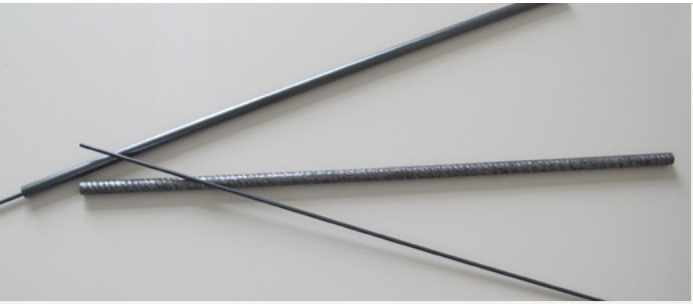
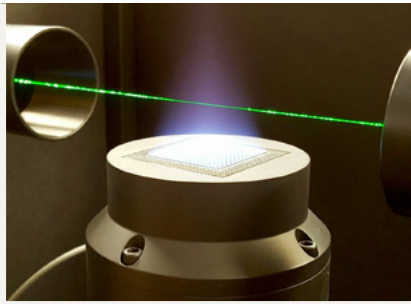
EMPRESS
TEMPERATURE METROLOGY FOR PROCESS EFFICIENCY

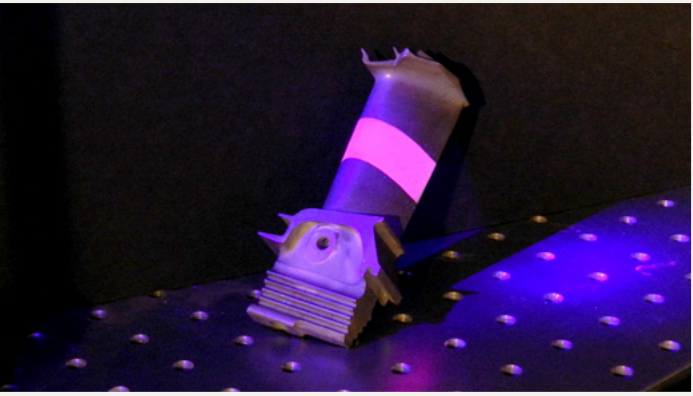
EURAMET

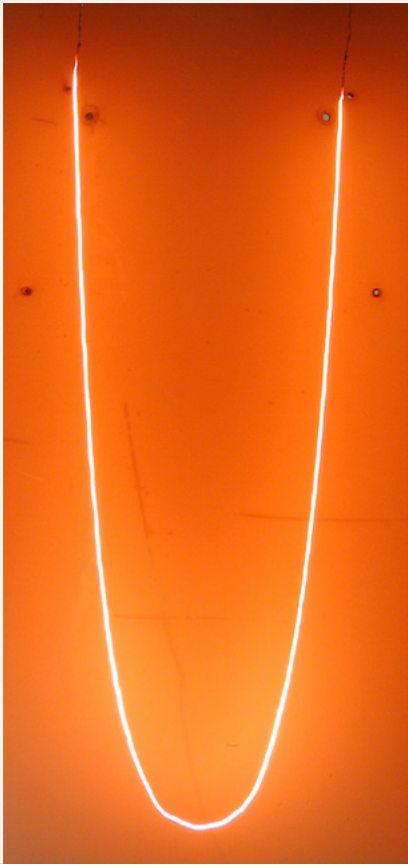
Enhancing process efficiency through improved temperature measurement

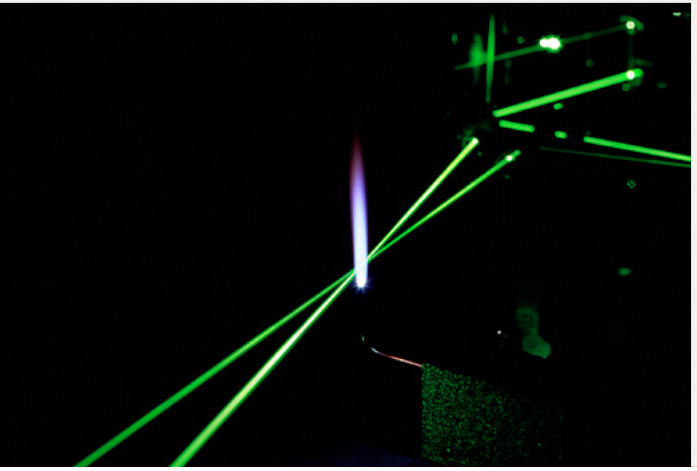
Duration: **May 2015 – April 2018**
Project coordinator: **NPL (National Physical Laboratory)**











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Most industrial processes need to be maintained at a specific temperature to maximise efficiency; and accurate control of temperature ensures process efficiency.

By improving temperature measurement techniques for selected applications, this project aims to enhance the efficiency of high value manufacturing processes in terms of reduced wastage, improved yield, more consistent processing, increased intervals between sensor checks and maintenance, increased reliability, improved energy efficiency and reduced greenhouse gas emissions.

Funded by EURAMET's European Metrology Programme for Innovation and Research (EMPIR), the project is characterised by trials of the developments in-process at end users' facilities, to solve documented manufacturing problems in high value manufacturing environments and to introduce in-situ traceability to the International Temperature Scale of 1990 (ITS-90).

Benefit industries

- Automotive manufacturing
- Aerospace manufacturing (sintering, propulsion, forming, creep testing)
- Marine manufacturing
- Metals production and processing
- Casting
- Forging
- Forming
- Welding
- Heat treatment
- Metal coating
- Nuclear fuel processing

Specific objectives

WP1

Develop novel low drift temperature sensors for enhanced production and temperature control to above 2000 °C

By objective optimisation of the Pt-Rh thermocouple with regards to stability at high temperature; development of carbon thermocouples for use at temperatures from 1500 °C to above 2000 °C; development of a contact thermometer based on a sapphire tube and blackbody arrangement for use up to 1800 °C; demonstration of the devices in industrial process environments.

WP2

Develop zero-drift contact sensors optimised for heat treatment applications at around 1350 °C

By development of a self-validating thermocouple within a 7 mm ceramic sheath, indistinguishable from current thermocouples used in heat treatment environments; development of novel ultra-stable mineral insulated, metal sheathed flexible Type K/N thermocouples; demonstration of the devices in industrial process environments.

WP3

Develop traceable surface temperature measurement methods to enhance materials/chemical processing to around 500°C

By improving calibration techniques for contact thermometers using fluorescence thermometry; development of non-contact fluorescence thermometers immune to background radiation; development of a contact surface thermometer with compensation for heat flow; demonstration of the devices in industrial process environments.

WP4

Develop an in-situ combustion standard for the validation of optical flame temperature measurements

By development of a portable standard flame; characterisation of the flame (temporal and spatial uniformity, traceable temperature assignment); establishment of a portable flame as a practical resource for establishing ITS-90 traceability in the user community.

Partners

Eighteen partners from the metrology community, high value manufacturing industry, sensor manufacturing and academia.

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