

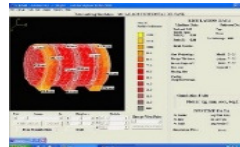
# QUB - Mechanical and Aerospace Engineering PhD Project 2019-2020

**Title:** The Development, Simulation and Optimisation of an Advanced Robotic Manufacturing Cell for the Rotational Moulding Process.

## Project description:

Queen's University Belfast have been at the forefront of developments in rotational moulding technologies for more than 30 years ([www.qub.ac.uk/pprc](http://www.qub.ac.uk/pprc)). The main aim of this project is to revolutionise the rotational moulding process for plastics through the introduction and exploitation of the latest technological developments in advanced digital manufacturing / Industry 4.0. The rotational moulding industry worldwide recognises there is an immediate need for the introduction of new, automated systems and sensors and have approached Queens to address this. It is planned that this new research platform will act as a springboard for development of such technologies across the rotational moulding industry worldwide. An industrial support / supervisory team representing industrialists from the UK, Germany and Australia has already been established.

This project is uniquely international as industrial support is being provided by a consortium representing more than 200 companies in 14 countries, and it is planned for the student to spend 4 months at international sites in Australasia and Europe.



The introduction of intelligent automated processing, monitoring and digital control benefits, have the potential to fundamentally change, significantly improve and ultimately revolutionise rotomoulding practices.

We are looking for an outstanding candidate with a very strong mechanical engineering background coupled to an interest in advanced manufacturing and a desire to travel. Knowledge of polymer materials and processing, and experience in the use of process modelling, robotics and computer programming software would be distinct advantages.

The project will take advantage of QUB's wide expertise in rotomoulding, automation, simulation and digital manufacturing for the development of the technologies required for robot assisted moulding technologies.

## Aims and Objectives:

The main technical objectives of the project are to:

- (1) Complete a Process Manufacturing 4.0 audit – heating / cooling / material handling / product handling
- (2) Develop a fully programmable robotic 'service' arm
- (3) Simulate material dosing, mould heating and mould cooling - heat transfer, process optimisation
- (4) Add Intelligent monitoring of in-mould temperature / in mould pressure / in process wall thickness
- (5) Extend modelling capabilities to control of shrinkage / warpage, wall thickness distribution, internal mould heating and cooling.
- (6) Develop a demonstrator platform and show case technology to industry partners worldwide.

## Key skills required for the post:

Applications are invited for a 3.5 year research studentship in the field of advanced polymer process digital manufacturing, leading to the award of a PhD degree. Generous funding for the project has been provided

through Rotoconnect via the EPSRC CASE studentship. RotoConnect is an industrial polymer processing trade organisation representing over 200 companies in 14 countries worldwide. Ideally, candidates should have a minimum degree of 2:1 (or equivalent) in Mechanical / Manufacturing Engineering, Mechatronics or a related discipline (or a combination of qualifications and/or experience equivalent to that level.)

**Key transferable skills that will be developed during the PhD:**

This project will provide a very broad range of training experience and a truly global opportunity to learn directly from member companies of Rotoconnect worldwide. An integrated visit and training plan of 4 months is proposed via residencies at rotomoulding facilities in Australia and Germany. As well as high level training in research technologies, the student will gain wide-ranging business knowledge of the entire global manufacturing sector. This will bring a breadth of new skills and knowledge in: international business, systems thinking, multidisciplinary problem solving, sustainability, entrepreneurship, communication, networking, team working and leadership.

<b>Lead supervisor:</b>	Dr Peter Martin, School of Mechanical and Aerospace Engineering, QUB Telephone +44 (0)2890 974140; email: p.j.martin@qub.ac.uk
<b>Other supervisor(s):</b>	Mark Kearns, Polymer Processing Research Centre, School of Mechanical and Aerospace Engineering ,QUB Telephone +44 (0)2890 974711; email: m.kearns@qub.ac.uk
<b>Guaranteed stipend and top-up:</b>	<p>This 3.5 year studentship is funded by EPSRC. Normally, to be eligible for a full award of fees, stipend and top-up a student must have no restrictions on how long they can stay in the UK and have been ordinarily resident in the UK for at least 3 years prior to the start of the studentship (with some further constraint regarding residence for education) (<a href="https://epsrc.ukri.org/skills/students/help/eligibility/">https://epsrc.ukri.org/skills/students/help/eligibility/</a> )</p> <p>The studentship covers fees and includes a tax free income of £19,750 per annum (comprising a £14,750 basic stipend plus a industrial top-up of up to £5,000). There is also the opportunity to undertake teaching and demonstration duties within the School to earn an additional £2,400 per annum.</p> <p>The successful candidate will be expected to be in post by October 2019.</p>

***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.***