NPL
National Physical Laboratory

New metrology unlocks £500k of potential sales in just two months for advanced materials innovator

The excitement around advanced materials is palpable. They hold transformative potential across a range of industries and investment in their application is high. In health and biotechnology they are opening up new frontiers in personalised medicine; in the energy sector materials such as graphene and perovskite are enabling the development of better batteries and more efficient solar cells; and in wearable technology and textiles they are being integrated into smart fabrics that can track biometric data or adjust insulation levels in response to body temperature.

DZP Technologies is at the forefront of innovation in this field. Based in Cambridge since its establishment in 2018, it boasts a team of highly experienced specialists in both the development and application of advanced materials. The company sells off-the-shelf products such as adhesives and inks that can conduct electricity, and materials that can dissipate heat very effectively. But more than 70% of its revenue comes from bespoke work for clients with a specific requirement. This means DZP is regularly developing new technologies that expand the boundaries of what advanced materials can do and how they integrate with other technologies and systems. Whilst this creates opportunities for both customers and DZP, it also presents some difficult challenges. One of those is how to measure, and therefore prove, the capabilities of brand-new technology where existing metrology processes may not work.

Challenge

In 2024 DZP successfully developed a new printed sensor based on graphene, a highly advanced and very stretchy, flexible material. The sensor can measure the stress or strain an object is put under when it is being used and can monitor the strength and integrity of large structures such as bridges, aircraft, buildings and the major parts of performance cars - all thanks to the unique capabilities of graphene.

The novel design and its use of a highly advanced and complex material such as graphene meant that measuring how well the sensor worked was proving difficult. DZP had tested it in-house and consistently generated positive results. But when it gave the sensor to customers, the data they obtained was very different Not only was this creating a lack of confidence in DZP's new product, but the company was concerned it might affect its reputation as an expert in advanced materials. The company realised that it was the way in which customers were testing the new device and the environments in which they were being tested that were causing the differentiation. They needed a new and independently-verified way to measure how the sensors were performing so they could demonstrate how their true effectiveness.

DZP approached NPL through the Measurement for Business (M4B) programme to help it develop that new approach. The two organisations had recently collaborated on a different M4B project that, so DZP's founder, Dr. Zlatka Stoeva, already had confidence in NPL's capabilities.

"We needed to solve this emerging problem quickly. We already knew NPL had the required knowledge, equipment and facilities so we engaged them immediately. It was imperative that we had access to advanced metrology that could determine the performance of our technology with an extremely high degree of accuracy to build confidence with customers and the wider market."

Solution

NPL's highly controlled test environments were a valuable aspect of this engagement but it was the NPL's deep expertise in the electrical characterisation of advanced materials that made this project so compelling for DZP.

NPL understood that because the sensor in question represented a significant technical leap forward, the metrology used to measure its performance also needed to be more advanced. NPL's scientists recommended a specific measurement technique to help DZP Technologies develop a suitable test method that would provide considerably more data than its current approach. Not only would this provide independent verification of the sensor's performance, it would also give users the opportunity to predict how it might perform under different circumstances, helping them extract maximum benefit from DZP's technology.

NPL had to create a bespoke process that involved adapting existing capability so it was applicable to DZP's sensor. This required the integration of advanced metrology instrumentation and extensive automation to ensure tests on DZP's sensor could be run continuously for hours or even days, and make the analysis and visualisation of the resulting data, and the reporting and reviewing process much faster. Achieving this involved developing a significant number of new software scripts to make the automation possible, along with implementing rigorous quality assurance and verification processes to ensure everything functioned as intended. It was a significant undertaking. Yet NPL completed the work in 20 days.

"We could have approached a university or another research organisation to help us with this measurement challenge, but it would have taken them much longer to deliver, because they usually have other priorities" explains Dr Stoeva. "NPL had so much existing knowledge of the underlying technology and the metrology involved, we were guaranteed a much quicker route to successful delivery."

Impact

The M4B project has had an immediate impact. Two months from the completion of the project DZP has generated more than £500,000 of new revenue opportunities as a clear result of the increased confidence it can offer in the performance of its sensor.

"Being able to offer independently verified evidence that our technology works has made a huge difference," says Dr Stoeva. "Not only are we now attracting new customers, we are also able to increase the support we provide existing customers by offering them a proven method to help them achieve their own objectives. That is essential because each of our customers has a different application for our sensing technology, so they all need to generate new validation data that reflects the unique way our sensors are being used."

The work has been so successful so quickly that DZP has already applied for a follow-on M4B project. The collaboration with NPL is therefore set to continue.

The success of NPL's work on this M4B project has much wider implications for a range of industries because DZP customers are usually at the very edge of emerging technologies. Having the confidence in DZP's expertise and products allows them to integrate them into their development process and move further down their innovation path, taking society a step closer to accessing exciting new technologies, from wearable smart textiles to robotics and the next generation of planned space missions.

Furthermore, because the project has enabled NPL to create an entirely new measurement process for sensing technologies utilising complex advanced materials, it is now able to offer this out to a wider range of organisations working with similar challenges. This has extended its commercial opportunity in this space, and increased the number of companies that can benefit from a verifiable way to measure the performance of these devices.

National Physical Laboratory, Hampton Road, Teddington, Middlesex, TW11 0LW
Tel: **020 8977 3222** | Web: **www.npl.co.uk**