
Summary

The Plastics Industry represents a major contributor to European wealth generating sales in excess of €160 billion. Plastic Extrusion is undoubtedly the most important processing technology representing 36% of all plastics consumed. The process design flexibility and complexity involved in mixing require a comprehensive understanding of the physical processes involved.

Twin-screw extrusion is recognised as a key knowledge-based technology. There is a fundamental lack of understanding of the relationships between machine design, total process operation, polymer flow and mixing behaviour. This gap in knowledge represents a major barrier to the advancement of twin-screw extrusion for knowledge-based processes.

The PEPT-Flow project will use Positron Emission Particle Tracking (PEPT), an innovative, non-invasive, flow visualisation technique to address this barrier. The project will also develop new knowledge-based machine design criteria and simulation software, thus contributing to the continued sustainability and competitiveness of the industry sectors concerned.

The Core Project Strategic Objectives

1. **Knowledge**: To undertake detailed quantitative and qualitative investigation of twin-screw extrusion and consider the influence of machine design, total process operation and specific polymer/additive systems.
2. **Design Criteria**: To define knowledge-based twin-screw extruder design criteria and guidance.
3. **Simulation Software**: To develop and validate accurate flow simulation software for twin-screw extrusion.
4. **Demonstration**: To demonstrate the new design criteria, simulation software and processing know-how within 5 commercial twin-screw processes.
5. **Transfer**: To achieve effective technology and knowledge transfer throughout the communities of European SMEs.

Methodology

PEPT-flow brings together a supply chain of SMEs to the plastics industry with researchers in the field, thus pooling existing understanding. The partners bring extensive practical knowledge of screw design and machine construction together with processing know-how and applications. A target trade and technical literature survey will also be carried out. In addition the project will develop new insights into the mixing process using the non-invasive PEPT. The results will be included in state of the art software models which can feed design criteria into machine construction and investigate industrial scale up. The role of the member organisations will be to disseminate this new knowledge base for the benefit of SMEs throughout the plastics supply chain across the EU. The resulting processing solutions to real world plastics problems can then be scaled to production applications.

Company/Organisation | Country
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Smithers Rapra | UK
Fraunhofer ICT | Germany
University of Birmingham | UK
University of Ghent | Belgium
Small/Medium sized Enterprises
Brandan Technology | UK
Treffert | FR
Vamp Tech | IT
Extraform | DE
DC-In | FR
ICM San Gorgi | IT
Centre for the Development of Plastic Applications | IT
InterPlas | FR
Centre Computer Consultants | FR
MAPEA | FR
RCT | IT

Membership organisation
Milano Chamber of Commerce | Italy
British Plastics Federation | UK
Italian Plastics Machinery Manufacturers and Rubber Association | Italy
German Plastic Extruders Association | Germany
Plastics Machinery, Manufacturers and Distributors Association | UK
Turkish Plastics Manufacturers Research, Development and Educational Foundation | Turkey

› Flow diagram for the Peptflow Project

Tacit and implicit knowledge are combined with trade and technical literature and novel PEPT measurement to improve software tools for machine design.