

## **THE CHILEAN METROLOGY NETWORK – A NATIONAL EXPERIENCE PRESENT STATE OF THE METROLOGY IN CHILE**

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**Abstract:** The traditional approach for the establishment of a metrology infrastructure in other countries has been established as central laboratory, call generically National Metrology Institute (NMI) which has an official recognition to enhance the capacities of measurement of the country or economy. Chile has took the decision to have a Network more than an unique NMI, so at the present time, the structure of the Network is included by 7 magnitudes managed by 6 Institutions, CESMEC (mass and temperature), IDIC (force) and ENAER (pressure), DICTUC S.A. (length), CISA (Liquid Flows) and University of Concepcion (electrical Magnitudes).

**Keywords:** Chilean metrology network

### **1. INTRODUCTION**

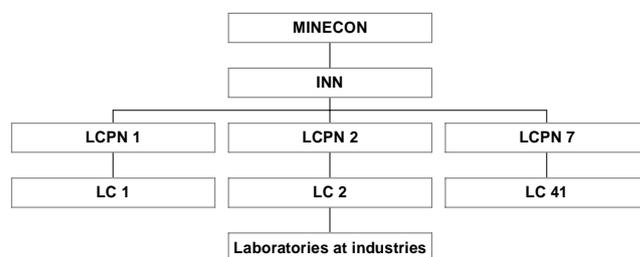
The traditional approach for the establishment of a metrology infrastructure in other countries has been established as central laboratory, call generically National Metrology Institute (NMI) which has an official recognition to enhance the capacities of measurement of the country or economy. Within each country the National Metrology Institutes (NMIs) are designated to develop and maintain national standards for one or several quantities. The institutional arrangements for NMIs are as varied as the countries themselves. Some countries centralise all the national standards to one institution, others decentralise widely. Many NMIs are wholly owned by their governments, others are semi-private agencies and others are wholly private. A number of NMIs are also primary laboratories, which are internationally recognised for providing primary standards. Some NMIs are exclusively reference laboratories, which provide a national standard traceable to a primary standard. Many NMIs concentrate on pure metrology whereas others have a range of activities including commercial interests.[1]

In addition to that, it is not necessary that the national metrology standard are located closely together of the international standards. It is only necessary that standard must be recognized and be used like standard for the calibrations required by the industry of the country.

The difficulty of the centralize scheme is in the highest cost to maintain that infrastructure, considered in several tens of millions of dollars. For that reason and from an effective

reduction of the fiscal apparatus in Chile for already several years, it became necessary to look for an alternative that allowed to conjugate the necessities of the metrology with the real sources of financing.

Taking the advantage for the already existing potentialities in some national institutions and their experience about metrology, it was created an integrated system that works in a coordinated form. This system was denominated National Metrology Network (RNM), because it is compound of 7 National Standard Laboratories (LCPN) who grants the traceable to the international units to a second level of 40 Calibration laboratories (LC) and finally destined to scatter the units to the national industry. Fig 1 illustrates in schematic form the configuration of the RNM and its relation with the rest of the productive organizations.



**Fig.1. Chilean Metrology Network**

### **2. DEVELOPMENT OF THE NATIONAL METROLOGY NETWORK**

#### **2.1. Decision base on economic benefit study**

The economic importance of measurement structure arises from the fact that all industrial activity depends on accurate measurements of components and production processes at each stage from R&D, through production to marketing. Indeed in a wider sense the use of measurement in society also adds an economic dimension, as does the requirement for measurement and testing after a product's death that is when the environmental impact of disposal has to be taken into account.[2]

There are some concepts related with the evaluation of the cost -benefit ratio that was taking in count to establish the Chilean Metrology Network, those were:

1. Market Selection
2. Appropriation
3. International Trade

The market place concept was fundamental to fix which measurement technologies or which technical measures and measurement techniques were necessary to solve the market place requirements. Often the process of competition leads to one product or service becoming dominant within the market and perhaps even setting the market standard. Based on that, the decision was taken to solve the requirements of some specific industrial measurements like pressure, length, mass, temperature and force.

The second step was how to solve the potential conflict between appropriation and the social benefits of the network structure. Measures and measurement techniques have many of the elements of a public good and wide scope to deliver positive externalities. These are maximised the wider is the diffusion of knowledge. However this leads to a conflict between the social benefits that arise from measurement technology and the private costs of producing the technology in the first place.

To solve that the Chilean metrology network has been established under the concepts of “laboratories contestable”, this means that the designated laboratories are not “owner” of “designation”, only they are manage the magnitude, meaning that If there is another institution which has interest and best measurements capabilities (BMC’s) in some specific magnitude, there will be a new designation.[3]

In other way there is some incentive to participate of the network like:

1. recognition
2. access to public funds to maintain their BMC’s or to improve that.
3. access to an increase number of metrological services

The third step was the understanding of how the national measurement systems were a potential source of competitive advantage, which could support domestic industries and industrial development and could protect domestic markets by creating idiosyncratic standards, which differentiate domestic goods in terms of quality and familiarity.

The concepts was when international measurement standards are adopted there is an opportunity for specialization in production of measurement instruments. Domestic investment in measurement know-how can help support the domestic measurement instrumentation sector, which in turn can have positive spillovers to other industries.

## 2.2. Formal designation and corporate image

To improve the Chilean Metrology Network the Physikalisch-Technische Bundesanstalt (PTB) of Germany has been supporting that implementation by funds, know how and training. In that way was establish that the mission of the National Network of Metrology of Chile (RNM) is to guarantee and to scatter the traceable of national measurements that are made with the finally to in benefit of the industry and the manufacture, the export and the

commerce, the protection of the consumer and the environment, the regulating beings and the society in general. For that reason the RNM must obtain and fortify the international recognition. Also the mission of the RNM to create conscience and to spread to the knowledge and the importance of the metrology in the industry and the commerce, science and teaching, the public and the private sector as well as in the society in general.

The RNM is working under a formal regulation, which include the nomination to all laboratories by the Ministry of Economy of Chile, as is shown as example in table 1, and the recognition of a internal regulation ( Reglamento Red Nacional de Metrologia ). That regulation include the responsibilities to all constituent part as Ministry of Economy (MINECON), National Institute of Standardization (INN), and the National Laboratories.

**Table 1. National Laboratories Decree**

Institution	Decree	National Designation
Cesmec	775 de 30 de Diciembre de 1999	Mass
Cesmec	775 de 30 de Diciembre de 1999	Temperature
Enaer	76 de 21 de Abril de 2003	Pressure

The next step was to create an corporate image dealing with a national Logo, as shown in Fig.2, and to create the conscience that the Chilean Metrology Network must be work under the concept of “ Virtual National Metrology Institute”



**Figure 2: Chilean Metrology Network Logo**

## 2.3. Actual and Future Situation

At the present time, the structure of the Network is included by 7 magnitudes managed by 6 Institutions, CESMEC (mass and temperature), IDIC (force) and ENAER (pressure), DICTUC S.A. (length), CISA (Liquid Flows) and University of Concepcion (electrical Magnitudes), Fig 3.



**Figure 3: Chilean Metrology Network**

The 4 first laboratories are accredited under NCh ISO 17025 by the national Accreditation System managed by INN and ISO 17025 under the German Accreditation Institution, DKD. CISA has the national accreditation recognition and the other 2 remaining laboratories are in process to get both, national and international recognition.

**Table 2. Actual Situation of National Laboratories**

Institution	National Designation	Accreditation by INN	Accreditation by DKD	Appendix C – KCDB BIPM
Cesmec	Mass	LC-020	DKD-K-28401	√
Cesmec	Temperature	LC-026	DKD-K-28402	√
Enaer	Pressure	LC-040	DKD-K-39101	-
Idic	Force	LC-028	DKD-K-33001	√
Dictuc	Length	LC-003	-	-
Cisa	Liquid Flow	LC-019	-	-
U. de Concepción	Electric magnitudes	-	-	-

The next goal will be to get the recognition by appendix C – BIPM to pressure laboratory, to get the international recognition by the Deutscher Kalibrierdienst (DKD) to length, liquid flow and electric magnitudes laboratories.

Currently we have been working to get the national recognition to 5 chemical metrology laboratories, which will have the responsibility to support 3 main relevant areas, environment, food and mining.

### 3. CONCLUSION

Some countries have defined a centralized model to establish a traceable NMI, Chile took the network model to establish the Chilean Metrology Network based on our economic and social interest and guided by the German Experience. This model has defender and opponent but more than it the network is still walking to have a complete national and international recognition. Finally has been a national decision therefore is our responsibility to enhance it.

### ACKNOWLEDGMENTS

Thanks to IMEKO to bring us this space to show a different experience about an NMI.

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