Polymer processing

Introduction
Food & Biobased Research offers extensive knowledge and facilities in the field of polymer processing. This equipment is dedicated for our research on biobased polymers but also available for third parties. Trained operators and researchers are available to operate the equipment and advise on experimental setup, process optimisations and analysis of results.

Extruders
Food & Biobased Research has a range of extruders for polymer processing, compounding and reactive extrusion. These extruders have a modular screw- and barrel set-up. The equipment can be provided with (side-) feeders for granulates powders and liquids, a melt-pump, degassing unit and underwater pelletizing systems. The available extruders include:
- Berstorff ZE 25; co-rotating twin screw, 25 mm, 40D.
- Berstorff ZE 40; co-rotating twin screw, 40 mm, 38D (and can be extended to 50D).
- Clextral BC 45; co-rotating twin screw 45 mm, 23D.
This year the installation of a new 16mm co-rotating twin screw extruder is expected allowing small scale extrusion experiments.

Co-extrusion/film blowing
A highlight in our pilot facilities building is the co-extrusion/film blowing equipment. With this set-up, multi-layered blown films and flat sheets can be extruded. The number of layers can be varied from 1 to 5, with a maximum width of 25 cm (flat sheet) to 40 cm (blown film). At this pilot facility throughputs are usually around 15 kg per hour so relatively small amounts of material suffice for initial testing. The equipment is suitable for processing conventional and biobased materials ranging from stiff polyesters (e.g. PLA) to flexible TPE-like materials.

Injection moulding equipment
For injection moulding 2 injection moulding machines are available:
- Demag D60NC IIIK; 60 ton 66 g PS
- Demag D25NC IV; 25 ton, 20 g PS
This equipment is mainly used for the preparation of test specimen, to study the properties of compounds prepared during extrusion. Moreover, important research topics regarding injection moulding that are studied include:
- Reducing cycle times (when producing heat stable PLA products).
- Thermal stability of materials in hot runner systems.
- Improving the flow properties of materials.
- Material properties as a function of processing parameters.

Other processing equipment
- For mixing rubber compounds and PVC compounds we have a two-roll mill. This equipment is frequently used for the testing of biobased plasticisers for PVC.
- For small scale mixing (300 g batch scale) we have a Haake kneading mixer. Two runs on this mixer will provide sufficient material for injection moulding of test specimen.
- We have 2 compression moulding machines for the production of for example; small test specimen, films, particle board, MDF, HDF or thermoset composites.
- Various other facilities include lab-scale coating equipment, vacuum forming equipment, cutting and milling equipment and foaming equipment (extrusion and expandable beads).

Concluding remarks
The processing equipment at Food & Biobased research is very well suited for the development of novel (bio-based) materials and products. Main activities in this field are:
- Material development and optimisation.
- Process development and optimisation
- Material testing.
- Application development.
- Scale-up; intermediate between lab- and industrial- or pilot scale application development.