Translating Local Research onto the Global Stage

Professor Thomas Maschmeyer, Professor of Chemistry, University of Sydney, 6 Feb 2024

Professor Maschmeyer gave us a very informative, stimulating and encouraging presentation on the research he leads that is aimed at solving important real world problems using engineering and chemical technologies in an imaginative way and exploiting the benefits of market and economic forces.

He is clearly enthusiastic about the potential of Catalysis – the introduction of a small amount of material to speed up chemical processes. He provided an amusing video demonstration involving a small quantity of hydrogen peroxide that showed dramatic results!

He has a particular interest in environmental issues including reducing aircraft emissions through the development from waste materials of sustainable aircraft fuels (SAF) used as a blend, with domestic and global carriers facing increasing regulatory pressures and the market growing exponentially (with SAF projected to provide 90% of jet fuel by 2050). His initial work using brown coal as a cheap feedstock was technically successful, but politics prevented access to mines in prospective locations like Victoria and Germany. So he and his company team turned to using waste plastics, biomass, used lube oil for catalytic conversion to high value products. Initially their theories were proved at his start-up company Licella , which developed a biomass-based version of the initial brown coal focused technology originated by Ignite Energy. This was extensively supported through interaction with the University of Sydney across the Faculties of Science, Engineering and Business, as well as his own laboratory.

Professor Maschmeyer looks to generate impact as soon as possible, sees it as his public duty. More often than not, this occurs via setting up spin-outs, which allow the off-campus progression to pilot plants, and then to large scale production. Thus far, he has reached global scale three times. There have been some great successes, along with a few failures, such comes with experimentation at the cutting edge.

Successes include Licella Holdings in the waste conversion business (including from Bio Mass to Bio Crude). A local example is at Somersby, NSW where the first pilot plant was built in 2007 and it has been the site of various

demonstration models up to 8000 tpa nameplate capacity to prove out the concepts.

With the prospect of the world's oceans containing more plastic than fish by 2050 and the mountains of plastic and other wastes going to landfill, his team is pursuing the development of converting mixed plastic waste and other wastes like biomass into useful chemicals and fuels. He gave an example, including Nestle/Coles/Licella, of how a large number of companies need to interact to completely demonstrate a full circular use of waste – producing new KitKat wrappers from end-of-life mixed plastic, now in commercial use. With 30,000 KitKats wrapped in this manner, it was a world-first demonstration of modern recycling success.

Another major success is in energy storage, developed by his team in Sydney and based on the university spin-out Gelion Technologies Pty Ltd, which then listed in London under the name Gelion plc. Here, he is using silicon, zinc and lithium sulphur in leading edge energy storage technologies. The opportunity arises from the huge increase in the need for storage capacity associated with the growth of global renewable energy sources (estimated at US$5 trillion per annum by 2030) and the abundance of sulphur as a potential alternative to the expensive critical minerals currently used (e.g. nickel, manganese, cobalt). Gelion's technology can be tuned for energy density and long cycle life to meet multiple applications

It is a reflection of his capability and enthusiasm that Professor Maschmeyer has attracted a number of large corporations in energy, packaging and retail, and universities as well as research organisations like CSIRO and ANSTO into a supportive "ecosystem".

In his vote of thanks, on behalf of members Alan Locke congratulated Professor Maschmeyer on his achievements and wished him and his team continued success.