Project title:	Lightweight parts made of 3d textiles in combination with 3d printing
Partner:	Frankfurt University of Applied Sciences ITA Institut für Textiltechnik of RWTH Aachen University
Duration:	04/2021 – 03/2023
Funding Agency:	Federal Institute for Research on Building, Urban Affairs and Spacial Development (BBSR)

Univ.-Prof.
Prof. h.c. (Moscow State Univ.)
Dr.-Ing. Dipl.-Wirt. Ing.
Thomas Gries
Director

Gözdem Dittel
Research assistant
Marina Chernyshova
Research assistant

Ref.: GD, MC
05.08.2022

Mission Statement: 6dTEX deals with the combination of two process technologies that have so far been considered separately. The synergetic combination of the production of 3d textiles and 3d printing processes is investigated. The aim is to gain insights into new lightweight construction applications in architecture by optimizing technical 3d textiles in combination with additive 3d printing processes, in particular for non-load-bearing secondary components in the building envelope (facade, roof, sun protection).

Spacer fabrics are being considered in particular. Their three-dimensional, mesh-embossed sandwich structure with optionally differently porous cover layers and interstices is suitable for generating resilient composite elements from recyclable materials of the same material in interaction with additive printing processes. Using 3d printing, the surface structure of the 3d textiles can be supplemented with a defined, printed counterpart. The result is interlocking relief structures made of fibers and opaque or translucent printed material that hardens or remains elastic. At the same time, 3D printing offers the possibility of closing the otherwise open edges of the textile sandwich, forming channels if required, and generally generating a wide range of design options in combination with the textile, as well as different mechanical and physical qualities.
The challenge is to print the elastic, i.e. non-pressure-resistant, textile sandwich structure or the composite behavior between polymer composites such as PET fibers and PET printing or glass fibers and concrete printing. Findings are expected on non-load-bearing secondary components including associated joining options, which can optionally be rigid or movable, opaque or

translucent, can be manufactured with a precise fit over large areas, and are insulating and low-tolerance due to the textile carrier layer.

Figure 1: 3D printing on 3D textiles, project "6dTEX" FRA-UAS

Approach

In the 6dTEX project, a new, previously uninvestigated research approach is being worked on together. The focus is on the combination of targeted variations of design and materiality of the standing and weft thread-reinforced 3d spacer fabrics with 3d printing processes for internal and external printing of the textile sandich structure for building applications. The investigations for the first-time combination of the described technologies are basically carried out experimentally. FRAU-AUS focuses on the 3d printing technology and the development of application scenarios. The ITA complements the investigations with the development of the textile variation and the evaluation of the textile 3d structures as well as the bonding system.

Acknowledgement

The project is funded by the Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR) as part of the Zukunft Bau research funding program.

Contact
Gözdem Dittel M.Sc.
goezdem.dittel@ita.rwth-aachen.de
+49 241 80 24721

Marina Chernyshova M.Sc.
marina.chernyshova@ita.rwth-aachen.de
+49 241 80-49142