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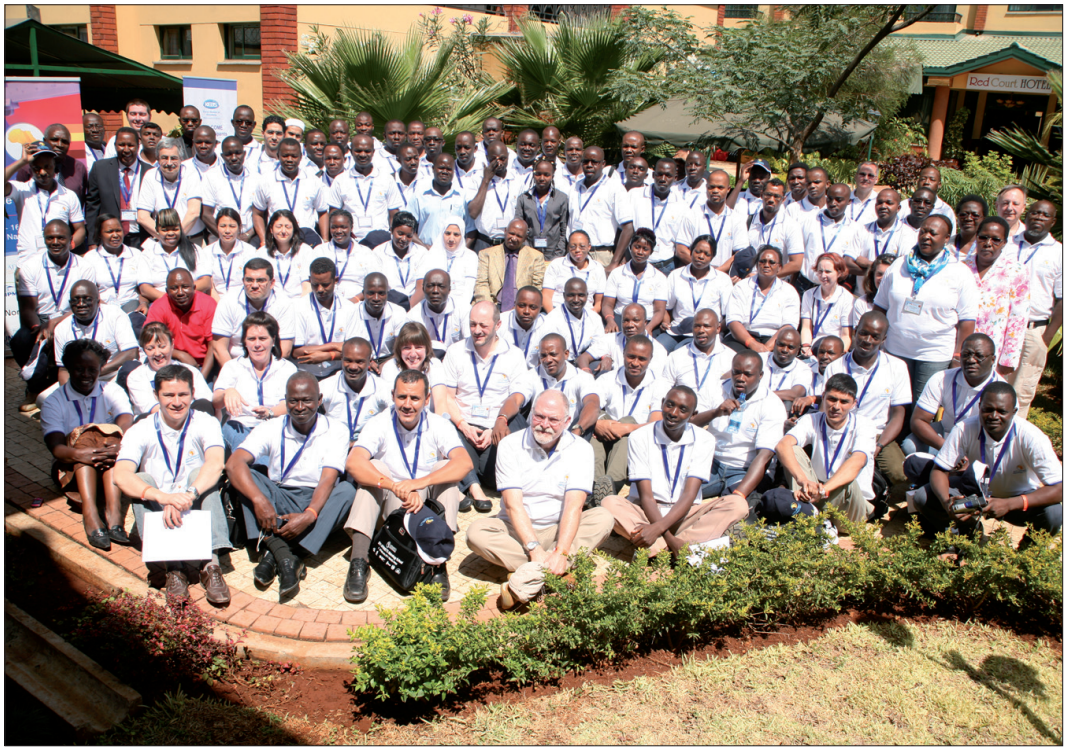

Delegates attending the AFRIMETS 2011 Metrology School in Nairobi, Kenya

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Editorial

Stephen Patoray
BIML Director

Special work projects at the BIML

Upon my arrival at the BIML three short months ago I was welcomed by all the staff who, along with CIML President Johnston, CIML President-Elect Mason and many other CIML Members, have helped to smooth out many of the bumps during my initial transition. In addition to their regular workload, here are just a few highlights of some special projects the BIML staff have taken on.

As a result of the work of **Philippe Leclercq**, Administrator, and **Florence Martinie**, Accountant, we have completed the financial audit for 2010 and received the approval of the auditor in time for the Presidential Council meeting. The accounts also include the information identified in Resolution 27 of the 45th CIML Meeting.

Jean-Christophe Esmiol, IT Systems Engineering, is preparing a plan to fully upgrade the BIML IT system. This will provide us with tools to make access to information much easier and provide for a greater level of security.

Thanks to the work of **Chris Pulham**, Editor and Webmaster, we now have a new printing company and a new method of delivery for the Bulletin. We believe this has improved its look and feel, all at a small cost reduction.

Luis Mussio, Engineer, is now planning for a presentation on legal metrology and the workings of the OIML to be given at the International Symposium on Metrology, METROLOGY 2011 in Cuba this May.

Patricia Saint-Germain, Office Manager, completed all of the preparations for the March Presidential Council meeting. Patricia also researched and chose both the language instruction school for my French language training and also the photographer used for the new photos of the BIML staff and the Presidential Council now seen on the OIML website.

Jacques Bourgeois, Office Clerk, has taken on a project to organize the documents housed at the BIML. This will be one of Jacques' final projects as he prepares to retire in June 2011 after 33 years at the BIML.

Willem Kool, Assistant Director, working with Stephen O'Brien, CIML Member, New Zealand, has completed the planning for the upcoming Conformity To Type Seminar in June. Information from this Seminar will be reviewed and discussed at the 46th CIML Meeting in Prague.

Recently **Ian Dunmill**, Assistant Director, participated in the AFRIMETS Metrology School and SADCMEL. These activities are highlighted in this issue of the Bulletin.

A team of **Luis, Chris**, and **Jean-Christophe** worked with Andy Henson and Laurent Le Mée at the BIPM and Martin Kaiser at the PTB to design and complete the World Metrology Day website. This was a great collaborative effort by all.

For me, I am enjoying getting to know and working with the excellent staff at the BIML. I continue my French classes. Finally, I have also had the pleasure of meeting and working with Michael Kühne, Brigitte Perent, and Andy Henson of the BIPM and plan to meet quarterly with them going forward.

This is only a small sample of what has been happening at the BIML over these past three months. We encourage you to contact any of us at the BIML for more information on these or any other topics. ■

MOISTURE MEASUREMENT

Rice moisture measurement in Thailand

SURACHAI SUNGZIKAW and WARACHAI TRIARUN
Central Bureau of Weights and Measures
Thailand

1 Introduction

Thailand has rice growing areas covering around 108 000 km^2, classified as seasonal (around 92 000 km^2) and off-seasonal (around 16 000 km^2), which can produce about 30 million metric tonnes per year. Therefore, rough (or "paddy") rice is an economically very important crop which generates high income earnings for Thailand. Rice farming generates an income for farmers (about 4 million households or about 16 million people out of Thailand's population of approximately 66 million earn their living from rice farming).

In general, trading of rough rice is based on weight but in Thailand the buyer will measure the moisture content in the rough grain to determine the price of the product. If the moisture content is above the set limit for safe storage, the buyer will reduce the weight of the product to compensate for the drying cost and weight loss after the drying.

Generally speaking, if the moisture content of the rough rice does not exceed 15 % based on wet weight or wet basis and the impurities do not exceed 2 % of the product weight, the farmer can receive full payment without weight reduction. But if the moisture content exceeds 15 %, the weight of product is reduced by 15 kg per 1 000 kg for every percent exceeding the set limit (15 %). In this case if the rice moisture meters have a 1 % error, this will cause a loss or gain of about 4 USD per metric tonne. Thus the accuracy of rice moisture measurement contributes to fair trade and to the confidence of stakeholders in rough rice transactions.

For these reasons the CBWM (Central Bureau of Weights and Measures) plays an important role and puts considerable effort into setting up the legal metrology control system on rice moisture meters in Thailand.

		2005/2006	2006/2007	2007/2008	2008/2009
Rice growing area (million m^2)	Seasonal rough rice	92.4	92.1	91.8	91.7
	Off-seasonal rough rice	15.8	16.1	15.9	18.1
Rough rice production (million metric T)	Seasonal rough rice	22.8	23.31	23.2	23.0
	Off-seasonal rough rice	6.8	8.79	8.4	8.3
Average unit price of rough rice *($/T)	Seasonal rough rice	196.0	254.9	290.7	300.9
	Off-seasonal rough rice	187.8	368.6	292.9	

Source: Department of Internal Trade, *1 USD = 33 Baht (approx.)

Table 1: Rice growing area, rough rice production and average unit price of rough rice

a. For verification and inspection of rice moisture meters against a rice standard

		MPE	
		Verification (%)	Inspection (%)
Rice moisture meters	Moisture content does not exceed 16 %	0.8	1.0
	Moisture content Exceeds 16 %	0.05 × MC	0.06 × MC

b. For verification and inspection of rice moisture meters against a standard rice moisture meter

	MPE	
	Verification (%)	Inspection (%)
Rice moisture meters	0.8	1.0

Table 2: Maximum Permissible Error (MPE)

2 Acquisition and development

In 2001 the CBWM set up a legal metrology project on rice moisture meters and received training support from the PTB. During 2002–2005 the CBWM also collaborated with the APLMF to survey rice moisture meters used in Thailand and sent representatives to participate in the training course on traceability of rice moisture meters held in the Philippines, Vietnam and Thailand.

Subsequently, the CBWM has set up a traceability system, standards used for calibration, and verification and inspection of rice moisture meters. The CBWM now has ministerial approval and is therefore able to enforce the regulation on rice moisture meters.

2.1 Legislation

In 2004 the CBWM issued ministerial regulation no. 2 B.E. 2547 based on OIML R 59:1984 *Moisture meters for cereal grains and oilseeds*. Rice moisture meters used for commercial transactions shall be verified by weights and measures officers and the validity period of verification is 2 years. During this period, officers can inspect rice moisture meters to be used in the marketplaces to determine whether their accuracy still complies with the prescribed MPE.

2.2 Traceability system

Based on OIML R 59, the rice moisture content is determined by using the air oven method according to ISO 712:1998 *Cereals and cereal products - Determination of moisture content - Routine reference method*. The reference standard rice moisture meter is calibrated by comparison with the rice standard according to ISO 7700-1:1984 *Food products - Checking the performance of moisture meters in use - Part 1: Moisture meters for cereals*. The working standard rice moisture meter is calibrated by comparison with the rice standard or reference standard rice moisture meter. Finally, the rice moisture meter is verified or inspected by comparison with the rice standard or working standard rice moisture meter (see Figure 1).

The MPE is the maximum difference between the meter reading and the nominal value of the working standard.

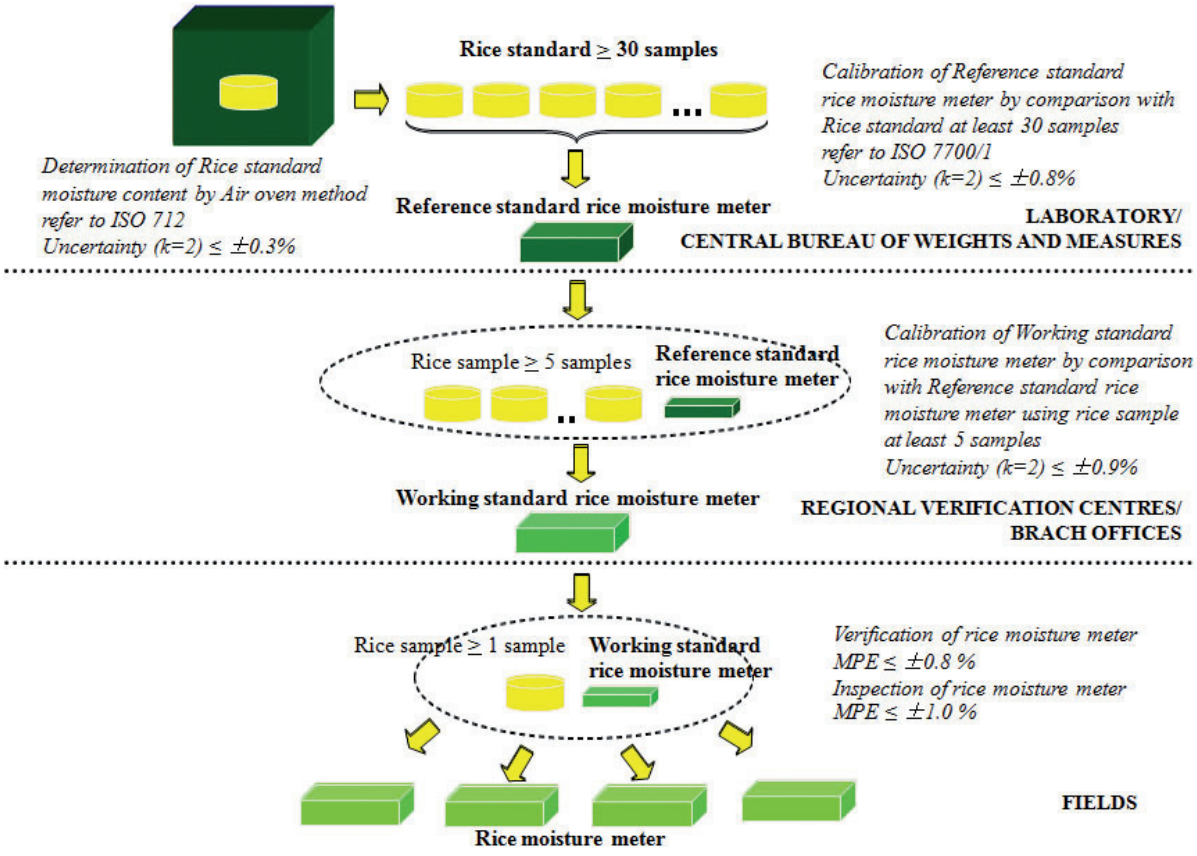

Figure 1: Traceability system of rice moisture meters

2.3 Standards

The CBWM has set the standards and classified them into 3 levels of accuracy as follows:

(1) Rice standard used for calibrating the reference standard rice moisture meter with an uncertainty (k = 2) of less than or equal to ± 0.3 %.
(2) Reference standard rice moisture meter used for calibrating the working standard rice moisture meter with an uncertainty (k = 2) of less than or equal to ± 0.8 %.
(3) Working standard rice moisture meter used for the verification and inspection of rice moisture meters with an uncertainty (k = 2) of less than or equal to ± 0.9 %.

2.3.1 Rice standard

2.3.1.1 Preparation of rice standard

Rough rice samples are collected during the harvest season in the high moisture range of about 26 %–28 %, approximately 10 kg per sample. Each sample is cleaned using winnower and hand sieves and then divided into several portions, approximately 1 kg per portion. The moisture content of each portion is decreased to obtain several moisture values in the measuring range of the rice moisture meter for calibration, verification and inspection by 2 methods:

(1) drying under laboratory conditions; and
(2) drying in the oven at 30 °C or 60 °C which is required when the moisture content is lower than 16 %.

Finally, the sample is put on a rolling machine until its moisture content is homogeneous and the temperature of the sample is stabilized in the laboratory.

2.3.1.2 Determination of the moisture content of the rice standard using ISO 712

For a sample with a moisture content less than or equal to 15 %, take a sample of 5 g ± 1 g as a test sample. Grind the test sample until the size of the particles obtained is no greater than 1.8 mm, using an electric mill which does not absorb moisture, which does not generate heat, and which is not in contact with the outside air during the grinding process, by very short successive grinding actions.

Rapidly pour the ground sample into the drying can and close the lid. Weigh (m_0) using a weighing instrument of class II with maximum capacity 220 g and resolution 0.1 mg. Spread the sample evenly over the base of the drying can and open the lid before drying in the oven at 130 °C for 2 h, using a fan forced oven which has a temperature stability and uniformity ≤ ± 0.5 °C. After the drying time has elapsed, close the lid in the oven, take the drying can out of the oven, and leave in the desiccators for about 45 min to cool down to laboratory temperature before weighing (m_1). Laboratory conditions: t = 25 °C ± 1 °C and h = 50 % ± 10 %. Carry out two determinations on the same sample.

For a sample with a moisture content greater than 15 %, take a sample of slightly greater than 5 g as a test sample and weigh (m_2) in the drying can with the lid on. Dry the test sample in the oven at 130 °C for about 10 min and then cool down to laboratory temperature for 2 h before weighing (m_3). Proceed in the same way as for the sample with a moisture content less than or equal to 15 %.

2.3.1.3 Evaluation of the measurement uncertainty of the rice standard

The moisture content, w, less than or equal to 15 % is obtained from:

$$w = \left(1 - \frac{m_1}{m_0}\right) \cdot 100\%$$

Then the uncertainty of the moisture content less than or equal to 15 % is to be estimated as:

$$u^2(w) = \left(\frac{100 \cdot m_1}{m_0^2}\right)^2 \cdot u_{m_0}{}^2 + \left(-\frac{100}{m_0}\right)^2 \cdot u_{m_1}{}^2 + u_R{}^2 + u_C{}^2 + u_L{}^2$$

The moisture content, w, greater than 15 % is obtained from:

$$w = \left(1 - \frac{m_1 \cdot m_3}{m_0 \cdot m_2}\right) \cdot 100\%$$

Then the uncertainty of the moisture content greater than 15 % is to be estimated as:

$$u^2(w) = \left(\frac{100 \cdot m_1 \cdot m_3}{m_0^2 \cdot m_2}\right)^2 \cdot u_{m_0}{}^2 + \left(-\frac{100 \cdot m_3}{m_0 \cdot m_2}\right)^2 \cdot u_{m_1}{}^2 +$$

$$+ \left(\frac{100 \cdot m_1 \cdot m_3}{m_0 \cdot m_2^2}\right)^2 \cdot u_{m_2}{}^2 + \left(-\frac{100 \cdot m_1}{m_0 \cdot m_2}\right)^2 \cdot u_{m_3}{}^2 + u_R{}^2 + u_C{}^2 + u_L{}^2$$

where:

w is the moisture content, as a percentage of the mass of the rice standard
m_0 is the mass of the rice standard
m_1 is the mass of the rice standard after drying
m_2 is the mass of the rice standard taken before pre-conditioning

m_3 is the mass of the pre-conditioned rice standard

u_{m0} is the uncertainty due to the weighing mass of the rice standard

u_{m1} is the uncertainty due to the weighing mass of the rice standard after drying

u_{m2} is the uncertainty due to the weighing mass of the rice standard taken before pre-conditioning

u_{m3} is the uncertainty due to the weighing mass of the pre-conditioning rice standard

u_R is the uncertainty due to the repeatability of the moisture measurement

u_C is the uncertainty due to the capability of the oven to dry the rice standard

u_L is the uncertainty due to the moisture loss while the rice standard is exposed to the air before weighing

The uncertainty due to the weighing mass u_{m0}, u_{m1}, u_{m2}, u_{m3} was considered from weighing the mass of the rice standard by using a weighing instrument under laboratory conditions as specified in 2.3.1.2. The repeatability of the weighing instrument was determined experimentally from weighing the mass of the rice standard in the drying can, evaluated as a type A standard uncertainty with a normal distribution from the standard deviation of the weighing equal to 0.07 mg. The linearity of the weighing instrument was ± 0.11 mg obtained from the calibration certificate, evaluated as a type B standard uncertainty with a rectangular distribution for weighing the empty drying can and the drying can with the rice standard equal to:

$\frac{0.11}{\sqrt{3}}$ = 0.06 mg. The standard uncertainty of weighing the mass of the rice standard was evaluated as being equal to:

$$u_{m_0}, u_{m_1}, u_{m_2}, u_{m_3} = \sqrt{(0.07)^2 + 2 \cdot (0.06)^2} \text{ mg} = 0.11 \text{ mg}$$

The uncertainty due to the repeatability of the moisture measurement u_R was considered from the limited difference value between two moisture determinations on the same sample, and shall not exceed 0.15 g of moisture per 100 g for a sample with a moisture content of ≤ 15 % or shall not exceed 0.20 g of moisture per 100 g for a sample with a moisture content > 15 % as specified in ISO 7700-1:1984, evaluated as a type B standard uncertainty with a rectangular distribution equal to:

$$u_{R,\, mc \le 15\%} = \frac{0.15\ \%}{2 \cdot \sqrt{3}} = 0.043\ \% \quad or \quad u_{R,\, mc > 15\%} = \frac{0.20\ \%}{2 \cdot \sqrt{3}} = 0.058\ \%$$

The uncertainty due to the capability of the oven to dry the rice standard u_C was considered after drying the maximum number of samples that the oven will accommodate at a temperature of 130 °C ± 3 °C, then heating the same test samples for 2 h and then for a further 1 h. The results did not differ by more than 0.15 g of moisture per 100 g of sample as specified in ISO 712:1998, evaluated as a type B standard uncertainty with a rectangular distribution equal to:

$$u_C = \frac{0.15\ \%}{2 \cdot \sqrt{3}} = 0.043\ \%$$

The uncertainty due to the moisture loss during the time the rice standard was exposed to the air before weighing u_L was considered for the sample that was ground according to the conditions specified in ISO 712:1998, exposed to the air at t = 25 °C ± 1 °C and h = 50 % ± 10 %, in the period of grinding operation less than 20 s as in Table 3, evaluated as a type B standard uncertainty with a rectangular distribution equal to:

$$u_L = \frac{0.036\ \%}{2 \cdot \sqrt{3}} = 0.0104\ \%$$

2.3.2 Reference standard rice moisture meter

2.3.2.1 Calibration of the reference standard rice moisture meter

Adjust the temperature of the rice standards and the reference standard rice moisture meter until stabilized at the laboratory temperature. Simultaneously measure the moisture content of the rice standards and of the reference standard rice moisture meter by the routine reference method.

No.	Time during which the ground sample was exposed to the air							
	0 s		10 s		20 s		30 s	
	Weight g	Moisture loss %	Weight g	Moisture loss %	Weight g	Moisture loss %	Weight g	Moisture loss %
1	5.2740	0.000	5.2734	-0.011	5.2721	-0.036	5.2716	-0.046
2	5.0757	0.000	5.0747	-0.020	5.0741	-0.032	5.0732	-0.049
3	5.2221	0.000	5.2209	-0.023	5.2203	-0.034	5.2194	-0.052

* The moisture content of the sample in the experiment is approximately 15 %.

Table 3: Moisture loss for the ground sample exposed to the air at t = 25 °C ± 1 °C and h = 50 % ± 10 %

		Sample with moisture content less than or equal to 15 %			Sample with moisture content greater than 15 %		
Quantity X_i	Probability distribution	Standard uncertainty $u(x_i)$	Sensitivity coefficient c_i	Uncertainty contribution $u_i(y)$	Standard uncertainty $u(x_i)$	Sensitivity coefficient c_i	Uncertainty contribution $u_i(y)$
m_0	normal	0.00011 g	17.00000 %·g^{-1}	0.00187 %	0.00011 g	14.99967 %·g^{-1}	0.00165 %
m_1	normal	0.00011 g	-20.00000 %·g^{-1}	-0.00220 %	0.00011 g	-17.64667 %·g^{-1}	-0.00194 %
m_2	normal				0.00011 g	12.49972 %·g^{-1}	0.00138 %
m_3	normal				0.00011 g	-14.16667 %·g^{-1}	-0.00156 %
u_R	rectangular	0.04300 %	1	0.04300 %	0.05800 %	1	0.05800 %
u_C	rectangular	0.04300 %	1	0.04300 %	0.04300 %	1	0.04300 %
u_L	rectangular	0.01040 %	1	0.01040 %	0.01040 %	1	0.01040 %
Combined uncertainty				0.06176 %			0.07302 %
Expanded uncertainty (k = 2)				**0.12352 %**			**0.14604 %**

Table 4: Uncertainty budget for determining the moisture content of the rice standard according to ISO 712

2.3.2.2 Evaluation of the measurement uncertainty of the reference standard rice moisture meter

The error of the reference standard rice moisture meter reading is obtained from:

$$E_P = \bar{e} = \frac{\sum_{i=1}^{k}\sum_{j=1}^{n}(MR_{Pij} - w_i)}{kn}$$

Then the uncertainty for the reference rice moisture meter reading is to be estimated as:

$$u^2(E_P) = u(\bar{e})^2 + u_{dP}{}^2 - u_w{}^2$$

where:

E_P is the error of the reference standard rice moisture meter reading

$\bar{e}$ is the average error of the reference standard rice moisture meter reading from the routine reference method

MR_{Pij} is the reference standard rice moisture meter reading obtained from j–n repeated measurements of the rice standard i–k

w_i is the moisture value of the rice standard i–k obtained by the routine reference method

$u(\bar{e})$ is the uncertainty due to the variance of the reference standard rice moisture meter reading error

u_{dP} is the uncertainty due to the limited resolution of the reference standard rice moisture meter

u_w is the uncertainty of the rice standard

The uncertainty due to the variance of the reference standard rice moisture meter reading error $u(\bar{e})$ was considered from the standard deviation of the error of the reference standard rice moisture meter reading using the routine reference method, evaluated as a type A standard uncertainty with a normal distribution. For example, if we use the standard deviation value s = 0.36748 % from the data in Figure 2, the uncertainty will be equal to:

$$u(\bar{e}) = 0.36748\ \%$$

The uncertainty due to the limited resolution of the reference standard rice moisture meter u_{dP} was considered from the reading resolution of the meter, d = 0.1 %, evaluated as a type B standard uncertainty with a rectangular distribution equal to:

$$u_{dP} = \frac{0.1\ \%}{2 \cdot \sqrt{3}} = 0.02887\ \%$$

The uncertainty of the rice standard u_w was considered from the expanded uncertainty (coverage factor k = 2) of the moisture measurement of the rice standard by the routine reference method, evaluated as a type B standard uncertainty with a normal distribution equal to:

$$u_w = \frac{0.15\ \%}{2} = 0.075\ \%$$

2.3.3 Working standard rice moisture meter

2.3.3.1 Calibration of the working standard rice moisture meter

Adjust the temperature of the rice standards, reference standard rice moisture meter and working standard rice moisture meter until stabilized at the laboratory temperature. Measure the moisture content of the rice standards using the reference standard rice moisture meter and working standard rice moisture meter continuously.

2.3.3.2 Evaluation of the measurement uncertainty of the working standard rice moisture meter

The error of the working standard rice moisture meter reading is obtained from:

$$E_S = \bar{e} = \frac{\sum_{i=1}^{k}\sum_{j=1}^{n}(MR_{Sij} - MR_{Pij})}{kn}$$

Then the uncertainty of the working standard rice moisture meter reading is to be estimated as:

$$u^2(E_S) = u(\bar{e})^2 + u_{dS}^2 - u_P^2 - u_{RP}^2 - u_{dP}^2$$

where:

E_S is the error of the working standard rice moisture meter reading

$\bar{e}$ is the average error of the working standard rice moisture meter reading from the reference standard rice moisture meter reading

MR_{Sij} is the working standard moisture meter reading obtained from j–n repeated measurements of the rice standard i–k

MR_{Pij} is the average of the reference standard rice moisture meter reading obtained from j–n repeated measurements of the rice standard i–k

$u(\bar{e})$ is the uncertainty due to the variance of the working standard rice moisture meter reading error

u_{dS} is the uncertainty due to the limited resolution of the working standard rice moisture meter

u_p is the uncertainty of the reference standard rice moisture meter

u_{RP} is the uncertainty due to the repeatability of the reference standard rice moisture meter obtained from j–n repeated measurements

u_{dP} is the uncertainty due to the limited resolution of the reference standard rice moisture meter

The uncertainty due to the variance of the working standard rice moisture meter reading error $u(\bar{e})$ was considered from the standard deviation of the error of the working standard rice moisture meter reading from the average of the reference standard rice moisture meter reading, evaluated as a type A standard uncertainty with a normal distribution. For example, if the reference and working standard rice moisture meters to be used have the same calibration curve, the standard deviation should therefore not exceed 0.2 %. The uncertainty will be equal to:

$u(\bar{e})$ = 0.2 %

The uncertainty due to the limited resolution of the working standard rice moisture meter u_{dS} was considered from the reading resolution of the meter, d = 0.1 %, evaluated as a type B standard uncertainty with a rectangular distribution equal to:

$$u_{dS} = \frac{0.1\ \%}{2 \cdot \sqrt{3}} = 0.02887\ \%$$

The uncertainty of the reference standard rice moisture meter u_p was considered from the expanded uncertainty (coverage factor k = 2) of the reference standard rice moisture meter calibration, evaluated as a type B standard uncertainty with a normal distribution equal to:

$$u_P = \frac{0.75\ \%}{2} = 0.375\ \%$$

The uncertainty due to the repeatability of the reference standard rice moisture meter reading u_{RP} was considered from the maximum standard deviation of the reference standard rice moisture meter reading repeated measurement 10 times the rice standard i–k, assumed to be equal to 0.1 %, evaluated as a type A standard uncertainty with a normal distribution equal to:

$$u_{RP} = \frac{0.1\ \%}{\sqrt{10}} = 0.03162\ \%$$

The uncertainty due to the limited resolution of the reference standard rice moisture meter u_{dP} was considered from the reading resolution of the meter, d = 0.1 %, evaluated as a type B standard uncertainty with a rectangular distribution equal to:

$$u_{dP} = \frac{0.1\ \%}{2 \cdot \sqrt{3}} = 0.02887\ \%$$

Quantity X_i	Value x_i	Standard uncertainty $U(x_i)$	Probability distribution	Sensitivity coefficient c_i	Uncertainty contribution $u_i(y)$
$\bar{e}$	0 %	0.36748 %	normal	1	0.36748 %
u_{dP}	0 %	0.02887 %	rectangular	1	0.02887 %
u_W	0 %	0.07500 %	normal	1	0.07500 %
E_P	0 %				0.37 616 %

Expanded uncertainty (U) = $k \times u$ (E_P) % = 2 × 0.37616 % = 0.75233 %

Table 5: Uncertainty budget of the reference standard rice moisture meter calibration

Quantity X_i	Value x_i	Standard uncertainty $u(x_i)$	Probability distribution	Sensitivity coefficient c_i	Uncertainty contribution $u_i(y)$
$\bar{e}$	0 %	0.20000 %	normal	1	0.20000 %
u_{dS}	0 %	0.02887 %	rectangular	1	0.02887 %
u_P	0 %	0.37500 %	normal	1	0.37346 %
u_{RP}	0 %	0.03162 %	normal	1	0.03162 %
u_{dP}	0 %	0.02887 %	rectangular	1	0.02887 %
E_S	0 %				0.42678 %

Expanded uncertainty (U) = $k \times u$ (E_S) % = 2 × 0.42678 % = 0.85356 %

Table 6: Uncertainty budget of the working standard rice moisture meter calibration

2.4 CBWM collaborates with manufacturers in developing rice moisture meters

CBWM organized a meeting among manufacturers and dealers to inform them about the regulation, and which direction they should follow when developing rice moisture meters in Thailand.

CBWM and manufacturers jointly developed the rice moisture meters calibration curve by using various domestic rice varieties as samples, in particular those varieties that are of the greatest economic importance such as Khao-Dawk-Mali-105. The result of this collaboration was the "Thai rice calibration curve", which is more suitable and more accurate than before. The accuracy of the calibration curve also aligns with the MPE specified by Ministerial Regulation No. 2 (see Figures 2 and 3).

3 Benefits

After the implementation of Ministerial Regulation No. 2, the CBWM set up the legal metrology control system on rice moisture meters, complying with international standards, and took on responsibility for the verification and inspection of rice moisture meters. Meanwhile, farmers and stakeholders in rough rice transactions can increasingly access rice moisture meters to be verified and inspected by weight and measure officers. Those rice moisture meters that fail in the process of the inspection are prohibited for use until repaired and re-verified (see Figure 4).

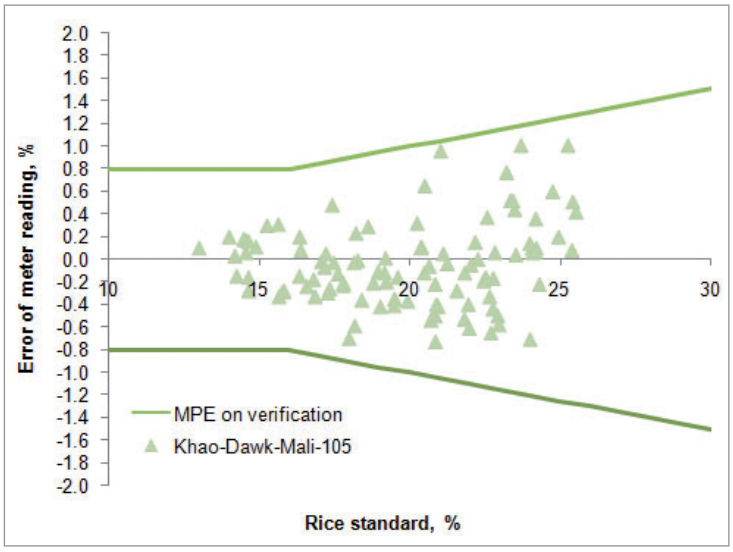

Figure 2: Checking the calibration curve of Capacitance type rice moisture meter (model: PM 410), by rice standard; rough rice type, Khao-Dawk-Mali-105 variety, low part of the North-eastern Region of Thailand and crop year 2008/2009

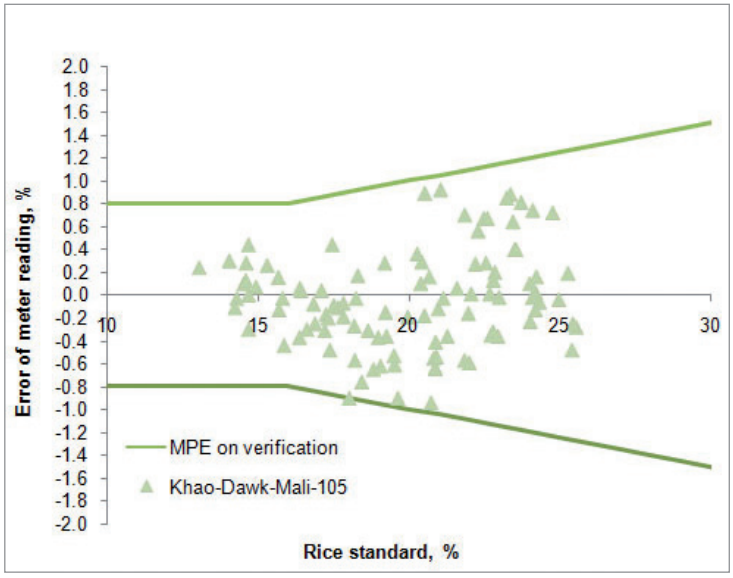

Figure 3: Checking the calibration curve of Capacitance type rice moisture meter (model: EE-KU 60th anniversary), by rice standard; rough rice type, Khao-Dawk-Mali-105 variety, low part of the North-eastern Region of Thailand and crop year 2008/2009

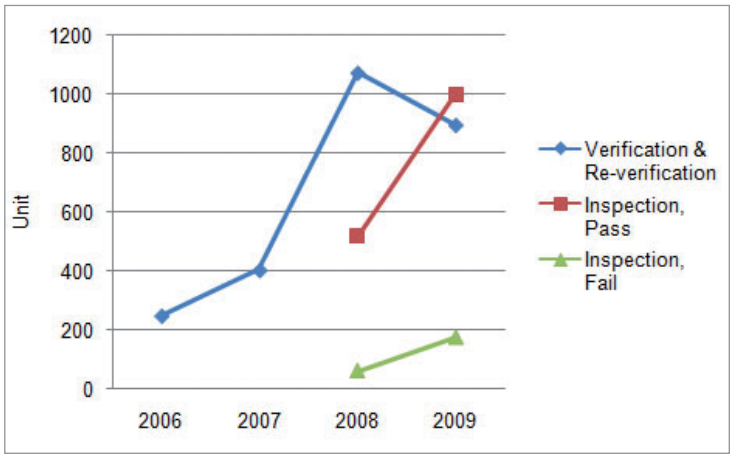

Figure 4: Statistics of verification and inspection of rice moisture meters

4 Results and expectations

From the statistics results it was found that the number of rice moisture meters is increasing, and that it is important to control the process of moisture measurement of rice standards and the calibration of rice moisture meters used as standards.

As seen in Table 4, the accuracy of the rice standard is suitable for use as a standard for verification and inspection of rice moisture meters due to its expanded uncertainty which is less than 1/3 of the MPE, but the expanded uncertainty of rice moisture meters used as standards will be more than 1/3 of the MPE.

However, practically, the use of rice moisture meters as standards is necessary for re-verification and inspection of rice moisture meters in those areas that are distant from the laboratory. Thus the calibration process and/or the capability of the rice moisture meters would need to be developed further in the future. ■

References

[1] OIML Recommendation R 59:1984 *Moisture meters for cereal grains and oilseeds*

[2] ISO 712:1998 *Cereals and cereal products - Determination of moisture content - Routine reference method*

[3] ISO 7700-1:1984 *Check of the calibration of moisture meters - Part 1: Moisture meters for cereals*

[4] APLMF *Guideline: Accuracy maintenance of moisture meters for cereal grains* (draft), 2002

REGULATION

Why do we regulate measuring instruments used for trade?

RICHARD SANDERS
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Introduction

The answer to the question seems obvious - it's what most countries do, isn't it. But does the regulation of trade measuring instruments actually provide the best way of protecting consumers? To find out, we set about examining whether the theory of regulating instruments could be supported by economic evidence that proves that regulation of instruments is indeed the optimal way of protecting consumers[1] when trading by reference to weight, volume or length.

In the UK some £622 billion worth of goods are sold on the basis of the measurement of their quantity[2] each year. If we multiply this to give a global figure, it shows how vital it is for consumers to have access to sufficient information for them to make informed choices and comparisons. Moreover, for most purchases e.g. petrol it is virtually impossible for the consumer to check the quantity they are paying for so it is important for there to be controls in place to protect them. On the other hand, businesses expect a regime to be in place that they can understand easily and without undue cost. They also demand an enforcement regime that is consistent and proportionate and does not give rise to undue compliance costs.

This paper describes some economic work carried out in the UK commissioned by the National Measurement Office to answer these important questions.

[1] In this paper, the term 'consumers' also includes businesses acting as consumers

[2] Analysis of the Economics of Weights and Measures Legislation, Deloitte June 2009

1 Economic considerations

Economic theory is useful in identifying areas where government intervention (i.e. regulation) is likely to be required. Standard economic theory states that the free market will usually produce the best outcomes for consumers. However, it also identifies several ways in which markets can fail. A lack of competition can lead to market failure and this is why governments intervene to ensure competitive markets. Another source of failure is where consumers do not have full information about the products or prices and consequently are not able to make an informed decision on whether to purchase. When markets, even competitive markets, fail to provide good outcomes for consumers then government intervention can improve these outcomes. In the case of weights and measures, consumers are subject to imperfect information or "information asymmetry" because they have no practical means of verifying the quantity of product being purchased, such as the weight of some purchased vegetables or the volume of fuel put into a motor vehicle. This leaves the trader with a potentially unfair advantage because he is able to provide a quantity of product less than the stated amount. There are also competition implications because those traders providing less of the product per unit price will gain an economic advantage over honest traders supplying the correct amount.

2 Social reasons for regulating instruments

The current legal protections ensure that the goods offered for sale by quantity can be trusted because the amount has been determined by a legally controlled (prescribed) measuring instrument whose accuracy is independently monitored according to risk by the enforcement authorities. The law gives the same protection to those who are normally thought of as vulnerable consumers, as to all other consumers in this respect. Such vulnerable consumers may need this protection more than others, for example because they spend a higher proportion of their disposable income on subsistence items such as utilities (gas, electricity and water), motor fuel, and food (all of which have become more expensive), or make more use of street markets where goods are sold loose in bulk. However, it is right to extend the same protection to all. This is because where goods are sold by weight or measure, it is strongly arguable that *all* consumers (and in many cases business customers as well) are "vulnerable" much of the time, because it is difficult for them to independently verify or

effectively dispute that the purported quantity is as stated without having access to an alternative accurate and reliable measuring instrument at the point of sale. For example, for purchases of petrol/diesel it is impossible for a buyer to determine how much fuel he/she has received the moment it enters the fuel tank.

'Vulnerable consumers' include a surprisingly high proportion of the adult population of both consumers with a low income - for whom deregulation could mean the onset of over-inflated/unaffordable price increases - and/or those who suffer from illiteracy, and who are therefore dependent on accurate measurement rather than written information about quantity and price such as that found on package labelling which they cannot read.

3 The theoretical case for regulating instruments

The purpose of regulating equipment is to ensure that those who sell by weight or measure have systems in place that minimise the risk of mistakes being made in the vast majority of "honest" transactions. If the equipment is manufactured and maintained to a sufficient degree of accuracy, each individual transaction in which that equipment is used to weigh or measure goods should be accurate – in the absence of fraud or gross incompetence on the part of the seller. There are many more transactions than there are instruments, so that from an enforcement point of view, an intervention to correct an inaccurate instrument, based on equipment controls, may be expected to deliver greater public benefit than an intervention based on a single instance of giving short weight, based on transaction controls. Indeed, from a value for money point of view the argument for relying on equipment controls in preference to transaction controls is overwhelming. Transaction controls rely on test purchases, which by their nature are more expensive to conduct than the examination of instruments, while giving no more assurance as to the levels of accuracy being maintained.

Moreover, as noted above, in many transactions it is difficult, if not impossible, for most customers to check whether the seller has delivered the quantity of goods they have contracted for, so that the only realistic way in which the consumer purchasing goods is protected is by making as sure as possible that the instrument delivering the product is accurate. This is done by controlling the equipment through a process of design or type approval and then by in-service controls (i.e. the periodical checking of the instrument to ensure its continued accuracy). Removing controls would place vulnerable consumers at a much greater risk of detriment.

Although equipment controls may appear to impose an additional requirement, they actually make life easier for business. They mitigate the severity of a requirement such as the prohibition on giving short weight or measure by providing traders with a defence. For example, a trader selling 0.5 % less of a product than he purports to sell commits a short weight offence, but if the level of accuracy required of the equipment allows for a margin of error of between 1 % less and 2 % more than the correct measurement, and the equipment used falls within those limits, the trader is very likely to have a defence. In practice, therefore, all the trader has to do is to ensure that his equipment complies with the equipment rules and he should never face prosecution under the transaction rules.

This is not to say that where equipment is controlled, there is no need for a transaction control, because it is always possible to misuse a perfectly accurate piece of equipment so as to achieve a dishonest result.

4 The economic case for regulating instruments

It was recognised that the arguments given above in favour of relying on equipment controls are largely theoretical. Therefore in 2009, NMO commissioned some independent research into (i) the typical costs of equipment inspections as opposed to test purchases and (ii) the statistical assurance of compliance levels achieved by the two different approaches. This was to determine whether the cost will be more, less, or the same if measuring instruments were de-regulated while maintaining at least the same level of consumer protection that we currently enjoy.

Specifically, the task assigned to the researchers was to provide:

> *"An economic and statistical assessment of the relative effectiveness of enforcement with and without type approval and verification. Included in this should be an assessment of what number of additional inspection activity would be required to give the same level of confidence as with prescription; the current financial burden on businesses of instrument prescription; the effect on levels of consumer protection if instruments were de-regulated; and whether the financial burden of regulation is outweighed by the consumer protection benefits gained from it. Finally, the current enforcement regime should be compared in overall terms with the alternative, giving a short and long term view on which represents the most cost-effective option."*

4.1 Key findings on prescription versus de-prescription

The economists assessed the relative effectiveness of enforcement with and without regulation of instruments. Their assessment was driven by assumptions around the extent of switching to non-prescribed instruments which might follow de-prescription. They found this to vary widely between business categories. Some business types - such as packers and small non-licensed retailers - indicated that they would be more likely to take up non-regulated instruments, because of considerations of costs or flexibility, a belief that their own regular controls ensure the accuracy of equipment, or lack of knowledge of the regulatory process. Others, like petrol retailers, value the accuracy that regulation provides and so appear unlikely to take up non-regulated instruments. Discussions with enforcement experts indicated that additional inspections[3] would be required for a business using non-regulated instruments to maintain the same level of customer protection.

The estimate was that it would cost the enforcement authorities an additional £3.2m to £5.8m per year to provide the additional inspections required. This estimate assumes no constraints on increasing the number of inspections.

The total cost of de-regulation would also include the costs to business of the additional inspections, which were estimated to range from £190,000 to £320,000 per year. Other costs include additional legal costs, implementation costs and costs of recruiting additional inspectors. Together, we estimate the total quantifiable cost of de-regulation to be between **£3.8m and £7m** per year in the longer term. These costs would emerge over several years, as businesses gradually replace their existing regulated instruments.

These costs should be set against any benefits of de-prescription. Based on our assumptions of take-up of non-regulated instruments, we estimated that businesses could save between **£1.8m and £3.5m** per year by switching to non-type approved equipment and avoiding paying for verification services. Most of these savings appear to come from avoiding verification and re-verification services. The cost differential (in terms of the manufacturing cost differential, rather than the retail price differential) between prescribed and non-prescribed instruments is relatively small. This is because most of the cost of designing and manufacturing prescribed instruments would still be incurred in producing accurate instruments, so incremental costs tend to be relatively small. Furthermore, the additional costs relating to prescription are generally fixed and therefore spread across many instruments of the same model.

If the reduction in costs from de-regulating is subtracted from the additional costs for increased inspections, the net benefit for regulating instruments is between **£2m and £3.5m** per year.

5 Conclusions

We conclude from the economic analysis that on balance, regulation of instruments offers a more cost-effective enforcement option than if instruments were de-regulated. Moreover, there are a number of financial, practical and regulatory challenges which may lead to difficulties in implementing an enforcement regime of increased inspections. Therefore, we also conclude that de-regulation is likely to result in reduced levels of consumer protection, compared to the existing enforcement regime.

6 Acknowledgements

The author would like to thank Mr. Peter Mason and Ms. Christine Munteanu for their input to this project. ■

Richard Sanders

[3] Note that the UK does not specify statutory re-verification periods for regulated instruments in service. Instead the enforcement authorities inspect regulated instruments at a frequency determined by the risk of non-compliance.

INFRASTRUCTURES

Legal metrology in the Inter-American Metrology System (SIM)

Marcos J. H. Senna
Chairman of the SIM Legal Metrology Working Group

Introduction

Organized in five subregions (Noramet, Carimet, Camet, Andimet and Suramet), SIM is comprised of the National Metrology Institutes from 34 countries in the Americas.

In SIM, legal metrology subjects are discussed in the Legal Metrology Working Group (LMWG). It is the responsibility of LMWG, among others, to promote closer cooperation between SIM and the OIML, to encourage the utilization of OIML Recommendations and Documents among SIM Members, and to coordinate, with the Profesional Development Committee, SIM training activities in the field of legal metrology.

Legal metrology training activities have been the main activity for SIM. In 2008 the LMWG promoted a general meeting in Quito, Ecuador, with the goal of defining a strategy to meet the needs for training activities in legal metrology. It soon became apparent that the best approach would have to take into account the priorities of each country and try to sort them according to certain criteria. In order to reduce costs associated with air tickets it was proposed that those attending the training courses should preferably come from the countries of that SIM subregion in which the event is held.

Following these guidelines, a regular program of training courses has been implemented. It was noticed that for some regions coverage of both air tickets and per diem was necessary in order to achieve a high attendance figure, and in order to make this possible supplemental sources of financial support have been used when available.

The major sources of financial support for the activities of the SIM LMWG have been the OAS Project and certain agencies and organizations, including FINEP (the Brazilian Innovation Agency), the German Ministry of Cooperation (managed by PTB Q5), and CROSQ (the Regional Organization for Standards and Quality of the Caribbean Community).

Objectives

The main goal of the training courses and associated events was to provide a reference on how to implement legal metrological control activities, including the legal control of measuring instruments and the legal control of the quantity in prepackages. The contents of the courses were usually based on OIML Recommendations, which are model regulations that provide an agreed upon basis for the establishment of national legislation on legal metrology matters. Training courses usually include topics such as terminology, metrological requirements, technical requirements, methods and equipment for testing and verifying the conformity to requirements.

Results

Table 1 shows the details of the events held from March 2008 to December 2010. At least four events are scheduled to take place in 2011.

The instructors and speakers for the events came from CENAM (Mexico), PTB (Germany), INTI (Argentina) and INMETRO (Brazil).

Below are some examples of typical topics covered in the training courses concerning requirements that apply for mechanical sphygmomanometers and evidential breath analyzers.

Examples of metrological and technical requirements for mechanical sphygmomanometers:

- maximum permissible errors of the cuff pressure indication;
- technical requirements for the cuff and bladder;
- technical requirements for the pneumatic system: air leakage, pressure reduction rate, rapid exhaust;
- technical requirements for pressure indicating devices: nominal range and measuring range, scale interval, length and thickness of the pointer, hysteresis error, construction and materials;
- safety technical requirements: Resistance to vibration and shock, mechanical safety, tamper proofing.

Examples of metrological and technical requirements for evidential breath analyzers:

- maximum permissible errors;
- repeatability;
- drift;
- memory and residual effect;
- physical and physiological influence factors;
- physical disturbances;
- durability;

Table 1 Events with the participation of the SIM Legal Metrology Working Group

Venue	Date	Theme
Quito, Ecuador	March 11, 2008	Verification of material measures of volume
Quito, Ecuador	March 12, 2008	Authentication of hardware and software in fuel dispensers
Quito, Ecuador	March 13 and 14, 2008	Prepackages (OIML R 87)
Buenos Aires, Argentina	August 27 and 28, 2008	International Seminar on Software in Legal Metrology
Rio de Janeiro, Brazil	October 6, 2008	Mechanical sphygmomanometers
Rio de Janeiro, Brazil	October 7, 2008	Quantity of product in prepackages
Rio de Janeiro, Brazil	October 8-10, 2008	1st International Congress on Mechanical Metrology
St. George's, Grenada	March 16 and 17, 2009	Non-automatic weighing instruments (OIML R 76)
St. George's, Grenada	March 18, 2009	Liquid fuel dispensers
Tegucigalpa, Honduras	March 23 and 24, 2009	Electrical active energy meters
Tegucigalpa, Honduras	March 25 and 26, 2009	Taximeters
Joao Pessoa, Brazil	June 15 and 16, 2009	Equipment for the measurement of the speed of vehicles
Joao Pessoa, Brazil	June 17 – 19, 2009	8th International Seminar on Electrical Metrology
Rio de Janeiro, Brazil	Sept. 22 and 23, 2009	Electrical clinical thermometers
Rio de Janeiro, Brazil	Sept. 24 and 25, 2009	Automated sphygmomanometers
San José, Costa Rica	Nov. 24 and 25, 2009	Verification of road tankers
San José, Costa Rica	Nov. 26 and 27, 2009	Verification of liquid fuel dispensers
Georgetown, Guyana	March 22 and 23, 2010	Verification of non-automatic weighing instruments
Georgetown, Guyana	March 24 and 25, 2010	Verification of liquid fuel dispensers
Buenos Aires, Argentina	December 9-10, 2010	Seminar 'Legal Metrology and Road Safety'

- measurement range;
- scale interval;
- minimum exhaled volume;
- software requirements: identification and validation, fraud protection, storage of data, automatic storing.

Training activities have been designed to optimize the processes of learning and capacity building. As an example, considering that many tests required for type approval of instruments used for the measurement of the speed of vehicles are based on standards which involve electrical quantities, a training course on these instruments was coupled with a seminar on electrical metrology, in order to provide the participants with a broader and deeper view of the subject.

The same rationale applies to courses on requirements for evidential breath analyzers, which are better understood when topics of mass flow controllers, gas flow measurement, chemical thermodynamics and chemical metrology are also presented to the audience.

Conclusions

It is expected that the demand for training activities will continue to be high, since legal metrology structures are being implemented and are expanding in the region. Periodic surveys have been carried out to check both the adequacy of the program and the degree of satisfaction with the training courses and associated events. The feedback indicates that the current format should be kept for now.

The activities of the group have led to an increase in the awareness on legal metrology in all of the sub-regions. There have been a number of bilateral and multilateral initiatives for the implementation of cooperation projects in the field of legal metrology, with participation of National Metrology Institutes from SIM countries and other organizations, such as PTB and ABC (the Brazilian Cooperation Agency).

Training course on the verification of liquid fuel dispensers for the Carimet subregion held in Georgetown, Guyana, in March 2010

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ACCREDITATION

Accreditation and legal metrology

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1 Subject

Nowadays, it is generally admitted that accreditation is considered as being the benchmark way for a body to demonstrate its competence, in all of the fields where this can apply.

This article discusses the cases in which legal metrology can have recourse to accreditation, in all of its forms, based on French experience in this field. It presents the solutions chosen to achieve this and the relations that this has led to between the French Government department responsible for legal metrology, today the *Bureau de la Métrologie*, within the Ministry of Industry, and the French accreditation body, Cofrac. Section 4.2 indicates all the steps that a State should take in order to impose accreditation on the bodies in charge of metrological control operations.

This article also takes stock of the situation in Europe and within the OIML community.

2 Reminder of certain basic concepts and of the French metrology context

A review of certain basic metrological concepts and how metrology is organized in France is appropriate, so that the reader can properly understand what follows.

We usually speak of three forms of metrology:

a) Scientific (or fundamental) metrology for applications of metrology of the highest level (primary standards, research, traceability to the primary standards etc.).
b) Industrial metrology for applications which are necessary or useful to industry, particularly in connection with the national standards.
c) Legal metrology, when we speak of all of the rules that the State imposes concerning the system of units, the production or use of measuring instruments in order to guarantee the quality and reliability of measurements made in certain fields (commercial transactions, road safety, tax operations, etc.) or by means of certain measuring instruments.

The French Government assigned the supervision of French metrology (excluding legal metrology) to the *Laboratoire national de métrologie et d'essais* (LNE), replacing the former structure called the *Bureau national de métrologie* (BNM), not to be confused with the *Bureau de la métrologie*, which will be amply discussed in this article. Fundamental metrology is thus led by the LNE and, depending on the quantities or fields (mass, time, electricity, etc.), it is exercised by four primary laboratories whose activity is coordinated by the LNE, itself a primary laboratory for certain fields (see Insert 1 on the LNE for further information).

Insert 1 - Role and situation of the LNE in terms of metrology and accreditation

As indicated in the main article, the Government assigned the supervision of metrology (excluding the regulatory aspects), and also certification activities within the framework of legal metrology to the *Laboratoire national de métrologie et d'essais* (LNE). The LNE thus plays a very particular role with regard to metrology, leading it to become involved in various ways. When we speak of the LNE, it is thus important to know what we are talking about.

All of this leads the LNE to take a particular view of accreditation.

The LNE provides leadership and coordination of scientific metrology, including the primary laboratories in charge of the definition and implementation of the highest level fundamental units on the national level. In this role, based on the decisions or rulings of the appropriate commissions, it manages the funding made available to scientific metrology by the State. It represents France on the international level in scientific metrology, particularly within the Metre Convention.

The LNE is itself a primary metrology laboratory for several quantities. As of today, it is not the rule that the primary laboratories be accredited as such. Under the supervision of the LNE, it was decided that the French primary metrology laboratories should be accredited.

The LNE is also involved in industrial metrology in many fields. In this role, it is accredited by Cofrac like all of the French laboratories working within the framework of calibration chains guaranteeing traceability to the national standards.

Lastly, the State decided to assign to the LNE the legal metrology certification activities for all of the control operations relating to the design of measuring instruments, and also for the approval of quality assurance/management systems of manufacturers,

repairers or installers of measuring instruments. The LNE is accredited for each of these activities, based on the appropriate system of reference.

Of course, the LNE has many other study and certification activities (voluntary or imposed by a regulation) in fields more or less closely related to metrology: certification of medical systems, development of test methods and the carrying out of tests of all kinds. It is accredited for many of these activities, which makes the LNE one of the world champions in terms of the number of accreditations received.

Cofrac, a non-profit association under the Law of 1901, is recognized by decree as the sole national accreditation body. Its role is to allow the bodies that it accredits to prove their competency and their impartiality, so that they can offer companies, consumers and public authorities a guarantee of technical confidence and reliability of results for services carried out under accreditation.

With regard to the accredited calibration laboratories, a report on the results issued in the scope of accreditation guarantees the traceability of the associated standard or measuring equipment with the International System of Units (SI). Cofrac is thus an essential part of the machinery of industrial metrology.

Legal metrology, as indicated above, is the responsibility of the *Bureau de la métrologie*, under the authority of the Minister of Industry and, of course, the intermediary hierarchy. The *Bureau de la métrologie* is mainly in charge of:

- drawing up regulations;
- monitoring their proper application;
- designating certain certification bodies in legal metrology, of a national nature;
- leading and coordinating the activity of the services of the State in charge of control in the regions and bodies;
- international relations in legal metrology.

Each of these three forms of metrology cannot be carried out without concern for the other two:

- the units of measurement are defined by scientific metrology, but are imposed by legal metrology texts. Furthermore, it would be illusory to think that scientific metrology would exist if it did not lead to practical applications in industrial or legal metrology;
- industrial metrology is connected by the calibration chains to the primary standards developed and maintained by scientific metrology;
- verifications in legal metrology are done with standards connected in the same way as for industrial metrology.

The entities responsible for each of the fields have always had good relations and agents of legal metrology have long been involved in the work of the chains of calibration in the fields connected to legal metrology. Despite the separation of powers described above, all of this contributed to the coherency of the French metrological system, Furthermore, today, the *Bureau de la métrologie* is assigned to promote metrology in small and medium-sized enterprises and its director represents the Ministry of Industry on the metrology committee with the LNE, in charge of proposing orientations for scientific metrology activities, which can only reinforce the coherency of the metrological system.

3 Accreditation of metrology laboratories and connection to the standards

In many countries, the accreditation of metrology laboratories is in the voluntary domain and is therefore not directly imposed by legal metrology. It therefore does not relate to the main subject of this article. Nevertheless, to avoid the risk that this article be considered incomplete, the subject will be presented briefly.

The accreditation of calibration laboratories based on the reference system made up of the NF EN ISO/IEC 17025 standard: *General requirements for the competence of testing and calibration laboratories*, has become unavoidable for chains of calibrations, in France, since the beginning of the 2000's. The first accreditation issued to a calibration laboratory (according to guide ISO/IEC 25) dates from 1973.

Without challenging the good quality of the standards, for proper functioning they must be explained by guides developed horizontally by international or European organizations: the International Laboratory Accreditation Cooperation (ILAC) and European Cooperation for Accreditation (EA). Sometimes guides specific to a field are also necessary or can greatly facilitate the task of the bodies requesting an accreditation. These guides also contribute to the harmonized application of the reference systems in all countries and in all of the fields involved.

Good legal metrology must require that verifications be done using standards connected to the national standards or foreign equivalents. This indirectly requires that there are accredited laboratories, without however requiring through regulations the existence of an accredited laboratory in the country. In fields in which the number of accredited laboratories is low, sometimes reduced to one in extreme cases, the suspension of the activity of a laboratory can create

difficulties for the system. Nowadays, fortunately, with the calibration recognition agreements, there is the possibility of a connection abroad. But industrialists often prefer nearby services and legal metrology must make sure that it is relatively easy to observe these requirements.

Good legal metrology must also make sure that the uncertainties of the measurements made for verifications are compatible with the maximum permissible errors. This is not an issue of accreditation of metrology laboratories and therefore of this article, but it seemed useful to give a reminder of this in passing.

4 Accreditation of certification or verification bodies in legal metrology

We discuss here the essential subject of this article.

4.1 Context and other general considerations

4.1.1 First experience in France

For more than twenty years now, France has had a policy of delegation of metrological control operations, with the State having to provide surveillance of the system in appropriate forms; the principles of this surveillance were presented in 2002 on the occasion of the seminar *What will legal metrology be in the year 2020*, which was held in conjunction with the CIML Meeting (see the article "The evolution of the metrological control of measuring instruments in France – (the new professions in legal metrology)", published in Volume XLV – No. 2 of the April 2004 OIML Bulletin).

The first cases of delegation did not lead to imposing the accreditation of verification bodies. Things were different in the middle of the 1990's however, when there was delegation of the verification of measuring containers used for static measuring of stored or transported products (oil tanker containers, wine cellar vats, tank trucks, etc.).

At least four elements led to the imposing of accreditation of the bodies in charge of verifications:

1 Verifications require a high level of competence, particularly for determining the calibration uncertainties of measuring containers.

2 Further with regard to uncertainties, from the outset, the applicable regulations provided that the calibration tables should be determined with maximum permissible uncertainties. In this field, the notion of maximum permissible errors does not mean anything in and of itself, because the volumes are made to correspond with the heights recorded. In practice, these maximum permissible uncertainties range, depending on the fields and the gauging techniques, for standard applications, from the order of 0.2 % to 0.5 %. No one had ever tried to calculate the uncertainties using the tools offered by the *Guide for the expression of uncertainty in measurement* (GUM).

3 The need to harmonize the practices in this complex field, and the approvals issued by the various regional authorities risked skewing the competition between bodies.

4 The desire to ensure the continuity of and to transmit the competencies of the agents which were at that point those of the agents of the State, which are led to diminish for purely technical reasons in a field based on the delegation of controls.

To facilitate the work of the bodies, guides had been drawn up, in cooperation with Cofrac, particularly for the calculations of uncertainties, but experience had shown that this was not sufficient, confirming that the motivations at the outset were well-founded, because, at the initial term set it appeared that, while there was homogeneity in terms of the bodies, it was because none of them were satisfactory in the regulatory sense, chiefly with regard to calculations of uncertainties.

The deadline had to be postponed, and the necessary training sessions were organized and carried out to bring the bodies to the required level.

With these initiatives, the goal was reached a few months later, demonstrating through the difficulties encountered that the requirement of accreditation brought with it a guarantee of the competence of each of the bodies and the harmonization of the competencies. Prior to that, the bodies had been provisionally approved by the regional authorities, while awaiting the obligatory accreditation. This is a good demonstration that accreditation provides a significant complementary element with respect to the action that the State can take in terms of assessment of control bodies.

4.1.2 Other national applications

The first experience in terms of accreditation of control bodies had led to the conclusion that accreditation had positive consequences concerning the competence of the bodies and the harmonization of practices. Despite minor difficulties in achieving this, it was decided that the accreditation of the bodies would be required in the following conditions.

1 Systematically for the bodies that would be called on to intervene for application of a European Directive.

2 Systematically for the bodies working within the framework of control operations similar to the

operations provided for by the European Directives, but to be covered by national control: type approval, approval of the quality systems of manufacturers or repairers, initial verification, etc.

This decision is all the more logical given that the same body may be involved in the application of a European Directive for one category of measuring instruments and for application of a national regulation for another one.

3 Case by case, up until now, for the other operations for the control of instruments in service (periodic verification, etc.).

With regard to this third family of operations, the non-systematic nature of the recourse to accreditation was justified by the fact that, until now, while accreditation offers certain advantages, it also has certain drawbacks:

a) Unless the responsible administration involved on the national level decides to fully leave things up to the partners involved, particularly the accreditation organization, imposing accreditation requires greater efforts of this administration in terms of discussions than would be necessary in the absence of accreditation.

In the early stages:

- discussions (more thoughtful because it is always useful to discuss things) with the partners, particularly the representatives of the bodies involved and the accreditation organization,
- participation in the choice of accreditation benchmarks, and the preparation of guides,
- participation in the criteria of choice of the technical assessors who, when the procedure is established, are often in the administration that is in charge of applying the regulation.

b) As our first experience demonstrated, imposing accreditation raises the level of the bodies. The bodies must be ready to do this with relative ease.

c) Lastly, accreditation leads to additional costs, even if the administration and the accreditation organization agree to minimize them by implementing, in particular, measures adapted to the structure and the size of the verification bodies.

Before imposing accreditation on the bodies in charge of control, the administration must weigh the pros and cons and, in particular, consider what it offers in terms of competence, with regard to the capacity of the bodies to achieve this on the intellectual and financial levels. For the latter aspect, the number of verifications done per year by a body, the cost of the verifications before accreditation and the additional cost generated by accreditation must be taken into account.

In light of these considerations, we can, schematically for the time being and in France, consider that accreditation was made obligatory in half of the cases of controls of instruments in service. The service in charge of legal metrology (*Bureau de la métrologie*), however, planned to generalize the recourse to obligatory accreditation for verification bodies.

4.1.3 The European approach

The European directives, or at least those published up until 2008, do not mention "accreditation" for the conformity assessment bodies.

They specify that the bodies that comply with the standards that are applicable to the management of their activity are assumed to meet the requirements that apply for their designation and notification by the State in which they are based.

Accreditation was thus not obligatory and each State decided whether or not to impose it on its bodies. As mentioned above, France decided to impose it.

In order to improve the efficiency and the harmonization of the application of the European Directives and to guarantee the competence of the bodies in charge of the conformity assessment for products, the European Commission and the Member States of the European Union studied the drawing up and application of these Directives. This thinking led to the drawing up of various EU texts including Regulation EC No. 765/2008 of the European Parliament and Council of July 9, 2008 setting forth the requirements in terms of accreditation and surveillance of the market for the marketing of products and abrogating regulation EEC No. 339/93 of the Council (EU Official Journal of August 13, 2008), hereafter referred to in this article as "the EC Regulation concerning accreditation".

Accreditation is presented in it as the main means for assessing the competence of the bodies in charge of conformity assessment for products. The EC Regulation concerning accreditation sets forth or provides for:

1) The general principles concerning accreditation, in particular:

- Each State designates a sole national accreditation body,
- Or, failing that, and after having informed the European Commission and the other Member States, recognizes the assessments done by the national body of another Member State,
- The Commission keeps up-to-date the list of the national accreditation bodies and makes it public,

- Accreditation is an "public activity that must be formally recognized by the public Authorities".

2) The procedures for the functioning of accreditation (application, issuing, suspension and withdrawal of an accreditation certificate, recourse, etc.).
3) The principle of non-competition between the accreditation and certification activities, and also between the accreditation bodies. However, within the limited conditions set by the Regulation, a national accreditation body can perform accreditations in another Member State.
4) The requirements applicable to the national accreditation bodies, particularly with regard to independence, impartiality, competence and the need to submit regularly to peer evaluation.
5) The measures to be taken by the Member State with regard to a body that no longer meets the requirements.
6) The creation of a European accreditation infrastructure, supervised by the European Commission, in charge in particular of managing the peer evaluations and coordinating accreditation activities, particularly in compliance with the requests of the European Commission.
7) The rules of presumption of conformity of the accreditation bodies with the requirements that are applicable to them.
8) The information obligations of the accreditation bodies with respect to the Member State, with respect to the other national accreditation bodies, or even the public, concerning the results of their peer evaluation, and of the Member State with respect to the European Commission and the European accreditation infrastructure for the nature of the accreditation activities carried out by its national body.

When a Member State decides not to use accreditation, it gives the European Commission and the other Member States all of the documentary proof necessary for verification of the competence of the conformity assessment bodies. In this case, a conformity assessment body can nonetheless request accreditation from the national accreditation body of the Member State in which it is established or, for special cases, from the national accreditation body of another Member State.

Without making the accreditation of conformity assessment bodies strictly obligatory, this regulation should eventually make accreditation difficult to avoid. This European Regulation came into effect on January 1, 2010.

The European Commission chose European Cooperation for Accreditation (EA) as the European accreditation infrastructure (see Insert 2).

4.1.4 The point of view of WELMEC

WELMEC, European Cooperation in Legal Metrology, issues guides intended to facilitate harmonization of the application of the "new approach" type Directives. WELMEC works in close collaboration with the European Commission which publishes the reference of the guides useful for the application of the Directives.
The guides that have been released thus far were published before the publication of the EC Regulation regarding accreditation mentioned in 4.1.3. Nevertheless, in some of its guides WELMEC has already presented accreditation as the main means for a body to demonstrate its competence, while accepting that other rules demonstrating competence on the basis of equivalent criteria are acceptable for application of the guides.

Insert 2 - Accreditation and notification

Accreditation and notification are two distinct activities that are carried out separately according to specific processes.

An accreditation body cannot be a substitute for a notifying authority.

In general, within the framework of the implementation of the European directives accreditation is more and more frequently required as a prerequisite for notification or to maintain a notification.

This trend of recourse to accreditation as a prerequisite to notification has intensified since the issuing of the European regulation 765/2008 of July 9, 2008 concerning accreditation and market surveillance.

The notification decision remains the responsibility of the administrative authority involved, however.

In order to ensure harmonization of the requirements applicable to notified European bodies, EA published a guide (EA 2/17) that defines the general horizontal requirements that the conformity assessment bodies must respect if they want to be accredited for a notification.

The evaluation of the conformity assessment bodies involved must therefore by carried out based on this guide in association with the relevant harmonized standards, the corresponding EA, ILAC and IAF documents, and the associated regulatory requirements (directives and national transposition texts).

The harmonized application of the requirements of this guide is under the responsibility of the HHC (Horizontal Harmonization Committee) of the EA.

Observance of the effective application by the national accreditation bodies of these requirements concerning the accreditation of the notified bodies is verified during the peer audits, in particular, with the supervision of EA/ILAC/IAF.

The three WELMEC guides that are most useful within the framework of the evaluation and accreditation of conformity assessment bodies are:

1) Guide 8.0 "Generalities on the assessment and operation of notified Bodies performing conformity assessment",
2) Guide 8.5 "Assessment of notified bodies in charge of type examination Presumption of conformity based on EN 45011",
3) Guide 8.7 "Assessment of notified bodies designated for module F based on EN ISO/IEC 17020".

As its title indicates, guide 8.0 is a horizontal and general guide for application of the European Measuring Instruments Directive (MID). This guide is useful for all of the partners involved: national Authorities, conformity assessment bodies and manufacturers. It cites in particular the generic standards that allow for an appropriate assessment of the quality systems of conformity assessment bodies and manufacturers.

Guides 8.5 and 8.7 are more specific to the assessment of the bodies involved by the national Authorities. In the introduction of these guides, it states that it is hoped that they will also be taken into account by the bodies in charge of accreditation. Based on the standards indicated in their title, each of these guides can be considered to be the reference document serving as a link between the requirements of the Directive and the general fundamental principles that a body must apply to carry out the conformity assessments involved. In other words, they make up a list of essential topics or points which an assessor or technical expert must investigate, in order to guarantee quality assessments, in a harmonized fashion, taking into account the usual good practices in legal metrology.

4.1.5 The point of view of the OIML

The OIML also has recourse to accreditation to demonstrate the competence of the certification bodies (Certificate Issuing Authorities) and test laboratories, for application of the MAA (Mutual Acceptance Arrangement).

The Issuing Authorities must work in accordance with guide ISO Guide 65. Accreditation is obviously one of the means to demonstrate this. The laboratories that carry out tests within the framework of the type examination must work in accordance with ISO/IEC 17025. Accreditation is one of the only two means accepted to demonstrate this, with the alternative solution being peer evaluation.

The OIML maintains close relations with the international accreditation organizations for the purpose of defining specific accreditation programs for the operations carried out in legal metrology. A tripartite Memorandum of Understanding (MoU) was signed with ILAC for the tests carried out in legal metrology and with IAF (International Accreditation Forum) for the certifying bodies. A joint work program is defined every year within the framework of this MoU.

As it was aware of the need to make explicit the standards for the applications of legal metrology, the OIML drew up two specific guides: *Guide for the application of ISO 65 to the assessment of measuring instruments certification bodies in legal metrology* (D 29) and *Guide for the application of ISO/IEC 17025 to the assessment of testing laboratories in legal metrology* (D 30).

The first of these two guides was drawn up in the same spirit as the WELMEC 8.5 guide, with the exception that the WELMEC guide, although it was obviously drawn up taking into account the fundamental principles that govern the certification of the design of measuring instruments, is intended for the application of the MID, while the OIML guide was defined for the general application of the operations for certification of the design of measuring instruments, while specifying the specific modalities for application of the OIML Certificate System and the MAA in particular.

4.2 Practical implementation

This chapter mentions the approaches to be taken within the framework of the implementation of obligatory accreditation in legal metrology and the potential consequences of such a decision.

4.2.1 Prerequisites

Before imposing any accreditation, the State must start by defining the general framework in which the accreditations will be issued and choose a body that will be in charge of this: taking the legislative, regulatory or simply administrative texts needed to create the system, choosing the model of the legal structure for the entity in charge of the procedure, and choosing the body or creating it.

In a context of globalization, it would not be impossible to impose accreditation for application of a regulation without having a national accreditation body, but this would significantly complicate the task of the service in charge of this regulation and of the certification bodies.

In France, Cofrac was chosen from the outset as the sole accreditation body (see Insert 3 for further information).

4.2.2 Creation of the obligation

Then, a legislative or regulatory framework must be published that makes accreditation obligatory for the bodies in charge of the activities involved: example for the bodies in charge of initial verification.

In this text, the following, in particular, must or should be indicated:

- The requirements applicable to the bodies (whether accreditation is required or not, except for the fact of imposing the accreditation, the obligations are of the same nature).
- Whether the accreditation is a prerequisite to the designation, authorization or approval (or any other term; we use the generic term "authorization" hereafter) issued by the State to the bodies for the activity involved, or whether the accreditation is to take effect after a certain period of activity.
- The benchmarks applicable to the accreditation or the conditions in which they will be defined and whether these benchmarks are simply made up of standards or are supplemented by specific requirement documents.

4.2.3 Consultation with the accreditation organization and other partners

Firstly, the accreditation organization must be consulted to define the goals sought, the applicable standards or benchmarks and to consider the need for specific guides.

The accreditation organization must define an accreditation rule applicable to applicants. It can be specific to an application, common to several applications or linked to a generic regulation that already exists.

If applicable, the accreditation organization must also decide what section the accreditation applies to: the one in charge of calibration or test laboratories, the one in charge of inspection bodies or the one in charge of assessments of quality management systems. While in some cases the choice is obvious, this may not always be the case (see below).

In France, for activities covered by legal metrology, Cofrac adopted the following system:

- For the bodies in charge of assessment activities for the design of measuring instruments (only one body in France at present, the LNE), there is no specific reference system: the EN 45011 standard applies in a generic fashion, but a guide specific to the approval type activity was established in concert with the *Bureau de la métrologie*.

Insert 3 - Recognition of Cofrac as the sole accreditation body in France

In article 137, the French law of August 4, 2008, called the law of modernization of the economy, established the notion of sole national accreditation body.

The decree of December 19, 2008, made in application of the abovementioned article, designates Cofrac as the sole national accreditation organization authorized to issue certificates of accreditation to the conformity assessment bodies, both in the regulatory sector and in the voluntary sector.

The establishment of a legal monopoly for Cofrac, through a national law, was made possible by the adoption of the European regulation of July 9, 2008 which, among other things, gave accreditation the status of a public service.

That is why, up until then, the official recognition of Cofrac as a national accreditation body and not as the **sole** national accreditation body had only been covered by a convention between the President of Cofrac and certain ministers.

This recognition confirms a *de facto* monopoly situation that has existed for about fifteen years.

- For the bodies in charge of activities for the assessment of quality assurance systems of manufacturers or repairers of measuring instruments (only one body in France at present, the LNE), there is no specific reference system: EN 45012, replaced since then by ISO/IEC 17021, applies in a generic fashion. Defining a guide specific to the body's assessment activity was not considered useful, but it goes without saying that Cofrac must make sure that the body takes into account everything that was defined by the regulatory authority to assess the quality systems of the manufacturers or repairers of measuring instruments.
- For the bodies in charge of initial or periodic verification activities, Cofrac has drawn up documents specific to these activities for application of ministerial decision No. 08.00.110.007.1 of July 4, 2008 establishing the specific requirements applicable to the quality assurance systems of the bodies designated or approved for the verification of the regulated measuring instruments. This decision, like the Cofrac documents that constitute the accreditation requirements (LAB ML Ref 02, LAB ML Ref 05), are drawn up based on ISO/IEC 17020. To return to the points mentioned above, although this standard applies to inspection bodies in a generic fashion, Cofrac decided that this accreditation would be the responsibility of the section handling laboratories and not the one handling inspection bodies in general, in light of the concern of the *Bureau de la Métrologie* that the calculations of uncertainties be handled with all due care and attention.

Cofrac of course also applies the horizontal guides established by EA and ILAC.

For the reasons mentioned in 4.1.2, the other partners involved must also be consulted, without forgetting their capacity to change and without forgetting the financial aspects.

4.2.4 Choice and quality management and technical assessors

The choice of the quality assessors (formerly referred to as quality auditors; see Insert 4 on the Management of Cofrac assessors and experts), in charge of examining the organizational aspects, does not require lengthy explanations. Their qualification is granted based on specific provisions.

The choice of the technical assessors, who are in charge of examining the regulatory and technical aspects, merits some additional information however.

A technical assessor is a person who has the competence and qualifications necessary to carry out the assessment of the technical competence of a body for specific fields of the requested field of accreditation with regard to the applicable benchmarks.

A technical assessor thus has a very good knowledge of the regulations and of the control operation involved (initial verification, for example), with all of this applied to the category of measuring instrument involved (water meters, for example). It is also important that he has good notions of the instrumental techniques involved (functional principle of the instruments). He must at least have command of the knowledge and techniques required, inasmuch as this can have an influence on the result of the assessment of the competencies and procedures of the body.

Insert 4 - Management of Cofrac assessors and experts

In order to be in phase with the vocabulary used in the NF EN ISO/IEC 17011 standard, the reference system applicable to the accreditation bodies, the term "audit" was replaced by "assessment" in the applicable Cofrac documents. This update also led to the replacing of the term "auditor" with "assessor".

These modifications have been in effect at Cofrac since the implementation of the new process of management of assessors and experts in 2007.

In general, an assessor is a person appointed by an accreditation body to carry out, alone or as a member of an assessment team, an on-site assessment of a Conformity Assessment Body (OEC), in other words, the verification bodies in the field of legal metrology.

It is important to provide a reminder of a few definitions with regard to the various qualifications of existing assessors.

- A quality assessor (formerly called a quality auditor) is a person who has the competence and qualifications necessary to carry out an assessment of a quality management system of a body with respect to the applicable reference systems.
- A technical assessor (formerly called a technical expert) is a person who has the competence and qualifications necessary to carry out an assessment of the technical competence of a body for the specific fields of the requested field of accreditation with respect to the applicable reference systems.

Following the implementation of this new process of management of assessors and experts, the notion of technical expert was completely modified: it is now a person who provides specific knowledge or expertise for the assessment of a body. A technical expert can therefore intervene to support the assessment team on specific points (e.g. the method implemented), but does not act as an assessor.

These notions are supplemented by the notion of assessment manager: this person is a quality or technical assessor who has the competence and qualifications necessary to take on the entire responsibility for the specified assessment activities. The assessment manager leads an assessment team.

The term "technical auditor", used in the past, was thus replaced by the term "technical assessor – assessment manager".

Cofrac's assessor and expert recruitment and management process involves five main steps:

- Selection, after identification of the need, involving validation of the personal capacities and technical competencies expected of the candidate.
- Training in the reference system and assessment techniques, given by the permanent structure of Cofrac.
- Qualification, declared at the end of the above steps, if the required conditions are met.
- Monitoring of performance and competence throughout the qualification period.
- Renewal of the qualification, based on examination of all of the elements for the monitoring of performance and competency, supplemented by the examination of a supervision report for the assessors.

The MID includes such requirements regarding the competence that the assessment team must have in the case of assessment of the quality systems of manufacturers and this must also apply in the case of assessment of bodies in charge of a metrological control operation.

The "world of legal metrology" is relatively limited and, in consequence, the number of competent technical assessors can sometimes be limited, particularly for competencies in initial verification and especially type approval for application to a given category of measuring instruments, especially as there is a limited volume of activity for some categories.

Moreover, it is very desirable that a body be assessed by different technical assessors in the course of successive assessments. We can easily understand that a newly assessed quality system cannot claim to be perfect at the end of the first assessment and it is only after several assessments that it will be moving towards this perfection. The impossibility of detecting all of the imperfections of a quality assurance system at the first attempt is due to the impossibility of being exhaustive during an assessment and to the sensitivity or the favorite areas of interest of the assessors.

Furthermore, with rare exceptions, in the initial stages of the implementation of a field of accreditation in legal metrology, it may be that all of the technical and regulatory competencies required are only available among the agents who were in charge of the control operations in question, often State agents, when the definition of the field of accreditation is done jointly with the delegation of the operations to the bodies. Several difficulties may then arise:

1) The availability of the agents who could contribute to the assessments: if a decision is made to delegate the controls, it is often because people have too much to do and want to focus their activities in other fields. On this level, the hierarchy of the agent can have a very substantial effect.
2) The will of the agents to contribute to the effort of delegation of the controls to bodies: while is it fortunately not true for everyone, some people feel frustration when they see their activity, which they liked, assigned to others. It is also necessary to be willing to acquire knowledge of quality assurance because the accrediting body cannot call on people who have no knowledge in this field, even to assess the regulatory and technical aspects.
3) Maintaining the competencies of the agents initially in charge of the activities: while the State must take all of the measures necessary to guarantee the appropriate competence of its agents so that they can carry out efficient surveillance of the bodies, it is undeniable that the fact that it no longer carries out metrological control operations itself contributes to a decline in the level of the former technical competencies, while requiring the acquisition of new competencies, particularly in terms of the management and surveillance of the bodies.

Lastly, the fact must be taken into account that the bodies to which we want to delegate the controls must make major efforts to achieve this: developing quality systems, verification procedures, uncertainty calculations, etc. They could theoretically be reticent about the fact that assessment teams would include people from potentially competing companies. However, accreditation is based on the principle of peer evaluations. Measures are thus taken so that a technical assessor from a verification body can work within a potentially competing body while guaranteeing the necessary impartiality and confidentiality that the bodies being assessed have the right to expect.

For all of these reasons, the accrediting body, in concert with the administration involved, must manage its "pool" of assessors with great care - even strictness - and with diplomacy.

In light of all of this, in general, during the development of a new field of accreditation by Cofrac for the control operations and categories of measuring instruments involved, the technical assessors were, initially, almost exclusively provided by the government. Then, the bodies had to be made to understand that they must work towards a system in which the technical assessors would also come from potentially competing bodies, as is common practice in other fields.

As mentioned above, the accrediting body must guarantee the appropriate selection, training and qualification of the assessors in charge of the assessments, following a strict process.

4.2.5 Responsibility of the State and follow-up

a) Surveillance and renewal of decisions

The EC Regulation concerning accreditation mentioned in 4.1.3 does not specify whether the national Authorities must leave everything exclusively to the conclusions of the national accreditation body or whether they can – or must – carry out actions independently of those of the national accreditation body to decide to designate a conformity assessment body. The usual logic would be that the national Authorities maintain their prerogatives. Practice will show us how the Member States of the European Union apply this aspect.

In the meantime, and until now, as already mentioned, the French Authorities in charge of metrology considered that recourse to accreditation did not release them from their responsibility or from taking actions

that they consider useful for assessing a body. They authorize the bodies to carry out activities under the responsibility of the State, and they consider that it is their duty, in parallel with the action taken by the accrediting body, to establish a personal conviction about the quality of the action of the bodies.

So while decisions to renew authorizations are made based on assessments that are not as in-depth as traditional audits, the administration continues to carry out systematic periodic assessments (every year, in greater or lesser depth from one year to another), in the form of inspections referred to as "in-depth" (the term used for contrast with the unexpected inspections that are also done). Accreditation is assumed to have taken all of the aspects into account but, nevertheless, these in-depth inspections lead to additional verifications on essential points relating to the application of the regulation. In addition, it is always useful to maintain contact with the bodies to better understand their particular problems or the potential generic problems.

Whenever it is appropriate, the administration also organizes unexpected surveillance inspections intended to verify how the operators of the bodies work when the authorities are not present. This appears to be a complement that is very useful, or even necessary, with respect to the activity of the accrediting body, which conventionally works solely on the basis of assessments, and which therefore only meets the accredited body and its operators after it has notified the body of its visit.

b) Follow-up

Moreover, we should not believe that once accreditation is established, the administration no longer has anything to do.

At the time of its implementation, the difficulties must be handled, in particular dealing with the needs for possible postponement of the date by which accreditation will be mandatory. The French experience is significant in this regard: while accreditation has always turned out to be possible when it was decided, until the recent past, this was not possible within the period that was initially set, it was necessary to extend the period that was initially set by the regulatory text imposing accreditation.

At cruising speed, beyond the usual problems of application of the regulation, the administration can be called on to give its opinion on aspects caused by the accreditation, linked to the interpretation of a regulatory requirement. It is obviously necessary to know how to manage this without detracting from the prerogatives of the accreditation body and in cooperation with it.

The administration may also have to deal with a dilemma when the authorization depends on accreditation, the metrological control operations are done by a body in a situation of monopoly or quasi-monopoly of the activity, and this body no longer meets the accreditation criteria. The administration must then be prepared to deal with this deficiency that could bring the application of the regulation into question.

5 Conclusion

The French experience has shown that accreditation always led to improvement of the competence of the bodies in charge of metrological control operations, and to harmonization of the level of competence and the quality of the services of the various bodies in the fields where competition between bodies is necessary.

While certain government departments are certainly capable of assessing the capability of bodies to carry out metrological control operations, accreditation can only provide an improvement concerning this assessment and the harmonization of practices. This is due to the professionalism of the accrediting bodies, which work according to the rules and with the tools provided for this purpose: choice of the appropriate benchmarks, choice of the most competent assessors, and repetition of the assessments by different technical assessors during successive assessments.

Metrological control operations are very specific. While they may have similarities with assessments of products in various other fields, for example in the field of industrial safety, each field involves specific competences and practices and is covered by specific regulations.

Moreover, while the metrological control operations lead to the same end, the quality of the measurements made in service, they imply different rules depending on whether we assess the design of a measuring instrument, or whether we consider the level of control of production or inspection of the instruments in service.

The result is that accreditation from a universal standpoint makes no sense, but rather it is necessary to be accredited for a specific operation. Consequently, the accreditation benchmark, and especially the standard used to assess the bodies can be different from one control operation to another. Very often, the specificity of the fields linked to metrology and the specificity of each of the various control operations lead to supplementing the generic standards with specific guides to better specify the accreditation benchmarks.

Up until now, relatively few national Authorities resorted to accreditation to assess the competence of bodies. The European Union has just realized that accreditation was practically unavoidable for doing this. The authors of this article are betting that in a few years, recourse to accreditation will be the general rule.

This will require some thought. The French experience demonstrated in particular that we must think about philosophical questions such as "Which came first, the chicken or the egg?" More concretely: must accreditation be a prerequisite to the authorization of the bodies or should it come at a certain lapse of time after a provisional authorization? Strictly speaking, the full competence of the bodies can only be confirmed when they actually carry out the tasks for which they were approved. In the case of a regulation however, the body cannot operate without having been authorized by the State. As we can see, if we make it such that authorization depends on prior accreditation, in theory, we are going round in circles. This led the French Authorities in charge of metrology and the accreditation body to conclude that a provisional authorization, prior to any accreditation, should be the rule. It seems that Europe considers today that accreditation must constitute a prerequisite to any intervention of the bodies. This merits some thinking on the way to achieve this.

Independently of the need for the Authorities to assess the competence of the bodies prior to any accreditation or not, the recourse to accreditation does not discharge the Authorities from their responsibilities and should therefore not lead them to rely exclusively on the assessments done by the accreditation bodies. The Authorities should maintain an ability to assess bodies, which is not contradictory with the taking into account of the conclusions of the assessments organized by the accreditation bodies. Let us remember that the Authorities in charge of a regulation have prerogatives that an accreditation body does not have, which can lead them to investigate aspects that are complementary to those which an accreditation body would consider.

Consequently, and in conclusion, an authorization of a body in charge of metrological control operations should be subject to the obtaining of a specific accreditation to establish its competence and its impartiality. This accreditation must be considered as a necessary – but not sufficient – condition for obtaining the authorization. Recourse to accreditation does not discharge the Authority from its responsibilities and, in particular, from the need to implement the appropriate forms of surveillance of the bodies in charge of metrological control operations. ■

Editor's note: This article was originally written in French and was translated into English. The French text will be published in a later edition of the OIML Bulletin.

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OIML Systems

Basic and MAA Certificates registered 2010.11–2011.02

Information: www.oiml.org section "OIML Systems"

The OIML Basic Certificate System

The *OIML Basic Certificate System for Measuring Instruments* was introduced in 1991 to facilitate administrative procedures and lower the costs associated with the international trade of measuring instruments subject to legal requirements. The System, which was initially called "OIML Certificate System", is now called the "OIML Basic Certificate System". The aim is for "OIML Basic Certificates of Conformity" to be clearly distinguished from "OIML MAA Certificates".

The System provides the possibility for manufacturers to obtain an OIML Basic Certificate and an OIML Basic Evaluation Report (called "Test Report" in the appropriate OIML Recommendations) indicating that a given instrument type complies with the requirements of the relevant OIML International Recommendation.

An OIML Recommendation can automatically be included within the System as soon as all the parts - including the Evaluation Report Format - have been published. Consequently, OIML Issuing Authorities may issue OIML Certificates for the relevant category from the date on which the Evaluation Report Format was published; this date is now given in the column entitled "Uploaded" on the Publications Page.

Other information on the System, particularly concerning the rules and conditions for the application, issue, and use of OIML Certificates, may be found in OIML Publication B 3 *OIML Certificate System for Measuring Instruments* (Edition 2003, ex. P 1) and its *Amendment* (2006) which may be downloaded from the Publications page. ■

The OIML MAA

In addition to the Basic System, the OIML has developed a *Mutual Acceptance Arrangement* (MAA) which is related to OIML Type Evaluations. This Arrangement - and its framework - are defined in OIML B 10-1 (Edition 2004) and its Amendment (2006), and B 10-2 (2004).

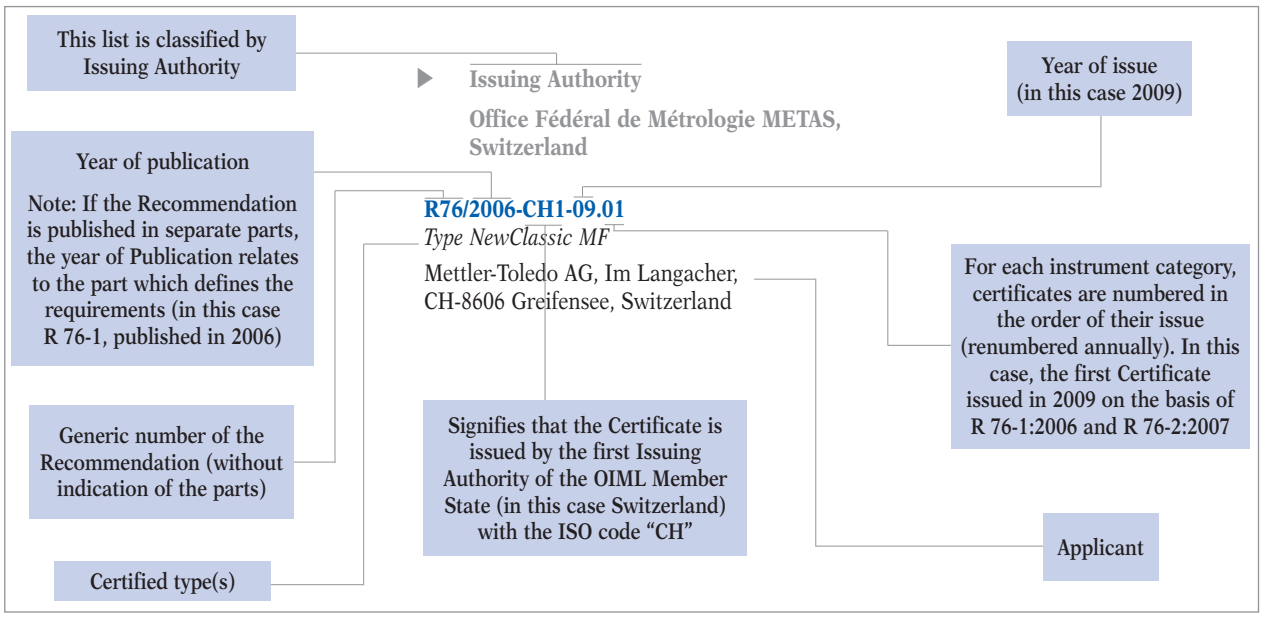
The OIML MAA is an additional tool to the OIML Basic Certificate System in particular to increase the existing mutual confidence through the System. It is still a voluntary system but with the following specific aspects:

- Increase in confidence by setting up an evaluation of the Testing Laboratories involved in type testing;
- Assistance to Member States who do not have their own test facilities;
- Possibility to take into account (in a Declaration of Mutual Confidence, or DoMC) additional national requirements (to those of the relevant OIML Recommendation).

The aim of the MAA is for the participants to accept and utilize MAA Evaluation Reports validated by an OIML MAA Certificate of Conformity. To this end, participants in the MAA are either Issuing Participants or Utilizing Participants.

For manufacturers, it avoids duplication of tests for type approval in different countries.

Participants (Issuing and Utilizing) declare their participation by signing a Declaration of Mutual Confidence (Signed DoMCs). ■



INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

Diaphragm gas meters
Compteurs de gaz à parois déformables

R 31 (1995)

▶ Issuing Authority / *Autorité de délivrance*
State General Administration for Quality Supervision and Inspection and Quarantine (AQSIQ), China

R031/1995-CN1-2010.01
Diaphragm gas meter - Type: G1.6
Chongqing Shancheng Gas Equipment Co. Ltd., Shimahe, Jiangbei District, CN-400021 Chongqing, P.R. China

R031/1995-CN1-2010.02
Diaphragm gas meter - Type: G2.5
Chongqing Shancheng Gas Equipment Co. Ltd., Shimahe, Jiangbei District, CN-400021 Chongqing, P.R. China

R031/1995-CN1-2010.03
Diaphragm gas meter - Type: G4
Chongqing Shancheng Gas Equipment Co. Ltd., Shimahe, Jiangbei District, CN-400021 Chongqing, P.R. China

▶ Issuing Authority / *Autorité de délivrance*
Russian Research Institute for Metrological Service (VNIIMS)

R031/1995-RU1-2011.01
Diaphragm gas meter
Wizitdongdo Co. Ltd., 633-7 Sunggok-Dong, Danwon-Gu, Ansan City, #425-833 KR-Gyeonggi-Do, Korea (R.)

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

Water meters intended for the metering of cold potable water
Compteurs d'eau destinés au mesurage de l'eau potable froide

R 49 (2006)

▶ Issuing Authority / *Autorité de délivrance*
Czech Metrology Institute (CMI), Czech Republic

R049/2006-CZ1-2010.01
Volumetric water meter - Type: PD-LFC
Ningbo Water Meter Co. Ltd., No. 99, Lane 268, Beihai Road, CN-315033 Ningbo, P.R. China

R049/2006-CZ1-2010.02
Volumetric water meter - Type: PD-SDC
Ningbo Water Meter Co. Ltd., No. 99, Lane 268, Beihai Road, CN-315033 Ningbo, P.R. China

R049/2006-CZ1-2010.03
Woltman water meter - Type: WP-LFC
Ningbo Water Meter Co. Ltd., No. 99, Lane 268, Beihai Road, CN-315033 Ningbo, P.R. China

R049/2006-CZ1-2010.04
Woltman water meter - Type: WP-SDC
Ningbo Water Meter Co. Ltd., No. 99, Lane 268, Beihai Road, CN-315033 Ningbo, P.R. China

▶ Issuing Authority / *Autorité de délivrance*
National Measurement Office (NMO), United Kingdom

R049/2006-GB1-2007.01 Rev. 2
Family of cold-water meters utilising a common, volumetric measuring element, with a nominal capacity of 36 revs/litre and having a rated permanent flowrate Q_3 of 2.5m^3/h.
Elster Metering Limited, Pondwicks Road, Luton, Bedfordshire LU1 3LJ, United Kingdom

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

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

R 51 (2006)

▶ Issuing Authority / *Autorité de délivrance*
National Measurement Office (NMO), United Kingdom

R051/2006-GB1-2009.03 Rev. 1
9000 Series Checkweigher/Weight or Weight-Price labeller
Marel Ltd. (AEW Delford System), Wyncolls Road, Severalls Industrial Park, Colchester CO4 9HW, United Kingdom

R051/2006-GB1-2009.05 Rev. 1
D3 family of checkweighers
Prisma Industriale S.R.L., Via la Bionda 17, IT-43036 Fidenza (PR), Italy

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

R060/2000-ES1-2010.03
Strain gauge beam (shear) load cell
Tecnicas de Electronica Y Automatismos S.A., C/Espronceda 176, ES-Barcelona, Spain

R060/2000-ES1-2010.04
Strain gauge bending load cell
Tecnicas de Electronica Y Automatismos S.A., C/Espronceda 176, ES-Barcelona, Spain

▶ Issuing Authority / *Autorité de délivrance*
State General Administration for Quality Supervision and Inspection and Quarantine (AQSIQ), China

R060/2000-CN1-2009.02 Rev. 1 (MAA)
Load cell PA28
Beijing True-Tec Co. Ltd., 4/F, Bldg. 2, No. 8, Hong Da Bei Lu, BDA, CN-100176 Beijing, P.R. China

R060/2000-CN1-2010.01 (MAA)
Load cell MB35
Hottinger Baldwin Measurement (Suzhou) Co. Ltd., 106 Hengshan Road, CN-215009 Suzhou, P.R. China

R060/2000-CN1-2010.02 (MAA)
Load cell PA6140
Yuyao Pacific Weighing Engineering Co. Ltd. (China), 50 Tianjialing East Road Yuyao, CN-315400 Yuyao Zhejiang Province, P.R. China, P.R. China

R060/2000-CN1-2010.03 (MAA)
Load cell CB005
Minnebea Co. Ltd., 1-1-1 Katase, Fujisawa-shi, CN-Kanagawaken, P.R. China

▶ Issuing Authority / *Autorité de délivrance*
Laboratoire National de Métrologie et d'Essais, Certification Instruments de Mesure, France

R060/2000-FR2-2009.02 Rev. 1 (MAA)
S-type tension load-cell, ZA 30 X series, with strain gauges, tested as part of a weighing instrument
Scaime S.A.S, Z.I. de Juvigny, B.P. 501, FR-74105 Annemasse Cedex, France

R060/2000-FR2-2011.01 (MAA)
Single point load cell (Type AX., with strain gauges, tested as part of a weighing instrument)
Scaime S.A.S, Z.I. de Juvigny, B.P. 501, FR-74105 Annemasse Cedex, France

▶ Issuing Authority / *Autorité de délivrance*
International Metrology Cooperation Office, National Metrology Institute of Japan (NMIJ) National Institute of Advanced Industrial Science and Technology (AIST), Japan

R060/2000-JP1-2010.19 (MAA)
Beam (bending) load cell - Type: C3B1-200K, C3B1-300K, C3B1-500K, C3B1-1T, C3B1-2T, C3B1-3T, C3B1-5T
Minebea Co. Ltd., 1-1-1 Katase Fujisawa-shi, JP-251-8531 Kanagawa-ken, Japan

R060/2000-JP1-2010.20 (MAA)
Compression load cell - Type: CC2-10T, CC2-20T, CC2-30T, CC2-50T, RCC2-10T, RCC2-20T, RCC2-30T, RCC2-50T, KCC2-10T, KCC2-20T, KCC2-30T, KCC2-50T
Yamato Scale Co. Ltd., 5-22 Saenba-cho, JP-673-8688 Akashi, Hyogo, Japan

R060/2000-JP1-2010.20 Rev. 1 (MAA)
Compression load cell - Type: CC2-10T, CC2-20T, CC2-30T, CC2-50T, RCC2-10T, RCC2-20T, RCC2-30T, RCC2-50T, KCC2-10T, KCC2-20T, KCC2-30T, KCC2-50T, CC21-12T, CC21-24T, CC21-36T, RCC21-12T, RCC21-24T, RCC21-36T, KCC21-12T, KCC21-24T, KCC21-36T
Yamato Scale Co. Ltd., 5-22 Saenba-cho, JP-673-8688 Akashi, Hyogo, Japan

R060/2000-JP1-2011.01 (MAA)
Compression load cell - Type: DCC1-20T, DCC1-24T, DCC1-36T
Yamato Scale Co. Ltd., 5-22 Saenba-cho, JP-673-8688 Akashi, Hyogo, Japan

R060/2000-JP1-2011.02 (MAA)
Beam (shear) load cell - Type: LB-XD-300L-HC, LB-XD-600L-HC, LB-XD-1.5T-HC
Kubota Corporation, 1-2-47 Shikitsu-higashi, Naniwa-ku, JP-556-8601 Osaka, Japan

Issuing Authority / *Autorité de délivrance*

National Measurement Office (NMO), United Kingdom

R060/2000-GB1-2010.06
Stainless steel, shear beam strain gauge load cell
Societa Cooperativa Bilanciai s.r.l, Via S. Ferrari, 16, IT-41011 Campogalliano, Campogalliano (Modena), Italy

R060/2000-GB1-2010.07
Stainless steel, shear beam strain gauge load cell
B & T Weighing System (Kunshan) Co. Ltd., Zhu Jia Wan Road, Zhou Shi Town, Kunshan, Jiangsu, P.R. China

R060/2000-GB1-2010.08
Stainless steel compression strain gauge load cell
Danlesco Gulf LLC, P.O. Box 50468, AE-Dubai, United Arab Emirates

Issuing Authority / *Autorité de délivrance*

NMi Certin B.V., The Netherlands

R060/2000-NL1-2010.16 (MAA)
Single point load cell - Type: UDB
Keli Electric Manufacturing (Ningbo) Co. Ltd., No. 199 Changxing Road, Jiangbei District, CN-315033 Ningbo, P.R. China

R060/2000-NL1-2010.17 (MAA)
Single point load cell - Type: UDJ
Keli Electric Manufacturing (Ningbo) Co. Ltd., No. 199 Changxing Road, Jiangbei District, CN-315033 Ningbo, P.R. China

R060/2000-NL1-2011.01 (MAA)
Bending beam load cell - Type: UDN
Keli Electric Manufacturing (Ningbo) Co. Ltd., No. 199 Changxing Road, Jiangbei District, CN-315033 Ningbo, P.R. China

Issuing Authority / *Autorité de délivrance*

Physikalisch-Technische Bundesanstalt (PTB), Germany

R060/2000-DE1-2010.09
Strain gauge shear beam load cell - Type: BM8H
Zhonghang Electronic Measuring Instruments Co. Ltd. (ZEMIC), P.O. Box 2, CN-723007 Hanzhong, ShaanXi, P.R. China

R060/2000-DE1-2010.10 (MAA)
Strain gauge double bending beam load cell - Type: ILY-SS
Keli Electric Manufacturing (Ningbo) Co. Ltd., No. 199 Changxing Road, Jiangbei District, CN-315033 Ningbo, P.R. China

R060/2000-DE1-2010.12
Strain gauge tension load cell - Type: MP76
Sartorius Mechatronics T&H GmbH, Meiendorfer Strasse 205, DE-22145 Hambourg, 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*

Dansk Elektronik, Lys & Akustik (DELTA), Denmark

R076/1992-DK3-2011.01
Non-automatic weighing instrument - Type: TEB / MEB
Tüm Elektronik Mühendislik San. Ve Tic. Ltd.Sti., Istanbul Deri Organize San. Bölgesi, I. Yol, H7 Parsel, Orhanlr, TR-34956 Tuzla, Istanbul, Turkey

Issuing Authority / *Autorité de délivrance*

National Measurement Office (NMO), United Kingdom

R076/1992-GB1-2009.08 Rev. 3
Non-automatic weighing instrument designated the AWB120
Avery Weigh-Tronix Ltd., Foundry Lane, Smethwick, West Midlands B66 2LP, United Kingdom

R076/1992-GB1-2010.01 Rev. 3
XM Series, Models XM 100, XM 200, XM 400, XM 410, XM 420, XM 500, XM 601 and XM 603 non-automatic weighing instruments
Avery Weigh-Tronix Ltd., Foundry Lane, Smethwick, West Midlands B66 2LP, United Kingdom

Issuing Authority / *Autorité de délivrance*

NMi Certin B.V., The Netherlands

R076/1992-NL1-2010.20 Rev. 1 (MAA)
Non-automatic weighing instrument - Type: DS-676
Shanghai Teraoka Electronic Co. Ltd., Tinglin Industry Developmental Zone, Jinshan District, CN-201505 Shanghai, P.R. China

R076/1992-NL1-2010.37 (MAA)
Non-automatic weighing instrument - Type: NS-608N

Teraoka Seiko Co. Ltd., 13-12 Kugahara, 5-Chome, Ohta-ku, JP-146-8580, Tokyo, Japan

R076/1992-NL1-2010.38 (MAA)
Non-automatic weighing instrument - Type: DS-676SS

Shanghai Teraoka Electronic Co. Ltd., Tinglin Industry Developmental Zone, Jinshan District, CN-201505 Shanghai, P.R. China

R076/1992-NL1-2010.40
Non-automatic weighing instrument - Type: XS..., XP..., XA..., XJ... or QD...

Mettler-Toledo GmbH, Im Langacher, CH-8606 Greifensee, Switzerland

R076/1992-NL1-2010.50

Non-automatic weighing instrument - Type: DS-866... / DS-867
Shanghai Teraoka Electronic Co. Ltd., Tinglin Industry Developmental Zone, Jinshan District, CN-201505 Shanghai, P.R. China

R076/1992-NL1-2011.02 (MAA)
Non-automatic weighing instrument - Type: DS-520III / DS-530III

Shanghai Teraoka Electronic Co. Ltd., Tinglin Industry Developmental Zone, Jinshan District, CN-201505 Shanghai, P.R. China

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

Physikalisch-Technische Bundesanstalt (PTB), Germany

R076/1992-DE1-2005.10 Rev. 1
Non-automatic electromechanical weighing instrument for persons - Types: M704x2 / M764x2 / COS01A

Seca GmbH & Co. KG., Hammer Steindamm 9-25, DE-22089 Hamburg, Germany

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

Swedish National Testing and Research Institute AB, Sweden

R076/1992-SE1-2009.01 Rev. 1
Graduated, self-indicating, electronic, single or multi-interval non-automatic weighing instrument - Type: UNI-7P, UNI-7 H, UNI-7 EV1, UNI-7 EV2, UNI-7 SS, UNI-7B, UNI-7 RP, UNI-5 B, UNI-5 P, UNI-5 EV1, UNI-5 SS

Ishida Co. Ltd., 44, Sanno-cho, Shogoin, Sakyo-ku, JP-606-8392 Kyoto, Japan

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

Non-automatic weighing instruments
Instruments de pesage à fonctionnement non automatique

R 76-1 (2006), R 76-2 (2007)

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

Office Fédéral de Métrologie METAS, Switzerland

R076/2006-CH1-2008.01
Non-automatic electromechanical weighing instrument - Type: MEAG

Bühler AG, CH-9240 Uzwil, Switzerland

R076/2006-CH1-2008.02
Non-automatic electromechanical wheel or axle weighing instrument - WL 104

Haenni Wheel Load Scales, Bernstrasse 59, CH-3303 Jegenstorf, Switzerland

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

NMi Certin B.V., The Netherlands

R076/2006-NL1-2010.39
Non-automatic weighing instrument - Type: RM-60

Shanghai Teraoka Electronic Co. Ltd., Tinglin Industry Developmental Zone, Jinshan District, CN-201505 Shanghai, P.R. China

R076/2006-NL1-2010.48 (MAA)
Non-automatic weighing instrument - Type: SM-5600

Teraoka Weigh-System PTE Ltd., 4 Leng Kee Road, #05-03/04/05 & 11, SIS Building, SG-159088 Singapore, Republic of Singapore

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

Physikalisch-Technische Bundesanstalt (PTB), Germany

R076/2006-DE1-2011.01 (MAA)
Non-automatic electromechanical instrument - Type: EL...

Bizerba GmbH & Co. KG, Wilhelm-Kraut-Strasse 65, DE-72336 Balingen, Germany

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

Fuel dispensers for motor vehicles
Distributeurs de carburant pour véhicules à moteur

R 117 (1995) + R 118 (1995)

▶ Issuing Authority / *Autorité de délivrance*
State General Administration for Quality Supervision and Inspection and Quarantine (AQSIQ), China

R117/1995-CN1-2010.01
Fuel dispenser - RT-C 112, RT-C 122, RT-C 124, RT-C 222, RT-C 224

WenZhou Realtech Petroleum Equipment Ltd. Company, West 1/F, Building 1, No. 108 Juguang Middle Road, Juguangyuang, CN- 325029 WenZhou City, Zhejiang, P.R. China

▶ Issuing Authority / *Autorité de délivrance*
NMi Certin B.V.,
The Netherlands

R117/1995-NL1-2010.01
Fuel Dispenser for Motor Vehicles - Type: Quantium XXXX

Tokheim Group S.A.S., Paris-Nord 2, 5 rue des Chardonnerets, BP 67040, Tremblay en France, FR-95971 Roissy Ch de Gaulle Cedex, France

R117/1995-NL1-2010.01 Rev. 1
*Fuel Dispenser for Motor Vehicles - Type: Quantium Q120T; Q220T; Q320T; Q420T; Q520T; XXXX**

Tokheim Group S.A.S., Paris-Nord 2, 5 rue des Chardonnerets, BP 67040, Tremblay en France, FR-95971 Roissy Ch de Gaulle Cedex, France

▶ Issuing Authority / *Autorité de délivrance*
Swedish National Testing and Research Institute AB, Sweden

R117/1995-SE1-2005.01 Rev. 3
One or two sided fuel pumps/dispensers for motor vehicles type

Dresser Wayne Inc., 3814 Jarrett Way, US-Austin TX 78728, United States

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

Evidential breath analyzers
Éthylomètres

R 126 (1998)

▶ Issuing Authority / *Autorité de délivrance*
Physikalisch-Technische Bundesanstalt (PTB), Germany

R126/1998-DE1-2011.01
Evidential breath alcohol analyzer - Type: Alcotest 7510

Drager Safety AG & Co. KGAA, Revalstrasse 1, D-23560 Lubeck, Germany

OIML CERTIFICATE SYSTEM

List of OIML Issuing Authorities

*The list of OIML Issuing Authorities is published in each issue of the OIML Bulletin. For more details, please refer to our web site: www.oiml.org/certificates. Changes since the last issue of the Bulletin are marked in **red**.*

		R 16	R 21	R 31	R 49	R 50	R 51	R 58	R 60	R 61	R 75	R 76	R 81	R 85	R 88	R 93	R 97	R 98	R 99	R 102	R 104	R 105	R 106	R 107	R 110	R 112	R 113	R 114	R 115	R 117/118	R 122	R 126	R 128	R 129	R 133	R 134	R 136
AT1	Bundesamt für Eich- und Vermessungswesen (BEV)					■	■	■		■		■		■	■		■	■		■	■		■	■	■			■	■	■								
AU1	National Measurement Institute (NMI)				■	■	■		■			■		■									■	■						■		■		■				
BE1	SPF Economie, PME, Classes Moyennes et Energie											■					■	■																			
BG1	State Agency for Metrology and Technical Surveillance (SAMTS)											■						■																			
BR1	Instituto Nacional de Metrologia, Normalização e Qualidade Industrial (INMETRO)											■																									
CH1	Office Fédéral de Métrologie (METAS)	■		■	■	■	■		■	■		■					■	■				■	■	■						■							
CN1	General Administration of Quality Supervision, Inspection and Quarantine of P. R. China (AQSIQ)								■			■					■	■																			
CZ1	Czech Metrology Institute (CMI)				■							■	■	■								■								■					■		
DE1	Physikalisch-Technische Bundesanstalt (PTB)	■		■	■	■	■	■	■	■		■		■	■		■	■	■	■	■	■	■	■	■			■	■	■		■	■	■	■		■
DK1	The Danish Accreditation and Metrology Fund (DANAK)					■	■		■	■		■						■				■	■	■						■				■		■	
DK2	FORCE Certification A/S				■																																
DK3	Dansk Elektronik, Lys & Akustik (DELTA)					■	■		■	■		■											■	■										■		■	
ES1	Centro Español de Metrología (CEM)				■		■		■	■		■					■	■															■				
FI1	Inspecta Oy					■	■		■	■		■		■									■	■						■							
FR1	Ministère de l'Economie, de l'Industrie et de l'Emploi (MEIE)	*All activities and responsibilities were transferred to FR2 in 2003*																																			
FR2	Laboratoire National de Métrologie et d'Essais (LNE)			■	■	■	■	■	■	■		■		■	■		■	■		■		■	■	■	■			■	■	■		■		■			
GB1	National Measurement Office (NMO) - Formerly NWML		■		■	■	■		■	■	■	■		■				■				■	■	■						■				■		■	
GB2	National Physical Laboratory (NPL)																■																			
HU1	Hungarian Trade Licensing Office (MKEH)											■																									
JP1	National Metrology Institute of Japan / National Institute of Advanced Industrial Science and Technology (NMIJ / AIST)								■			■																	■	■							
KR1	Metrology and Measurement Division (KATS)											■																									
NL1	NMi Certin B.V.		■	■	■	■	■		■	■		■	■	■			■		■			■	■	■						■		■	■	■		■	
NL2	KIWA Nederland B.V.				■																																
NO1	Norwegian Metrology Service (Justervesenet)					■	■			■		■										■	■	■						■				■			
NZ1	Measurement and Product Safety Service (MAPSS Wellington)											■																									
PL1	Central Office of Measures (GUM)											■						■		■																	
RO1	Bureau Roumain de Métrologie Légale (B.R.M.L.)																■	■							■			■	■								
RU1	Russian Research Institute for Metrological Service (VNIIMS)			■	■	■	■	■	■	■		■		■	■	■	■	■		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
SE1	Swedish National Testing and Research Institute AB (S.P.)					■	■		■	■		■		■				■					■	■						■							
SI1	Metrology Institute of the Republic of Slovenia (MIRS)											■																									
SK1	Slovak Legal Metrology				■							■																		■							
US1	NCWM, Inc.								■			■																									
VN1	Directorate for Standards and Quality (STAMEQ)											■																									

RLMO NEWS

The 2011 AFRIMETS Metrology School

7–16 February 2011

Nairobi, Kenya

Sara Prins, NMISA
Ian Dunmill, BIML

The first of its kind, the 2011 AFRIMETS Metrology School aimed to give young metrologists from Africa an introduction to the components that make up a sound measurement system for a country, and to give them hands-on experience in a number of technical fields. It was designed to introduce standards, quality, accreditation and metrology in a balanced way over ten days. The School was therefore an opportunity to equip a younger generation of metrologists with the knowledge necessary to build the African metrology infrastructure to an internationally accepted level.

The School was officially opened with welcome messages from the Norwegian Ambassador to Kenya – Per Ludvig Magnus, UNIDO's Director of the Capacity Building Branch – Lalith Goonatilake, UNIDO's representative in Nairobi – Ola Alterå, Managing Director of the Kenyan Bureau of Standards – Joseph Koskey and AFRIMETS Chairperson – Wynand Louw. A keynote speech by the Kenyan Assistant Minister of Industrialisation – Ndiritu Mureithi, completed the opening ceremony.

Over the first three days, plenary sessions with simultaneous interpretation in English and French covered:

- quality infrastructures,
- scientific metrology,
- legal metrology,
- standards,
- testing,
- accreditation, and
- quality systems.

Participants were also given an overview of AFRIMETS, and an overview of the PTB's and UNIDO's programmes in Africa.

The programme then became more specific, and several internationally renowned scientists shared their knowledge in their particular areas of expertise:

- measurement uncertainty,
- the International System of Units,
- mass metrology,
- dimensional metrology,
- thermometry,
- electrical metrology.

As well as lectures in these areas, practical sessions were organised in the laboratories of the Kenya Weights and Measures Department and the Kenyan Bureau of Standards (KEBS).

In addition to the lectures and laboratory exercises, participants also visited several Kenyan industries:

- General Motors East Africa Ltd,
- GlaxoSmithKline Ltd,
- Kenya Breweries Ltd,
- New Kenya Cooperative Creameries Ltd,
- Petroleum & Industrial Services Ltd.

During the visits, the participants were given the task of assessing the implementation of quality, standards and metrology, and their effect on the success of these industries. Over the course of the week following the visits, participants then worked hard in groups to produce reports on their experiences. On the final day of the School, the groups presented their findings to all the participants, presenters and invited industry representatives and replied to questions.

The school brought together around 80 metrologists from 34 African countries, and there were 7 participants from Asian and American countries, which enabled some networking and inter-regional knowledge exchange.

Some of the participants came from countries where no metrology infrastructure currently exists, and the aim of the School in these cases was to raise awareness.

The 2011 Metrology School was part of a project for the institutional strengthening of the Intra-Africa Metrology System (AFRIMETS) and was funded by the Norwegian Agency for Development Cooperation (NORAD) and the United Nations Industrial Development Organization (UNIDO).

A more detailed article on the School will follow in a future OIML Bulletin. ■

RLMO NEWS

Report on the 25th SADCMEL meeting

BRIAN BEARD, SADCMEL Secretariat

1 General

The 25th SADCMEL annual meeting was held in Gaborone, Botswana on 23 March 2011. It was attended by 12 of the 14 member states of the Southern African Development Community (SADC), one associate member and several observers including representatives of the BIML (Ian Dunmill) and the PTB (Kathrin Wunderlich and Martin Kaiser). The meeting was preceded by technical committee meetings dealing with requirements for prepackages and instruments.

2 Current Membership and office bearers

SADCMEL permanent members are made up of the 14 SADC member states. It has 4 associate members who represent the legal metrology organizations of Ethiopia, Ghana, Kenya and Uganda. SADCMEL is a member of AFRIMETS which is the Pan African Metrology Organization and participates in its activities with the view of strengthening legal metrology activities in the region. At present SADCMEL is chaired by Botswana, represented by Mr. D.D. Tau, and South Africa holds the Secretariat with the Regional coordinator being Mr. K. Temba.

3 SADCMEL Technical Committee meetings – 21 March 2011

3.1 SADCMEL TC 1 – Sale of Products

In an effort to harmonize technical regulations in the region the requirements in OIML Recommendations are used wherever possible. Where OIML requirements are not entirely suitable regional requirements are developed. Comprehensive requirements have therefore been developed for prepackages, namely SADCMEL Document 1 "Labelling requirements for prepackaged products and general requirements for the sale of goods" (based on OIML R 79) and SADCMEL Document 4 "Tolerances permitted for the accuracy of measurement made in terms of legal metrology legislation including the measurement of goods when prepackaged or when measured at the time of sale or in pursuance of sale, and requirements for inspection of prepackages". Proposals for the amendment of these documents were discussed and agreed to at the TC meeting. The amendments concerned:

a) Clearly prohibiting the marking of the gross mass in addition to the net mass on packages. This practice appears to be increasing on glazed products where ice accounts for up to 20 % of the gross mass and retailers sometimes use the marked gross mass to calculate the selling price.

b) Clarification of marking requirements for gas cylinders.

c) Prohibiting the injection of meat products with liquids for the sole purpose of mass gain (increasing yield). This practice, under the guise of improving flavour or texture, is on the increase and in some cases injected brine accounts for 25 % of the net mass. Local producers claim that this is an international practice which makes them uncompetitive with imported products if they do not do the same.

d) Prohibiting the words "when packed" and "approximately" in relation with the quantity statement.

3.2 SADCMEL TC 2 - Instruments

Certain members requested harmonized requirements for tyre pressure gauges for motor vehicles. A work group prepared draft requirements using OIML R 23 as a starting point. At the meeting discussions concerned the problem of OIML R 23 being outdated and not covering electronic gauges as well as a second Recommendation, that is referenced for metrological characteristics, having been withdrawn some time ago.

As insufficient expertise is available locally it was agreed to stop the project until OIML R 23 has been revised and can probably be adopted as is.

4 2011 Annual meeting – 23 March 2011

The following is a summary of important agenda items for the annual SADCMEL meeting.

4.1 SADCMEL Annual Report

The Annual Report summarized the activities undertaken during the previous twelve months which included representation at the meeting of Regional Legal Metrology Organizations (RLMOs) at the time of the CIML Meeting in Orlando and at ARFIMETS. The report concluded that all activities were undertaken as planned.

4.2 Member country and associated institution reports

In summary most members are modernizing legislation to be compatible with OIML requirements and latest technologies. In many cases the scope of enabling Acts is being broadened to cover health, safety and environmental measurements. Several countries are in the process of purchasing equipment to make it possible to test according to new requirements but many mentioned a lack of equipment and other infrastructure as being a challenge.

4.3 AFRIMETS Report

The report gave information on meetings held and activities in progress. Office bearers representing SADCMEL are Mr. Stuart Carstens (South Africa) who heads the AFRIMETS Secretariat and Mr. Geraldo Albasini (Mozambique) who is the Vice Chairperson. The AGM and Executive committee meetings were held in Egypt in September 2010. At the AGM the following were some of the matters discussed:

a) Restructuring of the technical committees and nomination of chairpersons.

b) Development of rules of procedure for the organization.

c) Development of a questionnaire for completion by member RLMOs on the African Continent in order to identify the level of development of the metrology discipline.

4.4 Report by the BIML

Mr. Ian Dunmill, Assistant Director at the BIML, reported on recent activities and staff changes within the OIML and the BIML. Mr. Dunmill warmly welcomed Zimbabwe as the latest OIML Corresponding Member and encouraged other SADCMEL members to become at least Corresponding Members. He outlined the benefits of participation in OIML activities and used the example of the need for requirements for motor vehicle tyre pressure gauges to illustrate how the region could participate on the relevant TC to ensure our needs are heard.

Information was given on an enquiry, which would be circulated by the Facilitator for Developing Country Matters, concerning the need for additional documents in areas such as the benefits of legal metrology, operation of a legal metrology service and qualifications of legal metrology personnel.

OIML participation in the AFRIMETS Metrology School in Nairobi, Kenya was highlighted.

As a result of several questions regarding type testing of instruments, the OIML MAA for type approval test results, including the many benefits, was discussed in detail. OIML Member States and Corresponding Members were encouraged to participate in the scheme. A resolution of thanks to Mr. Dunmill and the OIML was passed.

4.5 Reports by TC Chairpersons

The Chairpersons of TC 1 and TC 2 reported on activities over the past 12 months. The resolutions concerning the amendment of the harmonized requirements for prepackages and the stopping of the development of requirements for tyre pressure gauges, that were made at the TC meetings, were accepted by SADCMEL and resolutions were made.

4.6 Report on capacity building

The meeting was briefed on the final activities in the SADC/EU Funding Project that took place between April and November 2010. These included:

a) Training on requirements and verification of instruments covered by the following OIML Recommendations took place:
   - OIML R 107 – Totalizing hopper weighers,
   - OIML R 50 – Belt weighers,
   - OIML R 61 – Automatic gravimetric filling machines,
   - OIML R 21 – Taximeters.

b) Completion of a model law on metrology to guide member countries when modernizing their legislation. Representatives from member countries discussed the document at a workshop in Gaborone on 3 and 4 August 2010.

c) Visits were undertaken to seven member states to create awareness within Governments (Legislators) of the importance of a sound legal metrology structure and evaluate the successes and benefits gained from the funding project.

d) A final needs workshop, to evaluate the extent to which previously identified needs were satisfied by the funding project and confirm outstanding or new needs for future funding, was held in Gaborone on 5 and 6 August 2010.

e) The Secretariat met with and gave feedback to the EU Evaluation Team who compiled the final evaluation report on the project.

4.7 SADCMEL Website

Members were updated on the development of a new user friendly SADCMEL website. The website should come into use in the latter half of 2011 and will be hosted by the National Regulator for Compulsory Specifications (NRCS) of South Africa. It is being developed with funds from the German Government received via a PTB technical assistance programme. A new SADCMEL logo has also been developed for use with the website.

4.8 World Metrology Day

In a joint venture between the OIML, BIPM and PTB a poster has been developed for World Metrology Day to be held on 20 May 2011. The theme for this year is "Metrology in Chemistry" with the slogan "Chemistry - our life, our future". The poster was displayed and it was explained that it was kept simple so that it can be understood by the average citizen. The poster and other information can be found on

www.worldmetrologyday.org

The intention was to make copies of the poster available to members for use at, or to promote, World Metrology Day activities. Members were invited to place information on planned activities on the web page or send it to the OIML for placing on the page.

5 Conclusion

Input by delegates to the meetings and the excellent arrangements ensured that they were a resounding success. From discussions during the meetings the conclusion can be drawn that, although at a slower than expected pace, the SADCMEL aims of harmonizing legal metrology legislation and assisting less developed countries by building capacity in the region, are being attained. ■

BRIAN BEARD, SADCMEL Secretariat

DEVELOPING COUNTRIES

Third OIML Award for Excellent contributions from Developing Countries to legal metrology

IAN DUNMILL, BIML

Background

Many developing countries suffer from a lack of resources for the operation of a sound Legal Metrology System. Although these resources cannot be provided by the OIML, the Organization is willing to support initiatives for the development of legal metrology.

To highlight the importance of metrology activities in developing countries, and to provide an incentive for their improvement, the OIML established an Award for "*Excellent contributions from developing countries to legal metrology*".

This Award is intended to raise the awareness of, and create a more favourable environment for legal metrology and to promote the work of the OIML.

The Award intends:

> *"to acknowledge and honor new and outstanding activities achieved by individuals, national services or regional legal metrology organizations contributing significantly to legal metrology objectives on national or regional levels."*

Past Awards

This will be the third Award to be made: in 2009 Mr. Osama Melhem (Jordan) and in 2010 the Thai Legal Metrology Service were recognized for their outstanding contributions to legal metrology.

How can candidates be proposed?

The aim is for the nomination procedure to be as open as possible. Proposals should be sent to the OIML Facilitator on Developing Country Matters and may be made by:

- CIML Members;
- Regional Legal Metrology Organizations;
- Individuals concerned with legal metrology;
- The Facilitator on Developing Country Matters;
- The BIML.

Proposals may be made by the individual or organization seeking the Award and should contain facts, documents and arguments why the candidate deserves the Award. As they are received, the Facilitator will record these nominations and forward them to the BIML. The closing date is 1 July of each year.

Selection procedure

Each year, The Facilitator on Developing Country Matters will validate the nominations received and prepare a list of candidates highlighting the importance of the achievements, and will rank the applications.

The Award winner will be selected by the CIML President and announced at the following CIML Meeting.

Selection criteria

The criteria which will be used to assess the Award candidates will include:

- the significance and importance of the contribution or achievement;
- the novelty of the contribution or achievement;
- the attractiveness and adaptability of the contribution or achievement for other legal metrology services.

The OIML Award

The Award will consist of:

- a Certificate of Appreciation signed by the CIML President;
- a token of appreciation, e.g. an invitation to present the Award winning achievement at the next CIML Meeting or OIML Conference at the OIML's expense.

Further information

For more details, or to present candidacies for the Award, please contact:

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Ian Dunmill
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MEETING

Presidential Council

Paris, 7–8 March 2011

Left to right:
- Dr. Charles Ehrlich, USA
- Dr. Yukinobu Miki, Japan
- Mr. Peter Mason, UK, CIML President Elect
- Mr. Cees van Mullem, The Netherlands
- Mr. Alan Johnston, Canada, CIML President
- Pr. Lev Issaev, Russian Federation
- Pr. Roman Schwartz, Germany, CIML Second Vice-President
- Mr. Stuart Carstens, South Africa
- Mrs. Kong Xiaokang, P.R. China (representing Mr. Pu Changcheng)
- Dr. Grahame Harvey, Australia, CIML First Vice-President

Not present on the photo:
- Dr. Philippe Richard, Switzerland

Key discussion points:

- Review of the 2010 budget and discussion of how the implementation of Resolution 27 (45th CIML Meeting) affects it.
- Formation of a small work group to review and revise the current Strategic Plan which will then be presented to the CIML at its 46th Meeting in October 2011 for consideration.
- Discussion of the need to make several investments in the infrastructure at the BIML. The President instructed the BIML Director to prepare a detailed budget and work plan for these improvements for review by the CIML at its 46th Meeting.
- Discussion of the need to clarify the rules regarding the BIML Translation Center. The President instructed the BIML Director to prepare an agenda item and a resolution for consideration by the CIML at its 46th Meeting.
- Discussion of the need to continue to improve the work related to developing countries.

Press release

WORLD METROLOGY DAY 2011

Chemical measurements for our life, our future

www.bipm.org

www.oiml.org

World Metrology Day has become an established annual event during which more than eighty States celebrate the impact of measurement on our daily lives, no part of which is untouched by this essential, and largely hidden, aspect of modern society. Previous themes have included topics such as measurements for innovation, and measurements in sport, the environment, medicine, and trade.

UNESCO and IUPAC have decided to designate 2011 as The International Year of Chemistry (IYC 2011), a worldwide celebration of the achievements of chemistry and its contributions to the well-being of humankind. Under the unifying theme "Chemistry - our life, our future," IYC 2011 will offer a range of interactive, entertaining, and educational activities for all ages. The year 2011 also coincides with the centenary of the Nobel Prize in Chemistry awarded to Madame Marie Curie - an opportunity to celebrate the contributions of women to science.

Chemistry is a creative science that is essential for sustainability and improvements to our way of life. All known matter is composed of pure chemical elements or of compounds made from those elements. Humankind's understanding of the material nature of our world is grounded in our knowledge of chemistry. Molecular transformations are central to the production of foodstuffs, medicines, fuels, and metals - i.e. virtually all manufactured and extracted products.

The World Metrology Day 2011 message Chemical measurements for our life, our future builds upon the IYC 2011 theme. Chemistry and chemicals pose particularly interesting challenges to the measurement community: thousands of compounds must be measured, and the range of concentrations at which some compounds must be reliably detected, quantified, and in some cases regulated can nowadays extend down to parts per billion (or even trillion). Yet the ability to make appropriately accurate and reliable chemical measurements is crucial to our economy, our environment and our personal well being; in short we must not underestimate the importance of Chemical measurements for our life, our future.

National measurement systems must rely on agreed standards, units, and techniques to make consistent, reproducible and accurate measurements. Each system of national measurement standards and laboratories is then linked into a world-wide network coordinated by the International Bureau of Weights and Measures (BIPM). This network gives society access to accurate measurements in order to meet today's challenges in healthcare, within the environment and in all the new technologies and processes. In industry and commerce, it helps ensure product quality and interoperability, eliminates waste, raises productivity, and facilitates trade based on agreed measurements and tests. It also enables scientists to use a common language to underpin their collaboration across the world and ensure that their exploits can be taken up and accurately reproduced by companies wherever they operate.

National and regional metrological regulations must be based on agreed technical requirements in order to help avoid or eliminate technical barriers to trade, ensure fair trade practice, care for the environment and maintain a satisfactory healthcare system. The International Organization of Legal Metrology (OIML) has developed a worldwide technical structure by means of which it provides its Members with technical Recommendations and Documents as well as Guides, Vocabularies and other publications. When developing their metrological legislation and regulations, OIML Members can ensure they meet these objectives by including the requirements contained in the relevant OIML publications.

This year, in their messages to the world of metrology, Governments, companies, academics, and indeed to the man or woman in the street, the Directors of the International Bureau of Weights and Measures and of the International Bureau of Legal Metrology both highlight the importance of accurate, reliable and internationally accepted chemical measurements in the modern world as it deals with today's grand challenges.

www.worldmetrologyday.org

The OIML is pleased to welcome the following new

CIML Members

- **Albania:**
  Mr. Gledjon Rehovica
- **Bulgaria:**
  Mrs. Dimka Ivanova
- **France:**
  Mrs. Corinne Lagauterie

Corresponding Member

- **Zimbabwe**

Bulletin Subscribers:

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bulletin@oiml.org

OIML Meetings

TC 9/SC 2 Automatic weighing instruments
18–19 April 2011 (NMO, Teddington, United Kingdom)

TC 3/SC 4 (Statistical methods)
21 June - afternoon (BIS Conference Centre, London, UK)

TC 12 (Electricity meters)
22–24 June (BIS Conference Centre, London, UK)

TC 5/SC 1 (Environmental conditions)
27–28 June (Utrecht, The Netherlands)

OIML Seminar on Conformity To Type (CTT)
29–30 June (Utrecht, The Netherlands)

TC 6 (Prepackaged products)
26–30 September (NIST, Gaithersburg, MD, USA)

46th CIML Meeting and associated events
10–14 October (Prague, Czech Republic)

TC 8/SC 5 (Water meters)
8–10 November (NIST, Gaithersburg, MD, USA)

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Committee Drafts

Received by the BIML, 2010.11 – 2011.02

Revision OIML B 10-1: Framework for a Mutual Acceptance Arrangement on OIML Type Evaluations (MAA)	E	2CD	TC 3/SC 5	US
Revision OIML B 3: OIML Certificate System for OIML Type Evaluations of Measuring Instruments	E	3CD	TC 3/SC 5	US
International Vocabulary of Terms in Legal metrology (VIML 2)	E	3CD	TC 1	PL
Environmental requirements for measuring instruments (D 11)	E	1CD	TC 5/SC 1	NL
R 117-2: Dynamic measuring systems for liquids other than water. Part 2: Metrological controls and performance tests	E	1CD	TC 8/SC 3	US+DE

Delegates attending the AFRIMETS 2011 Metrology School in Nairobi, Kenya

Call for papers

OIML Members
RLMOs
Liaison Institutions
Manufacturers' Associations
Consumers' & Users' Groups, etc.

CIML meets in Orlando, Florida (USA)

- Technical articles on legal metrology related subjects
- Features on metrology in your country
- Accounts of Seminars, Meetings, Conferences
- Announcements of forthcoming events, etc.

Winner of the 2009 OIML Award for Excellent Contribution to Legal Metrology in Developing Countries: Assignment Report

Working across cultures in legal metrology

The **OIML Bulletin** is a forum for the publication of technical papers and diverse articles addressing metrological advances in trade, health, the environment and safety - fields in which the credibility of measurement remains a challenging priority. The Editors of the Bulletin encourage the submission of articles covering topics such as national, regional and international activities in legal metrology and related fields, evaluation procedures, accreditation and certification, and measuring techniques and instrumentation. Authors are requested to submit:

- a titled, typed manuscript in Word or WordPerfect either on disk or (preferably) by e-mail;
- the paper originals of any relevant photos, illustrations, diagrams, etc.;
- a photograph of the author(s) suitable for publication together with full contact details: name, position, institution, address, telephone, fax and e-mail.

Note: Electronic images should be minimum 150 dpi, preferably 300 dpi.

Technical articles selected for publication will be remunerated at the rate of 23 € per printed page, provided that they have not already been published in other journals. The Editors reserve the right to edit contributions for style, space and linguistic reasons and author approval is always obtained prior to publication. The Editors decline responsibility for any claims made in articles, which are the sole responsibility of the authors concerned. Please send submissions to:

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