FASERINSTITUT FIBRE BREMEN

PROJECTS

FLATISA

Flammgeschützte, temperaturbeständige Thermoplaste für den industriellen Serieneinsatz von Additiven Fertigungsverfahren

Motivation

In the recent years, the technologies for additive manufacturing (AM) have undergone a strong development in the areas of quality improvement and productivity and offer a high potential for economical small-scale production of highly complex components. There are still challenges, which block AM for series applications. The presently used polymers are not sufficient from a technical and an economical point of view to ensure the requirements for sustainable production in aviation, automotive and electronics industries. Especially in the region of temperature-resistant and functionalised flame-retardant materials, the available material variety cannot meet the industrial requirements.

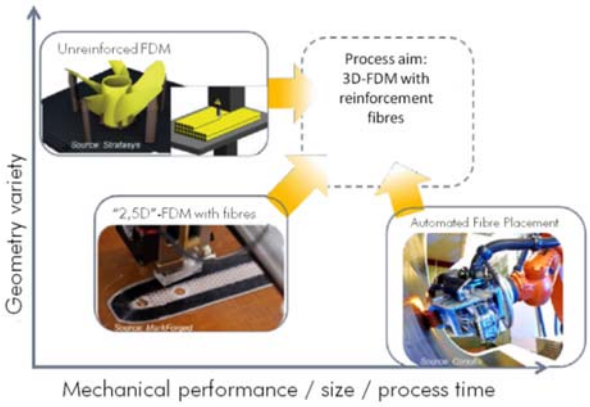

Figure 1:Depiction of the technological potential of the process-aim compared to the state of the art

The aim of the research project FLATISA is the development of temperature resistant and flame retardant thermoplastics for the industrial use of AM methods. The project focus is on the methods of Laser Sintering (LS) and Fused Layer Modelling (FLM). The Faserinstitut Bremen e.V. (FIBRE) focuses on material development on the FLM method as well as on the corresponding FLM process for continuous fibre reinforced materials.

Approach

The main approach of the research project is the development of high performance thermoplastics for AM. Therefore, the requirements for material and components, which shall be printed, are defined prior to the material development process. The materials must fulfil requirements for interior parts for cabin area of aircraft and rail vehicles. Thus, in case of fire, the limit values for heat release, burn length, release of toxic gases and smoke density must not be exceeded. A broad material screening of available matrix materials (PA 6, PA 6.6, PPS, PEI, PEKK PEEK) as well as various fibre materials (Fibre material, size, filament quantity and density) is carried out for the material development. These are examined for their suitability for the use of specific applications. Additionally, there will be development of additive-based materials, which reflect the required properties. For the fibre-reinforced FLM process, semi-finished product manufacturing strategies are going to be developed and investigated, which differ in the provision of the materials and the combination method. For FLM process development, the interactions of different parameters in the printing process are examined. In cooperation with the project partners, all individual functions of the printing head are analysed and refined.

Iteratively, the technical development is going to be driven forward to build up a demonstrator system for printing 2.5D- and 3D-structures the previously produced monofilaments with and without fibre reinforcement.

Figure 2: Prototype of printing-head while printing 3d-structures

In laboratory analyses, material and component properties which are typical for composites are determined and characterized. The analyses are executed with regard to the pre-set project goals in order to verify and validate the suitability of the materials and their combination.

Possible Applications

- Aircraft components: interior equipment
- Railway vehicle components
- Industrial housing for electronic components

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Project Partners

- Airbus Operations GmbH
- Siemens AG
- Universität Duisburg-Essen, Lehrstuhl für Fertigungstechnik (IPE-FT)
- ROWAK AG
- AM Polymer Research UG (AMPR)
- Vereinigte Elektronik Werkstätten GmbH (VEW)
- Airbus Group Innovations GmbH (AGI)
- Faserinstitut Bremen e. V. (FIBRE)

Faserinstitut Bremen e.V.

The Faserinstitut Bremen e.V. is active in research and development tasks in areas of testing, development and processing of fibres, textile preforms and carbon fibre reinforced plastics. The department of Composite Structures and Processes focuses on the examination of continuous process chains and the design of components for aircraft and automotive industry and other industrial fields.

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