Nancy Université, France
Laboratoire d'Etudes et de Recherche sur le Matériau Bois

COST Action FP 0904 – Thermo-Hydro-Mechanical Wood Behaviour and Processing
http://www.cost-fp0904.ahb.bfh.ch

Current and Future Trends of Thermo-Hydro-Mechanical Modification of Wood Opportunities for new markets?

March 26-28, 2012, Nancy, France

Faculté des Sciences et Technologies – Université de Lorraine
Boulevard des Aiguillettes, BP 70239
54506 Vandoeuvre les Nancy

Instruction for abstract submission
Guidelines for the authors

Authors are kindly invited to submit the abstract before November 18, 2011

The official language of the congress is English. We invite authors to propose contributions related to the topics covered by the four sessions depicted thereafter for presentation at the congress.

- Session1: TH treatment of wood
- Session 2: THM treatment of wood in closed system
- Session 3: THM treatment of wood in open system
- Session 4: Market applications of TH and THM treated wood

Papers presented to the meeting will be gathered in a book of abstract as extended abstract of two pages maximum.

To submit your abstract, please use enclosed template following the given guideline for each part inside the template.

Contact information:

Main author: Lars Blomqvist, Linnæus University, SE-351 95 Växjö, SWEDEN

E-mail: lars.blomqvist@lnu.se

Title: The influence of individual veneer orientation on the shape stability of planar lamination

Authors: Lars Blomqvist, Jimmy Johansson, Dick Sandberg, G. Kifetew

After completion, please send this page and the abstract to: Cost.nancy@lermab.uhp-nancy.fr

Current and Future Trends of Thermo-Hydro-Mechanical Modification of Wood (pp.160-162). COST Action FP0904 Thermo-Hydro_Mechanical Wood Behaviour and Processing, Nancy, France, March 26-28

The influence of individual veneer orientation on the shape stability of planar lamination

L. Blomqvist, J. Johansson, D. Sandberg, G. Kifetew

Linnæus University, Sweden
lars.blomqvist@lnu.se

Key words: adhesive, laminated, open system, THM processing, wood

Laminated veneer products manufactured using pressure and heat have high strength and elasticity. However, manufacturing industries of laminated veneer products may have a high degree of rejections both in production and later when the products are exposed to climate variations. The rejections are often due to distortion and cracks propagation. Causes of these problems have been investigated in several studies and have been summarized by Navi and Sandberg (2011).They include variations in temperature and moisture content, uneven distribution of surface pressure during moulding, thickness variations in veneers and the shape of the product, the properties of the veneers, and the induced high stresses and strains in the product during manufacturing. To understand this complex process, the influence of each material and process parameter on distortion and cracking must be studied. Therefore, empirical studies can be a feasible way to determine how different material properties affect the product performance. The main challenge of this study is to establish an understanding of how the orientation of each veneer in a laminated construction interacts and affects crack propagation and the shape stability of the product.

Three peeled veneers with a dimension of 1.2x150x150 mm were glued together into a planar assembly. The veneers and the glued assembly were conditioned at 20°C and 20 % RH to an equilibrium moisture content of about 5 % before and after pressing, respectively. The veneers were straight grained and had the fibre orientation parallel to two of the edges of the veneer sheets. For gluing, Urea formaldehyde adhesive was used for gluing (glue:hardener 100:20, 170 gram/m^2). Pressing was performed at 20°C without additional heating to avoid the influence of temperature gradients. The mean value of applied surface pressure was 0.5 MPa which was controlled via a sensor with a thickness of approximately 0.1 mm. The sensor is placed between veneer assembly and the press plate. A logger is connected to the sensor and the logger communicates with a computer, Figure 1.

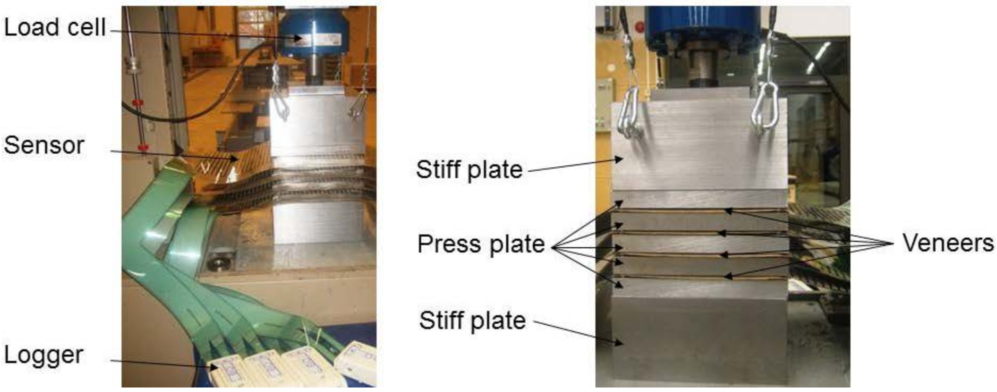

Figure 1. Experimental setup with samples and sensors between press plates

Peeled veneer has one side that is commonly called the *loose side* and the opposite side is called the *tight side*. The loose side has fractures from the knife as it peels the veneer from the log. The most common method in laminated veneer products manufacturing is to have the orientation of the loose side inwards the glued assembly. It is also common practice to orient every second veneer crosswise in plane to influence the swelling and shrinkage and thereby a more shape stable construction. The study was carried out as a factorial experiment with two variable parameters regarding veneer orientation, Table 1.

Table 1. Orientation of the veneer in each test group, i.e. the direction of the loose side of veneer and fibre orientation in the plane where ⊥ means that the fibre orientation of the veneer is 90 degrees to the adjacent veneer (–).

Group	No. of samples	Side of veneer (tight/loose) seen from above			Relative orientation between veneers in the plane of the assembly		
		Top	Middle	Bottom	Top	Middle	Bottom
A	3	Tight	Tight	Tight	–	⊥	–
B	4	Tight	Tight	Tight	–	–	–
C	4	Tight	Tight	Loose	–	–	–
D	4	Tight	Tight	Loose	–	⊥	–

After pressing and conditioning, the bow height of the distorted assemblies was determined crosswise (90°) and lengthwise (0°) according to the fibre orientation of the top veneer, Table 2.

Table 2. Mean values of bow height (mm/150 mm). Positive values increases and negative values decreases according to the top veneer seen from above

Group	Crosswise (90°)	Lengthwise (0°)
A	0	0
B	8.5	0
C	1.5	-0.1
D	-1.0	0

The results show that there is a clear difference in bow height between the groups of sample in the crosswise direction. In the lengthwise direction however in all groups none or a very small bow height were recorded. Results indicate that it is preferable that all veneers with the loose side or the tight side to be oriented in the same direction and every second veneer be oriented crosswise in order to improve the shape stability of the product, as in sample [Group A]. The traditional method of veneers orientation which is as in Group D also shows low distortion. However, according to the result presented there is still a tendency for distortion. The disadvantage of having all veneers oriented in the same direction [Group A and B] is that cracks in the loose side will be exposed on one side of the assembly. It is well known that crosswise gluing in plane of the veneers provides a stable assembly [Group A and D]. The probable explanation for the orientation of the loose side of the veneer to influences the shape stability of an assembly is that cracks, moisture and adhesive interacts differently when a loose and tight surfaces respective a loose and a loose surface meet.

From this study it can be concluded that the orientation of the veneer has a major influence on the shape stability of laminated products. Moreover, this study reveals that the orientation of the loose side of the veneer not only influences cracking but also the shape stability.

References

Navi, P. & Sandberg, D. (2011). The thermo-hydro-mechanical processing of wood. Presses Polytechniques et Universitaires Romandes, Lausanne.