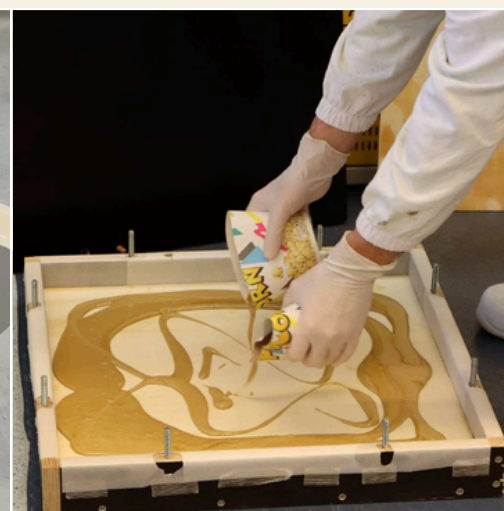
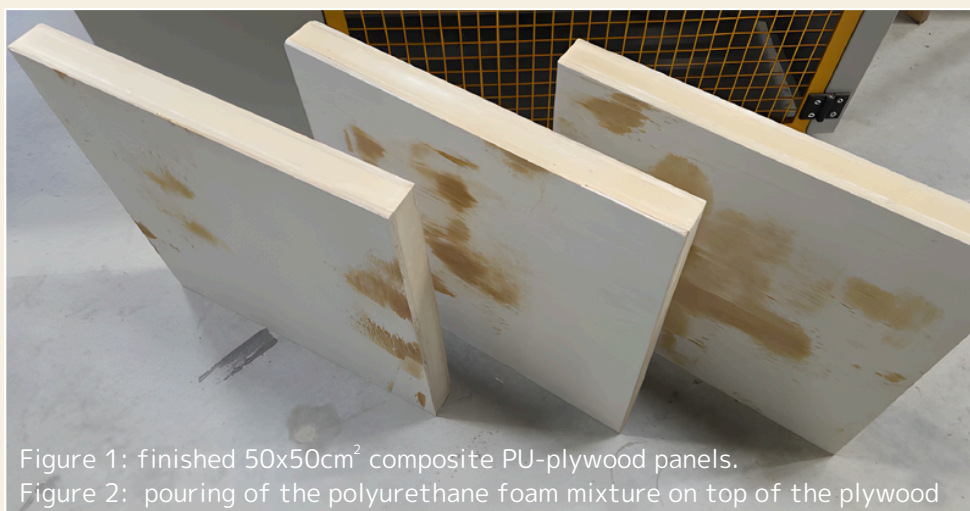


Revolutionizing Construction through Green Chemistry

Project goal: The NewWave Project, funded by the European Union's Horizon Europe Programme, is actively working to build a sustainable and circular economy by introducing innovative and bio-based raw materials into production lines. The goal is to replace toxic chemicals and reduce the environmental footprint of products.



The integrated research journey of the NewWave project is earning several results, aimed at merging diverse bio-based innovations into a single structural product for the construction industry. As part of this agenda, the manufacturing line for polyols and polyurethanes produced several composite PU-plywood panels, which will serve as performance indicators of the bio-based chemicals that have been developed throughout the project, as well as demonstrator pieces for the realization of a mock-up.

The Anatomy of a Composite Panel

The developed composite panels are not merely building elements; they are the result of integrating several innovative production lines brought forward by the project.

- **The Core:** a polyurethane (PU) foam formulated by AEP Polymers using a bio-polyol produced by BTG. This component is derived from fast pyrolysis bio-oil (FPBO), and partially replaces fossil-based raw materials.
- **The Facing:** two 1 cm-thick plywood layers enclose the core. These layers utilize green resins developed by Foresa, where traditional phenol is replaced by pyrolytic lignin, a fraction of FPBO.
- **Dimensions and Standards:** each panel measures 50x50x5 cm³. A 3 cm thickness for the internal foam was chosen to balance manufacturing ease with the need to comply, where possible, with international testing standards.

Production Challenges:

Researchers evaluated two strategies for bonding the foam to the wood: gluing pre-formed foam blocks or pouring the polyurethane mixture directly between the panels (pour-in-place process). The second method was chosen for several technical and economic reasons:

- **Efficiency:** it reduces production steps and eliminates the need for additional adhesives.
- **Continuity:** it avoids the “collage” effect of assembling small foam pieces, ensuring a uniform and structurally sound core.
- **Industrial Scalability:** the method mirrors processes already used for the large-scale industrial production of sandwich panels.

Process Precision:

The testing phase revealed that producing these panels requires rigorous control over several parameters:

Orientation and Sealing: preliminary tests showed that a closed horizontal mold is superior to a vertical one, as the latter caused adhesion defects in proximity of the pouring cavity.

Expansion Force: during the chemical reaction, the foam expands, generating enough pressure to deform the plywood unless a closed, reinforced mold—mechanically locked with bolts—is used.

Adhesion: to ensure an adequate bond between the foam and the wood, the internal surfaces of the plywood are pre-treated by sanding them with sandpaper.

Time Factor: the panel must remain sealed in the mold in order for the foam to cure, in this case at least three hours; this curing time is essential to ensure the structure will not be damaged during extraction from the mold.

Toward Real-World Application: The Mock-up and Testing

The project resulted in the production of 15 composite panels in total. 8 panels (covering a total surface area of 2 m²) will be installed in a facade mock-up at the InnoRenew headquarters, where they will be displayed alongside other project materials such as MDF panels, Cross-Laminated Timber (CLT) and modified cladding. The remaining 7 panels will be cut into smaller samples and characterized for their thermal insulation capacity, acoustic properties, and mechanical strength.

Learn more on newwave-horizon.eu

Project partners



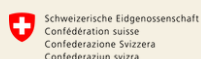
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