3 TRENDS IN LEGAL METROLOGY TOWARDS A GLOBAL MEASUREMENT SYSTEM

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The key nations of the past such as the Greeks, Romans, Incas, Chinese and others had all recognized the importance of a uniform metrology system and had consequently implemented it in their empires. The decisive step towards a worldwide uniform system of units was however accomplished in 1875 with the signing of the Metre Convention in Paris by seventeen countries. Its aim was to secure international agreement on and improve the Metric System; this agreement was finally reached in 1960 with the introduction of the International System of Units, the SI. Unfortunately, although most countries have since joined the Metre Convention, the SI is still not yet fully implemented some 125 years after it was instigated.

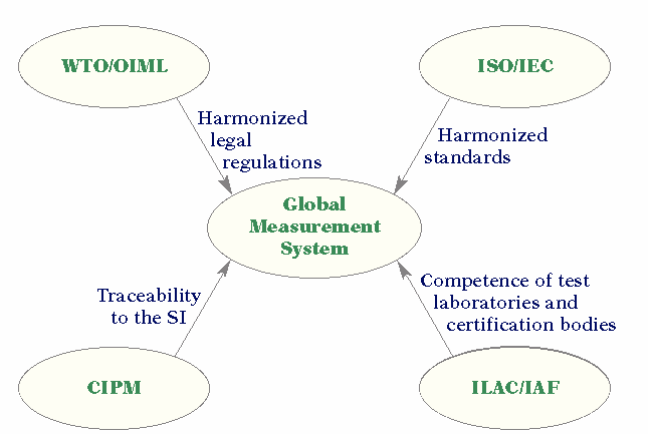
The second important step towards a global measurement system - which was far from a uniform system of units - came from the WTO which called upon the governments of its member countries to remove non tariff barriers to trade (TBT Agreement, Technical Barriers to Trade). This indirectly entails the requirement that national technical regulations in the field of metrology should be transparent and comprehensible and that they should not discriminate against any side so that they apply in the same manner to all those directly or indirectly involved in commercial transactions. This can be achieved only if the trade agreements are based on harmonized or, if possible, even on the same standards. These can be applied by the certifying bodies - usually test laboratories - to issue conformity certificates recognized, if possible, by all those having adopted the system. At this stage, it has of course to be mentioned that for nearly fifty years, the OIML has significantly contributed to the worldwide harmonization of requirements and test procedures in the special field of legal metrology. It is now reasonable to consider some definitions and basic elements of what a global measurement system and what legal metrology are.

A global measurement system is a kind of network in which a metrological task is solved according to the same criteria worldwide, i.e. the same physical units, internationally accepted standards and procedures and the same calculation of the measurement uncertainties. Legal metrology according to the *International vocabulary of terms in legal metrology* (VIML) is defined as “the part of metrology relating to activities which result from statutory requirements and concern measurements, units of measurement, measuring instruments and methods of measurement and which are performed by competent bodies”.

Now, what are the steps towards a global measurement system?

Not only the Comité International des Poids et Mesures (CIPM) and the OIML but also ILAC/IAF have made great efforts to set up a globally operating metrology and testing system. In detail four elements have to be considered, which constitute a global measurement system:

- A uniform system of harmonized national regulations in the field of legal metrology;
- A uniform system of harmonized standards in the field of non-regulated metrology;
- Worldwide recognition of the traceability of measurement results on the basis of the SI; and
- Worldwide harmonization of the requirements concerning the competence of test laboratories and certification bodies.



The various international organizations make the following contributions to these four elements within the global measurement system (see Fig. 1):

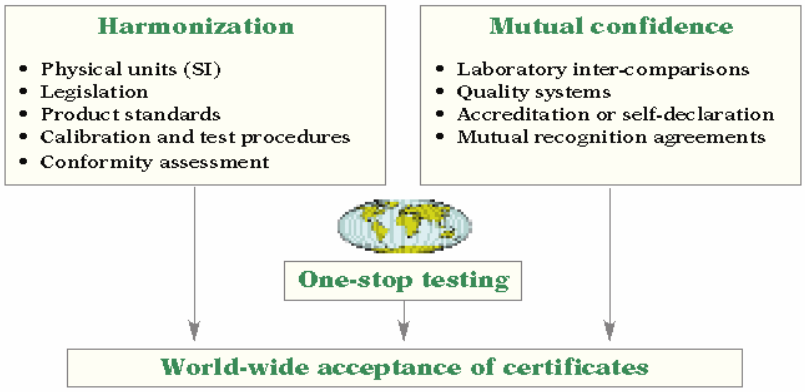
- The WTO and the OIML are responsible for harmonized legal regulations;
- ISO and IEC for harmonized standards;
- The CIPM for traceability to the SI; and
- ILAC and IAF for the competence of test laboratories and certification bodies.

In the field of legal metrology, an important contribution to the removal of technical barriers to trade is the development of the *OIML Certificate System* which helps to better respond to the needs of manufacturers for type approval and to develop procedures for acceptance or equivalence agreements in the years to come. As of today, 36 categories of measuring instruments are applicable within the *System* and nearly 1000 certificates of conformity for 13 categories of instruments have been issued to a total of 260 applicants. Millions of measuring instruments are manufactured following these certificates. Mutual cooperation, mutual confidence and mutual recognition are three steps towards achieving international harmonization in legal metrology.

Mutual confidence in the testing and metrological competence of those involved, which is an absolute prerequisite for the system to function, can be created in different ways. Some bodies are satisfied when they know that the partner institution has been notified for its task by officially authorized bodies or that it operates a recognized quality system complying with international standards. Other bodies require that the laboratory should have been accredited by internationally recognized bodies or they consider both measures to be necessary prerequisites for the mutual recognition of test certificates,

and they often even add the requirement that the laboratory should be a signatory to a regional or international *Mutual Recognition Agreement*. In the last analysis, these measures are, however, in a certain sense only subsidiary systems (subsidiary criteria), for the proof of technical competence actually desired is furnished by participation in metrological intercomparisons allowing for traceability and assessment of the uncertainty of measurement.

For society and the manufacturers of measuring instruments in particular the mutual recognition of certificates has the advantage that in international trade, further tests and conformity assessments can be dispensed within the importing country (see Fig. 2).



The ideal situation for a manufacturer would be to achieve worldwide acceptance of a certificate by one-stop testing of his product in just one laboratory of his choice.

On the global scale, different trends of a politico-economical nature are observed in legal metrology:

- While in the leading industrialized countries legal metrology was further developed and supported until the early nineties, a fundamental change took place in the last years. Due to political requirements in some European countries, legal metrology was gradually entrusted to private bodies and the exclusive supervision by the state was gradually cut back. Examples of this are The Netherlands and France. Other countries - among them Germany - may certainly follow;
- The development in the former Socialist countries is characterized by the adoption of the principles of market economics. This entails the development of a metrology system exclusively regulated by the state into a system making a distinction between areas under legal control and areas which are not subject to legal control; and
- Another trend is the regionalization of the economy. As a result of this development, the realization of the Single European Market since 1992 has set new general conditions. As a result, access to the market is also dependent on new politico-economical decisions which also affect legal metrology.

In addition, technical trends also exert an influence on development.

Fast innovation cycles and short times of adjustment make new forms of conformity demonstration necessary. Traditional type approvals have lost some of their importance.

In the field of economics, a strong trend towards globalization can be observed also as regards the methods of production and distribution, especially where large batch sizes are concerned. Establishing virtual fabrication (design, manufacture and distribution with alternating subcontractors) is only a matter of time.

The developments and trends in legal metrology can be summarized as follows:

- Removal of barriers to trade by the adaptation of national regulations and standards to regional or even International Recommendations (of the OIML) and Standards (of ISO and the IEC);
- Replacement of detailed technical product requirements by more general and flexible essential requirements ("new approach" of the European Union);
- Mutual recognition of test results, test reports or even test certificates, the prerequisites being comparable technical equipment, know-how, experience, regular exchanges of information and test data;
- More responsibility on manufacturers, including participation in different conformity assessment procedures depending on the quality management system, the background being decreasing innovation time for developing new products and the need for quick access of new products to the global market; and
- Transfer of formerly governmental tasks to private institutes, for example type approval of measuring instruments.

So for the future I expect two possible scenarios. On the one hand one can observe a strong current trend that is characterized by the slogans "deregulation, liberalization, less governmental influence, more privatization". This trend, which is due to the increasing metrological competence of partners in industry and trade, leads to a decreasing importance of former proofs of recognition which can already be seen for instance for large groups of companies. International cooperation between National Metrology Institutes (NMIs), verification authorities and private conformity assessors has already started and is being examined. The responsible bodies increasingly see that regional - in addition to national - market supervision must be ensured. A global policy for consumers and environmental protection is needed and is under discussion. With this scenario, legal metrology might be integrated completely into a general global measurement system. If today's trend (i.e. political restraint) continues, then there will be a further decrease in governmental influence on legal metrology, a further increase in manufacturers' responsibilities and a further increase in the number of private or semi-private test laboratories and certification bodies. That means that in the year 2020 governmental influence will have been reduced to an absolute minimum and restricted to specific areas.

On the other hand, there are also indications (especially during the last two or three years) that legal metrology will remain independent, with a focus on intensified market surveillance. There are some remarkable examples of scandals that make a second scenario possible due to a general loss of trust in a liberalized system. The second possible scenario is therefore that today's trends will reverse due to an increase in scandals such as BSE or frauds such as the contamination of foodstuffs by nitrate compounds. That means that in the year 2020 legal metrology will have practically kept a kind of special status, even under the conditions of a global market.

So what is my conclusion? The global measurement system and the worldwide acceptance of certificates is still a vision. From today's point of view and if all countries further follow the globalization strategy of the WTO, legal metrology will experience a strong development and be integrated by 2020. In the other scenario, legal metrology could remain independent with a focus on intensified market surveillance. What will legal metrology be in the year 2020 and which role will it play within a global measurement system? Some important aspects are summarized as follows.

Today, it cannot be predicted whether the first or the second scenario will occur because there are too many unknown parameters and unpredictable political influences.

I should also mention here that some years ago we considered a merger between the Metre Convention and the OIML but the time was not right.

Certainly one important factor will determine whether legal metrology still exists in the year 2020: the influence of new technologies such as the worldwide use of the Internet for all kinds of network, software control, remotely operated and remotely controlled measuring systems.

If governmental control and legal metrology are still necessary in the year 2020, it will be quite a challenge to maintain an effective surveillance system in a global market. New technologies are very demanding as regards both the drawing up of sufficiently flexible harmonized regulations and the competent checking of compliance by well educated, well trained and highly motivated civil servants.

Discussion

Comment: What about self-declaration or self-certification and its possible application in the field of legal metrology?

Reaction: The PTB is rather in favor of self-declaration based on a quality management system in the field of calibration. However, owing to the great number of countries which might participate in an OIML system of mutual acceptance, a kind of third party accreditation or certification system would be necessary.

Comment: It has been said that consumers should be better associated in legal metrology activities. This may just be a matter of information. In France, state controls are carried out to check whether metrology activities are adequately performed but the results of such controls are not publicized.

Reaction: This is quite right. In many countries citizens trusted the old verification systems; it should be the responsibility of the OIML and of CIML Members to clearly demonstrate to citizens the benefits of legal metrology as carried out now.

Comment: How is it possible to reconcile totally free circulation of goods, the WTO rules and the needs for a certain degree of verification at national level?

Reaction: Up to now, the problem has not been solved; the OIML is discussing the possibility of a quality mark to make sure that countries not only apply the same regulations but also have the same confidence in the system. But this is far from being an operational system at the international level.