

THE EUROPEAN VIRTUAL INSTITUTE FOR THERMAL METROLOGY

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Abstract

An EC supported project to develop a European Virtual Institute for Thermal Metrology (evitherm) was launched in January 2003 and is co-ordinated by the National Physical Laboratory (GB), Physikalisch-Technische Bundesanstalt (DE), Laboratoire National d'Essais (FR), CNR Istituto di Metrologia "G. Colonnetti" (IT) and the ARC Seibersdorf Research GmbH (AT) .

A consortium of more than 35 European institutes from 13 European nations has been formed, in order to ensure that thermal knowledge and services are made available to industry, for the benefit of industrial processes and the environment, offering low-cost easy access, particularly to small and medium enterprises. As a co-ordinated internet-based infrastructure linking together the geographically scattered centres of excellence and other groups and organisations concerned with thermal measurements and technology, evitherm is designed to provide a focal point for information exchange and knowledge transfer between all these organisations and industry.

The Physikalisch-Technische Bundesanstalt is leading the working groups for radiation thermometry and for knowledge transfer to meet the needs of industry and communicate effectively to different regions. The free part of the website is currently in the final revision process and will become public very soon at www.evitherm.org.

1. Introduction

At the beginning of 2003 a consortium has been formed to develop a European Virtual Institute for Thermal Metrology (evitherm). The primary aim of this institute is to *"ensure thermal knowledge and services are made available rapidly and easily to users, for the benefit of industrial processes and the environment."* A project, largely funded by the EC Framework

Programme 5 *Competitive and Sustainable Growth*, will last 3 years [1]. The consortium has currently partners from 39 organisations, from 13 European nations (Tab. 1 and Fig. 1), comprising national measurement institutes (NMIs), industrial research organisations, manufacturers, measurement and testing laboratories, centres of learning, and consultants, among others.

Table 1: evitherm project member organisations (*italic: principal contractors*)

evitherm work package leaders
1. <i>NPL, National Physical Laboratory, UK</i>
2. <i>ARC, Seibersdorf Research GmbH, A</i>
3. <i>IMGC, Istituto di Metrologia di "G. Colonnetti "- Torino, I</i>
4. <i>IKE, Universität Stuttgart Institut für Kernenergetik und Energiesysteme, D</i>
5. <i>LNE, Laboratoire National d'Essais, Paris, F</i>
6. <i>PLG, Thermal Technology Consulting, UK</i>
7. <i>PTB, Physikalisch-Technische Bundesanstalt, D</i>
8. <i>TC, Thermal Consulting, F</i>
evitherm members
9. <i>AIPT, Italian Society for Thermophysical Properties, I</i>
10. <i>AS, Assotec srl, I</i>
11. <i>CAP, Pyrocontrôle Chauvin Arnoux, F</i>
12. <i>CEM, Centro Español de Metrologia, E</i>
13. <i>CERAM, Ceram Research, UK</i>
14. <i>DB, DaimlerChrysler AG, D</i>
15. <i>EADS European Aeronautic Defence and Space Company, D</i>
16. <i>INM, Conservatoire National des Arts et Metiers, F</i>
17. <i>IPCF, CNR Istituto per i Processi Chimico-Fisici, University of Pisa, I</i>
18. <i>DSM, Geleen, NL</i>
19. <i>HD, Hot Disk AB, S</i>
20. <i>IKTS, Institut für Keramische Technologien und Sinterwerkstoffe, D</i>
21. <i>INSA, Institut National des Sciences Appliquees de Lyon, F</i>
22. <i>IPSAS, Institute of Physics, Slovak Academy of Sciences, SK</i>
23. <i>IQS, Chemical Engineering Dept, Institut Quimic de Saria, Barcelona, E</i>
24. <i>LMK, University of Ljubljana, Laboratory of Metrology and Quality, Slovenia, SI</i>
25. <i>NE, Nestlé Research Center, CH</i>
26. <i>NF, Nutrifreeze Ltd York, UK</i>
27. <i>NMi-VSL, Van Swinden Laboratorium, Delft, NL</i>
28. <i>OGI, Österreichisches Giesserei-Institut, A</i>
29. <i>RAYTEK, Raytek GmbH, D</i>
30. <i>RGU, Robert Gordon University, UK</i>
31. <i>RISOE, Risø National Laboratory, Denmark, DK</i>
32. <i>SMU, Slovak Metrologický Ustav, SK</i>
33. <i>SP, Swedish National Testing and Research Institute, S</i>
34. <i>TE, Testo AG, D</i>
35. <i>TUB, Technical University Budapest, H</i>
36. <i>TUG, TU Graz, Institut für Experimentalphysik, Austria, A</i>
37. <i>UNIMI, Italian Department of Food Science and Technology, University of Milan, I</i>
38. <i>UNITO, Chemistry Department, University of Turin, I</i>
39. <i>ZAE, Bavarian Centre for Applied Energy Research, D</i>

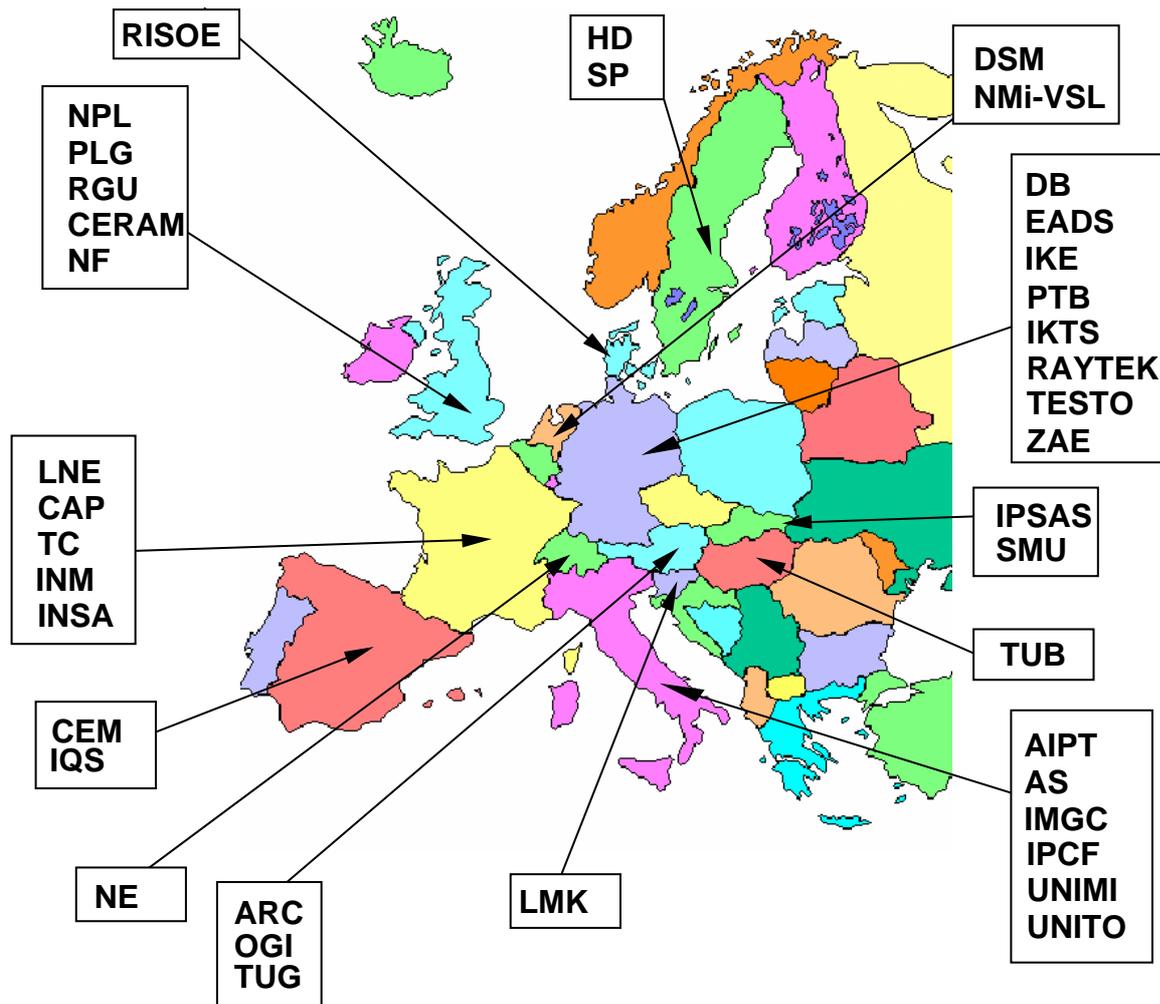


Figure 1: Geographic distribution of evitherm project member organisations, for abbreviations see Tab.1

2. The need for evitherm

About 60% of industries use thermal processes at some stage, and temperature and thermal measurements are vital in nearly all industries, from heavy, large volume industries, such as steel or glass production, shipbuilding, to high value and leading-edge areas such as aerospace and semiconductor processing. In many cases the requirements of regulation and safety laws are important drivers. Regulations such as those governing food or pharmaceutical product transport and storage, combustion and incineration, energy losses of buildings, air quality and global warming, underline the need for industry to validate and use their thermal processes and products properly. In these and many other applications an improved understanding and use of thermal measurement knowledge leads to improved process efficiency, product quality and

safer operation, leading in turn to more competitive and less environmentally damaging industries. This requires that organisations have access to appropriate and up-to-date training and measurement good practice advice, traceable measurement standards and reference thermal property data. However, this information and the supporting skills base are currently only available from a small number of institutes and research/industrial organisations and it is not readily or uniformly accessible to all who could benefit from it.

There is also a lack of understanding of thermal technology by many industrial users. These factors lead to inefficient, less competitive and more environmentally polluting industrial processes. Evitherm will address these issues by providing an internet-based infrastructure that links together the providers of information and expertise and presents it in a form that is accessible, understandable and appropriate for industry.

In many countries the teaching of temperature and thermophysics is just a small part of engineering or other science courses and so engineers or researchers in industry often have to rely on knowledge passed on by colleagues, or supplied by equipment manufacturers, or gained through attendance at specially designed training courses. Such variation in the availability and level of information and technical advice across Europe is a concern and an economic issue because of the impact of measurement on industrial efficiency. In particular it represents a barrier to the industrial advancement and competitiveness of many developing countries and SMEs. Evitherm aims to address these shortcomings by pulling together and further developing the existing dissemination and knowledge transfer mechanisms currently available throughout Europe and making them rapidly and easily available to a much wider range of organisations than at present.

3. Structure of the websites

The EC's definition of a virtual institute is a knowledge-based, market oriented network designed to facilitate rapid transfer and exploitation of R&D results and know-how into application. As a key step towards achieving this evitherm is developing a website offering information and services focusing on the needs of European organisations with interests in the thermal metrology field. The website specification has been developed and the plan is that it will have two levels of access, described briefly as follows.

Evitherm free website - free to all, providing directories of information: This part is currently in the final revision process and will become public very soon at **www.evitherm.org**.

- About evitherm; contact; constitution
- What evitherm can do for you - directory of member capabilities
- Conferences and meetings
- Trades and services directories
- Links to related groups and organisations
- Free access e-training
- Searchable basic glossary of definitions and introductions to thermo-physical concepts
- Reports, papers, presentations, meeting reviews etc.
- News
- User registration
- Feedback

Evitherm pay for website - for members only, providing access to information related to all technical areas by a number of routes, including thermal property, material, industry, application and country. This part of the website will become public in early 2005. Content will include:

- Qualified and specialised thermal property databases searchable by subject, material and industry sector
- Technology areas with data, best practice guides, standards, reference materials, software, frequently asked questions, contacts and hot links
- Notice board
- Information on latest science and technology
- Partners for collaborative research & other projects
- Advice line, consultancy, problem solving
- Discussion groups
- Training courses
- Funding opportunities

The potential scope and content of thermal metrology are vast but the resources of the evitherm project are limited and so it has been decided to concentrate the effort (for at least the first three years) on six key technical areas as follows:

- Thermal conductivity and diffusivity
- Thermal expansivity and density
- Emissivity and other infrared-optical properties
- Thermal analysis and calorimetry
- Contact thermometry
- Non-contact thermometry

The above are also the titles of the six technical work packages in the evitherm project, concerned with developing the website content. There are three other project work packages concerned with project co-ordination; developing and promoting evitherm; and meeting industry and regional needs. The website will be developed for use by engineers, scientists and technicians from a wide range of industries – materials production, chemical engineering, food and medical, automotive, aerospace and so on – to support production, design, testing, and other activities where thermal metrology is a key factor affecting process efficiency, energy saving, health and safety. The website content will be developed and reviewed by experts from science and also from industry to ensure that industry needs, and the demands of small and medium enterprises (SMEs) in particular, are catered for. The website will be "market-facing".

The Physikalisch-Technische Bundesanstalt is one of five Principal Contractors and is leading the work packages for non-contact thermometry and (together with IMGC/Italy) for knowledge transfer to meet the needs of industry and communicate effectively to different regions.

4. Aims and benefits

The overall aim of evitherm is to ensure that up-to-date and appropriate temperature and thermophysical properties information and expertise is readily available and easily accessible to European industrial and research organisations. For that purpose a special industry forum has been established in order to meet the needs of different industries, e.g. metal or glass production, power plant technology, aerospace, automobile industry, food production and microelectronics. In particular the institute aims to:

- Be a thermal information point for European industry
- Raise awareness of thermal knowledge transfer mechanisms
- Disseminate new measurement techniques and measurement best practice to industry
- Identify the thermal needs and capabilities of members
- Provide a forum for the interchange of ideas and technology know-how between members
- Facilitate collaborative R&D projects between members
- Enable feedback on the needs of industry to assist governments and other funding bodies in formulating their measurements and standards programmes.

Evitherm will help users to access organisations currently providing knowledge transfer activities, focusing specifically on the needs of European industry. Countries that already have knowledge transfer mechanisms in place will benefit from the increased pool of expertise and support material, and opportunities to collaborate and share knowledge with their counterparts in other countries. Countries that do not have such dissemination mechanisms will benefit from the wealth of information and expertise that is made available. Members will also have access to local national contacts for advice and training on how to interact with the virtual institute to gain most from it. The virtual institute will therefore provide a readily accessible mechanism that will significantly improve dissemination of thermal information and measurement good practice across European industry and thereby improve its industrial competitiveness and associated skills base.

One of the wider benefits of evitherm will be a much closer linkage between the NMIs, universities and industrial organisations participating as members in its development. Among the benefits of this will be (i) stronger and more industrially relevant collaborative research projects between member organisations and industry and (ii) a higher percentage of research outputs transferred to industry in a shorter time because of the increased industrial participation brought about by evitherm.

A key requirement for EC funding support is that a virtual institute should become a self-financing legal entity (a viable business) to ensure that the services it provides can be sustained beyond the 3-year period of EC funding. So it is vital, and the key challenge for evitherm, that it is attractive to industry users from the outset and that they recognise it as offering a unique or high value service that could not otherwise be obtained so easily or economically.



Figure 2: Members of the evitherm project Steering Group. Left to right: J.-R. Filtz (LNE), G. Bonnier (INM), J. Seidel (PTB), F. Pavese (IMGC), B. Sidhu (NPL), J. Redgrove (NPL), R. Angus (NPL), W. Hohenauer (ARC), V. LeSant (LNE), P. LeParlouër (TC), G. Neuer (IKE), P. Giles (PLG), J. Fischer (PTB).

The main control instrument of evitherm is the Steering Group (Fig. 2). In addition further members of the industry forum will complete that group. During the first meetings there were discussion of issues and decisions about the kind of legal entity evitherm will be; languages for website content; policies for selection of data bases, data entry, scope of website content, ownership of the data; editorial process of the content, choice of the website host, and much else.

5. Literature

[1] "The European Virtual Institute for Thermal Metrology", EC Competitive And Sustainable Growth Programme, proposal no. GTC1-2002-73009, 30 September 2002