
<td>Mr. Benoit Bellleville</td>
<td>University of Melbourne</td>
<td>Activity Leader</td>
</tr>
<tr>
<td>6</td>
<td>Mr. Adam Redman</td>
<td>Queensland Government</td>
<td>Acting project leader</td>
</tr>
</tbody>
</table>

Table 2. Study tour itinerary

<table>
<thead>
<tr>
<th>Day number</th>
<th>Company/Activity</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>21 October 2019</td>
<td>Glue bond testing training</td>
<td>Glue bond chisel test practical demonstration and PML hands on training</td>
</tr>
<tr>
<td>21 October 2019</td>
<td>Microscopy and adhesives training</td>
<td>The use of microscopy to investigate adhesive quality and control problems</td>
</tr>
<tr>
<td>21 October 2019</td>
<td>Mechanical testing training</td>
<td>Different mechanical tests demonstrated and PML LVL samples tested</td>
</tr>
<tr>
<td>22 October 2019</td>
<td>University of Queensland</td>
<td>Tour of mechanical testing and fire testing laboratories</td>
</tr>
<tr>
<td>22 October 2019</td>
<td>Multinail</td>
<td>Tour of Multinail mechanical timber fastener and machinery production facility</td>
</tr>
<tr>
<td>22 October 2019</td>
<td>Engineered Wood Products Association Australasia (EWPAA)</td>
<td>Discussion of potential membership and tour of mechanical testing facility</td>
</tr>
<tr>
<td>23 October 2019</td>
<td>Durability and preservation training</td>
<td>Trained by industry expert Mr. Jack Norton</td>
</tr>
<tr>
<td>23 October 2019</td>
<td>Workplace health and safety training</td>
<td>Standard operating procedures (SOPs), risk assessments and incident reports demonstrated</td>
</tr>
<tr>
<td>24 October 2019</td>
<td>Plywood manufacture training</td>
<td>Plywood manufacture value chain training including bond testing of PML VLV beams and hands on peeling and veneer thickness measurement</td>
</tr>
<tr>
<td>25 October 2019</td>
<td>Austral Plywood</td>
<td>Tour of plywood manufacturing mill</td>
</tr>
<tr>
<td>25 October 2019</td>
<td>TrussCorp</td>
<td>Truss and frame manufacturer using Multinail connectors</td>
</tr>
<tr>
<td>25 October 2019</td>
<td>Bunnings Warehouse, Oxley</td>
<td></td>
</tr>
<tr>
<td>25 October 2019</td>
<td>25 King Street Brisbane</td>
<td>Tour Australia’s tallest and largest engineered timber office building</td>
</tr>
<tr>
<td>28 October</td>
<td>Library at the Dock</td>
<td>Tour of Australia's first public building to be constructed of Cross Laminated Timber (CLT)</td>
</tr>
<tr>
<td>28 October</td>
<td>Vicbeam</td>
<td>Tour of Glulam manufacturing mill</td>
</tr>
<tr>
<td>29 October</td>
<td>Holmesglen</td>
<td>Tour of Building and Construction technical training centre</td>
</tr>
<tr>
<td>29 October</td>
<td>UoM MSD</td>
<td>Tour of acclaimed Melbourne School of Design (MSD) building</td>
</tr>
</tbody>
</table>
Tour details

Day 1 – 21 October 2019

Glue-bond testing training
Strong adhesive bonds are critical to successfully producing strong and reliable engineered wood products to be used in service. Factories producing veneer based products such as plywood and LVL are required to test that their glue bonds meet the recommended standards for the market/country they are to be used.

In this ‘hands-on’ training (Figure 1), the Australian/New Zealand standard chisel test was used to demonstrate glue bond integrity on plywood samples. The test followed the standard AS/NZS 2098.2:2012 – Method of test for veneer and plywood. Method 2: Bond quality of plywood (chisel).

Figure 1. PML Easbeam CEO learning the chisel test techniques to evaluate glue bond integrity.

Introduction to microscopy
Microscopy is an important tool to investigate glue bonds at the microscopic level. Particularly for troubleshooting adhesive problems and understanding how adhesives penetrate into timber. Microscopy is a critical tool for factories quality assurance testing. In this introduction company representatives were shown, by DAF microscopy expert Ms Maryam Shirmohammadi, relatively new technology, namely the Xylorix microscope (xylorix.com) that clips onto ones phone and is able to take clear images using the phone’s camera at up to 24 X magnification (Figure 2a). Images showing glue bond penetration into wood at the glue line were presented and discussed (Figure 2b).
Mechanical testing training

Examples of different standardised mechanical tests were demonstrated including tension (Figure 3a), shear (Figure 3b), hardness (Figure 3c). Finally, test LVL specimens, produced by the PML Easbeam Company at the National University of Laos, were tested for strength and stiffness (Figure 3d) as an initial test of product and species marketability of LVL production. End matched samples were also used to test glue bond integrity. The results of these tests will be reported separately.
Day 2 – 22 October 2019

University of Queensland

Participants toured the University’s mechanical timber testing and fire testing laboratories. Of particular interest were the exemplar student projects using a variety of engineered wood products (Figure 4a), the main lecture theatre featuring engineered wooded truss and beam roof structure (Figure 4b & c), and the methods used to test fire resistance on massive engineered wood panels (Figure 4d).

![Figure 4. University of Queensland student projects (a), lecture theatre featuring engineered wood interior structural members (b,c) and the fire testing laboratory (d)](image)

Multinail Company

Multinail is a 40 year old family run business, servicing the national and international frame and truss manufacturers. They manufacture and supply a large variety of nail plates and tie downs for wooden trusses and framing. Additionally they produce and supply a range of equipment necessary to optimise cutting of framing materials and nail plate pressing, as well as supplying their own propriety structural engineering and design software.

Multinail Engineer Mr. Matt Smith hosted the tour. The participants were able to view the manufacture of various styles of nail plates (Figure 5 a & b), the machinery factory and fabrication examples (Figure 6). The PML Easbeam company was particularly interested in this product and incorporating it in the future into their company profile.
Engineered Wood Products Association Australasia (EWPA)

The EWPA is a member association for manufacturers of engineered wood products, particularly plywood, laminated veneer lumber (LVL), particleboard and medium density fibreboard (MDF). They also represent a number of solid timber processors. From their office and testing laboratory, based in Brisbane, Australia, they support our membership throughout Australasia, including Australia, New Zealand, Fiji and Papua New Guinea.

The tour participants were hosted by EWPA CEO Mr. Dave Gover. The role of EWPA was discussed and the potential for the PML Easbeam company to use the EWPA testing facility in the future. The EWPA was currently in transition moving to a new location so limited equipment was available to observe as it had already been moved to the new location.

Day 3 – 23 October 2019

Durability training

Industry expert, with 53 years’ experience in the field, Mr Jack Norton provided training in wood preservation and durability.
The topics covered were:

- Wood – its origin and properties
- Causes of timber degrade
- Treatment chemicals
- Treatment processes
- Specifications and standards

Of particular interest to the PML Easbeam company was the discovery of a possible H3 (outdoor) glueline treatment for LVL to provide durability against fungal attack and termites. Testing of this product within the VALTIP 3 project is planned.

**Workplace health and safety training**

The DAF safety officer, Mr Chris Fitzgerald provided training in safety procedures used at the Salisbury Research Facility. In particular, the following topics were covered:

- First aid and CPR training
- Importance of fire safety systems and different extinguishers for different types of fires.
- Emergency meeting point
- Standard operating procedures and safety procedures
- Personal Protective Equipment
- How to undertake risk assessments and mitigate risks
- Near incident reporting
- Accident reporting and prevention.

Each PML Easbeam participant received a workplace health and safety booklet containing examples of risk management tools and how to undertake risk assessments, example hazard sheet and example standard operating procedures (SOPs) (Figure 7).

*Figure 7. Workplace health and safety booklet provided to PML Easbeam participants*
Day 4 – 24 October 2019

Plywood production
Dr Adam Redman (DAF) and Mr Simon Dorries (CEO of Responsible Wood) provided training in the production of plywood (Figure 8). The topics covered were:

- Log rounding and veneer peeling
- Veneer drying
- Veneer grading
- Principles of structural wood adhesives
- Adhesives and plywood production
- Trouble shooting and faulty bonds
- Adhesives and engineered wood product production
- Test methods and performance requirements

![Figure 8. Mr Simon Dorries performing training](image)

The training finished with more chisel testing of LVL samples provided by PML Easbeam Company (Figure 9a) and an in depth assessment of glue bond assessment with some hands on tutorials (Figure 9b). The results of these tests will be reported separately.

![Figure 9. PML Easbeam company LVL glue bond assessments (a) and hands on training (b)](image)
**Day 5 – 25 October 2019**

**Austral Plywoods**

Austral Plywoods is Australia’s primary producer of premium grade plywood and are based in Brisbane, Queensland, and have been operating since 1925. Their resource is 100% plantation grown Hoop Pine, sourced from HQPlantations in southeast Queensland. They produce approximately 5,000 m³ of plywood product per year. Their A-Bond products have a Super E0 rating, the lowest formaldehyde emission rating obtainable. They manufacture a wide range of panel products, specialising in marine plywood and appearance grade plywoods.

Mr Scott Mathews, the company CEO, provided the site tour. The tour group was able to see first hand the production from log storage and debarking (Figure 10a), peeling (Figure 10b), drying (Figure 10c), veneer cooling and storage (Figure 10d), composing (Figure 10e), layup and pressing and dispatch (Figure 10f).

![Figure 10. Austral Plywoods site tour with images showing the log yard (a), peeling line (b), jet-box dryer (c), veneer storage (d), composed veneer (e) and dispatch area (f)](image-url)
**TrussCorp**

Established as a family business in 2007, TrussCorp is now one of Queensland’s leading suppliers of prefabricated timber roof trusses, wall framing and floor systems to the housing sector. They use state of the art software, experienced designers/estimators and specialised manufacturing equipment. Additionally they use the Multinail connectors and manufacturing machines in their operations.

The tour included representatives from Multinail. In particular, Mr Travis Taylor, the Multinail Head of Asian Operations provided a good linkage for accessing Multinail products for the PML Easbeam Company. PML Easbeam participants were interested to see that the company was using LVL in their production (a), the high precision cutting equipment (b), truss (c) and frame (d) composition and the modular style of dispatching full construction projects (e).

![Figure 11. TrussCorp tour including use of LVL beams (a), cutting (b), finished trusses (c) and frames (d) and modular dispatch (e).](image)
**Bunnings Warehouse, Oxley**

A visit to Bunnings warehouse allowed the tour delegates to observe the types of veneer-based products retailing in Australia and associated retail prices. Products observed were domestic and imported structural (a) and non-structural plywood (b), as well as domestically produced structural LVL (c).

*Figure 12. Bunnings warehouse tour where structural (a) and non-structural (b) plywood and structural LVL (c) was observed*

---

**25 King Street Brisbane**

The 25 King Street building is owned by Aurecon and was built by Lendlease. Inspired by the environmental benefits and versatility of timber, 25 King showcases timber from roof to floor. The 9-storey plus ground superstructure utilises a combination of revolutionary engineered Cross-Laminated Timber (CLT) and glulam (glue laminated timber). The glulam is used for the structural beams and columns, and the CLT for the floors, walls, lift shafts and escape stairs.

The tour of 25 King Street was hosted by Callum Lillywhite, Senior Structural Engineer at Aurecon. The tour was shown the glue laminated timber beams and CLT walls and flooring on the second floor and in the lift shaft.
Day 6 – 28 October 2019

Library at the Dock

The Docklands Library & Community Centre was a joint venture project between the City of Melbourne, Places Victoria and Lend Lease. It is also Australia’s first GBCA 6 star Greenstar Public Building and the first Australian public building to be constructed of Cross Laminated Timber (CLT). The tour was hosted by Andrew Smith, Head of Design for Manufacture & Assembly (Integrated Solutions) at Lendlease. Andrew was personally involved during the design and construction phase of the Library, and take us through the building. The tour allowed the Lao delegation hearing about the advantages of using mass timber products versus other construction materials such as concrete and steel (e.g. lightweight properties of timber).
**Vicbeam**
Vicbeam is a manufacturer and fabricator of glulam engineered timber products for the domestic and commercial markets. The tour was hosted by Josh Wallace, managing director and co-founder of Vicbeam. The tour was shown the Glulam timber beam manufacturing process, quality control and the use of wood waste (sawdust) for value-adding (fire bricks/logs).

![Vicbeam](image)

*Figure 15. Vicbeam.*

**Day 7 – 29 October 2019**

**Holmesglen**
Holmesglen Chadstone campus is a provider of vocational and higher education in Victoria, including 16 building and construction course areas for aspiring trade workers such as carpentry, fabrication and furniture making. The tour of Holmesglen was hosted by Liz Jansz, Head of Building, Construction and Trades Department, and Leigh Hill, Educational Manager for the Furniture making course. The tour allowed seeing state-of-the-art carpentry and furniture making training facilities and visiting a multi-storey demonstration building highlighting mid-rise construction methods in Australia. Walking through the full scale mid-rise timber construction display structure allowed demonstrating all the structural, fire rating, and acoustic systems that is common in this construction method and understanding how connections are made and details why some areas are designed a certain way to meet the benefits of working with EWPs (e.g. mass timber brackets, bracing systems, LVL, CLT).
Figure 16. Holmesglen furniture making workshop and mid-rise demonstration building.

**Melb Uni MSD**

The Melbourne School of Design (MSD) building, located at the heart of the University of Melbourne campus, is designed as a learning building i.e. “Built Pedagogy”. The MSD building received numerous awards since its completion in 2014 (6 Star Green Star Design - Education Design, Australian Timber Design Award 2015, International Architecture Awards 2017). Exposed materials (e.g. LVL, perforated plywood cladding) and structures, such as the underside of the Y-Stairs, give insight into construction techniques and fabrication. Features such as the steel mesh balustrade, the atrium, and open-top gallery allow for sight-lines and transparency between levels. Andrew Middleton, development manager at Faculty of Architecture, Building & Planning, hosted the tour.
Outcomes

Following the last visit of the study tour, the participants from PML Easbeam have been interviewed (group interview). The participants were asked about their highlights, what they plan to use from the tour and what other research needs they have. The following is a collection of responses:

We have learned very interesting things over the past two weeks...knowledge and ideas that we can bring back and apply in Laos (e.g. multinails, building methods, design). More research needs to be done to better understand the technical side. Seeing many different buildings and sites changed our vision, i.e. how design can be applied in structures and buildings, which will require training from experts (ACIAR) on calculations for wood.

We will now share the knowledge with people back home and educate them on wood construction, construction methods and materials/products which he had never seen before.

The next project should provide training to workers and short-term, we hope ACIAR project will be able to assist so that PML can move forward on technical production and setting up the factory (advice on adhesive, drying veneer). The project should also provide material helping to promote wood and demonstrate the advantages over other construction materials. Another area of research should be about forest management and wood quality in an LVL manufacturing context

Highlights of the tour included 25 King street and the library at the Dock to get the big picture or a full structure, and wood research centre at Salisbury. A similar lab should be made available in Laos.

Highlights of the tour included design and Holmesglen training centre. A training centre which accepts people without specific qualifications should be established.
in Laos (no need for high school certificate or degree as with GYZ centre in Vientiane). Companies should be able to send their staff/employees.
Acknowledgements

The authors would like to thank the Australian Centre for Agricultural Research (ACIAR) for funding the VALTIP 3 project and the tour delegates for their genuine interest and participation in the activities. We would also like to thank DAF staff, UoM staff, Jack Norton and Simon Dories for their involvement in training activities.

References


Author/s:
REDMAN, A; Belleville, B; Dakin, T

Title:
Advancing enhanced wood manufacturing industries in Laos and Australia - PML Easbeam Study Tour

Date:
2019-11-01

Citation:
REDMAN, A; Belleville, B; Dakin, T, Advancing enhanced wood manufacturing industries in Laos and Australia - PML Easbeam Study Tour, 2019

Persistent Link:
http://hdl.handle.net/11343/230793

File Description:
Published version