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WORLD ENGINEERING DAY FOR SUSTAINABLE DEVELOPMENT

"The PHOSTECH prototype device was delivered on time, to budget and is a credit to the NPL engineering Team's dedication and exceptional efforts."

- Gavin Sutton

PHOSTECH: A Cutting-Edge Temperature Measurement Solution

Showcased by The Team

- **Temperature and Humidity** - Gavin Sutton
- **NPL Engineering** - Peter Lovelock, Matthew Stewart, Carter Wong, Joanna Brown, John Mountford, George Bolton, Joshua Shaylor, Kieron Smith
- **Partnerships** - Phil Cooper
- **Project Management** - James Holder

The Project

Many manufacturing processes require non-contact high temperature sensing to produce high quality outcomes e.g. welding and forging. Typically, this has been provided using infrared thermometers, but such devices are inaccurate, resulting in operators compensating by operating at higher than required temperatures to ensure the required manufacturing outcomes. Operating at these inflated temperatures has significant energy, quality and sustainability implications. PHOSTECH is a cutting-edge technology from NPL offering unparalleled accuracy in non-contact surface temperature measurement. It addresses limitations of traditional methods, providing significant benefits in advanced manufacturing where precise temperature measurement is critical for quality, cost-control and safety. In this project, a functional prototype phosphor thermometer has been designed and built by NPL's Engineering Team and tested in several field trials, leading the way to commercialisation opportunities.

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Impact and Sustainability

More accurate temperature measurement has the potential to increase productivity and reduce costs by improving efficiency, reducing energy consumption and enhancing product quality. For example, field-trials of an earlier prototype of PHOSTECH in a forging company demonstrated that the incumbent temperature measurement method was inaccurate, leading to overheating of their aluminum dies. If PHOSTECH was used across the plant, the company could potentially save an estimated c.£1m in annual energy costs and process efficiencies.

Collaboration Between Science & Engineering

By combining the expertise of the NPL scientists with Engineering Team, it has been possible to move the laboratory-based proof-of-concept to a working prototype in a short period of time which can now be used to demonstrate the performance and viability of the instrument to potential customers and end-users. The engineered prototype presents a stable configuration baseline to appraise strengths and weaknesses of the design which can be used to more logically plan the remainder of the development path.

The importance of the collaboration between the science and engineering teams cannot be overstated. Bringing together the unique skillsets of each has enabled a successful project outcome that simply would not have been achievable without the collaboration.

The collaboration between science and engineering has kept all intellectual property within the organisation. This presents more options in future and protects the knowledge developed during the project. The close working relationship has benefitted the project by eliminating barriers which may have been presented by working with a 3rd party.

What inspired this work?

PHOSTECH is based on over 25-years of experience in temperature measurement at NPL and a strong knowledge asset portfolio in phosphor thermometry. Translating the technology from a laboratory-based system to a practical instrument that can be deployed in real industrial environments has always been NPL's aspiration. With the support of NPL's dedicated Engineering team, we are much closer to achieving this ambition. The project was funded by a grant from the Government Office for Technology Transfer which was won with support from NPL's Tech Transfer team.

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"Having a known configuration baseline of the prototype facilitates learning from validation and implementing improvements in defined project iterations. This brings significantly more confidence in the outcome and focuses the benefit directly on the end-user by gathering feedback."

- Joshua Shaylor

Field trials of the PHOSTECH instrument designed and built by NPL's science and engineering teams at the Advanced Forming Research Centre (AFRC), Glasgow (February 2026), Testing of PHOSTECH on a forging die at the AFRC: (LHS, left to right) Matthew Stewart (NPL Principal Engineer), Dr Aurik Andreu (Heating Technologies Theme Lead, AFRC), Dr Gavin Sutton (NPL Principal Scientist); (RHS).

Challenges

The engineering teams' budget was reduced during delivery of the project. This required descoping of the project objectives. With careful planning, delivery of a fully functional prototype thermometer was still achieved.

UN Sustainable Development Goals

PHOSTECH is aligned with:

The Future

This version of PHOSTECH was designed and manufactured as a 'looks like works like' version of the technology and makes it possible to test the form-factor and functionality in representative environments. Further engineering and industrial design work will be required to refine and develop the product to prepare it to be manufactured at scale. The team will apply for further Government Office for Technology Transfer funding to make this possible.

Government Office for Technology Transfer