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Organe de Liaison entre les Etats membres



BUREAU INTERNATIONAL DE METROLOGIE LEGALE
11, Rue Turgot — 75009 PARIS — France

BULLETIN

de

l'ORGANISATION INTERNATIONALE de MÉTROLOGIE LÉGALE

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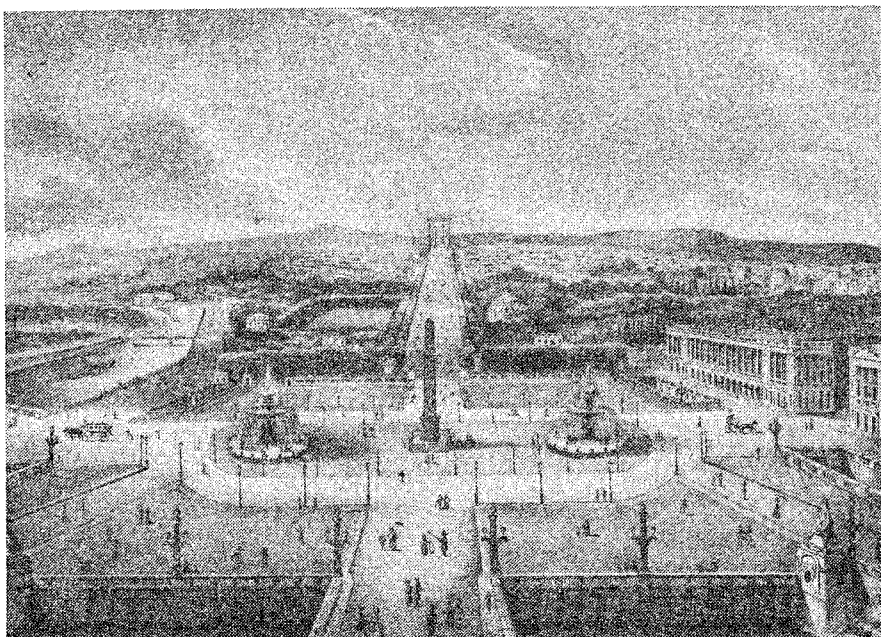
« La métrologie en République Populaire de Chine » (N° 102, Mars 1986)

Par suite d'une erreur typographique, page 6, la superficie de la République Populaire de Chine a été indiquée comme étant proche d'un million de km², alors qu'il faut lire dix millions de km².

CORRIGENDUM

« Metrology in the People's Republic of China » (N° 102, March 1986)

Due to a typographical error, on page 10, the area of the People's Republic of China was indicated as being close to one million km², which should read close to ten million km².



21^e Réunion du CIML

Le Comité International de Métrologie Légale a tenu sa 21^{ème} réunion à Paris, dans la salle de conférence de l'Office International des Epizooties, les 16, 17 et 18 avril 1986.

Cette réunion, qui avait été précédée par celle du Conseil de Développement de l'OIML, a donné l'occasion de commémorer le 30^{ème} anniversaire de notre Organisation, en présence de tous les participants à la réunion du Comité, des agents du BIML et d'invités anciens membres du CIML ou du BIML.

Dans son allocution commémorative, Monsieur K. Birkeland, Président du CIML, a évoqué les circonstances de la naissance de l'OIML, retracé les premières années de l'Organisation et rappelé les noms des principaux acteurs de sa création (*).

L'assemblée a observé quelques instants de silence à la mémoire de tous les créateurs de l'OIML aujourd'hui disparus.

Après Monsieur Birkeland, ont successivement pris la parole Monsieur van Male, Président du CIML de 1968 à 1980, et Monsieur Mühe, actuel Vice-Président du CIML et qui a participé aux travaux de l'OIML depuis son tout début, puisqu'il faisait partie de la délégation allemande à la Première Conférence en 1956.

Tous deux ont décrit les débuts et le développement de l'OIML tels qu'ils les ont vécus et ont évoqué certaines personnalités qui y ont joué un rôle primordial.

Après cette cérémonie, le Comité a examiné, en quatre demi-journées, l'ensemble des questions qui lui étaient proposées.

(*) voir à ce sujet le Bulletin de l'OIML N° 100, septembre 1985.

On retiendra en particulier les discussions et décisions sur les sujets suivants :

- pays en développement : le Comité a pris note du compte rendu sur la réunion du Conseil de Développement et a donné son accord au projet de programme de travail 1986-1988 présenté par Monsieur J. Gomez Rosell, Président sortant réélu pour une nouvelle période de deux ans,
- planification des travaux : le Comité a examiné les projets de programmes de travail 1985-1988 préparés par les différents Secrétariats-Pilotes et a chargé le Conseil de la Présidence d'étudier certains problèmes particuliers,
- certification : le Comité a pris des décisions propres à favoriser la reconnaissance mutuelle des résultats d'essais métrologiques et, en particulier, a adopté un Document International sur ce sujet,
- travaux des Secrétariats : le Comité a adopté à titre provisoire deux projets de Recommandations Internationales : Compteurs d'énergie thermique et Instruments de pesage électroniques,
- liaisons avec d'autres Institutions Internationales : le Comité a pris note d'un rapport sur la coopération entre l'OIML et certaines Institutions Internationales, en particulier le Conseil d'Assistance Economique Mutuelle et les Organisations européennes : Communauté Européenne, Association Européenne de Libre-Echange, Comité Européen de Normalisation, Comité Européen de Normalisation Electro-technique,
- personnel du Bureau : le Comité a prolongé de deux ans le contrat de Monsieur Petik, Adjoint au Directeur.

Enfin, le Comité a réélu comme Président et Premier Vice-Président : Monsieur Birkeland, Norvège, et Monsieur Issaev, URSS. Il a élu comme Second Vice-Président Monsieur Edgerly, Etats-Unis d'Amérique. Il a nommé Membres d'Honneur du Comité : Monsieur Mühe, R.F. d'Allemagne, et Monsieur Liers, R.D. Allemande.

Cette réunion a été marquée par deux réceptions, l'une donnée par Monsieur Madelin, Ministre de l'Industrie, des P. et T. et du Tourisme de la République Française, l'autre par le Président du CIML et le Directeur du BIML à laquelle ont participé de nombreuses personnalités : membres des administrations françaises concernées par la métrologie, anciens agents du Service des Instruments de Mesure ayant activement participé à l'élaboration des premières Recommandations Internationales de l'OIML et représentants de nombreuses Institutions Internationales ayant leur siège à Paris et entretenant une étroite coopération avec l'OIML.

21st CIML Meeting

The International Committee of Legal Metrology held its 21st meeting in Paris in the conference hall of the Office International des Epizooties, 16 to 18 April 1986.

This meeting, which was preceded by the meeting of the OIML Development Council, was an occasion to commemorate the 30th anniversary of our Organization in the presence of all the participants of the Committee meeting, the Bureau staff and the invited former members of the CIML and BIML.

In his commemorative speech, Mr. K. Birkeland, CIML President, called to mind the circumstances of the creation of OIML, retraced the first years of the Organization and recalled the names of the principal actors in its creation (*).

The assembly observed silence for several minutes in memory of all the creators of OIML who are no longer with us.

After Mr. Birkeland the floor was taken by Mr. van Male, CIML President from 1968 to 1980 and then by Mr. Mühe, CIML Vice-President who participated in OIML work from the start since he was a member of the German delegation at the First Conference in 1956.

Both described the beginning and the development of OIML as they had experienced it and recalled several personalities who had played a role of primary importance.

After that ceremony, the Committee examined in four half-days all the problems submitted to it.

One should recall, in particular, the discussions and decisions on the following subjects :

- developing countries : the Committee took note of the report on the meeting of the Development Council and gave its agreement to the draft of the 1986-1988 work program presented by Mr. Gomez Rosell, outgoing President who was re-elected for a further period of two years,
- planning of work : the Committee examined the drafts of the 1985-1988 work programs prepared by the various Pilot Secretariats and instructed the Presidential Council to study several specific problems,
- certification : the Committee took the appropriate decisions in order to promote the mutual recognition of results of metrological tests and, in particular, adopted an International Document on this subject,
- work of the Secretariats : the Committee provisionally adopted two International Recommendations : Heat meters and Electronic weighing instruments,
- liaison with other International Institutions : the Committee took note of the report on the cooperation of OIML with certain International Institutions, in particular,

(*) on this subject see OIML Bulletin No. 100, September 1985.

the Council of Mutual Economic Assistance and the European Organizations : the European Community, the European Free Trade Association, the European Committee for Standardization and the European Committee for Electrotechnical Standardization,

- Bureau personnel: the Committee extended the contract of Mr. Petik, Assistant Director, for 2 years.

Finally, the Committee re-elected as President and First Vice-President : Mr. Birkeland, Norway, and Mr. Issaev, USSR, respectively ; it elected as its Second Vice-President Mr. Edgerly, United States of America ; it nominated as Honorary Committee Members : Mr. Mühe, Federal Republic of Germany and Mr. Liers, German Democratic Republic.

Two receptions were held during the week of the meeting, one given by Mr. Madelin, Minister of Industry, Post and Telecommunication, and Tourism of the French Republic and the other by the President of CIML and the Director of BIML, both well attended by members of the French administration concerned with metrology, former members of the Service des Instruments de Mesure who have participated actively in the preparation of the first OIML International Recommendations and representatives of many International Institutions with their headquarters in Paris and maintaining a close cooperation with OIML.

RÉUNION

du CONSEIL de DÉVELOPPEMENT de l'OIML

Paris, 14-15 avril 1986

A la réunion assistaient les délégués de République Démocratique Allemande, Australie, Cameroun, Canada, République Populaire de Chine, République Populaire Démocratique de Corée, Cuba, Finlande, France, Indonésie, Japon, Kenya, Pakistan, Pays-Bas, Suisse, Tanzanie, Tchécoslovaquie, U.R.S.S. et Yougoslavie.

Parmi les organisations internationales et régionales invitées, seule l'UNESCO était représentée. ASMO, ORAN et IMEKO (TC 11) avaient cependant fourni des informations sur leurs activités dans le domaine de la métrologie, qui ont pu être présentées lors de la réunion.

Les délibérations étaient conduites par le Président du Conseil de Développement, Mr Jorge Luis GOMEZ ROSELL, Directeur de l'Institut de Recherches Métrologiques de Cuba.

Le BIML a présenté un rapport sur les activités de l'OIML pour les pays en développement pour la période avril 1984-mars 1986.

Les délégués ont ensuite été invités à résumer les activités de leur pays, relatives à l'aide bilatérale en métrologie. Quelques pays industrialisés ont des programmes très étendus d'assistance technique et de formation pour des pays en développement, en particulier l'Australie, la France, le Japon et l'U.R.S.S.

L'enquête du Président sur la situation de la métrologie dans les pays en développement montre que la formation du personnel est d'importance primordiale.

La réunion a examiné les réponses de 18 pays en développement, qui montrent que tous ces pays souhaitent envoyer du personnel pour formation à l'étranger ; le nombre total étant de plus de 110 par an. Il a été demandé au BIML de transmettre ces besoins aux pays industrialisés dans lesquels la formation a été demandée après avoir examiné plus en détail les besoins spécifiques pour la formation de longue ou de courte durée ainsi que les spécialisations nécessaires.

Le BIML doit également informer les pays industrialisés sur les besoins en matière de matériel d'enseignement et de matériel de vérification.

Parmi les sujets d'intérêt plus général qui ont été mis en avant par l'enquête, on peut mentionner les suivants :

- le Conseil de Développement et l'OIML doivent étudier des aspects d'ordre instrumental et d'autre origine, qui peuvent affecter l'exportation des pays en développement (refus d'accepter des livraisons en raison d'un manque de quantité ou de qualité),
- le Conseil de Développement doit essayer d'aider à la réalisation des étalons nationaux et des étalons secondaires (y compris les aspects d'étalonnage),
- il devrait être permis aux pays économiquement désavantagés de payer une contribution plus faible à l'Organisation et la participation de ces pays aux événements internationaux dans le domaine de la métrologie devrait être facilitée.

La réunion a adopté la version finale de la brochure « Verification Equipment for National Metrology Services » qui a été élaborée par le groupe ad hoc du Conseil de Développement (précédemment SP 25-Sr 3) sous la responsabilité de l'U.R.S.S.

En ce qui concerne la nouvelle brochure éditée par le BIML « Planning of Metrology and Testing Laboratories », il a été convenu de demander aux pays-membres de fournir des commentaires pour permettre de la compléter par des informations des pays ayant récemment créé de nouveaux laboratoires.

Les deux brochures « Fournisseurs d'équipement de vérification » et « Metrology Training » doivent être mises à jour avant la fin 1986 afin d'y inclure l'information reçue suite aux enquêtes du BIML ainsi que celle contenue dans les documents spécialement préparés pour la réunion par certains participants.

Le travail du SP 31 dans le domaine de la formation a été passé en revue. Les projets du SP 31-Sr 1 concernant la qualification des ingénieurs métrologistes et du SP 31-Sr 2 concernant la qualification des techniciens ont été adoptés par le CIML et seront prochainement publiés ensemble sous forme d'un Document International. Les avant-projets sur les programmes de formation doivent encore être approuvés par le Secrétariat-Pilote dont une réunion est prévue pour l'année prochaine et cela si possible en liaison avec un séminaire pour lequel le Secrétariat-Pilote cherche le soutien de l'UNESCO.

Une présentation audio-visuelle de l'Institut de Recherches Métrologiques de Cuba a été projetée pour les délégués. Les installations importantes de ce pays ont conduit le Président du Conseil de Développement, en liaison avec les autorités cubaines compétentes, à créer un cours annuel de métrologie spécialement pour les pays en développement, le premier a commencé en mai 1986. Cuba offre 3 bourses pour la participation à ce cours.

D'autres cours de métrologie sont également organisés pratiquement tous les ans par le Japon (et selon des informations reçues par correspondance également en Grande-Bretagne et aux Etats-Unis d'Amérique). Il a d'autre part été annoncé que l'IMEKO TC 8 envisage d'arranger un deuxième cours à Seibersdorf, Autriche en 1987 et que l'IMEKO TC 11 projette un cours en métrologie mécanique pour enseignants à Amman en janvier 1987.

La nouvelle école de métrologie à Douai dans le nord de la France, a été présentée par une maquette et par la projection d'une cassette vidéo. Cette nouvelle école accepte déjà des étudiants des pays en développement pour des études théoriques et pratiques de longue durée, qui conduisent au diplôme d'ingénieur en métrologie. L'enseignement dans d'autres langues que le français est également envisagé pour l'avenir (*).

Le programme de travail pour 1984-1986 a été passé en revue afin de vérifier le travail accompli et un projet de programme de travail pour 1986-1988 a été établi sur la base des discussions du Conseil et du résultat de l'enquête du Président.

L'assemblée a félicité le Président M. J.L. GOMEZ ROSELL pour ses initiatives très appréciées en vue d'aider les pays en développement. Il a été réélu pour une nouvelle période de deux ans.

(*) voir annonce dans Bulletin de l'OIML N° 102, mars 1986, p. 36.

RAPPORT SUR LES ACTIVITES DE L'OIML POUR LES PAYS EN DEVELOPPEMENT *

avril 1984 - mars 1986

Brochures-guides

Le BIML a coopéré avec le groupe ad hoc du Conseil de Développement sous la responsabilité de l'URSS, pour mettre au point la brochure sur l'équipement de vérification ayant pour titre :

« Verification Equipment for National Metrology Services »

BIML, March 1986

L'avant-projet de cette publication a été complété par un chapitre sur les mesures de pression.

Cette brochure d'environ 50 pages comprend maintenant des spécifications sommaires sur les étalons et le matériel de vérification dans les domaines de mesures de masse, volume des liquides, longueur et angle, température, électricité, pression et caractéristiques physico-chimiques.

Une autre brochure écrite par le BIML à la demande du Conseil de Développement a pour titre

« Planning of Metrology and Testing Laboratories »

BIML, March 1986

Cette brochure de 37 pages contient des conseils pour la planification, la construction et l'installation de laboratoires de métrologie ainsi que sur leur liaison avec des autres activités d'essais de produits.

Des mesures ont également été prises en vue de mettre à jour les deux brochures « Metrology training » et « Fournisseurs d'Equipements de vérification ». Il est prévu que ce travail sera terminé sous peu.

Cours de métrologie

Le BIML a participé au cours de métrologie organisé en septembre 1984 à Seibersdorf, Autriche, par IMEKO (TC 8), AIEA, ONUDI, l'Administration fédérale de Métrologie d'Autriche et le Centre de Recherche autrichien.

Ce cours rassemblait 20 participants des pays en développement et environ 60 des pays industrialisés. Il y avait 23 exposés et plusieurs visites de laboratoires. L'exposé présenté par l'OIML avait pour titre « International Recommendations of OIML » et contenait une revue des parties essentielles des plus importantes Recommandations de l'OIML ainsi que des propositions pour leur application par des pays en développement selon la brochure du BIML déjà publiée : « Guidelines for Establishing Simplified Metrology Regulations ».

Tous les exposés de ce cours ont été publiés en deux volumes avec le titre « Interregional Training Course on Ensuring Measurement Accuracy », Austrian Research Center, Seibersdorf 1984. Ils peuvent être achetés en s'adressant au secrétariat d'IMEKO à Budapest.

Le BIML a aussi fourni de la documentation et partiellement financé la participation de M. R. Laverne du Service de la Métrologie, France, au séminaire de formation de l'ORAN/UNESCO sur la normalisation, le contrôle de la qualité et la métrologie à Abidjan, Côte d'Ivoire, 26-30 août 1985. M. Laverne a, lors de ce séminaire, fait des exposés sur les sujets suivants :

* Présenté à la réunion du Conseil de Développement de l'OIML, 14-15 avril 1986.

- Rédaction des normes et des règlements techniques en métrologie
- Infrastructure pour le contrôle des poids et mesures commerciaux
- Contrôle des instruments de mesure utilisés pour l'agriculture et contrôle des distributeurs de carburants.

Un adjoint du BIML a participé en tant que conférencier au séminaire de métrologie organisé par l'INNORPI à Tunis, 5-6 décembre 1985. Le but de ce séminaire était d'informer des industriels tunisiens et des responsables des administrations sur une infrastructure de métrologie adaptée au pays. Deux exposés étaient présentés par le BIML :

- Métrologie et Relations Internationales
- et
- Création d'un Laboratoire National de Métrologie.

Les discussions qui ont suivi ces exposés étaient très fructueuses et il semble que la Tunisie sera en mesure d'établir une structure métrologique convenant aux besoins de son industrie.

Un colloque régional pour pays en développement dans le cadre du programme de métrologie de Asie-Océan Pacifique a été organisé par l'UNESCO et le Commonwealth Science Council à Nouvelle-Delhi, 2-13 décembre 1985. Il avait été demandé au BIML d'envoyer un conférencier, mais comme cela n'était pas possible à cause d'autres engagements, le BIML a demandé au membre du CIML de l'Inde de bien vouloir faire un exposé.

Des experts du National Weights and Measures Laboratory de Grande-Bretagne et de l'Administration de la Métrologie de Rheinland-Pfalz, Rép. Féd. d'Allemagne, ont fait des exposés au séminaire sur la technologie d'emballage en Tanzanie du 13 au 19 juin 1984 qui était organisé par l'ORAN avec support financier du Commonwealth Science Council.

Plusieurs exposés présentés au séminaire OIML sur le Contrôle des Installations de Pesage en Vrac, Paris 22-25 avril 1985, sont d'un grand intérêt pour les pays en développement et sont progressivement publiés dans le Bulletin de l'OIML. Parmi les 106 participants à ce séminaire, il y avait 11 participants des pays en développement.

Coopération avec les organisations internationales et régionales

Le Directeur du BIML a continué d'assister aux réunions annuelles de ISO-DEVCO et les membres du BIML participent directement dans les groupes de travail créés par DEVCO pour l'élaboration de deux manuels d'ISO : « The establishment of a testing laboratory » et « Participation in International Standardization ».

Le Directeur du BIML a également participé à l'Assemblée Générale de l'ORAN au Caire, 8-9 janvier 1986.

Outre le soutien de l'OIML aux cours et séminaires indiqués ci-dessus, la coopération avec les autres organisations internationales et régionales a continué surtout sous forme d'échange de correspondance et de publications.

Le BIML a ainsi collaboré en vue de trouver des experts en métrologie pour l'ONUDI par l'envoi de descriptions de postes aux pays-membres de l'OIML. Ces descriptions de postes concernaient des experts pour la République Démocratique Populaire de Corée (expert en thermométrie, mai 1984), Turquie (trois experts, octobre 1984), Kenya (expert au secrétariat de l'ORAN, juin 1985), Ethiopie (Chef de projet, octobre 1985) et dernièrement Koweït (un expert, mars 1986).

MEETING of the OIML DEVELOPMENT COUNCIL

Paris, 14-15 April 1986

The meeting was attended by delegates from Australia, Cameroon, Canada, People's Republic of China, Cuba, Czechoslovakia, Finland, France, German Democratic Republic, Indonesia, Japan, Kenya, People's Democratic Republic of Korea, Netherlands, Pakistan, Switzerland, Tanzania, U.S.S.R. and Yugoslavia.

Among the invited other international and regional organisations only UNESCO was represented. ASMO, ARSO and IMEKO (TC 11) had however sent information about their activities in the field of metrology which was presented during the meeting.

The meeting was directed by the President of the Development Council Mr Jorge Luis GOMEZ ROSELL, Director of the Metrology Research Institute of Cuba.

A report of the OIML activities for the Developing Countries for the period April 1984-March 1986 was presented by BIML.

The delegates present were thereafter asked to summarize the activities involving their country in the field of bilateral aid programmes in metrology. Some developed countries have extensive technical assistance and training programmes for developing countries in this field, in particular Australia, France, Japan and USSR.

Adequate training of staff is of utmost importance for developing countries as shown by the results of the President's enquiry on the Metrological Status in developing countries. The meeting reviewed the replies from 18 developing countries from which it appears that all these countries wish to send staff for metrology training abroad; the total number being in excess of 110 per year. The BIML was asked to convey these requirements to the industrialized countries in which such training is requested after having further investigated the specific needs for long-term or short-term training and the required specializations.

The BIML shall also inform the industrialized countries about the individual needs formulated concerning training material and verification equipment.

Among the more general subjects which were brought up through the enquiry the following may be mentioned :

- the Development Council and OIML should study aspects of instrumental and other nature which affect the export from developing countries (refusals of deliveries on account of low quantity or quality)
- the Development Council should try to arrange for assistance in the realization of national and secondary standards (including calibration aspects)
- the Development Council shall encourage the elaboration of metrology training manuals, video cassettes and films
- economically handicapped countries should be allowed to pay a lower contribution to the organisation and be given facilities to take part in international metrological events.

The meeting adopted as a final version the brochure « Verification Equipment for National Metrology Services » which was elaborated by the ad hoc group of the Development Council (formerly SP 25-Sr 3) under the responsibility of the USSR.

As regards the new brochure written by BIML on « Planning of Metrology and Testing Laboratories » it was agreed that comments should be requested from the OIML member countries and that it shall be completed by additional information to be received from some countries which have recently set up new metrology laboratories.

The two brochures « Suppliers of Verification Equipment » and « Metrology Training » will be updated before end of 1986 to include information being received on BIML enquiries including material which was specially prepared for the meeting by some of the participating countries.

The work undertaken by SP 31 in the field of training was reviewed. The drafts prepared concerning the qualifications of metrology engineers (SP 31-Sr 1) and metrology technicians (SP 31-Sr 2) have been adopted by CIML and will soon be published as an International Document. The predrafts of the training programmes still need to be approved by the Pilot Secretariat and a meeting of SP 31 is planned for next year possibly in connection with a seminar on training of metrologists for which the Pilot Secretariat is seeking support from UNESCO.

An audio-visual presentation of the Metrology Research Institute of Cuba was shown to the delegates. The important facilities available in Cuba has induced the President of the Development Council and the competent Cuban authorities to create a yearly course in metrology specially for developing countries, the first one to start already in May 1986. Cuba is offering 3 fellowships to applicants for this course.

Other metrology courses are also organised practically every year by Japan (and also in the U.K. and USA according to information received by correspondence). It was announced that IMEKO TC-8 will seek to arrange a second course in Seibersdorf, Austria in 1987 and that IMEKO TC-11 is planning a metrology teacher's training course in mechanical metrology in Amman in January 1987.

The new metrology school at Douai in the north of France was also presented by showing a model of the new building and a video-tape. This new school already accepts students from developing countries for long-term theoretical and practical studies leading to engineers diploma in metrology. Teaching in other languages than French is also considered in future depending on requests *.

The work programme for 1984-1986 was studied by the meeting to check the achievements and the skeleton for a new work programme was established on the basis of the discussions within the Council and the results of the President's enquiry.

The President Mr J.L. GOMEZ ROSELL was congratulated for his valuable initiatives to help developing countries and reelected for another period of two years.

* See announcement in OIML Bulletin No. 102, March 1986, p. 36.

REPORT ON OIML ACTIVITIES FOR DEVELOPING COUNTRIES *

April 1984 - March 1986

Notes for guidance

The BIML has cooperated with the equipment ad hoc group of the Development Council under the responsibility of USSR to finalize a brochure with the title

« Verification Equipment for National Metrology Services »

BIML, March 1986.

The previous drafts of this document have been completed with a chapter on pressure measurements.

This brochure of about 50 pages thus now contains summarized specifications of standards and verification equipment within the fields of measurement of mass, volume of liquids, length and angle, temperature, electricity, pressure and physico-chemical characteristics.

Another brochure, written by BIML staff at the request of the OIML Development Council, has the title

« Planning of Metrology and Testing Laboratories »

BIML, March 1986.

This brochure of 37 pages contains guidance for the planning, construction and furnishing of metrology laboratories and their connection with other product testing activities.

Action has also been taken to update the two brochures « Metrology Training » and « Suppliers of Verification Equipment ». This work is expected to be completed within a few months.

Metrology courses

The BIML has participated in the metrology course organised in September 1984 at Seibersdorf, Austria by IMEKO (TC 8), IAEA, UNIDO, the Austrian Federal Office of Metrology and the Austrian Research Center.

This course was attended by 20 participants from developing countries and about 60 from industrialized countries. There were 23 lectures and several laboratory visits. The lecture presented by OIML had as title « International Recommendations of OIML » and contained a review of the essentials of the most important OIML Recommendations along with proposals how they may be applied by developing countries in line with the previously published BIML brochure « Guidelines for Establishing Simplified Legal Metrology Regulations ».

All the lectures presented have been published in two volumes with the title « Interregional Training Course on Ensuring Measurement Accuracy », Austrian Research Center, Seibersdorf 1984. They can be procured from the IMEKO Secretariat in Budapest.

The BIML also supplied documentation material and financially supported the participation of Mr R. Laverne, Service de la Métrologie, France et the ARSO/ UNESCO training seminar on standardization, quality control and metrology in Abidjan, Ivory Coast, 26-30 August 1985. Mr Laverne treated three subjects at this training course :

* Presented at the meeting of the OIML Development Council 14-15 April 1986.

- The editing of standards and technical regulations
- The infrastructure of verification of commercial weights and measures
- The verification of measuring instruments used in agriculture and of petrol pumps.

A BIML staff member participated as lecturer in a Metrology Seminar organised by INNORPI in Tunis, 5-6 December 1985. The scope of this seminar was to inform Tunisian industrialists and chief staff from various administrative bodies about a suitable metrology infrastructure for the country. Two lectures were presented by BIML (in French) :

- Metrology and International Relations
and
- Creation of a National Metrology Laboratory.

The discussions which followed were most fruitful and it seems that Tunisia will be able to build up a metrology structure fitted to the needs of its industry.

A regional workshop for developing countries within the Asia Pacific Metrology Programme was organised jointly by UNESCO and the Commonwealth Science Council on 2-13 December 1985 in New Delhi. The BIML was asked to send a lecturer to this course. As this was not possible due to other engagements, the BIML asked the Indian CIML Member to deliver a lecture.

Experts from the National Weights and Measures Laboratory of United Kingdom and the Verification Administration of Rheinland-Pfalz, Fed. Rep. of Germany were lecturing at a seminar on packaging technology seminar in Tanzania, 13-19 June 1984 which was organised by ARSO with financial support from CSC.

Several papers presented at the OIML technical seminar on Testing of Bulk Weighing Installations, Paris 22-25 April 1985, are of great interest to developing countries and are published progressively in the OIML Bulletin. Among the 106 participants in this seminar there were 11 participants from developing countries.

Cooperation with international and regional organisations

The Director of BIML has continued to attend the ISO-DEVCO yearly meetings and BIML staff members participate directly in the working groups created by DEVCO for the elaboration of the ISO manuals « The establishment of a testing laboratory » and « Participation in International Standardization ».

The Director of BIML also attended the ARSO General Assembly in Cairo 8-9 January 1986.

In addition to the support provided by OIML to the courses and seminars listed above the cooperation with the other international and regional organisations has continued mainly in the form of exchange of correspondence and publications.

The BIML has collaborated in finding experts in metrology for UNIDO by sending out job descriptions to OIML member countries. These job descriptions concerned experts for the Democratic People's Republic of Korea (expert in thermometry May 1984), Turkey (three experts October 1984), Kenya (expert for ARSO headquarters June 1985), Ethiopia (Chief technical adviser October 1985) and recently Kuwait (one expert March 1986).

ASPECTS JURIDIQUES et ASPECTS TECHNIQUES de la MÉTROLOGIE LÉGALE

par E. MENNA *

RESUME — L'auteur, qui pendant de nombreuses années a été Chef du Service de Métrologie de Pavie en Italie, retrace les problèmes juridiques et économiques qui se sont posés dans le passé dans son pays. L'évolution technique des instruments et l'extension de la métrologie légale font que l'on peut envisager deux espèces de prescriptions ou normes, l'une se rapportant à la construction de l'instrument et l'autre aux exigences particulières de son domaine d'utilisation. L'auteur considère d'autre part que la taxe de vérification périodique doit être supportée par l'Etat et en expose les raisons.

SUMMARY — The author who was for many years Chief of the Metrology Service of Pavia in Italy, summarizes the juridical and economical problems of the past in his country. The technical progress of measuring instruments and the extension of legal metrology make that one may consider two types of regulations or standards, one which concerns the construction of the instrument and another one which concerns particular requirements for its field of use. The author also considers that charges for reverification should be supported by the State and he explains the reasons.

Les pouvoirs publics ont certainement établi des contrôles sur les poids et les mesures dès la première apparition de ces instruments. Une fois les unités de mesure déterminées, il fallait bien pourvoir à la reproduction des étalons de poids, de longueur et de capacité. Les balances pouvaient se dérégler par l'usage ou par des interventions frauduleuses. En effet, dans les civilisations les plus anciennes, notamment égyptienne, grecque et romaine, des lois ou ordonnances furent édictées en matière de poids et mesures.

Concevoir des normes en matière de contrôle n'était pas un problème quand les instruments étaient simples et qu'ils étaient employés presque uniquement pour des transactions commerciales. Mais nous avons assisté dans ce dernier siècle à une extraordinaire évolution en matière d'instruments de mesure avec leur développement en nombre et en espèce et leur diffusion non seulement dans le commerce mais encore en d'autres domaines où les contrôles paraissent non moins nécessaires ou souhaitables pour des raisons sociales.

D'autre part, le progrès technique nous apporte des instruments toujours plus fidèles et résistant aux altérations. Le nombre des contrôles qui pourraient augmenter énormément par la diffusion des instruments peut d'ailleurs se réduire par une meilleure confiance donnée par l'instrument et engageant la responsabilité des constructeurs et des usagers.

En quelques dizaines d'années la métrologie industrielle et scientifique a fait des pas de géant tandis que la métrologie légale se trouve parfois liée aux principes du temps jadis où l'on pouvait facilement généraliser du point de vue juridique sans prendre assez garde aux aspects techniques.

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Il pouvait être logique pour le législateur d'ordonner, comme c'est arrivé en France à l'époque de l'introduction du système métrique décimal, que tous les instruments qui portaient l'indication des nouvelles unités de mesure devaient être vérifiés. On s'aperçut, après, qu'une telle loi était trop généralisée et il fut établi que l'assujettissement était limité aux catégories d'instruments pour lesquelles il y avait des prescriptions de construction.

Une telle loi pourrait signifier que tout instrument réalisé hors d'une réglementation ne serait pas assujéti à la vérification. Mais en pratique il y aurait quand même bien des cas douteux. D'ailleurs, l'assujettissement ne peut pas s'appliquer dans un champ sans limite et le remplacement de la garantie du constructeur par la garantie de l'Etat paraît aujourd'hui maintes fois une tutelle excessive et parfois assommante.

La source naturelle des lois en poids et mesures comprend deux éléments essentiels, l'un est la nature des intérêts à protéger : intérêts publics ou intérêts économiques particuliers en fonction de l'intérêt général, l'autre est constitué par les possibilités techniques de la fabrication et du contrôle des instruments de mesure. Par conséquent l'aspect juridique ne peut pas méconnaître l'aspect technique.

Le contrôle de l'Etat s'applique aujourd'hui de différentes manières et par étapes successives :

- 1 — approbation d'un nouveau type d'instruments lorsqu'il n'est pas couvert par des spécifications réglementaires existantes ;
- 2 — vérification primitive à laquelle les constructeurs sont assujettis, afin de constater la bonne qualité de l'instrument ;
- 3 — vérification périodique à laquelle l'utilisateur est assujéti et qui concerne l'entretien de l'instrument ;
- 4 — la surveillance de l'usage correct de l'instrument.

Les trois premiers contrôles sont nécessairement successifs, mais des raisons techniques et pratiques pourraient limiter l'assujettissement aux deux premiers stades, considérant non nécessaire la vérification périodique, ou encore au premier stade seulement si sur les autres points la garantie du constructeur est considérée suffisante.

A l'obligation de vérifier les mesures de capacité pour les produits liquides certains pays ont exclu la vérification des mesures en verre car on avait constaté « qu'elles ne pouvaient que se casser ». En d'autres pays les vérificateurs devaient contrôler les mesures de capacité de métal par comparaison à une mesure étalon bien que ces mesures ne pouvaient pas se dérégler sans subir une déformation nettement visible. La plupart des mesures de longueur fabriquées suivant les normes légales de construction ne peuvent pas s'allonger ni se raccourcir. Voilà des cas et des exemples où le Service pourrait être appelé à effectuer des opérations inutiles tandis que la surveillance serait suffisante pour garantir la bonne foi de l'utilisateur et mettre hors service les instruments abîmés.

Une vieille loi italienne (1890), encore en vigueur dans ses lignes de base, établit l'assujettissement selon l'usage que l'on fait de l'instrument. Ceci est bien spécifié dans l'article 12 : « Les poids, les mesures et les instruments employés dans le commerce pour peser et mesurer, sont assujettis à deux vérifications, la primitive et la périodique » [1]. Il est donc évident que la vérification primitive est obligatoire seulement pour les instruments qui seront utilisés dans le commerce et qu'elle n'est pas obligatoire si la vérification périodique n'est pas requise. Cela est même confirmé par un avis du Conseil d'Etat (29-7-1913). Toutefois, en pratique, l'assujettissement a été étendu à tous les instruments qui, « par leur nature », pourraient être employés dans le commerce c'est-à-dire pratiquement à tous les instruments, sans tenir compte de leur destination, sauf à certains comme les règles à dessin et les pèse-lettres, expressément nommés dans les règlements d'application.

En ce qui concerne la vérification périodique, la dite loi déclare assujettis « ceux qui font usage de poids et mesures pour la vente ou l'achat ou un commerce quelconque... » [2]. Mais en vérification périodique aussi il y a eu une extension de l'assujettissement ; étant donné que la loi établit le paiement d'une taxe de vérification basée sur la profession, tous ceux qui exerçaient une profession commerciale étaient incorporés dans un rôle ou une liste d'usagers de poids et mesures même si l'instrument n'existait pas ou n'était pas nécessaire. De cette mauvaise application de la loi, les vérificateurs n'étaient pas responsables, mais la direction administrative qui, par des raisonnements parfois byzantins et méconnaissant l'aspect technique, tendait à généraliser l'aspect juridique et à augmenter la recette. Ces erreurs ne se seraient pas produites si la taxe avait été fixée sur la base du nombre et de l'importance des instruments.

Cette extension de l'assujettissement à la vérification périodique, loin d'avoir apporté des bénéfices financiers à l'Etat, a provoqué de considérables inconvénients économiques. En effet, la perception des taxes et la comptabilité relative à ces taxes ont tellement occupé les bureaux de vérification que les frais, à bien calculer, ont dépassé le montant des recettes, sans considérer la charge indirecte, c'est-à-dire les frais à supporter par le contribuable, parfois supérieure à la taxe payée. D'autre part les contestations des personnes qui s'estimaient être frappées à tort ont mobilisé les administrations publiques telles que Communes, Préfectures, Ministère compétent, Conseil d'Etat et Cour de Cassation. Avis et sentences de ces deux dernières hautes assemblées ont rempli des volumes de recueils au début du siècle. Ensuite les recours aux tribunaux administratifs ont cessé par convenance mais les contestations verbales se sont poursuivies pendant des dizaines d'années causant beaucoup de gêne aux bureaux de vérification.

Conclusions : les expériences du passé et les connaissances actuelles nous conduisent aux suggestions suivantes sur les principes à suivre dans l'organisation d'un service national de métrologie.

Les normes de construction et méthodes de contrôle, tant générales que particulières, sont nécessaires pour tout instrument de mesure qui pourrait être introduit en usage dans un domaine où le contrôle est obligatoire ou souhaitable. Le respect de ces normes conduit à prescrire la vérification primitive. Mais l'assujettissement ne peut pas ressortir de l'existence d'une norme officielle de construction mais de l'usage que l'on fait de l'instrument et, en principe, l'obligation naît au moment de l'usage, même si en pratique le constructeur fait légaliser l'instrument avant. Cette vérification primitive peut naturellement être demandée par le constructeur pour une reconnaissance officielle de la qualité de l'instrument.

Un élément essentiel de la qualité d'un instrument de mesure est la précision. Le niveau de précision demandé par les utilisateurs est très variable. Il est bien, par conséquent, d'établir des classes de précision des instruments, mais quand il s'agit d'assujettissement il faut établir un minimum de précision pour le mesurage en question et cela comporte pas mal de considérations [3].

En d'autres termes, nous pouvons envisager en métrologie légale deux espèces de normes ou prescriptions dont la première concerne la construction des instruments et les méthodes de contrôle, voire la nécessité d'un contrôle périodique durant l'usage, l'autre concernant les domaines de mesure dans lesquels l'emploi d'un instrument soumis aux contrôles est obligatoire. Les autorités compétentes dans les différents domaines seraient habilitées à établir les assujettissements.

La normalisation technique mérite d'être uniformisée sur le plan international même si en matière d'assujettissement les normes nationales peuvent présenter des différences selon la situation économique et sociale du pays.

L'organisation d'un service national de métrologie légale peut connaître des problèmes financiers à cause de la perception des taxes de vérification et des indemnités, parfois forfaitaires, que doivent payer les assujettis par suite des frais de déplacement [4].

Il faut tout d'abord considérer la légitimité des contributions. Le principe de la perception d'une taxe pour la vérification primitive est incontestable. Un service réel est rendu au fabricant et la valeur des instruments est augmentée par l'intervention du Service.

La légitimité de la taxe de vérification périodique, au contraire, est discutable. Anciennement elle était justifiée du fait que la vérification comprenait des petites opérations de réajustage. Après, on trouve dans les règlements que le vérificateur devait non seulement spécifier les défauts de l'instrument mais indiquer aussi quelles opérations étaient nécessaires pour le réajustage. En l'absence de toute assistance technique la taxe ne paraît pas légitime. Le contrôle est dans ce cas une opération de surveillance. On dit parfois que l'on fait payer à l'épicier pour une opération dirigée contre lui, car si la balance marque à son détriment il dispose lui-même de moyens pour s'en apercevoir. Puisque c'est la collectivité des consommateurs qui profite de l'opération, c'est l'Etat qui doit en supporter les frais.

En cas de perception de taxes de vérification, questions de légitimité mises à part, il faut éviter, autant que possible, d'engager le vérificateur dans cette opération car il serait obligé de consacrer plus d'attention à la comptabilité qu'aux opérations métrologiques avec préjudice pour la bonne conduite du service.

Références

- [1] Cette loi, publiée en traduction française dans le Bulletin de l'OIML N° 13 (septembre 1963), établit aussi la vérification des compteurs de gaz par un système différent de la primitive et de la périodique, et la vérification périodique des manomètres étalons.
- [2] En ce qui concerne l'assujettissement, voir une norme plus détaillée dans l'article 4 de la loi organique belge sur les unités et instruments de mesure dans sa version de 1939.
- [3] E. Menna : « Equivalence économique de la précision », Bulletin de l'OIML N° 18 (décembre 1964).
- [4] E. Menna : « Le rôle des taxes de vérification dans un service de Métrologie », Bulletin de l'OIML N° 48 (septembre 1972).

NORVEGE

HIGH CAPACITY BELT WEIGHER for IRON ORE *

by Jens Chr. LANGE

The Norwegian Service of Legal Metrology

SUMMARY — The iron ore extracted in the extreme north of Sweden is to a large part exported using the harbour of Narvik. The weighing installation put into use in 1978/1979 comprises primary belt weighers which regulate the belt speed of the final conveyor which has two successive weighing stations allowing an accuracy of ± 0.2 %. The supervision of the accuracy of the belt weighing installation, and whenever necessary its adjustment, is made by using a verified hopper scale having a capacity of 450 t.

RESUME — Le minerai de fer extrait dans l'extrême nord de la Suède est en grande partie exporté en utilisant le port de Narvik. L'installation de pesage mise en service en 1978/1979 comporte une installation primaire de pesage sur bande qui régule la vitesse de la bande du convoyeur final dont le dispositif de pesage à deux stations successives permet ainsi d'atteindre une exactitude de $\pm 0,2$ %. La surveillance de l'exactitude de l'installation finale et, si nécessaire son réglage, s'effectue à l'aide d'une bascule à trémie ayant une capacité vérifiée de 450 t.

1 Narvik ore harbour

Although the harbour of Narvik is as far north as the northern part of Sibiria and Alaska, it is ice free in winter due to the temperature of the water in the Gulf Stream. The ore is mined by the company LKAB in Sweden and some of this ore is shipped through the Swedish harbour of Luleå on the Gulf of Bothnia. But as this harbour is closed for handling large ore consignments for an average of five months of the year due to ice 75 % of the ore is shipped through Narvik.

The construction of the harbour of Narvik started in 1899, and the first ship loaded with ore left Narvik in the winter of 1903. The harbour has since that time been undergoing several improvements. It was totally destroyed during the World War II, but rebuilt again. The part of the harbour with the high capacity belt weigher described in this paper was ready for use in 1978/79.

2 Transport of the ore

The ore is mined in Kiruna, Svaappavaara and Malmberget, and most of the ore is sent to Narvik on a single electrified railway track. This railway has, on the 168 km section between Kiruna and Narvik, a daily capacity of 30 loaded trains and a corresponding number of empty trains running in the opposite direction. The round trip takes about 32 hours.

Each wagon has a pay load of 80 t, and a train takes about 4 000 t of ore. The train is hauled by a 270 t electric locomotive, of up to 7 200 kW power. This makes it possible to transport approximately 120 000 t of ore every 24 hours.

* Presented at the OIML Seminar on Testing of Bulk Weighing Installations, Paris 22-25 April 1985.

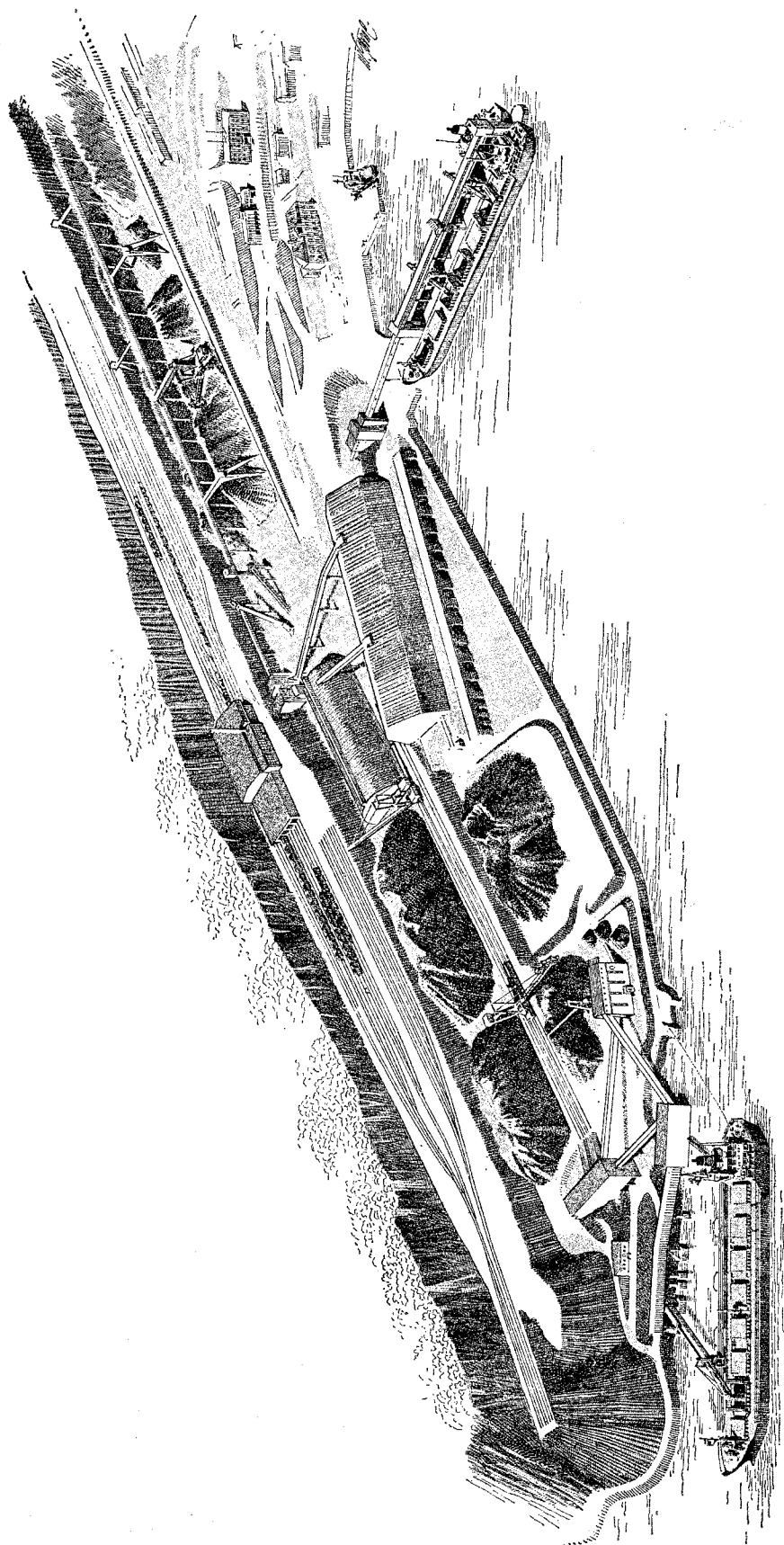


Fig. 1 — Narvik ore harbour

After the train has arrived at the unloading station, an unloading gear opens the bottom chutes of the wagons. In winter when the ore is frozen, the bottom chutes are thawed with hot air, and there are also car shakers vibrating the wagon to facilitate the discharging of the frozen ore. Afterwards the ore passes through scalping grids, which break up frozen lumps of the ore before it is fed onto a conveyor belt for transport to the various stockyards. There are four stockyards, with space for about 4 million tons of ore in some 10 grades.

The ore is reclaimed from the stockyard either with one of the 35 t grab cranes or with a bucketwheel reclaimer to a conveyor belt. To prevent damage to the belt from large lumps of frozen ore, and to minimise the fluctuations in the feed of ore to the weighing station, a grid is fitted in front of the feeder chute.

The conveyor belt from the transfer station at the stockyards to the quay is 2 meter wide and is designed for a capacity of 11 000 t of ore or 7 500 t of pellets per hour. The ore is routed to the quay conveyor belt on internal connecting belts.

Samples are taken continuously at a transfer point located between two conveyors during the loading of the vessel. The test batches are distributed to the sample preparation for chemical analysis and moisture determination. From the place where the samples are taken automatically, the ore is transported on a conveyor belt to the quay, and during this transport the ore is passing the weighing station.

3 The weighing station

The supplier of the new weighing station was requested by LKAB to guarantee an overall accuracy of $\pm 0.2\%$ of the material passing the weighing station, within a range of flowrates from 8 000 t/h to 11 000 t/h.

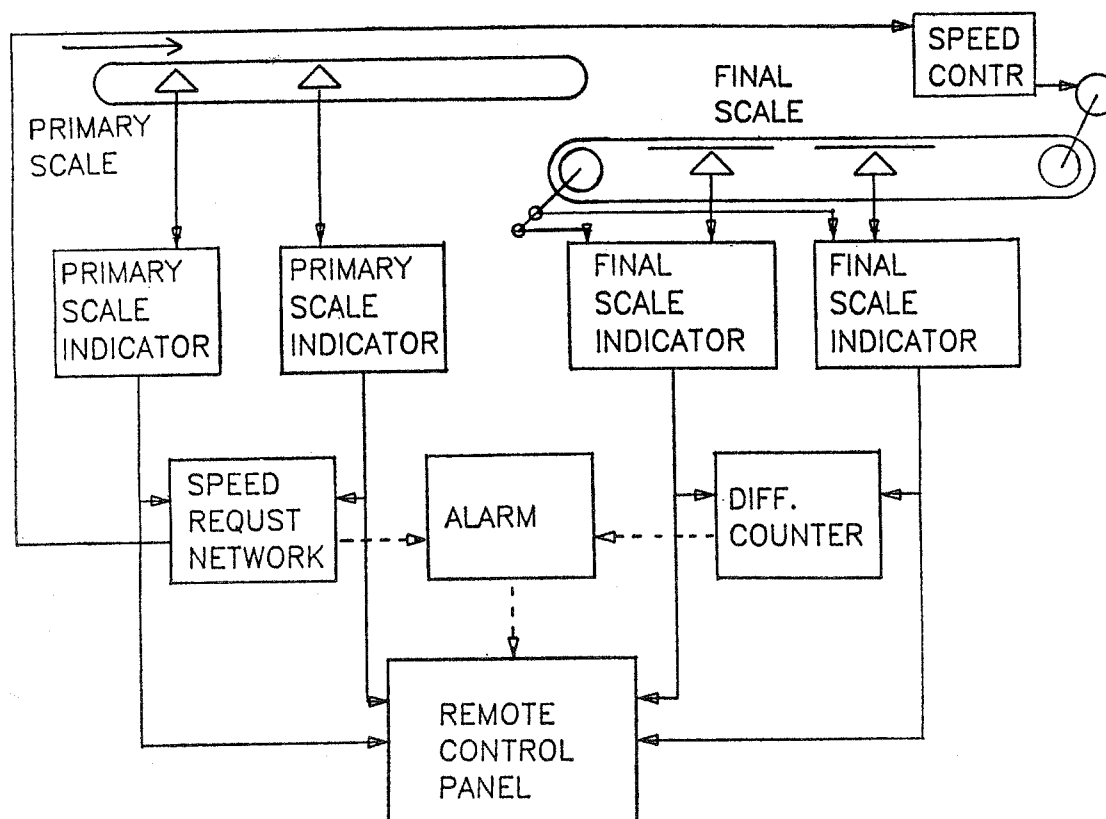


Fig. 2 — Schematic diagram of the belt weighing installation.
The primary scale is only used for belt speed control of the final scale.
Both scales comprise two separate weighing units to secure highest weighing accuracy.

- The solution to this weighing problems was to install as main components :
- a multiple idler belt weigher (final scale)
 - and
 - a hopper scale to be used as a control machine in direct connection with the belt weigher.

However, in order to maintain at all times the accuracy of $\pm 0.2 \%$, the final scale was duplicated by a consecutive multiple idler scale. These two final scales are equipped with a differential counter which gives a signal to the operator if the difference in indication exceeds a preset value.

Two single idler primary scales were also installed to weigh the material before it is fed to the final belt weighers so as to continuously regulate the belt speed of the final scales. Only one of the primary scales is normally in use, the other is on stand by if the first one should fail. The aim of the belt speed regulation is to maintain an approximately constant load on the final scales regardless of the fluctuations of the feed of the material on the conveyor from the reclaimer. The system attempts to maintain the load on the final belt weighers within the load range where they have the highest accuracy.

The load distribution (in kg/m) on the conveyor belt varies because of the fluctuations in the reclaiming capacity and the density variations in the grades of materials handled. The load distribution on the final scales is maintained within 750 to 900 kg/m for a conveyed capacity of 1 000 to 11 000 t per hour by regulating the belt speed of the final scale which thus varies automatically in the range from 0.4 m/s to about 3.4 m/s to achieve consistant accuracy of the weighing system.

The average error of the primary scales in the range from half capacity to 11 000 t/h is within $\pm 1 \%$ of the material passing over the scales.

For the final scales the maximum mean error is $\pm 0.2 \%$ of the total amount of material passing over the scales for flowrates from 8 000 t/h to 11 000 t/h. The maximum mean error is, however, not allowed to exceed $\pm 0.25 \%$ of the weight of material passing over the scales for flowrates within the ranges from 4 000 t/h to 8 000 t/h, and from 11 000 t/h to 12 000 t/h.

The weighing station is located inside a gallery and the weigh tables are mounted on a 20 m high concrete support. The conveyor belt of the final scales has an inclination of 2° , is 2 meter wide and approximately 60 meter long with a troughing angle of 40° . Each weigh table is supported on fulcrum points at each end.

The weigh table consists of two halves, each composed, of two I-section steel beams on which the idler supports are mounted, see Fig. 3. The two table halves are linked to each other with vertical flexible steel strips and supported on load cells at the centre of the weigh table and on each side of the conveyor. The difference in deflection of the central part of each weigh table at the load cell location does not exceed 0.6 mm between maximum load and empty belt.

The construction of the weigh tables gives a load profile as indicated by the broken line in Fig. 4. A load at point A in this figure is not involved in the weighing process whilst a load at point C is fully supported by the load cell. A load at point B is only partly supported by the load cell, and will only partly contribute to the weighing. If the distance between the rollers is 1 m and if we take a weight reading for every 3 m displacement of the conveyor belt, the load at C is registered just once, but a load at point B will be registered twice. The first registration of the load is when the load is in the area where the sensitivity is increasing, and the second registration is when the load is in the area where the sensitivity is decreasing. But the sum of these two registrations is the same as if the load had been registered in the area where the load C is indicated, and where the sensitivity is constant. In practice, however, readings are taken at every 0.8 m of the belt movement and the readings are processed accordingly.

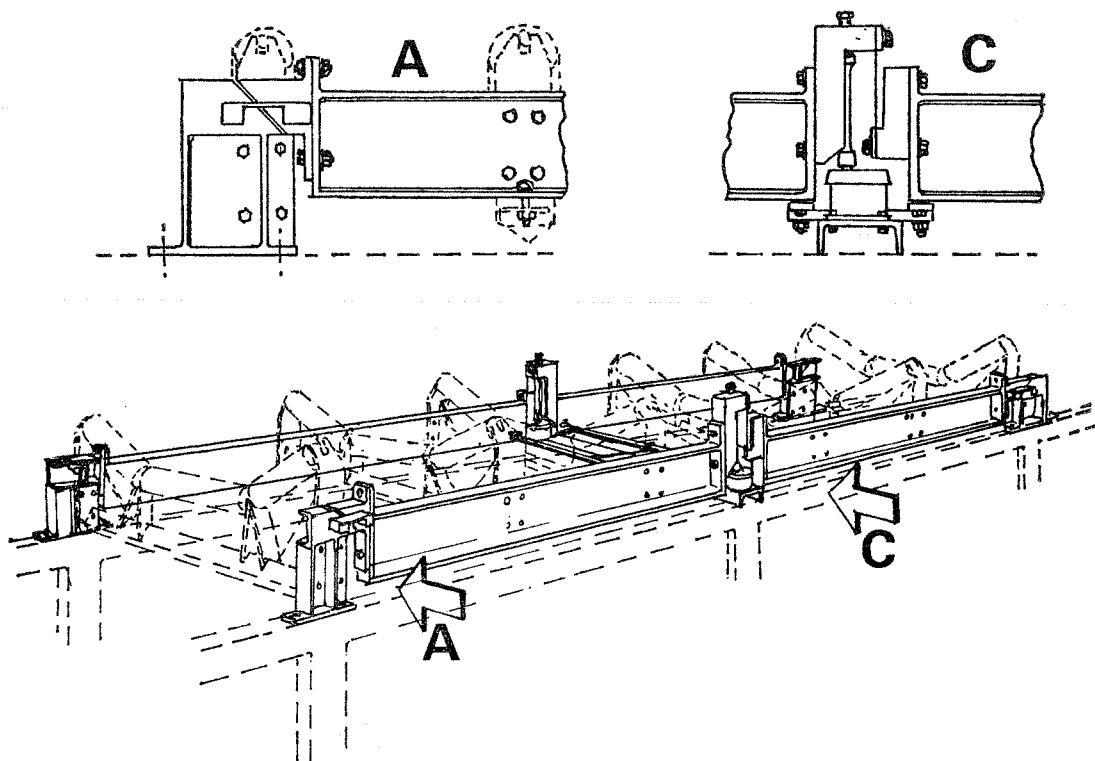


Fig. 3 — Lay-out of one of the multiple idler weigh tables of the final scale. The table has two halves with fulcrum points at A and steel band links at C where the load cells are located.

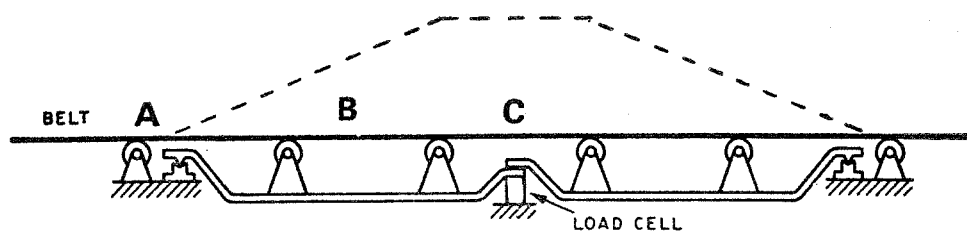


Fig. 4 — Schematic diagram of the weighing principle. The load profile is shown by a broken line.

Each scale or weighing unit is complete, it has its own displacement transducer (tachometer), recording and indicating devices, tare check equipment, electric load testing of the weighing system, and operation selectors.

The final scale conveyor is designed to discharge either onto the conveyor belt for the ship loader or by the use of a moving chute into the collecting bin of the control machine.

4 The control machine

Since the user of this equipment was aware of the actual accuracy of the weighing system, there was no question about the necessity of providing a control machine, we were only discussing its capacity.

At the time of construction the regulations in Norway on this point were that the minimum totalized load had to be at least equal to the largest of the following values :

- the load obtained at maximum flow rate in one revolution of the belt or
- 200 totalisation scale intervals.

In this case the regulations required a control machine with a capacity of only 52 t, and the material test would have been done in 17 s. As a result of the discussions it was however decided that the capacity of the control machine had to be about 500 t. The control machine is today verified up to a capacity of 450 t.

According to OIML R150 and the new Norwegian regulations the requirement for the capacity of the control machine for this installation is at least equal to 220 t.

The high capacity of the control machine gave us another problem, how to verify a 450 t hopper scale ?

First of all we needed a great number of test weights. As the user already had a stock of 50 t of verified 500 kg weights, we accepted that he only needed another 30 t of 500 kg weights, making a total of 80 t. In addition our local office has about 20 t of weights.

As a part of the verification procedure we always start with a verification of the weights. This verification is done with a transportable mechanical weighing machine with an arms ratio of 1 : 5, and with a sensitivity of only a few grams.

With these weights, a forklift and a special weight receptor beneath the hopper, it is possible to load the hopper with weights in steps up to between 80 and 100 t. We then use ore to substitute the weights and in this manner we reach the maximum capacity of the control machine.

The test procedure of the belt weighers is then to pass an amount of about 400 t of ore over the belt weighers and collect it in the control machine. The results of the belt weighers are compared with the result of the control machine. If the discrepancy is greater than a preset value, the belt weigher is readjusted.

5 The every day use of the belt weigher

The stability of zero is tested every day with a whole number of revolutions of the empty belt. The electronic devices are also tested every day by means of a simulation test equipment.

Whenever the conveyor is at rest for 12 h or more, the belt is always run for half an hour in order to trim the belt as well as the rest of the installation.

If nothing particular happens during the use of the installation, a material test is carried out every fortnight. If the difference between the results of one of the belt weighers and the control machine is greater than 0.25 % of the totalized mass, the actual belt weigher is readjusted. Usually the differences are within ± 0.1 %. During these material tests carried out every fortnight there are always representatives from the customer present to witness the test procedure.

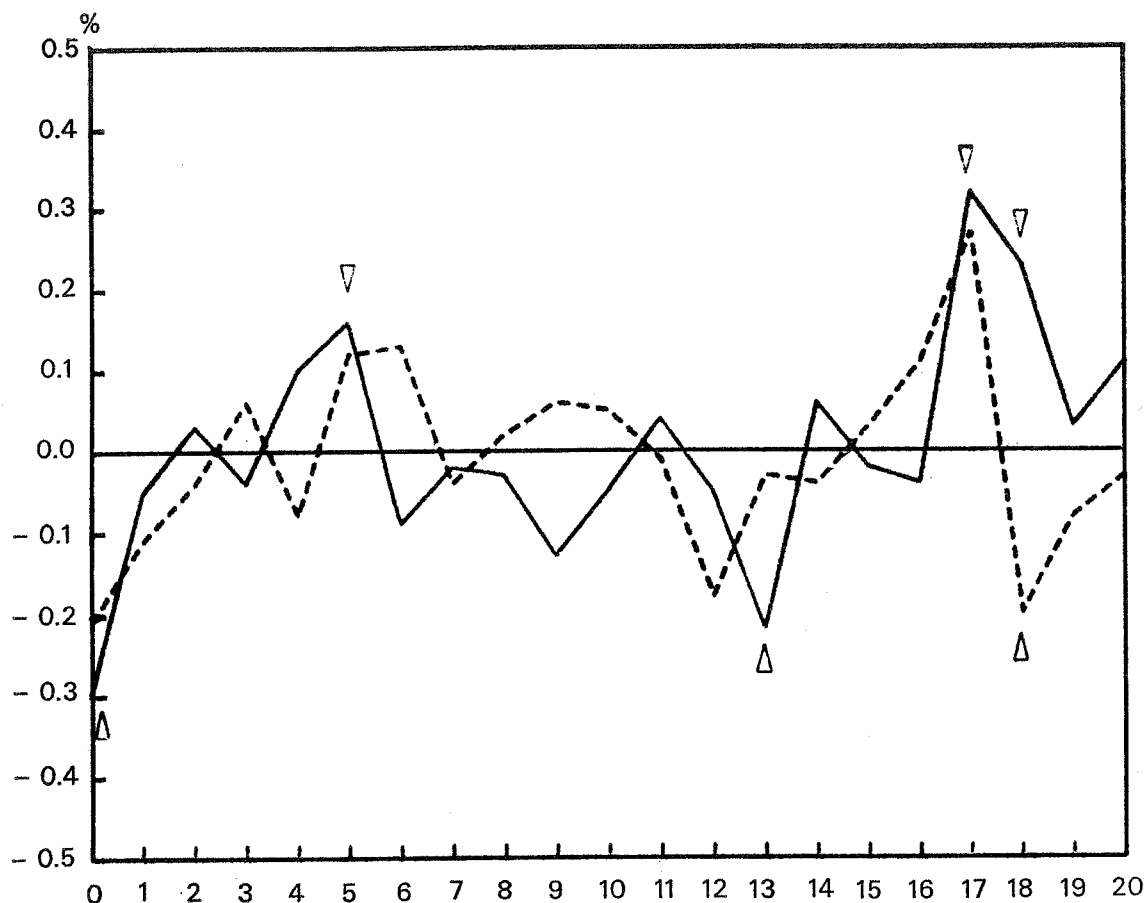


Fig. 5 — The differences in the results of weighing with the control machine and the two belt weighing units of the final scale.
The material tests as numbered are carried out every fortnight.
The arrows indicate readjustments of the respective belt weighing units.

———— Belt weigher No. 1
- - - - - Belt weigher No. 2

As already described the final scale consists of two identical multiple idler belt weighing units. These two units are both complete with separated weigh tables, signal processing and indicating devices. The weighing results from these two units are compared and if the difference is within the preset value, the result of the weighing for the invoice is the average of the two values. If the results of the two units differ by more than the preset value, the operator is warned and the weighing results of the two units are indicated separately. The operator then has to make a material test as soon as possible to determine which one of the two scales has failed.

The total weighing system with two primary belt weighers, a double final belt weigher and a control machine of 450 t may seem extravagant. The user had to make an extra investment of between 3 and 5 million French francs to get the uncertainty down to 0.2 %. In addition, an employee has the full-time duty of supervising the weighing equipment and testing the system.

But the answer is obvious ; even though the LKAB only used half the capacity of the harbour of Narvik in 1984, they exported through this harbour about 14.4 million t of ore and pellets. If we assume that the extra investment has made it possible to decrease the uncertainty from 0.5 % as the regulations require to 0.2 % as LKAB required, a simple calculation shows that the difference in uncertainty represents 43 200 t. With an estimated average price per ton of 200 French francs this improvement in the weighing system is worth 8.6 million French francs for 1984 only.

6 Conclusions

As a conclusion I would like to draw attention to some points which I feel are essential to obtain such good weighing results with a belt weigher.

With most weighing machines, the user is not allowed to use the adjusting devices. These parts are usually sealed by the weights and measures inspector after installation. This does not apply to belt weighers, in this case the user, the weight supplier, and the inspector have to co-operate to find the best way to test the actual installation. After the initial verification the user has to be able to make readjustments himself when needed.

This makes my first point :

- if you wish to succeed in having a good and accurate weighing installation, the user has to be interested in doing an accurate job.

My next points are more or less obvious :

- if the user has this interest and some insight in the weighing problems, he will easily see the need for a control machine. He will also install the control machine in such a way that it is so easy to do the material tests that these tests will really be done.

Then, as my last point, which is something of a personal obsession with me, that is

- that the user must assign to a special person the responsibility for the maintenance and the testing of all the weighing installations in the company.

TESTING of STATIC WEIGHBRIDGES *

by B.J. ANTHONY

W & T Avery Ltd

SUMMARY — Following a glance on the historic development of weighbridges the paper emphasizes the current problems in the United Kingdom concerning testing of modern electronic weighbridges in particular when the capacity is high and requires manipulation of a great number of heavy test weights for the linearity, hysteresis and repeatability tests.

RESUME — Après un aperçu sur l'évolution historique des ponts-bascules, cet exposé fait ressortir les problèmes de vérification que posent en Grande-Bretagne les ponts-bascules modernes de forte portée, en particulier en ce qui concerne la manipulation des masses étalons nécessaires pour les essais de linéarité, hystérésis et répétabilité.

« It will weigh a pound of butter or a ton of coal with equal accuracy. »

That bold claim was made by John Wyatt when he built the first lever type weighbridge at Snow Hill in Birmingham in 1743. Wyatt did not have the benefit of Pattern Approval or initial verification to support his claim as does today's manufacturer; the accuracy of his boast is therefore difficult to judge. The modern manufacturer of weighbridges is not, as far as I know, given to making such extravagant claims as Wyatt, but he does produce a sophisticated piece of equipment which is capable of performing a multiplicity of functions far beyond the simple task of weighing.

Wyatt would have a great deal of difficulty in recognising today's weighbridge; the « levers » that he so brilliantly pioneered have now been replaced by load cells; the deep pit required for siting the weighbridge is very much a thing of the past with surface mounted structures which can be assembled on site in a few hours, and the sliding poise indicator has now been superseded by the digital indicator which can be mounted on a desk or hung on a wall.

Wyatt's weighbridges when they were first introduced, had a very limited use. Most commodities, including solid fuels were required, at that time to be sold by capacity measurement rather than weight. It was not until the latter part of the 19th century that the law in the United Kingdom was changed to require sales by weight and since then the weighbridge, in common with all other types of weighing machine, has undergone significant changes, and has now reached the stage where it can play a vital part in the management and financial control of a modern production plant, as well as providing simple information about the weight of goods being received or despatched.

Consequent upon this increase in sophistication, the modern inspector of weights and measures is required to be much more of a specialist than his counterpart of one hundred years ago. The degree of knowledge and expertise that he requires is considerable, and the test equipment which must be available to him is expensive to provide and maintain.

* Presented at the OIML Seminar on Testing of Bulk Weighing Installations, Paris 22-25 April 1985.

In this short presentation it is difficult to do more than highlight the significant areas of concern when testing static weighbridges. To cover as much ground as possible, I have decided to structure my address around the procedures that the UK inspector must follow when he is called in to carry out an initial verification.

The first problem that the inspector is faced with is confirming that the pattern he is looking at is in accordance with the Certificate of Approval issued by the UK National Weights and Measures Laboratory. Over the last 30 or so years this problem has become more difficult. Until about 1950 the vast majority of static weighbridges would still have been recognisable to someone from Wyatt's era. The construction of the weighbridge was based on the long established lever principle whereby the mass of the load was converted via a system of levers and counterpoises into a direct downward pull on a sliding poise (steelyard) or translated via ribbons, pendulums and racks and pinions into a revolving chart or pointer indication.

It was therefore a relatively simple matter for an inspector to look at this arrangement and compare it with simple line diagrams contained in the Certificate of Approval.

Now however, when the mass of the load is converted into an electrical signal, as happens with today's load cell systems, and that signal is conducted by a bewildering array of resistors, diodes, capacitors and semiconductors across a number of printed circuit boards, the inspector has far less chance of confirming that what he is looking at is the same as the instrument described in the Certificate of Approval. It is no longer possible to adequately describe the equipment with a few simple diagrams and 3 or 4 paragraphs of written text. If we look, for example, at UK Certificate of Approval No. 1802, which describes the Avery 5150 CTH weighbridge, we find that it takes some 9 pages of closely typed text and some 7 illustrations to give a reasonable description of the equipment, which the inspector can use to recognise the machine he is dealing with. When we further consider that there are some 46 approved « variants » to this Certificate of Approval the size of the « inspectors » task in « recognising » the equipment can easily be imagined.

Having « recognised » the machine, the inspector now has to begin the time consuming task of testing the machine. Here again the situation which exists today is vastly different from that of 30 years ago, and again it is as a result of the technological advancement which has taken place in weighing technology.

When weighbridges were constructed on the « lever » principle, the system of manufacturing them involved assembling all the necessary component parts in one place, fitting them all together and testing the machine. A small team, usually of 2 or 3 men, were responsible for the full construction of the machine; they assembled the levers and bottomwork, connected the headwork, made all the necessary adjustments, and tested the system to its full capacity. Having done all that, and satisfied themselves it was correct, they would then arrange for the local inspector to be called into the factory. He would carry out a full test, which in the UK we called a « Preliminary Test » and mark the stamping points to indicate that it had performed satisfactorily. He would also issue a Certificate of Test, containing details of the errors he had found and identifying the equipment he had tested. This Certificate then accompanied the weighbridge when it was sent to the installation site. After installation the local inspector for that particular area would be called in and given the Certificate issued by the first inspector. He would then have the choice of repeating fully all the tests carried out by the first inspector, or simply « spot checking » that the performance of the system had not deteriorated.

Modern production methods however, effectively rule out this type of 2 stage verification. It is not uncommon for the various component parts of the system to be manufactured at different times and locations. Thus we can have the load cells manufactured at site A, the indicator manufactured at site B and the bottomwork at site C, with the whole lot only coming together at site D, the point of installation. In such a situation a 2 stage testing procedure is obviously out of the question. A

possibility does exist for the load cells and the indicator to be tested together using test beds at the manufacturer's premises but for various reasons, not the least of which is cost, this approach is not favoured by today's inspectors.

The inspector at the installation site is therefore faced with the problem of carrying out a full test on the system. With machines of 60 or 80 tonne capacity being the usual nowadays, this is no easy job. The amount of equipment needed, and the number of people required, make this a very costly exercise.

The most common method of carrying out the test is to use roller weights or bar weights which have to be transported onto the site by large motor vehicles. Even with vehicles which are of the maximum gross weight permitted by the Road Traffic regulations, only about 50 % of the weights necessary for high capacity machines can be moved in one go. The inspector therefore must choose whether he is going to use a substitution method of testing ; that is using his weights up to the highest point he can, then substituting loose material for the weights and then re-using the weights to reach the maximum capacity ; or whether he is going to use standard weights for the full test, in which case he will need to send his vehicle back to his office to collect another set of weights.

It is obviously preferable for the inspector to use standard weights for the whole test, it is a far more precise test procedure and will give the inspector a high degree of confidence in the result. However, accuracy is not the only factor the inspector has to consider. He must also consider the cost element and the time factor.

Dealing with cost first ; to provide a modern test vehicle fully equipped with sufficient weights involves a considerable amount of capital expenditure. Such vehicles are not cheap and the modifications which must be made to « standard » vehicles to equip them for weighbridge testing are also expensive. Having invested large amounts of money in test vehicles, it obviously makes economic sense to obtain the maximum use from them, and this can only be measured by the number of weighbridges tested. Any time which is used by sending vehicles back to a depot to be reloaded with weights is effectively « dead » time, and such time represents a waste of money.

Turning to the time factor, this again is an area where the inspector must exercise his judgement carefully. By the very nature of their use, weighbridges are very often situated in remote and inaccessible sites, well away from the main centres of population. The time taken in travelling to these sites can represent a considerable portion of the working day and the inspector who wants to obtain maximum use from his test vehicle is well advised to spend an hour or so planning his work very carefully.

It is however not only his own time that the inspector needs to consider, he should also be aware of the effect that his visit will have on the normal user of the weighbridge. Most users of weighbridges need to have their machines available to them as often as possible. For someone such as a Cement producer for example, who will have vehicles in and out of his premises at all times of the day and night, any time lost through non-availability of the weighbridge will be at least a considerable inconvenience and could be a very significant overhead in the running of his business.

Whilst I would not dream of advocating that the inspector should not have right of access to the weighbridge at any time, I firmly believe that unless the inspector has reasonable grounds for suspecting that something is drastically wrong with the weighbridge or the way it is being operated, he has a moral obligation to arrange his testing in such a way that it causes the minimum disruption to the normal operation of the factory or production plant in which it is situated.

Having decided on his test method, the inspector can now begin the test. But what tests is he going to carry out ? Obviously he wants to check that the weighbridge is in the language of the UK legislation, « fit for use for trade », and

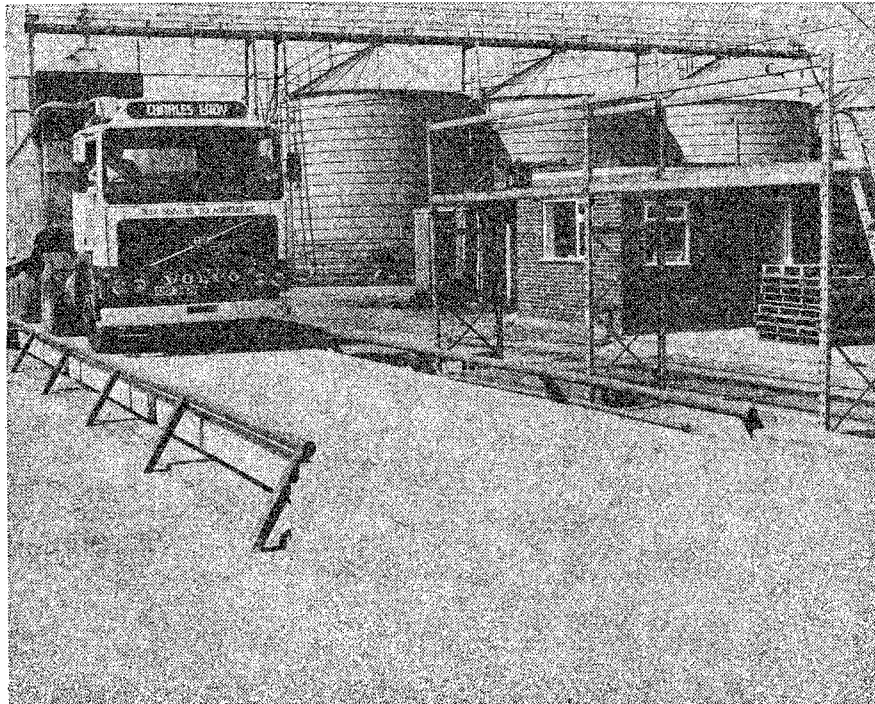


Fig. 1 — Modern surface mounted weighbridge using load cells

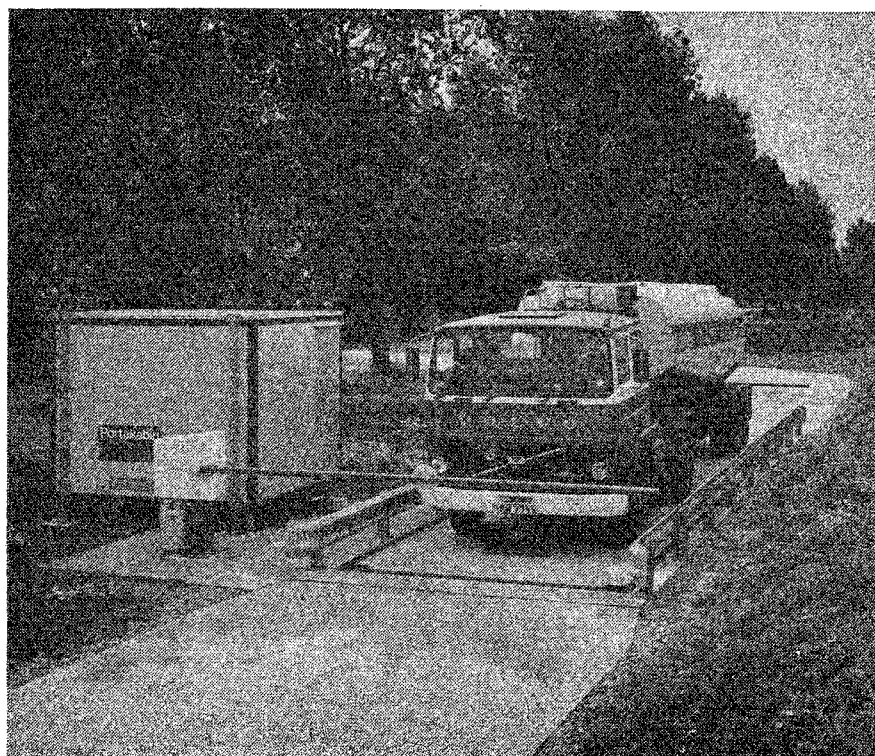


Fig. 2 — Unmanned weighbridge operated by the driver.
Automatic zeroising is carried out before the barrier is raised to allow the vehicle on the weighbridge.

this will involve determining the accuracy of the equipment at various points throughout its range. But at what points ? Here once more, the modern inspector has a more difficult task than his predecessor.

There were, generally, three types of indicator in use before the 1950s. These were the loose poise weight indicator, where an indication of balance was obtained by putting proportional weights onto a carrier mounted at the end of a fixed length « steelyard » indicator, the sliding poise indicator, where major and minor poise weights were moved along a notched « steelyard » until the point of equilibrium was reached, and the dial indicator where the weight was indicated by a revolving pointer moving across a graduated chart, the value of the indications on the chart being variable dependent upon a system of poise weights supported on one of the intermediate levers. Other types of indicators were used, but they never really achieved the market penetration of the three I have described and their use was never widespread.

For each of these types of indicator, the test points were almost decided for the inspector by the machine itself. For the loose poise weight machine the inspector would test using loads represented by the individual poises ; for the sliding poise indicator the inspector would test at each « notched » graduation and for chart type indicators the inspector would carry out his test at each major graduation on the chart and then at each subsequent « change point » when a new set of graduations came into play.

Today's digital indicator however, gives the inspector no guidance at all. It can have any number of graduations, 3 000 is common and 5 000 or 6 000 not unusual, and each of these graduations is equally achievable. If there were a system of variable error allowances in existence, as for example recommended in R13, that is $\pm 0.5e$, $\pm 1e$ or $\pm 1.5e$, depending upon the load, then the inspector would at least have some guidance. However, many countries, including the UK, have at the moment a fixed error allowance throughout the range of the machine, so the inspector is given no guidance there. The choice is really up to him and most inspectors in the UK have chosen to carry out the basic accuracy test using loads equivalent to 1/10th of the weighbridge's capacity.

Having carried out a « linearity and hysteresis » test, what other tests should the inspector apply ? If we look at R13 we find that it recommends the following tests for non-automatic machines :

- Eccentricity
- Repeatability
- Discrimination and sensitivity
- Temperature limits, including zero stability
- Variations in the electrical power supply

Eccentricity. In the UK our law requires that the eccentric loading test for weighbridges be carried out using a load equivalent to 25 % of the capacity of the machine placed on the ends or corners of the weighbridge. I am pleased to say that most inspectors gave up the practice of carrying out corner tests on weighbridges a long time ago. It is quite obviously not representative of the way in which a weighbridge is used. « End loading » tests are much more realistic — though there are those who doubt the validity even of these tests — yet the practical difficulty of moving 15 or 20 tonne of weights from one end of an 18 metre weighbridge plate to the other whilst causing as little influence as possible, other than the shifting of the point of application of the load, is not easily overcome. However, it can be done.

Repeatability. At first sight this should not present a problem, and for most weighing machines, it does not. For the high capacity weighbridge though, the test needs to be carried out at a point in the range where there is a reasonable chance of duplicating normal use. It would, for example, serve little practical purpose to test an 80 tonne weighbridge for repeatability using a test load of 500 kg or 1 tonne.

To have any meaning at all, the test must be carried out at a sensible point. Again we face the practical difficulty of loading and unloading the machine several times without bringing other influencing factors into account.

Discrimination and Sensitivity. Even for high capacity weighbridges these tests should present no real difficulty to the inspector.

Temperature. The field inspector has virtually no opportunity of carrying out any temperature test whatsoever. His test is limited to the prevailing temperature at the time. He may of course vary the season of the year in which he carries out his test, summer one year, winter the next, but normally he is restricted by the weather conditions which exist when he visits the site. He must rely on the fact that extensive temperature testing was carried out on the machine at the time of Pattern Approval, and fortunately, most Pattern Approval laboratories can cater for such tests, either by large scale temperature cabinets or by simulation.

Variations in the electrical power supply. Again, this is not a practical test for the field inspector to carry out. The equipment needed to generate the interference levels is both costly and cumbersome, and does not take kindly to being transported long distances in the back of an inspector's car. The inspector must rely on the tests which were carried out for Pattern Approval, though there might well be a case here for the two-stage verification procedure to be employed, with the manufacturer of the indicator unit calling in his local inspector to carry out such tests using load cell simulators in place of the usual bottomwork.

There are of course many additional features available to the user or modern weighbridges. Many of these, for example, tares, trip levels, printing of labels or tickets, directly relate to the use of the weighbridge. How far the inspector should go in testing these additional features is a matter of debate. The UK, in framing its legislation, has taken the view that any facility or feature which can affect the indicators of the weighbridge, and any equipment interfaced to the weighbridge and which can affect either the operation of the weighbridge or the transaction data that is generated by it, should also be subject to control. Obviously in the pursuit of efficiency the inspector will test as many of these features as he can while he is carrying out his normal weighing tests. This however, can take a great deal of time, especially where the weighbridge forms part of a management control system, dealing with such matters as the generation of delivery notes, the raising of invoices, and the monitoring of stock levels. Unmanned weighbridges, that is weighbridges where the operation of the system is left to the driver of the vehicle are now coming into use in the UK.

For such systems it is imperative to realise that the person who will be operating the system will be unskilled in its use, and a great many safeguards have to be built into the design. A means must be provided to ensure that the weighbridge is properly balanced, this is usually done by fitting induction loops under the surface of the approach road, so that when a vehicle is detected, the weighbridge is automatically balanced. Positioning of the vehicle on the weighbridge is also crucial, so there must be ways of ensuring that the vehicle is positioned properly.

All these are things which must be considered by the inspector, for after all his responsibility is not limited merely to determining the accuracy of the weighbridge, he also has a duty to ensure that the equipment is used properly and does not lend itself to fraudulent use.

An aspect we have not yet dealt with is how the initial verification process, and the in-service testing is to be funded. As we have seen the capital costs and labour costs in providing this service are extremely high. Who should pay ? In the UK we make no charge for in-service testing of weighing equipment. A charge is made for initial verification and determining the amount to be charged is no easy task. The income generated by initial verification should be high enough to give the local Authority a reasonable chance of recouping the costs of providing the service, but it obviously cannot be so high as to unfairly penalise the operator or owner of the

equipment. Typically the charge for initial verification in the UK is £180. At this level, providing the inspector uses the equipment efficiently and plans his work carefully, he stands a reasonable chance of obtaining a financial return for his employers whilst not unduly penalising the owner of the machine.

In order to keep costs to a minimum, we have found that many local Authorities have arranged with their neighbours to provide test equipment on a joint basis, either by sharing the initial cost of obtaining the equipment or by reaching hiring agreements where each Authority will pay for so many days use of the equipment, thus spreading the costs.

There remains one final ingredient in the recipe for successful testing of static weighbridges which we have not talked about, and this is probably the most important. It is — the inspector himself. No matter how much time and money we devote to testing, no matter how much equipment we provide, no matter how much we charge for testing, no matter how tightly we set the regulations, unless we devote the right sort of human resource, then our efforts have all been in vain. The modern weighing machine is a very complex piece of equipment, the weighbridge more complex than most, and if testing is not to become a sham, we must ensure that the person carrying out the test is properly trained in the art and that we ensure that he is kept up to date with modern developments.

Experience in the UK has shown that there is a great deal to be said in favour of employing inspectors who specialise in various aspects of the duties. I am not saying that testing should be restricted to a mere handful of inspectors. I am saying that it is extremely difficult for the inspector who may test only 1 or 2 weighbridges each year to be fully conversant with all aspects of the technology. The inspector of weights and measures in the UK has many duties, of which metrology is only one, albeit a very important one. Unless he is kept aware of the technical developments and made aware of how these developments impact on the weighing machine, then the test he carries out is unlikely to be anything more than a charade which will succeed in doing nothing more than lowering the overall standard for user, and customer alike.

In conclusion, I would be the first to agree that the technical aspects are important, essential though it is to regulate closely and be as specific as possible when laying down error allowances, tolerances and test procedures, it is important also to remember that at the end of all the debates, when all the discussions have taken place and the rules and regulations are agreed, then the man or woman at the end of the line, whose job it is to put rules into practice has his problems as well, and occasionally, it does us all good to remember that.

ROYAUME-UNI

METROLOGY FACILITIES of SOUTH YORKSHIRE TRADING STANDARDS UNIT

by M.J. BUCKLEY

Standards Officer

South Yorkshire Trading Standards Unit

SUMMARY — The verification of weights and measures is in the United Kingdom done by 90 independent local administrations which dispose of a total of 265 verification offices. Several of these administrations have in recent years modernized their laboratories. The author briefly describes the new facilities of one of these local administrations which in addition to legal control also undertakes certification of standards for industries and other bodies within the fields of mass, length and volume.

RESUME — La vérification des poids et mesures au Royaume-Uni est effectuée par 90 administrations locales indépendantes qui disposent d'un total de 265 bureaux de vérification. Certaines de ces administrations ont ces dernières années modernisé leurs laboratoires de métrologie. L'auteur décrit brièvement les nouvelles installations d'une de ces administrations qui en plus du contrôle légal peut aussi effectuer des étalonnages pour l'industrie ou d'autres administrations dans les domaines de masse, longueur et volume.

In the United Kingdom, legal metrology is enforced by local government, which in recent times has undergone considerable change. The South Yorkshire Trading Standards Unit was originally created by the South Yorkshire County Council as a centralised testing station for the administrative area of South Yorkshire which covers the industrial areas of Barnsley, Sheffield and Rotherham, with the principal steel and mining industries, and the more rural areas of Doncaster. Following local government re-organisation in April, 1986, the enforcement of legal metrology was again placed in the hands of each of these district councils. By joint undertaking, they have continued to run the South Yorkshire Trading Standards Unit.

One of the principal functions of the Unit, is to advise on Trading Standards matters. In the United Kingdom, standards of weight and measure are devolved by Act of Parliament [1] from the National primary standards, through Secondary and Tertiary standards (held by the National Weights and Measures Laboratory) to the local authority's local standards. The use and periodicity of these measures is controlled by statutory regulation. These local standards are housed at the South Yorkshire Trading Standards Unit and are used to establish the working standards which local authority Trading Standards Officers use for day to day inspection of trade premises.

Specialist testing equipment is also maintained by the Unit for the testing of road and rail weighbridges and heavy weighing machines, and for the calibration of meter measuring systems for liquid fuel. Mobile units are provided for routine inspection and verification of trade weighing and measuring equipment. An articulated weighbridge test unit carries about 20 000 kg of test weights for the inspection of weighbridges.

These facilities are also available for hire to other local trading standards authorities.



SOUTH YORKSHIRE
TRADING STANDARDS UNIT

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Measured Quantities, and Uncertainties for a confidence probability of
not less than 95%, for which BCS Approval has been granted

ITEM	MEASURED QUANTITY, INSTRUMENT OR GAUGE	RANGE	BEST MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±)
1	MASS	NOMINAL VALUE (g)	(mg)
		20 000	15
		10 000	7.5
		5 000	4
		2 000	1.5
		1 000	0.75
		500	0.4
		200	0.15
		100	0.075
		50	0.050
		20	0.040
		10	0.030
		5	0.022
		2	0.018
		1	0.015
		0.5	0.012
		0.2	0.009
		0.1	0.007
		0.05	0.006
		0.02	0.004
		0.01	0.003
		0.005	0.003
		0.002	0.003
		0.001	0.003
NOTE 1 The best measurement capability stated above relates to measurements made on integral austenitic stainless steel (25% Cr 20% Ni) weights, for which the values are quoted on the basis of comparison with standards of ascribed density 8000 kg/m ³ in air of density 1.2 kg/m ³ .			

Measured Quantities, and Uncertainties for a confidence probability of
not less than 95%, for which BCS Approval has been granted

ITEM	MEASURED QUANTITY, INSTRUMENT OR GAUGE	FLUID	RANGE	BEST MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±)
RANGE IN MILLIMETRES AND UNCERTAINTY IN MICROMETRES UNLESS OTHERWISE STATED				
2	LENGTH Precision Scales (linear) Stage Micrometers Graticules		Up to 1 000 Above 1 000 up to 2 000 Up to 10 Up to 10	1 + 2 x length in m 1 + 3 x length in m 1 1
3	VOLUME OF FLUID PASSED	WATER	500 to 2 000 litres	0.05% for calibration of positive displacement flow-meters 0.1% for calibration of other types of flow-meters
NOTE 2 All calibrations must be carried out in accordance with procedures agreed by BCS headquarters				
3			Flow-rates of 50 to 1 000 litres/minute can be generated.	
4			Calibrations can be given in other units as required.	
5			Temperature is not controlled - quantity is measured in terms of mass and converted to volume using the appropriate factors, with or without temperature correction.	

The Trading Standards Unit also offers a calibration service for local and national industry. The Unit has been accredited by the British Calibration Service [2] for certain measurements. The schedule of current accreditation is reproduced.

The British Calibration Service is a national service set up by the British Government, and administered by the Department of Trade and Industry, to provide authenticated calibration of scientific instruments and measuring devices, and certification of measurements of all kinds. Under the scheme, individual laboratories are specially accredited for particular measurements, for which they are authorised to issue official calibration certificates. A B.C.S. Certificate of Calibration provides a very high degree of assurance of the correctness of the calibration of a particular instrument or apparatus identified on the certificate.

Laboratory facilities

The laboratory offers to industrial and other users a measurement and calibration service with direct traceability to the United Kingdom Primary Standards, and is able to evaluate and issue reports on the performance of a wide variety of measuring instruments and other testing apparatus. Tests are performed in modern environmentally controlled laboratories using some of the latest test apparatus that can form a basis for confidence in the compilation of measurement data.

The laboratory also offers advice as to the design, construction and location of calibration equipment within laboratories, and to the facilities and construction of new measuring and calibration centres.

Mass

Mass calibration is undertaken using standards which have been calibrated against NPL primary standards, on precision balances equipped with optical projection for greater magnification.

Balances in use range from conventional three-knife balances, single pan micro and semi-microbalances, including a quartz-fibre beam balance, to the laboratory's primary balance at 1 kg level, which has a readability of 1 µg. This balance has recently been installed and is currently being commissioned. It is hoped that a study project will shortly be undertaken by Sheffield Polytechnic on behalf of the Unit, into ways of automating and improving this balance. Calibration work is undertaken by the Unit on behalf of local and national companies.

Length

Precision linear scales on glass or metal are calibrated against a helium-neon laser interferometer. Apart from conventional linear scales, the laboratory has recently been accredited for the calibration of stage micrometers, which are special reference scales for the calibration of microscopes, particularly used by asbestos testing laboratories.

In a new development the laboratory has recently installed a gauge-block interferometer, using helium and krypton light. This service will be made available to industry during 1986.

Volume

Metric and imperial capacity measures, in both graduated and ungraduated forms and up to 10 000 litres and 2 000 gallons, can be submitted for determining, in terms of content or delivery, either value or compliance to within a specified tolerance.



Fig. 1 — Control panel of gyroscopic weighing machine used for flow meter testing.

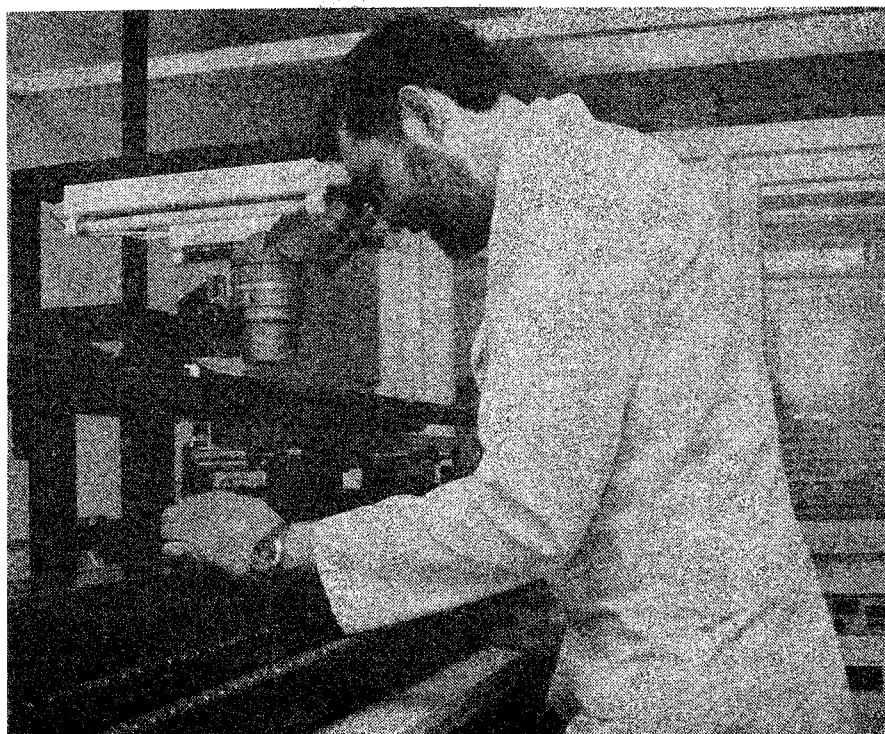


Fig. 2 — Comparator for line standards using a laser interferometer as reference.

The range of work normally handled includes standards and measuring containers in glass and metal and variously described as pipettes, burettes, flasks and proving tanks.

The normal test liquid is either mains or deionised water, according to circumstances and requirements. Calibration can be carried out gravimetrically or by volumetric reference to a capacity standard, depending upon the type of measure under test and the calibration accuracy required.

Additionally, water and bulk volumetric meters for the food, water and chemical industry may be calibrated on a test rig, able to take devices having from 25 mm to 150 mm nominal pipe line diameter, and covering flow rates from 50 to 1 000 L/min. The liquid may be passed through the meter from either a constant head tank or pumped from an underground sump. Calibration is achieved by converting the mass of water delivered into a tank mounted on a gyroscopic weighing machine into the volume of liquid which has passed through the meter.

The gyroscopic weighing machine has a capacity of 6 000 kg with a readability of 0.01 kg. Special arrangements are necessary to calibrate the weighing machine, as the cast-iron weights normally used for verification of heavy weighing machines are unsuitable for calibrating this machine. The test rig was constructed by departmental staff, and uses stainless steel piping throughout the measuring facility.

New Developments

The Trading Standards Unit is constantly aiming to provide a better service, often by utilising existing departmental equipment.

These developments will include the provision of external calibration services for liquid-in-glass thermometers, and for the calibration of liquefied petroleum gas meters.

The South Yorkshire Trading Standards Unit, is always pleased to receive information on new metrological techniques and staff co-operate extensively in inter-comparison and audit exercises.

A very small staff are currently responsible for the calibration of precision weighing and measuring equipment. The Trading Standards Unit has a staff of 22, of whom four are engaged full time in the testing of measuring equipment.

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- [1] The Weights and Measures Act 1985 c.72 pub. H M Stationery Office, London, 1985.
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CUBA

COURS DE METROLOGIE POUR PAYS EN DEVELOPPEMENT

Le Comité d'Etat de Normalisation de la République de Cuba a organisé à l'Institut de Recherches Métrologiques à La Havane, un cours de métrologie légale du 5 au 27 mai 1986 comprenant le programme suivant :

- Principes de base de la métrologie
- Organisation, structure et fonctionnement d'un service de métrologie légale
- Grandeurs et unités de mesure
- Etalons des unités de mesure
- Caractéristiques métrologiques des instruments de mesure
- Transmission des unités de mesure depuis l'étalon primaire jusqu'aux instruments de mesure
- Théorie d'erreurs. Fondements
- Mesurages des grandeurs mécaniques. Théorie et pratiques de laboratoire
- Mesurages des grandeurs thermodynamiques. Théorie et pratiques de laboratoire
- Mesurages des grandeurs électriques. Théorie et pratiques de laboratoire
- Mesurages des grandeurs physico-chimiques. Théorie et pratiques de laboratoire
- Pratiques de vérification

Les grandeurs comprises dans ce cours sont :

Grandeurs mécaniques :

- longueur et angle
- masse
- force et dureté

Grandeurs thermodynamiques :

- température
- pression
- volume et débit

Grandeurs électriques :

- électricité
- radiotechniques

Grandeurs physico-chimiques :

- polarimétrie et saccharimétrie
- réfractométrie
- spectrophotométrie
- colorimétrie photo-électrique
- mesurage de pH
- conductimétrie

Cette année, ce cours n'a pu être annoncé qu'avec un faible préavis, mais il sera en principe répété en 1987. Pour tous renseignements, s'adresser à

Comité d'Etat de Normalisation (CEN)
Egido No. 602 entre Gloria y Apodaca
Ciudad Habana, Cuba
Téléphone : 6-7901
Télex : 511422 cinan cu

CUBA

METROLOGY COURSE FOR DEVELOPING COUNTRIES

The State Committee for Standardization of the Republic of Cuba organized at the Metrology Research Institute in Havana a legal metrology course from 5 to 27 May 1986 comprising the following programme :

- Basic principles of metrology
- Organization, structure and performance of a legal metrology service
- Quantities and units of measurement
- Measurement standards
- Metrological characteristics of measuring instruments
- Traceability of units from the primary standard to measuring instruments
- Theory of errors. Fundamentals
- Measurements of mechanical quantities. Theory and laboratory practice
- Measurements of thermodynamical quantities. Theory and laboratory practice
- Measurements on electrical quantities. Theory and laboratory practice
- Measurements of physico-chemical quantities. Theory and laboratory practice
- Verification practices

The quantities included in this course are :

Mechanical quantities :

- length and angle
- mass
- force and hardness

Thermodynamical quantities :

- temperature
- pressure
- volume and flow

Electrical quantities :

- electricity
- radiotechnology

Physico-chemical quantities :

- polarimetry and saccharimetry
- refractometry
- spectrophotometry
- photoelectrical colorimetry
- pH measurements
- conductimetry

This year the course could only be announced with very short notice, it will, however, most probably be repeated in 1987. For all practical information please contact

State Committee for Standardization (CEN)
Egido No. 602 entre Gloria y Apodaca
Ciudad Habana, Cuba
Telephone : 6-7901
Telex : 511422 cinan cu

LITTÉRATURE

Métrologie en Chine

Comme cela a déjà été mentionné dans l'article de Mr Athané « La Métrologie en République Populaire de Chine », dans le Bulletin de l'OIML N° 102, la nouvelle loi de métrologie qui entre en vigueur le 1er juillet 1986 est disponible au BIML en traductions française et anglaise.

Parmi les nombreuses publications disponibles en chinois, nous pouvons mentionner les brochures :

- Grandeurs et unités GB 3100-3102 (1982)
- Système SI (1984)
- Matériaux de référence certifiés (1985).

Un livre « Théorie des incertitudes et ses applications » par Xiao Minyau a été publié en 1985. Ce livre de 650 pages est un traité très complet contenant les bases de l'enseignement de la théorie des incertitudes et on peut seulement regretter qu'il n'ait pas encore été traduit en français ou en anglais. La théorie des incertitudes et leur expression sont d'ailleurs des sujets qui ont été largement développés dans des monographies de l'Institut National de Mesures de Chang-Du (NIMC) et dans les revues « Acta Metrologia Sinica » et « Chinese Journal of Scientific Instruments ».

Un catalogue de normes et réglementations métrologiques, édité en 1984, montre que des prescriptions pour la vérification ont été établies pour plus de 350 espèces différentes d'instruments.

Recommandations Internationales de l'OIML en espagnol

La République de Cuba a traduit pratiquement toutes les Recommandations de l'OIML qui ont été publiées avant 1985. Des copies peuvent être obtenues en s'adressant au Membre du CIML de Cuba, Mr J. GOMEZ ROSELL.

Cours de métrologie à Seibersdorf

Les exposés présentés lors du cours de formation organisé au Centre Autrichien de Recherches à Seibersdorf, 11-21 septembre 1984 (voir Bulletin de l'OIML N° 97, p. 44) ont maintenant été publiés par IMEKO.

Les deux volumes contiennent 25 articles sur la mesure et les techniques d'étalonnage dans les domaines de mesure de masse, longueur, force, pression, chaleur, volume de gaz, fréquence et grandeurs électriques. Il y a également des articles traitant des problèmes généraux en métrologie, tels que incertitudes, traçabilité et le rôle du BIPM et de l'OIML. Huit articles concernant la mesure des radiations ionisantes :

Proceedings of the Interregional Training Course on Ensuring Measurement Accuracy
org. ed. Austrian Research Centre, Seibersdorf and the Austrian Federal Office of Metrology,
1985, Vol. 1-2, 650 pages, en anglais.

Ces publications peuvent être commandées auprès de OMIKK - Technoinform, P.O.B. 12, 1428 Budapest, Hongrie.

Programme de métrologie de la région Asie/Pacifique

Une brochure a récemment été éditée décrivant les nombreuses activités et publications du Programme de métrologie de l'Asie/Pacifique (APMP) institué à son origine par le Conseil Scientifique du Commonwealth. Une partie du contenu de la brochure a déjà été incluse dans un article du Dr M N G A Khan dans le N° 87 du Bulletin de l'OIML (juin 1982). Ces activités comprennent des cours de formation, des missions de consultants, l'étalonnage des étalons nationaux et des expériences d'intercomparaisons entre différents laboratoires. La brochure « APMP Aims, Objectives & Activities » Oct 1985 peut être obtenue en s'adressant au Commonwealth Science Council, Marlborough House, Pall Mall, London SW1Y 5HX.

La mesure de forces

Un nouveau livre sur les instruments de mesure de forces a été publié en russe. L'auteur est Mr A.S. Vishenkov, un collaborateur proche du Vice-Président du CIML, Dr L.C. Issaev.

Le titre du livre traduit en français est :

« Méthodes et moyens d'attestation, vérification et essais des instruments de mesure de forces », 184 pages édité par Isdatelstvo Standartov, Moscou 1985.

Le premier chapitre passe en revue les principes de reproduction et de transmission de l'unité de force et décrit la construction de machines d'étalonnage utilisées en URSS et dans d'autres pays. Le deuxième chapitre décrit les différents types de dynamomètres mécaniques et capteurs de force électriques.

Le troisième chapitre traite les caractéristiques, l'exactitude et les facteurs d'influence des dispositifs de mesure de force en général et le quatrième chapitre décrit les méthodes d'étalonnage.

La mesure de la dureté

Les exposés présentés au Symposium International sur la mesure de dureté, organisé par VDE/VDI et IMEKO à Fellbach, R.F.A., 10-11 mars 1986 sont maintenant publiés en version bilingue allemand/anglais.

Les 25 articles contenus dans ce livre donnent avec leurs nombreuses illustrations une idée assez complète de la situation actuelle des mesures de dureté comprenant aussi bien les méthodes classiques que les méthodes nouvelles basées soit sur le rebondissement d'une bille, soit sur l'impédance de contact ultrasonore. Plusieurs articles écrits par des spécialistes des instituts de métrologie et par le BIML (F. Petik) concernent l'exactitude des machines et blocs de dureté étalons. Le titre complet de cet ouvrage est :

« Härteprüfung in Theorie und Praxis - Hardness Testing in Theory and Practice »
Édité par VDI/VDE Gesellschaft für Mess- und Regelungstechnik, 562 pages, 1986
Publié par VDI Verlag, Postfach 1139, 4000 Düsseldorf 1, R.F. d'Allemagne.

Contenu des préemballages

Le National Bureau of Standards des Etats-Unis d'Amérique a édité un manuel à l'usage des agents de vérification en complément au manuel sur le contrôle des préemballages Handbook 133. Le titre est :

Package Checking Field Manual to Accompany NBS Handbook 133 : Checking of Net Contents of Packaged Goods (NBSIR 85-3172).

Pour s'informer sur la manière de se procurer ce manuel ainsi que le Handbook 133, s'adresser au Membre du CIML des Etats-Unis, Mr. D. EDGERLY.

Guide concernant les résidus de pesticides

Comme le secrétariat-rapporteur SP 17-Sr 4 s'occupe des mesures de pesticides, il convient de mentionner la publication de la dernière partie du Guide concernant les Recommandations du CODEX se rapportant aux résidus de pesticides. Cette publication est éditée en 9 parties sous la référence CAC/PR 1 à 9. Elle peut être obtenue, en français et en anglais, auprès du Codex Alimentarius, Via delle Terme di Caracalla, 00100 Rome, Italie.

Electrocardiographes et électroencéphalographes

Ces instruments font l'objet de projets de Recommandations en cours de préparation par le secrétariat-rapporteur de l'OIML SP 26-Sr 4.

Des exigences détaillées sur les mêmes sujets sont également contenues dans les publications suivantes reçues par le BIML :

- Diagnostic Electrocardiographic Devices, American National Standard ANSI/AAMI EC 11 - 1982 Developed by the Association for the Advancement of Medical Instrumentation and approved by ANSI, 34 pages, 1983
- Recommendations for the Practice of Clinical Neuro-physiology
Edited by The International Federation of Societies for Electroencephalography and Clinical Neuro-physiology, 190 pages, 1983
Publisher : Elsevier, Amsterdam, New-York, Oxford.

La dernière publication traite également l'électromyographie, c'est-à-dire l'enregistrement de l'activité électrique dans les muscles et les nerfs du corps humain, un sujet qui est également traité par SP 26-Sr 4 sous le nom de rhéoplétysmographes.

Matériaux de référence certifiés

Le National Bureau of Standards des Etats-Unis d'Amérique a récemment publié un manuel qui donne un aperçu assez complet sur la production, la traçabilité, les incertitudes et l'utilisation des matériaux de référence certifiés dans la mesure où ce sujet peut être abordé d'une façon générale et sur une base de mathématique statistique. La bibliographie contient un très grand nombre de références aux publications qui traitent des questions relatives aux espèces spécifiques de matériaux de référence. Le manuel constitue le numéro 100 des publications du NBS spécialement consacrées aux matériaux de référence dont une liste complète est également incluse.

Standard Reference Materials : Handbook for SRM Users
by J.K. Taylor
NBS Special Publication 260-100, 98 pages (Sept. 1985)

Cette publication peut être achetée en s'adressant à : The Superintendent of Documents, US Government Printing Office, Washington D.C.20402, USA.

Laboratoires secondaires d'étalonnage en dosimétrie

Il est prévu qu'un Document International sur les laboratoires secondaires d'étalonnage en dosimétrie (SSDL) sera prochainement édité par l'OIML lorsque le Secrétariat-Pilote SP 16 aura terminé la dernière mise au point. L'Agence Internationale de l'Energie Atomique, en coopération avec l'Organisation Mondiale de la Santé, a établi un réseau de SSDL comportant actuellement 50 laboratoires dont beaucoup sont localisés dans des pays en développement, le laboratoire central se trouvant à Seibersdorf en Autriche.

Ce réseau, qui est d'une grande importance pour les services de protection de la santé, est décrit dans la brochure :

Secondary Standard Dosimetry Laboratories : Development and Trends, IAEA, Vienna 1985, 34 pages.

Cette brochure contient également une Annexe qui indique les critères pour l'établissement d'un SSDL, ainsi qu'une liste de publications de l'Agence Internationale de l'Energie Atomique dans le domaine de la dosimétrie. Elle peut être obtenue auprès de l'Agence Internationale de l'Energie Atomique, Wagramerstrasse 5, P.O. Box 100, A-1400 Vienne, Autriche.

LITERATURE

Metrology in China

As already announced in the paper of Mr Athané « Metrology in the People's Republic of China », Bulletin de l'OIML No 102, the new law of metrology which comes into force on 1st July 1986 is available in English and French translation at BIML.

Among the numerous publications available in Chinese we may mention the brochures :

- Quantities and Units GB 3100-3102 (1982)
- SI-system (1984)
- Certified Reference Materials (1985).

A book « Error Theory and its Applications » by Xiao Minyau has been published in 1985. It is a very complete treatise of 650 pages containing teaching material on error theory and one may certainly regret that there is not yet any English or French translation. Error theory and the expression of uncertainties are subjects which also have been largely treated in several NIMC monographs and in the Chinese magazines « Acta Metrologia Sinica » and in the « Chinese Journal of Scientific Instruments ».

A catalogue of metrology standards and regulations has been issued in 1984 which shows that regulations concerning verification have been issued for more than 350 different kinds of instruments.

OIML International Recommendations in Spanish

The Republic of Cuba has translated into Spanish practically all the OIML Recommendations published before 1985. Copies may be obtained by contacting the CIML member of Cuba Mr. J. GOMEZ ROSELL.

Metrology course at Seibersdorf

The papers presented at the training course organized at the Austrian Research Centre in Seibersdorf, 11-21 September 1984 (see OIML Bulletin No. 97, p. 44) have now been published by IMEKO.

The two volumes contain 25 review papers related to measurement and calibration technologies in the fields of measurement of mass, length, force, pressure, heat, gas volume, frequency and electrical quantities. There are also papers treating general problems in metrology such as uncertainties, traceability and the role of BIPM and OIML. Eight papers are devoted to ionising radiation measurements :

Proceedings of the Interregional Training Course on Ensuring Measurement Accuracy org. ed. Austrian Research Centre, Seibersdorf and the Austrian Federal Office of Metrology, 1985, Vol. 1-2, 650 pages, in English.

The volumes can be ordered from OMIKK - Technoinform, P.O.B. 12, 1428 Budapest, Hungary.

Asia/Pacific Metrology Programme

A brochure has recently been published describing the numerous activities and publications of the Asia/Pacific Metrology Programme (APMP) some of which were highlighted in the paper by Dr M N G A Khan in the No. 87 of the OIML Bulletin (June 1982). These activities involve training courses, consultancy missions, calibration of national standards and inter-comparison experiments. The brochure « APMP Aims, Objectives & Activities », Oct. 1985 can be obtained from The Commonwealth Science Council, Marlborough House, Pall Mall, London SW1Y 5HX.

Measurement of force

A new book on the calibration of force measuring instruments has recently been published in Russian language. The author is Mr. A.S. Vishenkov a close collaborator of the vice-president of the CIML, Dr. L.C. Issaev.

The title of the book is in English translation :

« Methods and means of certification, verification and tests of force measuring instruments » (184 pages) edited by Isdatelstvo Standartov, Moscow 1985.

The first chapter of the book reviews the physical principles of reproduction and transmission of the unit of force and describes the construction of force standard machines in use in the USSR and in other countries.

The second chapter describes the construction of various types of mechanical force measuring devices (dynamometers) and electrical load cells.

The third chapter concerns the characteristics, accuracy and influence factors of force measuring devices in general and the fourth chapter describes calibration procedures.

Hardness measurements

The papers presented at the VDE/VDI/IMEKO International Symposium on hardness testing, 10-11 March 1986 in Fellbach, FRG have now been published in German/English fully bilingual version.

The 25 presentations included in this book give with their numerous illustrations a complete picture of where hardness measurements stand to-day including both the classical methods and new methods based on bouncing ball or on ultrasonic contact impedance. Several papers contributed by collaborators of metrology institutes and the BIML (F. Petik) concern the accuracy of standard machines and standard hardness blocks.

The full title of the book is :

« Härteprüfung in Theorie und Praxis - Hardness Testing in Theory and Practice » Edited by VDI/VDE Gesellschaft für Mess- und Regelungstechnik, 562 pages, 1986 Publisher : VDI Verlag, Postfach 1139, 4000 Düsseldorf 1, F.R. of Germany.

Contents of packaged goods

The National Bureau of Standards, USA has issued a package checking manual for field inspectors intended to be used together with the well-known Handbook 133. Its title is :

Package Checking Field Manual to Accompany NBS Handbook 133 : Checking of Net Contents of Packaged Goods (NBSIR 85-3172).

For information about how to obtain copies of both this manual and Handbook 133 please contact the U.S. CIML member, Mr. D. EDGERLY.

Guide concerning pesticide residues

As the OIML reporting secretariat SP 17-Sr 4 deals with measurement of pesticides it is in its place to mention the completion of the revised publication of the guide concerning the CODEX recommendations on pesticide residues. The publication is issued in 9 parts and referenced CAC/PR 1 to 9. It is available in French and English from Codex Alimentarius, Via delle Terme di Caracalla, 00100 Rome, Italy.

Electrocardiographs and electroencephalographs

These instruments are both subject to draft Recommendations being prepared by the OIML reporting Secretariat SP 26-Sr 4. As documentation material on the same subjects the BIML has received the following publications which both give detailed requirements for the performances of these instruments :

- Diagnostic Electrocardiographic Devices, American National Standard ANSI/AADIEC 11 - 1982 Developed by the Association for the Advancement of Medical Instrumentation and approved by ANSI, 34 pages, 1983
- Recommendations for the Practice of Clinical Neuro-physiology Edited by the International Federation of Societies for Electroencephalography and Clinical Neuro-physiology, 190 pages, 1983 Publisher : Elsevier, Amsterdam, New-York, Oxford.

The latter publication also treats to a large extent Electromyography i.e. the recording of electrical activity of muscle and nerve in man, a subject which is also treated by SP 26-Sr 4 under the name of Rheoplethysmographs.

Standard Reference Materials

The National Bureau of Standards U.S.A. has recently issued a handbook which gives a quite complete picture about the production, traceability, uncertainty and use of standard reference materials as far as this subject can be treated on a general and mathematical-statistical basis. The bibliography includes a very large number of references which treat questions related to specific reference materials. The handbook is the number 100 of NBS publications specially devoted to reference materials. A full list of this series of publications is also included.

Standard Reference Materials : Handbook for SRM Users

by J.K. Taylor

NBS Special Publication 260-100, 98 pages (Sept. 1985)

This publication may be purchased from the Superintendent of Documents, US Government Office, Washington D.C.20402, USA.

Secondary Standard Dosimetry Laboratories

It is expected that an OIML International Document on Secondary Standard Dosimetry Laboratories (SSDL) will soon be issued when the Pilot Secretariat SP 16 has finalized the text. The International Atomic Energy Agency in cooperation with the World Health Organization has established a network of SSDL's of presently 50 laboratories many of which are located in developing countries, the central network laboratory being located in Seibersdorf, Austria.

This network which is of great importance for health protection services is described in a recent brochure :

Secondary Standard Dosimetry Laboratories : Development and Trends, IAEA, Vienna 1985, 34 pages.

The brochure also contains an Appendix which indicates the criteria for the establishment of a SSDL and a list of IAEA publications related to dosimetry. It can be obtained from the International Atomic Energy Agency Wagramerstrasse 5, P.O. Box 100, A-1400 Vienna, Austria.

INFORMATIONS

MEMBRES DU COMITE

REPUBLIQUE FEDERALE D'ALLEMAGNE — Monsieur W. MÜHE, ancien Vice-Président du CIML, qui a participé aux travaux de notre Institution depuis 1956, a pris sa retraite. Il est remplacé, comme représentant de la R.F.A. auprès du CIML, par Monsieur M. KOCHSIEK, Regierungsdirektor, P.T.B.

AUSTRALIE — Monsieur T.J. PETRY a dû cesser ses fonctions de Directeur Exécutif de la National Standards Commission pour raisons de santé. Il a été provisoirement remplacé comme membre du Comité par Monsieur F. HARVEY.

CAMEROUN — Monsieur Edouard DIFFO, Sous-Directeur des Poids et Mesures, a été désigné pour représenter son pays en remplacement de Monsieur E. NDOUGOU, nommé responsable de la Normalisation du Cameroun.

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COMMITTEE MEMBERS

FEDERAL REPUBLIC of GERMANY — Professor W. MÜHE, former CIML Vice-President who participated in our activities since 1956 has now retired. The new F.R.G. representative in CIML is Dr. M. KOCHSIEK, Regierungsdirektor, P.T.B.

AUSTRALIA — Mr. T.J. PETRY has been obliged for health reasons to give up his duty as Executive Director of the National Standards Commission. He is within CIML until further notice replaced by Mr. F. HARVEY.

CAMEROON — Mr. Edouard DIFFO, Vice-Director of Weights and Measures has been designated to represent his country in the place of Mr. E. NDOUGOU who has been nominated to be responsible for standardization.

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QUELQUES EVENEMENTS A VENIR — SOME COMING EVENTS

- | | |
|---------------------------------|---|
| 24-26 septembre 1986 | Colloquium on Measurement and Instrumentation Education, (IMEKO TC 1)
Warsaw, Poland
Information : IMEKO Secretariat, POB 457, H-1371 Budapest 5, Hungary |
| 1er-3 octobre 1986 | Workshop on Laser Applications in Precision Measurement, (IMEKO TC 14)
Budapest, Hungary
Information : IMEKO Secretariat, POB 457, H-1371 Budapest 5, Hungary |
| 6-9 octobre 1986 | 1986 Meeting of the National Conference of Standards Laboratories. 25 years of Measurement Progress,
Gaithersburg, USA
Information : Ernest L. Garner, B 362 Physics Building,
National Bureau of Standards, Gaithersburg, MD 20899, USA |
| 6-10 octobre 1986 | 5th International Conference on Reliability and Maintainability, Biarritz, France
Information : M. Michel Potin, Centre Electronique, Matra-Harris Semiconducteurs, La Chantrerie, Rue de Gachet, BP 942, 44075 Nantes Cédex, France |
| 6-11 octobre 1986 | 10th International Congress and Exhibition for Instrumentation and Automation, Düsseldorf, FRG
Information : Interkama 86, Düsseldorf, Messgesellschaft mbH, NOWEA, Postfach 32 02 03, D-4000 Düsseldorf 30, FRG |
| 8-10 octobre 1986 | 3rd Symposium on Theoretical Metrology, (IMEKO TC 8)
Berlin, GDR
Information : IMEKO Secretariat, POB 457, H-1371 Budapest 5, Hungary |
| 28-30 octobre 1986 | Test and Transducer Exhibition and Conference, London, UK
Information : Norma Thewlis, Trident International Exhibitions Ltd, 21 Plymouth Road, Tavistock, Devon PL19 8AU, UK |
| 17-21 novembre 1986 | Symposium on Major Problems of Present Day Radiation Pyrometry, (IMEKO TC 12), Moscow, USSR
Information : IMEKO Secretariat, POB 457, H-1371 Budapest 5, Hungary |
| 30 novembre-
5 décembre 1986 | International Symposium on Pressure and Temperature Measurement, San Francisco, CA, USA
Information : Mr R. J. Moffat, Dept of Mechanical Engineering, Stanford University, Stanford, CA 94305, USA |

REUNIONS

Groupes de travail		Dates	Lieux
SP 2 - Sr 5	Contrôle par échantillonnage	26-29 août 1986	ST-GALL SUISSE
SP 20 - Sr 1	Problèmes généraux des préemballages		
SP 20 - Sr 2	Vérification des quantités contenues dans les emballages		
SP 7 - Sr 5	Instruments de pesage à fonctionnement automatique	15-19 sept. 1986	LONDRES ROYAUME-UNI
SP 17 - Sr 2	Mesure des pollutions de l'eau	15-19 sept. 1986	BIML PARIS
SP 17 - Sr 4	Mesure des pollutions par pesticides et substances toxiques		
SP 12 - Sr 8	Compteurs d'énergie thermique	30 sept.-1 ^{er} oct. 1986	BRAUNSCHWEIG R.F. D'ALLEMAGNE
SP 5S - Sr 8	Réservoirs de stockage	sept.-oct. 1986 (provisoire)	ROUMANIE
SP 5S - Sr 9	Camions et wagons citernes		
SP 5S - Sr 10	Péniches et navires citernes		
SP 5S - Sr 11	Dispositifs de repérage des niveaux de liquides dans les réservoirs		
SP 9 - Sr 9	Terminologie (masses volumiques)		
SP 17 - Sr 1	Mesure des pollutions de l'air	20-22 oct. 1986 (provisoire)	BERLIN-OUEST
SP 5D - Sr 3	Compteurs d'eau	23-24 oct. 1986 (provisoire)	BERLIN-OUEST
SP 23 et SP 23 - Sr 1, 2, 3, 4 et 5	Méthodes et moyens d'attestation des dispositifs de vérification	27-31 oct. 1986	PRAGUE TCHECOSLOVAQUIE
SP 7 - Sr 4	Instruments de pesage à fonctionnement non automatique	(3 ou 4)-7 nov. 1986	PARIS FRANCE
SP 6 - Sr 1	Compteurs de gaz à parois déformables	20-21 nov. 1986 (provisoire)	WASHINGTON D.C. USA
SP 6 - Sr 2	Compteurs de gaz à pistons rotatifs Compteurs de gaz non volumétriques		

PUBLICATIONS

- Vocabulaire de métrologie légale
Vocabulary of legal metrology
- Vocabulaire international des termes fondamentaux et généraux de métrologie
International vocabulary of basic and general terms in metrology

RECOMMANDATIONS INTERNATIONALES

INTERNATIONAL RECOMMENDATIONS

RI N°

- 1 — Poids cylindriques de 1 g à 10 kg (de la classe de précision moyenne)
Cylindrical weights from 1 g to 10 kg (medium accuracy class)
- 2 — Poids parallélépipédiques de 5 à 50 kg (de la classe de précision moyenne)
Rectangular bar weights from 5 to 50 kg (medium accuracy class)
- 3 — Réglementation métrologique des instruments de pesage à fonctionnement non automatique
Metrological regulations for non automatic weighing instruments
- 4 — Fioles jaugées (à un trait) en verre
Volumetric flasks (one mark) in glass
- 5 — Compteurs de liquides autres que l'eau à chambres mesureuses
Meters for liquids other than water with measuring chambers
- 6 — Prescriptions générales pour les compteurs de volume de gaz
General specifications for volumetric gas meters
- 7 — Thermomètres médicaux (à mercure, en verre, avec dispositif à maximum)
Clinical thermometers (mercury-in-glass, with maximum device)
- 9 — Vérification et étalonnage des blocs de référence de dureté Brinell
Verification and calibration of Brinell hardness standardized blocks
- 10 — Vérification et étalonnage des blocs de référence de dureté Vickers
Verification and calibration of Vickers hardness standardized blocks
- 11 — Vérification et étalonnage des blocs de référence de dureté Rockwell B
Verification and calibration of Rockwell B hardness standardized blocks
- 12 — Vérification et étalonnage des blocs de référence de dureté Rockwell C
Verification and calibration of Rockwell C hardness standardized blocks
- 14 — Saccharimètres polarimétriques
Polarimetric saccharimeters

- 15 — Instruments de mesure de la masse à l'hectolitre des céréales
Instruments for measuring the hectolitre mass of cereals
- 16 — Manomètres des instruments de mesure de la tension artérielle (sphygmo-manomètres)
Manometers for instruments for measuring blood pressure (sphygmomanometers)
- 17 — Manomètres, vacuomètres, manovacuumètres indicateurs
Indicating pressure gauges, vacuum gauges and pressure-vacuum gauges
- 18 — Pyromètres optiques à filament disparaissant
Optical pyrometers of the disappearing filament type
- 19 — Manomètres, vacuomètres, manovacuumètres enregistreurs
Recording pressure gauges, vacuum gauges, and pressure-vacuum gauges
- 20 — Poids des classes de précision E_1 E_2 F_1 F_2 M_1 de 50 kg à 1 mg
Weights of accuracy classes E_1 E_2 F_1 F_2 M_1 from 50 kg to 1 mg
- 21 — Taximètres
Taximeters
- 22 — Tables alcoométriques internationales
International alcoholometric tables
- 23 — Manomètres pour pneumatiques de véhicules automobiles
Tyre pressure gauges for motor vehicles
- 24 — Mètre étalon rigide pour agents de vérification
Standard one metre bar for verification officers
- 25 — Poids étalons pour agents de vérification
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- 26 — Seringues médicales
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- 27 — Compteurs de volume de liquides (autres que l'eau). Dispositifs complémentaires
Volume meters for liquids (other than water). Ancillary equipment
- 28 — Réglementation technique des instruments de pesage à fonctionnement non-automatique
Technical regulations for non-automatic weighing machines
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- 30 — Mesures de longueur à bouts plans (calibres à bouts plans ou cales-étalons)
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- 31 — Compteurs de volume de gaz à parois déformables
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- 33 — Valeur conventionnelle du résultat des pesées dans l'air
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- 34 — Classes de précision des instruments de mesurage
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- 35 — Mesures matérialisées de longueur pour usages généraux
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Hexagonal weights. Ordinary accuracy class, from 100 g to 50 kg
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Metrological characteristics of elastic sensing elements used for measurement of pressure. Determination methods

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pH scale for aqueous solutions
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Speedometers, mechanical odometers and chronotachographs for motor vehicles. Metrological regulations
- 56 — Solutions-étalons reproduisant la conductivité des électrolytes
Standard solutions reproducing the conductivity of electrolytes
- 57 — Ensembles de mesurage de liquides autres que l'eau équipés de compteurs de volumes. Dispositions générales
Measuring assemblies for liquids other than water fitted with volume meters. General provisions.
- 58 — Sonomètres
Sound level meters
- 59 — Humidimètres pour grains de céréales et graines oléagineuses
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Petroleum measurement tables
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- 72 — Compteurs d'eau destinés au mesurage de l'eau chaude
Hot water meters
- 73 — Prescriptions pour les gaz purs CO, CO₂, CH₄, H₂, O₂, N₂ et Ar destinés à la préparation des mélanges de gaz de référence
Requirements concerning pure gases CO, CO₂, CH₄, H₂, O₂, N₂ and Ar intended for the preparation of reference gas mixtures

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- 1 — Loi de métrologie
Law on metrology
- 2 — Unités de mesure légales
Legal units of measurement
- 3 — Qualification légale des instruments de mesurage
Legal qualification of measuring instruments
- 4 — Conditions d'installation et de stockage des compteurs d'eau froide
Installation and storage conditions for cold water meters
- 5 — Principes pour l'établissement des schémas de hiérarchie des instruments de mesure
Principles for the establishment of hierarchy schemes for measuring instruments
- 6 — Documentation pour les étalons et les dispositifs d'étalonnage
Documentation for measurement standards and calibration devices
- 7 — Evaluation des étalons de débitmétrie et des dispositifs utilisés pour l'essai des compteurs d'eau
The evaluation of flow standards and facilities used for testing water meters
- 8 — Principes concernant le choix, la reconnaissance officielle, l'utilisation et la conservation des étalons
Principles concerning choice, official recognition, use and conservation of measurement standards
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Principles of metrological supervision
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- 11 — Exigences générales pour les instruments de mesure électroniques
General requirements for electronic measuring instruments

- 12 — Domaines d'utilisation des instruments de mesure assujettis à la vérification
Fields of use of measuring instruments subject to verification
- 13 — Conseils pour les arrangements bi- ou multilatéraux de reconnaissance des :
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TURQUIE

Le Directeur du Service des Poids et Mesures
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