

# Queen's Doctoral Training Programme on Secure Connected Intelligent Design and Manufacturing

## **Title: DTP: Development of an Intelligent Robotic Rotational Moulding Cell for Advanced Manufacturing of Thermoplastics**

This project is part of the Queen's Doctoral Training Programme in Secure Connected Intelligent Design and Manufacturing. Many of today's industrial approaches require transformative changes to ensure long term societal, economic and environmental resilience and sustainability. PhD projects in this programme explore the potential of emerging digital technologies, such as artificial intelligence, robotics, and the Internet of Things, to transform the way we design, manufacture and operate products and services.

### **Project description:**

One of the latest developments in advanced manufacturing with plastics is a new robotic moulding system called Robomould®. This patented technology is set to completely revolutionise the existing rotational moulding industry by creating an intelligent, fully autonomous moulding process. The Polymer Processing Research Centre (PPRC) has already worked for several years with the system's developers, AMS Robotics, to advance its capabilities and to introduce this new technology to industry. Recently AMS has agreed to provide the PPRC with the latest version of Robomould (which includes a robotic arm and an electrically heated mould) for the purposes of further research and development, and this system will be dedicated to this new doctoral training project.



This exciting opportunity requires an ambitious, high calibre engineering graduate to drive the development of the new Robomould production cell. The work will involve a multinational, multidisciplinary team from the Schools of Mechanical & Electrical Engineering at Queen's, the Robotics Group at the Katholieke Universiteit (KU) Leuven and AMS Robotics. Throughout the project it is expected that the student will spend regular periods working in Belgium with AMS and KU Leuven and the PPRC will host KU Leuven students working on related projects.

### **Aims and Objectives:**

The main aim of this PhD project is to further research and develop the capabilities of the robotic moulding cell. Some of the key research objectives of the work are to:

- Study in detail the technical capabilities of the new robotic cell in comparison to existing rotational moulding production methods.
- Reduce production cycle times by fully exploiting the integrated control of robot movement and zonal heating/cooling of the mould.
- Introduce new in-process sensors to the mould and integrate these with the cell's automatic control system.
- Develop a range of novel multilayer processing techniques to enable production of high-quality automotive parts.
- Optimise the design and operation of the in-mould heating system and introduce automated internal cooling to the mould.

### **Key skills required for the post:**

- A minimum degree of 2:1 (or equivalent) in mechanical, manufacturing, electrical, electronics or mechatronics engineering, or another relevant discipline.
- Strong analytical, organisational and team-working skills with an interest in advanced manufacturing systems and robotics.

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

The programme offers a bespoke research and training programme that aims to develop students into cross-disciplinary, industry-conscious thinkers and leaders who will influence the roadmaps of future advanced

manufacturing technologies and their applications. They will have a balanced understanding of ICT (security, communications and data analytics) in the context of their application to Advanced Manufacturing and High Value Design.	
<b>Lead supervisor:</b>	Dr Peter Martin Director of the Polymer Processing Research Centre School of Mechanical & Aerospace Engineering, QUB
<b>Other supervisor(s):</b>	Dr Neil Mitchell School of Electronics, Electrical Engineering and Computer Science, QUB Prof Karel Kellens Robotics Group, Dept of Mechanical Engineering KU Leuven, Belgium
<b>Guaranteed stipend:</b>	This is a 3.5 year funded Queen's DfE DTPs studentship with Training Grant, to commence on 1 October 2020 (N.B. stipend for 20/21 is not yet known, but is likely to exceed £15,000). The studentship covers fees and maintenance and is available for UK residents (see full eligibility criteria - nationality, residency, and academic qualification at: <a href="http://go.qub.ac.uk/dfeterms">http://go.qub.ac.uk/dfeterms</a> ). <b>When applying using the Queen's portal please ensure you include "DTP:" along with the project title.</b>
<b>Conditional top-up available:</b>	An additional stipend top-up of £3,000 pa is available from the project's industrial sponsor, AMS Robotics, Belgium.
<b>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.</b>	

***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.***