IChemE ADVANCING CHEMICAL ENGINEERING WORLDWIDE
Food & Drink Special Interest Group
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Responsible Production Virtual Conference

2nd March 2022 | 08:00GMT

Speaker Biographies and Talk Abstracts

Towards an open-source energy digital twin platform for advanced process improvement

Dr Tim Walmsley, Assistant Director of Ahuora - Centre for Smart Energy Systems, School of Engineering, The University of Waikato, New Zealand

Talk Abstract

The digitalisation of industrial processes through digital twin technology promises step-improvements across all facets of the plant design and operation lifecycle. We define a digital twin as a digital (or virtual) representation that looks-like, behaves-like, and connects-to a physical process with the goal of improving decision making for any time horizon. Although each of the three attributes are necessary, the fidelity to which each attribute is modelled needs to vary depending on the purpose and application of the digital twin, as well as how far along the plant is on its own digitalisation journey. This presentation will give an overview of the digital twin paradigm and discuss progress of the Ahuora centre in deploying and applying original algorithms to the problems of process modelling building and process retrofit.

Speaker Biography

Dr Walmsley is an Assistant Director of Ahuora - Centre for Smart Energy Systems and leads the team's research on minimising process energy demand and contributes to research focused on the integration of high-temperature heat pumps. His research is supported by Project Ahuora (www.ahuora.co.nz), an Advanced Energy Technology Platform, funded by the New Zealand Ministry of Business, Innovation and Employment.

Enhancing the operation of dpray dryers with Computational Fluid Dynamics simulation

Dr Meng Wai Woo, Auckland and Monash University, New Zealand

Talk abstract:

Spray drying is widely used in the dairy industry to produce products in the powder form. Computational fluid dynamics (CFD) is a technique, which can be used to take the guesswork out of the operation of spray dryers. We will discuss a case study in using this technique to model a commercial scale spray dryer used for contract manufacturing. From the case study, we will discuss how the CFD technique is used for the troubleshooting of spray dryers. We will also discuss

how the industry can use this technique to make plant trials more efficient. In the last part of this webinar, we will discuss the roadmap of using this technique; in particular, what is important to bridge the gap between management, engineers and operators in adopting this powerful technique.

Speaker Biography

Associate Professor Wai Woo is an academic within the Department of Chemical & Materials Engineering in the University of Auckland, New Zealand. He is also the coordinator for the Food Engineering Masters program offered by the university. Wai is a member of the editorial board for the Drying Technology Journal published by Taylor & Francis. For the past 14 years, his main work has been on spray drying research focusing on the computational aspect as well as the operation of the process. He has published more than 100 refereed journal publications and he is a sole author of a book on spray dryer modelling. He has two patents pertaining to the development of unique spray dried products.

MVR evaporation and energy efficiency gains in the Dairy Industry

Dr Lana Kong and Ben Lincoln, University of Waikato, New Zealand

Talk abstract

In New Zealand, 68% of energy use from the food processing sector comes from dairy processing, particularly from generating process heat for milk powder production.The project aimed to develop a fully electric milk evaporation system with only existing thermal processing technologies in order to decarbonise the milk powder production process. An integral part of this was considering the best way to integrate Mechanical Vapour Recompression and other heat pump technology into the process. With feedback from industry experts, the final design was able to achieve 63% emissions reduction (current NZ grid emissions factor) and 33% operational cost reduction compared to a conventional MVR/TVR design.

Speaker Biographies

Lana Kong: Aspiring to work in sustainability, Lana decided to undertake a degree in Mechanical Engineering at the University of Waikato. She originally focussed on sustainable product design before joining Project Ahuora. Being part of Ahuora enabled her to learn and develop skills around large-scale decarbonisation that she was able to apply as part of heat pump

integration in the electric milk evaporator design. She will continue to work with Ahuora, undertaking a PhD related to heat pump technology.

Ben Lincoln: Having parents who were both dairy farmers, Ben was born and raised in the dairy industry. He decided to undertake a Chemical and Biological Engineering degree at the University of Waikato where he joined Project Ahuora and discovered his passion for energy engineering. Ben was able to apply his background, and process integration and simulation skills in the design of the fully electric milk evaporation system. He will continue on work in the dairy industry, undertaking a PhD on how to de-risk and de-cost retrofit of heat pumps in order to address some of the challenges faced by industries in moving toward net zero carbon.

Using CFD to model chocolate shell forming

Edward Throp BEng (Hons), Associate Principal Engineer, Global Chocolate R&D, Mondelez International

Talk abstract

Using computational modelling tools to assess the chocolate thickness and strength for filled chocolate products. This presentation will discuss the physical process that is being modelled, why a modelling approach was taken and talk through that approach including showing some results that have been obtained.

Speaker Biography

Edward graduated with a degree in Chemical Engineering from UMIST in 1998. He gained experience in process development and physical modelling of unit operations at ICI and also plant commissioning before joining Fluent (CFD) in a commercial role. After a number of years he took the opportunity to move into a technical role covering customer support, consulting and pre sales for Fluent and later ANSYS (following company take over), the last 4 years were spent as a team leader for the ANSYS consulting team in Sheffield where he managed a team delivering simulation projects across a broad range of industries ranging from Rolls Royce, nuclear industry customers through to water treatment. He joined Mondelez in January 2018 and is currently working on a number of CFD based projects across the categories.

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Towards a zero-emission food cold chain

Dr Xinfang Wang, Assistant Professor in Cold Economy, School of Chemical Engineering, University of Birmingham, England

Talk Abstract

Globally, the food system accounted for about 30% of total energy consumption and 20% of GHG emissions in 2011 (FAO, 2016). The supply chain, especially cold chain (temperature-controlled supply chain, including fridge, freezer, refrigerated truck/van, cold box etc.) is a key player in ensuring food quality and safety. However, temperature-controlled processing, distribution and storage, often based on inefficient equipment and protocols, have a significant environmental impact. To achieve UK's zero-carbon emissions target by 2050, the food supply chain including cooling needs to be decarbonised. How the decarbonisation will be achieved has significant implication for the economy, food and drink industry, social wellbeing, food security and energy system. It is essential to combine techno-economic, environmental, social and policy aspects in an integrated approach for the design and evaluation of decarbonisation solutions for the food cold chain from farm to fork.

In this talk, Dr Xinfang Wang will present the work undertaken by the team of the Centre for Sustainable Cooling at the University of Birmingham, where they have been building a whole systems framework to assess the demand of food cold chain up to 2050, considering the technology, infrastructure, environment, policy, behaviour, social, finance and business models. Dr Wang will explain the framework for understanding what the food cold-chain sector might look like in 2050, assessing the changing cooling needs of our food industry (chilled and frozen) and identifying the big areas of risk or win to zero emission targets.

Speaker Biography

Dr Xinfang Wang is an Assistant Professor in Cold Economy at the School of Chemical Engineering, University of Birmingham. She also sits on the UK Energy Research Centre's (UKERC) Research Committee and advises on the research strategy and priorities. Xinfang is currently co-investigator and working on three projects of decarbonising food cold chain in the UK and EU - Sustainable Food Cold-Chains, Zero Emission Cold-Chain, and European food chain supply to reduce GHG emissions by 2050.

Xinfang has a strong background in whole systems research, energy policy, economics and social practices on energy resilience, sustainable cooling and cold chains. Her research covers both developed and developing countries including Rwanda, Kenya, India, Bangladesh, Mexico, Nepal and China. Xinfang has been a co-I on a list of projects with a total value of over £20 million that are funded by EU H2020, EPSRC, GCRF, Newton Fund, Defra, BEIS, World Bank, and UKERC etc.

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New packaging technology for renewable packaging

Dr Scott Winston, PulpEx

Scott is the CEO of Pulpex Ltd, a new packaging technology company with a single-minded mission to deliver sustainability through renewable packaging. Scott is an R&D leader with extensive experience in developing, integrating and deploying the very latest technology advances to generate commercial growth within global brands to open new consumer opportunities.