Development of a metrology system difference between legal metrology and industrial metrology

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My professional background

• Mechanical engineer, Ph.D.

• 40 years work as metrologist (1966 – 2006)

• Vice-President of PTB (1998 – 2006)


• Professor TU Ilmenau (1991 – 2009)

• Consultant for measurement metrology (2005 – )
National Quality Infrastructure

- Key for National Economic Growth
- Participation in the Global Market
- Prerequisite for Joining the WTO
- Fair measurements for the society
Quality Infrastructure

- Accreditation
- Standardization
- Certification
- Quality Management
- Testing
- Metrology Calibration, Measuring
Key role of measurements

- Accurate measurements play a key role in industrial production
- **What cannot be measured cannot be manufactured**
- The globalisation of production of highly complex goods has significantly increased the demand for reliable and accurate measurements
- This is reflected by quality management systems which require the traceability on all levels of measurements, back to the SI.

- Industrial area (non-regulated)
Key role of measurements

Fair measurements are necessary under responsibility of the Government in several fields:

• Official measurements;
• Consumer protection;
• Labour safety;
• Environmental protection;
• And others

Legal metrology (regulated)
Key role of measurements

Main differences between legal and industrial metrology

- Legal metrology: necessity of consumer protection by correct measurements for non repeatable measurements, official measurements for legal purposes;

- Industrial metrology traceable measurements with an uncertainty budget for needs of industry in responsibility of industry.
To measure what is measurable and to make measurable what cannot be measured yet.”
The WTO’s achievements

- Nearly 90% of the trade is regulated

The answer of metrology:

A global metrology system has been established which ensures reliable measurements

- traceable to the International System of Units, SI
- correct within the calculated measurement uncertainties
- based on internationally accepted and implemented quality systems
- based on measures to proof competence which are transparent and documented.
Regulated and non-regulated area already mentioned

- Regulated area → legal metrology by government

- Non-regulated area → calibration service, scientific metrology …
  only framework by government e.g. Law on accreditation, National Metrology Institute, Organization of Calibration Services
Metrological Infrastructure

What has a country to do:

- Laws on metrology standardization and accreditation;
- Establishment of a CMA (centralized metrology authority);
- Regulations for a metrological infrastructure.
• Establishment of a National Metrology Institute, local authorities for legal metrology, accredited laboratories for calibrations (framework for private laboratories);

• Training, seminars for awareness, support to industry, information of the society in legal metrology and of industry in calibration services;

• Participation in regional (COOMET) and International Metrology Organizations (OIML, metre convention, ILAC). Aim of the participation is to establish mutual recognition of measurements, based on international standards and recommendations.
Steps to a Global Measurement System

One-stop testing

Harmonization
- Physical units (SI)
- Legislation
- Product standards
- Calibration and test procedures
- Conformity assessment

Mutual confidence
- Laboratory intercomparisons
- Quality system
- Accreditation or self-declaration
- Mutual recognition agreements

World-wide acceptance of certificates
Worldwide Co-operation

Regional Organisations

- EURAMET (38)
- COOMET (18)
- SIM (34)
- AFRIMETS (43)
- APMP (28)

Aim: Mutual Recognition of Metrological Results
Tasks of a country like Uzbekistan:

To establish the metrology infrastructure by:
Order of laws, decrees, standards for organizing the metrological infrastructure

- Law on metrology
- Decree with essential requirements for organization, procedures, measuring instruments
- Binding regulations, technical and other based on OIML Recommendations, ISO/IEC, …
- Voluntary standards on international, regional and national basis
Other objectives of the CMA to organize:

**Education**
- Apprenticeship
- University level

**Training**
- Special courses after education

**Qualification of Personnel**
- Keep knowledge on top
- Live long learning
The world-wide metrology system is well organized:

- detailed regulated area by government
  → legal metrology
  incl. medical devices with measuring function

- non-regulated area
  only framework by government
  → industrial and scientific metrology
Regional cooperation in legal metrology
e.g. APLMF, WELMEC, COOMET

Regional cooperation in non-regulated area
e.g. APMP, EURAMET, COOMET
International cooperation by

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Thank you for your attention.