

PhD Studentships

Project Title	“Design by Science” – integrated computational materials engineering of welded powder-formed components
Lead Supervisor	Prof Mike C Smith
Co-Supervisor(s)	Dr John A Francis
Programme	PhD in Mechanical Engineering
Research Theme	
Description	<p>Background</p> <p>Powder-based metallic manufacturing methods such as hot isostatic pressing show considerable promise for replacing conventional cast or forged components, particularly in industries where high quality and long life are required, such as aerospace and energy. It is important both to understand and to predict how the manufacturing process affects both the final material properties and how the component performs in service.</p> <p>The Universities of Manchester and Birmingham are working together in a £1M project, “Design by Science”, that aims to develop an “Integrated Computational Materials Engineering” (ICME) framework for multi-scale modelling of the entire process, starting with thermo-mechanical processing of the metal powder, then welding the powder-formed component to conventionally processed steel, and finally putting the component into service.</p> <p>To achieve this, we need to be able to apply a wide spectrum of advanced characterisation techniques at different size scales, including conventional and electron microscopy, innovative mechanical testing of small specimens, the fabrication and characterisation of large welded components, and the application of neutron and synchrotron diffraction techniques to understand those components. We then need to incorporate our new knowledge into computational models that can link microstructure development during processing to performance in service.</p> <p>The project</p> <p>The student will join the “Design by Science” team at Manchester. They will undertake the fabrication and characterisation of small and large scale welded components made from HIP’d AISI 316L steel, and apply both detailed microscopy and a range of material properties testing techniques to understand how HiP’d material behaves during the welding process. The knowledge gained will be incorporated into microstructurally informed continuum computational models of stress and distortion development in engineering-scale components, which will in turn be validated using techniques such as neutron and synchrotron diffraction</p>
Skills required	Computational solid mechanics, welding technology, materials characterisation test techniques, optical and SEM microscopy, steel metallurgy.

Industrial Links	Design by Science is supported by a broad range of industry partners, including Rolls Royce, EDF, Areva, Sandvik and the NAMRC and MTC Catapults Information on standard fees is available here: http://www.mace.manchester.ac.uk/study/postgraduate-research/degree/ Information on typical stipend is available here: http://www.mace.manchester.ac.uk/study/postgraduate-research/funding/
Closing date for applications*	Applications accepted all year round
Project specific enquiries*	Professor Mike Smith (mike.c.smith@manchester.ac.uk)

* denotes information to appear within Project Description on webpage.

General enquiries:

General enquiries relating to the postgraduate application process within Mechanical, Aerospace & Civil Engineering should be directed to:

[Martin Lockey](#) - Senior PG Recruitment & Admissions Administrator

Tel: +44(0)161 275 4345

Further information about how to apply can be found at:

<http://www.mace.manchester.ac.uk/study/postgraduate-research/apply/>