

Proposal for Presentation

Appropriate topic: I - Sustainable Housing and Construction in Europe

Title: Sustainability Performance Measurement for High Reliable Composite Wood Structures made of Fibre-reinforced Plastics, Technical Textiles and Compressed Wood

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Keywords: TIMBER CONSTRUCTIONS, COMPOSITES STRUCTURES, SUSTAINABILITY PERFORMANCE MEASUREMENT, DECISION SUPPORT TOOL

Having been used for centuries as a traditional construction material, wood is currently gaining technological importance by being developed to a highly reliable composite material. The focus of the research project that shall be presented is to combine different types of construction materials (fibre-reinforced plastics, technical textiles and compressed wood) and to assess the system's overall sustainable performance.

In comparison to other more commonly used materials such as steel or concrete, timber suffers from relatively poor durability, low dimensional stability and orthotropic material properties. In addition the load carrying capacity of timber is limited due to natural defects, such as knots. The goal of the research project performed at the TU Dresden is to mitigate these disadvantages by the use of tailor made reinforcements. The figures below show a cross section of a laminated beam and a tube consisting of densified wood that is further reinforced by a transparent glass fiber – epoxy composite glued to the outer wood surface. The laminated beam is reinforced by densified and resin impregnated wood located in the compression and tensile zone.



Experiments performed at the TU Dresden have shown that densified wood in combination with fibre-reinforced plastics can be efficiently used to increase the durability and reliability of timber structures. The developed timber composite elements are characterized by high durability, dimensional stability, strength and stiffness. The multi-functioning reinforcement justifies higher cost of the applied materials.

Based on the concepts of life cycle assessment (LCA) and life cycle costing (LCC), the composite material and

competing materials like steel or concrete are assessed in order to rank them by their environmental and economic performance. For both methods the entire life span has to be analysed, for the LCA the standard ISO 14040 will be followed, for the LCC the cash inflows and outflows have to be raised. One special interest in both, the environmental and the economic analysis is whether there is a trade off between a high energy demand (steel, concrete) and a higher input of manpower (composite wood structures). Currently the modelling process and data research for the LCA Studies are in progress. During the presentation in September the first results of the environmental impact of the different materials will be presented.

The outcomes of the project shall result in a decision support tool that allows decision makers to estimate the environmental and economic performance for a special building material in the context of sustainability.

