Royal Academy of Engineering

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PROFILE
Distinguished International Associate

Thematic area: Bioplastic production from palm oil

Project title: Sustainovative development of medium-chain polyhydroxyalkanoates (mcl-PHA) biodegradable plastics from palm oil

Strategic goals: The creation of a working prototype and process capable of delivering innovative medical-application products from palm oil, transferring this knowledge to stakeholders and the wider academic and engineering communities.

Background: I achieved an MSc and PhD in environmental engineering at Pennsylvania State University in the US, becoming an expert in bioremediation, industrial wastewater treatment technology and microbial fuel cell technology. I have been working as a lecturer and researcher at King Mongkut's University of Technology since 1997, and I have been a national consultant on various studies and research projects in Thailand. As an environmental engineer, I have driven industrial processes towards green practices, reducing environmental impact from the manufacturing process and recovering high-value chemicals from biomass and industrial waste.

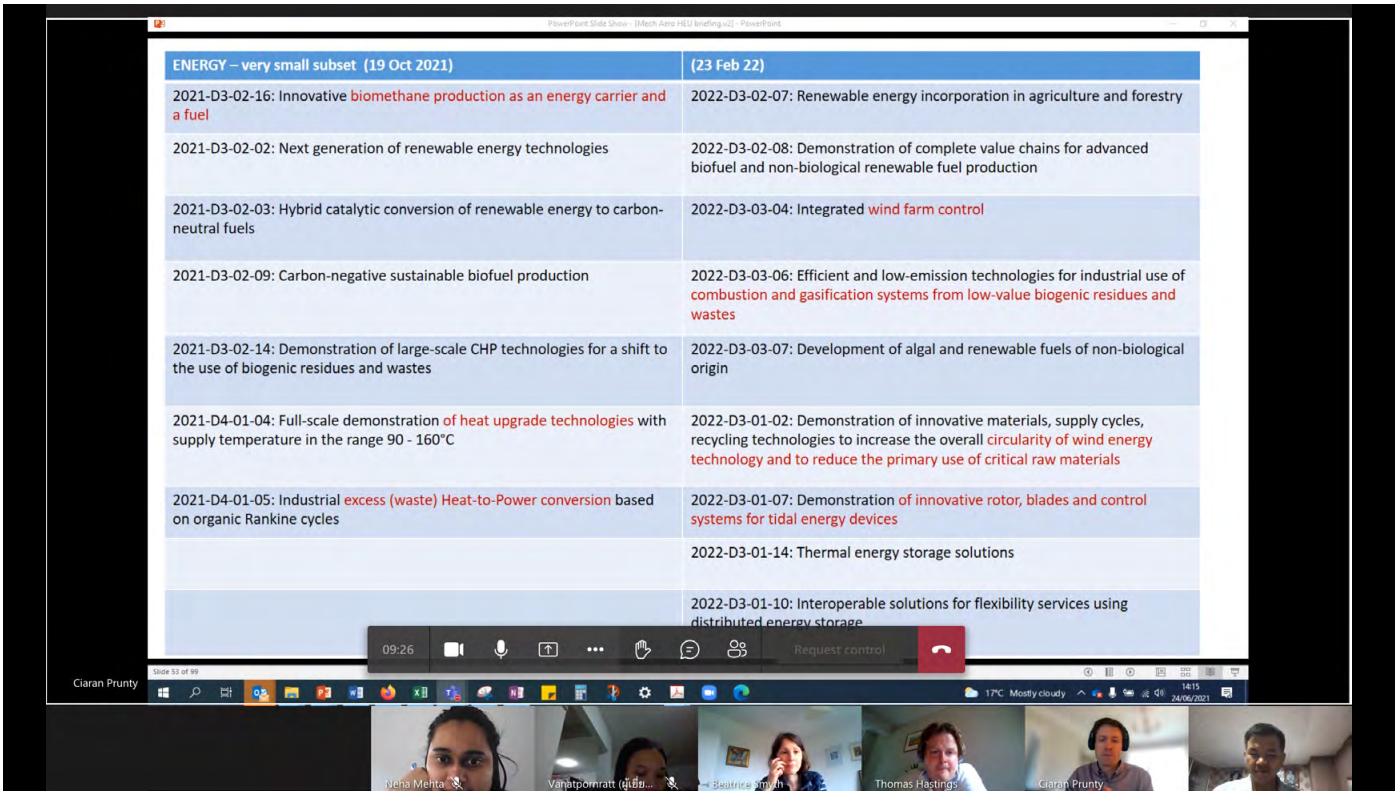
Previous Academy involvement: Since 2017, I have been collaborating with academics at Swansea University, Queen's University Belfast and Liverpool John Moores University on an Industry–Academia Partnership Programme (IAPP) scheme studying the production of mcl-PHA from palm oil. The DIA programme will build on the IAPP scheme's work.

About my project

Objectives: This project stems from discussions between academia and industry. The largest raw palm oil producer in eastern Thailand is looking for product diversification, to sell high-value innovative products in the world market. The palm oil industry is one of the main agro-industries in Thailand, and the company seeks to position themselves in alignment with Thailand 4.0 – a recent economic initiative intended to create sustainable business growth in industry sectors including agriculture, healthcare and pharmaceuticals.

Our project will be unique by incorporating bio-innovation as a major theme; mcl-PHA production from palm oil has yet to be commercialised. The ultimate goal is to develop and promote alternative technology for mcl-PHA production by focusing on the biochemical pathway of locally isolated bacteria that are highly efficient at converting palm oil to mcl-PHA. This is an attractive material for biomedical application because of its natural origin, biodegradability, biocompatibility and its ability to support cell growth and proliferation.

On the UK side... The collaboration will lead to knowledge exchanges between local and UK partners, with Thai and UK universities benefiting from technical training programmes. Swansea University will develop new ideas and methodologies around the chemical processing and purification of high-value mcl-PHA products, which could be further used to explore other applications, while Queen's University Belfast is also assisting with research work. UK partners not only provide technical input directly into the project, but they can also provide training to young Thai researchers.



Project output: A key output will be the development of in-house expertise in the manufacturing processes and engineering applications for producing mcl-PHAs from palm oil. The pathway to achieving this goal will generate lasting connections between institutions across a range of sectors, which will be promoted and disseminated at regional and national level workshops and conferences.

The findings will be published in national and international journals plus a manuscript, and we will promote the international aspect of this collaboration to attract other Thai industries to engage in future opportunities. We will also set up social media accounts (Facebook, YouTube, Instagram, and LinkedIn), and launch a website to promote the project while providing knowledge to the public.

Anticipated outcomes and impact: Developing new technologies for mcl-PHA production will generate sufficient data to enable design engineers to translate the results into commercial realities and realise its full potential. The main commercial goal is to develop large-scale production, which could lead to new opportunities to licence the technology or offer consultancy services, based on our expert knowledge. It could also create a new sustainable agro-industrial manufacturing sector based around renewable biomass (such as palm oil).

Final thoughts on the Distinguished International Associates programme: The DIA programme has provided funds, resources and opportunities to strengthen existing collaborations and initiate new ones. My work has certainly progressed in a positive way under the collaborations among the existing UK partners. Working side by side with both academia and industry partners means the existing network will grow stronger and expand further.

About the Distinguished International Associates Programme

The Distinguished International Associates Programme is an award scheme for international engineers working across all sectors, who are at the cutting edge of engineering research or innovation.

Awardees are offered a grant to amplify the impact of an existing collaboration with the UK in an area that aligns with the Academy's new strategic priority themes.

The programme aims to develop a broad international network of excellent diverse engineers across countries and disciplines, with research and innovation links to the UK, to work alongside the Academy to enhance progress towards achieving its goals for an inclusive economy and sustainable society.