



Delivering The Molecule To The Consumer

Have you ever wondered why there are so many different types of yoghurt? Have you ever stood in the supermarket unsure of which one to choose? Gelled, natural, Greek? Then you have been inadvertently interested in Formulation Engineering. Many consumer products are complex structures in which the processing history is important. Other classic examples include chocolate, pharmaceuticals, paints, catalyst supports, polymer films, cosmetics and detergents. In all of these products the microstructure controls the physical and chemical properties which are essential to the products performance.

The structure of the yoghurt determines the mouth feel and hence the sensory properties, by carefully controlling and manipulating the microstructure new sensory responses can be developed. Researchers at the Centre for Formulation Engineering within the Department of Chemical Engineering at the University of Birmingham have been working on problems such as these for the last six years.

The new Head of Department, Professor Peter Fryer explains "Classical process engineering is concerned with the processing of simple chemicals on a bulk scale. For example the physical properties of petroleum products or intermediate bulk chemicals can be clearly described using thermodynamics. Materials such as chocolate are much more complicated as the property of the product

depends on the processing conditions, i.e. the time, temperature and shear rate the product has been exposed to."

The Department has recently been strengthened by the arrival of Professor Ian Norton, formerly the Chief Food Scientist at Unilever. Professor Norton's expertise in food emulsions and hydrocolloids is now being translated into projects for generating novel microstructures for the next generation of mascara, lipstick, skin care products and ice cream. He is especially interested in foods designed to combat obesity.

The Centre also has a Pharmacist as a member of academic staff, which is quite unusual for a Chemical Engineering Department but reflects how the field of Formulation Engineering is now entering non

traditional areas. Dr Rachel Bridson is currently working on supercritical drying, granulation of pharmaceutical excipients, using ionic liquids as alternatives to conventional solvents and dry powder inhalers.

Formulation Engineering is not exclusively limited to the areas of foodstuffs and pharmaceuticals. Dr Neil Rowson is working closely with Imerys (formerly English China Clay) helping them transform simple minerals such as clays and calcium carbonate into added value products. He is also working alongside the Biosciences Dept on using bacteria to recover valuable metals from urban waste such as discarded hard disks and car exhaust catalytic converters. Given that the price of platinum is now over £ 35 per gram these urban wastes can be more lucrative than a commercial mineral deposit.

The Department's other strengths lie in the area of energy. Prof Kevin Kendall has recently been awarded £1.6 million to continue his research into the hydrogen economy and alternative fuels. The Department even has its own fuel cell powered car and hydrogen filling station. Five more cars will be coming in the near future to deliver the University mail and catering, thus reducing the University's carbon footprint.

A substantial amount of the research is carried out through the EPSRC sponsored Engineering Doctorate (EngD) scheme. For the last five years over 40 projects have been started working with blue chip companies such as Unilever, Procter & Gamble, Rolls Royce, Boots, gsk, Scottish and Newcastle, Johnson Matthey, Dupont -Teijin Films and Imerys. The Engineering Doctorate is a four year

postgraduate programme of study and research carried out by a Research Engineer embedded with an industrial sponsor working closely on a 'real' industrial problem as opposed to an academic project typically carried out by a PhD student working in a University laboratory. Stewart Welch an EngD Research Engineer working with Rolls Royce explains the benefits of the scheme – "The EngD is essentially a well paid four year job interview. I am carrying out interesting and fundamental long term research of benefit to my sponsors. Plus I also get a doctorate."

The scheme is extremely popular with R&D organisations as "It gives the companies the chance to have a high quality student examine some long term areas in depth in a



sustained manner, which is often not possible when an organisation has to react to urgent commercial needs due to changes in circumstances. This along with the intellectual support of a top University, who can provide novel ideas and a different approach to the problem, makes this extremely worthwhile." states David York from Procter and Gamble.

The scheme is not just for students with first degrees in Chemical Engineering, Dr Richard Greenwood, the

Programme Manager explains "Formulation Engineering is a interdisciplinary subject, hence we are extremely good at taking chemists, physicists and biochemists and training them to become formulation engineers." As part of the programme research engineers also have to take taught Masters level modules. The modules taken depend on the Research Engineer's background and the project, but they cover the fundamental science and engineering behind

Formulation Engineering as well as the business, legal and marketing aspects that allow the Research Engineers to converse fully with other divisions of their sponsors as well as the R & D section. Additionally the Research Engineers learn the equally important soft skills such as report writing, presentation and team working skills. The latter taking place at the University's own Centre on the edge of Lake Coniston in the Lake District

So if you are interested in carrying out industrially led research and seeing the fruits of your efforts appearing on the market as new products, then perhaps Formulation Engineering is for you. For more details visit: www.eng.bham.ac.uk/chemical/pg/engd/positions.htm

UNIVERSITY OF BIRMINGHAM

Engineering Doctorates available at The Centre for Formulation Engineering in the Department of Chemical Engineering

- Starting tax free bursaries of over £19,100 pa plus fees paid by the EPSRC
- A four year postgraduate qualification carrying out industrially relevant research
- Based in a sponsoring company not in the University
- Includes taught modules in science, engineering, team building as well as business and management
- Open to UK/certain EU nationals with a good first degree (upper second or better) in any relevant physical science or engineering discipline. Existing employees with relevant industrial work experience may also be considered
- Projects available include:
 - Astra Zeneca (Loughborough) Roller Compaction of pharmaceutical excipients
 - Bristol Myers Squibb (Wirral) Granulation of pharmaceutical formulations
 - gsk (Ware) Production of inhalable formulations
 - Imerys (Cornwall) Next generation calcined clays
 - Procter & Gamble (Newcastle) The physics of washing machines
 - Certech (Corby) Disposable ceramic cores for investment casting
 - Ross Ceramics (Derby) Disposable ceramic cores for turbine blade manufacture
 - RockTron (Gale Common) Environmentally friendly products from power station waste.

For more details on each project please see www.eng.bham.ac.uk/chemical/study/postgrad/engd_projects.shtml

- If you meet the EPSRC entry requirements please email your cv to r.w.greenwood@bham.ac.uk

