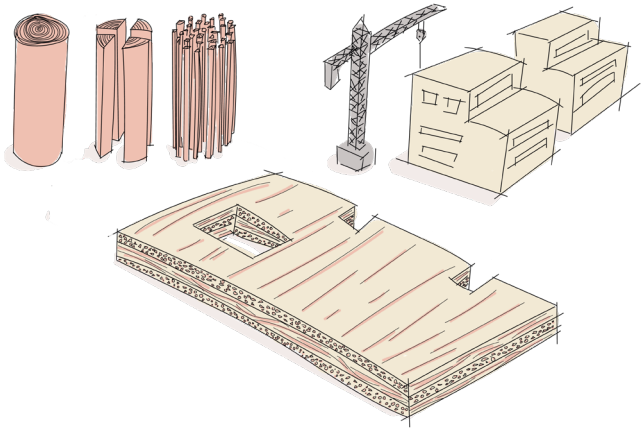
Bern University
of Applied Sciences

Upcycling of inexpensive timber products to produce high-performance construction components

Timber construction is booming. For load-bearing purposes, solid wood products are usually used today. These high-quality building products can perform the same functions as reinforced concrete in construction projects but have a much lower CO_2 footprint. However, strong demand means they are relatively expensive. Wood utilisation is not particularly high either at around 40%. Using an innovative splitting technology, a new construction product is being developed as part of the 'Upcycling of inexpensive timber products to produce high-performance construction components' project. This will enable the entire wood volume of a tree to be used long term and give used wood a new life cycle. Through this development, BFH – a leading wood technology research institution internationally – is making a major contribution to optimising the recycling of material in the construction industry.

Wood panels for load-bearing applications

The research project's aim is to develop Scrimber CSC, a new structural panel for load-bearing applications based on an innovative technology that produces high-strength strands of wood. The high tensile strength of the individual wood strands and the impressive mechanical panel properties are due to the fact that the strands are produced by splitting the starting material parallel to the grain instead of cutting through it. The rolling process to split the wood was developed in the USA and Australia for the manufacture of structural beam products under the name of Scrimber. The development initiated by TS3 AG now aims to apply this technology to large-sized panels for load-bearing purposes.



Using an innovative splitting technology, a new construction product for load-bearing applications is being developed.

Scrimber CSC versus cross-laminated timber CLT

The multilayer panel Scrimber CSC is to possess comparable properties to cross-laminated timber mechanically and during processing, but will be around 50% cheaper to produce due to the degree of timber utilisation of almost 100% and continuous manufacturing. Scrimber CSC has a number of other advantages over CLT: the bulk density and therefore strength can be controlled via the press force and not just through the selection of boards. Additives, such as fire retardants, can be inserted into the entire panel and not just the surface.
Compared with solid construction techniques, the components made of Scrimber CSC have the same benefits that generally apply to timber construction: These include the low weight of the components and high level of suitability for (semi) industrial prefabrication and consequent short installation times. The timber construction method offers impressive heat insulation properties from the load-bearing components and high CO2 capture in the building. The significantly lower production costs of Scrimber CSC compared to cross-laminated timber indicate the competitiveness of timber construction can be further improved compared to solid construction and that the use of eco-friendly construction principles will also become more attractive financially.

From strands to panels

The first step in the project is determining the manufacturing technology to produce the wood strands. The researchers will analyse existing processes and systems and engage in discussions with people and institutions who have acquired expertise on Scrimber technology over recent years. In the next step, the strands will be produced in the laboratory and processed to create lab panels. Extensive testing will be carried out to determine the optimal process conditions. After the successful development of single-layered panels, they will be glued together to create multi-layered products similar to CLT. In parallel to development activities, environmental and economical effects will also be evaluated.

BFH – an expert research partner

The Institute for Materials and Wood Technology IWH at Bern University of Applied Sciences BFH is contributing vast experience, tremendous expertise and infrastructure to the project. Besides conventional chip- and fibre-based materials, IWH focusses on lightweight materials, material combinations, as well as alternative raw materials and production processes. The modelling and simulation of manufacturing processes and properties and the environmental analysis of products and processes complement its competency profile. IWH's facilities include the Composite Lab for the manufacture of wooden composite boards, a temperature-controlled materials testing lab for the performance of mechanical and other testing, a state-of-the-art chemistry lab, a surfaces lab and an adhesives lab. The School of Architecture, Wood and Civil Engineering possesses vast expertise in timber construction. This gives the project team access to extensive expert knowledge from the Institute for Timber Construction, Structures and Architecture IHTA and enables it to work on a collaborative, interdisciplinary basis with the relevant areas of expertise.

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