

OUTPUTS AND RESULTS

Structural construction products: eco-beams and eco-columns

Ultimate outcomes of the CELLUWOOD project are the eco-beams and eco-columns.

The production process involved use of “greener” binding systems based on more natural raw materials. The processing technologies have been tailored with the application of the bioresin systems. This could be done with the conventional production facilities and gluing lines in the companies. In particular good results were showing the eco beams which were using the lignin-based gluing system. These beams showed good mechanical properties in some cases better than conventional beams. They are also suitable for outdoor use.

An important aspect of the use of the project developed gluing systems is that they do not require any extra investment in production lines.



CELLUWOOD

PROJECT CONSORTIUM



TARGET MARKET

All the products developed within the project have the potential commercial exploitation. The promotion of the technology to resin and glulam manufacturers worldwide could be envisaged in collaboration with lignin and nanocellulose producers.

Further commercialisation of the eco-beams and eco-columns can be of interest to small businesses of craftsmen (woodworkers, refurbishing workers, restorers, repairers) and SMEs clusters, as these products provide an opportunity to expand and complete their product offer. The developed eco-beams and eco-columns could also be of interest for architects and design studios in the sense that they can directly be implemented and included in product portfolios for commercial activities (e.g. promotion of eco-friendly designed building).

PROJECT CONSORTIUM

InWood Developments Ltd (UK)
www.in-wood.co.uk

Tecnifusta Ingeniería SL (ES)
www.tecnifusta.com

CBD d.o.o (SLO)
www.cbd.si

CHIMAR HELLAS SA (GR)
www.chimarhellas.com

AIDIMA (ES)
www.aidima.eu

Brunel University (UK)
www.brunel.ac.uk

InnovaWood (BE)
www.innovawood.com

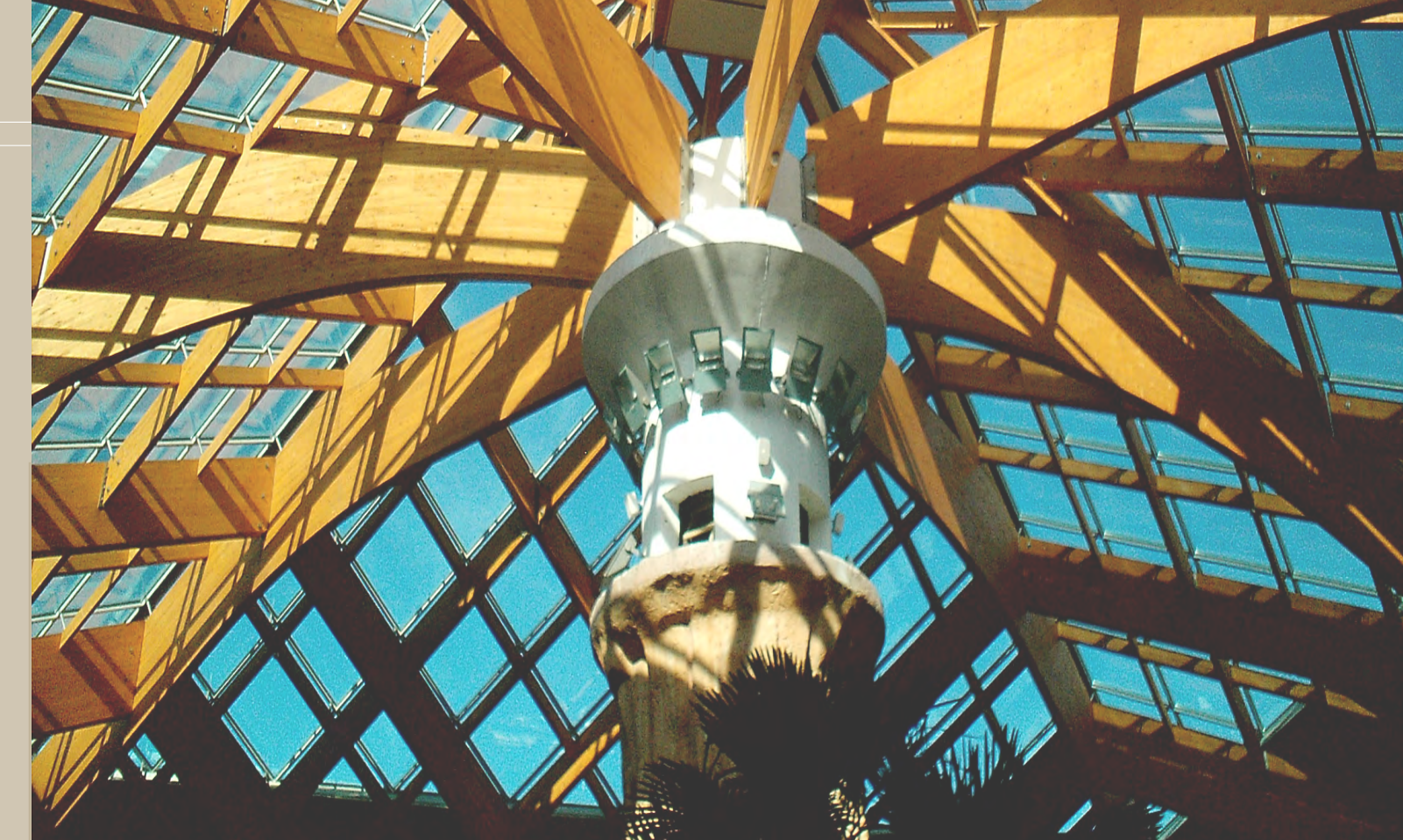
CONTACT

Mr. Edward Stenhouse
Project Coordinator
edwardstenhouse@btconnect.com

Prof. Dr. Mizi Fan
Project Management
Mizi.Fan@brunel.ac.uk

InnovaWood
Project Web and Dissemination
office@innovawood.com

CELLUWOOD



Co-funded by the Eco-innovation
Initiative of the European Union



CELLUWOOD

Laminated Strong Eco-Material for Building
Construction Made of Cellulose-Strengthened
Wood

OUR OBJECTIVES

The CELLUWOOD project aimed at developing a new range of structural elements for constructions made of wood by introducing innovative technologies.

The project developed fit for purposes lignin-based and nanocellulose bioresins and for novel applications in laminated wood production (glulam products) instead of synthetic resins made from petrochemicals.

The ultimate outcomes are new glulam re-engineered construction elements, namely eco-beam and eco-columns, manufactured with more natural based and eco-friendly adhesives in comparison with the conventional laminated beams and columns.



CELLUWOOD



The project objectives are achieved through:

- introduction of (new) technologies from other sectors (e.g. cellulose velvet, bio-composite reinforcement and bioresin);
- innovation in the use of nano/micro cellulose and bioresin technologies in timber re-engineering;
- development, testing and demonstration of novel products.

OUTPUTS AND RESULTS

New adhesive, bonding and structural components:

- lignin-based gluing system;
- nanocellulose epoxy and casein resins for eco-beams;
- inorganic core material for eco columns.

Lignin-based gluing system

The best project results were achieved in producing lignin-based gluing system consisting of lignin-modified PF resin and a suitable hardener to promote polymer setting.

The final outcome was a glue with a “greener” character capable of setting in cold pressing in order to be used as binder for glulam building materials in small and medium sized companies. This adhesive is of phenol-formaldehyde type resin where 50% of phenol has been replaced by lignin. This new lignin-based gluing system can be effectively used in the production of glulam beams and columns with a performance even better than with conventional gluing systems.



The low emission lignin modified PF resin is easy to apply and cheap to buy.

Eco-beams fabricated with the modified PF resin showed better mechanical properties than commercially available MUF (melamine-urea-formaldehyde) beams and are suitable for outdoor constructions.

The developed gluing system based on lignin-PF resin presents a clear environmental improvement regarding commercial ones: 74% vs MUF and 86% vs PU (measured with Ecoindicator 99 method). Besides this environmental advantage, it has lower cost and shows better technical performances.

CELLUWOOD

OUTPUTS AND RESULTS

Nanocellulose epoxy resin and casein resin for eco-beams

Nanocellulose reinforced adhesives have been another novelty developed concept within the project. Two types of glue were proposed and tested: nanocellulose reinforced epoxy and nanocellulose reinforced casein glues. The potential of nanocellulose is that it achieves strong and reliable bonds derived from the very high surface area of the nano-particles relative to their size.

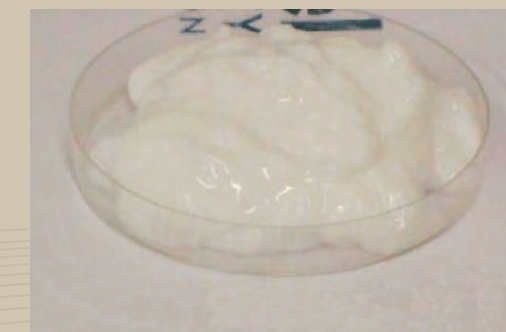
It has been proven that low addition of nanocellulose could significantly increase the bonding performance of both adhesives.

Nanocellulose reinforced resins have the potential to replace current used MUF and epoxy resins, and provide much efficient and high strength resin systems for laminated timber industries. However, it must be noted that current early stage of nanocellulose development, the cost of the nanocellulose is still high, although a lower dosage of the nanocellulose epoxy could be used for the same bonding outcomes, which could offset the costs.

Inorganic core material for eco-columns

In addition to different gluing system the project also developed and tested the Inorganic Core Material (ICM) for eco-columns. It is a novelty idea of using wood residues from timber beam and column production as core material for the eco-columns.

The key component for ICM is a modified sawdust and gypsum mixture formulation. It is envisaged that once the interface between the ICM and enclose lumber is improved, the ICM composite columns can potentially be commercialised to use wood residues and reduce raw material costs for the column production. ICM represent a versatile product, cheaper than solid timber.



CELLUWOOD