



# Manufacturing and materials week

## The green recovery

30 November-3 December 2020

# Report



Your future in  
manufacturing  
and materials

supported by



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## Foreword



**Professor Mark Jolly**  
Director of Manufacturing,  
Cranfield University

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**Manufacturing and materials week included a mix of live debates, lectures, workshops and pre-recorded videos, looking at the challenges the industry faces right now, as well as how we must adapt and innovate to support future global challenges such as achieve a Net Zero manufacturing sector by 2050.**

The inaugural week-long event that built upon long standing events such as the Manufacturing alumni awards, the National Manufacturing Debate and Manufacturing 2075 gave the opportunity explore the pivotal role of manufacturing in everyday life. Taking these events to the next level, the week showcased that society needs to accept manufacturing as part of our lives and how it can support our future. Our digital devices, tables and chairs, right down to our pots and pans – all part of manufacturing! But they use resources, materials and energy, and so as a population, we must be responsible custodians of our planet for the sake of future generations.

Through research and teaching, Cranfield University, alongside industry is working to solve problems of the future. Post Covid-19, manufacturing has the potential to address important psychological and social challenges.

# Your future in manufacturing and materials



# Your future in manufacturing and materials

## Kicking off the first of three live sessions over the week, Mike Bayes introduced the session and the plans for Cranfield's inaugural Manufacturing and materials week.

Bringing together industry leaders, students and academics, with a mix of live debates, workshops, lectures and pre-recorded content, all focused on the green recovery and considering what the manufacturing industry will look like post-Covid-19. Mike welcomed attendees to the session, designed to help potential students find out what studying at Cranfield University is really like.

**Mike Bayes**  
Marketing Partner,  
Cranfield University



### **Professor Kostas Salonitis**

Head of Sustainable  
Manufacturing Systems,  
Cranfield University

**Cranfield University is a leading institution in the areas of decarbonisation and sustainable manufacturing. The courses we offer integrate manufacturing and materials with management, bringing together technical skill with the all-important softer skills.**

The full-time courses cover different aspects of the product lifecycle - from material extraction, processing, formation of product, through its lifecycle, and to end of life. We focus on the circular economy and remanufacturing, looking at extending the life and value of products to meet decarbonisation objectives. As well as the technical knowhow, we also focus on the development of softer skills, including managing a team and communication.

Through problem solving, identifying new methodologies and new materials, we are seeking to develop the next generation of engineers who know how to solve industry challenges but, especially in light of the current pandemic, are also adaptable and resilient. Students work together in the context of real manufacturing challenges, ensuring they leave able and ready to meet the needs of industry, integrating quickly into a working environment and immediately adding value.

# Materials design for engineering for sustainability



**At Cranfield, we look at how to turn raw materials into end products, as well as adding smart functionality to materials. We are operating in a world where our aims are to improve efficiency as well as reduce CO<sub>2</sub> emissions.**



**Dr Jeff Rao**  
Senior Research Fellow, Coatings  
Technology, Cranfield University

In the aerospace sector, while we have found that you can reduce CO<sub>2</sub> by increasing the temperature at which you burn the fuel, it also places tremendous pressure on the material to operate. At Cranfield we are looking at how to deposit smart coatings to sustain performance of engine and protect the underlying substrates. A material the thickness of just two human hairs can be used to protect materials in jet engine.

We are also looking at alternative materials and pushing the boundaries of these materials in hostile environments. Biomimetics is the emulation of the models, systems, and elements of nature for the purpose of solving complex problems. How can we form materials with nature as our template?

We have used this model as part of a design challenge for modern start-stop engines. Here the components are subject to extreme wear and we needed to maintain an oil film to increase the longevity of components. Looking to nature we have used the structure of bone, a porous yet strong exoskeleton, to create a material that has the strength of bone but offers a porous surface. By combining two materials we were able to change the material surface chemistry.

In many ways, our students are pushing materials to see what they will allow us to do. Courses such as [Manufacturing Technology and Management](#) focus on converting raw materials into viable end products.



### Eva Pelazez Alvarez

Current PhD student and  
Aerospace Materials MSc alumna,  
Cranfield University

**Following an undergraduate degree in Aerospace Engineering in her home country, Spain, Eva chose Cranfield University with the specific aim to bridge her theoretical undergraduate learnings with the industry connections and career opportunities which Cranfield is renowned for.**

The [MSc in Aerospace Materials](#) was a blend of the technical and softer skills required to prepare for industry. Writing reports, meetings with industry, managing a team - the master's has been designed to prepare students for the rest of their career. While she had not planned to complete a PhD, and particularly not one focused so far from her aerospace beginnings, Eva was offered a fully sponsored PhD by an industry partner to work on the formulation of natural latex gloves.

From aerospace to latex gloves is a big leap, and one Eva admits that she needed support in key areas, such as chemistry, to progress. Yet this is what Cranfield can offer and what companies, such as MediTech, her sponsor, believe in. With so many projects, aligned to real manufacturing challenges, the opportunities at Cranfield are phenomenal.

Fine out more about the MediTech latex gloves project in this video.

## Q&A

**What are the main advantages of studying a PhD at Cranfield?**

**Professor Kostas Salonitis** - Here at Cranfield we offer a range of courses within manufacturing, all in support of the technical training and softer skills. From courses on time management to report writing, the softer elements blended with the technical application are paramount. The key difference at Cranfield though is its research staff. All academics are research intensive and as a result of this, they spend the time training their PhD students to become independent researchers.

**How easy is it to secure a funded PhD at Cranfield?**

**Dr Jeff Rao** - It depends on the current requirements of our industrial partners and their long-term vision. You can search all available PhD studentships on the website and this is updated on a monthly basis.

**Can you give us an example of an MSc project?**

**Professor Kostas Salonitis** - We try to identify projects that are of interest to the companies we are working with and that give students real experience of working with industry to solve a problem.

For example, we have created digital twins, which are factory simulations that enable us to run a number of risk-free experiments. Using this technology we can experiment with new configurations without the worry of failing, and then work with industry, whether this be pharma, food or aerospace, to apply and implement.

**Dr Jeff Rao** - A company who made shock absorbers for motorcycles found that some were failing in year one and others were not - for seemingly no reason. Students had to establish what was happening, why and most importantly, how we could solve. It is this exposure to a range of companies with live industry challenges that helps our students to secure employment post-Cranfield.

**Eva, what has been your highlight so far at Cranfield?**

So far, it has been the group project presentation completed during my master's. Presenting to the industrial partners, academics and peers was an incredible experience.

**During the MSc can you do an internship in a company?**

**Professor Kostas Salonitis** - We know that many European students like to do internships as part of their study. The thesis is a four-month long project. It is possible to negotiate with a company, establishing if the project is of a master's level, and complete an internship on this basis. The key to this is applying early, both to the company and to Cranfield.



Will there be on-campus delivery of courses for upcoming master's (starting October 2021)

**Professor Kostas Salonitis** - At the moment, Cranfield is delivering a large percentage of courses face-to-face. We aim to do as much as possible face-to-face but we are also learning from and adopting practices from the past few months, adapting to deliver online or pre-recorded content as well as face-to-face learning. Everything we do will be designed to add value to the student experience.

If someone wants to become an expert in manufacturing though an industrialised PhD, is this possible?

**Dr Jeff Rao** - Here at Cranfield we have part-time PhD students who complete their studies as part of their job. Certainly there are ways to do this but you will require a sponsoring company, and a research proposal that meets academic standards.

Eva, what do you hope to do after your PhD?

With two years left of my PhD, at the moment I am looking forward to continuing my current research into natural protein-free latex gloves for mass market production. I have had exposure to many areas of manufacturing here at Cranfield so far, from aerospace in my master's through to medical gloves today. It truly is a great experience.

Find out more about our manufacturing and materials MSc courses, short courses and research opportunities.



# Manufacturing and Materials Week closing remarks



**Professor Mark Jolly**  
Director of Manufacturing,  
Cranfield University

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**No one could have envisaged that in postponing our National Manufacturing Debate we would still be in lockdown in December 2020. A concept that grew out of a forced hand has opened up tremendous possibilities and led to a week of events with international speakers and audience that has benefited from the online format.**

Twice this event, we heard reference to Industry 5, first by Dr Ayotunde Coker, winner of our Distinguished Manufacturing Alumni 2020, and during Manufacturing 2075 by Dr Abigail Hird of KTN. The reality is that 2075 will come around very quickly - some of you in this week's audience will be around to see and be part of it we hope! It really is up to you!

## Save the dates

**Manufacturing and materials week 2021**  
29 November–2 December 2021

**National Manufacturing Debate**  
1 December 2021

**Manufacturing 2075**  
2 December 2021

[www.cranfield.ac.uk/manufacturingweek](http://www.cranfield.ac.uk/manufacturingweek)

**Graphene commercialisation conference**  
15 March 2022

[www.cranfield.ac.uk/grapheneconference](http://www.cranfield.ac.uk/grapheneconference)





**Cranfield University**  
Cranfield  
MK43 0AL, UK

E: [manufacturingweek@cranfield.ac.uk](mailto:manufacturingweek@cranfield.ac.uk)

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