



University of Natural Resources and Life Sciences

Department of Agrobiotechnology

Institute of Environmental Biotechnology

Bioplastics Technology

SPECIFICATIONS

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**Konrad Lorenz Str. 20
A-3430 Tulln
Austria - Europe
Tel.: +43-(0)1 47657 97403
Fax:+43-(0)1 47654 97209
Email: officent@ifa-tulln.ac.at**

Introduction

Research priorities of the Institute are the utilization of renewable raw materials as new composites.

The main attention is directed on raw materials rich in fibre, starch and protein. Already for years the institute works at the use of these raw materials in the technology of extrusion and injection moulding. Wood – Austria has plenty of – is the most important starting product. Besides, bioplastics and recycling becomes more and more important.

Beside our ultra-modern pilot plant and the chemical analysis, basic requirements for those developments are modern measurement and testing methods. The mechanical investigations are conducted according to standardized testing methods of the plastics and paper industry.

Apart from the research and development of new materials, we wish to give other companies the opportunity to carry out mechanical and chemical investigations in our Institute and to use our pilot plant for tests. With the following specifications, we would like to give an overview of our Institute's services and facilities. We will of course be happy to answer your questions at any time.

1 MATERIAL TESTING

1.1 Mechanical properties

On inquiry the required standard specimens for the mechanical investigations can be processed in the pilot plant (see chapter 2.2).

The respective test samples can be pre-conditioned in the climatic test cabinet:

Conditioning in the climatic test cabinet 10° to 90°C, 30-85% rel. humidity
Warming/Cooling chamber -40°C till +120°C
Climatic test room adjusted to 23°C/ 50% rel. humidity, 5°C/ 60% rel. humidity and 20°C/ 60% rel. humidity
Tensile test according to ISO 527
Flexural test according to ISO 178
Compression test according to ISO 604
Tensile creep test according to 899-1
Flexural creep test according to 899-2

Tensile, flexural, and compression tests and determination of modulus of elasticity are carried out on a Frank universal test unit with 10kN maximum force and are also possible in the tempering chamber on request.

Flexural impact test according to Charpy, ISO 179 (unnotched or notched impact strength)
Tensile impact test according to ISO 8256 (tensile impact strength, ultimate elongation)
Ball indentation hardness test according to ISO 2039-1

1.2 Heat distortion temperature, rheological properties

Heat distortion temperature HDT and VICAT – CEAST HV3S Manual testing device for measuring HDT and softening temperature VICAT of thermoplastics according to ISO 75 -1,-2,-3, ISO 306 at temperature range up to 300°C
MFI (Melt flow index) Determination of melt flow index according to ISO 1133

1.3 Physical properties

Thickness of sheets, paper or hard paper weighing capacity 0-30 mm +/- 0,002 mm, diff. pressure foots and weights
Bulk value/-density according to ISO 787-11
Sieve analysis
Density (solid sample) according to ISO 1183-1
Swelling, shrinkage according to ISO 62
Determination of water activity (aw-value)
Sorption isotherm (exsiccator method)

2 PILOT TESTS IN THE PILOT PLANT

We offer the opportunity to carry out tests on the production scale in our pilot plant. The charge depends on the testing days (basic 8-hours working day). Time for assembly and dismantling is charged separately.

2.1 Extrusion

Cincinnati Titan 58

Counter-rotating conical twin screw extruder with gravimetric raw material dosing. You can feed liquid at different points. Throughput till 250 kg/h, speed 82U/min. Dies for granulating (16x6mm and 32x3mm) and for extruding sheets or profiles respectively (0,5 to 3,0mm, width 300mm, 1 to 13mm, width 540mm, hollow and solid profile for terrace deckings), as well as different screw configurations are available. Expanded products depending on the raw material composition can be produced.

MAS 55

Co-rotating conical twin screw extruder with gravimetric raw material dosing and stuffing unit. Throughput until 500 kg/h, speed 200U/min. Dies for granulating (16x3mm, 54x4,5 mm) and tools for extruding sheets or profiles are available. Different screw configurations by modular design are possible.

Cincinnati Milacron 45 F

Counter-rotating conical twin screw extruder with volumetric raw material dosing. You can feed liquid at different points. Throughput until 100 kg/h, speed 82U/min, 10 different dies for granulating and for extruding sheets or profiles respectively, as well as different screw configurations are available. Expanded products depending on the raw material composition can be produced.

Extrunet ECE 42

Single screw extruder plus tools for Coextrusion

Collin laboratory extruder ZK 25

Counter-rotating cylindrical twin screw extruder. Free configuration of the screw. Throughput max. 5 kg/h

Additional equipment:

Pelletizer PRIMO 100 S

with quenching bath Type KW 2000 x 400/200 mm

Haul-off equipment incl. saw for profile extrusion with calibration units

Calender: calender can be installed behind the sheet die

Recirculating air dryer Type HD-T-25-SD-25

Dry-air dryer SIMAR KT50 for predrying of granulates

Dry-air dryer Wittmann Drymax ATON 2 for predrying of granulates

Infrared dryer KREYENBORG IM7 for continuous drying till 20kg/h

2.2 Injection moulding

Wittmann Battenfeld injection moulding machine SmartPower 120/750 UNILOG B8

Clamping force 120t, part weight up to max. 325 g, various tools, also for producing test specimens. Additional equipment: parts-removal robot

Battenfeld Injection Moulding Machine HM 60/210 S UNILOG B4

Clamping force 60 t, part weight up to max. 90 g

2.3 3D-Printing

German RepRap X400

Print surface: 400 x 400 x 350 mm
 Print technology: FFF (Fused Filament Fabrication)
 Print materials: PLA, ABS, PVA, PS, TPU, filled plastics and so on
 Layer thickness: min. 0,1 mm
 Print speed: 10-150 mm/s
 Print volume: approx. 56 l
 External dimension: 66 x 66 x 77 cm
 Weight: 55 kg
 Connection: 230 V
 Equipment: dual extruder, heating bed

Multirap M10

Print surface: 280 x 240 x 240 mm
 Print technology: FFF (Fused Filament Fabrication)
 Print materials: PLA, ABS, PVA, PS, TPU, filled plastics and so on
 Layer thickness: 0,02 – 0,4 mm
 Print speed: 10-150 mm/s
 External dimension: 55 x 65 x 80 cm
 Weight: 45 kg
 Connection: 230 V
 Equipment: dual extruder, heating bed

2.4 Vacuum drying

Comp. Heraeus

Pressure up to 13.33 mbar, range of temperature 20°-90°C, capacity approx. 25 liter. For the careful drying of thermally labile products under vacuum

2.5 Grinding

Comp. Jehmlich

Pinned disc mill, cross beater mill, cutting mill. Rate up to 150 kg/h.
Sieves 0.5, 1, 2, 3 und 4 mm

Comp. Dreher

Cutting mill, throughput up to 80-250 kg/h; with granulate sifter and diff. sieves (2, 3, 5, 8, 10 and 15 mm)

Comp. Amandus Kahl

Edge mill for rough precrushing of fibrous and lumpy raw materials

Comp. Peruvit

Taifun – Chopper till 50 kg/h with sieves 2, 3, 5, 8 and 10 mm

Comp. Wittmann

Cutting mill, throughput up to 80 kg/h, sieves 4, 6 and 8 mm

Comp. Wanner

Cutting mill, throughput up to 50 kg/h, sieves 3, 4 and 6 mm

2.6 Pelletizing

Comp. Amandus Kahl

Pelleting press 33-390
Matrices with diameter 3, 4, 5, 6 and 10 mm in different compression ratios

Laboratory pelletizer 14-175

Matrices with diameter 3, 4, 5 and 6mm in different compression ratios

2.7 Presses

Comp. Collin

Laboratory platen press
maximum pressure 250 bar, plates area 900 cm², heatable, coolable

2.8 Sieve machine

Comp. Allgäuer

Vibration sieve machine, sieves 1, 2, 3 and 5 mm

2.9 Mixing

Comp. Draisenwerk

Mixer 200l

Comp. Lödige

Heating-cooling mixer 150/295l

Comp. EMT

Single screw throwshovel mixer 770l, speed-controlled, with 3 milling heads for fracturing the agglomerates

Comp. Prodima

Inclined mixer 25l, stainless steel

2.10 Laser

Comp. Cameo

Laser system Epilog Zing 24 with 30 Watt CO₂ „WaveGuide“ laser
Laser engraving and laser cutting system, working range 609 x 304 mm
max. material thickness for wood and plastic 6 mm, besides cardboard and paper, max.
weight of part 11,5 kg