Utilization of Fast Pyrolysis Bio-Oil for Wood Modification

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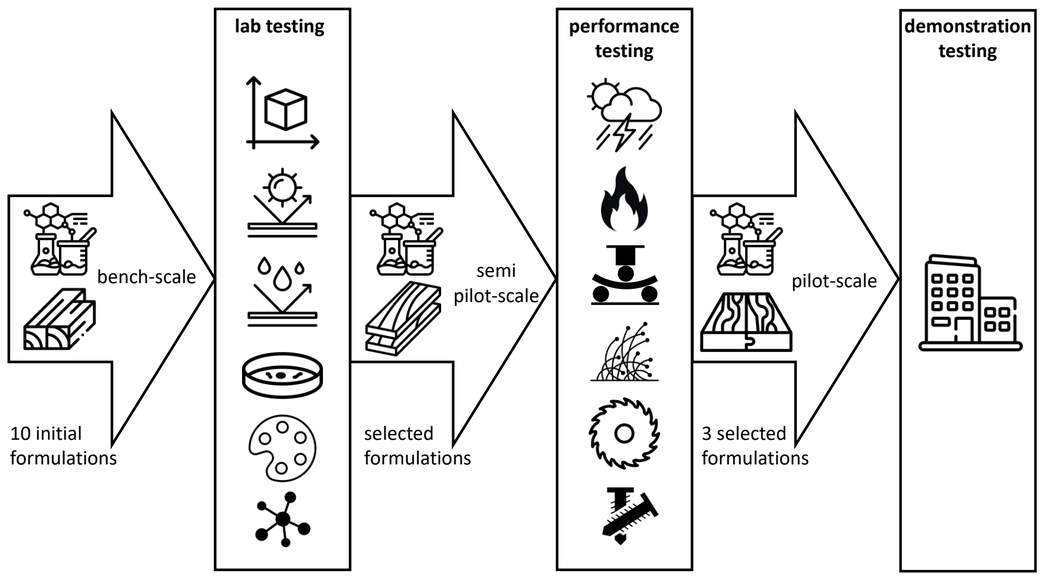
- **The NewWave project aims to contribute to building a circular economy by introducing sustainable raw materials in different manufacturing lines, replacing toxic chemicals and lowering the environmental footprint of the products. The raw materials are obtained from the thermochemical fractionation of biomass.**

- The Thermo Chemical Fractionation (TCF) technology has been developed to utilize low-value resources to produce a broad range of bio-based chemicals. This process converts biomass residues by fast pyrolysis into Fast Pyrolysis Bio-Oil (FPBO), a liquid product that contains chemicals derived from the depolymerization of chemical constituents of biomass.

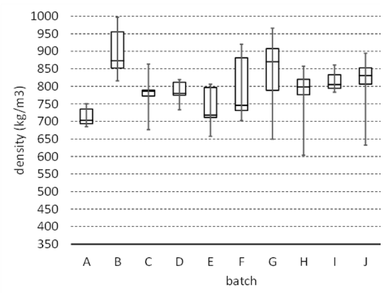
- This research focuses on the modification of wood with FPBO to develop an entirely biobased alternative to currently used toxic and fossil-based preservation agents such as copper salts, organic biocide ingredients and creosote.

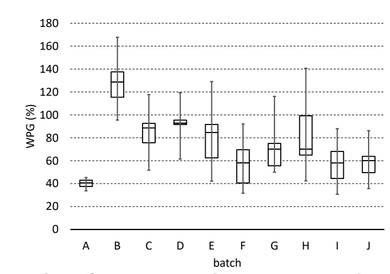


Schema of the workflow

Ten formulations (A-J) based on FPBO were prepared and characterized in terms of pot life, viscosity, and curing behaviour among others. The impregnation process of radiata pine samples was performed in the bench-scale reactor.

- Characterization methods included: Moisture uptake, dimensional stability, density, mechanical strength, UV stability, durability tests against fungi and moulds, fixation of components and VOCs emission.





Experimental samples and some results for samples treated in the bench-scale reactor

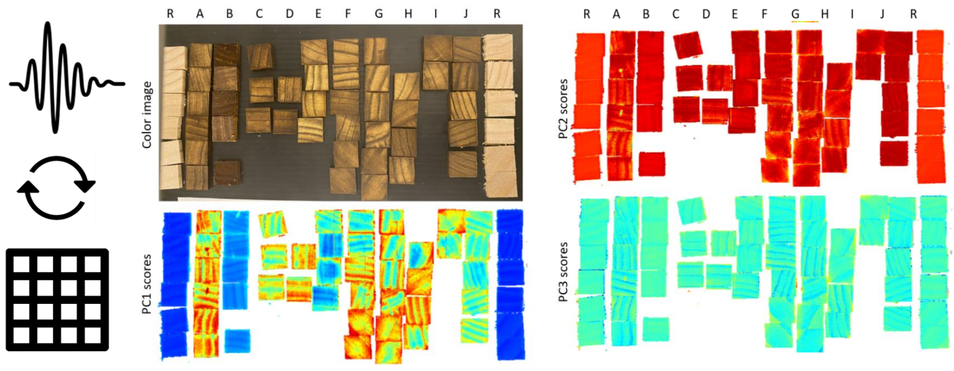


Image of samples and PCA analysis – PC1, PC2 and PC3 scores – FX17 camera (NIR: 900 - 1700 nm)

- As a follow-up of screening tests best-performing formulations will be selected and used for modification of larger amounts (ca. 1m^3) of wood (Radiata pine, Scots pine, European beech). Samples will be then evaluated in terms of weathering, durability, fire, and mechanical performance. **After extensive laboratory tests, new construction products will be manufactured at an industrial scale and used at a demonstration site.**

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