



Publishable Summary for 14RPT05 Eura-Thermal Developing traceable capabilities in thermal metrology

Overview

The overall objective of the project is to enhance the availability of facilities in the field of thermal metrology (i.e. high temperature contact thermometry, non-contact thermometry and thermo-physical properties characterisation) in emerging NMIs, where access to these types of facilities is currently limited.

Need

Currently, in Europe, more than 60 % of processes used by the manufacturing industry and common equipment used in every-day life depend upon accurate measurements of temperature and the thermal properties of the materials. Thermal metrology plays a key role in improving the efficiency and environmental impact of these industrial processes; and implementing traceable calibration facilities, measurement procedures and knowledge transfer to emerging NMIs and DIs in Europe will enhance the availability of facilities in the field of thermal metrology.

In the field of thermal measurement, Europe has several NMIs with extensive experience and capabilities, but smaller NMIs do not always have the capacity or capability to meet their national or regional needs.

There is a growing need in Bosnia and Herzegovina, the Czech Republic, Croatia, Hungary, Ireland and the Republic of Serbia to review their existing capabilities, identify and prioritise their traceability needs and strengthen or upgrade their regional metrology systems.

Objectives

The project addresses the following scientific and technical objectives:

1. To improve the accuracy of high temperature measurements by contact thermometry in the range 960 °C to 1084 °C in participating NMIs with limited metrology research capacity.
2. To develop reference standards for radiation thermometry in the range of 50 °C to 2000 °C in participating NMIs seeking to establish research capability in this field.
3. To consolidate the traceability and capabilities for thermal conductivity measurements by Guarded Hot Plate (GHP) in emerging NMIs and DIs from room temperature to 800 °C. Each emerging NMI will each implement thermal conductivity measurements by the GHP method and the outcomes will help these NMIs/DIs to participate in an inter-laboratory comparison in this field.
4. To enhance the availability of thermal metrology facilities for contact thermometry, non-contact thermometry and thermo-physical property characterisation for each emerging NMI and DI. An individual strategy for the long-term development of their research capability and the ability to offer calibration and advice services to industries at a regional level will also be developed.
5. For the emerging NMIs and DIs to contribute to, or extend, their declared measurement capabilities, quality schemes and accreditations (such as CMC entries and ISO/IEC 17025 accreditations).



Progress beyond the state of the art

This project will go beyond the state of the art in emerging NMIs and DIs by:

- setting up temperature measurement capabilities to a satisfactory level including the development of the necessary quality infrastructure, especially for industries working in the temperature range from 50 °C to 2000 °C
- developing research activities and establishing standards and methods for thermo-physical property measurements to an acceptable international level and useful for European or international trading

Results

The following summary describes the main targets that the project plans to achieve in participating NMIs/DIs:

- Field of Contact and Radiation Thermometry and Thermal Conductivity Metrology:
 - Strengthen and Provide expertise, Knowledge Transfer and traceability to emerging NMIs in Europe.
 - Provide direct traceability to SI.
 - Improve the references in the high temperature range starting with some fixed points in the case of thermometry and assess the uncertainty budget for all thermal fields

Impact

The main impact of the project will be to build upon the existing capacity and capability in partner institutes in the field of thermal measurements. The project will organise workshops and present the project results at conferences and in high-impact-factor scientific journals. Knowledge will also be disseminated by developing training courses. An advisory board, consisting of industry stakeholders, will regularly meet to exchange information with the consortium and ensure that the project is delivering relevant results.

This project will ensure that new or upgraded metrological thermal capacity, skills and expertise is available and suitable to support regional industry development and hence to sustain economic competitiveness of the European member states, particularly in the Western Balkans and Ireland.

In countries where contact temperature calibrations at high temperatures is not available, links with the wider European community, and effective training on the principles of high temperature contact thermometry, will help ensure that adequate support will become available to industrial stakeholders within those countries.

The project outputs will:

- Improve availability and capability of metrology services (calibration, measurement, training, consultancy, etc.) for the end-users of thermal instrumentation (e.g. thermocouples and radiation thermometers), or thermal measurements of materials (thermal conductivity) and better identification of their needs.
- Provide new skills and expertise in thermal and thermophysical properties metrology available in NMIs and designated and associated institutes, in central and south-east Europe and Ireland.
- Develop efficient and practical tools, such as measurement guidelines and calibration procedures, in order to accelerate the knowledge transfer between scientific partners and provide easy access to end-users.
- Make available traceable temperature calibration and measurement services to regional industries.
- Foster European traceability capabilities on thermal calibration facilities between European NMI/DIs in new emerging countries.



Impact on relevant standards

This project will establish connections with standardisation bodies, EURAMET, and BIPM to present relevant project outputs.

- Contributions to an improved survey of facilities available in emerging NMIs/DIs for high temperature measurements.
- At least 3 recommendations or guidelines are expected to be presented to the most appropriate bodies which will be identified during the project.

Impact on industrial and other user communities

The infrastructure for an intra-European high temperature calibration service, accessible to all industrial end users in the relevant European regions will be provided. This, in turn, will ensure that calibration services are more readily available for each instrument and therefore reduce calibration costs and risks from not having monitoring equipment available (e.g. thermometers, thermocouples, radiation thermometers and guarded hot plates).

The uncertainties of measurements at high temperatures and of thermo-physical properties will be improved to less than 5 %. This will allow for tighter tolerances on manufacturing processes and improve production quality and outputs.

Impact on the metrological and scientific communities

The metrological community (i.e. NMIs, DIs and accredited calibration laboratories) of emerging EURAMET member countries will benefit from the project outputs through the improvement of their measurement capabilities (in terms of accuracy and temperature range in particular) in the field of thermal metrology. The main intermediate impacts of this project in the metrology community, through the proposed scientific and technical activities (knowledge transfer, establishment of calibration/measurement procedures and uncertainty evaluation methods in the concerned countries/inter-laboratory comparisons) will be:

- Establishment of reliable capabilities for traceable measurements in thermal metrology (high temperature contact thermometry, non-contact thermometry and thermal conductivity measurement) at the level needed by each participating European country.
- Enabling emerging NMIs/DIs to participate more fully in future research programmes and inter laboratory comparisons.
- Submission of new or revised Calibration and Measurement Capabilities (CMCs) review by EURAMET and future publication in the KCDB.
- Provision of information and briefings to CCT and EURAMET TC-T about the output and the progress achieved in the project.

The project will support research and innovation in the scientific community of the involved countries by:

- Offering access to more comprehensive high quality facilities in the field of thermal metrology.
- Providing traceable and verified thermal conductivity data useful for their own research.
- Enhancing the consistency of measurements performed in the scientific community thanks to improved traceability chains.



Project start date and duration:		01 June 2015, 36 months
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Project website address: <i>under construction</i>		
Internal Funded Partners:	External Funded Partners:	Unfunded Partners:
Partner 1 LNE, France	Partner 11VINCA, Serbia	-
Partner 2 CMI, Czech Republic		
Partner 3 CNAM, France		
Partner 4 FSB, Croatia		
Partner 5 IMBiH, Bosnia and Herzegovina		
Partner 6 MKEH, Hungary		
Partner 7 MoE, Serbia		
Partner 8 NSAI, Ireland		
Partner 9 TÜBITAK, Turkey		
Partner 10 UL, Slovenia		