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SUSTAINABLE, RECYCLABLE TEXTILE FLOOR COVERINGS MADE FROM HEMP AND SMALL ADMIXTURES OF BIOPOLYMERS FOR GLUEING THE LAYERS

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Background: The project 'HempTuft — Sustainable, recyclable textile floor coverings made from natural plant fibres' aims to develop a tufted textile floor covering according to the principles of 'Design for Recycling' from bast fibres and bio-based as well as biodegradable polymers. This innovative product enables high-quality fibre-to-fibre recycling by using the Lyocell process.
The carpet secondary backing is a nonwoven based on hemp. To improve the bond between the pile yarn respectively the secondary backing and the adhesive component (e.g. PLA), small shares of PLA fibres can be mixed into the pile yarn and the secondary backing, or a PLA film can be needled on to the secondary backing. In addition, the performance characteristics, as well as the environmental and economic properties and the cost-effectiveness of the entire carpet structure, are evaluated.
Ongoing work is to optimize yarn parameters, construction of the carpet and setting up a reliable glueing concept for connecting the layers. The final results are expected at the end of the project in mid of 2027.

Project partners and tasks:

- **TFI** leads the work packages (i) for tufting and production of floor covering and (ii) coordinates the project work of all research partners.
- **FIBRE** is mainly engaged in (i) selection and quality assessment of natural fibre input and (ii) development of a hemp-based nonwoven as secondary backing.
- **TUL** leads the work packages for development of biodegradable glueing layers.
- Coordination by WNR e.V. (DE) and CLUTEX (CZ)

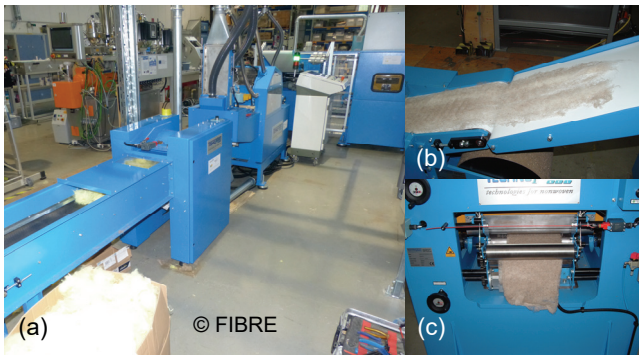


Figure 1. Lab-scale line to produce hemp-biopolymer nonwovens: (a) general view, (b) carded web and (c) needle felt. © FIBRE.

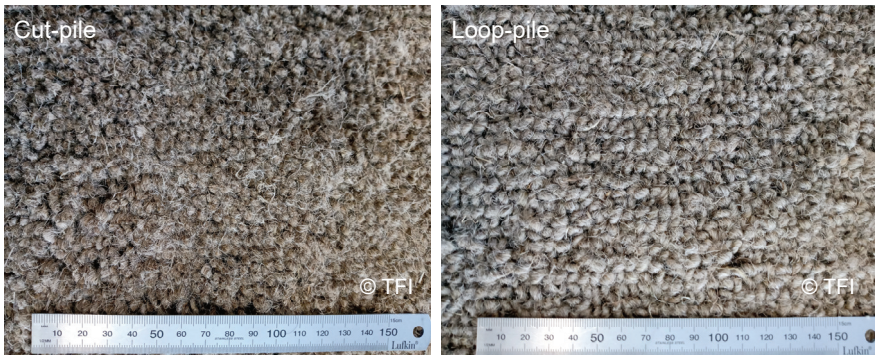


Figure 2. Tufted samples made of coarse hemp yarn (approx. 22,000 dtex). © TFI.

The overall innovation target of **HempTuft** is to develop a completely recyclable tufted textile floor covering. According to the principles of *Design for Recycling* it will be based on bast fibres and bio-based as well as biodegradable polymers.
In contradiction to conventional floor coverings, this innovative product has a lower environmental impact and enables high-quality fibre-to-fibre recycling by using the Lyocell process. The selection of regionally available materials will ensure the security of raw material supply with a resilient supply chain.
Concerning the carpet secondary backing, the development of a nonwoven based on hemp has been chosen in order to keep the ecological impact as low as possible. The nonwoven can be produced directly from mechanical separated fibres with a low number of process steps (typically carding, cross-lapping, needling, cf. Fig. 1). If a woven fabric would be used instead, several more process steps are necessary, combined with higher energy input, material loss and finally higher process costs. To achieve the project aims, the same materials as for the pile yarn can be added in small shares: flax fibres to enhance the proportion of finer fibres and PLA fibres to enable hot melt glueing. Finally, the material is similar to the pile yarn, enabling a recycling by the same process.
First tufted samples have been produced as cut- and loop-pile (cf. Fig. 2). Actual work is carried out on the glueing layers to finally select where to use PLA or PBS and optimizing the shares and type of introducing it into the construction.

The final results are expected at the end of the project in mid of 2027.

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