



Food Processing Facility

Pilot scale food processing equipment for the development of new ingredients, processes, or products. Our facility currently houses the following equipment:

Qbo15 Universal processing system (Roboqbo)

Bowl capacity maximum 15 kg max, minimum 5kg
Output 30-1000kg/hr
Cutting, mixing, homogenisation action
Pressure and vacuum capable
Steam jacketed bowl
Direct steam injection (direct, optional)



Retort (Lagarde)

Steam automatically and directly injected into retort
Horizontal format
1 basket for use with all container types

CRA226 Crystalliser (OMVE)

Scraped surface heat exchanger, pin worker and resting tube
Output 10-30 litres/hr
Up to 40 bar pressure
High flow CIP system



FT80 Tall Form Spray dryer (Armfield)

Comparable product to large scale production dryer capability
Individually controlled inlet and outlet fans
Variable nozzle positions
Co- or counter-current flow configurations
Output 2-7 litres/hour
Maximum residence time is 9 seconds
Drying air temperature 50 – 250 °C



LM20 Microfluidiser (Analytik)

High pressure homogeniser – drives product at a constant pressure through defined fixed-geometry microchannels within the interaction chamber.

Emulsification, size reduction and cell disruption action

Up to 30,000 psi (2068 bar)

Minimum sample size 14 ml

Output 90 ml/min

Twin screw extruder (Thermo Fisher Scientific)

Co-rotating twin screw extruder with barrel length of 960 mm and bore diameter of 24 mm (40 L/D). Two sets of screws (“hard” and “soft”) which offer differing degrees of material transformation. The extruder has the potential to run at a feed rate of 50 kg/hr – in our experience most samples require a feed rate of 8-12 kg/hr. Gravimetric(K-tron) and volumetric feeder available. 10 programmable temperature zones across the barrel – typical processing conditions used range from 60 – 150 °C. Variety of circular and slit dies available. Cooled slit die also available for high moisture meat analogue manufacture.



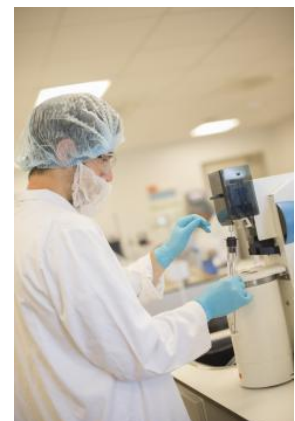
Compression popping machine (SYP6502, Shinyoung Mechanics)

High temperature and high pressure batch production of grains and pellets. Equipment produces 2 pieces at 65 mm diameter produced every 7 – 15 seconds, temperatures up to 270 °C.



Also available: steam jacketed vessels, mixers, proving ovens, ovens, batch ice cream crystalliser, rolling equipment, bowl chopper, high shear overhead mixers, colloid mill, hammer mill, drum dryer, freeze dryer.

Our facility also houses a quality control laboratory and fully equipped development kitchen. Quality control laboratory includes Texture analyser, Rapid Visco Analyser, Rheometer, Falling number, Microscope and C-cell.



For more details about any of our equipment or using our facilities, please email [HelloFMRC@nottingham.ac.uk](mailto>HelloFMRC@nottingham.ac.uk)



Biomaterials Laboratory

Analytical equipment to support us and our collaborators to establish the nature and interactions of food materials in a product matrix.

Macromolecule structure & composition

- Dynamic vapour sorption resolution (DVS) ([Surface Measurement Systems](#)) for gravimetric sorption measurement.
- X-ray powder diffraction (XRD) ([Bruker D8 Advance](#)) for quantitative analysis of both crystalline and amorphous phases, microstructure analysis.
- Fourier transform infrared spectroscopy (FT-IR) (Bruker Tensor 27) allows rapid identification of molecular structures based on which bonds are present, recently used for secondary protein structure analysis.
- High performance thin-layer chromatography (HPTLC) (CAMAG Linomat 5 and TLC visualiser) with automatic application.
- GC-MS
- ICS
- NMR (sodium and hydrogen)



Thermal analysis

- Differential scanning calorimetry (DSC) ([Mettler Toledo DSC 3+](#))
- Thermogravimetric analysis (TGA) (Mettler Toledo) utilised for thermal stability measurements.
- Dynamic mechanical thermal analysis (DMTA)([Perkin Elmer DMA 8000](#))

Rheological analysis

- Several Anton Parr Rotational rheometers (MCR301, MCR 302e, MCR 302) with a large selection of measurement systems.
- Tribometer
- Capillary breakup extensional rheometer (Thermo Scientific Caber Haake 1) allows the study of complex flows often more representative of industrial processes.
- Rapid visco analyser (RVA)([Perten Instruments RVA 4800](#)) with high temperature capacity (up to 140 °C) allows dispersions (typically in excess





water) to be characterised through a heating/cooling and shearing protocol.

Mechanical analysis

- Texture analyser (TA.HD plus, Stable Micro Systems) with a variety of probes and measurement setups available. Capable of measuring the mechanical properties of any solid/semi-solid product. FMRC experience in developing methodologies for a vast range of products and research objectives.

Dispersion structure analysis

- Interfacial analysis
 - Force tensiometer ([Sigma 700, Biolin Scientific](#)) with Wilhemy plate and du Noüy ring.
 - Pendant drop tensiometer (Sinterface PAT-1) with double syringe setup for interfacial tension and interfacial dilatational rheology.
 - [Interfacial rheology system](#) add on to our Anton Paar Rheometers allows us to study the interfacial shear rheology of liquid-liquid or liquid-air interfaces.
- Particle analysis
 - Litesizer ([500, Anton Paar](#)) enables particle characterisation in liquid samples via dynamic light scattering (0.3 nm to 10 µm) and determination of zeta potential.
 - LS13 320 (Beckman Coulter) laser diffraction particle size analyser for liquid and powder samples. Measures particle size from 0.04 – 2000 µm.
 - Bettersizer ([S3 Plus](#)) laser diffraction particle size analyser combined with image analysis for particle shape measurement. Measurement range 0.01 – 3500 µm.
- Turbiscan (Formulation) allows evaluation of the stability of concentrated liquid dispersions.

Microscopes

- Nikon Eclipse C1 microscope – with polarising filters for birefringence evaluation.
- EVOS microscope with multi-channels; fluorescence and brightfield.
- **Linkam shear stage capability, temperature?**

Also available: Benchtop scale spray dryer ([Buchi Mini Spray Dryer S-300](#)), freeze driers, high shear mixers