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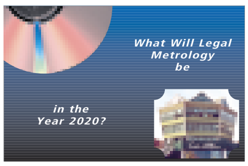

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Editorial

Jean-François Magaña
Director, B I M L

Reaching consensus will lead to global success

The year 2002 was a period during which we actively looked into the future directions legal metrology will have to take, and specifically how the OIML can not only react but anticipate future needs in line with the changing tendencies.

The Birch Report has progressed, and very interesting and fruitful discussions were held with John Birch both by e-mail and face to face during the 37th CIML Meeting. The 2020 Seminar held in Saint-Jean-de-Luz was a resounding success and the complete proceedings have just been published, opening up the way to detailed future research and study on the ideas put forward by a wide-ranging group of international experts. A Task Group on Developing Countries was also formed last year, much progress was made on the Mutual Acceptance Arrangement, and many other fields of interest continued to develop.

We are witnessing growing interest in increased cooperation on the part of other organizations (such as the WTO and UNIDO). A large number of conferences, seminars and workshops are regularly organized throughout the world on metrology and legal metrology and we can observe the effects of the marked increase in awareness of metrology outside our own community. The OIML must now answer the needs of its stakeholders over the coming years.

It is now time for the Bureau - and very shortly for the rest of the Organization - to embark on our journey into the future that we only envisaged and imagined up to now. This requires a profound transformation of the methods of work of the BIML, and we already started this process about one year ago.

Change and evolution will also require willingness on the part of OIML Members to actively contribute. And the success of the OIML will depend on the willingness of our Members to reach consensus, to consider that solutions proposed by other countries may be as effective as their own national systems, to accept that evolutions at international level may cause changes to happen in their national approach towards legal metrology.

Finally, in the development of a global metrology system, if the OIML were to fail then this would translate into a failure for each national legal metrology system. Success globally for the Organization, on the other hand, our primary objective, will hugely benefit Members and pave the way to a strong and bright future.

UNCERTAINTY

Confidence levels of measurement-based decisions

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Abstract

Metrological decisions are based on measurements that have uncertainties. Examples are car velocity measurements for law enforcement, tests, verifications and inspections that lead to the decision to approve or reject an instrument, and the significance of differences found during intercomparisons. This paper shows for each of these examples the relationship between acceptance criterion, tolerance, uncertainty and confidence level. From the discussion of these examples it can be concluded that uncertainties must be known in order to evaluate the risk on an erroneous decision. Confidence levels are associated with decisions for which it is impossible to achieve 100 % confidence.

Conformance and non-conformance are not two complementary notions. If the accepted risk on an erroneous decision is less than 50 % there is a range of observations for which the instrument is not conforming and not non-conforming at the same time.

For verifications, an increasing number of verification points leads to an increased risk of making an incorrect decision. In order to appreciate the extra information of more observations, a curve fit procedure described by Van der Grinten and Peters [1] can be followed. If there are sufficient data, i.e. at least 6 degrees of freedom, it is best to make a curve fit with a 95 % confidence envelope.

In all of the examples discussed above the statistical distribution of the observed results is not known. So the risk analysis is based on the assumption of a Gaussian distribution of the measurement results that is the worst-case representation of our knowledge. If other distributions can be demonstrated to describe the measurement results this will certainly lead to a higher degree of confidence or acceptance criteria that are closer to the tolerances.

Introduction

In the daily practice of metrology many decisions are based on tests or measurements. Instruments may be placed on the market and put into use after it has been clearly demonstrated that they meet the applicable metrological requirements, especially the accuracy requirements. And if instruments are in use for some time they may be subject to a re-verification system or an in-field inspection system that is supervised by the government (Market Surveillance). Here an instrument will be rejected after it is demonstrated that it is operating outside its metrological limits. Also in law enforcement people obtain a ticket if they have exceeded the limits beyond all reasonable doubts. So one may say that in legal metrology every measurement results in a decision: good - not good, fault - not fault. In other words it is decided that the instrument is conforming or not conforming, or that it is non-conforming or not non-conforming. As will be shown later, there is a difference between non-conforming and not conforming. The decisions based on doping tests that are carried out in modern top sports, require the same level of confidence as speeding tickets.

In scientific and industrial metrology, calibrations of instruments do not result in decisions. The deviations of an instrument are simply reported on a calibration certificate without making reference to a tolerance. However, industrial production requires (statistical) process control to monitor the production quality. Adjustments are made if production is no longer within preset factory tolerances.

One of the most important decisions in intercomparison testing is if deviations between laboratories are significant or not.

In the above situations it is vital that reliable decisions are taken. The reliability of a decision is expressed by the confidence level, which is one minus the probability (risk) that an erroneous decision is taken. If the measurement value is close to the tolerance, part of the uncertainty interval is within and another part is outside the tolerances. In other words due to the measurement uncertainty four possibility arise:

a) The object is within tolerances and is approved.
b) The object is within tolerances and is not approved.
c) The object is outside tolerances and is not approved.
d) The object is outside tolerances and is approved.

This Paper was presented by the Author at the 11th Flomeko Conference, May 2003, Groningen, The Netherlands. The Editors of the OIML Bulletin wish to thank both the Author and Flomeko for their kind permission to reprint it.

Cases b and d result in incorrect decisions. In practice people want to limit the risk that an erroneous decision is taken. This risk is dependent on the tolerance, the actual deviation and the uncertainty of the measurement result. A special case is where the deviation equals the tolerance, a situation displayed in Figure 1, case (2). The uncertainty band shows that 50 % of the values that can reasonably attributed to the measurand, is above the tolerance, the other 50 % is below the tolerance. The probability that this instrument is performing within the tolerance is 50 %. The decision of approving this instrument results in a confidence level of 50 %. In other words the risk associated with the approval of this result is 50 %. High risks are not acceptable in cases of health, safety and custody transfer where disputes or lawsuits may have enormous financial consequences.

The relationship between confidence level (risk), tolerance, observed deviation (error) and uncertainty will be demonstrated in the following sections:

- Inspection and law enforcement in traffic,
- Testing and verification of flow meters for a single observation and observations over a range of flow rates, and
- Intercomparison of laboratories.

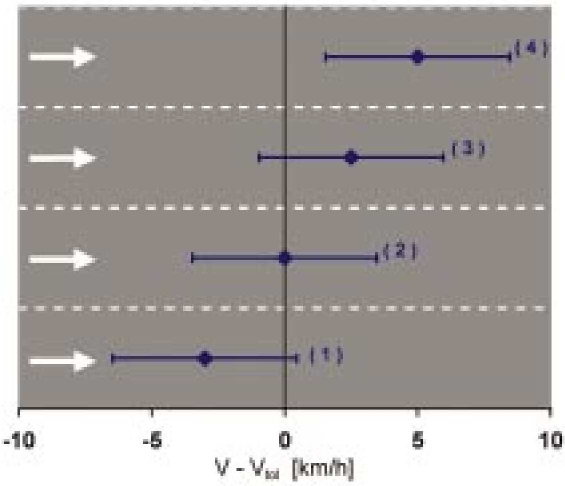

Figure 1 Four examples of excess of speed limit and uncertainty (k=2). The marks indicate the observed car velocities relative to the speed limit. The horizontal bars represent the uncertainty of the observed speed.

Inspection and law enforcement: Driving too fast

In law enforcement the police use speed control instrumentation such as radar and laser guns. The objective of these instruments is to detect motorists that are driving too fast. The decision to issue a speeding ticket has to stand up in a court of law beyond all reasonable doubt, or in other words with a high degree of confidence.

The legal tolerance or maximum permissible error MPE for in-field speed measurements is 3 km/h and above 100 km/h it is 3 %. The meaning of this requirement is that the reading of the speed control instrumentation can actually deviate 3 km/h or 3 % from the reference to which the speed meter is traceable. Based on this information the uncertainty of the speed control instrument is obtained by assuming a rectangular distribution. The relationship between the MPE and the standard uncertainty is obtained from the GUM [2] or EA-4/02 [3].

$$u_s = MPE / \sqrt{3} \qquad (1)$$

The expanded uncertainty (k=2) is:

$$U_{k=2} = 2 \cdot MPE / \sqrt{3} \qquad (2)$$

The results of these calculations are tabulated in Table 1.

Table 1 Relationship between MPE and measurement uncertainty

Range	MPE	Standard uncertainty u_s	Expanded uncertainty $U_{k=2}$
0 – 100 km/h > 100 km/h	3 km/h 3 %	1,73 km/h 1,73 %	3,46 km/h 3,46 %

In Figure 1 four examples are given of a speed control measurement as might be observed on a motorway. On the abscissa the velocity relative to the speed limit is shown. For each of the cars the observed velocity and the expanded uncertainty (k=2) are plotted. Case (1) is the motorist that is below the speed limit. Due to the uncertainty of the measurement there is a small probability that he is actually driving faster than the speed limit. For the second motorist (2) this probability is actually 50 %. The third motorist (3) is exceeding the speed limit, however there is still a probability that he is driving at less than the speed limit. The fourth motorist (4) is clearly exceeding the speed limit. Only in this fourth case is a fine the result of a decision with sufficient confidence.

The relationship between excess speed, uncertainty and the risk of erroneously fining the motorist is a classical problem in statistical process control [4][5], which is well documented if the measurement result has a Gaussian distribution. In metrology, hardly any

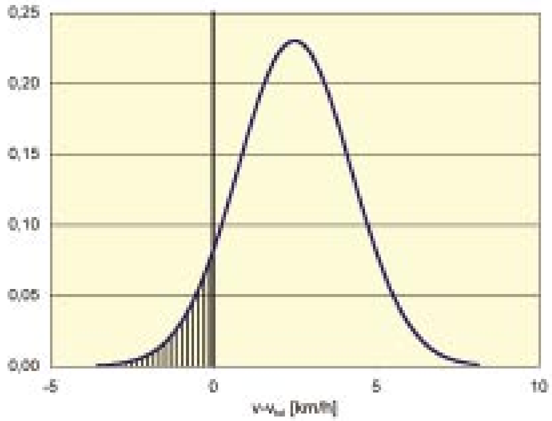

Figure 2 Velocity knowledge distribution corresponding to a car driving 2,5 km/h too fast and a standard uncertainty of 1,73 km/h. The shaded area represents the risk that the motorist is incorrectly given a speeding ticket.

information is available on the statistical distribution associated with the measurement uncertainty. So an assumption needs to be made that corresponds to the worst-case situation: i.e. the Gaussian distribution where the standard uncertainty equals the standard deviation. This distribution function is not a distribution in the statistical meaning but is a knowledge representation. An example is given in Figure 2 for a car that is driving 2,5 km/h too fast, which corresponds to car (3) in Figure 1.

Now the probability that a motorist is driving faster than the speed limit $P(v_{obs} > v_{tol})$ can be calculated from the cumulative Gaussian distribution:

$$P(v_{obs} > v_{tol}) = \int_{z_{tol}}^{\infty} \frac{1}{\sqrt{2\pi}} \cdot e^{-z^2/2} dz \qquad (3)$$

in which $z = (v - v_{obs})/u_s$, $z_{tol} = (v_{tol} - v_{obs})/u_s$ where v is the velocity, v_{tol} the speed limit and u_s is the standard uncertainty of the observed car velocity v_{obs}. The risk that the car is driving at less than the speed limit is $1 - P(v_{obs} > v_{tol})$ and is displayed as the shaded area in Figure 2. Since only one tolerance is involved, this test is called a single side test.

The result for different car velocities is shown in Table 2. In the first column the excess of the speed limit is expressed as a multiple of the standard uncertainty. The second column shows the probability that the motorist is exceeding the speed limit. The last column is the risk of an erroneous decision if the police give the motorist a speeding ticket. From Table 2 it is shown that if a motorist is exceeding the speed limit by 2 standard uncertainties or more, the risk of an erroneous penalty is 2,3 % or less. Due to the worst-case character of the assumed Gaussian distribution the confidence level of the decision taken is always higher than calculated.

In the Netherlands the instruction of the Prosecution Counsel is to fine the speed excess with a threshold of 7 km/h for v_{tol} < 100 km/h, and for $v_{tol} \geq$ 100 km/h the threshold is 8 km/h [6]. The fines are based on the observed velocities reduced by 3 km/h for v_{obs} by 3 % for $v_{obs} \geq$ 100 km/h, respectively [7]. In combination with an in-field MPE of 3 km/h or 3 % this means that the risk of erroneously being given a speeding ticket is limited to the order of 0,01 %. Since the tariffs for speeding show a step-wise increment, the maximum risk of an incorrect amount on the ticket is 4,2 %.

During type approval and initial verification the velocity meter has to stay within an MPE of 1 km/h for v_{obs} < 100 km/h or 1 % for $v_{obs} \geq$ 100 km/h. During a field test the velocity meter has to stay within the ± 3 km/h or ± 3 % [7]. In addition, the Prosecution Counsel has ordered all speed meters to be re-verified annually. This guarantees the motorist only a low risk of being given an incorrect speeding ticket.

Table 2 Confidence levels $P(v_{obs} > v_{tol})$ for a single sided test depending on the observed relative speed excess $(v_{obs} - v_{tol})/u_s$. The risk is $1 - P(v_{obs} > v_{tol})$.

$(v_{obs} - v_{tol})/u_s$	$P(v_{obs} > v_{tol})$	Risk
1,00	84,1 %	15,9 %
1,64	95,0 %	5,0 %
1,96	97,5 %	2,5 %
2,00	97,7 %	2,3 %
2,33	99,0 %	1,0 %
3,00	99,9 %	0,1 %

Testing and verifications, single point case

In the previous section the confidence of exceeding one tolerance was calculated. This section deals with testing and verification where it needs to be demonstrated that the instrument stays within two tolerances or MPEs. The starting hypothesis is that the instrument is performing within tolerances. Since two tolerances are involved, this test is called a two-sided test. The confidence level of the test, i.e. the probability that the observed value is between tolerances, equals:

$$P(e_{tol-} < e_{obs} < e_{tol+}) = P(z_{tol-} < z_{obs} < z_{tol+}) = \\ = \int_{z_{tol-}}^{z_{tol+}} \frac{1}{\sqrt{2\pi}} \cdot e^{-z^2/2} dz \qquad (4)$$

Table 3 Confidence levels $P(e_{tol-} < e_{obs} < e_{tol+})$ for a double sided test depending on the observed relative error difference $|e_{tol}| - |e_{obs}|/u_s$ and for different ratios of tolerance and uncertainty. The risk is $1 - P(e_{tol-} < e_{obs} < e_{tol+})$.

$\|e_{tol}\| - \|e_{obs}\|/u_s$	$\|e_{tol}\| \gg u_s$	$\|e_{tol}\| = u_s$	$\|e_{tol}\| = 2 \cdot u_s$	$\|e_{tol}\| = 2{,}5 \cdot u_s$	$\|e_{tol}\| = 3 \cdot u_s$
1	84,134 %	68,269 %	83,999 %	84,131 %	84,134 %
1,64	95,000 %		94,074 %	94,960 %	94,999 %
1,96	97,500 %		95,433 %	97,382 %	97,497 %
2	97,725 %		95,450 %	97,590 %	97,722 %
2,33	99,000 %			98,625 %	98,988 %
3	99,865 %				99,730 %

in which $z = (e - e_{obs})/u_s$, $z_{tol\pm} = (e_{tol\pm} - e_{obs})/u_s$ where e is the deviation of the meter, $e_{tol\pm}$ are the + and – tolerances and u_s is the standard uncertainty of the observed meter deviation e_{obs}. Of course $z_{obs} = 0$. The decision to accept the instrument has a risk of $1 - P(e_{tol-} < e_{obs} < e_{tol+})$. The confidence level is also influenced by the ratio of the tolerance and uncertainty as is shown in Table 3.

The alternative hypothesis is that the meter is performing outside the tolerances. The probabilities that the observed deviation is above the upper tolerance e_{tol+} or below the lower tolerance e_{tol-} are:

$$P(e_{obs} < e_{tol-}) = P(z_{obs} < z_{tol-}) = \int_{-\infty}^{z_{tol-}} \frac{1}{\sqrt{2\pi}} \cdot e^{-z^2/2} dz \qquad (5)$$

and

$$P(e_{obs} > e_{tol+}) = P(z_{obs} > z_{tol+}) = \int_{z_{tol+}}^{+\infty} \frac{1}{\sqrt{2\pi}} \cdot e^{-z^2/2} dz \qquad (6)$$

The risks associated with the decisions based on these test are $1 - P(e_{obs} < e_{tol-})$ and $1 - P(e_{obs} > e_{tol+})$, respectively. A graphical display of the risks associated with the acceptance or rejection of the instrument is shown in Figure 3. This figure shows that there is a high risk associated with the acceptance of an instrument if observations are outside tolerances. Likewise, rejection of an instrument if observations are within tolerances has a high risk. If the maximum acceptable risk on an erroneous decision is 5 %, the width of the rectangles in Figure 3 represents the range of observations in which no decision can be taken. Between the shaded areas the instrument is said to be conforming, outside the shaded areas the instrument is non-conforming. Inside the shaded areas the instrument is not conforming and not non-conforming at the same time. The width of the rectangles is dependent on the risk level accepted: the larger the risk the smaller the width of the rectangle. In case of a 50 % risk there will be no rectangle at all. In the latter case, acceptance or rejection of an instrument comes close to tossing coins.

In line with previous discussion, Sommer and Kochsiek [8] propose acceptance criteria obtained by reduction of the tolerance with the expanded measurement uncertainty. They also state that this results in a de-facto reduction of error limits and that common use in legal metrology seems to be unlikely due to the commercial implications of such a reduction. Moreover the acceptance criteria are variable, depending on the uncertainties that are obtained by different laboratories.

It is very clear that 100 % confidence or zero risk can never be obtained when taking metrological decisions. For a given confidence level a smaller measurement uncertainty results in acceptance criteria closer to the applicable tolerances. This is an advantage for manufacturers that have their instruments verified with a low uncertainty. The confidence level or risk is also influenced by the Gaussian knowledge distribution assumed. If it can be proven that another statistical

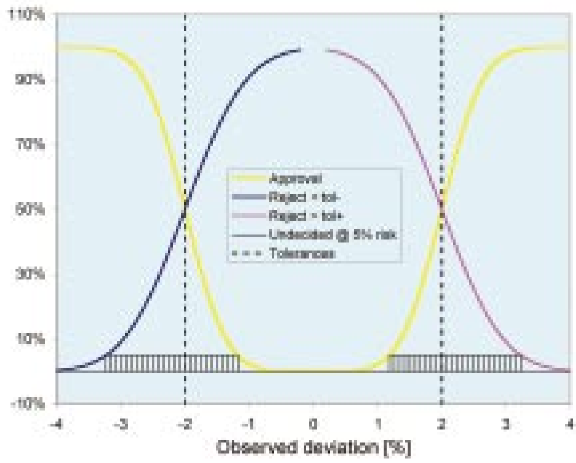

Figure 3 Risk distribution for the approval or rejection of an instrument that must perform within two tolerances ± 2 %. The uncertainty (k=2) of the approval observations is 1 %. The uncertainty of the rejection observations is 1,5 %. The shaded rectangles represent the range of observations where no decision with less than 5 % risk is possible.

distribution gives a more adequate knowledge representation, this will most certainly result in acceptance criteria that are closer to the tolerances. The use of distributions will be an important research issue in the near future.

The current practice of initial verification and law enforcement by in-field inspection of fuel dispensers in The Netherlands is already aiming at limiting the risks of metrological decisions. Accredited organizations that perform the initial verification of a fuel dispenser use as an acceptance criterion ± 0,4 % where the tolerance is ± 0,5 %. The law enforcement officers close the fuel dispenser if it is deviating more than + 0,7 %. For deviations within ± 0,5 % no action is required. In all other cases repair by the owner is required. This practice has worked for more than 10 years to the satisfaction of all parties involved [9] due to a reduced risk that an already approved fuel dispenser will appear non-conforming. Another example of risk reduction concerns coriolis meters intended for metering gasses, which may be verified with water if reduced tolerances are used. The reason is that the use of gas introduces additional uncertainties. This practice has not been established yet for other metrology areas in The Netherlands. In the light of these different metrological practices, the question of which risks are acceptable should be elevated to the level of the OIML Technical Committee on verification.

Testing and verifications, multi-point case

In the previous section the confidence level of a single point test was determined. However most instruments operate in a range and the result of a test or verification is based on observations spread over the range of the instrument. If one of the observed deviations does not meet the acceptance criteria, the meter is not approved. Now the risk that the instrument is not conforming, is the sum of the risks of all individual observations. An example of a verification of a turbine gas meter is shown in Table 4. For a normal initial verification the deviation is measured at 6 different flow rates. For curve fitting purposes two additional verification points are added. The right-hand column shows for each observation the risk that the observation leads to an erroneous approval of the meter. The highest contribution is found at 20 m^3/h where the difference between the observed deviation and the tolerance equals the uncertainty. If the difference between tolerance and observed deviation is two uncertainties (k=2) or more, its contribution to the risk of erroneously approving the meter can be neglected. For a better impression of the performance of the meter more observations can be made. The paradox

Table 4 Example of a verification of a turbine gas flow meter. The third column represents the uncertainty of the observed deviation. The last column represents the risk that an observation leads to an erroneous approval of the meter. At the 8th row the sum of all risks is displayed. The two bottom lines are additional verification points that are used in the curve fit.

Flow rate m^3/h	Deviation e	U_e (k=2)	Tolerance	Risk
5	– 1,50 %	0,40 %	2 %	0,62 %
10	0,00 %	0,40 %	2 %	0,00 %
20	0,70 %	0,30 %	1 %	2,28 %
40	0,55 %	0,30 %	1 %	0,13 %
70	0,40 %	0,30 %	1 %	0,00 %
100	0,00 %	0,30 %	1 %	0,00 %
				3,03 %
55	0,50%	0,30%	1%	0,04%
85	0,30%	0,30%	1%	0,00%

of this approach is that despite obtaining a better impression of the meter performance, the risk attributed to erroneously approving the meter increases with an increasing number of observations.

A method that utilizes the additional information of the extra verification points is the linear curve fit method developed by Van der Grinten and Peters [1]. As a standard curve fit method does not count with the individual uncertainties of the data points, it is only suitable for type A evaluation of uncertainties. Verification data, however, contain uncertainties that are the result of both a type A and a type B evaluation. For the linear case Van der Grinten and Peters calculate the fit, which is identical to the standard regression method, and an uncertainty envelope in which the uncertainties of the individual data are included. All regression methods require at least 6 degrees of freedom. The regression line is:

$$e(x) = m \cdot (x - x_0) + e_0, \quad x = Q^{-1} \tag{7}$$

where m is the regression coefficient, e_0 the deviation at x_0 and Q the flow rate in m^3/h. If x_0 and e_0 are chosen to be the arithmetic averages of transformed flow rates and the deviations, respectively, the uncertainty envelope U_e (k=2) is found from [1]:

$$U_e^2(x) = (x - x_0)^2 U^2(m) + U^2(e_0) \tag{8}$$

in which $U(m)$ and $U(e_0)$ are the combined uncertainties of the regression coefficients m and e_0. The trend line will meet the tolerances with a confidence level 1 – α if the bounds $e_\pm(x)$ are within the tolerances, where:

$$e_\pm(x) = e(x) \pm \tfrac{1}{2} t_{1-\alpha/2} U_e(x) \tag{9}$$

and $t_{1-\alpha/2}$ follows from the Student-t distribution for 6 degrees of freedom. The results of applying this method to all the experimental data of Table 4 are displayed in Figure 4, where the results are transformed back to the flow rate domain. Figure 4 shows that the 95 % confidence envelope is within the tolerances everywhere except for the lowest flow rate. A better fit with smaller uncertainties will be obtained if higher order curve fits are utilized for the trend of the meter curve. To this end the method developed in [1] has to be generalized for the multi-linear regression case.

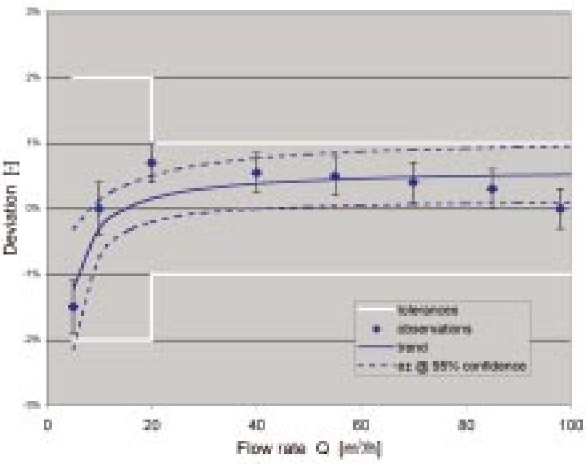

Figure 4 Linear curve fit (solid line) together with the 95 % confidence envelope (dotted lines) of the verification data of Table 4. The deviation is plotted versus the indicated flow rate in m³/h.

For the moment it seems practical to use the following strategy to determine the risk associated with approving an instrument. For low numbers of data the risk of erroneously approving an instrument is the sum of the risks that an individual data point leads to an incorrect decision. If there are sufficient data, i.e. at least 6 degrees of freedom, it is best to make a curve fit with a 95 % confidence envelope.

Intercomparisons

The last example of taking decisions concerns intercomparisons and round robins when measurement results from different laboratories are compared. If two or more laboratories measure the same specific quantity under fully comparable conditions they will obtain different results. According to EA recommendation EA-2/03 [10] two measurement results differ significantly if the absolute value of the difference is greater than the uncertainty of the difference:

$$|R_1 - R_2| > \sqrt{U_1^2 + U_2^2} \qquad (10)$$

Here $R_1 \pm U_1$ is the result by laboratory 1 and $R_2 \pm U_2$ is the result by laboratory 2. U is the expanded measurement uncertainty with k=2. Another quantity used for comparing results is the normalized difference E_n:

$$E_n = \frac{|R_1 - R_2|}{\sqrt{U_1^2 + U_2^2}} \qquad (11)$$

If E_n is greater than 1 the difference is called significant. What is the degree of confidence associated with the above significance criteria? Or in other words what is the risk of the decision that the results of two laboratories are significantly different. Again the answer can be given by means of statistical testing and again the statistical distribution of the difference $|R_1 - R_2|$ is not known. Also here the worst-case approximation is the assumption of a Gaussian distribution with an average of $\Delta R = |R_1 - R_2|$ and a standard deviation s equal to:

$$s = \tfrac{1}{2}\sqrt{(U_1^2 + U_2^2)}.$$

Applying the transformation $z = (r - \Delta R)/s$ the confidence level is obtained from the standard Gaussian distribution:

$$P(E_n < 1) = \int_{-2}^{2} \frac{1}{\sqrt{2\pi}} \cdot e^{-z^2/2} dz = 95{,}4\% \qquad (12)$$

So the maximum risk of the decision that two laboratories have different results is 4,6 %.

Conclusions

From the preceding analysis the following conclusions can be drawn:

- From a statistical perspective, confidence levels and risks are associated with decisions, not with uncertainties.
- It is impossible to achieve 100 % confidence for any decision taken, i.e. there is always a risk of an incorrect decision.
- There are two types of tests: one is carried out with the objective of approving the meter; the other type is to find instruments that are performing outside the metrological tolerances. If the accepted risk on an erroneous decision is less than 50 % there is a range of observations for which the instrument can

neither be approved nor rejected: the instrument is both not conforming and not non-conforming at the same time.

- In order to establish a relationship between acceptance criteria, tolerance, uncertainty and confidence level a statistical distribution has to be assumed that represents our knowledge of the measurement results. For this purpose the worst case approximation is the Gaussian distribution. This means that in practice the confidence level of the decision taken will always be higher than calculated. If our knowledge can be represented by other statistical distributions this will certainly result in acceptance criteria that are closer to the tolerances.
- For the moment it seems practical to use the following strategy to determine the risk associated with approving an instrument based on a multi-point verification. For low numbers of data the risk of erroneously approving an instrument is the sum of the risks that an individual data point leads to an incorrect decision. If there are sufficient data, i.e. at least 6 degrees of freedom, it is best to make a curve fit with a 95 % confidence envelope.
- In intercomparisons the criterion for a significant difference is if the difference of two results is bigger than the uncertainty (k=2) of the difference. The confidence level of this decision is 95,4 %.
- With respect to the acceptable risks of metrological decisions there are different practises in different metrological areas. The juridical and commercial implications of applying lower risk levels should be discussed at OIML level. ■

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How will the development of regional and local authorities affect inter-governmental organizations such as the OIML?

Jean-François Magaña
BIML Director

Globalization in legal metrology has been on its way for centuries

Historically in feudal organizations taxation depended on local authorities, on the definition of measurement units, and on the systematic prosecution of fraud-related offences concerning the quality and quantity of products traded. Originally, legal metrology was a consistent system locally within each feudality, using the definition of measurement units as a basis and extending to that of good measurement practices. But the downside of this local consistency was that important discrepancies were witnessed from one region to another. Traders had to travel with their own measures and instruments, and had to deal with significant differences in units and/or in measurement standards from one city to another.

The formation of states, which brought these feudalities together into "merged federations", was accompanied by a number of harmonization measures: the language of the ruling bodies became the national language, currencies were unified and were managed by central government, local taxes on the transit of goods were progressively abolished, and the measurement units in use in the central capital city became the national measurement standards. The prosecution of fraud-related offences concerning the quality and quantity of goods generally remained within the scope of local regulations and jurisdictions. As the centuries passed, each country established its own national measurement system, but local units sometimes survived and were used locally as customary units.

By the end of the 18th Century, the situation of metrology in most countries had already become quite complex. The uniformity and consistency which had existed in the feudalities had sometimes given way, at national level, to the coexistence of national and local units bearing the same name, but having different values. In France for example, one could have to deal with the pound of Paris (the national one), but also with the pound of Bordeaux or of other cities. The local jurisdictions, in charge of fair trading, practiced legal metrology at their level, but no authority was in charge of unifying measurements and legal metrology regulations at national level.

During the 19th Century, the development of energy and technologies resulted in the emergence of industry and in the acceleration of trade. The systems of units were unified in each country, in order to answer the new needs of science, technologies and the economy. These systems were extended to new fields of measurements, giving rise to new units. A singular country, whose scientists and philosophers had cooperated together for decades, made a political decision at the very beginning of the 19th Century to abolish the old unit systems and to introduce a new scientific-based system. In so doing, France anticipated the future needs of unification and consistency and proposed the metric system to other nations. However, this new system was only generalized when the economy and industry felt there was a real need, some decades later.

The rapid development of national trade during the 19th Century convinced most governments to introduce some degree of consistency into their regulations related to measuring instruments used in trade, thus rebuilding a national legal metrology system. However in a number of countries, and especially in federal states, the prosecution of fraud-related offences and the implementation of legal metrology controls remained the responsibility of local authorities. Legal metrology was then often rebuilt in a bivalent way, where measurement units and measurement standards, and most often technical requirements, were the responsibility of the central authority or government, while the implementation of legal metrology controls was the responsibility of local authorities or governments.

Very soon, the necessity to harmonize measurement standards at international level appeared and this resulted in the adoption of the Metre Convention in 1875. The international situation at the end of the 19th Century (and up to the middle of 20th Century) reproduced on a larger scale the situation which had prevailed nationally at the end of the 18th Century: a fairly good harmonization of measurement units and of measurement standards at international level, but diverging national legal metrology requirements and sometimes even specific custom-designed units.

At the end of World War II, a number of Inter-Governmental Organizations – among which the OIML – were founded. All these Organizations had for objective to set up (by consensus) mechanisms for regulation in fields in which countries previously acted individually: international relations (UNO), health (WHO), alimentation (FAO), development (UNDP, OECD), finance (IMF), trade (GATT then WTO), etc. The OIML's objective is to contribute to setting up a *Global Measurement System*, as described in the report published by CIML Immediate Past President Knut Birkeland.

Everything could have continued to progress within the OIML, as in other Organizations, in a steady and foreseeable way. Based on the legitimacy of states and on their competence, the OIML developed model regulations on the basis of which Member States would voluntarily harmonize their national regulations and recognize each other's measuring instruments and measurement results. In this way, the dialogue between states would have been a simple way to provide the intended regulations, if the end of the 20th Century had not brought about a number of new transformations which also had to be taken into account.

The construction of new economical and political blocks

In the second half of the 20th Century the industrial, commercial and financial structures developed in a transnational way, having developed in a national way during the 19th Century. This globalization is sometimes considered as a totally new phenomenon, but in fact it is a simple and logical continuation of the globalization pattern started one century before, which led these structures to develop naturally from local to national level. This globalization is of course now considerably accelerated by the development of information technologies.

During the 19th Century, local governments found themselves increasingly unable to regulate their respective economies and to face this growing trend towards globalization, and national governments had to take over this mission. Today, in a similar way, individual states are no longer able to achieve the required economic regulation and they are organizing themselves into regional structures (political and/or economic): the European Union, APEC, SADC, etc.

This construction is still under development, and in particular has neither abolished nor politically merged the individual states - which are in fact the only entities which may legally participate in intergovernmental Organizations such as the OIML. However, in the fields of activity of these Organizations, the Member States are also transferring an increasingly significant part of their power to the regional structures, which deal with support to the economy, technical regulations, taxes, social protection, etc., and which are players in the fields covered by the International Organizations, without being able to be members thereof.

It is possible to come to a consensus on a model regulation within the OIML, while a diverging model regulation would be adopted by consensus in a regional structure. As regional structures are not necessarily bound by the OIML Convention, they may issue diverging regional regulations and make them binding for their Member States. Those OIML Member States which are also Members of a regional structure may therefore lose a part of their autonomy and scope of responsibility, and may not be able to fulfill all their obligations towards the OIML. This power transfer from individual states to regional structures is a loss for the OIML, if the regional structures do not themselves participate in the OIML.

The fragmentation of states

When the United Nations was founded in 1945, there were initially 51 UN Member states. Today there are 189.

From the middle of the 20th Century onwards, an explosion was observed in the number of independent states, sometimes of a small size. This evolution resulted from a considerable demand for a return to specific cultural identities. A number of states which existed before the middle of the 20th Century were split into several smaller states corresponding to these cultural identities. Other states evolved towards a decentralized organization, in which a large autonomy was granted to local authorities. Local parliaments were sometimes installed, with quite far-reaching powers. Many states evolved towards a more federal organization, or split up into different states.

A question may be raised when states are fragmented into several smaller independent states: will technical structures be viable in each of these independent states? Is it appropriate - and possible - to develop Metrology Institutes and Legal Metrology Institutes in each of the smaller states which are similar to those which existed in the original country? What is the minimum population or gross national product necessary to be able to afford such institutes, and what capacity may be envisaged for them?

Federal organization raises a number of questions to Organizations such as the OIML. In the same way as the regional structures mentioned above do not have the status of a state and are not Members of the Organization, neither the local structures in a decentralized state nor the states of a federation can individually participate in the OIML, while at the same time their increasing power may raise new technical barriers to trade.

The development of these federal or decentralized schemes transfers power to the local structures. Does this transfer, added to the transfer of power to the regional structures mentioned above, contribute to decreasing the power of the states? Shall we in the years to come, see most regulatory activities disappear at the level of states and be transferred partly to regional structures, partly to local authorities? What would then be the meaning of intergovernmental treaties such as the OIML Convention?

The trend towards privatization

Another evolution affects the role of the states in legal metrology: the present trend to privatize or to delegate the technical tasks of legal metrology to private bodies. Other lectures in the 2020 Seminar present the consequences of this evolution on the role of the states, but the consequences on the international activity of legal metrology may also be important.

A number of bodies in charge of important legal metrology tasks such as type approval and initial verification, are already private bodies. The technical competence required for OIML work for the most part lies in these private bodies and they play an increasing role in the Member State representations in the OIML structures. Is the OIML moving towards a more specialized allocation of competences and work, where the Member States would be essentially present in the Conference and where the Committee would essentially be composed of increasingly private technical bodies?

Considering the perspective of several states sharing resources, any institute that owns costly equipment used by several states will enjoy, *de facto* if not *de jure*, competence in legal metrology in each of these states.

In this evolution towards privatization or delegation to private bodies, it could happen that a given private body be designated for type approval by several countries, that several private bodies from different countries merge or take on mutual shares, or that a private body becomes a major shareholder in other countries' bodies.

The international technical control bodies, who are active in the fields of security control, product certification, bulk quantity certification and quality systems certification, and who already provide measurement and calibration services, could quite rightly wish to play a specific role in national and international legal metrology.

Such evolutions, which are simply the continuation of the ongoing increasing tendency towards globalization, raise the crucial question for the OIML of the relevance of having formal relations with private transnational or international bodies, and having such bodies play a specific role in the global legal metrology system that the OIML has to develop.

Which evolutions can the OIML expect in this context?

The above considerations do not question the utility of the OIML. The need for regulation mechanisms (at international level), compatible metrology systems, and a Global Measurement System, become more and more evident as globalization progresses.

A possibility was conceived some years ago by observers from outside the OIML: to consider the OIML as a "plain" international standardization body and to transfer most of the OIML's work to the general international standardization bodies. But this would be an error. Indeed, the OIML deals with technical issues using methods close to those employed by standardization bodies, but the essential purpose is to harmonize regulations and legal requirements, and the legal aspects - the issues related to law implementation - are of major importance in the Organization's work, including that which seems to be of a purely technical nature. In addition, such an evolution would be contrary to the goals and efficiency of the OIML, as the commitment of Member States would disappear. The strength of the OIML, as a harmonization body, directly stems from the legal authorities of the member countries.

The Members of the OIML are states, and can legally only be states. In the future it will be necessary to improve the implementation of the obligations specified in the OIML Convention, and to make sure that these obligations are taken into account by the Regional Organizations as well as by the local authorities.

This requires a constant dialog between the OIML and the Regional structures in order to take account of their policies, to answer their needs and to encourage them to make use of the OIML in their policies. It is not foreseeable under the present Convention that regions become members of the OIML and participate in the formal process of decision making, nor in the adoption of Recommendations. On the other hand, regions could be more formally associated in the preparation of the

OIML Action Plan and priorities. To accomplish this, it is essential that those regions that are already structured become or continue to be partners of the OIML, and that the OIML encourage the development of structures in those regions which are not yet organized.

An example of relations between regional structures and Intergovernmental Organizations must be noted. In the World Trade Organization, the members are states. However, the members of the European Union decided to delegate their powers in negotiations as well as their votes, to the European Commission. This is a very efficient way to better involve a Regional Organization in international work, and benefits at the same time the Regional Organization, its Members and the International Organization. This shows that establishing links between an International Organization and a regional structure is not only the task of the International Organization, but also that of the participating states. The development of relations between the OIML and Regional Organizations will not be done against the Member States' will, but in harmony with them.

To prevent subnational authorities from drawing up local regulations which diverge from OIML Recommendations is a difficult task for the OIML and can only be done by each Member state. The role of the OIML may only be one of monitoring, communicating information, and maintaining updated databases on national and local regulations. This function is an extension of the role of the OIML Documentation Center mentioned in the OIML Convention. This requires a very important reform of the principles of this Documentation Center, in particular using new information technologies.

The information society

A phenomenon which has appeared over the last few years may play a prominent role in the political and social evolution at international level, and in the future of International Organizations.

Globalization advances using the communication tools that technology and the economy provide it with. In the 19th Century, such communication tools were the railways, newspapers and telegraph. In the 20th Century, airplanes, radio, television and telephone were used and now - since the last few years - the Internet. These are the tools for the globalization of economies, trade and political organizations. They have different geographical ranges and have successively permitted globalization at the level of countries, then continents, and now worldwide. However, the use of these tools is not restricted to industry, banks and governments, now they are readily available to the general public. After a short period of diffusion and appropriation, these tools allow public opinion to be globalized, i.e. they allow the emergence of public opinion within their specific geographical range: a country, a continent, or the world.

Today we can observe the beginnings of an international public opinion, whose expression is just starting. International associations are expressing general concern about environment protection, durable development, food safety, and the need for mechanisms to regulate the globalization process. This international public opinion is still anarchic, it has no clear representation, it may not yet be democratic, but it is appearing and growing, it has a notable influence on national public opinions, and it will probably be a major political fact in the coming years.

This international public opinion needs counterparts to dialog with. Political counterparts are governments, collectively (G8 summits) or individually. But it also needs to have a dialog with Intergovernmental Organizations, who work on specialized issues on behalf of governments. It will be essential in the future that International Organizations be as transparent as possible for public opinion, that they provide all necessary information about their objectives and their work, and that they listen to the needs and concerns of this international public opinion.

Until now, the OIML did not have any direct communication with the public, all dialog went via the CIML Members. In the future, some direct communication on the part of the OIML with the public has to be envisaged, and a policy must be developed by the CIML for this. The awareness of governments on metrology and legal metrology will depend on the awareness of the public, and the OIML must help governments to answer the needs of the public in metrology. ■

Legal Metrology and the Metre Convention

LEV K. ISSAEV
CIML SECOND VICE-PRESIDENT,
DEPUTY DIRECTOR, VNIIMS, RUSSIAN FEDERATION

One can say that OIML was established initially in 1937 because the First International Conference on Practical Metrology which had been convened that year by the French government had created a Provisional Committee of Legal Metrology in place of the intended Permanent International Consultative Committee for Practical Metrology acting as an advisory body to the CGPM (*Conférence Générale des Poids et Mesures*). This was the proof that at that time it was considered appropriate to create a new international body, independent from the Metre Convention, to deal with legal metrology. This new body was in fact finally established in 1955 and in 2005 we will celebrate the fifty-year anniversary of the establishment of the OIML.

Some years ago (March 1995) there was a proposal from the French government to study the possibility of merging the two intergovernmental metrology bodies which are located in or on the outskirts of the same city, Paris. After much discussion it was decided that a merger was not appropriate (at least not for the time being) but that regular contacts between the two organizations should exist. A joint Metre Convention/OIML working group was established, and meets annually in February. This group has recently been enlarged in order to associate ILAC.

The participants in the Metre Convention activities are the National Metrology Institutes (NMIs) and the main focus is on national measurement standards. For legal metrology, these national measurement standards are important but are not the primary concern because legal metrology is related to other activities. Therefore, the participants in the activities of the two intergovernmental metrology bodies are quite different, with the exception or perhaps five or six countries for which the OIML representatives are the Directors (or their Deputies) of NMIs. I suppose that it is quite clear that the two organizations have different and well-defined fields of activities. In addition, I would like to repeat my opinion that metrology is not only the science of measurements: it also includes specific activities related to measurements, this second aspect of the definition of metrology being close to our legal metrology activities which include type approval testing and verification, as well as procedures related to metrological supervision and control.

The Metre Convention bodies (including the International Committee of Weights and Measures - CIPM - of which I am a Member) are mainly responsible for the highest level of accuracy and for traceability at the level of the national measurement standards, whereas legal metrology is close to the measuring instruments, their usage and the requirements applying to such instruments. In fact there is a gap between matters of traceability and matters of usage of measuring instruments with no specific international body responsible for this part of metrology. So I understand that this gap is covered by bodies which are not explicitly related to metrology, e.g. bodies which are close to standardization, certification, accreditation, etc., which means that we are gradually losing our metrological position in this field. Sometimes we are trying to say that type approval testing is some kind of conformity assessment, and that verification is not a very important procedure because it is close to calibration - or maybe it is some type of certification. This is a dangerous and unacceptable situation for us.

Some years ago, Prof. Kind (who was at that time President of the International Committee of Weights and Measures) made a classification of our activities with the following three groups of activities: measurement standards, measurement-related regulations, and applications by users. The widely recognized need for quality of products and services is closer to the application by users. The classical scheme comprises several elements:

- NMIs, which are responsible for establishing and maintaining national measurement standards, for disseminating the size of these units, and for acting as centers for expertise in measurements;
- Calibration networks, calibration laboratories and laboratory accreditation;
- Regulations and specifications, including governmental regulations, legal metrology, and voluntary and regulatory standards; and
- Users of metrology (including metrological information, measuring instruments, etc.): these are manufacturers and other industries, bodies involved in trade and commerce, health and safety, environmental protection, science, communication, transporta-

tion, enforcement of government regulations, production and distribution of energy, military services, etc.

For certain of these activities there exist international bodies: the Metre Convention bodies for units and calibration, including the CIPM MRA; ILAC is active for laboratory accreditation, the OIML for type testing and verification laboratories, etc. However it is not clear where the responsibilities of NMIs stop. It is possible for the OIML to be between the NMIs and the users of metrology since this field of work may be empty in many countries and since it involves regional bodies with which the OIML has good relations. The OIML should increase its membership so that all UN countries participate, directly or indirectly, in its activities. This could be achieved through the increased participation of regional organizations in the OIML so that the OIML might increase its influence worldwide.

When comparing the situation of the OIML with that of the Metre Convention especially as concerns certain trends in our modern world, in my opinion the OIML is in a better position especially considering its relations with the WTO, since the OIML has observer status within the WTO. Therefore, the OIML is closer to the UN family, closer to the WTO and closer to practical life.

As a conclusion, it seems to me that its is not possible to envisage a merger between the two international metrology organizations even in the future, since both have very well-defined and clear responsibilities. However, it is necessary that the OIML activity fills the gap between users of metrology at international level, thus establishing a worldwide measurement system. ■

The role of metrology in a cognitive society

Thierry Gaudin*
President of the Association "Prospective 2100"

Most of the work I will present was carried out for the French Ministry for Research in order to gain a foresight into the 21st century. The first point I will stress is the speed of change. But we do not believe in the acceleration of history - let me give an example.

At the time of the French Revolution, for the first time hot air balloons could transport people. At last man could fly, and thus century-long dreams became reality. One hundred and twenty years later airships were invented, and it was only after another hundred years that the first useful application was conceived in Germany - a cargo-lifter, which was in fact an airship used as a crane which transformed rescue operations and was also of use in the construction industry.

So the lead time for concrete technical changes to happen in this example was over two centuries. Transformations in technical systems do take this long, and when you examine patterns of progression in the past, this was also the case even 12 or 6 centuries B.C.

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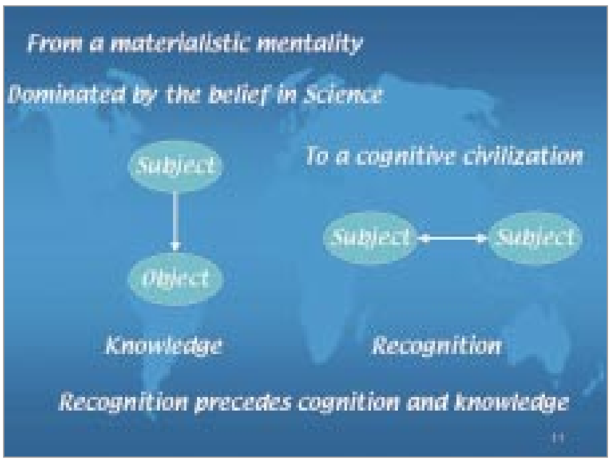
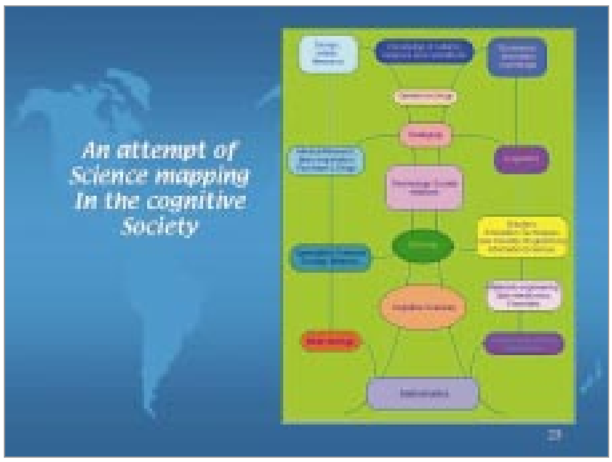
During the industrial revolution (which started around 1750) there were four major technical poles: materials, energy, time scale and the "man-biosphere" relationship. Industry began to evolve: combustion was used to generate energy, the second or 1/10 second could be measured and Pasteur developed microbiology techniques at the end of the XIX century.

But this industrial revolution is not yet over on a planetary scale and there are signs of a new technical system revolution which we call the "cognitive revolution". The four poles are changing: for example the time scale is now the nanosecond and will become the femto-second in some ten or twenty years' time. And biotechnology is delving deeper and deeper into the exploration of living matter.

So this is a global change - which is a change not only in technology but also in civilization itself, and which is evolving from a materialistic mentality (a remnant from the industrial age dominated by the belief in science) to a cognitive civilization which is a relationship between subjects and also the recognition process, not merely the knowledge system. It is not an information society, it will be a recognition society, which is quite different. Of course this leads to the emergence of very small enterprises with values based on autonomy and recognition, and of course the infrastructure is geared around telecommunications.

Networking this civilization requires a much greater quantity of information than the former one. Spoken language normally consists of some 60 000 words. But to describe modern science and technology, some 6 million references are required, which is one hundred times a language. So no expert can totally dominate modern science and technology. Intelligence at all levels is necessary and of course there is also the phenomenon of the Tower of Babel. We are not living in an information society but in a disinformation society, because no one brain can handle all the knowledge and so everyone is a victim of the disinformation processes!





The classical economic theory is no longer valid because this theory assumes that there is a need for perfect information and, in this ocean of information, information is mostly imperfect. The basis affects day to day life; this is of course a characteristic.

On the Internet one can find medical images modeling the brain, showing the amount of knowledge which is immediately accessible. But of course technology also creates barriers between human beings. All sciences both now and in the past have relied on metrology. But now, we have the femto-second system.

The recent Nobel prize-winner Cohen Tanuggi demonstrated that everything is now under the model of vibration. This changes the way in which we consider the universe and the way we look at ourselves too. The other difference is that at the time of the industrial revolution, mines and crude oil were the basis on which industry was built but nowadays, in a cognitive society, measurements are the basic input.

This is the core of my message: industry relies on mines and crude oil, and the cognitive society relies on measurements.

Measurements are also necessary for nature because concern over nature is increasing. The second world summit in Johannesburg recently illustrated how things are developing right now.

Let us also talk about globalization. If we look at a world map drawn ten years after Christopher Columbus' trip to Cuba and other islands, it shows that the desire at that time was to make a world map in order to organize world trade. But the first signs of globalization date back to longer ago than that: it was the silk way from the Mediterranean region to China. The silk way started during the 6th century B.C. and was still operational in the 2nd century B.C. The center was Samarkand in Uzbekistan.

The second globalization trend concerned the maritime field, with Vasco de Gama, Columbus, etc. and the third trend relates to present-day electronics. But the idea of globalization is long-standing and dates back to the Mesopotamian civilization which created metrology for trade. They invented trade, accountancy, schools, courts and business, and the first recorded measurement inspector lived in 2700 B.C. in Ur in the center of Mesopotamia.

In the agricultural civilization, the territory is land. In the industrial civilization, it is capital and ownership, and in the cognitive civilization, it is intellectual property, i.e. patents and copyright. This is an acceleration of competition with the rule "the winner takes all". You have or you do not have the pattern. This is an acceleration of capitalist concentration in the first stage which firms up the forecasts for the next twenty years.

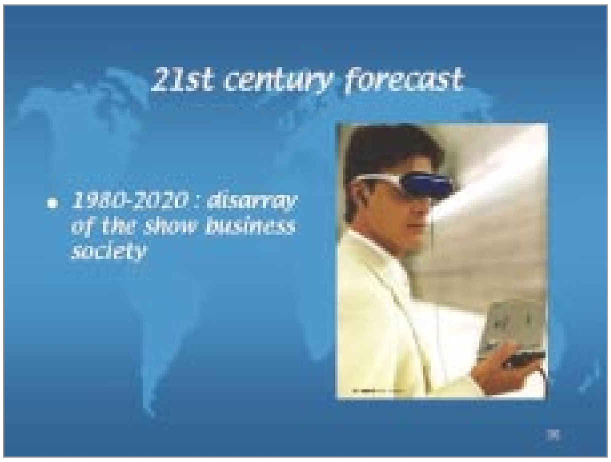
There is another phenomenon: when a new technical system comes along, it marginalizes the work force of the previous system. A slow period of exclusion started in the 1980's and worldwide there now exists a very important phenomenon which causes all kinds of disorder.

The responses can be multiple. The first one would be to create local moneys instead of global moneys (such as exists in Argentina due to the recent crisis).

But in the nineteenth century, when you had this crisis and the European revolution of 1848, what occurred is that the ruling class started a new policy, a very tough and voluntary policy, with education and public works like the Suez Canal and urban development such as Haussmann's work.

So we can guess that the following years will be of that kind. The first stage between now and 2020 will be the disarray of the show-business society. The second stage will be education and a public works society. And maybe, the third stage will be a creation society at the end of the XXI century.

To sum up my presentation, I would say that the result is that the transition to a cognitive society will be one from *homo cocacolansis* that we have now to *homo sapiens*. ■



Towards total approach in legal metrology

Bruno Vaucher, CIML Member,
Deputy Director, METAS, Switzerland

In Switzerland we have decided to totally renew our legal metrology system and I think that other decision makers, metrologists and experts should maybe consider the reflections and solutions that we are about to implement.

The first step when thinking about the future is to know exactly what our objectives will be. In broad terms, these may be summarized as *protecting people against the effects of inaccurate measurements and eliminating technical barriers to trade*. I feel sure that these same objectives will be still valid in the year 2020. What is going to change are the ways and means to reach them.

The means are adequate legislation and effective enforcement by an efficient infrastructure. What protection measures and which level of protection will be decided, remain a political question. If we study the present situation, we cannot avoid the conclusion that the existing system has many strong points, but it also has several weak features, some of which will be briefly mentioned here.

Legal metrology today suffers from outdated regulations in the field of trade consisting of too many details and requirements which are too rigid and which focus solely on measuring instruments. On the other hand in other fields like health, safety or environmental protection, metrological legislation is either non-existent or has many large loopholes.

Since legal metrology has expanded or is in process of expanding into many new fields other than trade, it is of paramount importance that the various state authorities responsible for these areas coordinate their actions. This coordination is largely lacking today.

Another failure in the present situation is the lack of data security. Rough data is increasingly being transmitted and evaluated through complex and extended networks. This is fine so long as nobody can tamper with it. But since this is the subject of another paper of the seminar, I will not expand on it.

About the means, with one exception, today we still only have the procedure to ensure the continuing measurement reliability of measuring instruments: this procedure is pattern approval coupled with verification. Although quite adequate for measurements in trade, it is hopelessly inadequate for other areas in which the people performing the measurements and the procedures are much more important than the instrument itself. Take for example non-ionizing radiations emitted by antennae of mobile phone networks. The measured quantity is vectorial, depends on reflections, on mobile reflecting objects, number of channels used at the time of measurement, etc. The procedures and experience of the staff is much more relevant to correct measurements than the instruments themselves.

From that starting point, the question is: what are the ways and the means to overcome these failures?

We have decided:

- to use all the existing competence of state authorities and private bodies as soon as their competence can be proved;
- not to restrict legal metrology to the classical field;
- to set up a national coordination committee in which every state authority having metrological responsibilities is represented;
- to introduce performance-oriented requirements for measuring instruments and methods, fully harmonized with those of our main trade partners, which includes legislation on prepackages; and
- to take all necessary measures in order to have all our metrological certificates recognized worldwide and to recognize certificates of other countries.

We have also decided to add to the traditional scheme, type examination and product verification, the new features of the European Union as laid down in the new and global approach, and to complement this system which covers only the production and putting on the market, by the necessary ways and means to maintain measurement reliability in all stages of measurement activities.

Unlike the classical system in which only one possibility of conformity assessment is offered, namely pattern approval and verification, the new system offers a modular solution at two phases of the life of measuring instruments.

Firstly, the manufacturer has the choice of different modules in order to establish the conformity of its instruments before the long-term placing on the market; these modules are described in the EU Directive on the global approach. It also has the choice of competent bodies, state or private, which will perform the necessary tests and evaluations for it to prove conformity. In this system, the manufacturer is responsible for conformity and this shift from the current preventive system to a more or less repressive system requires that we have market surveillance in order to ensure the protection of both people and the environment.

Secondly, there is a choice of different ways to maintain measurement reliability depending on the features of the measuring instrument. This includes periodical verification and also remote calibration and verification, and a combination of these. The competent authorities will prescribe which modules are valid for which type of instrument used in their field of responsibility.

At all steps of this scheme, the severity of the activity required will depend on the risks associated with erroneous measurement results. If the risk is small, the conformity assessment procedure and surveillance will be simple. If the risk is high, for instance for medical dosimetry or radiation protection in nuclear power plants, the procedure will be much more demanding. For that reason, not every module will be available for every type of instrument. The specific ordinances will prescribe what modules or conformity assessment and which level of measurement reliability assurance will apply to a given type of instrument. The scheme is also applicable to measurement methods and procedures such as for non-ionizing radiations. In this case the measurement procedure must be examined and approved and compulsory comparisons must be performed. Moreover, the testing laboratories have to be assessed and/or accredited.

A new surveillance concept will be introduced to control that the new system is correctly enforced at all steps of measurement activities; this surveillance has several elements. First there is the surveillance of conformity assessment bodies. The state authority shall not only assess and notify them, but also control that they maintain their competence and correctly perform the tasks they have been mandated to carry out. For that it can rely on accreditation. The surveillance authority shall check by means of random controls that the instruments declared to be conform really do comply with the legal requirements at the time they are put on the market. To achieve that, a centralized information system is required to avoid multiple controls. We also have surveillance on the enforcement, whereby we monitor that the procedures prescribed for maintaining measurement reliability are really and completely performed in the prescribed time spans. The user is responsible for this.

The last factor is that the authority shall control whether the instruments and the measurement procedures are adequate for use and whether they are used and perform correctly.

A very important feature for surveillance is measurement, which in my opinion is more important than fastidious checks of documents and certificates. The main points will be to actively check that the instruments measure within their maximum permissible errors and that the measurements are reliable. I call this scheme measuring surveillance.

As of now the state authority will be responsible for this surveillance. According to the level of risk associated with erroneous results, the authority may delegate all or part of the surveillance to competent third parties.

In the above explanations I have tried to show you steps involved towards total approach. We shall start with the introduction of new means not only for the control of measuring instruments (including software of course), but also measurement methods and, if necessary, the measurement actors in order to ensure measurement reliability, and this not only for trade but also in the new fields. For that, coordination between the state authorities is a must. We will try to achieve this by setting up the coordination committee already mentioned.

I think it is clear for everyone involved that our tasks and activities will become even much more complex and demanding in the future considering the ongoing technical developments and the new field of legal metrology. Therefore, it is a must that all parties involved maintain and develop their competence and collaborate closely together to reach a transparent, universal and global measurement system and conformity assessment system. Only this will allow us to attain the main objectives of legal metrology outlined at the beginning of my presentation and I do hope to see one day, and this before 2020, the merger of the international organizations involved. This will also solve the dispute about names we had just a few minutes before: whether it is "legal metrology or "metrology", or "trade metrology".

A final remark: total approach does not mean total surveillance or over-regulation. It means appropriate, effective and efficient measures to protect people and the environment where, and as much, as is needed. And here I agree with a statement made yesterday: when it is not necessary to regulate something, then it is forbidden to do so. For that we need to monitor the outcome of our activity both with the public and in line with the feedback of this controlling system, with a view to increasing, maintaining or reducing our efforts. ■

OIML Certificate System:

Certificates registered 2003.02–2003.04

For up to date information: www.oiml.org

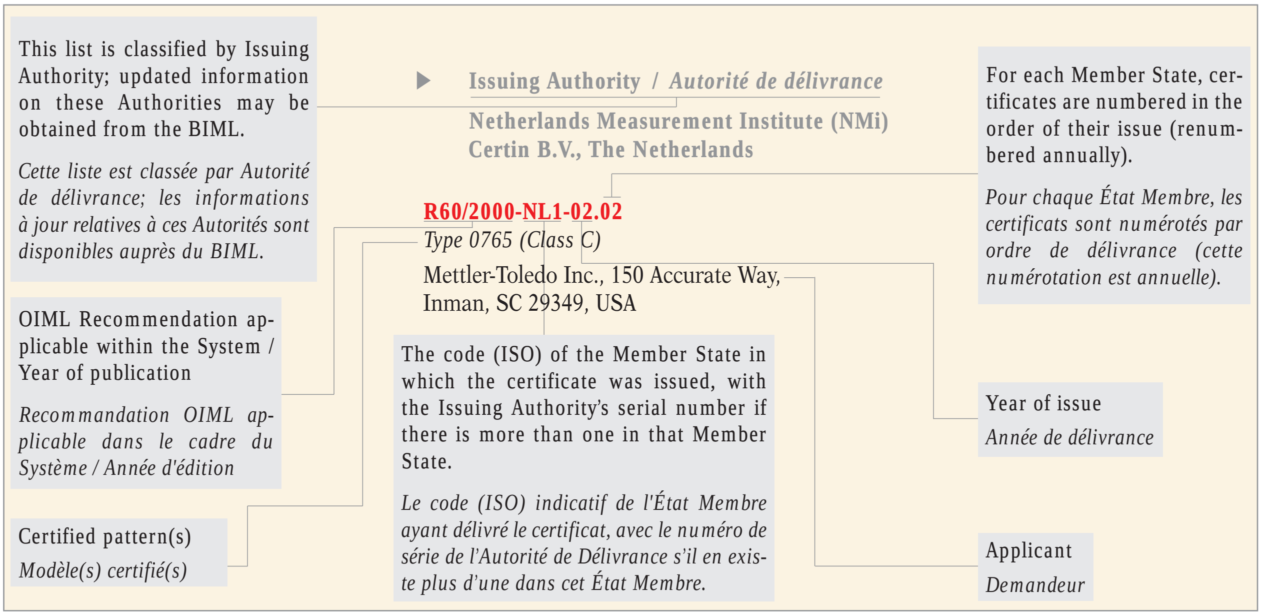
The *OIML Certificate System for Measuring Instruments* was introduced in 1991 to facilitate administrative procedures and lower costs associated with the international trade of measuring instruments subject to legal requirements.

The System provides the possibility for a manufacturer to obtain an OIML Certificate and a test report indicating that a given instrument pattern complies with the requirements of relevant OIML International Recommendations.

Certificates are delivered by OIML Member States that have established one or several Issuing Authorities responsible for processing applications by manufacturers wishing to have their instrument patterns certified.

The rules and conditions for the application, issuing and use of OIML Certificates are included in the 2003 edition of OIML P 1 *OIML Certificate System for Measuring Instruments*.

OIML Certificates are accepted by national metrology services on a voluntary basis, and as the climate for mutual confidence and recognition of test results develops between OIML Members, the OIML Certificate System serves to simplify the pattern approval process for manufacturers and metrology authorities by eliminating costly duplication of application and test procedures. ■



Système de Certificats OIML:

Certificats enregistrés 2003.02–2003.04

Pour des informations à jour: www.oiml.org

Le *Système de Certificats OIML pour les Instruments de Mesure* a été introduit en 1991 afin de faciliter les procédures administratives et d'abaisser les coûts liés au commerce international des instruments de mesure soumis aux exigences légales.

Le Système permet à un constructeur d'obtenir un certificat OIML et un rapport d'essai indiquant qu'un modèle d'instrument satisfait aux exigences des Recommandations OIML applicables.

Les certificats sont délivrés par les États Membres de l'OIML, qui ont établi une ou plusieurs autorités de délivrance responsables du traitement des demandes présentées par des constructeurs souhaitant voir certifier leurs modèles d'instruments.

Les règles et conditions pour la demande, la délivrance et l'utilisation de Certificats OIML sont définies dans l'édition 2003 de la Publication P 1 *Système de Certificats OIML pour les Instruments de Mesure.*

Les services nationaux de métrologie légale peuvent accepter les certificats sur une base volontaire; avec le développement entre Membres OIML d'un climat de confiance mutuelle et de reconnaissance des résultats d'essais, le Système simplifie les processus d'approbation de modèle pour les constructeurs et les autorités métrologiques par l'élimination des répétitions coûteuses dans les procédures de demande et d'essai. ■

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

Diaphragm gas meters
Compteurs de gaz à parois déformables

R 31 (1995)

▶ **Issuing Authority / *Autorité de délivrance***

Netherlands Measurement Institute (NMi) Certin B.V., The Netherlands

R31/1995-NL1-03.01
Types NPL12 / NPA 12
Nuovo Pignone S.p.A, Via Roma 32,
I-23018 Talamona (SO), Italy

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

Continuous totalizing automatic weighing instruments (belt weighers)
Instruments de pesage totalisateurs continus à fonctionnement automatique (peseuses sur bande)

R 50 (1997)

▶ **Issuing Authority / *Autorité de délivrance***

Netherlands Measurement Institute (NMi) Certin B.V., The Netherlands

R50/1997-NL1-03.01
Type SFB 23e (accuracy class 1 and 2)
Wöhwa Waagenbau Josef Wöhrl GmbH & Co.,
Öhringer Straße 6, D-74629 Pfedelbach, Germany

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

Automatic catchweighing instruments
Instruments de pesage trieurs-étiqueteurs à fonctionnement automatique

R 51 (1996)

▶ **Issuing Authority / *Autorité de délivrance***

Physikalisch-Technische Bundesanstalt (PTB), Germany

R51/1996-DE-03.02
Type KWD-2 (classes X(1) and Y(a))
Wolf Verpackungsmaschinen GmbH, Bettenhäuser Str. 3,
D-35423 Lich-Birklar, Germany

▶ **Issuing Authority / *Autorité de délivrance***

National Weights and Measures Laboratory (NWML), United Kingdom

R51/1996-GB1-01.01 Rev. 3
Type 8060 (Classes X(1) and Y(a))
Delford Sortaweigh Ltd, Main Road, Dovercourt,
Harwich, Essex CO12 4LP, United Kingdom

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

Metrological regulation for load cells (applicable to analog and/or digital load cells)
Réglementation métrologique des cellules de pesée (applicable aux cellules de pesée à affichage analogique et/ou numérique)

R 60 (2000)

▶ **Issuing Authority / *Autorité de délivrance***

Centro Español de Metrologia, Spain

R60/2000-ES-03.01
Type AW514/02000C (Class C)
Applied Weighing International Ltd., Unit 5, Southview
Park, Caversham, Reading, Berkshire, United Kingdom

Issuing Authority / *Autorité de délivrance*

Netherlands Measurement Institute (NMi) Certin B.V., The Netherlands

R60/2000-NL1-03.04
Type SCL ... (Class C)
Precia-Molen, Teteringsedijk 53, NL-4817 MA Breda, The Netherlands

R60/2000-NL1-03.05
Type FT1A (Class C)
AEP Technology S.r.l., Via Bottego 33, I-41010 Cognento (Modena), Italy

R60/2000-NL1-03.06
TypeOSBH series (Class C)
Bongshin Loadcell Co., Ltd., 148, Sangdaewon-dong, Jungwon-ku, Seongnam-city, Geonggi-do, Rep. of Korea

R60/2000-NL1-03.07
Type CP series (Class C)
MASTER-K, 38, avenue des Frères Montgolfier, B.P. 186, F-69686 Chassieu Cedex, France

R60/2000-NL1-03.08
Type FT (Class C)
Laumas S.r.l., via 1° Maggio n.6, I-43030 Basilcanova Parma, Italy

R60/2000-NL1-03.09
Type 1242 (Class C)
Vishay Tedea Huntleigh International Ltd., 5a Hatzoran St., New Industrial Zone, Netanya 42506, Israël

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

Automatic gravimetric filling instruments
Doseuses pondérales à fonctionnement automatique

R 61 (1996)

Issuing Authority / *Autorité de délivrance*

Physikalisch-Technische Bundesanstalt (PTB), Germany

R61/1996-DE-02.01 Rev. 1
Siwarex A, Siwarex AWS for accuracy class Ref (0.2)
Siemens AG Fürth, Würzburger Str. 121, D-90766 Fürth, Germany

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

Nonautomatic weighing instruments
Instruments de pesage à fonctionnement non automatique

R 76-1 (1992), R 76-2 (1993)

Issuing Authority / *Autorité de délivrance*

Physikalisch-Technische Bundesanstalt (PTB), Germany

R76/1992-DE-02.09
Types BPW ... and BPWD ... (Class III)
Bizerba GmbH & Co. KG, Wilhelm-Kraut-Straße 65, D-72336 Balingen, Germany

R76/1992-DE-03.02
Types NT ... (Classes II, III and IIII)
Bizerba GmbH & Co. KG, Wilhelm-Kraut-Straße 65, D-72336 Balingen, Germany

▶ **Issuing Authority / *Autorité de délivrance***

Netherlands Measurement Institute (NMi) Certin B.V., The Netherlands

R76/1992-NL1-02.38 Rev. 1
Type SM-300... (Class III)
Teraoka Seiko Co., Ltd., 13-12 Kugahara, 5-Chome, Ohta-ku, Tokyo 146-8580, Japan

R76/1992-NL1-03.02
Type DB-IIF (Class III)
CAS Corporation, CAS Factory # 19 Kanap-ri, Kwangjeok-myon, Yangju-kun Kyungki-do, Rep. of Korea

R76/1992-NL1-03.06
Type DS-500 (Class III)
Shanghai Teraoka Electronic Co., Ltd., Tinglin Industry Developmental Zone, Jinshan District, Shanghai 201505, China

R76/1992-NL1-03.07
Type SM-500... (Class III)
Teraoka Seiko Co., Ltd., 13-12 Kugahara, 5-Chome, Ohta-ku, Tokyo 146-8580, Japan

R76/1992-NL1-03.08
Type AD-1 (Classes III and IIII)
A&D Instruments Ltd., 24 Blacklands Way, Abingdon Business Park, Abingdon, Oxfordshire OX14 1DY, United Kingdom

R76/1992-NL1-03.10
Types PS Panda 7 (Class II)
Mettler-Toledo A.G., Im Langacher, CH-8606 Greifensee, Switzerland

MILESTONES IN METROLOGY

Speech: "Towards a Global Legal Metrology System"

Maastricht, The Netherlands

2003.03.31–2003.04.02

GERARD FABER, CIML President

Dear Delegates,

Six months ago, the OIML organized and hosted a Seminar entitled "*What will Legal Metrology be in the Year 2020?*". The purpose of this event was to exchange ideas and views on the present trends of legal metrology in the different countries and Regions, on the probable evolutions in the future and on the needs to be addressed by International Organizations (such as the OIML), Regional Organizations and National Legal Metrology bodies. This Seminar clearly indicated that some very important changes lie ahead of us. The reorganization of European Legal Metrology, which started in 1990 with the NAWI Directive and which will become generalized with the Measuring Instruments Directive, is quite an interesting example of these changes.

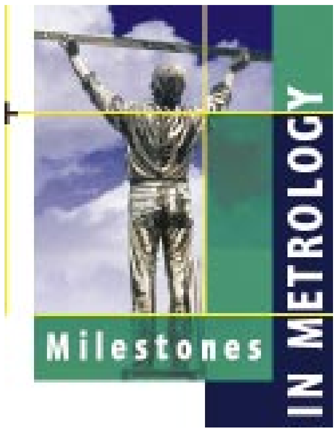
Globalization deeply transforms both our views and our practice of Legal Metrology. The same industrial products are put on the market in most countries, manufactured by multinational companies, and even when these products are designed and assembled locally, they are generally made up of components which originate from a variety of international sources. All legal metrology services have to deal with the same instruments and ensure that these instruments are fit for use, not misleading, reliable, cannot be tampered with, and that they can provide the required accuracy of measurements. Since these instruments are designed and manufactured by international companies, each type must comply with all the requirements of the various countries, all of which share the same common goals.

The acceleration and internationalization of technologies serves to make modern and efficient instruments available all over the world. The same instruments, with their modern electronic devices and software, are available in developing countries as well as in industrialized countries, at ever-decreasing prices. The instruments' software also makes it possible for them to be able to respond to specific local needs.

But the risks and vulnerability of the software increase in line with the diversity of requirements that they have to comply with. The software has to include specific routines to comply with varying national requirements, but for each country only *some* of these routines may be activated, the use of others being forbidden. So, without harmonization of the requirements, the complexity of the instruments increases dangerously and this has an effect not only on design costs, but also on the risks and vulnerability of the instruments. When different functions have to be present and activated (or deactivated) according to the country, this increases the risk of errors and leaves the instruments vulnerable to tampering.

The reduction in technical barriers to trade is a necessity for economic development and requires the harmonization of technical regulations and standards. But this harmonization is also essential for the purposes of the national legal metrology systems.

Mrs. Liu gave you an oversight of the missions and actions of the WTO for the development and facilitation of trade. The role of the International Standard-setting Organizations is essential for the elimination of technical barriers to trade. As such, the OIML draws up and publishes Recommendations which give harmonized requirements for the different types of regulated measuring instruments; the TBT agreement signatories, as well as the OIML Member States, must base their own technical regulations, if any, on these OIML Recommendations. This is a key element for the elimination of technical barriers to trade.



But harmonizing the requirements concerning measuring instruments is not sufficient to eliminate multiple testing and multiple control, and is not sufficient either to provide mutual confidence in measurement results, which are essential for the trade of commodities and prepackages. The elimination of technical barriers to trade does not only require harmonization, it also requires mutual confidence and mutual recognition.

This is what is being done in the European Union, in particular with the European Directives, and this is what the OIML should aim at internationally. The European Directives provide technical requirements which are identical for all EU Member States, but they also provide a common conformity assessment system which allows products to be placed on the market and put into use throughout the EU. All National Legal Metrology systems for initial conformity assessment are merged into this European system, and measuring instruments can really circulate without barriers inside the European Union.

Similarly, during the OIML 2020 Seminar held at the end of September 2002, most countries expressed the need for a Conformity Assessment System to be developed by the OIML, which would provide conformity assessment for all countries. This is probably the most important task for the OIML in the coming years and a very difficult one, but this has been a very consensual issue. An OIML Conformity Assessment System should provide harmonized technical and metrological requirements, type evaluations and individual conformity assessment for measuring instruments.

It should also provide a certification system for measurement results. Legal Metrology does not only deal with requirements for measuring instruments, it also has to provide confidence in the results of measurements. Two fields of legal metrology are of utmost importance for international trade: the control of the content of prepackages and the measurement of bulk commodities in international trade. The OIML has to set up a certification system for the content of prepackages, and this is one of the important current projects. The OIML also has to consider setting up a system for the mutual recognition of the measurement of bulk commodities.

OIML conformity assessment systems for measuring instruments or for prepackages must be developed in such a way that they can easily be recognized by all OIML Member States. The considerable difference between the European system and future OIML systems is that the EU treaty makes mutual recognition mandatory for Member States, while the OIML treaty makes all OIML decisions "morally binding", which in practice means "highly recommended, but voluntarily applicable". There is not such a political commitment in the OIML treaty as there is in the EU treaty. One advantage of this situation is that the OIML has no other alternative but to develop the best possible systems, taking into account the needs of all its Members.

Why build an OIML Conformity Assessment System? Fundamentally because an individual State cannot have full control over all the technical aspects of the measuring instruments and the processes used to manufacture them. Design and production have been globalized at international level, and so must conformity assessment. A number of countries do not have all the necessary facilities to examine some aspects of the instruments, some countries already share facilities, most do not have the opportunity to review manufacturing installations, etc. In addition, to repeat testing and examinations in each country is a considerable waste of resources of the Legal Metrology bodies, and such wastage is no longer considered acceptable by Governments. The only reasonable and efficient way to respond to the globalization of design and manufacturing of instruments is to globalize the control of instruments manufactured.

There will be several steps towards an OIML Conformity Assessment System for measuring instruments. The first step has been to harmonize requirements by drawing up OIML Recommendations. The next step has been to define test procedures and test report formats for the type evaluations of measuring instruments and to set up a voluntary *OIML Certificate System*.

The third step, which will hopefully be finalized this year, is to develop a framework document on a *Mutual Acceptance Arrangement*, presented by Mr. Ehrlich during this meeting. Further steps will be necessary, by developing requirements and procedures for individual conformity assessment and by setting up a Conformity Assessment System for measuring instruments. The final objectives are that i) an instrument that complies with OIML requirements may be identified with an OIML conformity marking, ii) that the OIML requirements and this individual conformity marking serve to provide confidence, and iii) that this is legally recognized in the various countries. This will take time, efforts and good will on the part of the Member States, but must be achieved.

What would such a Conformity Assessment System look like? In the same way as in the European system, conformity assessment will not be carried out by an international certification body, but will rely on mutually recognized national certification bodies and on the active cooperation of all the national legal metrology authorities. Some general aspects of the future Conformity Assessment System may be envisaged:

- all national technical requirements should be aligned with OIML Recommendations,
- the OIML would issue criteria for the competence and impartiality of conformity assessment bodies and on the evaluation and follow-up of these bodies,
- CIML Members would have the possibility to designate conformity assessment bodies, providing that they evaluate and follow up on these bodies according to the above criteria,

- the national legal metrology legislations should accept that the OIML Conformity Assessment allows the placing on the market and putting into use of instruments in the country,
- the control of the installation of complex instruments will have to be carefully studied,
- market surveillance and alerts should be provided by linking the national legal metrology authorities within an OIML network, and
- further control (after putting into use) will remain the sole responsibility of each national authority.

This description looks like a sketch of the European system. Indeed, the above principles also exist in the implementation of the European Directives, and hopefully they could make such an OIML system acceptable to the European Union. However, many aspects of the European "Global Approach" are not included in this description, and the Conformity Assessment System could differ from it.

These evolutions will have a very deep impact on the organization of legal metrology in the various countries. National type approval and initial verification bodies will progressively be integrated into the OIML network. Some of them may considerably be reduced, others will specialize in some categories of instruments, and all of them will work in close cooperation within the international network. This is already the case in the European Union, in fields covered by the new approach Directives. One of the difficulties will be that although a great part of the work will be shared internationally, the technical competence should not be lost in the different countries. The reduction in conformity assessment activity in a country should not be extended to a global reduction in all the legal metrology resources, and should not result in a loss of technical competence which is required for the other legal metrology activities.

However, it must be remembered that legal metrology is not limited to conformity assessment and covers a wide range of missions of public interest. The reduction in technical barriers to trade essentially concerns the technical requirements for instruments and their conformity assessment procedures, which are quite an important part of the OIML issues. In complement, the OIML has the mission to support Member States in all aspects of legal metrology. This is why the OIML work must not be limited to the reduction of technical barriers to trade but must also aim at building a Global Measurement System which will include the Conformity Assessment System and all the other legal metrology issues which support legal metrology activities in Member States and therefore contribute to social and economic development. ■

OIML TC WG MEETING

OIML TC 12: Instruments for Measuring Electrical Quantities – Revision of OIML R 46

Maastricht, The Netherlands

2003.03.27–28

ANDERS BERGMAN (Convenor of TC 12 WG),
SP Swedish National Testing and
Research Institute, Sweden

The Working Group of OIML TC 12 *Instruments for Measuring Electrical Quantities* held a meeting on 27 and 28 March 2003 at the International Conference Centre in Maastricht. The meeting was attended by 29 delegates representing 15 P-Members (out of 23), three O-Members of TC 12 and the BIML. This high attendance level is an indication of the importance that is attached to the revision of OIML R 46 by OIML Members. Below is the summary report submitted by the TC 12 Working Group.

OIML Recommendation R 46 on active electrical energy meters has been withdrawn because developments in metering technology have rendered it outdated. Within OIML TC 12 a revision Working Group has been formed consisting of members from most parts of the world, to ensure that the revised Recommendation meets with wide acceptance.

In the absence of an updated OIML Recommendation, electricity meters are presently tested against IEC standards or national or regional standards. A revised OIML Recommendation should be written in such as way as to be acceptable in most parts of the world, and have for objective to lower testing costs for both manufacturers and nations, and - in the end - consumers.

Electricity meters used to be entirely based on electromechanical techniques; now the trend is that solid-state meters, often software controlled, take large market shares. Even though type testing should be technology independent as far as possible, the requirements concerning for example EMC and software functionality and integrity have become much more important. Since meters nowadays contain many more components and software is very easily changeable, a “meter type” is harder to define. Two issues must somehow be addressed: to what extent is it possible to change components in a meter without having to conduct a new type test, and how can software be tested and secured.

The OIML TC 12 Working Group began its project at a meeting in Borås, Sweden in September 2002, at which time Task Groups were formed for different parts of the standardization process. An Internet web site was also set up with restricted access, where Working Group members can freely retrieve information and download, change or upload working documents. Input from the different Task Groups was collected on a pre-draft that was discussed during the present meeting.

In Maastricht, most of the items in the pre-draft were discussed and either decided on or put aside for further development at a later stage. The main discussions concerned two topics: how to define the accuracy requirements, and the permitted level of effects of influence quantities. Quite a number of influence quantities could in fact affect accuracy, and it was argued that the maximum permissible error should cover all these conditions, or at least most of them. However, it is far from obvious that the effects of different influence quantities are independent from one another, and therefore not obvious that the effect of each one could be measured and then summed up by the root-mean-square law as proposed.

Since there are quite a number of influence quantities, the total level of allowed effects may be quite high. All levels should therefore be kept as low as possible. These levels are of course to a certain degree dependent on the technology. Can the Recommendation be written so that it excludes some technology used today? Or can one class be left for old technology?

These questions must be answered in future work. Responsibilities were defined for several Task Groups that will work to find answers to these questions; this work is organized via the web site to avoid the need for frequent face-to-face meetings.

A new Working Group meeting is planned to be held in the Autumn of 2003 in Brazil, and it is hoped that most of the major unanswered questions will be solved at that time.

INTERNATIONAL EVENTS

WTO/OIML/IEC Seminars

Lima - Maputo

April - May 2003

JEAN-FRANÇOIS MAGAÑA
IAN DUNMILL
BIML

At the initiative of the WTO Technical Barriers to Trade Committee, two Regional Seminars were organized in conjunction with the OIML and the IEC in order to address the issue of enhancing the participation of developing countries in the standard-setting activities of these two organizations.

The first of these Seminars was held in Lima (Peru) from 8 to 10 April 2003 for Latin American countries, and the second in Maputo (Mozambique) from 6 to 8 May 2003 for Southern African countries.

These Events were attended by representatives of Trade Departments, Standardization Bodies and Legal Metrology Authorities of each Region. About 20 participants from ten countries attended the Lima Seminar and about 40 participants from 14 countries attended the second in Maputo.

At each Seminar, presentations were given by a representative of the BIML and by one or two members of the appropriate Regional Legal Metrology Organization (Mr. Cesar Luiz Leal Moreira da Silva for SIM and Mr. Stuart Carstens for SADCMEL). The Seminars were organized in four sessions related to the WTO/TBT Agreement, the OIML, the IEC and one session for discussions in subgroups.

The program was typically the following:

- From the WTO: presentation of the TBT Agreement
- From the OIML and the IEC:
  - General presentation of each Organization, including its goals, structures and methods of work,
  - Benefits of the Organizations' activities for trade, and the importance of participating in the work of the Organizations,
  - Experience of a country from the Region in the work of the OIML and the IEC, and the role of Regional bodies therein.
- Discussions in subgroups about the needs, problems and solutions to enhance the participation of countries in the work of the OIML and the IEC, and reports from the subgroups.

The reaction of the participants was generally very positive, as was that of the WTO. These events were an excellent occasion to raise the awareness of the Trade Authorities in the various countries present as to the importance of technical work carried out in the OIML and the IEC, and in fact several countries have already contacted the BIML requesting more information about how to become a Member State or Corresponding Member.

The conclusions of these Seminars are now being compiled by the WTO/TBT Committee and should be published shortly. Presentations given by BIML Staff Members will shortly be downloadable from the OIML web site. ■

RLMO REPORT

13th COOMET Meeting

Jalta, Ukraine 29–30 April 2003

MANFRED KOCHSIEK
Vice-President, PTB (Germany)

The 13th Committee Meeting of COOMET (Euro-Asian Cooperation of National Metrological Institutions) and meetings of its three Technical Committees:

- TC 1 Joint Committee on Measurement Standards
- TC 2 Legal Metrology (4th meeting) and
- TC 1.1 General Metrology

were held at the Republican Resort Center "Iy-Danyl" near Jalta, Ukraine from April 29 to 30, 2003.

The Meeting was organized by the restructured *State Committee of Ukraine for Technical Regulation and Consumer Policy*. 37 delegates from 10 (out of 13) member states participated: Belarus, Bulgaria, Cuba, Germany, DPR of Korea, Lithuania, Moldova, Russian Federation, Slovakia, Ukraine.

Main discussion topics

- Progress of the COOMET Working Program for 2002–2003
- First report on the new organizational structure (see Fig. 1)
- Results of the:
  - TC 1: Joint Committee on Measurement Standards (Korostin, RU)
  - TC 2: Legal Metrology (Hahnewald, DE)
  - TC 3: Quality Forum (Bily, SK)
  - TC 4: Information and Training (Astafijeva, BY)
- 10th JCRB and COOMET objectives
- Implementation of the Meter Convention MRA
- Financing of the Secretariat

Report of the COOMET President

The President, Dr. Zhagora, welcomed the participants, who briefly presented themselves. Delegates then reported on important progress achieved and/or changes made in the metrological infrastructures of the member states. Many of the joint discussion points concerned subjects such as market surveillance, accreditation, notification and certification, QM systems in accordance with ISO/IEC 9000 or 17025, the impact of the adoption of the Measuring Instruments Directive (MID) of the European Union, and extension of jurisdiction.

Participants of the 13th COOMET Meeting, 29–30 of April, 2003, Jalta, Ukraine

Since the foundation of COOMET, 272 projects have been proposed. At present, there are 65 agreed projects, 30 proposed projects under approval and 11 new projects have been proposed. 3 projects were finished this year and 6 were excluded from the COOMET work program. 13 projects concern legal metrology. The Secretariat has started work on a publicity booklet about COOMET activities (deadline: end of 2003).

COOMET plans to strengthen its cooperation with the OIML, the Meter Convention and with several regional metrology organizations.

A procedure for carrying out an internal review of calibration and measurement capabilities declared by COOMET NMIs and participation in inter-regional reviews initiated by other RMOs is also being developed.

Information and training still play an important role in the activities. Reports on several (mostly bilateral) information and training events were presented.

A more detailed COOMET Development Program for 2003–2004 was approved. A paper concerning "Model regulations for COOMET Structural Bodies" was also approved and included in the list of COOMET documents (D5/2003).

Meeting of TC 2: Legal metrology

- The participants reported on the situation of legal metrology in their countries. At present, the efforts of meeting the requirements of ISO/IEC 17025 for test procedures are of decisive importance.
- Nomination of the heads of the four Subcommittees of TC 2.
- Agreement of benchmarks for the function of the Technical Committee. These will be included in a corpus of technical regulations to be drawn up in accordance with the model provided by COOMET.
- At present, five active projects are being handled. One project aimed at summarizing the information of the member states on the situation of legal metrology was concluded (project coordinator: Germany). For another project, coordinated by Russia, an interim report on the analysis of legal regulations for the preparation of proposals for their harmonization is available.

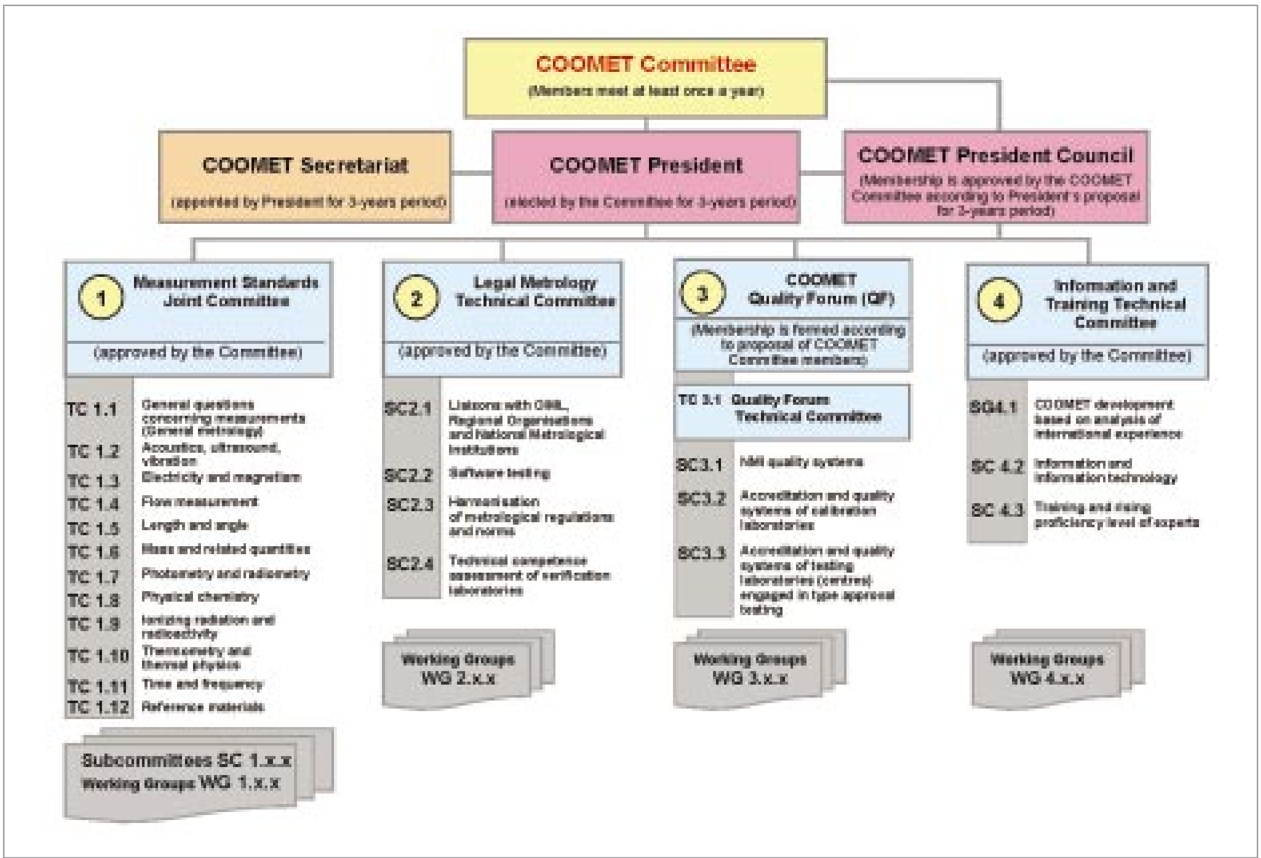


Fig. 1 Structure of COOMET

- Contents and terms of reference of projects were discussed and will - after coordination with the heads of the Subcommittees - lead to project proposals.
- The next meeting of TC 2 will probably be held in Bratislava (March/April of 2004).

The preparation of a conference organized by COOMET, the OIML, the Gosstandard (Russia) and the PTB (Germany) entitled “The role of metrology under the condition of market globalization” was concluded.

Between May 12 and 14, 2003, scientists and experts of the PTB and the Gosstandard (Russia), as well as representatives of the OIML, COOMET, EUROMET, WELMEC and EA presented reports on the subjects of globalization, technical barriers to trade, and mutual recognition of certificates (calibration, testing). One focal point was the European Measuring Instruments Directive (MID) whose adoption is to be expected in the near future.

The resolutions agreed upon at the 12th COOMET Committee Meeting concerning the structure of COOMET, COOMET MoU, rules of procedure, preparation of CMC and key comparisons, and quality management systems of NMI have meanwhile led to concrete activities.

The latest news of the international metrology organizations was presented by:

- M. Kochsiek for the OIML
- H.-D. Velfe for EUROMET
- O. Staugaitis for WELMEC
- R. Domnizky for STC Meter

Prof. Kochsiek was awarded the title *Honorable Metrologist of COOMET.*

Under the experienced direction of President Zhagora, the 13th COOMET Meeting was a success.

The 14th COOMET Meeting will be held in Bulgaria in June 2004. ■

www.coomet.org

RLMO NEWS

SADC SQAM Meetings

Livingstone, Zambia 7–11 April 2003

Brian Beard
Technical Advisor: Legal Metrology
South African Bureau of Standards

The annual SADC SQAM (Standards, Quality Assurance, Accreditation and Metrology) meetings took place in Livingstone, Zambia, from 7 to 11 April 2003. This series of annual meetings comprises meetings of the four sister organisations (SADCSTAN - Standards, SADCA - Accreditation, SADCMET - National Standards and SADCMEL - Legal Metrology) and the SQAM Expert Group (SQAMEG).

The 13th Meeting of SADCMEL was held on 9 April 2003. It was preceded on 7 April by meetings of SADCMEL TC 1 that deals with requirements for the sale of goods and SADCMEL TC 2 that deals with requirements for instruments.

SADCMEL TC 1

This meeting was attended by 22 people. The only agenda item was the resolution of outstanding issues in the SADCMEL harmonised technical regulations dealing with labelling, units of measurement and prescribed package sizes for pre-packages. Most of the issues discussed resulted from discussions with industry and consumer organisations in member countries. The most important agreements reached concerned:

- Not having requirements for desiccating products to be marked "when packed" but rather to publish an agreed list of products in a second document dealing with maximum permissible errors and then regulating the period after packaging during which these products should comply.
- Adoption of the wording from the latest version of the amended OIML R 87 that describes what constitutes a liquid medium in order to define what products should be marked with a drained mass.
- Splitting the annex prescribing standard sizes and the measuring units to be used for the sale of various products into a mandatory section for products for which full consensus was reached and a section for recommended sizes that may be added to, providing that the application of the additional sizes does not constitute a technical barrier to trade.

Consensus was also reached on amendments to standard sizes or units to be used for sale of twelve product categories. The committee then agreed to recommend to the 13th SADCMEL meeting that the document be adopted for implementation in member countries.

SADCMEL TC 2

The meeting was attended by 22 people and dealt with recommendations from industry for amendments to two SADCMEL documents dealing with Mechanical Non-Self-Indicating Counter Scales and Beam Scales and Balances, respectively. These documents were produced as stand-alone documents incorporating relevant requirements from OIML R 76 and additional local requirements or exemptions, as necessary. Some of the concerns of industry were how some of the requirements would be checked, for example the hardness of knife edges which is required to be at least 58 Rockwell C.

Consensus was reached on various amendments and it was agreed that the documents be recommended for adoption by the 13th SADCMEL meeting.

13th SADCMEL meeting

The meeting was attended by 37 people including members of the other structures, OIML, PTB, SADC secretariat and associate members.

The following is a summary of the key agenda items.

Highlights from country reports were invited and it was encouraging to note that the provision of a legal metrology infrastructure in developing member countries is gaining momentum.

Ian Dunmill gave an overview on current OIML activities and specific matters reported on included:

- Development Council Task Group,
- MAA Framework for accepting pattern evaluation test results,
- Changes to the OIML Certificate System, and
- Development of a policy on liaisons with Regional Legal Metrology Organisations.

Dr Kai Stoll-Malke of the PTB gave an overview of PTB support activities within the region over the past year. He also announced that future funding for regional capacity building projects, which will include training, supply of equipment and awareness seminars, would be finalised at an upcoming meeting between the SADC and the German government.

During the agenda item on the activities of TC 1 it was agreed to adopt the SADCMEL labelling and sale of goods document as a final document for implementation by members. The latest version of the amended OIML R 87 document was briefly discussed. As it will probably be adopted by the CIML at its next meeting, it was decided to start with a SADC equivalent that would also contain requirements not covered in the OIML Recommendation. A questionnaire in which members were requested to comment on additional requirements for inclusion, was briefly discussed and once replies have been received the drafting process will begin. It is hoped to hold a workshop on the requirements of OIML R 87 in conjunction with the next SADCMEL meeting.

During the agenda item on the activities of TC 2 it was agreed to adopt the SADCMEL documents on Mechanical Non-Self-Indicating Counter Scales and Beam Scales and Balances as final documents for implementation by members. The TC chairperson was asked to prepare a questionnaire requesting members to propose instrument types for which unique SADCMEL documents are required and indicate their priorities.

Under the agenda item on Training the TC 4 chairperson confirmed that the final version of the SADCMEL document outlining suggested minimum training requirements had been distributed for implementation.

South Africa was confirmed as the Regional Coordinator for the next three years.

The next meeting of SADCMEL will take place in Malawi during November 2003.

In summary, all the meetings were successful in that they achieved objectives and resulted in defined future activities to advance the harmonisation of legal metrology within the SADC Region. ■

OIML | Metre Convention | ILAC

Press Release

Paris, 26 February 2003

A total of 14 persons comprising the Presidents, Vice-Presidents, Steering Committee Secretaries, Council Members and Bureau Directors representing the Metre Convention, the International Laboratory Accreditation Cooperation (ILAC) and the International Organization of Legal Metrology met at the OIML headquarters in Paris on Wednesday 26 February 2003 in order to discuss matters of common interest and initiate joint actions whenever appropriate. A representative of UNIDO was also invited to attend this meeting to evoke Developing Country issues.

Mr. Gerard Faber, President of the International Committee of Legal Metrology, welcomed the participants and stressed the importance of the joint work and coordination of the three Organizations. The meeting opened with brief descriptions being given of the major events that had taken place within each Organization since the previous meeting held on 27 February 2002.

The three Organizations are developing and addressing strategic issues. Study reports are being finalized both in the Metre Convention and in the OIML which highlight and analyze the economic impact of metrology and legal metrology. All three Organizations have a common interest in collaborating with a number of other international Organizations. Specifically, they are all interested in ways to assist Developing Countries in participating in the activities of the Organizations. The different mutual recognition arrangements and agreements which are either already set up or which are being established is also a major issue and will continue to provide many opportunities for common actions and further harmonization that will strengthen the integrity and effectiveness of the world system of measurement traceability, accreditation and recognition and acceptance of calibration, measurement and testing reports.

Three fields of joint actions were extensively discussed, as detailed below.

Actions in favor of Developing Countries

The three Organizations were involved in the creation of the *Joint Committee on Coordination of Assistance to Developing Countries in Metrology, Accreditation and Standardization* (JCDCMAS). The purpose of this Joint Committee, which also comprises IAF, UNIDO, ISO, IEC and ITU, is to provide an international framework for coordinating assistance to developing countries (and those in transition) in the areas of metrology, accreditation and standardization (MAS). The provisional secretariat of JCDCMAS is held by the BIPM. The Joint Committee's Terms of Reference should soon be approved by all the Organizations, and some concrete actions should be initiated in the coming months such as joint coordinated presentations on metrology, accreditation and standardization, lists of available experts recommended by the Members of the Organizations, etc.

Seminars are being planned by the WTO to enhance the participation of Developing Countries in standard-setting activities, in particular in the IEC and the OIML. These seminars will also be an occasion to raise the awareness of decision-makers as to the importance of metrology in its broadest sense.

Second Seminar *The role of Metrology in Economic and Social Development*

Following the Seminar on *The role of Metrology in Economic and Social Development* organized jointly by the PTB (Germany), the OIML, the BIPM and IMEKO which took place in Braunschweig in June 1998, the PTB and NIST (USA) are planning to organize a follow-up Seminar in June 2004. The targeted audience was discussed, namely political decision-makers, senior officials in governments, donor agencies and/or representatives of National and Regional metrology bodies. An Organizing Committee will be set up and will progress in the organization of this event and, if relevant, other Regional Seminars of this kind.

Law on Metrology

At the request of many of its Members, the OIML has started a revision of its International Document No. D 1 *Law on Metrology*. At the 2002 coordination meeting of the three Organizations, it had been decided to set up a Joint Working Group to cooperate on this Document, which addresses not only legal metrology but also measurement units, traceability, and metrology in general. D 1 will be a guidance document for countries which are in the process of drawing up or revising their national legislation concerning metrology. Work is progressing well, and a second Draft Document should be available in the first half of 2003, the intended deadline for its final adoption being 2004. ■

Assessment of OIML Activities

2002

Contents

Assessment of OIML Activities 2002

1 OIML Member States and Corresponding Members

Member States:	58	(0)
Corresponding Members:	51	(–2)
Total:	**109**	**(– 2)**

2 New and revised OIML Recommendations and Documents issued

New Recommendation issued:	1	R 133
Revised Recommendations issued:	2	R 16-1 & R 16-2, R 75-1 & R 75-2
Revised Document issued:	1	D 18

	1999	2000	2001	2002
Total number of Recommendations:	108	111	114	115
Total number of Documents:	26	26	27	27
Total number of other Vocabularies:	3	3	3	3
Total number of other Publications:	17	17	17	17

3 OIML Technical Committees and Subcommittees: Meetings and degree of participation of OIML Members

TC 12	19–20 September 2002	Borås	14 P-members present out of 23 + 5 O-Members
TC 13 (Informal meeting)	4 June 2002	Frankfurt	9 P-members present out of 16
TC 5/SC 1	21–22 October 2002	Delft	11 P-members present out of 21 + 2 O-Members

4 Liaisons with other international and regional bodies

BIML representatives participated in the following meetings in 2002:

World Bank	January	Paris (BIML)	*Consultation on Development issues*
WTO TBT Committee	February	St. Lucia	*Seminar for Carribbean countries*
CIPM - ILAC - CIML	February	Sèvres	*Joint Meeting*
WTO TBT Committee	March	Geneva	*Informal Meeting and Committee Meeting*
SADCMEL	April	Seychelles	*Committee Meeting*
JCGM	May & October	Sèvres	*WG2 Meetings*
UNIDO-OIML-PTB	June	Abidjan	*Common Metrology Development Project*
WELMEC	June	Vienna	*Committee Meeting*
UN/ECE	October	Geneva	*Working Party 6 Meeting*
APLMF	November	Ho Chi Minh City	*Committee Meeting*
ISO CASCO	November	Geneva	*Plenary Meeting*

In addition, the CIML President, Vice-Presidents, Development Council Chairperson and certain CIML Members represented the OIML at meetings of:

APLMF - COOMET - EMLMF - EUROMET - ISO - SIM - WELMEC

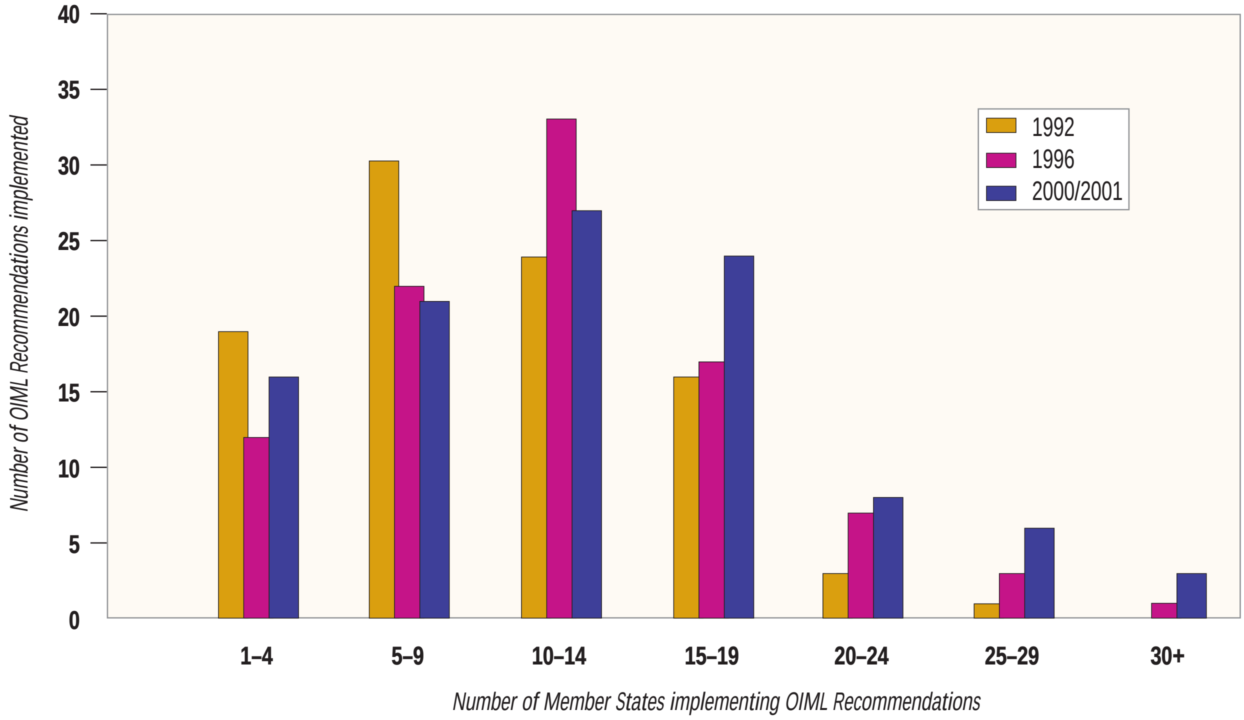
Concerning various technical activities of ISO, IEC, CEN, CENELEC and the European Commission, OIML experts participated in meetings and/or reports were given for the following fields:

- Water meters
- Draft European Directive on Measuring Instruments (MID)
- Acoustic measurements
- Electricity meters
- Electromagnetic interference

5 Degree of implementation of OIML Recommendations by OIML Members

An inquiry on the implementation of OIML Recommendations was made in 2000. In comparison with the previous inquiries made in 1992 and in 1996, the significant increase in the number of countries implementing individual Recommendations and in the degree of implementation ensured is represented in the histogram on the following page. Based on the inquiry, on additional information and on corrections received from Member States in 2001, the highest performing OIML Recommendations in 2001 were as in the table below:

R 76	Nonautomatic weighing instruments	*Implemented in 39 countries*
R 35	Material measures of length for general use	*Implemented in 33 countries*
R 111	Weights of classes E_1, E_2, F_1, F_2, M_1, M_2, M_3	*Implemented in 33 countries*
R 50	Continuous totalizing automatic weighing instruments	*Implemented in 29 countries*
R 31	Diaphragm gas meters	*Implemented in 29 countries*
R 117	Measuring systems for liquids other than water	*Implemented in 29 countries*
R 51	Automatic catchweighing instruments	*Implemented in 28 countries*



Histogram showing the degree of implementation of OIML Recommendations in force in 1992, 1996 and 2000/2001

The next inquiry on the implementation of OIML Recommendations will be carried out in 2004.

6 Categories of measuring instruments covered by the OIML Certificate System

Thirty-six categories of measuring instruments are covered by the following OIML Recommendations:

R 16	R 85	R 107	R 123
R 31	R 88	R 110	R 126
R 50	R 93	R 112	R 127
R 51	R 97	R 113	R 128
R 58	R 98	R 114	R 129
R 60	R 102	R 115	R 130
R 61	R 104	R 116	R 131
R 65	R 105	R 117/118	R 132
R 76	R 106	R 122	R 133

Total number of categories	1997	1998	1999	2000	2001	2002
	21	25	28	31	34	39
	+ 19 %	+ 12 %	+ 11 %	+ 10 %	+ 15 %	

7 Cumulative number of registered OIML Certificates (as at the end of 2002)

Category:

Category		
Nonautomatic weighing instruments (R 76)	469	≈ 45.7 %
Load cells (R 60/1991 *Note: Certificates may no longer be issued*)	226	≈ 22.0 %
Load cells (R 60/2000)	101	≈ 9.8 %
Automatic catchweighing instruments (R 51)	82	≈ 8.0 %
Automatic gravimetric filling instruments (R 61)	46	≈ 4.5 %
Fuel dispensers for motor vehicles (R's 117/118)	41	≈ 4.0 %
Gas meters (R 31)	20	≈ 1.9 %
Automatic level gauges (R 85)	16	≈ 1.5 %
Automatic weighing instruments (R 107)	8	≈ 0.8 %
Continuous totalizing automatic weighing instruments (R 50)	8	≈ 0.8 %
Direct mass flow measurement systems (R 106)	7	≈ 0.7 %
Evidential breath analyzers (R 126)	1	≈ 0.1 %
Clinical electrical thermometers (R 115)	1	≈ 0.1 %
Multi-dimensional measuring instruments (R 129)	1	≈ 0.1 %
Cumulative total, as at the end of 2002	**1027**	

Cumulative number of registered OIML Certificates

1997	1998	1999	2000	2001	2002
318	452	582	736	879	1027
	+ 42 %	+ 29 %	+ 26 %	+ 19 %	+ 17 %

282 manufacturers and applicants of measuring instruments from 33 countries have been granted OIML Certificates

8 Degree of acceptance of OIML Certificates by OIML Members

The most recent inquiry on the acceptance of OIML Certificates by OIML Members was carried out by the BIML in 2000. Forty-two countries sent responses and the results can be summarized as follows:

- More than 190 Certificates were accepted and more than 260 were taken into consideration to facilitate the process of national type evaluation and approval;
- Certificates were accepted by 10 Member States and 3 Corresponding Members;
- Certificates were taken into consideration by 18 Member States and 4 Corresponding Members.

The next inquiry on the acceptance of OIML Certificates will be carried out in 2003.

9 Distribution of the OIML Bulletin and revenue from the sale of OIML Publications

	1999		2000		2001		2002
Average number of **Bulletins** distributed quarterly	1044		1100		1050		1038
		+ 5.4 %		– 4.5 %		– 1.1 %	
... of which **Bulletin** subscribers	163		156		153		161
		– 4.3 %		– 1.9 %		+ 5.2 %	
Sales of **Publications** (EUR)	28 549*		32 626*		38 021*		41 500
		+ 14.2 %		+ 16.5 %		+ 9.2 %	

** Figures for previous years have been converted into Euros for ease of comparison*

10 Connections to and development of the OIML web site (www.oiml.org)

- 1998: 500 connections / 1999: 1 000 connections / 2000-2001: 2 500 connections per month
- 2002: average 6 500 visits / 34 500 pages viewed / 110 000 hits per month

Weekly site update; Members Area including downloadable circulars, deadlines for replies and an interactive database; information on OIML events, meetings, etc.; reduction in the number of paper documents mailed out; new dedicated host server.

11 Activities in support of development

Main activities:

- OIML Development Council Meeting (1 October 2002, Saint-Jean-de-Luz) with 86 participants;
- Establishment of, and preparation for the first meeting of the OIML Development Council Task Group (30 September 2002, Saint-Jean-de-Luz);
- Establishment of a web site for the OIML Development Council Task Group;
- Follow-up of the existing work programs of the Development Council Working Groups;
- Examination of the possibilities for funding development activities;
- Contacts with international organisations (WTO TBT Committee, ISO DEVCO, UNIDO, UN/ECE, etc.), and regional metrology and legal metrology organisations;
- Contacts with the national legal metrology institutes of a number of developing countries;
- Contacts with the bodies in a number of countries which provide assistance to developing countries (PTB Germany, NWML UK, SdM France, etc.);
- Participation in a PTB/UNIDO/OIML project in West Africa concerning the development of metrology in the region (Ivory Coast, June 2002);
- Participation in a seminar organized by the WTO on TBT-related technical assistance for the Caribbean region (St. Lucia, February 2002).

BIML, June 2003

International Metrology Conference

Dear Colleague,

The First International Conference on Metrology in Jerusalem (May 16–18, 2000) was so important for the physicists, engineers and analytical chemists working in metrology who attended the meeting, that we received many requests from all the world to organize a second one.

The past few years have been a time of significant increase in the recognition of metrology and its impact on global trade. It now affects the competitiveness of companies in aerospace, electronics, communications, chemicals, petroleum, food & drug and other industries, as well of companies from the areas of environment, health and safety.

It is my pleasure and privilege to invite you to participate in the Second International Conference on Metrology, where the trends in metrology and its new applications in calibration and testing laboratories will be discussed. This second conference is being organized, as the first one was, by the National Conference of Standard Laboratories (NCSL International), the Cooperation on International Traceability in Analytical Chemistry (CITAC) and the Israeli Metrological Society (IMS).

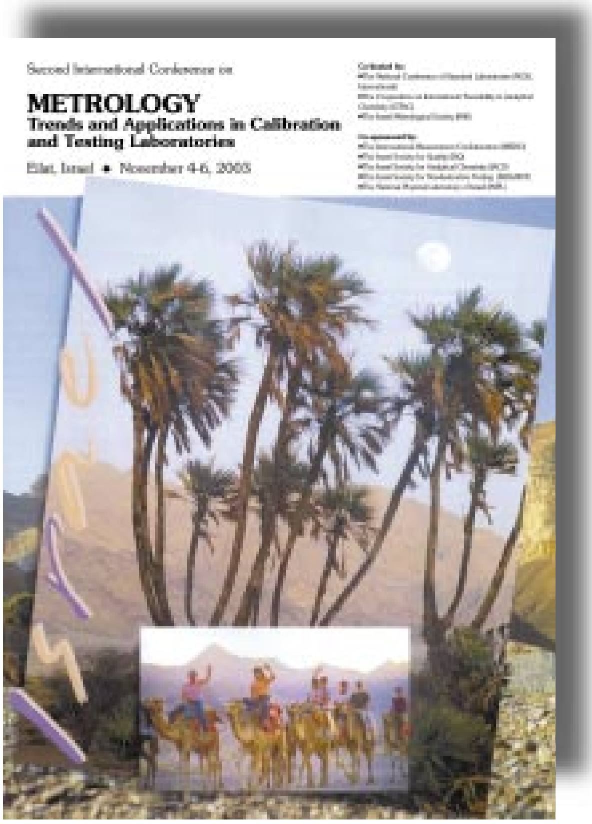
The International Measurement Confederation (IMEKO), the Israel Society for Quality (ISQ), the Israel Society for Analytical Chemistry (IACS), the Israel Society for Nondestructive Testing (ISRANDT) and the National Physical Laboratory of Israel (INPL) are the conference co-sponsors.

All of us hope that the year 2003 will be peaceful, particularly in Israel. We look forward to welcoming you and your colleagues to Eilat.

Dr. Avinoam Shenhar
Conference Chair

Conference Topics

- Trends in metrology
- Legal metrology
- Metrology as a business
- Regional metrological organizations
- Measurement methods and their validation
- Measurement instruments and their qualification
- Measurement standards (etalons) and reference materials (RMs)
- Uncertainty estimation in measurement and chemical analysis
- Traceability
- Interlaboratory comparisons and proficiency testing (PT)
- Conformity assessment
- Laboratory information management systems
- Accreditation of calibration and testing laboratories
- Accreditation of RM producers and PT providers
- Metrology in nondestructive testing
- Metrology in chemistry, petrochemistry, pharmaceuticals, environmental and clinical analysis
- Metrology for utilities
- Ethical problems in metrology
- Education



Conference Secretariat:
ISAS International Seminars, P.O. Box 34001, Jerusalem 91340, Israel
Tel: +972-2-6520574 Fax: +972-2-6520558 email: confer@isas.co.il

The OIML is pleased to welcome the following new

CIML Member

Italy

Daniela Primicerio

www.oiml.org

- Bulletin
- Calendar
- Certificates
- Events
- Liaisons
- Member Listings
- News
- OIML Structures
- Orders
- Publications
- TCs and SCs

OIML Meetings

18–19 September 2003 - Beijing, China *(To be confirmed)*

TC 17/SC 1 - Humidity
Revision R 59

September 2003 - Copenhagen, Denmark *(To be confirmed)*

TC 13 - Measuring Instruments for Acoustics and Vibration (in conjunction with the IEC TC 29 Meeting)

6–9 October 2003 - Paris, France

TC 8/SC 3 Dynamic volume measurement (liquids other than water)
TC 8/SC 4 Dynamic mass measurement (liquids other than water)
Revisions of R 86, R 105 and R 117

4–8 November 2003 - Kyoto, Japan

Development Council Meeting
38th CIML Meeting

Committee Drafts

Received by the BIML, 2003.02.01 – 2003.04.30

Revision D 1 "Law on Metrology"	E	2 CD	TC 3	USA
Revision D 9 "Principles of metrological supervision"	E	1 CD	TC 3/SC 2	Czech Republic
Annex "Test report format" to R 125	E	1 CD	TC 8/SC 2	Russian Federation