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**Being on the right track**

Manufacturing skis from hemp tapes

In the reinforcement of composites, natural fibers are becoming increasingly important as an efficient, sustainable alternative to synthetic high-performance fibers for the lightweight construction industry.

Some of the bio-based composites are winners of this year's JEC Composites Innovation Award, including a snowboard from silbaerg made from hemp tapes from FUSE GmbH.

FUSE has set itself the task of developing high-performance technical applications for bio-based fiber raw materials, taking into account the entire value chain from the raw material in the field to the finished composite product. A project is currently underway to produce a hemp-based alpine ski. The funded project started in January 2023 and will run for three years.

KARL MAYER Technische Textilien GmbH is on board as a partner for the production of non-crimp fabrics. On the COP MAX 5 multiaxial warp knitting machine from the KARL MAYER GROUP composite specialist, the FUSE hemp tapes are processed into reinforcement textiles for their demanding task in winter sports, which are used in high-performance composites.

At the upcoming JEC World in Paris and Techtextil in Frankfurt am Main, the HempSki will be a highlight at the KARL MAYER GROUP stand.

**A sport in and with nature**

Skiing combines sport with the experience of nature, all the more so when the equipment is made from bio-based materials.

There are already innovative biogenic reinforcement materials for composites in the ski sector, but only processed in small batches by ski manufacturers. The HempSki project aims to develop a solution that makes it possible to manufacture skis using materials from renewable raw materials and waste streams on an industrial scale.

Companies from Germany and Austria are participating in the project alongside research institutions.

**FUSE tapes made from hemp score points ecologically and economically**

In order to achieve ski production with an improved environmental balance and a closed material cycle, the ski core is made from waste streams of former ski end products, and the previous prepregs made from glass fiber-reinforced plastics are replaced by bio-based variants. The basis of the environmentally friendly semi-finished products is the hemp fiber-based UD-Tape FUSE HMP, which is impregnated with bio-resin.

Hemp is used as an industrial fiber in the tapes. "Industrial fiber means on the one hand that this fiber can be produced very effectively, i.e. automated in large industrial processes, and on the other hand that the quality of the fibers is always the same in order to guarantee the same properties in the product. A natural product cannot offer this, but there are various ways and means of still being able to deliver consistent quality," says Lovis Kneisel CEO of FUSE GmbH.

FUSE UD tapes have already proven themselves in preliminary tests, particularly as a top layer in sandwich elements. They can be processed either dry by hand lamination or wet as prepreg. While corresponding flax fiber-based sandwich elements are already state of the art, the FUSE HMP UD tapes based on hemp are an innovation. The tapes are available with variable basis weights between 100 and 250 g/m2 and can be processed into composite components with individual properties.

FUSE's bio-based raw materials come 100% from sustainable regional cultivation in Europe. The supply chain is therefore short, direct and transparent.

A high continuous running length of up to 500 m per roll and short process control through direct surface formation from the fiber also make FUSE more efficient than other natural fiber-based flat semi-finished products on the market.

**Processing premiere on the COP MAX 5**

For the HempSki project, the FUSE HMP UD tapes were processed into textile reinforcement surfaces on a COP MAX 5. The multiaxial warp knitting machine is predestined for the production of multiaxial fabrics from carbon fiber tapes. A model has now been used for the first time in the KARL MAYER Technische Textilien technical center for the use of tapes made from natural fibers. When the rolls of hemp tape were delivered, application engineer Kay Burkhardt and his team were very excited about the subsequent processing on the COP MAX 5. After just a few running meters, it was clear that the bio-based material runs smoothly and without any loss of speed. The biaxial and triaxial fabrics produced show an even fiber distribution and have the desired basis weights. Kay Burkhardt is delighted with this success. On the COP MAX 4, the application technology team has already processed continuous flax yarns without any problems. The use of tapes represents a further step towards the use of bio-based composites. "If natural fiber tapes are used instead of yarns, spinning is no longer necessary, the value chain is shorter and therefore more efficient. In addition, shorter and therefore more cost-effective fibers can be used in tapes with unidirectional fiber orientation while maintaining the same performance. The fiber achieves optimum performance due to the lack of yarn twist and the resulting load-oriented alignment," says Kay Burkhardt.

KARL MAYER Technical Textiles continues to support the composites industry with know-how and machine technology on the way to greater efficiency and sustainability.

**Further steps**

Following the construction of the first skis at the SPURart ski manufactory, production is now being transferred to an industrial scale. A partner from the winter sports industry has already been won. In addition, the HempSki project will further qualify the hemp material as a fiber composite for industrial production. Intensive development work and discussions are already underway in the areas of water sports - wake and surfboards as well as boat building etc. - and automotive.