NOVEMBER 2015, NO 4

CIRP RA Winter News

Editorial

Dear CIRP colleagues,

It was great to meet with many of you in the southern hemisphere in the General Assembly! This year has been very exciting and productive given the involvement through various activities organized by the research affiliates. We had the 8th CIRP Research Affiliates (RA) workshop at AMRC, Sheffield UK and the 4th CIRP Global Web Conference(CIRPe 2015) . RAs also met during the CIRP General Assembly in Cape Town. Within the RA network, we aim to engage the affiliates through collaborative efforts that will foster research and development activities throughout disciplines. In this edition, firstly, you have the words from the RA steering committee. Updates from the RA workshop and CIRPe conference follow. We are happy to share some good news from several RA members. Finally, we share the list of the new RA members that joined us in August. We welcome them on board. Hope you enjoy this edition. And yes, please do not hesitate to contact us with your questions/suggestions.

Warm regards from CIRP-RA newsletter's Editors,

Erdem Ozturk(AMRC, University of Sheffield) & Vikram Bedekar(Timken Company)

Words from the RA steering commitee

by PETRA WIEDERKEHR, CHAIR

In the end of 2015, we, Olga (Vice-Chair), Taner (Secretary), and me, are looking back on our first year as RA steering committee. In August 2015, 22 new Research Affiliates were elected and it is a great pleasure for us to welcome them to our network. In total, we are 111 RAs at the moment coming from 25 different countries. Looking at the list of the CIRP members, it is a great success that since 2010 24 RAs became CIRP Associate Member and 4 RAs became Corporate Member.

2015 was a year full of events. We had an excellent RA workshop which was hosted by the Advanced Manufacturing Research Centre and the University of Sheffield in England. We had keynote and technical presentations given by Research Affiliates and invited guests, a poster competition sponsored by the CIRP UK and a themed workshop. We enjoyed our time in Sheffield and I would like to use the opportunity of this newsletter to kindly thank Erdem Ozturk, Taner Tunc and Candice Majewski for organizing this successful workshop.

The General Assembly in the wonderful city of Cape Town, South Africa was an additional highlight in 2015. Besides different presentations and an interactive workshop, we learned about teaching and research practice in South Africa in a presentation given by Tiaan Ooshuizen and about the African culture during our RA dinner.

In the end of September/beginning of October, we had the 4th CIRPe Online Web Conference entitled Understanding the life cycle implications of manufacturing. This was the first RA online conference with live presentations and it was very successful. The recorded presentations are available online: http://cirpe2015.com/watch/. I would like to thank John A. Erkoyuncu and Rocco Lupoi very much for their great effort and the excellent organisation of the conference.

I am looking forward to meet you again during the CIRP Winter Meeting in 2016!

Figure 1: CIRP General Assembly in Cape Town: Research Affiliate Dinner

CIRP RA Workshop 2015

Advanced Manufacturing Research Centre (AMRC) hosted the 8th CIRP Research Affiliate Workshop on 6-7th of July. It is co-organized by Dr Taner Tunc, Dr Erdem Ozturk and Dr Candice Majewski.

Research Affiliates travelled to the University of Sheffield AMRC campus to exchange information on some of the latest developments in their fields and develop the collaborative Expertise Atlas project.

The workshop was opened by the talks from Dr Sam Turner and Dr Jamie McGourlay. Dr Turner is the Head of the Process Technology Group and CTO of AMRC with Boeing. He is also a CIRP corporate member representing the High Value Manufacturing Catapult. Dr Turner gave a general overview of AMRC in his talk. Dr McGourlay, who is the partnership manager between Rolls-Royce and AMRC, gave examples of how Rolls-Royce and AMRC partnership made an impact on Rolls-Royce production. He also shared the manufacturing challenges in the future.

Areas of research covered at the workshop included new ways of depositing diamond-based materials, simulating gear hobbing operations, parallel turning and milling dynamics, process simulation for grinding and multi-axis milling, robotic milling operations, thermal measurement methods in composite machining, additive manufacturing, interferometry and CONALI onthology.

In the evening of first day, the workshop dinner was held in the Kelham Island Museum which represents the industrial story of Sheffield. The Research Affiliates had a private tour of the interactive galleries that tell how it was like to live and work in Sheffield during the Industrial Revolution. The Research Affiliates also witnessed how steelmaking influenced both the city and the world during the Victorian Era and the two world wars.

During the workshop, the participants developed the first version of the Expertise Atlas which is hosted in the Googlemap platform. It will act as a tool to facilitate collaboration among Research Affiliates by providing key information to setup collaborations. A screen shot from the first draft of the Expertise Atlas is below. It is hosted on http://bit.ly/1OlPUSv. It is far from complete to cover all the expertise available at the network yet and needs several improvement in the data structure. We will discuss how we will develop this further in the next RA meeting as it can be a very powerful tool in the future. In the meantime, please review it and share your comments with Dr Erdem Ozturk (e.ozturk@sheffield.ac.uk).

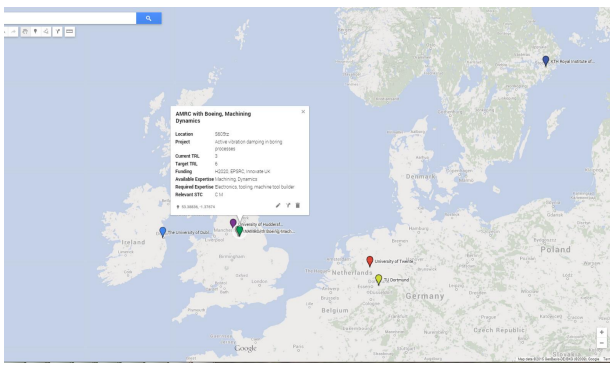

Figure 2: Expertise atlas http://bit.ly/1OlPUSv

Figure 3: RA Workshop dinner at Kelham Island Museum

The workshop was closed by attendees voting for the CIRP UK best poster award. Petra Kersting from Institute of Machining Technology at TU Dortmund University won with her poster about analysis and optimization of machining processes.

She was presented with the CIRP UK best poster award certificate signed by Professor Jane Jiang, who is the chairman of CIRP UK, and a £100 prize. The certificate is handed by Rolls-Royce Machining Specialist Andy Mantle, who is a CIRP Corporate member.

List of Participants:

- Olga Battaia, CIRP-RA, Ecole des Mines de Saint-Etienne
- Kevin Kerrigan, Guest, AMRC with Boeing
- Petra Kersting, CIRP-RA, TU Dortmund University
- Rocco Lupoi, CIRP-RA, The University of Dublin, Trinity College
- Antonio Maffei, CIRP-RA, KTH Royal Institute of Technology
- Candice Majewski, CIRP-RA, University of Sheffield
- Andy Mantle, CIRP corporate member, Rolls-Royce
- Haydn Martin, CIRP-RA, University of Huddersfield
- Jamie McGourlay, Guest, Rolls-Royce
- Erdem Ozturk, CIRP-RA, AMRC with Boeing
- Nikolaos Tapoglou, Guest, Cranfield University
- Taner Tunc, CIRP-RA, NAMRC
- Sam Turner, CIRP corporate member, AMRC with Boeing
- Wessel Wits, CIRP-RA, University of Twente

CIRPe 2015

The 4th CIRP Global Web Conference (CIRPe 2015) has taken place between 29th September and 1st of October. The conference continues its tradition to be hosted fully online and organised by the CIRP Research Affiliates. The theme for this year was The through life implications of manufacturing. We were delighted to see that there were presentations from all over the world. The proceedings will be published in Procedia CIRP and selected papers will be published in a journal. The conference covered a range of topics such as: Additive manufacturing, Machining, Virtual prototyping, Milling and Simulation. In order to view the presentations please go to the conference website http://cirpe2015.com/watch/).

Organising Committee

Dr. John Ahmet Erkoyuncu, Manufacturing Department, Cranfield University, UK

Dr. Rocco Lupoi, The University of Dublin, Trinity College, Ireland

Figure 4: Rocco Lupoi from Trinity College Dublin

Trinity College Dublin to lead a major ESA-funded project aimed at "Cold Spraying" 3D components

Engineers at Trinity College Dublin will lead an international study to develop a new technology that allows 3D "printing" of metal components. The €500,000 project represents the largest single research award made to the university by the European Space Agency (ESA). The technique will help the space agency acquire unique new engineering components with previously unavailable characteristics.

Yet the same 3D method could also be used to make the ultimate non-stick frying pan and components for the family car. The goal is to improve efficiency and reduce the cost of a manufacturing process called "Cold Spray", effectively a new kind of three dimensional printing.

"This is the largest ESA research project awarded to Trinity, and we will bring cold spray to the next level," says Dr. Rocco Lupoi who leads the project. "We want to make cold spray cheaper without losing performance," says Lupoi who is assistant professor in mechanical and manufacturing engineering at Trinity. Technical problems to be overcome include delivering a fast process that remains highly precise and reducing the current high cost of cold spray manufacture.

"It is a challenging project but there is a detailed technical plan approved by ESA that will address all of these issues in a four-year period."

Cold Spray is different from all of the other methods: it can make engineered metal parts while working at room temperature. Bonding does not rely on heat, and it needs no special environment to allow bonding to take place. Low temperatures are useful in a metallic environment because there is no heat-related distortion or damage to the components. The key to this technology is speeding up the sprayed material to supersonic speeds, to velocities in excess of 1000m/s. The particles are moving fast enough to penetrate into the surface and bond in a quick way so you can build up say five millimetres of material over a 100x100mm surface area in a matter of seconds, several order of magnitudes faster than other techniques. Nor does it matter what metal you are trying to apply, which means you can start with one and switch to another and then back to the first, depending on what is wanted.

For this reason absolutely unique components with special characteristics can easily be made. "One part of a component may have one characteristic while another part of the same component has another," says Dr. Lupoi. "You can mix materials in it and can make it any way you want."

Dr. Lupoi will work with with ESA staff Prof David Jarvis, Dr Wayne Voice and Mr Andrea Amaldi. Dr. Lupoi expects to have a post-doctoral and a PhD researcher on the project. The space industry is the initial target but it is believed that there are a vast range of applications for this technology if it can be made cheaper to run. "Some automotive parts in modern engines are difficult to manufacture using conventional methods so companies have to compromise on their designs. They see a benefit from this technique."

And Cold Spray remains useful as a way to bond materials to a metallic surface. It would be ironic if that great home product from the early space race days, Teflon non-stick coating that has stopped eggs sticking to the pan for decades, was replaced five decades later by a newer frying pan technology made possible by an investment from the space industry.

Figure 5: Steven Peters from wbk at KIT

Dr Steven Peters and Prof.Jung-Hoon Chun define "Technology Multiplier" after research collaboration at MIT

In summer 2015, CIRP Research Affiliate Dr. Steven Peters from wbk at KIT, Germany, spent several weeks at

MIT in Cambridge, MA, USA to work together with CIRP Fellow Prof. Jung-Hoon Chun on scenarios about future manufacturing in the automotive industry. They used scenario technique to discover potential future value chains.

The role of manufacturing knowledge to innovate in the established fields of powertrain and body-in-white as well as the impact of the new economy, namely the big information and communication technology (ICT) companies, were discussed. On the one hand, ICT can boost the way to more efficient production of variants by utilizing smart manufacturing approaches; on the other hand ICT enables new features for cars such as autonomous driving, which might change customers' expectations and selling propositions from established criteria like lightweight and performance to connectivity.

Both researches believe that ICT approaches like the internet of things or smart manufacturing (Industry 4.0) will improve operational excellence but will not lead to a commoditization of production. Moreover, Jung-Hoon and Steven defined the term "technology-multiplier", an effect which underlines the importance of enabling manufacturing technologies like additive manufacturing, aluminum-aluminum resistance spot welding or resin transfer molding to industrialize advanced materials such as carbon fiber reinforced plastics. Its multiplying effect is based on the assumption that companies with a high share of their own value creation (deep production depth) are able to learn more and to learn faster and as a consequence are able to shorten the time-to-market of new technologies and to produce complex products with higher accuracy or at a lower cost. A literature review on effects of outsourcing as well as some latest announcement of selected automotive companies underlines this suggestion by our two CIRP scientists.

Figure 6: Twin Control Project Logo

Twin Control project was awarded 5.6 million H2020 funding

Twin-Control is a new concept of machine tool simulation because it unifies the different concepts that affect the machining process; combining advanced simulation models and including vital aspects in industry, such as maintenance and energy efficiency. In addition, it will allow for the integration of the actual machine state in the models, increasing productivity through model-based control and even assisting with predictive maintenance actions.

The alliance is made up by the following partners: IK4-TEKNIKER (coordinator, Spain), the University of Sheffield (UK), Samtech S.A. (Belgium), Technische UniverstiÃd't Darmstad (Germany), Predict S.A.S. (France), Artis GmbH (Germany), Module Works GmbH (Germany), Gepro Systems S.L. (Spain), Mecanizaciones AeronÃąuticas, S.A. (Spain), Comau France S.A.S. (France) and Renault S.A.S. (France).

Dr Erdem Ozturk and his team from AMRC, University of Sheffield will work on developing process models for milling and turning processes for prediction of cutting forces, vibrations, form errors and surface roughness and its integration in the holistic simulation tool.

New RAs since the Winter Meeting

- BECKER Till
- BUFFA Gianluca
- CALAON Matteo
- DIETRICH Franz
- GHADBEIGI Hassan
- GUO Ping
- HIPPMANN Sophie Ulrike
- JAGER Andreas
- KERRIGAN Kevin
- KONG Lingbao (Boby)
- LAW Mohit
- MARIMUTHU Sundar
- MENCK Nicole
- MIN Junying
- NIELSEN Chris Valentin
- PEDERSEN David Bue
- RAHMAN Azrul Azwan Abdul
- SIMEONE Alessandro
- TAPOGLOU Nikolaos
- YOON Hae-Sung
- ZHANG Xinquan
- ZHANG Yang