

Processing, biorefining and extraction: News from CIRCBUILT!



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Through the drafting of a guideline document gathering technical requirements (D.1.1 Technical requirements and specifications report available [here](#)), CIRCBUILT partners have described the specifications, agreed protocols, and regulatory frameworks for the creation of the Intermediate components (ICs) and final products. Based on this, recent activities have aimed at developing bio-based intermediate components (ICs) at lab-scale, as well as formulating and investigating their properties.

IC1 - Foam formed materials

VTT, INRAE, and AISTI work on the lab-scale development of IC1. **INRAE** formulates different surfactant-free foams and molds them into small-scale sheets while visualizing dry solid porous foams. **VTT** optimizes high-consistency recipes, enhances mechanical and thermal properties through pretreatments, and manufactures small scale sheets. **AISTI** optimizes recipes to achieve the targeted acoustic properties and manufacture small-scale sheets. **INRAE** receives powder materials prepared by **VTT** from different raw materials and focuses on characterizing their granulometry and composition, including glucose, proteins, and lignin.

IC2 - BioNIPU adhesive

BFH first develops an extraction protocol to generate extracts as a basis for the BioNIPU adhesives. Secondly, **BFH** works on identifying a suitable formulation and synthesis protocol for the BioNIPU adhesives for particle board manufacturing. During this step, routes are established for extracting valuable tannins, saccharides, and other bio-based molecules of interest from various secondary sources alongside chemical analysis using liquid chromatography and other spectroscopic methods. Finally, **BFH** uses physical modelling to predict pressing conditions and downstream production parameters for particleboard manufacturing with the adhesive.

IC3 - Films & coatings

VTT works on adaptive passive cooling cellulose-based films by developing an up-scalable formulation for cellulose nanofibers (CNF) film using refined raw materials. **VTT** develops biorefining processes for secondary bio-based materials, applying mechanical and chemical refining techniques to optimize cellulose fiber yield and quality. In addition to CNF films, **VTT** will develop a suitable fire-retardant coating formulation for post-treatment of the different panels' surfaces. **ENVI** studies complementary extraction and purification protocols; drafts and implements optimized protocols for lab-scale extraction, separation, and purification, specifically targeting substances with thermoacoustic insulation characteristics.

In parallel with the intermediate components development, **VTT**, supported by **INRAE**, **BFH**, and **AISTI**, lead the evaluation of compatibility between the different ICs, together with the analysis of their properties to ensure they meet the necessary standards for final product development, while also exploring potential uses for these components outside of the final products. **VTT**, **INRAE**, and **AISTI** will each assess the mechanical properties of their created sheets through compression testing and evaluate insulating properties with specialized equipment.

Stakeholder engagement

During the first months of the project, ZHAW worked with the consortium to define a strategy for stakeholder engagement and collaboration. A Stakeholder Forum has been recruited to co-design solutions aligned with industrial needs and market requirements. To collect feedback on the foreseen products, a survey has been conducted among Forum members (see full results [here](#)). These insights have enabled the partners to progress significantly in the design and fabrication of the products, bringing them one step closer to creating sustainable construction materials made from bio-based secondary materials. The ZHAW team is now working on the participatory process to co-design the final products – acoustic panels, thermal insulation panels, construction panels and adaptive cooling windows based on the following intermediate components (IC).



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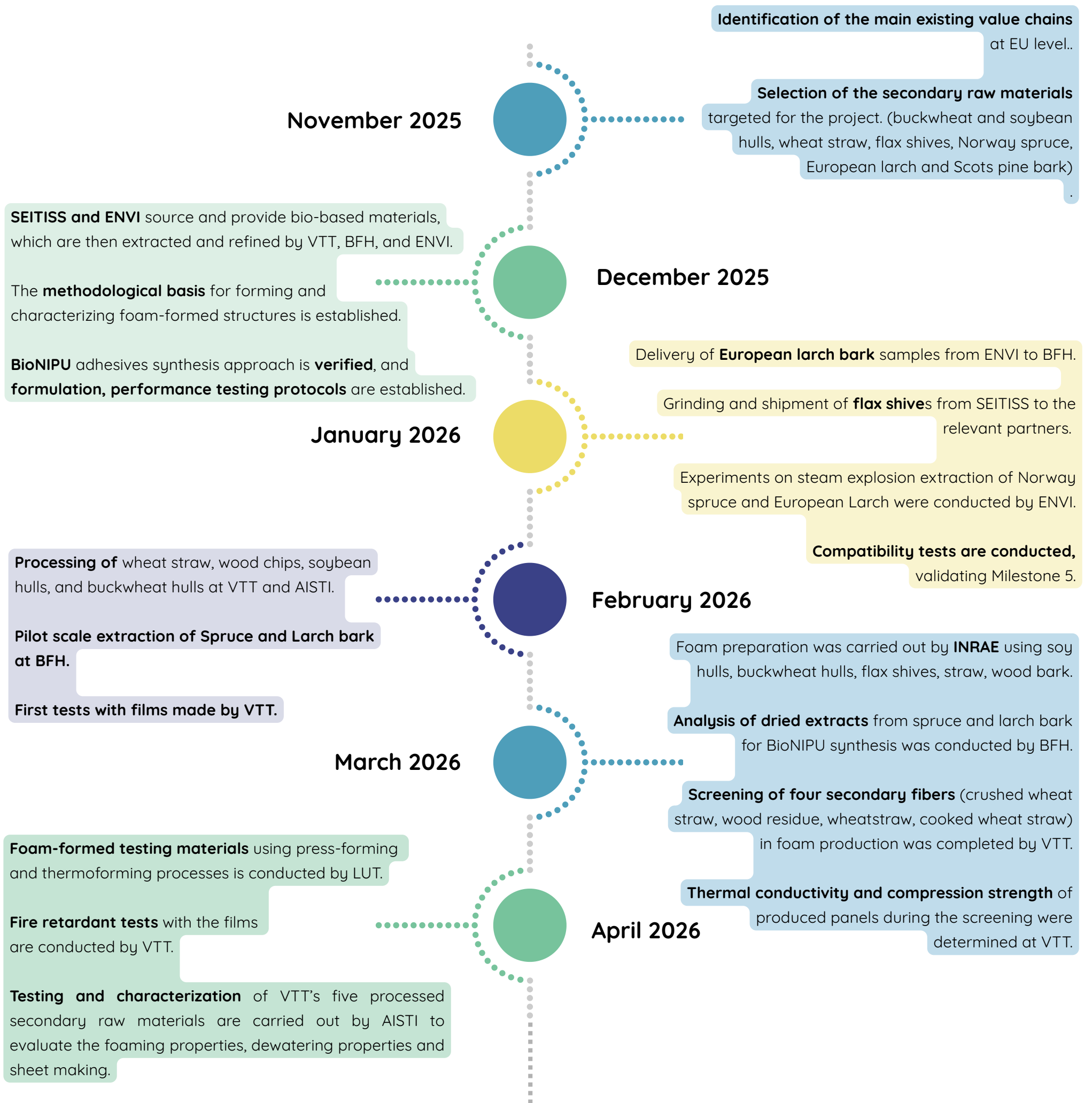


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What's next ?

In the coming months, VTT will continue testing the addition of fibers and shives in selected foam formulations. On the IC2 development, BFH will carry out the synthesis protocol for BIONIPU development and **prepolymer chemical characterization** until the end of June 2026. The development of adhesive formulation including **catalyst evaluation** and performance testing will be made until October 2026. For the IC3, VTT will continue the **development of cellulose films prepared from CIRCBUILT raw materials**. They will also carry out **preliminary compatibility testing** of biophenol-based flame retardants, as well as perform mechanical and optical characterization, including the characterization of thermal conductivity and compression strength of foams from selected formulations.