

12 ISSUES AND TRENDS IN LEGAL METROLOGY FROM A U. S. PERSPECTIVE

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Introduction

In forming our views, we have consulted with various parties in the United States, including both regulatory officials and instrument manufacturers. From the title of this presentation, it is probably clear that we are not going to make many bold predictions concerning the future of legal metrology, but will rather discuss only issues and trends that we feel are likely to lead us in new directions.

Legal metrology historically covers a large range of topics and activities. The challenge posed by this Seminar is certainly daunting as we try only to correctly identify areas in which significant changes are likely to occur over the next 20 years, and not specifically what those changes might be.

If we begin by asking whether the overall functions of legal metrology will be different in 20 years the answer to us seems to be “no”. Documentary standards and regulations will still need to be developed and harmonized globally. There will still be the need for type evaluation and approval and verification of measuring instruments, as well as net quantity and labeling requirements for prepackaged products. Responsibility for enforcing compliance with standards will remain the province of the legal metrology official. What will change is how these processes are carried out, and possibly how requirements are established. The following discussion addresses issues and trends that we see in each of these areas.

Standardization and harmonization

Beginning with the standards development process itself, there is little question that the global marketplace is demanding that legal metrology standards become more harmonized internationally to reduce the number of different requirements that must be met around the world. Mergers and acquisitions have consolidated business into a smaller number of multinational companies that desire a single worldwide standard for a particular type or category of measuring instrument or prepackaged product. In the United States, the National Conference on Weights and Measures (NCWM) was created in 1905 to bring about harmonization of standards among the States. Now that such harmonization is somewhat routinely achieved, the situation has evolved to where there is growing interest on the part of the NCWM to better align the U.S. national standards with international standards, and to play a greater role in international standards development. It should be recognized, however, that there will always be cultural, developmental and market differences among countries making it unrealistic to expect complete worldwide agreement on individual standards.

In the United States in areas of legal metrology other than weights and measures, such as health, safety and protection of the environment, there has generally not been an equivalent unified approach to harmonizing standards used in government regulation with those that have been developed on a voluntary consensus basis in the private sector. This has led to market inefficiencies in some sectors, where manufacturers have had to develop products to meet non-uniform requirements for different federal, state and local government agencies. As most of you are aware, part of the problem is that responsibilities pertaining to legal metrology in the United States exist across different levels of government depending on the subject area, so that central coordination is difficult. What can be said with some certainty is that this decentralized system of authority will not change, since it has strengths that frequently outweigh the weaknesses. However, to address the problem of various requirements in assorted federal regulations, the National Technology Transfer and Advancement Act was enacted by the U.S. Congress in 1996 to require federal regulatory agencies to incorporate private sector standards, if they are available and appropriate, into their regulations. The Act also encourages state and local agencies to do the same, so that there is now at least a motivation and growing trend towards harmonization of regulatory and other requirements in the United States.

The speed with which standards are developed and harmonized, both domestically and internationally, is also recognized as an important issue. Here we see technology playing an increasingly important role.

As electronic means of communication become more routinely available in all regions of the world, the time required to develop a standard should be reduced.

E-mail, the internet, and telephone/video-conferencing are currently being used for this purpose, as documents can be distributed much more quickly than through conventional mail, and virtual meetings can be held where the participants may be at different locations around the globe. We see this trend increasing.

Another current trend concerning standardization that will likely shape the face of legal metrology in the relatively near future is the establishment of formal international and regional agreements and arrangements among nations to recognize each other's capabilities in calibration, testing and certification. This is seen in the United States, as elsewhere, as creating the potential for tremendous market efficiencies and for better facilitation of trade. As an example, the Mutual Recognition Agreement (MRA) of the International Bureau of Weights and Measures (BIPM) has facilitated the creation of the key comparison database that will, one hopes, be used by regulators as a strong basis for recognizing traceability of measurement results across international boundaries. This recognition should allow manufacturers and testing laboratories to successfully achieve and claim traceability of their measurement results directly to National Metrology Institutes (NMIs) in the countries in which they wish to do business, eliminating the requirement for duplicative calibrations. Similarly, the OIML Mutual Acceptance Arrangement on OIML Type Evaluation (MAA) should serve to facilitate marketplace efficiency through reducing the need for duplicative type evaluations and approvals for measuring instruments under legal metrological control. The MRA among the members of the International Laboratory Accreditation Cooperation (ILAC) could likewise help reduce duplicative accreditation audits of the competence of legal metrology testing laboratories. These agreements have the added benefit of making the regulatory bodies

in the various countries think more routinely on an international basis. This is surely happening in the United States with the NCWM. All such agreements should serve to increase competence, confidence and efficiency at reduced costs for both industry and regulators worldwide.

Two important international documents are used in some countries as standards for both metrology and legal metrology purposes; these are the *Guide to the Expression of Uncertainty in Measurement* (GUM) and the *International Vocabulary of Basic and General Terms in Metrology* (VIM). These documents were developed under the auspices of the Joint Committee for Guides on Metrology (JCGM), led by the BIPM and comprised of seven other sponsoring organizations, including the OIML. Current work related to developing supplements to the GUM is likely to lead to a universal methodology for incorporating measurement uncertainty into conformity assessment decisions, such as those concerning maximum permissible error (MPE) requirements in legal metrology. The future will likely see the increased development and greater application of software packages that aid not only in the calculation of measurement uncertainties, but also aid regulators in establishing MPEs that best suit the need based on estimated likely levels of uncertainty and acceptable risk. Better means of testing individual instruments on a statistical basis covering simultaneous changes in several influence quantities is also likely to be developed. The work related to both the VIM and the GUM should lead to more comprehensive terminology, resulting in a better understanding of the measurement process at all levels, from the national metrology institute to the testing laboratory to the field verification site. There is certainly a global trend towards more organizations using and relying on these documents, and we expect that to continue.

Type evaluation

There is a clear global desire for market efficiency in type evaluation. From the manufacturer's perspective, this means only a single type evaluation test per type of measuring instrument, preferably performed locally according to a universally agreed upon standard, the results of which would be accepted in all countries. The *OIML Certificate System* was certainly established with this objective in mind. However, experience shows that the *Certificate System* does not always achieve this goal. Reasons may be because there is a lack of confidence in the data obtained by the pertinent testing laboratories, or because some countries have requirements not interpreted to be compatible with the applicable OIML Recommendations. The OIML MAA will address these issues, and we anticipate that it will make great progress in establishing confidence among the participants. However, the establishment of bilateral and multilateral agreements between and among countries to address these same issues is also expected to continue, at least until the MAA matures. We may always need both of these different approaches, however, since it has become clear in the development of the MAA that there are different views concerning the level of cost and effort necessary to establish and maintain confidence in the competence among participants. We certainly hope that a single type approval will eventually result in worldwide acceptance.

There is also the question of whether it is practical from a global perspective to have type evaluation capability in every country for a given type of instrument. We expect that expertise for performing type evaluation and issuing certificates of conformance will be concentrated in the future among a relatively small number of countries that may

have to ascertain compliance to a broader range of requirements. This trend may reduce the differences in national requirements; however, the differences are not likely to disappear by 2020.

Ensuring production compliance

Another key issue that is receiving considerable attention in the United States is how to ensure that production-meets-type: that is, how can the regulator efficiently establish that the instrument in service has the same metrological characteristics and performance as the instrument for which a type approval certificate has been issued? Similarly, have any performance problems developed over the life of the instrument? Confidence is currently obtained primarily through the initial and subsequent verification processes during field inspection, but it is anticipated that future databases will contain such information collected on a national - or possibly an international - level to detect widespread problems. The nature of the local legal metrology infrastructure and service structure will be expected to play an important role in how such information will be collected.

Increasing efficiency in regulatory activities applies to prepackaged consumer products as well. Since the marketplace is increasingly global, it is desirable that importers and the regulatory authorities in the destination countries are assured that imported products comply with local product and quantity standards, rather than requiring testing when the product arrives in a country or after it has entered the market. The most logical solution to these problems is to accept products based upon the quality system of the manufacturer, or based on sampling and testing by a third-party product certification body. The acceptance or rejection of prepackages then would be based on the credibility of the manufacturer's quality control system, sampling plans, and frequency of testing. Distribution factors, such as local environment or length of time in storage, can also affect the net contents of prepackages. This issue remains to be resolved, but with reduced resources, the pressure to increase efficiency, and the interest on the part of importers to be assured that their imported products will comply with the applicable requirements, we can expect this to become a global priority.

Enforcement activities

We expect that effective and efficient enforcement programs will remain essential for ensuring compliance with legal metrology regulations. However, the testing that is carried out for enforcement can be very time consuming, so new methods must be developed. Transportation time alone in getting to field sites can be costly. We see technology and automation playing an important role here. We are likely to see more use of electronics to perform verification and surveillance activities, especially remotely, similar to the digital photography and video examinations that are currently being used in the medical field. A scale industry representative [1] reports that remote reading of instruments and components, such as load cells, already permits efficient monitoring of performance to determine if a device remains within tolerance, without the regulator having to be on site. Railroad companies use the internet to obtain information from scales that are weighing railroad cars. This trend is expected to extend to virtually all electronic measuring instruments in the future.

Diminishing resources in the United States continue to pressure regulators to find better and more efficient methods to test instruments and devices for compliance to

requirements. The efficiency of testing retail motor fuel dispensers has increased greatly as a result of mounting volume standards on trucks with storage tanks to reduce the time needed to return the product to the storage tanks. Perhaps in the future the retail motor fuel dispenser will have a built-in calibration capability, or a new type of field standard will be developed to allow the dispenser to be tested while product is delivered into the motor vehicle.

Increased competition forces companies to control the variables that affect the quantity and quality of the products that they produce. Manufacturers are incorporating accurate weighing and measuring devices into manufacturing processes to reduce waste and promote desirable characteristics in the raw materials that they purchase. For example, grain moisture and protein measurements allow grain processors to pay a premium for grain that has the desired moisture and protein levels most beneficial for use in the final product and pay less for grains that do not have the desired characteristics. Similarly, the meat processing industry is using high technology instruments to measure the percentage of fat on animal carcasses, then paying a premium or reduced price based on these measurements. The trend to pay prices for raw materials based upon their quality is expected to increase. The consequences for regulatory officials are that performance standards, test methods, and reference standards will be needed to test these instruments. The field of legal metrology will continue to expand into quality measurements, even though regulatory resources decrease.

From a regulatory perspective, the use of surveys or questionnaires to assess the levels of compliance of commodities and measuring instruments across a marketplace will be an essential tool for legal metrology officials to exercise a high level of supervision over a marketplace that is expanding in size, diversity and operation every day. Targeted national surveys, such as the models jointly conducted in the United States by State and Federal agencies on retail prices of products and the net quantity of dairy products, conducted in the 1990s, proved the capabilities these surveys had in allowing their participants to achieve maximum leverage of their resources. The State of California is an experienced leader in conducting marketplace surveys similar to those just mentioned and their efforts and results will likely serve as a model for other States considering developing survey programs in the future.

These coordinated surveys were especially useful in: 1) collecting a large amount of data from a broad range of packagers of similar products, using uniform test procedures for testing the prepackages; 2) facilitating data analysis that both identified problem areas and allowed officials to define what constitutes “current good manufacturing practice”; 3) integrating training with practical application which prompted industry to implement proactive changes in its packaging and pricing practices; and 4) bringing national and stakeholder attention to the importance of legal metrology activities and reconfirming the need to have this type of metrological supervision to provide consumer protection and ensure value comparison and fair competition in the marketplace.

In the future, surveys of specific types of products, marketing practices, and weighing and measuring instruments will allow officials to measure compliance levels across a broad segment of an industry so that regional variations in practices and environmental effects that impact test results can be identified. These survey results can then be used as a baseline to measure the effectiveness of future information gathering, educational activities, and enforcement efforts that may be implemented in response to the survey

results. But the primary goal of surveys should be for developing and implementing information gathering and educational efforts, enforcement procedures and frequency-of-inspection policies so that resources can be focused on reducing noncompliance rather than repeatedly confirming high levels of compliance. One of the absolute truths of law enforcement is that a visible presence of regulatory officials in the marketplace on a routine basis ensures the highest levels of voluntary compliance. Testing and retesting products that have high compliance levels will likely, in this new era of declining resources and increased availability of data collection and analysis tools, be considered wasteful and counterproductive. In the future, as it is today, administrators will be evaluated on their effectiveness of resource utilization and on how high a return in equity and value they can deliver on their investment of tax dollars. Regulators will have to share test results and information so that inspection efforts can be focused on testing devices or products with a history of problems, rather than on testing devices that have traditionally demonstrated good performance. Testing only a sample of devices rather than all of them may be a more efficient use of resources. Another approach may be to educate the management of companies on the importance of the proper use and maintenance of measuring and testing equipment instead of the companies expecting regulatory inspection to fulfill such “service” needs. More effective targeting of inspection resources on problem areas may result in higher rejection rates for equipment tested for enforcement purposes, which will actually reflect more effective and efficient approaches to enforcement.

Resource availability

As suggested several times, the need to do more with less in all areas of operation is probably the biggest issue facing weights and measures officials today in the United States. The legal metrology infrastructure is typically being taken increasingly for granted, as reflected in dwindling funding to maintain programs. As products and measuring instruments become more sophisticated, it is necessary to have more highly trained staff for testing and inspection, yet budget cuts in most States are moving things in the opposite direction. Thus it is becoming increasingly necessary to develop strategies to perform as many tasks as possible more efficiently or in an automated fashion, and this is seen in the United States as an inevitable direction for legal metrology.

Since the weights and measures regulatory responsibility in the United States is at the State level, it is difficult to initiate a national campaign to bring attention to the dire financial situation being experienced by most States. However, a coordinated effort is needed to educate consumers, industry stakeholders and especially elected officials about the need for and benefits of legal metrology. An alternative to doing more with less is, of course, just doing less. However, this would be a viable alternative only if the consequences were still acceptable. Of course, effectively demonstrating that the consequences would be unacceptable, such as by showing adverse economic impact or an increase in unfair trade practices, may be the way to obtain additional resources. The use of national surveys is again seen as an important tool for collecting such information, and efforts are currently under way.

Conclusion

In conclusion, we have provided our perspective on those issues and trends in legal metrology that are considered most likely to lead to significant changes in the future. We have noted that the rapid growth of electronics and computerization will have the largest, and hardest to predict, influence on the state of legal metrology over the next twenty years, as it has during the last thirty years. Means for developing and harmonizing standards more quickly will result. International agreements for calibration and testing are also anticipated to improve worldwide efficiency for type approval and surveillance. New means of ensuring that production meets type will be developed. From a regulatory perspective the use of marketplace surveys to assess the compliance of commodities and measuring instruments will be useful in developing sound enforcement procedures and policies, and hopefully in providing information that can be used to persuade elected officials to reverse the current trend of declining operating resources in the United States.

Reference

[1] Mr. David W. Quinn, President, Weighing Consultants, Inc.

