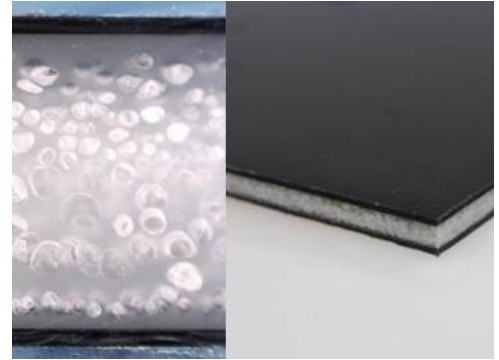
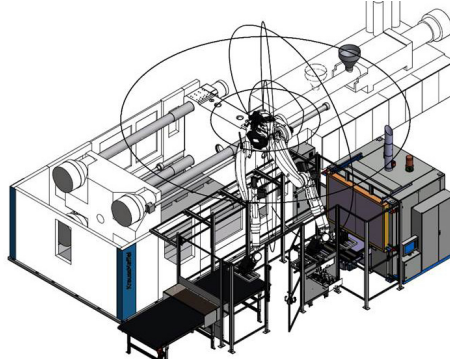
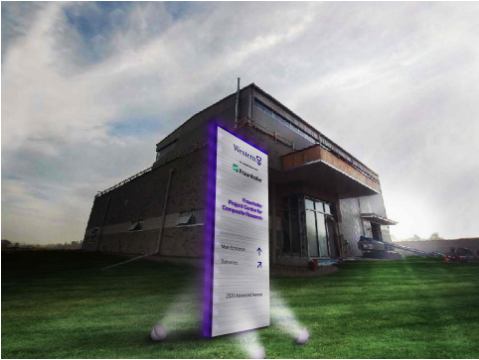


Fraunhofer Project Centre @ Western

Injection Moulding



Injection Moulding of Thermoplastic, Lightweight Parts

At the Fraunhofer Project Centre @ Western, a 1,600 ton injection moulding machine is capable of moulding lightweight parts up to a size of automotive front end carriers. The injection unit is equipped with a fibre-preserving long-fibre injection screw (for LFT processing). In order to make the parts even lighter, the machine is fitted with innovative foam injection moulding (FIM) technology. An additional MuCell® injection unit allows the production of fibre-reinforced parts with an integral foam design; injection moulding components with a foamed core inside surrounded by solid skin. All thermoplastic materials, unreinforced as well as short and long-fibre reinforced granules can be processed. Additionally, a circulating hot air oven is integrated in the machine for preheating of continuous-fibre reinforced, thermoplastic organic sheets (fabrics / UD-tapes). An integrated 6-axis robot is able to load the tapes and sheets in the oven and to transfer them into the mould. These reinforcements can then be overmoulded using suitable resin types.

This machinery setup at the Fraunhofer Project Centre @ Western is the first of its kind in full industrial scale. The technology was introduced in fall 2013 and on intermediate scale only. With this equipment, the Fraunhofer Project Centre @ Western has a unique position for injection moulding of automotive parts.

Key Research Topics in the Field of Injection Moulding

- Formulation and process development for processing of long-fibre granules
- Formulation and process development for processing of foamed parts
- Incorporation of local continuous fibre reinforcements
- Integration of functions and consolidation of part assemblies into integrated structures
- Mould and part design for simultaneous local reinforcements and foaming
- Formulation and process development for manufacturing of in-situ sandwich structures for high stiffness and high strength applications
- New rules for designing parts and moulds will be derived and know-how for the resin and fabric selection will be created

Equipment and Facilities

- KraussMaffei injection moulding machine KM 1,600/12,000/4,300 MX L
- Different, replaceable injection units
 - Long fibre screw ($\varnothing = 120$ mm)
 - MuCell® process with long-fibre screw ($\varnothing = 120$ mm)
 - MuCell® process with standard screw ($\varnothing = 120$ mm)
- Pressure accumulators for higher injection speed
- Clamping unit with 16,000 kN
 - Injection compression moulding (with parallelism control)
 - Negative embossing (foam injection moulding with decompression)
- Fully automated manufacturing cell for continuous-fibre reinforced parts
 - Circulating hot air furnace (Paternoster principle)
 - 6-axis-handling robot for handling of organic sheets (fabrics / UD tapes)

Fraunhofer Project Centre @ Western

Western University and the Fraunhofer Institute of Chemical Technology ICT have partnered to provide joint expertise for industry needs.

Together, Western and Fraunhofer will develop lightweight composites for the transportation and building materials sectors, focusing on applied research in the fields of methods, materials and manufacturing technologies for composite materials.

Collaborations

With Industry

- Develop industrial processes
- Apply developed innovative processes
- Optimize existing processes and materials

With Fraunhofer

- Process and material development
- Scientific research at intermediate level
- Transfer from basic research to industrial scale

With Universities

- Basic research on fibre matrix phenomena
- Simulation and design
- Investigation of fundamental interests