Metrology 2013 – Round Tables Sessions Presentation

Metrology challenges for nanotechnologies

For a decade, nanotechnologies have provided a growing number of potential applications in the key sectors of industry (aeronautics and space, communications, micro-electronics, cosmetics, building trade, food processing, toys…), but also in health services (vectorial medications, medical imagery, and therapy) and environment-related fields (renewable energy, water processing). On the other hand, the development of nanomaterials raises regulatory issues as regards their use and possible risks to health, environment, and safety. The development of a new metrology is required to provide suitable support to the manufacturers of this very promising field and facilitate risk/benefit analysis. Only such nanometrology will be capable of taking up the many metrological challenges nanotechnologies raise. This new science of measurement at the nanometer scale requires a greater multidisciplinary approach than traditional metrology and the emergence of new concepts. It includes the measurement of dimensional quantities (length, surface…) and of other physical quantities as well (electrical, magnetic, mechanical, thermal…) or chemical.

This round table is run in partnership with Club NanoMétrologie, set up at the initiative of Laboratoire National de métrologie et d'Essai (LNE) and C'Nano (C'Nano is a joint programme sponsored by CNRS, CEA and MESR). It will discuss the main issues facing industry in this field, review the major R&D efforts being carried out currently at both national and European levels, and characterise the future developments required to meet the needs of industries and government agencies, and of the European Commission as well. Application issues raised by the recent French decree requiring users to submit annually (starting January 2013) the list of nanoparticles they process, may also be discussed.

The metrological requirements specific to high-tech trades (automotive, aerospace, medical)

In large-scale mechanical industries, the use of metrology have often been, and for many years, restricted to quality control applications, hence limiting its potential for providing greater benefits. But it can no longer be ignored without serious consequences and increased costs, as the new technological developments of products and processes require higher levels of measurement, and stricter standards

in product design (e.g. tighter specifications) and manufacture (guarantee of conformity). Greater quality assurance was also a major factor of such evolution.
At the same time, cost constraints often resulted in limiting metrology applications in companies. Wider use of metrology led to greater effectiveness, moving it from limited product manufacturing control activities based on narrow frames of reference, to larger measurement process control in design. This new trend required new competences with greater metrology involvement upstream in the new developments.
Design offices now make extensive use of digital simulation, which becomes a new field of metrology application since the digital models must be validated based on physical measurements. But the requirements of specific industry standards, such as ISO/TS16949 for the automotive industry, still need to be updated to include such new features.
Each field of industry has its own set of requirements. Measurement processes in the automotive industry must be put under control since any failure of the surveillance process may result in the recall of thousands of vehicles. Similarly, any error of 'local measurement' in the space industry may involve the loss of satellites. This is also the case for medical devices for which reliability is a must, for instance when a surgeon is to implant a prosthesis or a cardiac valve in the body of a patient.
How do metrological requirements meet such needs for technical and cost performance? How to define what is 'just necessary'? How such new technical and economic challenges 'drive' the new features of modern metrology? How the current frames of reference used need to be adjusted to include these new trends? What new requirements are to be taken into account?
These are the issues to be discussed by experts at this next round table.

The importance of metrology in food processing

Metrology is widely used in the food processing industry, but its importance remains largely ignored outside of this sector. And yet, microbiological measures make it possible to assess product fit for consumption. As events periodically reported in the media have shown, any measurement error can have dramatic consequences for consumers, as well as for the production companies involved, or even for the whole food processing chain. Other quality measurements, such as for fatty or protein contents in the milk industry, also help determine the price of a product.
Measurement processes are also of vital importance in the manufacturing process itself to determine dosing of the various ingredients, to monitor the weight of packaging or cooking temperature, to guarantee that vacuum is effective, to ensure that cold chain is maintained, or to improve taste by means of sensory metrology.
This round table will be mainly focused on measurement and its implementation in the manufacturing process. How to measure and control temperature in a baking oven of several meters length? How to make a packaging meet a dual requirement: for instance the number of duck thighs included in the can, and the weight set for the product, or the filling level of a bottle on the one hand and the liquid quantity on the other hand…
The experts invited at this meeting will provide answers to these issues, but they will also discuss that various solutions which can be implemented in your own particular setting, as consumer, food processing manufacturer or supplier of specialist food packaging.

Medical laboratories and accreditation: which tools to control analysis

In France, the evolution of the regulations requires the medical laboratories to be accredited for all its activities of analysis before 2016 according to the sectorial standard ISO 15189 " Medical laboratories - Particular requirements for quality and competence ". This approach, in addition to the implementation of a quality management, requires a control of the methods of analysis, the implementation of a management of the test and measure equipments, an estimation of the uncertainties associated with the testing results.
What can be the contribution of metrology in this approach, new for medical laboratories ? For certain measured quantities such as temperature or mass, the methods used in other areas of testing apply or are adaptable. By cons, many equipments of these laboratories are complex machines managing in any

autonomy cycles of analyses according to the current analytical methods. Traceability of physical quantities measured and controlled in these analyzes is not necessarily easy or even impossible to achieve for such equipment. Should we consider new approaches and methodologies for the control of measures and analysis in medical laboratory ? The cases of the qualification of thermocycler, centrifuge, regularly discussed, are the illustration.
Moreover, it will be interesting to open the discussion beyond French borders and to examine the requirements that meet the medical laboratories in other countries. Experiences known elsewhere could enlighten solutions to be implemented for French medical laboratories.

This round table will bring together experts, equipment suppliers and users, provide evidence and solutions for control measures and analysis within the medical laboratories in the framework of accreditation.

Risk management in assessing the product conformity

The assessment of product conformity is intended to guarantee that the products meet both legal requirements and technical standards applicable, as set by the regulation authority of the importing country. Therefore, the conformity requirements may vary for the same product, depending on the country concerned.
The assessment of conformity consists of checking product conformity against such applicable technical and legal requirements in force. It covers the sampling operations on site, as well as the tests and audits conducted in the production plants. Following assessment of product conformity, a conformity certificate is issued, which is often required to clear goods through customs.
Product conformity assessment prevents imports of hasardous, non-conforming or counterfeit goods or equipment. It contributes to consumer health and safety protection as well as environmental protection.
Product conformity assessment facilitates trade, while protecting the interests of the parties (importers and exporters) involved in WTO-regulated transactions.
What is the role of metrology in such business activities? The main issue is to determine whether the measurement results show that product characteristics are within the limits set by the regulation, or by the technical standards applicable to the products.
As regards the measurement system, the main task is to put the measurement processes under control to ensure correct assessment of conformity. The uncertainties involved in such results will be of critical importance in such assessment, especially near the acceptance levels, as well the traceability to the units of the International System of Units (SI). The process will include the sampling operations making it possible to issue a statement of batch conformity.
The standards used in the assessment of conformity are part of the ISO/CEI 17000 series of standards, particularly ISO/CEI 17020 and 17025. The new 2012 version of the standard applicable to inspection activities details the requirements for the measurement processes.

Participants of inspection bodies, laboratories, experts and users, will attend this round table and report on the solutions they implemented in the control of measurement processes.

How measurement supports the development of Low Carbon Technologies to address the energy challenge

Countries within the European Union have set themselves ambitious targets to reduce carbon emissions whilst at the same time maintaining a secure energy supply. The resulting challenges include either more efficient energy generation with more economical processes increasing output for lower input. Alternatively, more efficient energy consumption hinges on the introduction of smart appliances, new building materials and workable Carbon Capture and Storage Technologies. Low Carbon Technologies (technologies that enable mitigation of climate change) are seen as the panacea

moving towards a greener economy with an enormous market potential. Yet their commercial exploitation and success is lagging and considerable uncertainty exists regarding their effectiveness and efficiency. Measurement plays a vital role in providing confidence for new technology developments directly or through standards, driven by trade or regulation. The European Commission has just introduced a new pilot programme to provide credible and independent technology verification and thereby encourage market penetration. This workshop will explore what the challenges are and what more can be done to accelerate the development of low carbon technologies and products. In particular it will address:

• Whether regulation is required to drive standards and development,

• An industrial perspective, how measurement can support and accelerate the development in absence of regulation and standardisation

• How in a European context, the measurement industry can further support the implementation of the European Energy Strategy under Horizon 2020.

Participants from Industry, the Measurement Infrastructure and policy makers will provide case studies and critically assess existing schemes and future requirements.
The outputs of this roundtable will directly feed into the European Energy Strategy under Horizon 2020.

The round table is organised with the support of the NPL's Center for Carbon Measurement.