



- 1 Structural parts made from biobased thermoplastic materials.
- 2 WPC-profile with extruded bio-foam.

## PROFILE EXTRUSION – NEW APPROACHES AND METHODS

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The compounding and extrusion group of the Fraunhofer ICT develops new thermoplastic materials and adapted processes for the development of structural parts using profile extrusion processes.

#### State of the art and future challenges

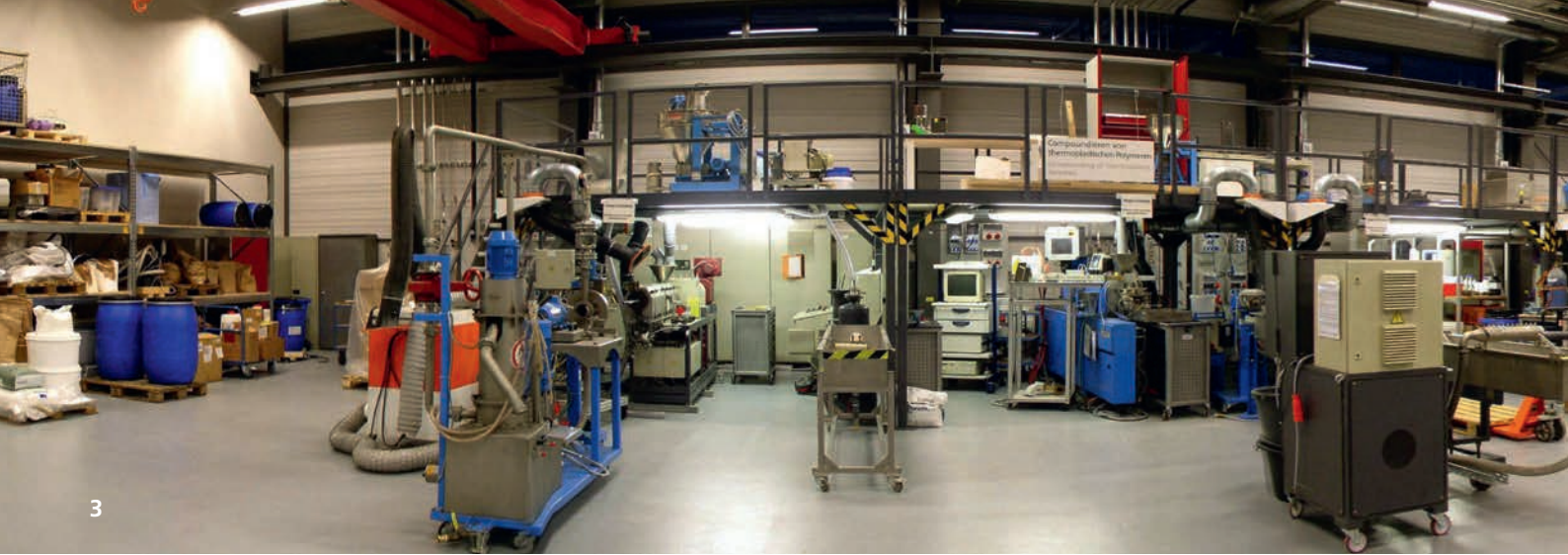
With the continual risk of a Europe-wide prohibition of PVC in industrial applications, the development of alternative matrices is essential for many companies active in this field. For this reason the Fraunhofer ICT develops innovative solutions in every aspect of profile extrusion.

With a laboratory production line optimized for research and development (see below), the Fraunhofer ICT is able to develop solutions from an idea up to product validation on site. Beside compounding, injection molding and testing facilities within the institute also allow developments over

the whole value chain from commercial raw materials up to characterization of final parts. The research topics of the group cover material as well as process development.

#### Material development

Among well-established thermoplastic materials such as polyethylene and polypropylene or the blend system PC/ABS, biopolymers in particular show promising material properties for application in profile extrusion processes. Blending with suitable polymers, the use of functional fillers or additives and multilayer parts are state of the art and allow researchers at the Fraunhofer ICT to produce non-PVC profiles. Consequently, for every individual application the Fraunhofer ICT investigates individual solutions for our customers to guarantee their success.



## Process development

The processing of newly-developed blend systems could potentially be performed on conventional profile extrusion lines. If a subsequent processing of the profiles after shaping is desired, such as the application of a cover layer or the precise optimization of the molecular structure of a part, new processes and concepts must be applied.

One of the new technological approaches for the production of profiles from biopolymers is the application of a variothermic shaping process of the produced profile to create crystalline phases in the skin layer areas of the profiles for improved heat deflection temperatures and material properties, utilizing functional fillers and additives.

Related competences of the institute, such as microwave technology or foaming technologies, are of course also incorporated into the research area of profile extrusion. A subsequent processing or functionalization of the shaped material using different kinds of energy sources, or the combination of compact materials with insulating polymer foams, are part of the material and process development of profile extrusion.

## Lab-scale profile extrusion line

### Cincinnati CMT 35

Counter-rotating twin-screw extruder with peripheral units (calibration table, cooling system, haul-off, cutting device, stacking unit).

- Conical screws
  - Front: 35.0 mm
  - Rear: 75.0 mm
- Torque maximum: 1,7 kNm
- Screw length: 665 mm
- Max. output rate: 80 kg/h
- Available dies:
  - 2-chamber WPC profile (foaming)
  - 3-chamber window system

### Cooling unit

A vacuum system is available for the cooling of profiles.

- Max. profile-Ø: 85 mm
- Calibration length: max. 2.15 m
- Total length: max. 4.90 m

### Caterpillar haul-off

Heavy-duty caterpillar haul-off for the production of profiles.

- Max. profile-Ø: 100 mm
- Contact length: 1,60 m
- Haul-off force: max. 5230 N
- Haul-off speed: 0.6 – 12 m/min

### Belt haul-off

Adjustable haul-off for the production of profiles.

- Max. profile-Ø: 90 mm
- Contact length: 90 cm
- Haul-off speed: 0.5 to 90 m/min

### Cutting unit

Flying profile saw with profile length adjustment for cutting off profiles.

- Max. profile-Ø: 90 mm