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Regional Seminar on a System of Standardization and Metrology for Latin America

Edited by:

H. Steffen Peiser
Robert S. Marvin

Office of International Relations
National Bureau of Standards
Washington, D. C. 20234

Held June 24 and 25, 1974

The Seminar was conducted as a part of the program under the US/NBS/Agency for International Development PASA TA(CE) 5-71

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February 1976

U.S. DEPARTMENT OF COMMERCE, Elliot L. Richardson, *Secretary*
James A. Baker, III, *Under Secretary*
Dr. Betsy Ancker-Johnson, *Assistant Secretary for Science and Technology*
NATIONAL BUREAU OF STANDARDS, Ernest Ambler, *Acting Director*

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PREFACE

The realization of the degree of industrialization desired by most developing countries has been slow or even elusive in many regions of the world. Sincere attempts to provide assistance have been made by highly industrialized nations, but the results have often been disappointing to both donor and recipient nations. Yet the much discussed seemingly widening development gap, with its frightening implications for all nations of the world, provides a strong argument for redoubled efforts to render such assistance.

Under a modest program sponsored by the U.S. Agency for International Development, the National Bureau of Standards has agreed to consider ways in which its experience in the U.S. might be relevant to less developed countries, and what lessons from that experience can be effectively transferred. This calls for thought, experiment, and pilot-scale action. In analyzing our role we at NBS have accepted the following premises:

1) The experience and skills of the NBS staff are primarily in the physical and engineering sciences. However, industrial development depends on many other factors, such as capital, management skills, and a knowledge of the history, culture, and resources of the developing country. So any NBS program can at most assist in one aspect of the complex process of industrialization.

2) The technology needed for industrial development must be mastered by medium and small firms that cannot afford to have specialists in all relevant technical fields. The transfer of this technology to individual manufacturers poses the greatest problem of development. The enhancement of their standardization and measurement skills, the speciality of NBS, should prove an effective means of developing the needed technology in individual factories.

3) Typically, the human resources and their technical potential in underdeveloped countries are very considerable, and need only to be guided for their effective utilization. Therefore, self-reliant development is possible in almost all countries, and is rightfully much preferred by these countries.

Thus NBS under this AID sponsored program has developed a number of small experimental programs. In one of these we say to colleagues in standardization from less industrialized regions: "Come and visit us to observe how NBS and other agencies and organizations in the academic, public, and private sectors support standardization, industrial quality control, and metrology in the U.S.A." In this project we warn our visitors against blindly imitating the U.S. system, but instead we propose to them to select and modify its features to suit their own needs and conditions.

Closer to this Seminar is a second NBS/AID program element in which we suggest the following to interested governments: "We will send a team of about ten specialists from NBS and third countries to your state to survey, with your counterpart experts, your local availability and needs for standardization and measurement services. The visiting team will be entirely under your direction. Let them, for example, study the availability of local services that might be needed but are under-utilized, let them bring to you an awareness of choices you have in technical alternatives, let them with you analyze losses due to lack of quality of exports, and let them describe international or other national programs that can bring you technical comprehension and other help without the loss of local control". Just before this Regional Seminar, NBS, funded by AID, finished such a Survey of Bolivian Standardization and Measurement Services, and I have been persuaded to include a summary description of that Survey in this Seminar (Introductory Session - Paper 2), although strictly speaking that review is slightly outside our Seminar subject.

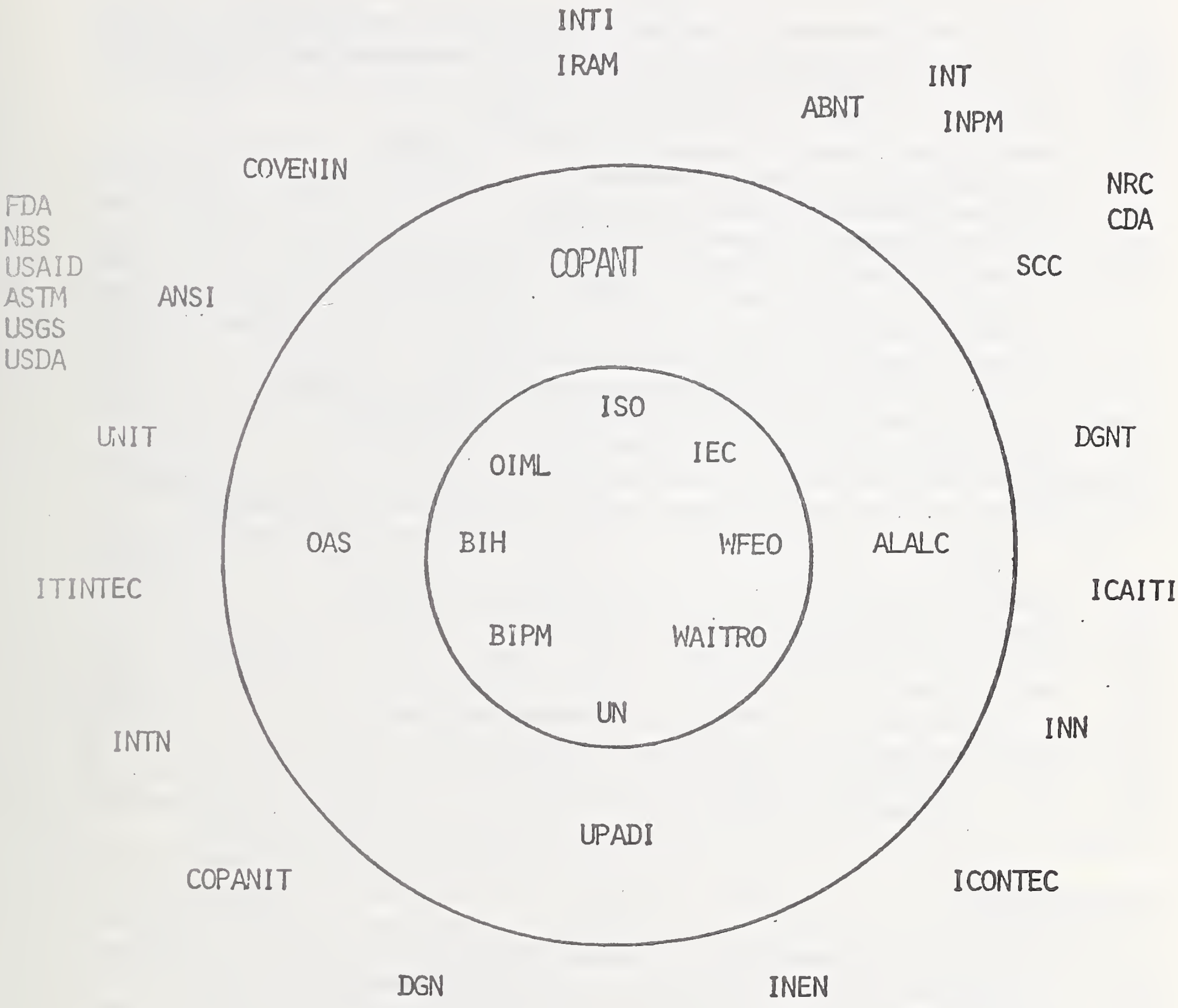
I have good reason to describe yet a third small NBS/AID project, because this Seminar is the first in an intended series of Regional Seminars. Rapidly developing countries in a region will be invited to discuss, under NBS technical guidance, a specific common problem that might be alleviated by mutual help to their industries. What better topic of this type could there be than "A System of Standardization and Metrology for Latin America"? The original idea was contained in a draft statement reproduced in Appendix I. The proposed title then was "A Network (System) for Standardization and Measurement Services in Latin America". Discussions which followed the circulation of this proposal led to the shorter Seminar title.

There already exists a Latin American regional institution for standardization, the Comision Panamericana de Normas Tecnicas (COPANT). It needs more financial support and encouragement from some governments, but it is functioning and its potential is widely acknowledged. Cooperating national standards bodies exist in most Latin American countries with effective links with both domestic and international organizations. Some of the principal institutions are included in Figure 1.

The situation for metrology, that is for the technology of making measurements, is quite different. This Regional Seminar made the first moves towards creating a new regional organization concerned with metrology. In fact, as this preface is being written, the Organization of American States has taken the first operational steps

LIST OF PRINCIPAL STANDARDS - ORIENTED ORGANIZATIONS AFFECTING LATIN AMERICA

(ORGANIZATIONS ORIENTED TOWARDS A SPECIFIC INDUSTRIAL SECTOR OMITTED)



Outer Ring: National Standards Bodies and Principal Other National Standards Oriented Organizations (In alphabetic clockwise order of country name).

Middle Ring: Regional Standards Oriented Organizations in Latin America.

Inner Ring: International Standards Oriented Organizations.

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Figure 1

INDEX OF ABBREVIATIONS

(Clockwise from 12:00) - <u>Outer Circle</u>:

INTI - Instituto Nacional de Tecnologia Industrial (Argentina)
IRAM - Instituto Argentino de Racionalizacion de Materiales (Argentina)
ABNT - Associacao Brasileira de Normas Tecnicas (Brazil)
INT - Instituto Nacional de Tecnologia (Brazil)
INPM - Instituto Nacional de Pesos e Medidas (Brazil)
NRC - National Research Council (Canada)
CDA - Canadian Development Agency (Canada)
SCC - Standards Council of Canada (Canada)
DGNT - Direccion General de Normas y Tecnologia (Bolivia)
ICAITI - Instituto Centro Americano de Investigacion Tecnologia Industrial (Guatemala)
INN - Instituto Nacional de Normalizacion (Chile)
ICONTEC - Instituto Colombiano de Normas Tecnicas (Colombia)
INEN - Instituto Ecuatoriano de Normalizacion (Ecuador)
DGN - Direccion General de Normas (Mexico)
COPANIT - Comision Panamena de Normas Industriales y Tecnicas (Panama)
INTN - Instituto Nacional de Tecnologia y Normalizacion (Paraguay)
ITINTEC - Instituto de Investigacion Tecnologica Industrial y de Normas Tecnicas (Peru)
UNIT - Instituto Uruguayo de Normas Tecnicas (Uruguay)
ANSI - American National Standards Institute
FDA - Food and Drug Administration
NBS - National Bureau of Standards
USAID - U.S. Agency for International Development
ASTM - American Society for Testing and Materials
USGS - U.S. Geological Survey
USDA - U.S. Department of Agriculture
COVENIN - Comision Venezolana de Normas Industriales (Venezuela)

<u>Middle Circle</u>:

COPANT - Comision Panamericana de Normas Tecnicas
ALALC - Asociacion Latino Americana de Libre Comercio
UPADI - Union Panamericana de Asociacion de Ingenieros
OAS - Organization of American States

<u>Inner Cirle</u>:

ISO - International Organization for Standardization
IEC - International Electrotechnical Commission
WFEO - World Federation of Engineering Organizations
WAITRO - World Association of Industrial and Technological Research Organizations
UN - United Nations
BIBP - Bureau International des Poids et Measures
BIH - Bureau International de l'Heure
OIML - Organization Internationale de Metrologie Legale

in that direction (see Appendix I of NBSIR 75-769, Report on an NBS/AID/OAS Workshop on Standardization and Measurement Services in Industrializing Economies, available from National Technical Information Service, Springfield, Va. 22151, U.S.A.)

The reader should be aware that only the papers, not the discussion following each presentation, are included in these Proceedings. We regret our inability to recapture enough of these discussions, the most significant of which took place outside the formal sessions, to make their inclusion feasible. They were a most rewarding part of the Seminar to those in attendance. Without this complete record, we can only emphasize here the cordial atmosphere of the Seminar, created both by the excellent arrangements made by the Direccion General de Normas y Tecnologia and the highly distinguished participants. Colonel Miguel Ayoroa Montano, Bolivian Minister of Industry, Commerce and Tourism, had previously given the NBS/AID Survey of Bolivian Standardization and Measurement Services enormously valuable support. He had opened the doors of government agencies and industry to that study and personally participated in several sessions. At this Seminar, he not only made the formal welcoming speech, but went far beyond normal courtesies by proclaiming a policy of initiatives in standardization, quality control, and measurement technology which was to be supported by the national university campuses as well as DGNT itself. Regional collaboration within and beyond the Andean Pact nations was a key element in Bolivian industrial and commercial policy. He instructed all Bolivian participants to listen carefully to the Seminar papers and to share with him suggestions on how to implement in Bolivia the recommendations of this Seminar.

The Seminar was further honored by the appearance in person of the U.S. Ambassador to Bolivia, the Honorable William Perry Stedman, Jr., who made a cordial speech of welcome. He indicated that technology transfer to less industrialized regions of the world was a key policy of the U.S. Government. He called for serious study of mechanisms that could effectively contribute to this goal. Mr. Arthur Mudge, Assistant Director of the USAID Mission, made another speech in which he outlined how industrialization programs had received support from that Mission.

The Seminar was attended by many leaders of Bolivian governmental agencies, industry, and the scientific community. The participants whose presence was most appreciated by the Bolivian hosts undoubtedly were those from far away countries not normally in close contact with Bolivia: Dr. Choi, Jong Wan, Administrator of the Korean Industrial Advancement Administration, Mr. Ömer Göncü, Director of the Electrical Laboratories of the Turkish Standards Institute, and Dr. Charoen Vashrangsi, Chief Chemist in Thailand's Department of Science, described their experience in papers reproduced in these Proceedings and widely discussed between sessions. The neighboring country representatives contributed equally effectively. Eng. Felix von Ranke, Executive Secretary of the Associacao Brasileira de Normas Tecnicas, was on his first visit to Bolivia. Ing. Patricio Sierra H. formed the link with the Chilean Instituto Nacional de Normalizacion. Ing. Juan Cabrerizo came from Peru and represented at the same time the Andean program for standardization. Ing. Raul Estrada, the Director General of the Instituto Ecuatoriano de Normalizacion of Ecuador, had the most effective advice, especially for the Director General de Normas y Tecnologia.

The team from NBS was balanced between standardization, physics and chemistry. It consisted of Mr. William E. Andrus, Dr. Yardley Beers, Mr. David Edgerly, Dr. Kurt F. J. Heinrich and the author of this Preface. NBS team members acknowledge with profound gratitude the contributions of Ing. Orlando Donoso T. and all the remarkable engineering and clerical staff at the Direccion General de Normas y Tecnologia.

H. Steffen Peiser

OBJECTIVES OF THE SEMINAR

By: William E. Andrus, Jr.
National Bureau of Standards

It is certainly a pleasure to be here today and to participate in this "Seminar on Standardization and Metrology". The theme of our sessions, "Systems for Standardization and Measurement in Latin America", is most important because when we talk about standardization, we are in fact talking about a system - a system which has a number of interrelated activities involving the interaction of many people of different disciplines. It is a dynamic system and one which is becoming most important as its impact is increasingly felt in the way we conduct our business transactions and in our daily life.

If we look at the infrastructure of the standardization system, we see that standardization involves some eight major activities or disciplines. These are not mutually exclusive activities and their boundaries are not distinct because they are interrelated and dependent upon one another. Nevertheless, for our purposes here today, we will use this classification:

1. Measurement Research - research conducted in search of new and better ways of measuring such basic quantities as length, mass or time - the development of new and better measurement techniques with the increasing precision and accuracy required by modern day science and technology.

2. Custody of Base Standards - the maintenance of base standards upon which the measurement systems within a nation are based - provides the final authority for the accuracy of measurements which we call in the United States "traceability".

3. Calibration Services - the process of testing and calibrating the instruments used in commerce, science, and industry in order to maintain the degree of precision and accuracy needed.

4. Reference Materials - materials and devices whose properties are used to develop reference methods of analysis and test and in the calibration of measurement systems.

5. Weights and Measures Services - the development and implementation of standards, codes, and laws to insure uniform and honest equity of measured quantities in the marketplace - the inspection of measuring devices and other services related to the commercial measurement system.

6. Product Standardization - the development, promulgation, and implementation of standards and test methods for the performance, design, and other characteristics of products and commodities.

7. Quality Control - the system for measuring and maintaining the required quality and other characteristics of products required by law or consumer acceptance.

8. Product Labeling and Certification - the system for identifying products which are in conformance with prescribed standards and other requirements.

The interrelationships and interactions of these standards disciplines is the standards system which we will be discussing these next two days. To what extent any or all of them are required by a particular country is wholly dependent upon its industrial and social development.

Perhaps the most fundamental standards activity required in a country is weights and measures services, since this provides equity in the marketplace by assuring the accuracy of weighing and measuring devices. This, however, is not always the first or the most important initial activity. Frequently, equity in the marketplace in some countries is established more by "negotiation" than by measurement. Also, depending upon a country's state of development, equity may be established more by "sense" than by measurement. A man can "see" the quantity of feed he buys for his horse but cannot see the amount of gasoline pumped into his automobile.

In many cases, the desire to export products and enter into the international market arena places early emphasis on the product standards area and the incumbent requirements for providing products of acceptable and consistent quality levels. This can propel a developing nation into a level of standards sophistication far beyond its know-how and capabilities. Most frequently this is the area in which assistance from the more developed nations is direly needed.

In considering a systems approach to standardization, we must also include the concept of the "super system" - the harmonization of these different standards activities on an international basis. In every case there is a forum for reaching international, and in some cases regional, accords. The programs of the International Organization for Standardization (ISO), the International Electrotechnical Commission (IEC), and the International Organization of Legal Metrology (OIML) are proving to be increasingly effective in the product standardization area. So are our own regional efforts in Latin America under the Pan American Standards Commission (COPANT) and the Accord of Cartagena (the Andean Pact). The General Conference of Weights and Measures (CGPM) has played a most important role for many years in the international accords and harmonization of matters relating to basic standards and measurement systems, and along with OIML has made significant contributions towards the harmonization of weights and measures laws.

As we focus on the systems aspects of standardization these next two days, we should keep in mind the various disciplines associated with the standardization process and should consider as our ultimate objective the need to accomplish international accord on each and every one of these disciplines.

SUMMARY OF COMPLETED SURVEY ON STANDARDIZATION AND MEASUREMENT SERVICES IN BOLIVIA AND AN OUTSIDER'S VIEWS OF THE GENERAL DIRECTORATE OF STANDARDS AND TECHNOLOGY OF BOLIVIA

By: H. Steffen Peiser
National Bureau of Standards

I know you are wondering what ten strangers from far away countries with almost infinitesimal knowledge about Bolivia could possibly have achieved on the complex subject of standardization and measurement services in this country. I owe you some explanations about results and limitations of the NBS/AID Survey of Standardization and Measurement Services, although it is too early for a fully reasoned analysis about our conclusions and possible recommendations arising from them.

If the Survey is judged a success, it will be for two reasons. Firstly, there were the excellent preparations which Director Donoso and his colleagues have made. Activities were selected with unerring foresight of the points of interest and of the critical technical issues faced for Bolivia's progress towards its national goals in development. Secondly, we can record outstanding friendships and mutual confidence developed between the Bolivian and foreign participants from Korea, Thailand, Turkey and the U.S.A., coupled with the close cooperation which was given to us by virtually everyone of the more than 40 Bolivian organizations visited to discuss mutual technical problems and ways in which such problems can be overcome or alleviated by services provided by DGNT.

Perhaps the most striking of our impressions is an important contrast experienced by manufacturing and processing companies. On the one hand, they face a highly competitive market, serious problems of shortage of capital, an adverse tax structure, and sometimes illegal competition through smuggling across the long borders of Bolivia. On the other hand, the Bolivian organizations feel there exist sources of support and encouragement in technical matters.

We have identified eleven types of such channels of technical know-how, as illustrated in Figure 1. Not all these types of channels are or should be used by all companies, but each kind of channel we clearly identified in several organizations visited. Let me highlight just three of these types:

1) In the first type, know-how comes with the purchase of plant and equipment. The milk and cement industries,

TECHNICAL INFORMATION LINKS IN SUPPORT OF SMALL MANUFACTURING AND PROCESSING ENTERPRISES IN BOLIVIA

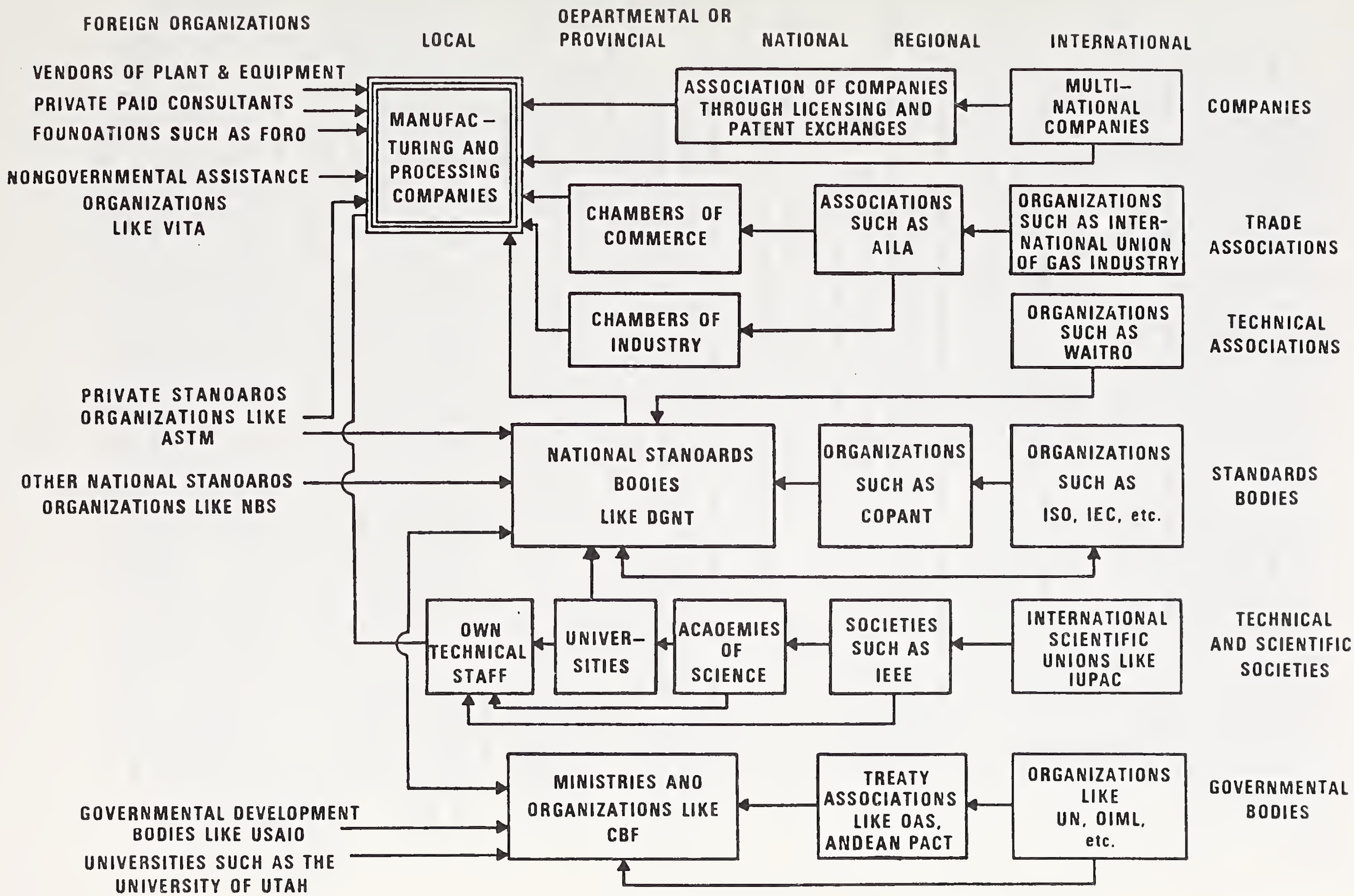


Figure 1

for example, obtain much up-to-date technical know-how in this way. Similarly with the procurement of laboratory equipment by institutions such as the Institute for Investigations in Mining and Metallurgy in Oruro, one obtains access to latest scientific developments. Here then is an additional argument for the purchase of the latest plant or equipment, a consideration not to be forgotten when making careful selections for applying all-too-limited capital funds.

2) Much technical information for companies comes from their own technical staff, obtained from continued contact with the outside professional world especially through technical and scientific societies. The Survey Team may well conclude that Bolivia would be well served by having national technical societies with activities in major urban centers for cross-fertilization of ideas between companies and universities. In addition, there should be more contact encouraged with regional and international societies coupled with in-service training both at home and abroad.

3) My last example of a type of technical support for companies concerns the channel through DGNT. Perhaps no other technical contact compares in importance with the potential usefulness to companies of DGNT services. Take technical information for instance. DGNT has access to enough technical information to overwhelm every technical man in Bolivian industry who is now dangerously starved of access to even the text-book literature. Director Donoso has discussed with us in detail how to channel the right information selectively to the right people, in the right places, at the right time and in the right amount. This crucial and difficult task presupposes close contact of DGNT staff with companies. From rapidly developing cities like especially Santa Cruz, it seems far to La Paz on the mountain. Let DGNT with its services never again be unknown to industrial enterprises in Santa Cruz. The Survey Team supports the request - or should it not be the demand - of that city for a DGNT man on the spot.

How then does the Survey Team view the services of DGNT to Bolivian industry?

1) As I have already mentioned, DGNT provides information services.

2) DGNT provides services to help in making correct measurements intended to govern the exchange of goods and delivery of services in trade and commerce. For example, many

measurements can be improved by the use of standard reference materials, with which DGNT is in a unique position to assist. Maybe Bolivians do not care or do not realize that in the purchase of gasoline or cotton or cement they may receive one or two percent less than the nominal quantity. Even the manufacturer of weights complains that he has no way of adjusting the weights. Some purchasers of kilogram weights no doubt would prefer a light one to a heavy kilogram! Much more serious, and surely unsuspected by Bolivians, is the finding of Mr. Göncü, our team member from Turkey, that some small consumers with primarily resistive electrical appliances may pay about twice as much for their power as compared with users of primarily inductive electrical equipment.

3) There are quality control advisory services. These are to be described rather fully in a subsequent paper ("A National System for Certification and Quality Control in Ecuador" by Raul Estrada A., Session II, Paper 3). DGNT can also explain the desirability of introducing production controls at every production step.

4) DGNT operates a quality marking scheme.

5) DGNT provides test services through its own laboratories, the establishment of which is being given highest priority; and through a system of accredited laboratories in industry, research institutions, and the universities.

6) There are certification services for products especially for exports. I hope Ing. Cabrerizo will make some comment on this subject which is of special concern to the Andean Common Market region.

All these tasks place demands on DGNT and its staff for the highest technical competence, integrity, and devotion to duty. Mr. Chairman, the Survey Team has found these attributes in DGNT. The staff, in part through far-sighted training received abroad, is very well qualified. No other standards laboratory in an industrializing country is known to us as having been better staffed at its beginning.

However, I cannot escape from the duty of indicating the problems of DGNT as the Survey Team sees them. After all we have not come to Bolivia just to enjoy and to praise. We live in a hard world and good advice must include warning and anticipation. In this vein we should make the following points although many are addressed to higher authority.

1) DGNT should cultivate great credibility and visibility in Bolivian industry, and should be cautious in attempting to direct quality control of companies like YPFB, the petroleum enterprise, in their field where they will always have the superior quality control know-how.

2) DGNT should activate quickly ambitious programs commensurate with its capable staff.

3) DGNT in its regulatory function must be careful not to interfere with the significant support services to industrial units. My point here needs an illustrative example to be understood.

   When the pharmaceutical and the brewery industry has a complaint about glass bottles, I am advocating DGNT should take the problem straight to the glass industry, not with a regulatory "stick", but rather with technical innovation and advice on how to cure color and volume uniformity problems of bottles without the plant closing and throwing its workers out of their jobs. Good quality and standards bring more work to industry. This is what DGNT is out to prove. Industrial scrap is a loss not only to the company but also to the image of DGNT.

4) DGNT, already active in support of other Ministries, should be given the opportunity to offer its knowledge of standardization procedures and measurement science to additional laboratories, for instance, the Health Laboratories.

5) As DGNT becomes more successful, it will lose more staff to industry. It should regard this not as a loss but as an opportunity and a healthy continuous process for the benefit of Bolivia.

6) DGNT should give high priority to building codes and safety standards to combat costly inadequacies.

7) DGNT might consider a limited project of listing the existence of maintenance capabilities and spare part supplies in the country, at least for instruments and laboratory apparatus.

8) DGNT, with collaboration of the National Council of Higher Education, should foster the teaching in Bolivia of quality control, standardization and measurement procedures.

The NBS/AID Team has collected a great deal of statistical information on the views of Bolivian industry which we have yet to analyze in detail. However, even before you see the results, you can feel encouraged. The great majority of Bolivian industry believes in the goals of DGNT and supports it. Consequently, the Survey Team believes that the future will see a more prosperous, self-reliant, technically competent Bolivian manufacturing and processing industry.

Mister Minister, by your invitation for an NBS/AID Survey Team to visit Bolivia, you have given us a great opportunity. It has been an unforgettable privilege to attempt to serve your country under the direction of Ing. Donoso. On behalf also of my colleagues I express our most profound gratitude.

BOLIVIAN ADMINISTRATIVE DATA INFORMATION SYSTEM

By: Reynaldo Salgueiro P.
Engineer
Bolivian Academy of Sciences
National Council of Higher Education

That there is significant development in science and technology is a fact which cannot be denied, so that organizations, researchers, and technicians must carefully consider the problem created by the information explosion, due to the tremendous mass of data produced in various fields by the dynamic activity in science and technology in the American countries. This is particularly true in those nations like Bolivia in which these activities are multiplying extensively due to new scientific-technological policies and strategies adopted with a view to creating rapid development in the assessment of natural resources.

Given this complex frame of reference with its significant features, in contrast to the normal development of scientific-technical activities in this hemisphere, we have considered, defined, and approved a data information policy plan on a scientific and technical level, which will contribute effectively to the better interrelation between scientists and technologists. Our effort has been to standardize the conventional information system which is functioning inadequately in our activities today, and to insure that the new system develops harmoniously in relation to the multiple scientific, technical, and cultural activities of the country.

This undertaking of great national importance will be achieved on the basis of a scientifically conceived plan for the development of the SIBA (Bolivian Administrative Data Information System). It is necessary to understand that this information system covers a broad range of processes within the overall spectrum of human activity, like the function served by the nervous system in the human body. In other words, it is made up of components whose functions are to obtain, classify, trace, transmit, store, recover, convert, process, produce, present, and disseminate information as a function of the requirements and goals sought, with a view to achieving its best use, to optimize the decisions made, the yield of field operations, laboratory work, data analysis, and research, and to obtain results contributing to the development of science and technology on various levels and in various parts of the country. This tremendous task will be implemented on the basis of priorities established as time passes.

A flexible and modular overall data information system has been designed, having to do not only with our interactions with the other countries in this hemisphere, their organizations, scientists, and activities, but covering a large number of other countries on this earth. Thus, the Bolivian Administrative Data Information System is seeking to achieve the modern characteristics which will be consistent and responsive to the requirements of international, regional, and national programs, and which will give a substantive aspect to their functioning, in order to obtain the maximal yield at the least cost and with a saving in time.

Normally, we are in the habit of saying that a data information system is created with the establishment of an international, regional, or national focal center responsible for the gathering of bibliographic material in the scientific-technical realm or other disciplines in the social and cultural sciences, its goal being the logical organization and later distribution of the same. If indeed this concept covers one of the functions of a data information system, it is only one part, since the system as such involves not only this activity but all those having to do with man in the universal system wherein he lives. In other words, the data information system is a "universe" including all types of activity, manifestation, process, production, development, and results achieved in any activity in which man participates in the physical world in which he lives. Therefore, in designing a specialized information system, we are providing a partial solution to the overall problem, contributing to the construction of the total macromodel of the data information system. Thus, in discusssing the Bolivian Administrative Data Information System, the purpose of this brief informative report, we are dealing with a specialized part of the overall goal of the creation of data banks for a multitude of disciplines. An important part of this is the functioning of the information system for science and technology in the country, which is related to the general scheme of action for the community to which we owe our primary debt, because we depend on it, we work for it, and we want to achieve its prosperity.

The goals for the development of the Bolivian Administrative Data Information System are summarized below:

1. Creation of an overall scientific-technical data information system, the purpose of which will be the development and quality control of pertinent projects in those priority areas which are set forth in the national plan for development and strategy.

2. Development of an adequate structure, adapted to the progressive functional requirements of a multidisciplinary data information system, seeking a proper design and systematic implementation which can achieve

its broadest diffusion in order to encourage and promote the development of the national institutions in the public and private sectors.

3. Use of the existing means and procedures and promotion of the development of their application by specialized international and domestic bodies, in order to share jointly in the production of data information systems.

4. Establishment of an integrated scientific and technological information system on the basis of the organization and administration of systems which will make it possible to coordinate, relate, modernize, and check on the yield of the functional units.

In order to achieve the above mentioned domestic goals, a plan of action has been drafted on the following bases:

1. Analytical studies of the situation concerning existing information systems and those being developed, in the potential areas of science and technology, to establish the systems of priority interests.

2. Implementation of preliminary studies, planning, designing, and implementation of systems by specialists with the national bodies interested in the Bolivian Administrative Data Information System. This work is being carried out on the basis of standardized instructions.

3. Diagnoses to establish guidelines which will make possible the better planning of future information systems.

4. Another requirement on which special stress has been placed is that having to do with education. In this connection, a national data information education plan is being drafted, involving courses, seminars, meetings, and other means for training executive, higher, and middle level personnel, operators, and users, in the realms of information, systems engineering, scientific documentation, and operation.

With a view to putting the Bolivian Administrative Data Information System to work, the adoption of certain initial steps leading to the functioning of the Bolivian information system has been suggested.

These steps are:

1. Organization, establishment, and functional operation of the National Focal Center and the Local Focal Points for information, which would have the responsibility for working harmoniously on the basis of a plan for action.

2. Inventory of the national bibliography and documentation on scientific and technological information.

3. Maintenance of an information flow between focal points distributed geographically throughout the country, using the existing communications media.

4. Study of the information systems and subsystems which may become a part of the Bolivian Administrative Data Information System after being put to use and under quality control.

5. Implementation of the National Data Information Education Plan.

Now then, if we consider the tremendous investments our countries are making every year in the prospecting program for ores and oil, specialized multidisciplinary studies and projects, and the probably limited research, we are in a position more precisely to judge the scope of a major project which should be proposed for implementation. I am speaking of the need for the development of an integrated information system for science and technology, the goals and guidelines of which illustrate the kind of integrational and humanistic nature we want to create. It will not be possible to achieve real goals if we do not create this tool for public mastery as a means of sharing between those who have and can do more with those having less. In other words, it is necessary to seek to develop a system which will not only be integrated from the cold scientific viewpoint, but will be dynamic and with ideas oriented toward the building of a society such that in the future people will understand and live better. Specifically, we are seeking to join together human and economic effort now available in the country in connection with the promotion and development of a massive exchange of experience and dissemination of scientific information throughout all parts of the Americas.

On the international level, the definition of the establishment of an integrated scientific and technological data information system would be practical, and to this end, this task will be entrusted to a specialized work group which will draft norms and general instructions to provide the basic guidelines for the establishment of systems. These manuals should include norms and instructions resulting from the experience acquired and deemed desirable for use in the operations carried out by the experts in the information sector, with whom scientists and technologists should cooperate effectively. Insofar as possible, it is essential to avoid the scattering and duplication of efforts, since we must seek to use and exploit to the maximum our human resources and our production, and to draft plans for the future which are oriented toward the highest goal of scientific policy concerning information. It is important that such international bodies as the United Nations, the UNESCO, the Organization of American States, the IPGH, the Inter-American Institute of Agricultural Sciences, the Cartagena Agreement, the Andres Bello Agreement, the Andean Development Corporation, the Latin American Petroleum Industry Mutual Aid Association, and others, promulgate an immediate statement of purposes and coordinate their programs in the information sector, so that each one of them can produce systems and subsystems adapted to the socio-economic development of the various countries.

NEW CHALLENGE FOR THE NATIONAL STANDARDIZATION BODIES: IMPROVEMENT OF PROCEDURES FOR THE FORESEEN "WORLDWIDE INTEGRATED SYSTEM OF STANDARDS"

By: Felix von Ranke
Executive Secretary General
Brazilian Association for Technical Standards

Experts in many countries believe that world trade requires a worldwide integrated system of standards for which new procedures are needed to achieve standards harmonization and certification accepted by buyer and seller countries. There is no question about the need for improving the existing procedures in worldwide practices. This need represents the greatest challenge for the National Standardization Bodies. Decisions have to be taken at the earliest possible time if a serious retarding effect is to be avoided in the growth of international trade. The purpose of the present paper is to stimulate the exchange of ideas, ideas which will eventually lead to international decisions.

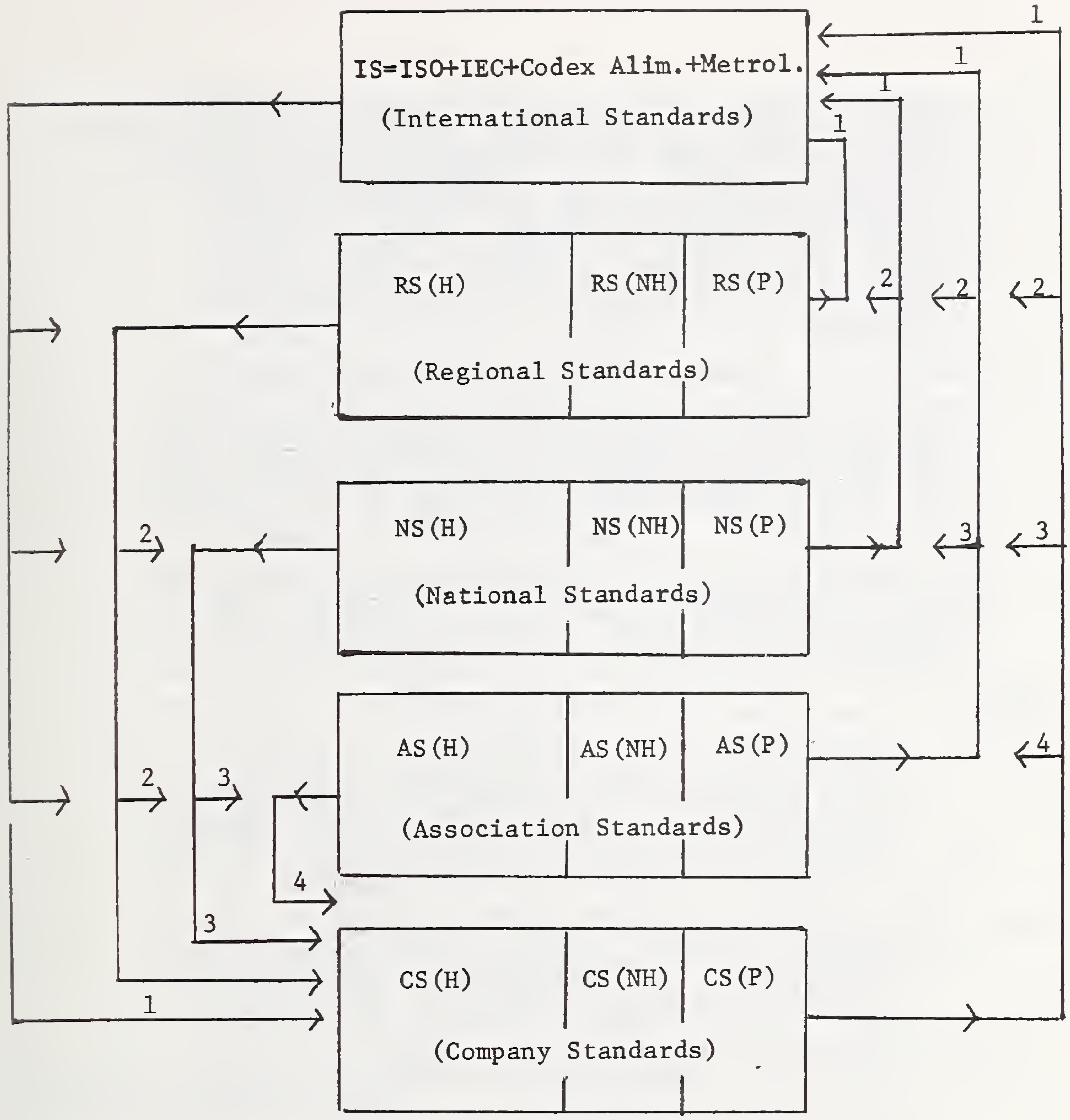
These decisions are urgent because there will be no possibility for greater participation in international commerce if the national standardization authorities insist on the use of procedures which emphasize a national harmonized system of standards without a high degree of harmonization with international standards (ISO, IEC, Codex Alimentarius, OIML, etc.).

First of all it is necessary to define the foreseen "Worldwide Integrated System of Standards". This system was discussed at the UNIDO/ISO/DGN meeting held in Mexico City in September 1973, on the general topic of the "Role of Standardization in Economic Development". In the author's paper "The Role of Standardization in Technology Transfer", the basic ideas can be represented in Figure 1.

We will accept the order in which the ideas were previously presented in Mexico City, and we will give some indications about the possible implementing actions. Some of these actions can probably be used with success by some National Standardization Bodies. Here follows a description of some of the possible actions:

1. The importance of the forecast "Worldwide Integrated System of Standards" can be nationally disseminated especially to governmental and industrial circles.

2. The adoption of harmonized national and company standards can be accelerated as shown in the Figure through the rapid transfer of technology from international



(H) harmonized with I.S.
(NH) not harmonized with I.S.
(P) of pioneering character

<u>Technological Transfer</u>
1-if there is a worldwide interest
2-if there is only a regional interest
3-if there is only a national interest
4-if there is only association interest

Figure 1

standards (arrow 1) and also from regional standards (arrow 2) to national and company standards. Included in this process would be the immediate revision of harmonization with existing international standards. The National Standardization Body can stimulate the harmonization of company standards and the revision of those company standards that were previously not harmonized.

3. Work on the pioneered national and company standards should be concentrated as shown in the Figure on projects which have the purpose of providing a rapid transfer of the technology to international standards (arrow 1) or regional standards (arrow 2) if the request is made or if a future interest is foreseen. This aim implies greater cooperation in the establishment of international and regional standards. The National Standardization Body can, therefore, stimulate company standards of a pioneering character.

Note 1: If an enterprise is unable by itself to develop a pioneering company standard, it should consider the possibility of obtaining cooperation from specialists or of developing the standards in cooperation with other interested enterprises seeking pioneering association standards.

Note 2: It may be helpful to obtain the cooperation of specially trained personnel for the development of pioneering company standards. This assistance can be obtained through special training courses on standardization at different levels. The National Standardization Body should be involved in the establishment of a program and for the coordination of such courses.

Note 3: The harmonized and pioneering national standards work should be planned by sectors of activity (such as housing, railroads, etc.). There should be a system of priorities and an indication of the sources of technological data and available facilities. Eventually, non-harmonized national standards, if any, should be reviewed both at the company and national level.

Note 4: The sectorial plans mentioned in Note 3 when combined should form the national plan for standardization which should be revised periodically.

Note 5: The National Standardization Body should stimulate work concerned with harmonized and pioneering standards to be done by companies. This work should be planned for each sector of activity with a clear indication of priorities and actions at the national, regional, and international standardization levels. All the sectorial plans together will form the "Company Plan of Standardization", which also should be revised periodically.

4. The national procedure for standards formulation can immediately be harmonized with the ISO procedure and allowance can be made for the IEC, Codex Alimentarius, OIML, and the regional (like COPANT) procedures.

5. The National Standardization Body should stimulate the immediate harmonization of association procedures of standard formulation with the ISO, IEC, Codex Alimentarius, OIML, regional (like COPANT) and the national procedures of standard formulation.

6. The National Standardization Body should stimulate Regional Standardization Bodies (like COPANT) to accelerate the establishment of harmonized regional standards because they, if expressed in a language used in various countries, can be adopted directly, very quickly, and with economic benefit as national standards by one or more countries. Perhaps this will be the only way to obtain an effective national system in an acceptable time and at acceptable expense.

Under the previously presented order of ideas, the National Standardization Body may also:

1. engage in public explanation of the existing connection between standards at various levels with the organizations responsible for their development and of the nature of the compromise concerning their use; this compromise is ultimately determined by agreements, like the forecast "Code of Conduct" in negotiation in the GATT (General Agreement on Tariffs and Trade); and

2. engage in public explanation of the nationwide responsibility for keeping the links in operation and for corresponding financial support.

The more a developing country is concerned with increasing its participation in world trade, the more urgently it has to consider the adequacy of its standardization procedures. Therein lies not only the challenge but also the special opportunity for reducing the existing technological gap.

A PRACTICAL STANDARDS INFORMATION NETWORK BY TELEX

By: William E. Andrus, Jr.
National Bureau of Standards

This morning in my opening remarks on the theme of our Seminar, I described some eight areas of standardization that might be addressed by a developing nation in considering its standardization needs. The last three areas, all relating to standards on products and commodities, involve the development and promulgation of product standards and their implementation through quality control and product certification.

If we consider just this aspect of standardization, it is estimated that there are more than 300,000 of these kinds of standards in existence today throughout the world - international standards, regional standards, and national and "association" standards. In this context I am calling standards like those promulgated by the American Society for Testing and Materials (ASTM) or the Boiler and Pressure Codes promulgated by the American Society of Mechanical Engineers (ASME), association standards. These standards, though somewhat national in nature, are not truly "national" standards, but have gained wide recognition and use throughout the world.

There is, of course, much duplication in these standards; certain national standards are technically equivalent to other national standards or are technically equivalent to certain international and regional standards. However, it is interesting that, out of these 300,000 or so standards, the international standards of the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC) account for only 3,400 of them - a little more than one percent. This number of international standards, of course, is increasing very rapidly, and it is projected that in the next eight to ten years the number of international standards will increase to ten to twelve thousand to meet expected worldwide needs.

As the total number of standards increases, it becomes increasingly impractical for any one organization or country to maintain a complete library of the standards that are applicable in the various parts of the world. The volume, of course, is manageable with today's sophisticated information processing equipment, but what is becoming unmanageable is the complexity of useful information about each standard that is needed. We need now much more information about the changes that are occurring in this complex standards system - the technical details of the thousands of standards that are under development in draft form or standards that are under revision. The increasing need for more detailed information on the technical equivalency of one standard to another (and most importantly, the subtle differences) all point to the need for better and more effective information systems to assemble this information. Only with such a system will we be able to provide timely answers to the many questions that are now being asked by manufacturers, exporters, governments, and other sectors of society.

The ISO Council Committee INFCO was established in the late 1960's, and one of its charges at that time was to recommend actions that ISO might take in addressing this information explosion. However, little progress was made until just this past 18 to 24 months. In fact, it was just last month that INFCO restructured itself and established its primary focus on the information systems aspects of its program.

There are now four working groups under INFCO. Working Group 1 is concerned primarily with data formats - the structure of the information that must be maintained for each standard. Mr. Sutter from the Association Française de Normalisation (AFNOR) in France is Chairman of this Group. The second Working Group is charged with the development of a multi-lingual thesaurus (initially in the ISO languages - English, French, and Russian). This Group is under the Chairmanship of Mr. Romanov of Gosudarstvennyj Komitet Standartov Soveta Ministrov S.S.S.R. (GOST) of the Soviet Union. The third Working Group, of which I am Chairman, is charged with developing the operating protocols and procedures of the ISO Information Network which is now called ISO/INFONET. The fourth Working Group, chaired by Poland, is charged with developing training programs for standards information center personnel.

The ISO/INFONET actually came into being somewhat separate from INFCO. Last year in May a group of us met in Geneva at the request of the ISO Secretary-General to prepare a recommendation to the ISO Council for the formation of an information network. The recommendation which was ultimately accepted by the ISO Council at their meeting in Washington in September 1973 called for the formation of an information center at the ISO Central Secretariat and for the network to become operational January 1, 1974. Initially the network consisted of Telex terminals in the ISO Geneva Information Center and in the information centers of five countries which operated as nodes in the system. These centers were the BSI in the United Kingdom, AFNOR in France, DNA in Germany, GOST in the Soviet Union, and the National Bureau of Standards, which provides the information center support for the American National Standards Institute (ANSI) in the United States.

The initial choice of Telex was primarily based upon the fact that the system could become operational quickly with the exchange of simple information as to the existence and applicability of standards. The Information Center in Geneva will develop and maintain a data base on international standards, and each of the five countries, acting as nodes in the system, will develop and maintain a data base on the national standards of its country as well as other standards that are used or required in its country.

The network became operational the first of this year, and since then 28 other countries have joined the network in an inquiry mode with Telex terminals. Their role and responsibilities in the network are not as yet clearly defined but will be in the near future.

An interesting sidelight to the ISO network is the meeting of the Information Committee of the World Federation of Engineering Organizations (WFEO) which was held in Cairo this past April. At this meeting, using the ISO Network as a model, agreement was reached to conduct an experimental program with developing nations on a regional approach, tied directly into the ISO/INFONET. Although these agreements have not as yet been formalized, they will probably involve the Arabic nations with the Arabian Standards and Metrology Organization (ASMO) as a focal point. Also UNESCO, under its UNISIST program, has tentatively agreed to help finance this experimental program.

UNISIST and other organizations have been struggling for years to put together an operable and useful information system in the sciences and technology. The complexity and the mass of the data involved has, however, been a serious roadblock to significant progress. The information base for standards on the other hand is finite and is structured geo-politically in a way that it is manageable. For this reason, I believe that the ISO network will be a success and this is why WFEO and UNESCO have shown so much interest in it.

Although the present system is barely operational and is quite simplistic in nature, we envision a much more sophisticated system in the next few years - one involving computer and teleprocessing terminals and a system capable of responding quickly to very complex questions. We must be able to respond to questions on the technical equivalency of standards and the subtleties of their application and implementation - and perhaps questions which are the most difficult to answer on the assessment and projected impact of standards under development or revision.

The ISO/INFONET on the surface looks like a tool for assisting developed (and developing) nations in the international marketplace, which it is, of course. But it is also a tool for individual nations in the promulgation and implementation of standards at the national level. Hopefully, it will eliminate much of the duplication in standards development efforts and will lead to greater harmonization of standards throughout the world.

The ISO/INFONET will most certainly contribute to reaching that goal I discussed earlier today - a worldwide system of harmonized standards.

THE PROCESS OF STANDARDIZATION IN BOLIVIA

By: Rodolfo Costas L.
Directorate General of Standards and Technology
La Paz, Bolivia

Thanks to a kind invitation extended to me by the Directorate General of Standards and Technology, I have the high honor of addressing this select audience for the purpose of tackling the topic of "The Process of Standardization in Bolivia", within the framework of this important event sponsored and organized by the United States National Bureau of Standards and the Agency for International Development and by the Bolivian Directorate General of Standards and Technology, and participated in by prominent persons and experts from standardization agencies of various countries. The set of problems raised by the need for having technical factors facilitating and guiding the processes of production and marketing and, at the same time, rationalizing them and relating them to each other has caused some public and private institutions to make efforts for the purpose of working out, adopting, or adapting technical standards for their own use. These efforts have had no appreciable results, first of all, because they tended to meet limited requirements and, then, because they were made in an isolated, sporadic manner.

As a result of this need and on the basis of the concept (supported by the lessons of experience and theory) that standardization is a process that must be tackled in a rational, orderly manner by competent organizations devoted to the subject, the Directorate General of Standards and Technology was established as an agency under the Ministry of Industry, Commerce and Tourism, in May 1971, "for the purpose of preparing national technical standards of quality, output, dimensions, and so on, tending to rationalize the processes of production and marketing and to protect the consumer from defective products". On the basis of this principle and with a broad field of action, the DGNT (Directorate General of Standards and Technology) started its tasks in national technical standardization. It has fallen my lot to make these tasks known in this seminar.

The first problem confronting the DGNT was how to tackle the process of standardization in Bolivia.

It proceeded to make a detailed study of the work accomplished by other similar organizations for the purpose of solving this problem, seeking to assimilate the experience obtained by those organizations and the manner of applying it to Bolivia's situation. The study also included the work performed by international agencies, especially by the Pan American Commission on Technical Standards (COPANT) on the continent.

In addition, a careful study was made of the Government's plans and programs in the economic area and of the documents that would serve as a basis for the processes of integration in which Bolivia is participating, most especially the ones connected with the Andean Group and the LAFTA (Latin American Free Trade Association).

Once a familiarity with all this background material had been acquired, the next step was to prepare one of the DGNT's most important documents, important not only because of its content, but also because of its scope and because it represented the guide for the process that was to be developed.

This document, which was prepared by the DGNT technicians, is the National Standardization Plan, an instrument containing the basic parameters to which the preparation of Bolivian Standards must be adapted. It indicates precisely the fields of action of the process and the mechanisms needed for putting it in practice.

Special emphasis must be given to this plan, not only because of the reasons just stated, but also because of the consequences produced by its process of preparation, some of which I am taking the liberty of mentioning:

1. During its preparation, it was possible to obtain active experience with regard to what is included in the task of standardization by the method followed in drawing up the plan. A discussion committee was set up with the participation of the personnel who later would be responsible for implementing it. The good results obtained made it possible to lay the groundwork for an incipient domestic technical standardization school.

2. When the needs and requirements of the country's economic sector were evaluated, both from the domestic point of view and with regard to its relations abroad, priorities of work were established with a knowledge of the nation's situation. This knowledge was passed on to those who would be responsible for executing the plan subsequently with a full knowledge of causes and effects.

3. Special consideration was paid to the work performed by similar institutions in other countries and by international organizations. This aspect served not only for assimilating experience and for avoiding possible errors in this way and for applying tested methods, but also

it was a determining factor in the subsequent effort carried out for the purpose of establishing excellent relations with institutes in other countries and for obtaining an exchange of information and experience in addition to collections of standards so important to the studies. Special mention is deserved of the fact that it was realized in this phase how important it is for the DGNT to participate in the work of regional standardization being carried out by COPANT and subsequently in the work of a worldwide nature performed by the ISO (International Organization for Standardization).

4. It showed the need for obtaining personnel training in various fields of the specialty and for achieving technical and economic assistance from abroad.

The National Standardization Plan was conceived as an elastic instrument, subject to revisions and amendments that would not alter it basically. The first revision provided made it possible to introduce amendments. In subsequent revisions, it is likely that others will be introduced as experience is acquired and whenever circumstances require it.

The plan, published in December 1971, also served as an optimum instrument for promotion and dissemination, when it was circulated all over Bolivia among those who will be involved in the process.

It should also be noted that the plan makes it possible to project the activities that will be performed in each sector, in accordance with established priorities. This facilitates, in turn, its subsequent correlation with standardization plans on the Pan-American and worldwide level. This last-mentioned aspect is taking on increasing importance especially for our country, which has already overcome its status as a monoproducer by gradually diversifying its economy, since it is just as important to know what is bought as it is to know what is sold.

The National Standardization Plan specifies the creation of standardization committees, which are the instruments for establishing the production of national standards.

In fact, the "standardization universe" is divided, by branches of science, engineering, economics, and so on, into standardization committees, which are, in turn, divided into specialized subcommittees.

Thus, we have the Committee on Building Materials, with a broad field of action, divided into various specialized subcommittees, like cements, aggregates, ceramics, and so on, or the Committee on Food Products, divided into various subcommittees, like milk and its byproducts, cereals, and so on.

In accordance with what has been stipulated, based on justifiable reasons, a subcommittee can become a committee, like, for example, the present Committee on Alcoholic Beverages, which was formerly a food products subcommittee.

By definition, the standardization committees are composed of delegated technicians representing the following sectors, in their respective subject matter: production, marketing, consumption, state, science, and technology. In this way, with the collaboration of all those involved in the process, it is hoped to achieve correlation of the strong interests at stake, based on a unification of the technical criteria of the participants and to achieve in this way the necessary knowledge and consensus for a subsequent application of the standards.

In spite of the fact that there is a large number of delegates participating on the various committees in operation, it is necessary to point out that it is not always possible to obtain the requisite number of representatives of every sector on them.

This shortcoming was detected at the very start of the work. It poses a considerable problem, the problem of promoting technical standardization and of creating an awareness of it. This problem, which I regard as not foreign to any standardization organization in the world, came up in all its magnitude in Bolivia. A promotion campaign was conducted in this connection and some results have already been obtained. It can be summarized as follows:

1. Scheduling and conducting theoretical and practical courses for Bolivian technicians, especially those working in industry, and for recently graduated professional persons. These courses have been given up to now by foreign professors, thanks to COPANT-OAS collaboration. Courses on quality control are outstanding among them. More courses will be given in the future, many of them with Bolivian technicians.

2. Holding of seminars, with participation by executives of public and private enterprises and with the collaboration of prominent persons in the field of standardization. This seminar is included in this category.

3. Extensive dissemination of the material produced by the DGNT, bulletins, sectorial documents, programs, catalogs,

standards, and so on. This phase culminated in a periodical financed by advertising. It is an important mouthpiece for the DGNT.

4. Constant contact by DGNT employees with enterprise technicians and executives, stressing the transmission of technical information on the processes being developed in standardization on a continental level (COPANT) and on an international level (ISO).

5. Provision of information and technical assistance to industry. This program is in its initial phase and will be put in operation shortly.

6. Visits to industrial plants.

Although it is true that these programs and activities have been centralized in La Paz, the intention is to extend them to other cities in Bolivia.

A survey conducted in the last few days with the cooperation of NBS and AID covering industrial areas in our country has contributed enormously to this effort. The results of this survey will be extremely useful to the future work of the DGNT and it can be stated right now that this survey represents an important contribution to the development of standardization.

The mechanism for preparing and approving Bolivian Standards is rather simple and can be outlined as follows:

The DGNT appoints one of its officials as head of a specific committee, responsible for submitting a program of work for each subcommittee to be put in operation. Once the subcommittee has been put in operation, it proceeds to draw up a list of standards that must be prepared. It should be pointed out here that the preparation of a standard originates in the programs of the DGNT on the basis of priorities specified by the Government or requested by industry and other institutions.

The first phase of a Bolivian Standard is the outline of a standard, that is to say the document prepared by the DGNT. This document is submitted to the appropriate subcommittee and, after its review and approval, it becomes the draft of a standard, the basis for subsequent discussion.

After going through its appropriate procedure, the draft of a standard is approved by the subcommittee and the DGNT proceeds to circulate it as a proposed Bolivian Standard.

This phase is truly important, because the proposed standard is subjected to a period of public survey for a specific time, for the purpose of receiving observations from the institutions and persons to whom the proposed standards are sent. This phase is known as public discussion and precedes approval of Bolivian Standards.

I believe it advisable to point out that in each case the process of preparation of a standard is preceded by a study period in which the job of compiling standards from other countries and international standards, in addition to a reference bilbliography, is performed. In most cases, the procedure in this phase is to "adopt" a standard coming from abroad, with due regard for Bolivian conditions in each case. These conditions introduce variables that frequently are important and determine the conduct of the necessary research work.

In other cases, a special study is made for the purpose of "preparing a standard". In these cases, the process is usually slower and is performed only when circumstances require it.

Finally, and on the basis of the work of standardization on the international level, a standard is "adopted" as a Bolivian Standard.

Several COPANT standards and recommendations have followed this route (at the most with small variations in form), and I dare say that, in proportion to its size and age, the DGNT is one of the organizations that has adopted most COPANT standards and recommendations as its own.

At any rate, regardless of the path followed in preparing a Bolivian Standard, it must be approved in its various phases by the DGNT, by the pertinent committee, and finally, after public discussion, by the executive branch.

The final approval of a proposed standard is up to the executive branch, represented by the Ministry of Industry, Commerce and Tourism, in most cases. Once the proposed standard has been checked, the ministry approves it as a Bolivian Standard by means of a ministerial resolution specifying whether or not the standard involved is obligatory, based on the recommendation of the pertinent committee.

Therefore, the committee originally determines whether a standard is obligatory or voluntary, but the executive branch has the final word in this connection.

It is necessary to take the proposed standard to the Cabinet for consideration in very few cases. One of them is approval and regulation of the Bolivian Standard in relation to the International System of Units. All these phases tend to guarantee the Bolivian Standard in itself and to facilitate its subsequent application, and I believe that this is happening. Another aspect that has not been neglected is the one connected with the revision of standards, and, although no cases have yet come up in this regard, the method is prescribed in the National Plan.

Finally, I have to indicate the type or kind of standards being prepared in Bolivia.

Most of the Bolivian Standards are of the "fundamental" type, that is to say, definitions, classification, terminology, and so on.

This is not the result of chance, since there has been considerable discussion on the topic of the type of standards to be prepared. The preparation of fundamental standards is a long, difficult process, without apparent appreciable results. Nevertheless, I believe that the results obtained so far justify the method. At present, the subsequent task in each field of action has been simplified, with a firm basis not only from the internal point of view, but also because the basis of that "common language" of which theory does not speak has continued to be laid. In general, this makes it possible to aspire to an increased production of standards, but especially to a more extensive application by means of an understanding of them.

I have tried to summarize the process through which Bolivia is going at present with regard to technical standardization, but this report would be incomplete if no mention were made of the work performed with regard to quality control. By means of its specialized division, the DGNT is preparing a National Quality Control Plan consisting of two phases: quality certification and promotion and technical assistance. The first phase has already been completed with the approval of the Regulation on Quality Certification, while the second phase is in its final study stage.

The importance of the work being performed by the DGNT is really enormous. It requires much time and suitable adjustments, since standardization is a slow, constant process. Nevertheless, I believe that firm bases have been laid on which technical standardization can become a very useful tool for improving the living conditions of the Bolivians.

THE THAI EXPERIENCE IN STANDARDS AND PROBLEMS IN ESTABLISHING EFFECTIVE WORKING LINKS BETWEEN ORGANIZATIONS

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INTRODUCTION OF INDUSTRY DEVELOPMENT

During the economic development period starting in 1961, Thailand has emphasized the development of industry. While the industry grows, there has been a certain demand by consumers for standardization of commercial goods produced by local factories. It followed that the Thai Industrial Institute (TISI) was established by law in 1968. The function of the Institute is to set up a program for industrial standards and a TISI standards mark in order to promote the quality of locally produced goods.

It has been the Thai experience that at the beginning stage of industrial development there appeared to be a general suspicion by consumers. They did not recognize the quality of locally produced goods. The goods manufactured in the country are not easy to sell and vendors found it difficult to compete with imported products. The manufacturers of local products had a serious problem and needed some kind of certification or guarantee from an authorized government agency. For this reason, the Department of Science had set up a certification program and later a standard mark program to certify locally produced quality goods.

The certification program has been operated for the last twenty years. It is based on the specifications decided upon by the Department of Science. The manufacturer who needs a certificate for his product must submit a request to the Department of Science with a payment of a very low service charge. After sampling inspection and testing, if the product conforms to the specification, the certificate of quality is issued. This certificate is re-examined every year. Recently TISI has offered a standard mark program. The producer of goods must submit a request and follow the procedure of TISI with a payment of a considerable service charge. The inspection and tests are carried out according to TISI standards. The tests are usually assigned to other laboratories available and qualified to give that service. They include the laboratories of the Department of Science.

At the beginning of the standard mark program, the producers seemed to appreciate this mark of quality for the purpose of their advertisements. However, the program ran into complicated problems at a later time. Those problems may be summarized as follows:

1. The process of testing and analyzing according to standards is time-consuming and needs a great deal of manpower and equipment. The testing is expensive and, therefore, increases the cost of production. Many producers are not able to afford that increase. Moreover, if the product does not conform to the standard, the whole production lot may be rejected, which causes a big waste in the manufacture.

2. It happens very often that the equipment used for production control of the manufacturing process is not properly calibrated and maintained. This situation causes considerable errors in measurement. The products from such a process may fail to conform with the standard specifications.

3. It is often found that the products manufactured by the same factory give different results when tested by different laboratories. Such results are caused by machines which are not properly calibrated.

The occurrence of these problems may be attributed to a lack of a capable service that can serve the need of instrument calibration. During June 1973, Thailand had requested the NBS/AID Survey Team to investigate the problem and seek solutions.

The Survey Team suggested that the Government of Thailand establish a central laboratory. This laboratory should be responsible for an instrument calibration service to serve both Government and private enterprises, in standardizing all kinds of measuring equipment by making full use of testing facilities available in the country. At the beginning, the functions of this laboratory would mainly involve a collection of standard equipment as well as standard reference materials in order to serve the urgent needs of the present time. The subsequent step is to investigate the availability of testing equipment in existing laboratories and plan for collaboration. Standard materials will be distributed and calibrating equipment will be circulated for checking the correctness and reliability of existing equipment. The calibrated equipment can be assigned to the testing of certain products for the standard mark program or for quality control in the manufacturing process.

ADAPTABILITY OF QUALITY CONTROL SYSTEM

The certification and standard mark programs, involving time- and cost-consuming procedures, seemed to increase the expenses to the producers. As a result the economic value of the program is decreased. It would be more reasonable if the industry could apply modern techniques of quality control in production, which would lower the cost of production and raise the quality of the products.

According to this concept, the standard specifications may be regarded as a reference for the minimum requirements on quality. However, for the purpose of market competition, the quality can be raised fully to meet the requirements of the consumers. Since the Standards Body will be busy with drafting of standards, inspection of concerned products and issuing a standard mark, it may be best if another organization would provide to the industry facilities and technical know-how for modern quality control. The Department of Science has for this purpose provided training courses and seminars on total quality control for several factories.

In modern industry, the producers tend to rely on their own testing facilities and techniques of quality control in order to build in the quality in the production process. Rejection of finished products can thus be avoided. A calibration service for testing machines of such an industry is required and the central laboratory at the Department of Science has been regularly providing this service to several kinds of industries.

Many small industrial factories do not have their own testing equipment. It is necessary for the central laboratory to offer a testing service in order to enable small scale industry to perform quality control in the production process.

At the present time, there exist many testing laboratories, available for industrial product testing; some are owned by the Government, others by the private sector. In order to maintain good testing results in such laboratories, it is necessary for the central laboratory to provide a regular service of calibration. By these means, the central laboratory at the Department of Science is acting as a central link in the country for standardization of available equipment. Thus, we could make full use of available resources and achieve good fast results. For such a responsibility, however, the laboratory needs a much larger budget for equipment, staff and training facilities. The exchange of experience and training of personnel among different countries will be very useful for the implementation of this program.

PROPER QUALITY CONTROL CAN SAVE INDUSTRY FROM ECONOMIC DISASTER

As the industry grew, there was a loose control in management by government organizations concerned. Quality control in industry has emphasized mostly technique-consciousness, but less the quality management and quality-mindedness of the workers. It was during July and October 1973, that the Thai industry had a great setback by a worker strike which involved more than 200,000 workers who protested against management personnel. Most of the industrial production stopped and this caused a great loss to the economy of the nation. Such a disaster would not happen if government organizations concerned would take full responsibility in planning and collaboration in the process of industrial development; therefore, it might be reasonable to point out that such a crisis occurred because of the misunderstanding among the workers and management personnel which created an unpleasant atmosphere in the factories. The cause of such feelings might be attributed to lack of quality-mindedness and to the fact that a quality control technique was not correctly implemented. It should also be pointed out that quality control techniques are as important as standardization. The lesson is clear: we must take more precautions in planning industrial development.

A NATIONAL SYSTEM FOR CERTIFICATION AND QUALITY CONTROL IN ECUADOR*

By: Raul Estrada A.
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INTRODUCTION

For many years now, many countries, especially the industrially more advanced ones, have been setting up official quality control systems under the auspices of the respective national technical standards institutes. These systems are based on the general belief that quality is a statistical fact that is difficult to verify and which must involve the following two elements. One is the complete cooperation of businessmen, in the sense that they must have adequate incentives for putting out quality goods; the other is the existence of a highly specialized agency which is responsible for certifying quality, based on a system of checking or monitoring quality at the production level.

The total responsibility for quality control belongs to the manufacturer or processor. The specialized agency in charge of certifying quality is only required to guarantee to the consumer that the manufacturer possesses a scientifically designed and honestly utilized system for maintaining the quality of his goods within the range of specifications previously established in accordance with reference standards.

There are two methods for certifying quality that are widely used throughout the world; they are:

1. certification by means of a seal or trademark guaranteeing conformity with standards, and

2. certification by lot.

Certification by seal or trademark is a system which helps the consumer to distinguish in the marketplace between a high quality product and another product which does not carry the corresponding guarantee. This is accomplished by placing on all certified products a seal or trademark which is recognized by the national standards

* Reprinted here is only Director General Estrada's verbal summary of his longer printed paper given to Seminar participants.

institute. The producer is authorized to use this trademark through a bilateral contract. This system is based on the establishment of adequate quality controls at the production level. Such an undertaking requires close cooperation of all the elements involved in production, including the sales, purchasing, production, clerical and above all, managerial staff, in order to ensure that what is manufactured adheres to the established standards. This system is also based on a series of tests by the standards institute, utilizing samples taken at the market or production level. This provision makes possible the selection of truly representative samples which are sent to laboratories which have been given official status. The results are then analyzed by the standards institute with the idea of maintaining adequate controls on production that has been certified by the seal.

The system of certification by lots is conceptionally simpler, since it only requires working with an individual lot of goods that the manufacturer is trying to market. The lot is inspected and sampled, and the entire gamut of analyses is carried out to insure that quality meets established technical standards. This system of certification commends itself for some import and export goods.

THE ELEMENTS OF A NATIONAL QUALITY CONTROL SYSTEM

From the above we can see that the basic elements for a national quality control system are, in order:

1. A coherent set of technical reference standards (in decreasing order of desirability: international, regional, national, association, or company).

2. An international, company level, quality control system which encompasses all the divisions and elements involved in the production of a given good, i.e., management, production, inspection, the laboratory, monitoring, etc.

3. A scientific, technical agency in charge of certifying quality as a national regulatory function. It will establish the ground rules for effective quality control not only at the company level, but also through systems outside the firm. It will tend to delegate authority not only to lighten its own workload, but in order to disseminate a widespread understanding and responsibility for quality control.

4. An integrated system of official analysis and testing laboratories, with the means to carry out a wide variety of tests, such as those needed to check or monitor the quality of a great number of domestically produced goods. This system will be an added check on the laboratory tests carried out at the company level as a basic element of an internal quality control system.

5. A law whose provisions establish the respective national authorities as well as the investigations needed at both the domestic and international level.

6. Complete information nationwide on how the system functions. This will enable consumers to understand the basis for certifying goods, and thus encourage the choice of products whose quality has been guaranteed.

THE QUALITY CONTROL MANUAL

In each case a contractual agreement will be signed between the INEN and the individual firm for the creation of the internal quality control system, which will be both reliable and dependable. Its scientific and technical base will ensure that the standardized quality level is achieved and maintained, despite potential changes in certain variables which are inherent to every industrial process. The quality control manual will set down the precise contractual relations between the firm and the institute, for the purposes of monitoring quality. The manual will also contain the following information: reference standards for quality control on raw materials, semi-finished and finished goods; sampling standards; destructive and nondestructive tests; frequency of inspections; equipment to be used in tests and checks; the responsibilities of each sector in the factory, both in terms of production and of management or administration, etc.; in general, all the rules that are needed to maintain and improve quality with the passage of time.

OFFICIAL ANALYSIS LABORATORIES

One of the main aspects of the system is the creation of a system of accredited official analysis laboratories to check and monitor quality outside the firm itself, thus providing an additional reference on quality. These laboratories will work with random samples (selected by standardized procedures) taken from stores or outlets selling direct to the consumer, as well as from the company's own warehouses.

The enormous number of products whose quality must be verified nationwide, together with the wide variety of chemical, physical and mechanical tests needed for this, require that all laboratory services available to the country be integrated. This involves not only agencies directly related to the Government, but university and private facilities as well. There are certain sectors which are already covered by agencies which perform specific functions in this regard, such as the Izquieta Perez Institute in the area of foodstuffs, cosmetics, drugs and pesticides, and the National Fishing Institute in the area of seafood products. Nevertheless, there is still an enormous number of individual fields in which specialized laboratory services are needed. The country must have analysis facilities which are not only wide-ranging, but which are highly specialized for each field, e.g., building materials, paper, plastics, paints, steel, etc.

The above considerations demonstrate that each university must be encouraged to specialize in one or more fields in which it can achieve maximum efficiency, so that the corresponding analyses can be carried out there with the speed required by our nation's industry and trade, and at suitable prices, given the present conditions of beginning industrial development. Once these fields are determined, the INEN will recognize the respective laboratories as official analysis laboratories within the national quality control system. Consequently, it will channel to them samples produced domestically in the field, thus helping to finance these services. Through its department of metrology, the INEN will offer a permanent consultation service, in addition to services for calibrating tools, weights and measures, in order to maintain nationwide confidence in the test results obtained. Moreover, through the systematic distribution of standard reference material samples, the INEN as well as the universities themselves will be able to maintain complete control over the suitability of environmental conditions, equipment, reagents and laboratory personnel.

All this will make possible the operation of a scientifically designed quality control system which can guarantee high quality to the consumer and which is not based on police measures but rather takes into account the best interests of all involved. A prosperous Ecuador is one in which the average citizen can obtain goods of the highest quality at a price which is both just and an incentive to production.

THE INTERNATIONAL ORGANIZATION OF LEGAL METROLOGY (OIML) A CASE STUDY OF HOW TO TAKE ADVANTAGE OF AN INTERNATIONAL ORGANIZATION

By: David E. Edgerly
National Bureau of Standards

My remarks, Mr. Chairman, are largely inspired by my experience during the Survey of Bolivian Standardization and Measurement Services and the central role of the General Directorate of Standards and Technology in Bolivia. I have little doubt that these remarks apply similarly to other Latin American countries and their National Standards Bodies. The General Directorate of Standards and Technology (DGNT) has a very important role to play in the development of the Bolivian economy. It has been proven time and time again that a strong program of standardization and metrology is a necessary foundation of a successful economy. This is certainly true in the United States and in every other industrialized economy. In part, the task which DGNT faces is simplified in that there are many nations and international organizations that are prepared to assist in developing a successful program of standardization and metrology. However, it has also been said that too much advice can be as confusing as attempting to build a program without any guidance. In effect, it is the DGNT which ultimately must decide what program will best fit the needs and the uniqueness of Bolivia.

My purpose this afternoon is to bring you information of an international organization that is dedicated to the development of standards in the area of metrology. While metrology is but part of DGNT's program responsibility, it is indeed a very crucial part. Accurate measurement is necessary in all segments of an economy because it is the guarantee upon which there is built mutual trust between buyer and seller that both quality and quantity standards are being adhered to. Without measurement standards there is little chance that an economy can support rapid industrialization.

The organization to which I refer is the International Organization of Legal Metrology (OIML). It was founded in 1955 to promote intergovernmental cooperation in the field of legal metrology, which broadly relates to the compatibility of standards of measurement and the legislation and government regulations which may affect such standards of measurement. Aside from its activities as a center of documentation and information exchange in legal metrology, the OIML most importantly recommends uniform international requirements for measuring instruments and works out model laws and regulations for consideration by member states. There are, in fact, 42 member nations of OIML. Organizationally, OIML consists of: (1) the International Conference of Legal Metrology, which is composed of delegates from member nations and which meets at least every 6 years. Decisions of the Conference are submitted to member nations "for information, consideration, and recommendation", (2) the International Committee of Legal Metrology (CIML), which consists of one delegate from each nation, and which meets every 2 years. The technical work of OIML is conducted by working groups within the framework of the Committee; and, (3) the International Bureau of Legal Metrology (BIML), headquarterd in Paris, which constitutes the Secretariat for the Organization.

OIML's primary functions are: (1) to form a center of documentation and information in the field of legal metrology; (2) to establish close relations with weights and measures officials of each member nation; (3) to furnish advisory assistance to interested nations; (4) to determine the general principles of legal metrology; (5) to issue uniform international recommendations respecting legal requirements for use and control of measuring instruments; (6) to establish a code of specifications and tolerances with which measuring instruments must comply in order to acquire international approval; and, (7) to establish and promulgate model laws and regulations in the field of legal metrology.

OIML has now published 34 International Recommendations dealing with such subjects as: mass standards, volumetric standards, meters for liquids, clinical thermometers, pressure gauges, vocabulary for legal metrology, and medical syringes. The decisions of the Organization are promulgated as recommendations; they do not have the force of law until adopted by a member nation. However, members of OIML are "morally obliged to implement these decisions as far as possible". Member nations in practice have the essential latitude in deciding for themselves how far is "as far as possible".

Before discussing the importance of OIML for instance to Bolivia, and to DGNT specifically, I would like to relate the importance which we attach to OIML in the United States. Public authorities have the obligation to insure that legal measurements within a country are on a uniform basis. The national regulations that have been developed for this purpose in the United States have for many years been developed within the country independently of similar work in other countries. Consequently, our laws and regulations often differ widely from those of other countries. Today, with rapidly developing and changing technology, and with the rapid expansion of international trade, these differences pose a potential impediment to international trade. For example, the U.S. exports some $500 million worth of measuring instruments. If a country's laws or regulations are such that they require certain specifications that are different from specifications employed in the United States, trade with that country is severely hampered. Thus, the development of uniform international recommendations by OIML goes a long way towards reducing these barriers to trade. Basically, we consider the benefits of participation in OIML to be as follows:

1. to improve opportunities for exporting measuring instruments;

2. to obtain and disseminate in the United States better information regarding measurement techniques in the field;

3. to influence internationally adopted measurement techniques so U.S. procedures will not be put at a disadvantage; and

4. to insure that the United States can have its views heard in the process of adoption of model laws and uniform procedures dealing with legal metrology.

I realize that Bolivia, at present, is not worried about exporting measuring instruments. However, Bolivia is currently in a position of deciding upon the laws and regulations within Bolivia that are necessary for legal metrology. This is a very critical period because it will affect trade within Bolivia for years to come. Thus, when Bolivia is in a position to expand its exports, it too will be faced with the possibility that certain export markets may be closed because of non-uniform measurement standards used in the production of various products. Aside from general trade considerations, which are rather long-termed insofar as DGNT's current priorities are concerned, it makes good sense to look to OIML standards as a basis for legal metrology in Bolivia. This is true for several reasons: first, OIML is international, and its members comprise most of the industrialized nations of the world; and secondly, OIML maintains a rather broad liaison with important international organizations. For example, OIML coordinates its standards recommendations and activities with: the International Bureau of Weights and Measures; the International Organization for Standardization; the International Electro-technical Commission; the International Union of the Gas Industry; the International Commission for Uniform Method of Sugar Analysis; the International Association of Cereal Chemistry; the International Bottling Center; the International Office of Wine; the Customs Cooperation Council; the International Union of Pure and Applied Chemistry; the International Union of Pure and Applied Physics; the European Committee of Weighing Instrument Builders; and the European Committee of Builders of Oil Meters. OIML maintains administrative and technical liaison with the U.N. Economic and Social Council, the

U.N. Economic Commissions for Europe and Asia, the U.N. Educational and Scientific Council, the U.N. Industrial Development Organization, the Organization for Economic Cooperation and Development, COMECON, and the International Measurement Conference. OIML also maintains liaison with about 25 commercial and/or standards organizations in European countries.

The question, therefore, is one of how a country like Bolivia can interact with OIML and what OIML can, in turn, offer to the DGNT in the form of assistance. Interaction with OIML is actually very simple. It can be accomplished by contacting the Organization in Paris and letting it know of interest in receiving assistance under its Developing Country Program. This program is currently in the planning stages, however, and will require perhaps as much as a year before it is completely operational. Before leaving for Bolivia, I asked Monsieur Bernard Athane, the Director of the International Bureau of Legal Metrology, to bring me up to date on the program for developing countries. I would like to share his views with you and then perhaps close with some remarks about what could be done almost immediately.

A committee has been organized within OIML to prepare programs in four broad metrology areas that would be of interest to developing countries. These areas include: (1) regulations dealing with legal metrology for developing countries; (2) teaching of legal metrology in developing countries; (3) structure, operation and equipment of a legal metrology service in a developing country; and (4) a plan for accession to OIML of non-member developing countries. Considerable success has already been achieved in developing the contents for two areas; namely, regulations dealing with legal metrology and the structure, operation and equipment of a legal metrology service. I believe that it is the intent of OIML, in its developing country program, to provide all of the necessary ingredients for an effective metrology service. Basically these ingredients are considered to be as follows:

1. A law setting out the physical quantities to be used for measurement.

2. The establishment of physical standards for the units of measurement.

3. The establishment of necessary laboratory facilities for the preservation, maintenance and use of the standards.

4. The recruitment and training of the necessary qualified personnel to maintain and use these standards.

5. The dissemination of the measurement capabilities in the metrology laboratory to all areas of activity in the country - for example, to trade, industry, the scientific sector, etc.

OIML has not yet considered how to finance the programs but the determination to proceed is so firm and the benefits expected so great that surely a way will be found.

As has been previously mentioned, DGNT has a very important role to play in the development and strengthening of the Bolivian economy. As has also been mentioned, the foundation of the economy will rest on the success and strength of standardization and metrology programs. I would, therefore, suggest DGNT and the equivalent other national standards bodies of other Latin American countries to begin contacts with the International Organization of Legal Metrology. Initially, I think that OIML is in a position to offer those International Recommendations that have already been developed in the area of metrology so that, for example, DGNT can begin to develop its own metrology plan that is based upon international practice. Secondly, at perhaps a later date, I think it is possible for OIML to arrange for individual on site visits of an international team of experts in the field of metrology to provide specific recommendations on the nature of the metrology network required in Bolivia. Lastly, I would very much like to see Bolivia and other Latin American countries become members of OIML so that they can participate in the work of the organization and so that they can lend their experience in support of other developing countries.

I would like to close by saying that it has indeed been a pleasure to participate in the Survey and Seminar on a Standardization Network for Latin America; I would also like to thank Ing. Orlando Donoso and the staff of the DGNT for the many courtesies extended during our stay in this beautiful country.

REGULATORY STANDARDS FOR FOODS

By: Benjamin M. Gutterman
U.S. Food and Drug Administration

It is a distinct pleasure to be here, and I deem it an honor that you have invited me to meet with you and participate at this Seminar on Standards and Metrology. I must say that I find it most unfortunate that my schedule does not permit me to spend more time in this lovely country of Bolivia. I shall look forward to returning soon for a longer visit and hope to see many of you again.

Recently, in my own country, I had the pleasure of meeting Engineer Donoso, our Chairman and the General Director of Standards and Technology, Ministry of Industry and Commerce. As a result of even the very short time we had together, I would like to think of him as not only a professional associate but also as a friend. I was impressed with not only his managerial and professional capabilities but also his intense desire to participate and contribute to the progress of standards and metrology.

Further, I have read much of the efforts, vision, and dedication of Engineer Rodolpho Costas. I have every reason to believe that men of such vision as that of Engineers Costas, Donoso, and their associates will be able to accomplish their goals.

I have been asked to talk to you today, although briefly, about kinds of standards somewhat different from the ones you normally discuss. My subject is Food Standards. I shall limit myself to only a few different types. Further, I prefer to confine myself almost entirely to the types used for processed foods.

First, there are standards of identity for processed foods - that is those standards that establish the name of a food; that specify what ingredients may be used and specify whether or not there should be limitations on such ingredients; and finally that specify what information must appear on the label and in what manner.

There are also standards of quality which concern defects such as blemishes, color deviations, insects, injuries, excessively hard products or excessively soft products, and other types of aesthetic defects plus limits on safe bacteria loads. Some countries also include hygiene and sanitation requirements in these quality standards whereas others set out these hygiene and sanitation requirements in other companion regulations. Further, in some standards, the levels of certain ingredients or components are also considered as factors of quality.

A third common type of standard is that establishing a fill-of-container level or quantity for a food. These simply set out requirements as to how much of a food or a component of a food must be in a particular type and style of container. This may be based upon volume, drained weight, net weight, etc.

In some countries standards are mandatory. In some they are voluntary. And in some countries we find both.

In the United States of America for some products such as meat and poultry, food processors are permitted to operate only while a government inspector is on duty in the plant. Other products are examined for compliance after they have been produced and are in storage or after being shipped. In some instances, processing operations and products are examined as inspectors are available or as often as is needed to determine compliance. This may be done several times each year, or every few years, or in response to a complaint. Different problems require different inspection frequencies and techniques. Each country must decide for itself what level and kind of inspection is the optimum based upon its own problems - present or potential - its own staff capabilities, priorities, and budget.

In the United States of America we use all of these systems depending upon needs. Further, under the Federal laws the U.S. Food and Drug Administration is responsible for those foods which move primarily in interstate commerce - that is, they are introduced for sale across state lines. The individual states are responsible for foods manufactured and sold within a state. They may also inspect and take action - as the Federal inspectors may - against violative foods shipped into their state. In one form or another each state has its own laws and regulations. However, many of the states adopt and enforce the Federal laws and regulations in their own states and more are expected to do so soon. In some instances, upon request, the Federal Government provides financial and technological support to the states.

Food standards - set at a reasonable level and properly enforced - are important in a number of ways. They are important because they assure consumers of the identity, quality - including safety and nutrition - and fill of container of the foods they buy. Further, consumers then have a reasonable assurance that that which they purchase today - and like - will be the same tomorrow - next week - next month or next year, unless the standards are changed.

Processors of the food also benefit. Reasonable standards, properly enforced in an impartial manner provide for fair competition. The processor need not be concerned with a cheating competitor who may force him out of business because he can sell for less a product that appears to be the same as the good product but is in fact significantly inferior.

Earlier I referred to three different types of standards - they are standards of identity, quality, and fill-of-container. It might appear that standards do not permit a processor to exercise extra effort to provide a better product than his competitor. However, this is not the situation. Quality standards are set at a minimum level; below this level, although the foods may still be offered for sale and are recognized as good food but of low quality, they must be clearly marked as substandard in quality so as to alert consumers. The same holds true for fill-of-container. On the other hand such is not the case for identity standards. There is no such thing as "Below Standard of Identity". The foods either comply with the standard or they are not permitted to be represented as, nor purported to be, the food of a particular standard.

In order for standards to be effective they must be available not only to the inspectors and government analysts but, also, they must be available to all the public. This would include processors, distributors, brokers, retailers, analysts and consumers. The standards must be understandable and reasonable.

Participants from many disciplines should be involved in the development, establishment and enforcement of standards. These participants should come from the fields of food science, food processing and technology, food engineering, chemistry and chemical engineering, statistics, pharmacology and toxicology, microbiology, and a number of others.

I have made available to you copies of the Food, Drug and Cosmetic Act of my country. I recommend that you read it in detail to see how one country establishes and enforces its regulations which include food standards. In our Code of Federal Regulations, we bind together all of our regulations. We also prepare and make available - sometimes at a minimal handling cost - a number of other publications such as inspectors manuals, administrative guidelines, compliance programs, and many others. If you wish I shall be happy to discuss the purposes and functions of these. Your commercial attache in Washington can readily obtain most of them for you.

In the United States of America the entire procedure for standards development and establishment is public, and any individual or group may participate. In other countries they are developed and established by select committees - often a mix of food processors and government analysts. These are then made legal by an official body. In still other countries, the legislature establishes food standards. I would like to take a moment to very briefly describe for you how we in the Food and Drug Administration of the United States of America establish food standards.

The purpose of and procedures for establishing standards are set out in the Federal Food, Drug and Cosmetic Act.

This law requires that a food standard must be reasonable. This means, among other things, that the food is capable of being produced in accordance with good commercial practice, but, and most importantly, a standard is established in our country to promote honesty and fair dealing in the interest of consumers. I cannot overemphasize this feature. The welfare of consumers is the raison d'etre for food standards.

A standard may be proposed for establishment or amendment by any interested person. A "person" includes among others, individual consumers or food processors, or any association of consumers or food processors, or the Commissioner of Food and Drugs - for that matter anyone.

In accordance with the law and rules which have been set out, a showing must be made by the person desirous of a standard that if the proposal is adopted it should be reasonable and promote honesty and fair dealing in the interest of consumers. We use such things as surveys of both consumers and processors, analytical studies, market studies, and so forth, to make this showing. The proposal, if adequate, is published in the Federal Register, our official document for the publication of regulations.

Comments, in writing, are invited from all interested persons. All comments are evaluated. The Commissioner of Food and Drugs then publishes his order ruling on the proposal. All persons who claim to be adversely affected are invited to file objections. The objections must be specific, supported by data, and provide support for an alternative if one is offered. The offer of simply increased competition is not acceptable as "adverse effect". Further, the person objecting must request a public hearing on the matter and be prepared to participate at such a hearing personally or by means of a representative.

If objections are received which raise valid issues, then the Commissioner is required by law to conduct a public hearing to consider the issues. Based upon substantial evidence of the hearing record, the Commissioner will affirm his earlier ruling or change it in whole or in part. Any who now take exception to the Commissioner's decision may appeal to the Federal Courts for a judicial review of the matter and an appropriate decision is rendered.

Our procedure, although time consuming and expensive, is one which provides a full test of each and every proposal and a test of the decisions reached. And very importantly, all who are affected and who wish to participate may do so. Our standards, once established, must be and are applied impartially not only to those foods produced by our own manufacturers but also to the foods of foreign manufacturers who export their products to us. Our standards are presently being reviewed for consideration of amendment to comply with the FAO/WHO Codex Alimentarius standards. More about the Codex Alimentarius program in a moment.

The absence of national food laws and regulations or the absence of proper enforcement if such laws and regulations exist is not only detrimental to domestic consumers and the industry within a country, but trade on an international or regional basis is inhibited. For proper encouragement of international trade, consideration should be given to the development of standards compatible with other countries - at least on a regional basis if not on a world basis. As Mr. Edgerly said yesterday, national standards unrelated to world standards hamper trade.

Let us first consider the Latin American Food Code. This regional Code is considered by many as a monumental piece of work. It was developed, I believe, by as many as 16 Latin American countries led by Dr. Carlos A. Grau of Argentina. The first draft was approved in 1959 by the Seventh Latin American Chemical Congress in Mexico City and later - in 1960 - published in Buenos Aires. It was revised in 1964. However, I do not believe any country has yet fully adopted the Code. One may assume that present consideration by certain Latin American countries to create a Common Market will lead to further consideration of adoption of the Latin American Food Code. The Code covers general principles, rules for the general treatment of foods, labeling, and individual standards of identity for many foods.

Another set of regional food standards now in existence and which should be fully considered by each country in establishing food standards are the "Normas Sanitarius de Alimentos". These consist of almost 400 standards including analytical methods and lists of permitted additives. The credit for development of these standards goes to Dr. Ariosto Buller-Souto, Director of the "Instituto Adolfo Lutz", and his associates. The participating countries are the Central American States. Panama is an associate member. Dr. Buller-Souto had considered and incorporated much from the Latin American Food Code.

Let us now consider another food standards program which is being developed on a global scale. These are standards sponsored by the joint Food and Agriculture Organization/World Health Organization (or FAO/WHO) Codex Alimentarius Commission which are set out as follows:

1. To protect the health of consumers and to ensure fair practices in the food trade.

2. To promote coordination of all food standards work undertaken by international governmental and non-governmental organizations.

3. To determine priorities and initiate and guide the preparation of draft standards through, and with the aid of, appropriate organizations.

4. To finalize standards elaborated under number 3 above, and after acceptance by governments, publish them in a Codex Alimentarius either as regional or worldwide standards, together with international standards already finalized by other bodies under number 2 above, whenever this is practicable.

5. To amend published standards, after an appropriate survey in the light of developments.

After development of a worldwide standard or a regional standard (and time permitting I shall be happy to discuss later the elaboration procedure for standards if you should desire to do so) member states have several acceptance alternatives as follows:

1. Full acceptance of the standard with immediate enforcement.

2. Target acceptance of the standard with delayed enforcement.

3. Acceptance with minor deviations.

4. Refusal to accept - with an explanation of the reasons.

A country, by virtue of accepting a Codex standard agrees not only to permit importation of all foods complying with that standard but also to prohibit importation of non-complying foods. It also agrees to enforce the standard upon its own production. The Latin American Food Code has been recognized as a set of regional standards by the Codex Alimentarius Commission.

Of the approximately 100 countries throughout the world which are members of the Codex Alimentarius Commission, about 19 are from Latin America. This is most commendable. On the other hand, I am informed that a number of these Latin American countries do not actively participate in the proceeedings. To attempt to shape the worldwide standards to more readily meet your needs, your active participation should be encouraged. Qualified delegates should be considered for appointment and encouraged to engage in the standards deliberations.

I am aware that many countries throughout the world, including some in South America, do not have sufficient personnel trained in food technology nor the funds to both develop and enforce food standards. One main purpose of my telling you of a few of the major systems for food standards establishment is to bring to your attention that if you are unable to gather together enough qualified personnel or to provide the funds (or for any other reason) to develop your own standards, there are many already established from which you may pick and choose.

One significant problem we people who are involved in food regulation continually face is that of the scarcity of persons trained in food technology and related fields. In some countries the problem is more pronounced than others. However, all is not lost. Until such time as a sufficient number of technologists become available, there are several alternatives available. One would be to support, participate, and subscribe to the reports from local, regional, and international standards and methods development organizations. Another is to send new inspectors and analysts who show high potential to centers of learning. These may be universities, food processors, institutes, or combinations of them. At this time, in my country we are carrying out a concentrated educational program to provide for safer low-acid canned foods. The teaching staff comes from universities, food processors, can and jar manufacturers, and my own agency, the Food and Drug Administration. A national center for consultants to advise on standardization and methodology should be considered by those countries that have insufficient food technologists to supply both industry and government - the buyers and sellers.

Many countries, such as my own, and all international agencies are often willing to provide you with experts to teach or assist you in all aspects of food processing, establishment of standards to serve your consumers, and the development of inspectional techniques suitable for use by professionals or subprofessionals. We work closely with the scientific and commercial attaches of the embassies in our country. We are fostering better contacts with the consular officials in our port cities.

We invite technical and administrative people to visit our laboratories and our technical and administrative people. As our time and personnel are available, we will train foreign technologists. For example, we are training Mexican laboratory personnel in pesticide analysis. Programs such as this will reduce the number of rejections at our ports of entry and thereby reduce the costs to the manufacturers in other lands. Fully qualified inspectors are a necessity - even if you receive foods accompanied by guarantees. You must check the guarantees.

Let us now move to the analytical methodology. A proper food standards program to be effective must be supported by analytical methodology of a professional level accompanied by statistical procedures for sampling and determination of compliance with the standards. In the absence of applicable methods that have been accepted, the buyers' and sellers' analysts, using different methods obtain different results. Conditions become chaotic.

A monumental source of well-proven analytical methods that brings order out of the chaos is the collection of methods established by the Association of Official Analytical Chemists with headquarters in the United States of America. However, don't permit the word "Chemists" in the name of the association to mislead you. In addition to chemists the membership consists of;

Toxicologists
Pharmacologists
Physicists
Medical Men
Entomologists
Engineers
Microbiologists
Parasitologists and others.

Members are concerned not only with foods but also with drugs, cosmetics, pesticides, food additives, etc. They come from Federal, State, city, county, industry, and university laboratories. A number of countries throughout the world have participating representatives. The comprehensive "Book of Methods" last published in 1970 sold over 15,000 copies. About 1/3 of them were bought by about 72 countries. In many countries including the United States of America, the Courts accept the results of analyses conducted by AOAC methods.

AOAC methods must be collaboratively studied before they may be adopted. That is, employing only written instructions - the same instructions must go to each collaborator - each collaborating analyst, without additional instructions, must find the amount of an ingredient in a product. This amount is unknown to him prior to his analysis. His results may deviate from the known amount only by a statistically acceptable amount. The results of all collaborators must agree with each other with only statistically acceptable differences.

A method to be adopted must be:

1. Reliable - that is
   Accurate
   Precise and
   Reproducible when used by qualified analysts.

2. Practical - that is
   Simple and as
   Rapid as possible but still reliable

3. Available - no trade secrets or methods involving confidential documents are permitted.

4. Substantiated - that is
   Supported by collaborators
   Published or
   Accepted for Publication

I shall also be happy to discuss in detail a number of techniques we use in my country to enforce our standards and how we encourage food processors to comply.

My meeting with you shall forever remain as a high point in my professional career. I am enjoying Bolivia and hope to return someday soon and to stay somewhat longer than my schedule now permits.

I wish to thank Ing. Donoso of DGNT, Mr. Peiser of the National Bureau of Standards, and the Agency for International Development for inviting me to meet with you. I believe that there is much that I can learn from you technologically and otherwise. I know that I have gained much from attendance at this Seminar. However, I would be remiss if I didn't say thanks to you, Director General Donoso, and your staff for showing Mrs. Gutterman and me how to make a visitor welcome.

INDUSTRIAL ORGANIZATIONS IN BOLIVIA SEEKING AID IN SOLVING TECHNICAL PROBLEMS

By: Juan Pereira Fiorilo
Under Secretary of Industry
Ministry of Industry, Commerce and Tourism

The topic assigned to me to present before an audience of professional persons of such national and international prestige obliges me to analyze a little the set of problems that Bolivian industry has in trying to find aid in solving its technical problems. I trust that the indications that I shall give may contribute to providing guidance in some of the many aspects that are keeping industrial production organizations in Bolivia in grave peril of undergoing impacts that may even cause them to shut down when we begin to experience competition from the Andean countries, and the results of the policy of tariff reduction to be started in 1976 in some items, or the reduction already existing in fields of metalworking, begin to be felt.

The presentations that I heard yesterday in the opening meeting from prominent persons like William E. Arthur Mudge and Steffen Peiser contribute somewhat in guiding me in this modest presentation of mine.

By instructions of the supreme Government of Bolivia, 26 sectorial meetings are being held on a nationwide scale, so that the industrialists and executives assembled in the National Chamber of Industries may lay the bases - in frank, open dialog with the economic and financial authorities - for a new policy that will enable us to overcome all the obstacles affecting industry, including the fields of technology, law, social security, legal and illegal competition, taxation, customs duties, transportation, and so on. A final document will be prepared from these meetings, which will be concluded in the second week of July. This document, which will be an analysis at a high political and industrial level, will contain recommendations on all the measures that should be adopted to try to achieve a strengthening of industry, based on an expansion of its production activities by means of mergers, better technological systems to be applied with replacement of machinery, a more careful selection of raw materials in order to ensure higher quality than at present, a standardization of products, a division of labor areas in order to prevent ruinous competition, and so on.

BOLIVIAN POLICY ON STANDARDS AND TECHNOLOGY

Our Directorate General of Standards and Technology is 3 years old and in this short period of time, thanks to the excellent activity of its executives, professional personnel, and assistants, firm bases have already been laid that, fortunately for us, are yielding beneficial results to the Government and especially to industry.

Nevertheless, since the scope of the work has not yet been sufficiently published, I shall give an example, on the basis of the scope of its operation, of all that has come up in the sectorial analyses of industry to which I have already referred and that will contribute to the awareness required by industrialists, university and secondary-level professional persons, and civil servants, so that they may collaborate in fostering the work of our Directorate General.

Some 300 documents already prepared in the National Standardization Plan are establishing an initial vigorous activity that has to continue to increase. This number represents only 1.5 percent of the standards in existence, for example, in the United States of America. This work, to the benefit of the nation's industry, will make it possible to obtain products based on standards that will ensure uniform quality and that will make it possible to have our country's products accredited not only on a national but also on an international scale. This will probably be very important in a search for the expanded Andean market and also the LAFTA (Latin American Free Trade Association) market, if an examination is made of the various standards giving rise, at the same time, to dissimilar quality in, for example, alcoholic beverages, viticulture, dark tobacco, sausages, lumber, building materials, textiles, leathers and footwear, sweets and chocolates, glass, and so on. In spite of having excellent raw material, we are not able at present to think about competing with similar imported products in most of these items.

If account is taken of the fact that a large number of business executives lack professional, and especially technical, training, we have to agree that they cannot carry on the work of standardization. They even lack training for using the terminology of standards that would make a complete technological and scientific interpretation easy for them in the exchange of goods and services, in technical design, preventing a countless variety of products by a simplification or unification of consumables, as by for example, in the case of paper used in Bolivia's printing industry. As the industrialists themselves in this last-mentioned sector realize, a great waste of raw materials and, at the same time, an increase in production costs are involved. The use of standards would avoid immobilization of operating capital because of accumulated stocks and unused raw materials in warehouses.

In advising the nation's enterprises, for example in the field of metalworking, that we are beginning to integrate in the Andean industrial programming, or in future automotive vehicle programming, the Directorate General of Standards will be able to let the enterprises know what tolerances and adjustments, design and calculation, dimensions, and so on, are required to establish a rational system of interchangeability of components and parts.

The objective pursued by the Bolivian Government is to try to have established industries, and industries still to be established, realize that this rationalized system of processes will make it possible to achieve an increase in production, a decrease in inventories of raw materials, semifinished and finished products, the introduction of time and labor systems that would result in a reduction of costs. A country like Bolivia, strangled by its landlocked situation, finds it difficult to have low selling prices and, consequently, competitive prices on the international market.

PRODUCT QUALITY

We underdeveloped countries have created a psychology inclined to reject a domestic in favor of an imported product. This is usually due to the fact that the technology used is not precisely the best, or that, owing to competition from imported products, an attempt is made to achieve low costs, without much concern for the quality of the final product.

The situation is changing at present. The Andean tariff reduction policy, legal competition, smuggling, and a greater outward movement of manpower toward foreign countries, are causing enterprises to begin to be concerned in this regard. In view of this situation, we need cooperation and assistance in the establishment of laboratories, information centers, and so on, which cannot be internally financed in countries with a relatively low degree of economic development. Such cooperation and assistance might come from international organizations like the specific working groups of the United Nations or the Pan American Commission on Technical Standards, or from the industrialized countries through agencies like the United States National Bureau of Standards and similar agencies in Europe, Japan, and elsewhere.

Small businesses, unfortunately, cannot obtain funds for making contracts for international experts. The following are some concrete examples:

The leather industry, in which those abroad who know how to cure wild animal hides refuse to pass on this knowledge under the pretext that they cannot transfer their technology and they prefer to import uncured hides. This constitutes an indirect system of exploitation of our natural resources.

There is, in Bolivia, a dark tobacco that is extraordinary in quality and there are excellent climatic conditions for producing at least the

Burley varieties and perhaps even Virginia-type tobaccos. Nevertheless, it is difficult for a small Bolivian factory, like the one in Sucre, to be able to obtain, without sizable outlay of funds, an expert familiar with the technology who will make it possible for them to start to produce cigars that could yield considerably more revenue than does the export of this raw material to France.

Because of technological problems in glasswear also, we have no standardized bottles. Therefore, there is difficulty in using them in the viticulture industry. Our bottles are not strong enough to resist pressure in bottling preserves.

Our industrialists still lack efficient technological information services and Bolivia's small industry cannot finance laboratories of its own.

The smallness of the Bolivian consumers' market prevents the establishment of large-scale production plants. Therefore, advantage cannot be taken of modern electronic technology, designed for large-scale production.

The small size of our scientific research companies also makes it impossible to gain the cooperation of similar companies abroad, in order to take advantage of a large source of information that could be very useful to Bolivian producers!

Unfortunately, we cannot count on international coooperation for training our industrialists abroad, since we do not have sufficient funds to support these people in the world's large industrial centers.

In the future, I hope that we shall have - based on the Bolivian Directorate General of Standards and Technology, the university, and scientific research organizations - the cooperation that will enable us in time to change the situation of Bolivia's industry and the relatively small economic development in the country.

ADVANCEMENT IN STANDARDIZATION AND MEASUREMENT TO MEET THE TRANSITION OF INDUSTRIAL STRUCTURE

By: Jong Wan Choi
Administrator
Industrial Advancement Administration
Republic of Korea

STRUCTURAL STATUS AND FUTURE PROSPECTS OF KOREAN ECONOMY

In order for a system or a service to get proper acceptance and support for substantial development, it must be adaptable to social requirements. Systems of standardization and measurement must be carried out in accordance with the degree of industrial development or industrialization of society. Of course, it is true that systems of standardization and measurement often play a leading role or act as accelerations in the process of industrialization.

It is, therefore, necessary to discuss briefly the status and future prospects of Korean industry before going into the details of the Korean systems of standardization and measurement.

The vigorous implementation of an ambitious development program under the First and Second Five-Year Economic Development Plans (1962-71) laid the groundwork for Korea's industrialization during the 1970's. The real gross national product grew at an annual average rate of 9.2 percent during the period 1962-1971. The mining and manufacturing sector grew at a rate of 17.2 percent and the social overhead capital sector at 10.7 percent per year. These sectors have been mainly responsible for the rapid economic growth achieved to date.

The First Five-Year Plan (1962-66) which marked the early stage of industrialization in Korea, concentrated on the construction of coal, electric-power and oil-refining facilities, fertilizer, cement and light industries such as textiles and foodstuffs. The Second Five-Year Plan (1967-71) paved the way toward the development of heavy and chemical industries. Construction of petrochemical, steel, metal, electronics and electric machinery, automobile and shipbuilding industries was initiated. Planned targets for most of these industries were met ahead of schedule except for steel and petrochemicals.

As a result, exports increased sharply, growing at an annual average rate of 41.3 percent from 1962 to 1971, strengthening the export structure remarkably. The ratio of manufactured products to total exports rose from 27 percent in 1962 to 88 percent in 1972.

Consequently, industrial products have come to take the lion's share of all Korean exports, unlike the export pattern of many other developing countries which are more dependent on exports of primary products.

Korea has an abundant labor force, with manpower resources not only readily trainable in advanced technology, but also possessing a high degree of adaptability and diligence. This is an important factor which can expedite the development of heavy and chemical industries capable of competing in the world market.

The Government in January 1973 announced its "declaration of heavy and chemical industry development policy" as the means by which Korea can take advantage of world economic trends and meet the challenge of the 1970's. Under this policy, the Government is formulating a plan to remodel the nation's industrial structure, with emphasis placed on the development of heavy industries.

The industrial structure, which in 1971 consisted of agriculture, forestry, and fisheries, 28.9 percent, mining and manufacturing, 22.8 percent, and social, overhead, capital, and other services, 48.3 percent, is to be remodeled into one in which these sectors will contribute 18.2 percent, 35.1 percent, and 46.7 percent, respectively, by the early 1980's.

The ratio of heavy industry to manufacturing will be increased from 32.5 percent in 1971 to 45.8 percent in 1981. The ratio of heavy industry products to total exports is also to be expanded from 19.1 percent to 60 percent or more during the same period.

The general features of heavy and chemical industries today are the requirement for big capital investment, especially investment in advanced equipment and machinery, a high interindustrial dependency, the need for an integrated and specialized organization of industry for the production of sophisticated products, and the demand for advanced technology. These features in turn require highly developed and extensive systems of standardization and measurement.

In order to meet this need in the development of heavy and chemical industries, Korea must now realign and make up-to-date its relatively old-fashioned systems of standardization and measurement.

SYSTEM OF STANDARDIZATION IN KOREA

Present Status

A modern system of Standardization was first introduced in Korea in 1961 when the Government promulgated the Korean Industrial Standards

Law. Under this Law, the Bureau of Standards of the Industrial Advancement Administration and academic and trade organizations prepare the drafts of industrial standards, and these are referred to the Industrial Standards Council for deliberation and approval for public announcement. The announced standards are revised, reconfirmed, or repealed once every three years in accordance with the development of technical levels of industry.

The Industrial Standards Council operates through the general meetings, 23 sub-committees, and many expert committees. Participating in these activities are professors, representatives of producers and consumers, and experts in various fields of society.

Up to the end of 1973, a total of 3,559 standards had been established and announced for various industrial sectors. In order to promote the system of standardization and protect consumers as well, the Government has instituted a system under which industrial products manufactured in conformity with the standards are allowed to display a K.S. (Korea Standard) Mark, and such products are called K.S. mark products. K.S. mark means the Government's guarantee of quality. Since this K.S. mark system was put into force in 1963, a total of 1974 products has been allowed to display this mark. The number of factories producing K.S. mark products now stands at 262.

The Korea Standards Association was established as a private organization designed to guide and enlighten industry on standardization and quality control. Its work includes the publication of books on Korea standards, quality control guidance in industry and the training of quality control specialists.

Korea joined the ISO (International Organization for Standardization) and the IEC (International Electro-Technical Commission) in 1963 in order to promote relations between Korea standards and international standards. The Government sends delegations to annual meetings of these international organizations in order to reflect ISO and IEC standards in the establishment of Korea standards.

Standards Policy and Achievements in 1973

Emphasis was placed on the establishment of standards for products of heavy and chemical industries in conformity with the Government's effort to remodel industrial structure to becoming heavy and chemical industry oriented. As a result, 537 new standards were established and 620 existing standards were revised or improved.

In addition, the Quality Control of Industrial Products Law was chiefly designed to protect consumers. It has been revised and strengthened to establish a pre-market inspection system for those industrial products having the possibility of doing harm to the general public, and a post-market inspection system for general merchandise necessary for people's daily living to insure more adequate consumer protection.

The Law on Safety Control of Electric Appliances had been revised to provide greater penalties for building contractors using substandard electrical goods in power supply systems, in addition to existing surveillance procedures of production processes of electrical appliances, with a view to protecting consumers.

In order to protect consumers from the danger of high-pressure gas, the Law on Safety Control of High-Pressure Gas has been enacted. Also, the Thermal Control Law has been recently established to insure effective use of energy.

SYSTEM OF MEASUREMENT IN KOREA

Present Status

Korea first established regulations governing modern weights and measures in 1902, although the national physical standards of the meter and the kilogram were obtained in 1894. But it was in 1959 that Korea ratified the Convention of the Meter and the Metric System and the system was put into force in 1961 to modernize weights and measures.

Under the Law of Weights and Measures, those who manufacture or repair metrological instruments are required to obtain the Government's license to ensure the precision and accuracy of such instruments. The license is issued by the Industrial Advancement Administration. In addition, metrological instruments fabricated, repaired, or imported are subject to Government inspection. Also, there is a regular program for inspection and calibration of all metrological instruments for industrial and commercial use, to maintain their precision and accuracy.

Primary responsibility for the surveillance of metrological instruments belongs to the Industrial Advancement Administration, and part of the above responsibility, namely for the instruments for commercial uses, is delegated to the provincial governments. But inspection and calibration services are to be conducted by various research institutes, testing laboratories, and inspection agencies for industrial products, traced to the national physical standards of weights and measures which will be maintained by the National Industrial Standard Research Institute of IAA.

Measurement Policy and Achievements in 1973

A fact-finding survey of weights and measures was conducted in order to establish a basic policy for the service system. The survey revealed:

First, industry has an inadequate number of precise and accurate measuring instruments for the manufacture of products meeting their established standards.

Second, the calibration of measuring instruments is not regularly done, in spite of the fact that this is necessary to maintain their precision and accuracy.

Third, the management, especially the top management, is lacking in understanding the importance of weights and measures to industrial development.

Fourth, there is an insufficient distribution of standard reference materials and of weights and measures for the calibration of measuring instruments, requiring a system of calibration services.

Fifth, industry is lacking in understanding the need for standard reference materials, with the result that a supply system of standard reference materials is required.

The Law of Weights and Measures has been revised to provide better inspection and calibration service for measuring and weighing instruments which are used in industries to secure quality control. To promote more rational implementation of the system of weights and measures, a system of licensing metrologists has been established, and a mandatory quality control system has been introduced in the metrological instruments industry.

FUTURE PROGRAMS

Standardization

The number of standards will be increased so that it will become almost equal to the number held by advanced countries by the early part of the 1980's. Outdated standards will be revised and improved in accordance with the development of industry, especially the development of industrial technology, so as to make them up to date.

In addition to the increase in and modernization of standards which are but piece-meal steps of the standardization program, such technical projects as the establishment of an industrial safety code, engineering standards, and the specifications for designing, fabrication, and inspection for industries will be extensively carried out.

Weights and Measures

The National Industrial Standards Research Institute, an organization similar to the U.S. National Bureau of Standards, will be strengthened and expanded with the recruitment and training of competent staff members and the procurement of up-to-date equipment and instruments for the maintenance and development of the national standards of weights and measures.

A nation-wide calibration service system will be established for systematic calibration of the instruments held by industry in reference to the national physical standards of the meter and kilogram kept at the National Industrial Standards Research Institute. For effective operation of this service, calibration technicians will be extensively trained.

In order to extend standardization and calibration services to all fields of industry, the national network of testing and inspection laboratories will be expanded.

An effort will also be made to give industry, especially private industry and trade associations, incentives and encouragement for autonomous programs to improve standards and measurements.

These programs for improvement of standards and measurements of Korea need the cooperation and assistance of international organizations and foreign organizations for their successful implementation.

PROBLEMS AND OPPORTUNITIES OF ANALYTICAL CHEMISTRY IN UNDERDEVELOPED COUNTRIES

By: Kurt F. J. Heinrich
National Bureau of Standards

Analytical chemistry is an important tool for the quality control and characterization of materials. I intend here to discuss some special problems and opportunities presented to this science in the context of a developing economy. I have, however, some misgivings concerning the use, or abuse, of terms such as "underdeveloped" or "developing" when applied to countries. The definition of the state of development of a society is most relevant in its relations with other societies or in comparison with other periods, but we must not exaggerate the importance of the existence or absence of specific technological features in a given ambience. (For a useful definition of "underdevelopment" see the contribution of Mr. Ömer Göncü.)

At the present time, serious problems related to technological development arise from the enormous interaction between diverse cultural and industrial media. The advance of the means of public communication such as television, radio and cinema produces a crisis of expectation every time a significant product is developed; new devices, such as transistors, jet aircraft or modern plastics, become part of all ambiences, almost regardless of the local conditions, and whatever problem may arise concerning raw materials and quality control, as well as those related to pollution and energy balance, cannot be limited to those countries in which these products were first created.

Analytical chemistry is certainly a time-honored art. In many branches of industry, analytical tests of raw materials and products have been performed for a century. Notwithstanding, analytical chemistry is in a continuous flux. Here are some factors which account for the unending search for analytical tools and procedures.

1. The development of some new technologies introduces new materials, such as gallium arsenide, phosphors for light sources, or laser glasses, which had not been used previously. The quality requirements for such new materials are invariably high, and their successful use frequently depends on the development of adequate analytical procedures.

2. Other technologies require materials of familiar composition, but with greatly increased purity requirements. In some cases - such as silicon - these requirements tax or exceed the capabilities of even the most sophisticated methods.

3. The miniaturization of components, notably in the electronic and communication industries, requires information on a microscopic level which can only be obtained with the aid of microprobe techniques. For instance, the spatial distribution of dopants, impurities and vacancies in semi-conductor materials frequently determines their electronic properties. For such analytical problems, reliable techniques must still be developed; most probably, they will require the use of very expensive instruments such as ion microprobes and secondary ion mass spectrometers.

4. The introduction of new materials with toxic properties is an increasing threat to society. The dangers of widespread distribution of poisonous materials is not, by any means, limited to undeveloped countries. The frequent occurrence of lead poisoning in several cities of the U.S.A. due to ingestion of flaking lead paint by children is a good illustration of the problem.

Some of the most spectacular and tragic accidents were due to mass poisoning of populations by chemicals. A well-known episode of this kind occurred in the Bay of Minamata, Japan. A large quantity of mercury was discharged from an industrial plant into the bay, and the mercury concentrated in marine organisms and was ingested by the local population. Hundreds of deaths and cases of crippling brain damage demonstrated the dangers of accidental release of toxic materials. In Iran, the ingestion of cereal grain which had been intended as seed material and impregnated with a fungicide containing an organic mercury compound, claimed an equally large number of victims. In both cases, the ignorance of the consumers, and the lack of adequate quality controls of food materials (or the abuse of seed grain not intended for human consumption which was not labeled in the language of the user nation), had disastrous consequences. The danger of such events is particularly high in underdeveloped countries in contact with new and unfamiliar technological products and procedures.

Of less serious immediate consequence, but of great importance due to the magnitude of the problem, is the pervading presence in the biosphere of non-degradable insecticides, such as DDT. Traces of such substances, which have proven adverse ecological consequences, require delicate procedures for their isolation, detection and measurement, and the problems of correct sampling of specimens can also be serious. A similar problem which affects extensive sectors of the world's waterways is posed by the ambient contamination due to crude petroleum which can be caused by careless cleaning practices of tanker ships or by accidental leaks from vessels and pipe lines. For many of the contaminations, adequate analytical methods are either lacking or not in widespread use.

5. The volume and accuracy of determinations required, the speed of control necessary for modern production lines, and the increase in the cost of labor in laboratories requires the replacement of time-honored manual methods by automated procedures.

Such changes of procedures do not occur without problems and penalties, and even in countries such as the U.S.A., in which the trends toward automation and computerization are strong, every decision in this direction is, or should be, made on its own merits. It must be taken into account that automated equipment is expensive, often requires extensive precalibration, and sometimes also presents problems of maintenance which did not exist in the technique which is being displaced. For instance, modern automatic analytical balances having delicate electronic components may not be very useful in regions where services and calibration for electronic devices are not available. At such locations, a common mechanical balance would be preferable. Furthermore, extensive retraining of the laboratory personnel may be required to make efficient use of the new facilities.

It is due to these difficulties that developments in analytical chemistry do not make an equal impact at all locations. There is still a widespread use of "classical" techniques, particularly in smaller establishments, and where the required volume of analyses is not very high. But, there are also trends in the use of analytical chemistry which should be of interest to those scientists and industrialists concerned with the development of technology in smaller countries.

It was customary for all but the smallest establishments to perform all analytical and quality-control measurements in-house. Such a procedure, if feasible, is the most rapid and simple from the standpoint of communication; it also provides the safeguards of confidentiality frequently required in private industry. However, at present there is a remarkable change going on. In the first place, the development of modern production methods requires a close interplay of industries and laboratories; without voluntary standardization of materials and procedures, the situation would be chaotic. There is, therefore, an increase in the number of comparisons and round-robin or collaborative tests - even among establishments which are, in other aspects, in a competitive position. Moreover, while some smaller establishments find the purchase of expensive equipment, such as an electron probe or a reactor facility for activation analysis, beyond their means, other companies which have acquired them find it necessary to offer analytical services to other customers in order to keep the operation of their analytical facilities profitable. Finally, an increasing number of small and middle-sized laboratories dedicate themselves exclusively to providing their clients with specimen characterization of a sophisticated and specialized nature.

If growing pains of materials characterization are obvious and apparent in nations such as the U.S.A., the same problems become much more serious in an area where the market for analyses and the physical size of corresponding establishments are smaller. Consider, for example, the manufacturers of a relatively simple device such as an electric lamp. The size of the plant in a smaller country, the difficulty of purchasing, importing, installing, and maintaining expensive laboratory equipment, will limit the extent to which the manufacturer can and should duplicate the analytical facilities and practices existing in a similar but much larger plant in the U.S.A., England or Japan. The same considerations and limitations also apply to the academic establishments. Each situation should be soberly evaluated on its merits rather than from abstract or prestige considerations.

At the same time, the efficiency of quality control can be greatly furthered if the principle of centralization and intercommunication of centers or scientific activities is applied. The more limited the possibilities for expansion are, the more challenging and ultimately satisfying is the task of technical and scientific coordination. Such interplay should not only cover geographic distances, but also unite in a common goal the laboratories which serve private industry and commerce, the schools and universities, and the governmental agencies. Cooperation is particularly useful in the utilization of computer facilities. The success in the U.S.A. of time-shared computers, which can be reached by a large number of users via telephonic connections, is well known. The time-shared computer is also used for accessibility from various sites within a large establishment, such as a large university campus.

However, coordination is frequently complicated by the fact that diverse branches of technology have been imported from, and are sill influenced by, different foreign sources. In such cases, it is an important step to initiate a process of standardization and norming of terms before a significant interaction between organizations can be carried on without continuous misunderstandings. This is also a phase in which the National Bureau of Standards can provide assistance conducive to a more efficient use of existing resources.

THE TRAINING OF METROLOGISTS

By: Yardley Beers
National Bureau of Standards

Metrology is the science of making quantitative measurements at or near to the highest accuracy or at least the highest precision, that is attainable at the time and in the environment in which the measurement is made. A metrologist is one who practices this science.

The needs of highly industrialized countries are such as to require the accuracy of the measurements that are made to be at or near the state of the art. In contrast, in developing countries measurements of lower accuracy are often sufficient to meet current needs. However, the desirable characteristics of a trained metrologist in these two types of situations are essentially identical: a solid knowledge of science or technology, patience in repeating measurements, and an ability to identify causes of error and unreliability. Therefore, the same type of training applies in both cases. Perhaps the main difference is that the metrologist in the developing countries is less well equipped and must learn to improvise with materials that are at hand.

If a visitor should question the members of a large established metrology and standards laboratory, he would find that few, if any, of them had received any specialized training in metrology before joining the laboratory. And at the time of joining the staff, most of them were considering employment opportunities in other types of laboratories, in universities and in industrial firms, as well. Therefore, the first requirement placed upon a good metrologist is that he be competent as a scientist or engineer in some appropriate field such as physics, chemistry, metallurgy, electricity, or mechanics. The process whereby someone with general training becomes an expert metrologist is a gradual one, mainly depending upon both formal and informal contacts with experienced members of the staff. In addition, it is important that he be brought into frequent contact with people in other laboratories and industry who use the measurements and standards, the co-called "users" or "customers". Sometimes also it may be desirable for a new staff member to have additional formal instruction in courses taught either in the laboratory by staff members or at a local university while he is employed.

First, it is most important that the specialist in metrology have up-to-date general knowledge of his field of science or technology. In many years past the network of measurements was based upon prototype standards such as the standard meter bar, and the metrologist somewhat resembled the curator of a museum, guarding his treasures and giving access to them only to a chosen few who could present impressive credentials. However, now the network of measurements is based more and more upon quantum effects in atoms and molecules, and except for the standard of mass, most prototype standards have been abandoned. Measurements based upon quantum effects are the products of recent sophisticated basic research, and the metrologist cannot be successful unless he is informed about new developments and unless he has an understanding of them. Examples of the application of quantum phenomena to methods of measurement are numerous: using the wavelength of visible light rather than a meter bar as a standard of length, measurement of magnetic fields through the use of magnetic resonance, the use of a spectral line of cesium as a standard of time and frequency, and the use of a Josephson superconducting junction along with the measurement of frequency to serve as a reference for voltage measurements. Recently some of my colleagues have made very accurate measurements of both the frequency and wavelength of the same spectral line generated by a laser, and it is hoped that work of this type will lead to a defined value for the velocity of light. Obviously a metrologist cannot hope to be successful in this ever-changing situation without good basic training in his field.

A new employee with good basic training usually is able to perform useful work soon after starting his new position by consulting or working under the supervision of more experienced members of the staff. Some of the larger laboratories have programs of basic research, in which the work is similar to that the newcomer did as his thesis at the university, but in which the topics are selected on the basis of their connection with measurement problems. For example, one new member of the staff of the National Bureau of Standards was asked to study certain effects affecting the width of spectral lines, especially as observed with atomic beam equipment. His results, although basic in nature, ultimately led to a more complete evaluation of the errors in atomic beam frequency standards and to their improved design. While pursuing this basic research, a new staff member, perhaps partly unconsciously, becomes informed of more practical measurement problems, and in time either by voluntary choice or by administrative assignment, he transfers some or all of his effort to work upon them. At the same time, the managers of the laboratory should pay careful attention as to whether the new employee is developing an aptitude and interest in working on metrological problems, and if he does not do so within a reasonable time, he should be encouraged to seek employment elsewhere.

In laboratories where there is no substantial program of basic research, a new employee has to be assigned to practical problems at the start. In such a case, in the beginning he must receive supervision and personal instruction from his supervisor, but if he is a suitable employee, the need for supervision rapidly decreases to nearly zero.

The distinction between a metrologist and a scientist or engineer working in the same field in laboratories of other types, perhaps is one of point of view and of character rather than of formal training. Many young men and women are attracted to science with the hope of discovering some new spectacular phenomena such as new particles, quasars, or some phenomenon in the solid state, or with the hope of developing an important extension to some theory such as relativity or quantum mechanics. While in his first assignment in a metrology laboratory, a successful metrologist gradually realizes that learning how to make a measurement with ten times its previous accuracy or developing an apparatus for measuring some quantity that had not previously been measured, and thereby improving the quality of some product, may be just as fascinating as making some of these more newsworthy discoveries. Also he develops the satisfaction that his work is bringing more immediate benefit to his fellow men.

At the same time the metrologist must develop superior patience in repeating his measurement countless times and become a detective in locating subtle sources of error. Several years ago while I was engaged in studying the Stark effect of gases, I had an absorption cell in which the position of one of the plates could be adjusted from outside the vacuum seal. The design of my apparatus incorporated details that had been used elsewhere in the laboratory, and I thought my apparatus was sufficiently rugged, but nevertheless I had unusual difficulty due to mechanical instability. A mechanical engineer joined the project, and he sensed that the difficulty was due to changes in atmospheric pressure applied to the adjusting knobs that were transmitted to the plate inside the chamber. He redesigned the equipment so that the plate was isolated from changes in atmospheric pressure, and the trouble disappeared.

This incident illustrated not only that a metrologist must continually be on guard for unsuspected sources of error, but also that in metrological work a wide diversity of talents and disciplines are required. It would be economically impractical to set up a comprehensive course for metrologists in a university because of the large number of specialties that are required, even if it were possible to identify the students who were going to be metrologists when they enter the university.

It is important that a new member of the staff of a metrological laboratory, especially one whose previous training has been in basic research, be brought into contact with users as early as possible. Contact with these people causes him to understand their problems and motivates his work. Often his analysis of their problems may be different than theirs, and he may be able to suggest a better solution than the one they had considered. As he becomes more experienced and as he is able to provide solutions and supply the design of instruments, his role is not only to be a listener but also to be a teacher, as he instructs them in the correct way of making measurements. In this he must often exercise a great deal of tact and diplomacy. Contact between metrologists and users should be at the working level as well as at the administrative one.

Metrologists who are directly concerned with the design of instrumentation to be used directly to check quality control in industry must become aware of some problems related to human nature. Apparatus which gives good performance in a research laboratory when operated for limited times by well-trained and highly motivated staff may be unsatisfactory when used on the production line for long periods by inexperienced and poorly motivated people. Readout devices, preferably digital, should be of a type that are easy to read, and they and any knobs which require adjustment should be placed in positions that are easy to reach in order to reduce fatigue. Any adjustments which set the calibration of the instrument should be made inaccessible. Stops or safety devices should be included to prevent damage by incorrect adjustment or by throwing the switches in the wrong order.

There are a few technical skills which are needed in nearly every metrological activity. One is a knowledge of the statistical treatment of errors so that the observer can determine whether the results of his measurements are statistically significant and also so that he can design his experiments so that the effects of disturbances or changing environmental conditions are minimized. A second skill is some knowledge of electronics, perhaps not to the extent that the metrologist can build his own equipment, but at least to the point where he knows what can and what cannot be accomplished by electronic circuits so that he can supervise others in building equipment or so that he can purchase it intelligently from outside sources. Finally now there is a universal need of knowledge concerning computers and computer programming. Indeed, there is now the modern trend with complicated measurements or with ones that are made repetitively to use automated or computer-controlled apparatus, where the computer checks whether the apparatus is in working order, sets the conditions of the experiment, turns the switches and valves at the right times, reduces the data and prints out the results. Sometimes, a computer controlled experiment can obtain superior results to a manually operated one. A computer-controlled microwave spectrometer can obtain either ten times the signal-to-noise ratio or ten times the resolving power compared to a manually operated one with the same total observing time.

Some of the burden of learning to program a computer is disappearing because some computers now have libraries of programs that have been written, and the experimenter merely has to know how to call up the correct program and how to enter his data in it to obtain the answers he wants. Now there are even some pocket electronic calculators which contain some limited programming capability. In one, it is possible to punch in a group of numbers and obtain the mean and standard deviation. On the other hand, if one must process huge quantities of data, often he can do it more economically by understanding the details of the computer that is available and writing a special program. Also, often there are problems which are specialized but not very complicated with which just a little elementary knowledge of computer programming can save a lot of time. For example, in a recent experiment I performed, the data had to be corrected by use of the following formula:

$$C = ay^4/x^6 + by^8/x^{14},$$

where C was the correction to be added, a and b were constants known from theory, and x and y were parameters which determined the conditions of each observation and which took on new values with each observation. This formula was a simple one to write down, but to calculate C just once using a slide rule or a desk calculator was very laborious, especially as one had to repeat the calculation more than once and obtain the same result to be sure that he had not made a mistake. On the other hand, it was only a five minute task to enter in a computer a four line program pertaining to this formula. Once it was stored in the computer, it was a simple matter to obtain C immediately by punching in the values of x and y, and furthermore, there was a printed record which could be checked at any time to see that the correct values had been entered.

Changes in the program of the laboratory such as change of emphasis on microwaves to one on lasers or on important new technologies such as the replacement of vacuum tubes by transistors, or the replacement of discrete transistors by integrated circuits may make it necessary to retrain portions of the staff.

It may happen that an individual staff member may find that his performance of his assigned tasks is limited by lack of knowledge of some particular topic, which could be learned by taking a standard course. Perhaps it might be in statistics or in computer programming, which topic the man happened to have missed when he took his previous full-time university course. Therefore, the management of a metrology laboratory must make provisions for such training on a part-time basis while the staff members are still employed. In some cases the courses may be taught by informed staff members. More generally, the instruction is obtained at a nearby university or technical school.

It hardly needs to be said that it is most desirable, if not essential, to have a metrological laboratory located near a university so that such instruction can be available when needed. Such a location has the added advantage that the faculty members frequently can serve as expert consultants or as part-time staff members in their free time. Conversely, experienced scientists at the metrological laboratory teach part time whenever it is to the mutual advantage of both the university and the metrologist.

In summary then, the training of a metrologist consists of four parts, the last of which is optional: 1) graduation from a technical school or university with a degree in some relevant field, 2) interaction with more experienced members of the staff, which may consist of formal supervision, informal discussion, or group meetings, 3) interaction with actual or potential users of measurements and standards, and 4) part-time formal training, usually at a local university or technical school, while the man is employed as a metrologist.

IMPLEMENTATION OF STANDARDIZATION IN DEVELOPING COUNTRIES

By: Ömer Göncü
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I would like to start by defining what a developing country is. Being a citizen of a developing country, I would like to depart from the definitions given by the members of developed countries and without hesitation call it an underdeveloped country. An underdeveloped country, as all of us know, is a country whose industry is largely based on agricultural products, raw materials, and related small industries. The underdeveloped country exports these products to developed countries and imports consumer products from them.

Generally there is no specific level of standardization in these imported products. The level of standardization is closely related to the standardization activities of the country from which products are imported. The underdeveloped country has no say and is not informed of changes that take place in the level of standardization in these producer countries.

The first change is experienced when there is competition in the foreign markets to the line of products exported. In order to sell the products at a higher price and keep a share of the market, the underdeveloped country starts classifying products and packs them in a way that is suitable for transportation and presentation. This is the first step toward standardization in underdeveloped countries. It is accompanied by the transfer of technology to the underdeveloped country by marketing firms in the foreign market. In time, competition causes the exporters to be more conscious about the products. This leads the government to take actions to prepare national standards in order to achieve higher prices for the products exported and keep a good share of the foreign market.

In the process of switching from a company to a national level of standardization, an organization to prepare standards for the products exported needs to be founded and a controlling organization set up to prohibit the exportation of substandard products. Generally these institutions are called "standardization institutions". Soon these institutions establish laboratories for testing and controlling the quality of products according to the related standards available. Many problems that were solved at a company level are now solved at a national level so that a certain extent of uniformity is reached.

As the underdeveloped country increases its trade relationships with developed countries, there is a technology transfer to a certain extent to the underdeveloped country through the standardization process. When the underdeveloped one approaches more closely the developed country, the firms in the underdeveloped country realize that they can easily produce most of the consumer products imported at high prices themselves at a much lower cost. With this initiative the country starts importing machines capable of producing consumer products. With these machines and the technology transferred from developed countries, various consumer product producing plants are erected. As these plants are built, the companies selling these machines sell the technology they have developed together with the patents which are already included in the prices of the machines.

Contrary to the process of standardization in agricultural products, domestic competition takes place early in the first phase of industrialization. The first controller of this competition is the consuming public. The home country consumers compare the domestic products with those which were once imported. The result of this comparison leads the public and government to institute a certain level of standardization in industrial production. Again the standardization process at the company level is raised to a national level.

The standards institution, once set up to control the quality of agricultural products, now has to implement standardization of industrial products. As the standardization process expands, these institutions get in contact with organizations in developed countries and start adopting their standards. This is the process that leads to development and transfer of technology at a higher level, depending on the socio-economic environment present in the underdeveloped country.

It is not right to call a country developed on the basis of industries which do not require high technology such as the textile industry. In order to call a country developed, it is necessary that the country be able to produce machines for the production of consumer goods and a heavy industry infrastructure so that it can be self sufficient and export some of its products to other countries.

Turkey, of which I am a citizen, exports industrial goods to countries like the U.S.A., Germany and Switzerland. Turkish textiles are the most looked for in these countries. We also export glass to the U.S.A., refrigerators to North African Countries, the Middle East and Pakistan, and cars to Jordan, but even at this level, we can hardly call Turkey an industrialized country. Years ago we were selling agricultural products and buying consumer goods; today we have added consumer goods to our agricultural products and now we are buying goods that need higher technology at very high prices from developed countries which have developed such technologies.

It is my belief that the gap between industrializing and industrialized countries is increasing at a rate that is parallel to the rate of change of technology in developed countries. Only if the developing countries can avoid a lengthy path of industrialization and make a jump to higher technologies that will enable them to produce high technology goods will they have a chance of being developed in a short period of time.

To summarize the stages of standardization:

1) In industrializing countries the standardization process starts with agricultural products. The country has to implement standards from the field to the market at every level and to better the quality of its products depending on the highest technology available. These countries set up standardization organizations to prepare and implement standards that are suitable for the socio-economic structure of the country.

2) In time, these countries start industrializing and preparing standards for industrial goods and services. For this purpose, the standardization organizations prepare standards and implement them, and through this process a technology transfer occurs from the developed to the underdeveloped.

3) Later, in the process of standardization, international relations are set up and adoptation of international standards takes place. This process helps technology transfer at the international level and eases trade barriers once experienced by the underdeveloped country.

APPENDIX I
(see also Preface)

February 1974

DRAFT FOR COMMENTS

Statement Relating to the NBS/AID Regional Workshop
Proposed to be Held in La Paz, Bolivia
June 24 and 25, 1974 on the
Subject of a Network (System) for Standardization
and Measurement Services in Latin America

Introduction

Following an NBS/AID Survey of Standardization and Measurement Services in Bolivia, it is proposed to hold a Regional Workshop on such services in Latin America. The tentative location is La Paz, Bolivia; the revised dates are to be June 24 and 25. The Workshop languages shall be English and Spanish with simultaneous translation between these languages.

The Concepts

The Workshop will discuss and modify as necessary the following concepts and debate their usefulness.

"Standardization" shall refer to all technical engineering, product, and safety standards; technical codes of practice and specifications; the relevant information and dissemination services; and the associated calibration, product testing, inspection, and certification systems.

"Measurement" shall refer to all technical quantification procedures, be they chemical or physical, and be they simply numerical or by visual inspection against a standard scale of reference or by use of standards or reference such as standard reference materials.

"Network" shall refer to a system of organizations (nodes), each of which has some technical mission and is linked to at least two other nodes by directionally specified technical working relationships (channels) consisting of standardization and measurement services. Any two nodes can be linked by more than one channel, even in a single direction. Examples of the types of nodes that will be found in the Network are:

N.C. - Certification Authority
N.G. - Governmental Agency

N.ISB. - International Standards Body
N.M. - Manufacturer
N.NSB. - National Standards Body
N.RSB. - Regional Standards Body
N.TL. - Test Laboratory

Typical examples of channels might be

C.C. - Consultative
C.ID. - Informative
C.M. - Metrological
C.SG. - Standards Generating
C.R. - Regulatory
C.T. - Training

Individual nodes are identified by further assigned symbols individually or in groups.

Channels can join or fork at places other than nodes.

The Purpose of the Workshop

Good standardization and measurement are widely recognized as the principal technical ingredients for production controls in manufacturing industry and quality control of products for successful trade.

Standardization and measurement systems are in general applied more effectively in highly industrialized regions of the world than in less developed communities. Yet to less developed countries the adoption of a good standardization and measurement infrastructure promises such additional advantages as effective technology transfer and successful use of imports from a diversity of high technology countries. The typically smaller local manufacturing organizations in less developed countries rely more on national, regional or international technical services than are needed by multinational corporations. Knowledge of the identity and availability of such services is often deplorably lacking.

Using the example of Bolivia, it is hoped to identify the network and disseminate knowledge of its channels so that manufacturers can avail themselves of existing resources and permit governmental agencies to develop new needed nodes and channels.

It is hoped that the Workshop results will form a model with potential for application to other Andean or even all Latin American countries.

Participation

To discuss these wide-ranging topics representatives should be invited from:

1.) Bolivian industry,
2.) Bolivian Government,
3.) Bolivian universities,
4.) Bolivian standards and test organizations,
5.) Standards and test organizations of other nations (highly industrialized and less developed),
6.) National and international development assistance organizations.

For an effective Workshop the total attendance should not be large. Despite the shortage of time all participants should come ready to make an effective contribution to the Workshop. A short abstract of each proposed contribution should be sent in advance to H. S. Peiser.

For material mailed after June 1, use the following address for Mr. Peiser:

c/o Ing. Rodolfo Costas L.
General Director of Standards and Technology
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The Sessions

Participants at the Workshop should find the two days, June 24 and 25, crowded, hard work, but rewarding. There will be four sequential half-day sessions each headed by a chairman and recorded by a reporter. There will also be a dinner on the 24th followed by a brief technical discourse by an invited speaker. The Conference Sessions will have the following titles:

Interactions for Information.
Interactions for Standards.
Interactions for Solutions (to problems).
Interactions for Training.

Each session shall concern itself with the technical infrastructure of a practical standards system supported by a measurement technology and statistics. Discussion is needed in each session on the governmental mandate, the relevance to national goals, the implementation of production and quality controls, as well as on the testing and certification procedures. Each session should concern itself with the parts played by government, manufacturing enterprises, universities, and international standards organizations. Moreover, let us not forget the consumer or the innovator. One essential task for the reporter is to develop for the audience in his session the relevant network sketch for Bolivia showing the relevant channels.

Officers of the Workshop

There will be one Bolivian and one U.S. President of the Workshop, one Bolivian and one U.S. Secretary. H. S. Peiser will be the sole program coordinator. There will be a Local Organizing Chairman and other officers according to need.

The Final Report

The chairmen will be asked to insist on brevity and rule out of order undue repetition, non-technical topics and development of well-known concepts. Requirements of excessive brevity is not placed on written contributions handed in before or up to one month after the Workshop. This unusual practice is suggested because there should be a lot of new material, about which participants can think after their return to their institutions. If then they have wise second thoughts, these should still be entered into the Workshop record. This record will be published in English and Spanish.

APPENDIX II

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16. ABSTRACT *(A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here.)*

This report contains the papers presented at the first of a series of Regional Seminars, organized under the technical guidance of NBS and sponsored by the U.S. Agency for International Development and the Direccion General de Normas y Tecnologia of Bolivia. The Seminar was held at La Paz on the 24th and 25th of June, 1974, with participants from Bolivia, Brazil, Chile, Ecuador, Korea, Peru, Turkey, Thailand, and the United States of America. The Seminar was organized into four sessions, each of one half day duration, covering: Session I, "Interactions for Information"; Session II, "Interactions for Standards"; Session III, Interactions for Solutions to Technical Problems"; and Session IV, "Interaction for Training".

17. KEY WORDS *(six to twelve entries; alphabetical order; capitalize only the first letter of the first key word unless a proper name; separated by semicolons)*

AID; assistance; certification programs; education of metrologists; industrializing nations; LDC's; metrology.

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