Imagine Intelligent Materials Case Study

Imagine Intelligent Materials is a developer of graphene-based solutions that effectively allows infrastructure and industrial components to communicate to users in real time. They received a NERA Innovation Voucher in 2017 to help continue their development of predictive maintenance applications. NERA spoke to Chris Gilbey, Chief Executive Officer at Imagine Intelligent Materials, and Robert Gorkin, their Research Relations Manager, about integrating new and disruptive materials into the supply chain.

Tell us about Imagine Intelligent Materials – what does the business do?

Imagine is a vertically integrated company that makes intelligent materials that can communicate. We utilise these materials to develop an entirely new kind of sensing that enables infrastructure to talk to you – to communicate on their state, on the state of their environment, and on their continuing structural integrity.

The first product we developed and released to the market was Imgne X3, a coating for geotextiles that enables leak detection. Geotextiles are an extraordinary part of the built environment. They're under roads, under buildings and railway tracks and dams, and the purpose of these geotextiles is to either exclude or include water. For example, in tailings dams that have toxic leachate in them, you have to stop that water from leaking into the groundwater. Our material identifies whether there is a hole in a lining system prior to commissioning.

What is graphene? What can it do and how you are using it at Imagine?

Graphene is a new, two-dimensional material. It is a super material in every sense of the word – the strongest, most conductive thermally and electrically, and impervious to all gases. More importantly, it can lend these qualities to other materials, leading to the potential for a panopoly of applications that could be useful in industry and society generally. We see its real potential as being able to integrate it into the products around us, and at Imagine, our core interest is in measuring minute changes in electrical conductivity to create sensing materials.

Graphene allows infrastructure to communicate with you. To some extent this is happening already with individual sensors being used in conjunction with data analysis to provide predictive maintenance, giving indications of when something may fail. But what if we could embed sensing into the structures themselves that could tell you in real time, "I'm a bridge, and there is a crack in a key component so I'm about to fail", or "I'm a wall of a tailings dam and I've sprung a leak"? This goes beyond predictive maintenance to real-time monitoring that can deliver important information, not only to customers and consumers, but to the general population.

What is the importance of standards in bringing a new product into the supply chain?

As Imagine's solution involved implementing new materials into a supply chain, it was particularly important to adhere to industry standards. Our customers wouldn't touch our products unless they were certain the end results adhered to the standards that their customers required, so we had to build certification models across the supply chain to maintain those standards.

Having a new material is wonderful in the laboratory but how do you turn that into a product? It involves working with industry partners to understand the supply chain, and how to implement solutions across that supply chain that make sense – from a business and financial standpoint, from a safety and regulatory standpoint and so on.

We recently established a CRC-P (Co-operative Research Centre Project) with Swinburne University to investigate graphene throughout the supply chain. This allowed us to certify graphene-based materials and ensure they deliver what they are required to so that users to trust them.

Several research facilities and companies (including ours) recently established the Australian Graphene Industry Association to represent interested parties and ensure there is advocacy at a government level for the developing industry. It will also ensure there are Australian Standards for health and safety and utilisation of the material, and input into International Standards. This is a new global industry where Australia is already a leader and it could be very important for Australia's economy in the next 20-30 years.

How have you engaged with universities in developing and commercialising your products?

We principally work with Swinburne University, Deakin University, RMIT in Melbourne, CSIRO's textile research group at Geelong, the University of Oklahoma and the University of Wollongong, so we have a broad set of academic research connections. We have an extraordinary relationship with universities and research groups. Australia has an amazing resource in its academic research and it's a terrible crime there's not more commercial application of research transferring into industry. There is a need to accelerate engagement with industry to get products out, to be commercially relevant, and to not operate in silos.

NERA's Innovation Vouchers and other programs run by government and industry groups are helping to break down barriers, while making SMEs aware of what's available and helping researchers understand the needs of industry.

How has NERA's Innovation Voucher helped you in developing your technology?

We applied for a NERA Innovation Voucher to test the strain response of a graphene-coated fibre-based epoxy composite to determine whether the proof of concept was technically viable. The Innovation Voucher helped us continue development into sensing materials for structural health monitoring. These materials will report on components' structural health, bringing a significant improvement in efficiency and productivity by reducing equipment maintenance costs and downtime.

A key part of translating revolutionary ideas into reality is demonstrating it. That's where programs like NERA's Innovation Voucher come into play, allowing us to take the fundamental research and development, and create a prototype product that can be trialled in the real world. This helps to get buy-in from industry partners and other funders to take real steps towards making a mass distributed product for the industry.