VARIABLE HOLLOW STRUCTURES FOR ADDITIVE AND ROBOTIC MANUFACTURING

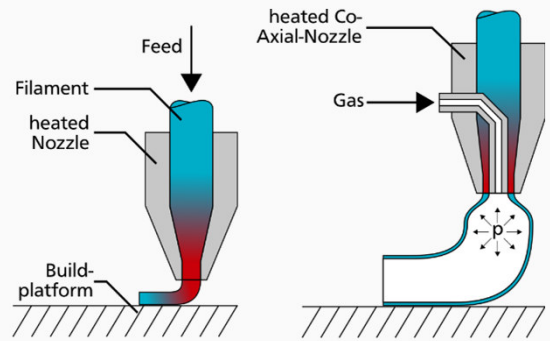
NEW DEGREE OF FREEDOM FOR FUNCTIONAL AND AESTHETIC APPLICATIONS TO SAVE MATERIAL AND COSTS

STATUS QUO

In 3D printing of plastics using extrusion methods, solid cross-sections are always laid down in strands and layers to produce a three-dimensional part. Large components therefore require a lot of material, resulting in high costs and heavy weight. Alternatively, cavities can be produced layerwise to save material. However, layer-by-layer production is time-consuming.

OUR TECHNOLOGY

Our technology makes it possible to extrude hollow cross-sections made of thermoplastics directly out of the nozzle. The diameter can be changed by controlling the internal pressure, regardless of whether the medium is a gas or a liquid. The higher stiffness of the tubular profile enables manufacturing without restrictions in three dimensions without supporting structures. This means that variable hollow cross-sections can be produced continuously, without tools, intrinsically (i.e. without layer-by-layer manufacturing) freely in all directions using 3D printing or robotics.



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

Approach "3FBX" Expansion using internal pressure (Blow eXtrusion)

BENEFITS

- New freedoms: Decoupling of volume and mass
- Large components quickly and with little material
- Function integration & lightweight construction

APPLICATION POSSIBILITIES

- Large-format 3D printing, e.g. for the construction industry or mold making for composites
- Architecture & design: façades, insulation, lighting
- Construction: Displacement bodies for concrete
- Function integration: liquid within the tubular system for sensors, self-healing, energy harvesting

COMMERCIALIZATION OPPORTUNITIES

There are various possibilities for cooperation between the industrial partner and TU Darmstadt: from an exchange with the know-how carriers of the technology up to a close cooperation in case of further development needs. The technology is protected by intellectual property rights and can be used by the industry partner after a sale or licensing agreement.

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 produced variable hollow structures in the lab (height about 30 cm)

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