



The Biorefining Technology Transfer Centre: Pilot scale technologies at the BioComposites Centre



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The Biorefining Technology Transfer Centre has a number of key technology platforms. The flexibility of operation and scale of the equipment at the Centre, coupled with mechanical and physical testing for materials and chemical analytical capabilities are unique in the UK, and offer companies the opportunity to work across a number of areas from proof of concept, to prototyping and onto pilot and ultimately commercial scale. In addition there is an experimental data capture capability linked to both laboratory and pilot scale equipment. This allows companies to access crucial information regarding energy consumption, for conducting Life Cycle Assessments (LCAs) and in order to evaluate the economic/ environmental impact of new products or processes developed.

Technologies

Biomass pre-processing

- Andritz Sprout-Bauer 12" pressurised refiner, coupled to an in-feed hopper/MSD (modular screw device) with a 60 litre digester and a 120 metre flash drier/cyclone system for fibre recovery
- Sprout Waldron 12" atmospheric refiner
- Large scale (35 litre) batch ultrasound processing cell
- Hammer mill (3-36mm screens)
- Forage chopper (production of 6-158 mm fibre lengths)
- Additional knife and roller milling equipment

Biomass conversion

- Wet biomass fractionation line consisting of 2x150 litre jacketed tanks, linked to decantor/separator units, ultrafiltration and pilot scale spray drying
- Biocomposites production line consisting of forming station, prepress and hotpress for the production of 1m² boards (MDF, OSB etc) at a range of thicknesses
- Pulp moulding/thermoforming equipment for the production of plant fibre packaging
- Twin screw extruder and pelletiser for wood fibre and polymer composites
- Sheet and film casting line
- Pulp and paper section including handsheet production and testing, fibre analysis, fibre freeness and deinking
- Drum blender (1000 litre) and jacketed ribbon blender (15 litre)

Biomass extraction

- 2x50 litre, stirred glass jacketed reactors
- Laboratory and pilot scale liquid/supercritical CO₂ extraction equipment (2x16 litres, operating temp. pressure: 5-80°C and up to 700 bar)
- Liquid-liquid separation up to 10 litres
- Vacuum filtration up to 20 litres
- Stand-alone rotary evaporator for 20 litre batch processing or semi continuous operation and can be simply adapted for solvent reflux

Core Competencies

- Biomass pre-processing, extraction and conversion
- Biocomposites and bioresins for applications in construction
- Plant extracts for food, personal/healthcare applications
- Bioprocessing/extraction of renewable natural materials using conventional solvents extraction and liquid/supercritical fluids
- Plant fibres and bioplastics for packaging applications
- Formulation, blending and evaluation of biobased plastics
- Green solvents including supercritical carbon dioxide
- Sustainability and life cycle assessment



The Biorefining Technology Transfer Centre

In 1989, The BioComposites Centre established an MDF (medium density fibre board) pilot plant at Bangor, North Wales with the backing of industry and the Welsh Development Agency. The aim of this facility was to provide technology transfer services and a research capability to the Forest Products Industry and other sectors. The facility carried out elements of what is now known as biorefining, by adding value to plant fibre. Feedstocks have included forest residues (including saw dust from mills and wood chips) and agricultural co-products such as wheat straw and hemp fibre, in order to produce biocomposite materials for a range of construction applications. Since 1989 a wide range of collaborative industrial projects have been undertaken at the facility to study the use of novel materials, new resins, additive technologies and process configurations.

The BioComposites Centre's pilot scale equipment was relocated to a new site on the Island of Anglesey in 2006, with over 600 m² of floor space. The remit of the Technology Transfer Centre (TTC) has since broadened to include work on the wider aspects of biorefining, including biomass fractionation and the study of a wide range of biobased products for applications across many different sectors. These include:

- Application of plant fibres and biopolymers such as polylactic acid and starch for food/ materials packaging,
- Isolation and modification of bioresins and other additives for the panel products/ polymers sectors
- Extraction of speciality chemicals from biomass using supercritical carbon dioxide technology, for the cosmetics, flavours and nutraceuticals sectors
- Enzyme mediated fractionation of biomass to generate new products for the food industry

The combination of a wide range of pilot scale equipment at the TTC, coupled with staff expertise in a number of core areas makes the facility unique and an ideal partner for working with industry.

For information on pilot scale technologies, please contact:

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