Implementation of a Quality Management System According to the ABNT ISO/IEC 17025:2005 in the Gravity Laboratory of Observatório Nacional

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Abstract

An implementation of a Quality Management System (QMS) according ISO 17025:2005 and obtaining formal accreditation can significantly improve the reliability and credibility of laboratory testing and calibration in the greatness *gravity*. This standard establishes the criteria for those laboratories wishing to demonstrate their technical and scientific, which have a system of effective quality and are able to generate technically valid results, establishing a single international standard and to certify the competence of laboratories to carry out tests and / or calibrations, including sampling.

The main document of the QMS is the Quality Manual, where the general policies of the Laboratory are established. The general policies list the procedures and other documents that constitute the Management System. The technical-scientific procedures and methods will provide the instructions and also designate the personal responsibility of the tanging actives. And finally, the documentation for the plans, systems, instructions, schedules, programs and the other items of the "Master List", which are all Quality Documents.

Introduction

In order to align the ways of managing the systems aiming at the improvement of results, the International Organization for Standardization (ISO), present in over 160 countries, is a non-governmental organization with the largest number of international publications regarding the for standardization of systems and methods. So the quest for Excellence and Quality in products, services and scientific circles has made to grow the demand for certification and accreditation. In the case of Calibration laboratories and testing, the ISO sets to the ISO 17025, this establishes basic requirements for standardization at the international level. The implementation of this standard norm happens in institutions foreign counterparts that are in the process of implementing a Quality Management System in its laboratories and research groups in gravimetric, for example: METAS, Switzerland (equivalent to Inmetro), BKG, Germany (Equivalent to IBGE), National Geografic Institute, Spain (equivalent to IBGE), Geodetic Observatory Pecný, Czech Republic (Equivalent to ON) and NIST, USA (equivalent to Inmetro).

The implementation of a QMS based on ISO/IEC 17025:2005 attests: the degree of quality of technical and scientific experiments tests performed in the laboratory (reliability of results) as well as the competence of the laboratory to quantitatively measure *gravity*, the permission to participate in programs of comparison testing in quality laboratory accredited by the National Metrological Institute (Inmetro) and equivalence and international acceptance of their laboratory activities.

Objectives and Relevance

The Gravity Laboratory of Observatório Nacional (LabGrav/ON, Figure 1) performs gravimetric tests and calibrations to meet the needs of both research and teaching as other academic institutions in partnership. Moreover, it is occasionally required to meet demands from customers external to ON, whether in geophysical exploration, either in metrology force, pressure and viscosity. Though, the need to have a QMS implemented in the LabGrav, thus enabling quality assurance to all internal and external clients of the laboratory.

Figure 1 – The Gravity Laboratory of Observatório Nacional in Vassouras (RJ, Brasil)

It is extremely important to implement a quality management system based on ISO 17025:2005 for the Gravity Laboratory of ON. To be recognized and integrate: the Brazilian Calibration Network (RBC/Inmetro), the Brazilian Network Testing Laboratories (RBLE/Inmetro) and the Brazilian System of Technology (Sibratec/Finep-MCTI).

The accreditation allows the formalization of laboratory activities with the Regulatory Agencies, academic institutions and the private sector regarding the quality of greatness gravity, Contributes to greater visibility of the

Institute in the areas of metrology, geodesy and geophysics, Confidence in gravimetric measurements performed by laboratory staff and used in undergraduate research, dissertations, theses and scientific research projects and establish partnerships with other laboratories accredited.

What is a Quality Management System?

The Quality Management System is assembled from de preparation of technical-scientific procedures and laboratory management property documented, i.e. signed and controlled. This ensures continuity of the systematic methodology used by a laboratory staff to perform the greatness that state having jurisdiction to measure, and always with the same quality. Each of procedures adopted to describe the achievement of a standardized and appropriate laboratory activity, describing the proper record of this activity. The Quality Manual is the primary document that is made explicit in laboratory quality policy which is followed as shown in the Figure 2 – Hierarchy of documents recommended by ISO 17025.

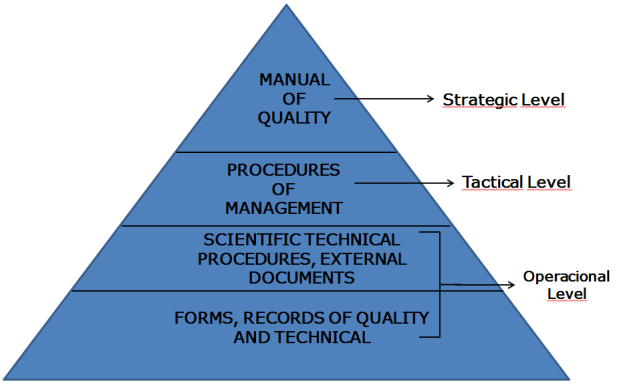

Figure 2 – Hierarchy of documents recommended by ISO 17025

Besides, the central component of QMS is its structured documentation showing how the organization words. In most cases, the documentation can be presented in three levels:

- Strategic Level: Quality policy, manual and objectives,
- Tactical Level: Documental procedures,
- Operational Level: Working Instructions, guides and records.

The implementation of the QMS can include three important pillars, as shown in the Figure 3: organizational structure, documentation system and an operation staff.

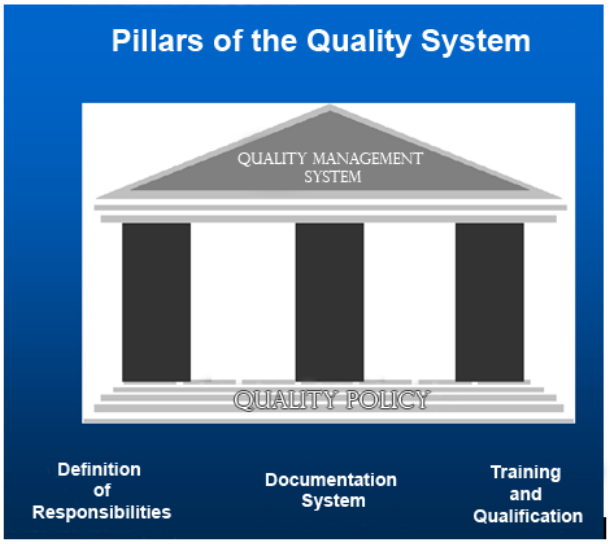

Figure 3 – Pillars of Quality Management System

The organizational structure aims to define policies that are a permanent base on which to build strategies, actions are formulated and decisions are made, such as: The quality policy, compliance with the standard's requirements and continuous improvement and sustainable Quality System. Besides, defining roles and responsibilities of all personnel involved.

The document structure is composed of a set of documents with hierarchy (shown in Figure 2) formally supporting the Quality System. These documents are: Manual of Quality, the manual operation of equipment, technical-scientific procedures, external documents, forms and records of Technical and Quality, among others.

The third pillar is the functional structure (operating system), and identified several factors that can influence the quality of results directly, such as the methods, equipment, raw materials and personnel.

All governed by a quality policy described in the Manual of Quality, approved by senior management of the institution being known and appreciated by the entire staff of the laboratory.

Management and Scientific & Technical Procedures

After making a diagnosis, the implementation process was initiated for drafting the Quality Manual and management and scientific & technical procedures, according to the standard ISO 17025: 2005, presented in Tables 1 and 2, respectively.

Table 1 – Management Procedures

Management Procedures
Preparation and control of documents
Critical Analysis of Claims, Proposals and Contracts
Purchasing services and supplies
Qualification of suppliers
Treatment of non-compliances, preventive, corrective and improvement actions
Customer Complaints
Records Control
Audits
Critical Analysis
Staff Training
Method Validation
Calculating the Estimation of measurement uncertainty
Equipment Management
Traceability of Measurement
Handling of test and calibration items
Quality assurance of test and calibration results
Evaluation of Participation in Crosscheck Programs
Control Chart
Storage and Protection and Electronic Transmission of Results
Validation of Spreadsheets and Softwares
Customer service
Presentation of Results of testing and calibration
Evaluation of Test Certificates

Table 2 – Scientific &Technical Procedures

Scientific & Technical Procedures
Operation Manual of LaCoste & Romberg Model "G" and Scintrex CG-5 gravimeters
Assessment of Clients' LaCoste & Romberg Model "G" and Scintrex CG-5 gravimeters
Routine Evaluation of LaCoste & Romberg and Scintrex CG-5 gravimeters
Calibration of LaCoste & Romberg and Scintrex CG-5 gravimeters
High precision absolute determinations of 'g' and its vertical gradient in laboratories
High precision relative determinations of 'g' and its vertical gradient in laboratories

Beyond this, standard forms for the technical & scientific records and records of qualities were created, aiming to standardize the documentation and organization of Gravity Laboratory of Observatório Nacional, Brasil.

A Master List of Documents, equipment, manuals was built contemplating all the documentation mentioned in Tables 1 and 2.

Results and Conclusions

The implementation of a Quality Management System aims to systematize better organizational performance and adequate technical & scientific standardization, whose purpose is to obtain reliable results with a level well characterized and a small variation in the provision of services, scientific research.

The procedures are being developed (already achieved about 50% of them). In a second step, as all the three pillars of QSM will be finished, the PDCA cycle will be used in order to perform an improvement, a change, a critical analysis and an adjustment of all documentation and records, as shown in the Figure 4.

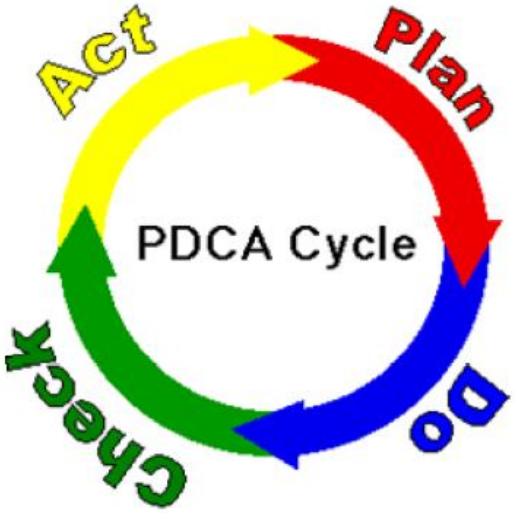

Figure 4 – PDCA Cycle

After turning the PDCA cycle, accomplish all adjustments necessary for conducting an internal audit, covering the management and technical requirements of the mandatory ISO 17025: 2005. The audit aims to verify compliance with all the requirements of this standard.

After rotating the PDCA, external audit, a review meeting critical and calculating the uncertainty estimate, requirements of INMETRO, National Metrology Institute (NMI) in Brazil, in order to enter with a request accreditation for testing and calibration of gravity of gravimeters. There is still no one accredited in Brazil to carry out these activities.

Parallel to obtain the results described above, remains the effort of awareness and motivation toward all employees understand the importance of the laboratory of the fundamental aspects for the implementation of quality: the importance of standardization of technical and scientific procedures as well as management procedures, quality records and technical-scientific records whether in forms, whether in books of fields standardized according to ISO 17025:2005, routine verification, calibration and preventive and corrective maintenance of all equipment in the lab, the qualification and training of staff, and common sense of cleanliness and organization laboratory.

Besides implementing the quality management system, which requires much effort, and yes, keep this system, is a great challenge, through improvement tools such as external and internal audits, meeting critical analysis, among others. It is the cycle of PDCA, Plan, Do, Check and Act.

Acknowledgments

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