ADDITIVE MANUFACTURING OF FOAMED PLASTIC COMPONENTS USING SUPERCRITICAL FLUIDS

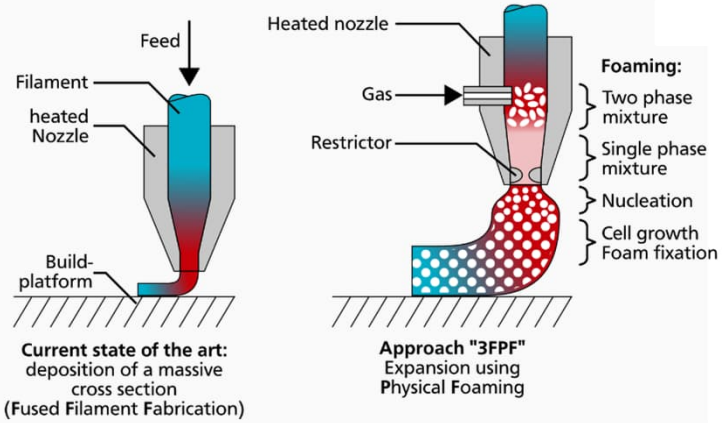
A NEW APPROACH FOR PRODUCING LIGHTWEIGHT, FUNCTIONAL, AND SUSTAINABLE FOAM STRUCTURES

STATUS QUO

In additive manufacturing, plastics are currently printed mostly as solid or less frequently chemically foamed materials. Foams offer significant advantages over conventionally printed components. However, chemical blowing agents limit material selection, control of porosity, and recyclability. Physical foaming with supercritical fluids offers a sustainable alternative with precise process control, which so far has only been realized in conventional large-scale extrusion systems.

OUR TECHNOLOGY

Our technology enables the 3D printing of foamed polymer components by controlled injection of supercritical fluids, particularly CO_2 or N_2, directly into the polymer melt. Standard Material can be melted, mixed with the supercritical fluid, and then extruded. By controlling the flow of the foaming agent, porosity can be tuned in the print without chemical blowing agents or special filaments. This process allows the production of lightweight, recyclable parts with variable density and new functionalities.



Current state of the art: deposition of a massive cross section (Fused Filament Fabrication)

Approach "3FPF" Expansion using Physical Foaming

BENEFITS

- Savings in weight, material, and printing time for large components
- Adjustable density during print for new functional parts
- Independent of material type and free from chemical blowing agents

APPLICATION POSSIBILITIES

- **Construction:** large-scale 3D printing of insulation and formwork structures
- **Medical technology:** porous bone implants made of biocompatible polymers such as PEEK

COMMERCIALIZATION OPPORTUNITIES

We offer industrial partners the opportunity to participate in the further development of this technology, from feasibility studies to integration into existing printing systems.

CURRENT STAGE OF DEVELOPMENT TECHNOLOGY READINESS LEVEL (TRL)

9	Product ready to launch
8	
7	Prototype
6	
5	
4	
3	Proof of Concept
2	
1	Idea

The development is at TRL 3:
We have already produced foamed strands using a prototype printhead.

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