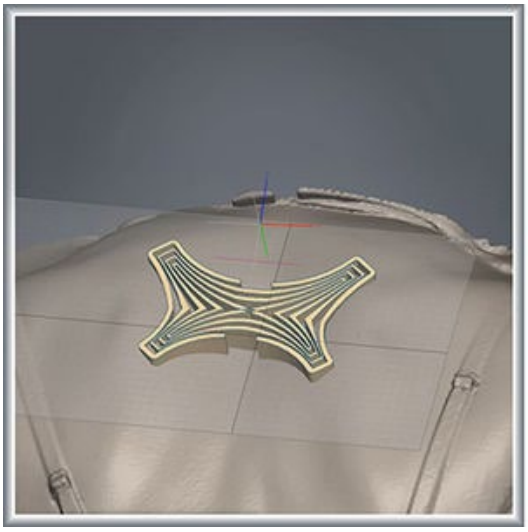

F3D PRINT
FABRICATION OF FUNCTIONAL & CUSTOM-FIT TEXTILES USING 3D PRINTING BASED ON SCANNING TECHNOLOGY

Gefördert durch:

iGF

Bundesministerium für Wirtschaft und Energie

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F3DPrint - Manufacturing functional and custom-fit textiles using scanning and 3D printing technologies

In the past few years, there has been a clear trend in the textile and clothing industry in Europe towards the production and sale of products with increased value that are strongly geared towards the specific needs of customers. Whereas in the past the focus was mainly on the functional aspects, people now also want more comfort and an individual fit. This mainly affects functional clothing from the sports, work safety and health safety sectors. At the same time, digital technologies such as scanning and 3D printing are developing with great potential in line with Industry 4.0. Especially with rapidly changing production cycles and small series production, digital technologies also enable cost-efficient process management on site.

In this project, a new methodology was developed to acquire customer-specific data profiles via scanning and CAD modeling processes. These were used to create individually adapted textile products directly via 3D printing on textiles For this purpose, thermoplastic elastomers (TPE) of different hardnesses based on polyurethane (thermoplastic polyurethane, TPU) and styrene block copolymers (TPS compounds) were investigated for their use as 3D printing materials in the melt layer extrusion process, both in filament form (using fused deposition modeling, FDM) and as pellets (using Arburg Freeformer and Pellet

Various woven and knitted fabrics of different material compositions (including cotton, polyester, aramid, polyamide) from the targeted application areas were used as textile substrates. A number of test methods were established in order to evaluate the bond adhesion and durability properties (wash and abrasion resistance) of the 3D-printed composite materials.

Suitable TPU and TPS materials were identified in which print performance and textile material requirements for the target applications are combined in the best possible way in terms of use and comfort.

A back protector for outdoor sportswear, a knee pad for workwear, a face mask for cleanroom suits and an outdoor sole for socks were selected as exemplary case studies. For personalization, the appropriate data for 3D printing was created for each case by combining scans of the required body region and CAD modelling, which ultimately allowed the precisely fitting demonstrators to be produced as finished ready-to-wear parts for the selected application scenarios via several optimization loops.

This project was able to show that digital process steps using 3D printing of thermoplastic flexible polymer materials can be used to create a new customized approach for tailoring textiles.

Project partners

The project was carried out by the Research Institute for Textiles and Clothing at the Niederrhein University of Applied Sciences FTB (project management: Prof. Dr. Maike Rabe / Prof. Dr. Michael Ernst) in cooperation with the Belgian research institute Centexbel.

The project committee consisted of major textile companies from the sportswear, workwear and (military) protective clothing (PPE) and orthopaedics industries as well as companies from the compounding, polymer and filament sectors.

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Duration

30 Month (1.1.2018 – 30.06.2020)

Ansprechpartner*innen

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