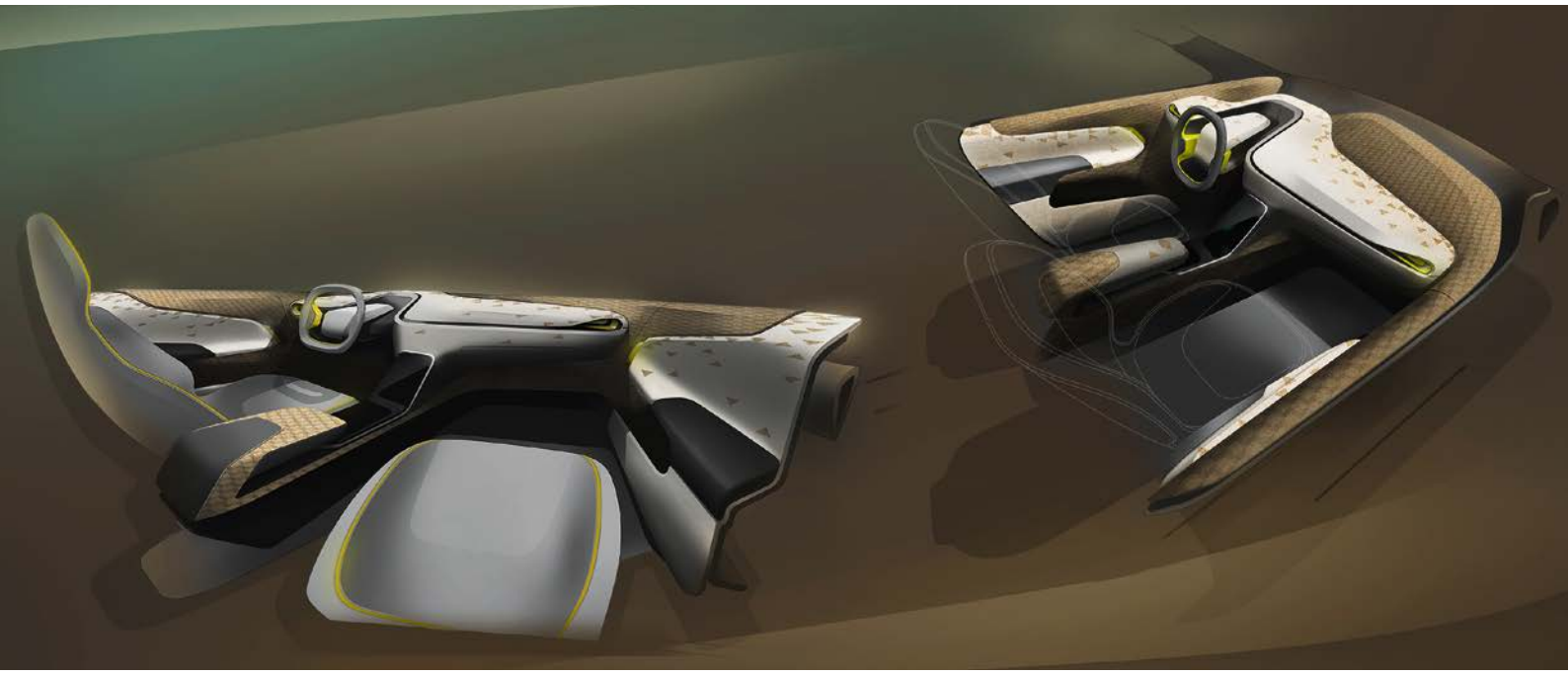
Elegant Surfaces with Visible Natural Fibers

Natural Fiber Compression Moldings with a Luxury Finish Made with a New Composite Material Press Process

The use of natural fiber-reinforced composite materials is currently gaining new impetus in the form of decoratively finished designs which retain a natural appearance. A newly developed finishing technology from Yanfeng Automotive Interiors (YFAI) makes natural fibers visible.



It does not always have to be just piano black: natural fibers in the visible area create a visual and haptic contrast to the multifunctional, high-tech interior (© YFAI)

With a new compression molding process attractive and individual surfaces with natural fiber are possible. The result is the new EcoCor Premium surface technology, which was developed at the Yanfeng Automotive Interiors (YFAI) technology center in Neuss, Germany, and which creates high quality natural fiber designs with structures ranging from twill to linen. With regard to selection of materials, design, sustainability, functionality and durability, the Tier1 supplier will not only highlighting the core brand characteristics of each automaker, but also catering for the Zeitgeist of end customers. Know-how from plastics technology combined with design and processing expertise in the field of synthetic fibers, hybrid natural fiber plastics (NFK) and technical fabrics made from renewable natural fibers (NF) were the basics in the development of an new process for high class natural fiber compression molding. On the basis of this process development, the company can now offer a wide range of novel surface variants with natural fiber, non-woven fabric finishes for customized car interiors.

Natural Protagonists in Automotive Interior

Because they are natural, individual, lightweight and sustainable, vegetable fibers are being introduced into many textile material compositions for ecological, interior components which are reinforced with natural fibers. The spectrum ranges from local Central European fibers such as hemp or flax to (sub) tropical fibers such as kenaf. Various bast fibers, e.g. from bamboo, as well as leaf fibers such as sisal from agave, or abaca fibers, which are »

obtained from banana plants, as well as fruit fibers, especially coconut, are being processed industrially. They are a sustainable and vegan alternative to natural animal fibers and provide important ecological benefits in combination with petrochemical materials.

The high quality finishing process makes natural fibers visible. Whether with individual printing, finished with natural fiber fabric or left unobtrusively natural, the lightweight natural fiber support components are appropriate as attractive decorative surfaces for door panels, floor consoles or decorative areas of the instrument panel (**Title figure**). The manufacturing process will enable a high design flexibility, even with small production runs, with short re-tooling times for the machinery and acceptable production costs. The new surface is available in many different versions, for example as a stylish printed version (**Fig. 1**) or with a linen structure, or also a non-printed, natural-looking premium surface.

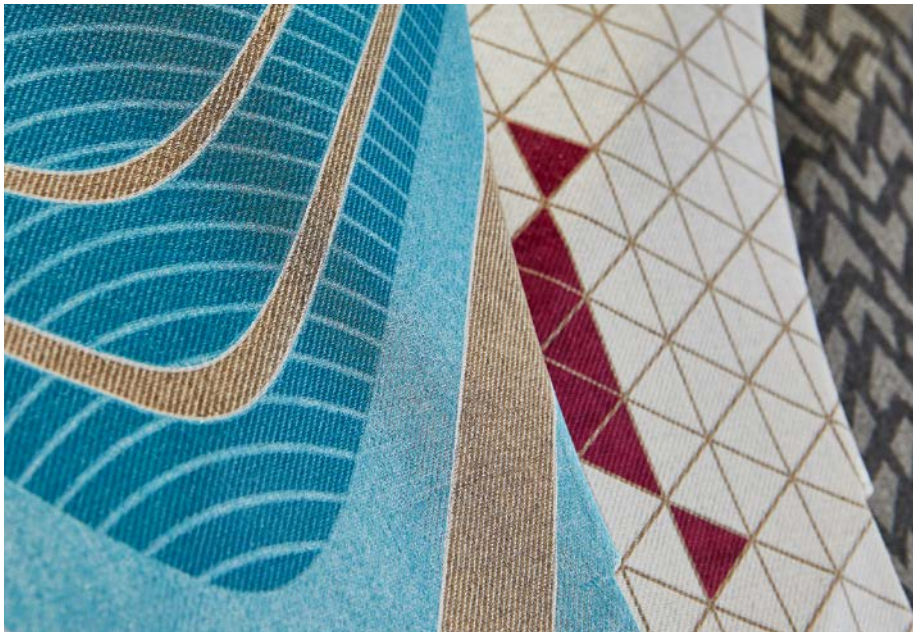


Fig. 1. A decorative fleece and a laminate printed on the rear side are responsible for the colorful natural fiber surfaces. The door panel consists of three layers that are pressed together in a single-stage process (© YFAI)

Luxury Class Visible Natural Fiber Decor

The natural fiber compression molding process features a three layer structure. The base layer is a lightweight polypropylene/natural fiber mat. Hemp, flax, kenaf or jute are equally suitable as the main component of the natural fiber mats. The natural fibers are combined with thermoplastic or thermoset plastics and depending on the project requirements and further processing technology, e. g. in the one-shot process, are provided with various covering fabrics and printable protective laminations. As usual in the industry, the NF-PP mat is made of equal portions of artificial and natural fibers – a substrate material which has been widespread in the market for more than 50 years. Sealing with a thin film of polypropylene is necessary to protect the surface against environmental factors such as moisture, chemicals and UV light. This dual combination of NF-PP mat and protective film is now transferred into a new three-layer product concept.

The technological process innovation is due to the inclusion of an additional decorative layer made from natural fibers. In the course of developing the process, the YFAI process engineers and interior designers experimented with many combinations of natural fiber non-woven fabrics, films and printing inks in a wide range of film thicknesses, fabric layers, decorative structures and material properties. The result is the combination of an extensive range of decorative non-woven fabrics for the middle layer, of the NFK composite material as well as a lamination layer which can be printed from the rear.

From fine cotton fiber and elegant linen accents to coarsely structured flax or coconut fiber fabrics, technically, many different layer structures can be implemented on the basis of renewable fibers. The development engineers in Neuss have held many expert discussions in this respect, such as with the Textile Technology Institute of the RWTH Aachen University. In addition, the latest colors and patterns are used: the decorative effect of the natural fiber layer is rounded off by optional printing, which is applied to the rear side of the protective lamination.

The further-developed luxury surface technology from YFAI is produced in a one-shot process, which is based on the technology of the EcoCor compression molding method for natural fibers. In a single process step, the natural fiber and plastic layers are compressed together with the decoration to form the end product.

Initially, the natural fiber-reinforced artificial mats consisting of 50 % polypropylene (PP) and 50 % of a variable proportion of natural fibers, are compressed and pre-pressed in a thermoplastic process stage together with the carefully select-

Quality of Life and Mobility

As part of a globally conducted research study, YFAI investigated the time that people spend in their vehicles. The focus was on the question of how car-sharing, the ownership of a vehicle and other factors of the quality of life influence the use of this time. The quality of life is growing in importance worldwide compared with conventional success criteria. These include human needs, such as the desire for peace, interpersonal relationships, a meaningful and fulfilled life and good health.

2000 participants in Germany, China and the USA were questioned for the study. The research results show that there are eight key aspects of the quality of life that are seen as important influencing factors. The three aspects of security, physical well-being and quality are seen almost identically in all the regions. Although the values for the quality of life change with age, emotions, connections and relationships remain equally important in all the age groups.

Fig. 2. The natural materials are laminated with a protective film to ensure that the surfaces meet the demands made on them. The challenge in this process is the forming of all the materials at up to 200 °C (© YFAI)

ed, enhanced NF thin structural non-woven fabrics or high quality textile fiber layers. Robots then lay ready cut decoratively printed thin film protective foil onto this substrate. These three layers are then bonded to each other and the protective film is laminated on. The various raw materials, from PP film to natural fibers must withstand a wide range of temperatures and pressures.

Natural Fibers for an Environmentally Friendly Lifestyle

Among others, the challenges in the manufacturing process involve the requirements for heat-resistance, elasticity, ductility and tear resistance, as well as in the adhesive properties of the printing inks which are used. Because during the production process, the materials are heated to temperatures of up to 200 °C. (**Fig. 2**).

For the production of luxurious surface qualities visible natural fibers are a natural lightweight alternative to leather or fabric coverings and rear-injected plastics in automotive interiors. The surface combines the quality of workmanship of the visible fibers, the attractive appearance of the design and the tactile of stroking the surface. With this, the new natural fiber/plastic combination meets the expectations for lightweight construction, CO_2 reduction, quality and individual design. In addition to this, it meets consumer expectations for ecological mobility and physical wellbeing. With the use of alternative forms of mobility such as car-sharing or electromobility, young drivers wish to make a holistic ecological contribution. At the same time, they wish to feel fashionable and secure. The company gained these insights in the context of a research study (**see Box p. 72**) and ultimately used this knowledge in the development of new surfaces. ■

The Authors

Dr. Nils Becker is Senior Process Engineer at Yanfeng Automotive Interiors in Neuss, Germany, and has worked for the company since 2015.

Dr. Werner Klusmeier is Senior Manager Process Innovation at Yanfeng Automotive Interiors. He has worked for the company, which was then known as Johnson Controls Interiors since 1989 and has been involved in the use of natural fibers in vehicle interiors for 20 years.

Service

Digital Version

A PDF file of the article can be found at ***www.kunststoffe-international.com/6736744***

German Version

Read the German version of the article in our magazine ***Kunststoffe*** or at ***www.kunststoffe.de***