



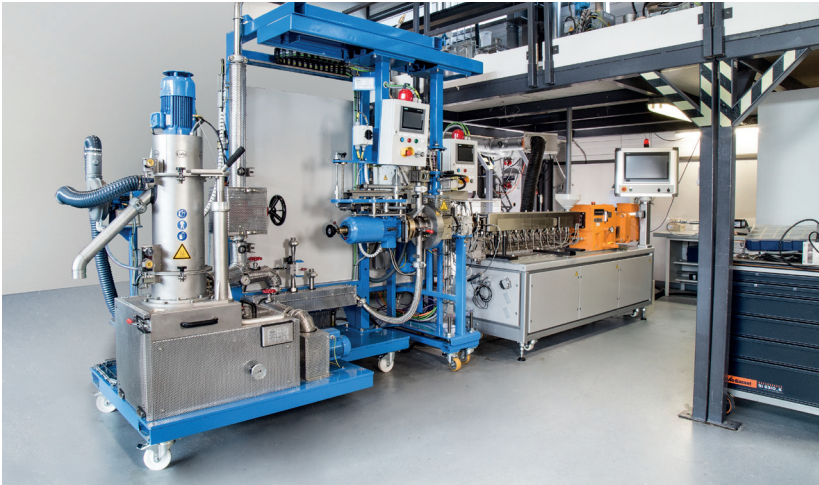
Fraunhofer
ICT

Polymer Engineering Department

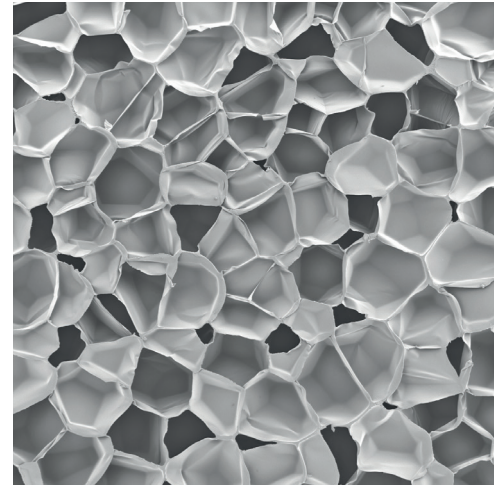


Foam technologies





Particle foam line for the continuous production of particle foams



Foam morphology, REM imaging

High-performance materials for lightweight construction, and their resource-efficient manufacturing, are important fields of development. Foamed materials make a significant contribution, and are finding increasing application in transport packaging, thermal insulation in buildings, and the automotive sector.

Our core research topics include the development of new foamed materials and thermoplastic foams with tailored properties. We also focus on innovative processes, including the optimization of existing systems and the production of foam compounds, significantly broadening the application field for these materials.

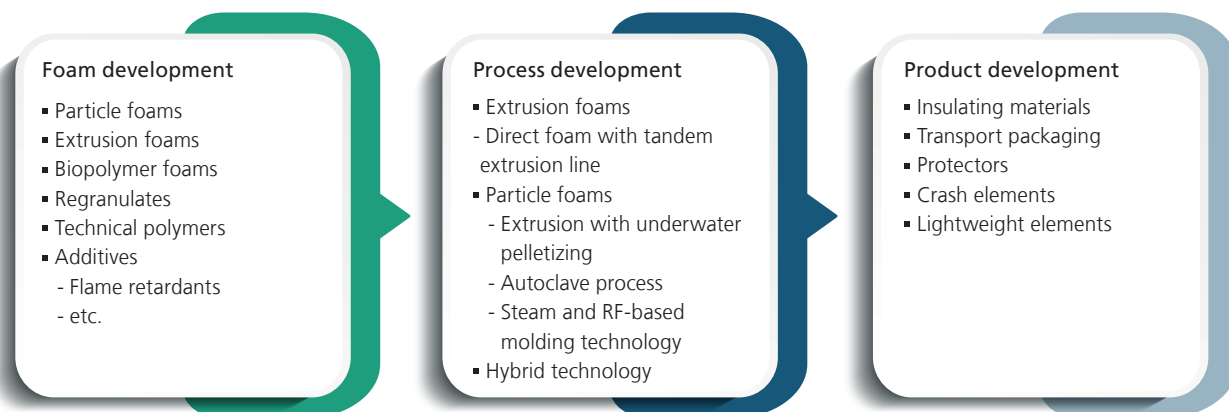
Using technologies across the entire process chain for foam development, foamed materials can be produced both as semi-finished products in direct extrusion and as particle foams in extrusion with underwater pelletizing, and via autoclave

processes. Beside conventional polymers such as polyethylene, polypropylene and polystyrene, biopolymers and technical polymers are also investigated.

Current research topics in the field of foam development include the extrusion manufacturing of foamable polymer compounds based on sustainable raw materials, and the targeted application of functional additives, for example environmentally-friendly flame retardants, or additives to improve the mechanical properties or temperature stability of the materials.

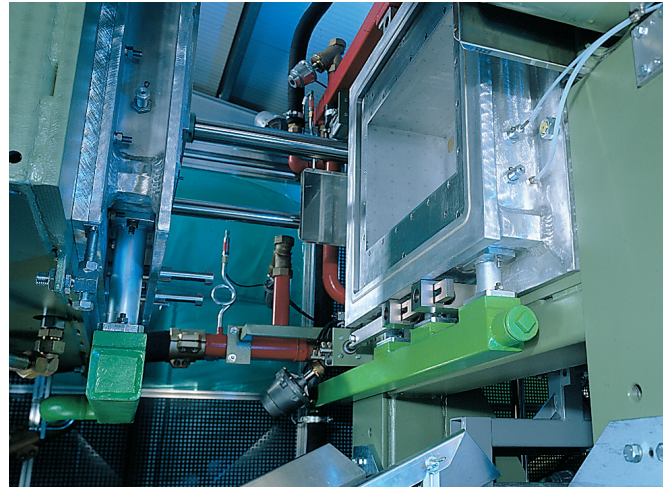
The key element in process development is the optimization of process configurations and the development of new processing concepts for the production of material compounds. In the processing of particle foams, emphasis is placed on reducing the material density during pre-foaming, and on optimizing component production.

The entire development chain for foam processing at a glance





Schaumtandex extrusion line



Steam chest molding machine

Facilities and equipment

Flexible and modern processing units are available in Fraunhofer ICT's pilot plant for direct foam extrusion and for particle foam technologies:

- New extrusion line consisting of a twin-screw extruder (Leistritz TSE 27 MAXX), a melt pump and an underwater pelletizer (Gala); throughput 5– 40 kg/h
- Schaumtandex laboratory unit (Berstorff ZE 30/KE 60) for the production of foamed semi-finished products up to 300 mm wide and 60 mm thick; throughput 30– 60 kg/h
- Melt cooler for foam development and characterization
- Dosing station (high and low pressure) for hydrocarbons, nitrogen and carbon dioxide (Lewa, Maximator)
- Dosing equipment for granules, powders, liquids and nano-scale additives
- Autoclave for particle foam production (up to 15 l)
- Discontinuous pre-foamer 150 l/2.5 bar (overpressure) (Erlenbach)
- Laboratory steam chest molding machine (components: 200 x 200 x 50 mm³) (developed in-house)
- Freely-programmable steam chest molding machine (clamping surface: 670 x 570 mm²) (Erlenbach)
- Radio frequency molding machine for particle foam processing, and for processing high-temperature thermoplastics (Kurtz Wave Foamer) (max. mold size 700 x 600 x 450 mm)
- Foam characterization facilities
 - Mechanical and thermal tests
 - Rheology (extensional rheology, melt rheology)
 - Microscopy for foam morphology analysis, (light microscopy, scanning electron microscopy)
 - Flame retardancy and thermal conductivity
 - Heatable hydrostatic pressure test rig for foams

Our offer

We offer our customers individual and market-oriented development services for foamed materials. Starting from basic investigations and feasibility studies, we optimize polymer foam materials and develop them up to technical implementation.

- Material development and optimization of the foam structure in the extrusion process
- Production of foamed semi-finished products in a Schaumtandex unit
- Development of foamed beads, or granules containing blowing agents, via underwater pelletizer
- Development of foamed beads or components using an autoclave foaming process
- Investigation into the foaming of granules to generate foamed particles in the laboratory pre-foamer
- Development of molds to process new material combinations
- Investigations into processing in the steam chest molding machine - product development
- Characterization of materials and components, cell structure, density, melt strength, shear viscosity, thermal conductivity, mechanical properties
- Customized services



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