



COST Action FP1407

1st Conference

**Life Cycle
Assessment
EPDs and
modified
WOOD**

COST Action FP1407 1st Conference

Life Cycle Assessment, EPDs and modified wood

Koper, Slovenia

August 25th – August 26th, 2015

COST Action FP1407

Understanding wood modification through an integrated scientific and
environmental impact approach (ModWoodLife)

Life Cycle Assessment, EPDs, and modified wood

First COST Action FP1407 International Conference
Koper, Slovenia
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Editors: Andreja Kutnar, Michael Burnard, Matthew Schwarzkopf, and Amy Simmons

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Feasibility of highly durable plywood production with poplar wood as a substitute of tropical species

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Keywords: Poplar, Plywood, Durability, Heat treatment, Mechanical properties

Naturally durable tropical species such as Okoumè (*Aucoumea klaineana* Pierre) are used for the production of plywood in highly demanding environments. The use of these species could result in environmental risks and high impact operations in tropical forests and soils. In this work the feasibility of the production of plywood panels using local fast growing species with durability enhanced by heat treatment is analysed.

The heat treatment was performed on poplar (*Populus sp.*, I-214 euro-american clone) veneers to be glued after heat treatment (post) and on panels glued before heat treatment (pre) both with melamine-urea-formaldehyde (MUF) resins. Veneers and panels were treated at 180 °C for 8 hours with a dry mass loss of about 5 %. Two groups of untreated and treated samples are shown in Figure 1.



Figure 1: Heat treated (on the left) and untreated samples (on the right).

The mechanical properties were assessed according to the reference testing standard EN 310. Test results in terms of strength and stiffness reduction are presented in Table 1.

Table 1: Reduction of the mechanical properties of the panels as a percentage of the initial value.

	MOR L [%]	MOR T [%]	MOE L [%]	MOE T [%]
pre	38	30	10	3
post	25	37	0	7

For both cases, according to Kruskal-Wallis and Pairwise Wilcoxon Test for independent values used as post-hoc, MOE did not show significant differences compared to the control, while MOR suffered serious reductions. The bonding quality was investigated according to the EN 314 standard using the pre-treatment 5.1.2 and the shear strength (f_v) determined (Table 2). ACWF (Apparent cohesive wood failure) is not reported because a large part of the samples broke across the glue layers.

Table 2: Reduction of the glue performance as a percentage of the initial value.

	f_v [%]
Pre	69
Post	64

The panels obtained after heat treatment show very large reductions of MOR for both samples glued before and after treatment. The variation of MOR was verified not to be statistically significant. The reduction of the glue shear strength is very large. This research showed that production of heat treated poplar plywood is feasible but needs important improvements in order to avoid reductions in mechanical properties.

References

- EN 310. 1994. Wood-based panels - Determination of modulus of elasticity in bending and of bending strength.
 EN 314-1. 2005. Plywood - Bonding quality - Part 1: Test methods.

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Working Groups

The main (although not exclusive) aim of this Action is to characterize the relationship between modification processing, product properties, and the associated environmental impacts and their comparison to normal wood based products and alternative (often) non-renewable materials. This includes the development and optimization of modified processing to maximize sustainability and minimize environmental impacts. The benefits of performance improvement need to be measured against 'baseline' scenarios with more conventional wood products. The key research and activities needed to achieve the goal are presented in Section D.1 of the MoU (available online at <http://costfp1407.iam.upr.si>), where academic and industry researchers along with other experts will join the interdisciplinary research theme. The Action's members are grouped in the 4 Working Groups described below, although there will be strong collaboration and networking among Working Groups.

Working Group 1: Product Category Rules

Objectives: To develop product category rules for modified wood based on the scientific and industrial state-of-the-art of commercialized and developing modified wood products and technologies. Evaluation of current PCRs and adoption where appropriate.

Activities:

- Thermodynamics and chemical reactions associated with wood modification processing
- Process parameters leading to thermal degradation and chemical, structural, mechanical, and physical properties changes
- Innovative wood modification processing for specific applications in construction and interior design.
- Performance of modified wood: machining of the wood surface (with reference to FP0802; see also partial results of E35); the impact of the combined actions of heat, moisture, and mechanical pressure (results of FP0904), surfaces (FP1006) and wider issues (FP1303).

Leader: Dick Sandberg (Sweden); Deputy leader: Robert Nemeth(Hungary)

Working Group 2: Life Cycle Assessments

Objectives: To perform objective environmental impact assessments of commercial modification processes and incorporate environmental impact assessments into wood modification processing and product development, including recycling and upgrading at the end of service life.

Activities:

- Crucial environmental aspects associated with innovative wood modification processing technologies and resulting products

- Reference service life of the product, maintenance requirements and performance in service (in cooperation with FP1303).
- Optimization of the developed processes from the sustainability point of view.
- Scenarios for up-cycling after product service life based on the cradle to cradle concept.

Leader: Christelle Ganne-Chedeville (Switzerland); Deputy leader: Lauri Linkosalmi (Finland)

Working Group 3: Environmental products declarations

Objectives: To develop environmental product declarations based on WG1 and WG2 and force a harmonization of various national EPDs in the field of wood modification.

Activities:

- Environmental product declarations of modified wood
- Product design guidelines and properties of assemblies made of modified wood
- Data to architects, engineers, and industry of the physical and structural properties, combined with environmental impacts of the wood modification processing in a clear and consolidated form

Leader: Callum Hill (UK); Deputy leader: Ana Dias (Portugal)

Working Group 4: Integration, dissemination and exploitation

Objectives: To ensure dissemination, evaluation, and exploitation of the Action's results together with establishing a strong network with the relevant industrial stakeholders.

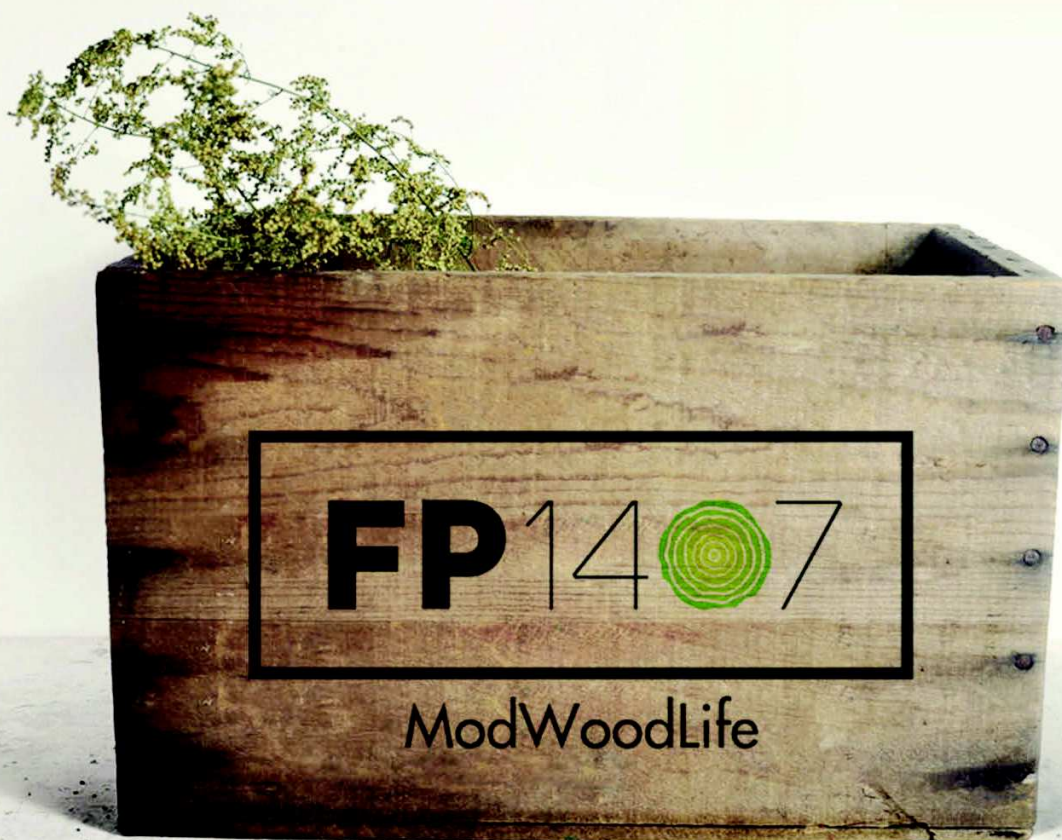
Activities:

- Promotion, dissemination and commercialization of knowledge acquired in WG1-WG3
- Evaluation of research results of WG1-WG3 by the industry stakeholders
- Marketing campaigns on social networks with the aim to increase social awareness and acceptance
- Lobbying – reaching policy makers and European and national program operators.

Leader: Edo Kegel (Netherlands); Deputy leader: Michael Burnard (Slovenia)

COST Action FP1407

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(ModWoodLife)



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