

QUB - Mechanical and Aerospace Engineering PhD Project 2019-2020

Title: Finite Element Modelling for Optimisation of Renewable packaging

Project description: This project aims at developing fundamental knowledge of the processing behaviour for a new bio sourced polymer that will transform the packaging industry (an industry worth 57 billion) by replacing petroleum based PET containers for the carbonated soft drink (CSD) and water industries. This project will focus on developing a mathematical model describing the material behaviour in a stretch blow moulding simulation (Figure 1). This is an exciting development for the packaging industry due to the fact that a) the resin is produced from a bio source (Figure 2)) and b) it has superior mechanical and barrier properties compared to PET, thus offering an opportunity to lightweight containers and enter applications which are not in reach of PET.

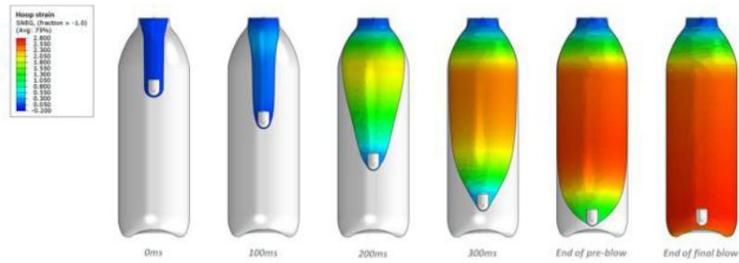


Figure 1: FEA simulation of stretch blow moulding



Figure 2: Container produced from waste food stock

This project will involve a collaboration with an international company who manufacture the resin and the successful candidate will be expected to travel to the company and spend a short secondment as part of the research.

Aims and Objectives:

The objective in this project is to develop an understanding of the material behaviour during the stretch blow moulding process making use of the specialist instrumentation, equipment, simulation software and knowledge that has been developed for PET at QUB for the past 25 years. The major challenge for the PhD student will be to develop novel and efficient characterisation/modelling techniques using a combination of solid mechanics and finite element analysis to determine optimum processing conditions and design parameters for optimum performance of the product after stretch blow moulding.

Key skills required for the post: Solid Mechanics, Finite Element Analysis, programming

Key transferable skills that will be developed during the PhD:
Experimental mechanics: State of the art techniques such as digital image correlation
Finite Element Analysis: Nonlinear finite element analysis
Programming: Python, FORTRAN
Polymer mechanics: Nonlinear viscoelasticity

Lead supervisor:	Dr Gary Menary, telephone 02890 974780, email: g.menary@qub.ac.uk
Guaranteed stipend:	£14,925/year. Fees at ~£4k/year. Note: UK/EU applicants only. Stipend and fees are NOT available for international applicants.
Conditional top-up available:	£3000/year for students with 1 st class honours and exceptional performance at interview.

PhD students in the School have the opportunity to apply to be demonstrators on undergraduate modules. Compensation for this can amount to in excess of £2,400 per year.

Queens University Belfast is a diverse and international institution which is strongly committed to equality and diversity, and to selection on merit. Currently women are under-represented in research positions in the School and accordingly applications from women are particularly welcome.