

# Ensuring the circularity of wood products for the construction industry

**Project goal:** The project NewWave focuses on the development on new and sustainable bio products for the construction industry. A key element is to ensure the circularity of the products realized. In this summary, we take a look at how we demonstrated the circularity of modified wood and plywood products developed within the project.

## Key Technology: Thermo-Chemical Fractionation (TCF)

Circularity is demonstrated through **Thermo-Chemical Fractionation (TCF)**, an innovative two-step process (currently at TRL-6/7).

This transforms residual biomass and end-of-life products into sustainable feedstocks.

- **Fast Pyrolysis (FP):** the biomass is converted into Fast Pyrolysis Bio-Oil (FPBO).
- **Fractionation:** the **FPBO** is subsequently fractionated—based on chemical functionality—yielding a reactive liquid pyrolytic lignin (LPL) fraction and a pyrolytic sugar-rich fraction (PSW). These fractions are excellent starting materials for the production of bio-based chemicals and materials.

## NewWave products tested

We tested two main products for their recirculation into the TCF process:

- **Plywood:** Supplied by the Spanish partner Foresa Tech. This panel is made by gluing wood veneers with a resin that, in the NewWave context, contains up to 50% by weight of pyrolytic lignin.
- **Modified Wood:** Supplied by the Dutch partner Foreco. This product is made by vacuum/pressure impregnation (typically of Radiata Pine) with a formulation derived from FPBO, containing up to 80% by weight of FPBO.



Plywood boards supplied Foresa Tech



Modified wood supplied by Foreco

## Experimental results on circularity

To investigate **circularity**, samples of plywood and modified wood were prepared, analysed, and reused as feedstock in the fast pyrolysis process, followed by laboratory-scale fractionation. During pyrolysis (performed with the BTG Mini Pyrolysis Plant), operational challenges were encountered:

- **Plywood:** the process caused a rapid increase in reactor pressure, suggesting the formation of contaminants, likely triggered by components in the resin.
- **Modified Wood:** due to the material's "fluffy" nature and high fine dust content, feeding and flowability issues occurred.

It is believed these problems can be resolved by co-feeding the NewWave materials with clean biomass and adapting the feeding system and pyrolysis parameters, although this requires further testing. The modified wood showed a significantly higher carbon content (**58.1%** by weight) compared to the reference biomass (softwood dust: **49.2%** by weight), attributable to the FPBO-based impregnation process.

Unlike the reference biomass which produced a single-phase FPBO, both NewWave products generated FPBOs that separated into two distinct phases (a light aqueous phase and a heavy organic phase). Plywood yielded a higher proportion of heavy liquid, while modified wood produced more light phase.



Figure a-b-c show the sizing and grinding of plywood and modified wood.



Figure d shows the grinded modified wood  
Figure e shows grinded plywood



Left: Plywood and fractions produced. Right: Modified wood and fractions produced

## Conclusions

Despite the process challenges, the yields and properties of the fractions (LPL and PSW) obtained through water extraction were determined and compared to standard reference materials. Analyses and simple laboratory curing experiments indicated that the fractions obtained are very similar to the original fractions.

The **fractions can likely be reused** (alone or in a blend): the PSW fraction is particularly suitable for wood modification formulations, while the LPL/FPBO fraction can be reused in resin production for plywood applications.

In summary, the latest activities **demonstrate** the suitability of end-of-life modified wood and plywood for recirculation into the TCF, supporting NewWave's objective of creating an essentially waste-free production processes for wood products.

Learn more on [newwave-horizon.eu](http://newwave-horizon.eu)

Project partners



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