Update on the IDC in Composites Manufacture

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Overview

• Industrial Doctorate is a 4-year EngD programme
• Funded by UKRI EPSRC
• Matched funding from Industry for each EngD project
• Embedded in the Future Composites Manufacturing Research Hub – also funded by EPSRC
• The goal is to connect the research base in Universities with Industry in the TRL range 3-5
• The IDC provides highly skilled personnel aware of business needs directly to industry to help bridge the so called valley of death in innovation
• Started in 2014 has so far provided 16 graduates to industry
• Diverse cohorts with over 30% female research engineers
IDC EngD structure

Research component in industry

➢ Research Engineer is embedded in Industry throughout the EngD programme
➢ Provides a strong industry pull
➢ Aligns with business need
➢ Produces resilient adaptable workforce with skills required by industry
➢ Bridges the innovation gap

Taught component – intensive units – in week-long blocks

➢ Constituents of composites
➢ Manufacturing of composite structures
➢ Laminate analysis, modelling and design of composites
➢ CAD for composites design and manufacture
➢ Mechanical performance of composites
➢ Process modelling and control in composites manufacture
➢ Design for manufacture of composites
➢ Study Tour
➢ Technology Strategy
➢ Commercialisation

Materials Science focuses on structure-property relationships

Mechanical Engineering focuses on design and applications
Impact

Harry Clegg: involved in design and repair of a racing yacht - now on its way to NZ

Alex Cochrane at the Lightweighting Centre chatting to Scotland’s First Minister

Laxman Sivanathan and Guy Atkins from Jo Bird receiving the Queen’s Award for Enterprise
Cohort Building

Dissemination: June 2019, Queens’ Building, IDC Open Day

Training: November 2020, Vox Coaching communication skills virtual group session

Sharing experience: IDC Interactive – a regular online discussion forum

Social event: Escape Room, Real, October 2019 Virtual, November 2020
EngD successes in 2020

• Harry Clegg – “Exploring the possibilities and pushing the boundaries of TTR” (Bristol) sponsored by NCC – now self employed consultant, USA

• Harry Barnard – “Composites to metal joining methodologies for high tensile load applications” (Bristol) sponsored by National Oilwell Varco Elmar, now working for NOV in Aberdeen

• Vincent Gill – “The impact of scaling component size and production rate on composite manufacturing process, technical capability and cost” (Bristol) sponsored by Rolls Royce, now working for RR in Singapore

• Laxman Sivanathan – “Developing process control in contact moulding and infusion processing for low cost high volume manufacture of critical safety products” (Bristol) sponsored by JoBird Ltd, now head of R&D

• Oliver Parks – “The future of composites for marine applications” (Bristol) sponsored by AEL (Hexcel) just finalised and exploring career opportunities

• Gabriele Voto – “Composites optimised for rapid production of aerospace components” (Cranfield) sponsored by Hexcel and now employed by Cranfield University in a research role

• Caterina Palange – “The effects of surface modification of microfibrillated cellulose on its dispersion and reinforcement potential in polyolefin composites” (Bristol) sponsored by Fiberlean now a project engineer at Pall Europe

• Dimitrios Karanatsis – “Advanced CFRP simulation for the development of fabric architectures and process improvement” (Nottingham) sponsored by Formax (Hexcel) now working in Greece

• Alex Cochrane – “Development of local through thickness reinforcement material and reinforcement architectures to achieve effective delamination management and tailored mechanical performance” (Bristol) sponsored by Rolls Royce, now at the Lightweighting Centre, Strathclyde, where he had a study tour placement
Current status

- 25 EngD projects running
- 3 projects with viva planned (all now employed by NCC)
  - Daniel Griffin – “Development and delivery of cure and material state monitoring within liquid moulding processes for fibre reinforced composites” (Bristol) co-sponsored by NPL and NCC
  - Petar Zivkovic – “Improvements and innovations in automated fibre placement” (Bristol) sponsored by Rolls-Royce
  - Simon Wilkinson – “Thermoplastic press forming” (Bristol) sponsored by NCC
  - All three now working at NCC
- 6 projects started since October 2019
  - Huw Edwards – “Development of liner-less lightweight composite pressure vessels” (Bristol) sponsored by NCC
  - David Langston – “Structural testing methods for next generation wind turbine blades” (Bristol) sponsored by OREC
  - Lachlan Williams – “Development of forming simulation capabilities for use in large-scale next-generation composite aerospace structures” (Bristol) sponsored by Airbus
  - Patrick Sullivan – “Effective use of recycled composites” (Bristol) sponsored by NCC
  - Will Darby – “Advanced Thermoplastic Composites Manufacturing, Understanding Defects and Failure” (Bristol) sponsored by NCC
  - Joe Soltan – “Manufacturing complex, large-scale composite components through “Modular Infusion”” (Bristol) sponsored by NCC
- 3 projects to start on 1st December
  - “Carbon rapid tape Shear 3D” from iCOMAT
  - “Digitalisation of composite manufacturing” and “Coupling digital and automation technology with process efficient future in composites manufacture” both from Airborne Composites Ltd.
Going forward

• Still some studentship available!
• Offering our technical taught units as CPD and gearing up for blended, online and distance learning
  • Intensive blocks of face to face practical work
  • Pre-recorded lectures
  • Post-course assignments.
• Looking into future - IDC is a model for doctoral mobility
  • Taught units pattern enables study whilst in full time employment.
  • No need to commence studies in September – flexible for students from non-standard backgrounds and for industry timescales.