

ACCREDITATION OF MEASUREMENT LABORATORIES

POPA Ionuț-Raul, GHEORGHITA Denisa Elena, STRUGARU Raluca Alexandra
Faculty of Industrial Engineering & Robotics, Quality Engineering & Management,

3rd year, denisagheorghita6@gmail.com

Conducător Științific: Prof.dr.ing. **Irina SEVERIN**

SUMMARY: The scientific work entitled "Accreditation of measurement laboratories" is based on a list of questions (checklist) created using the ISO 17025: 2005 standard which is implemented in an accredited laboratory. The study is conducted in a laboratory called "Laboratory for Food Safety" based on the determination of heavy metals, pesticides and antibiotics in food and water and in a wood compression testing laboratory within ICECON, accredited by RENAR, the only company in Romania that does this.

The results and conclusions we have reached are presented in the scientific work.

KEY WORDS: accreditation, laboratory, procedures, accreditation bodies, calibrations.

1. Introduction

The attestation by a third party represents the accreditation, that is it the official approval that a body is totally competent to accomplish specific conformity evaluation tasks

Accreditation is important for the legalization of laboratories, such as: it gives trust in the technical competence, objectivity and uprightness of bodies and laboratories that achieve conformity assessment, contributes to increasing the competitiveness of products and services, in the context of globalization of markets, contributes to promoting the free movement of products and services, it means also the promotion of safety regards life, individuals and health.

The objectives of paper entitled "Accreditation of measurement laboratories" are to follow the requirements of ISO 17025: 2005 "General requirements for the ability of testing and calibration laboratories" implemented in various testing and calibration laboratories accredited by accreditation bodies in Romania. The objectives are achieved through a list of questions to which we have obtained answers from qualified UPB and ICECON qualified staff in this field.

2. Trends / Perspectives

In Romania, there is a law for the accreditation of measurement laboratories, Law 608/2004, which generated both regulations and the creation of bodies capable, legally and competently, to evaluate and give the vote of confidence to the product.

The ISO 17025: 2005 standard covers all the conditions that testing and calibration laboratories must meet if they want to prove that they are operating in accordance with a quality model, that they are technically capable and that they are able of producing technically reliable results.

Currently, in Romania, accreditation of testing laboratories is done conformable with SR EN ISO 17025 of 2005, entitled "General requirements for the competence of testing and calibration laboratories", which specifies the conditions that a laboratory must meet to be recognized by the competent bodies.

Accreditation bodies that admit the ability of testing and calibration laboratories should use this European standard as a foundation for their accreditation.

Issues that directly affect data quality and technical competence in laboratories are addressed in ISO 17025.

The use of International Standard SR EN ISO 17025: 2005 clear the way for collaboration between laboratories and other bodies and will help to exchange information and experience, as well as to harmonize standards and procedures.

3. Implementation of conditions of the SR EN ISO 17025: 2005 standard in accredited laboratories

3.1. Implementation of conditions of the SR EN ISO 17025: 2005 standard in food safety laboratory within UPB

The National Center for Scientific Research for Food Safety (CNpSA) is based on the arrangement of 5 laboratories within the CAMPUS-UPB complex, including the Laboratory for Food Safety (LpSA), having in its composition 4 other spaces that allow taking over a larger volume of evidence, increase the beneficiaries' confidence in the results obtained and interlaboratory validation of the results obtained.

The spaces where the activities within LpSA are carried out are: Sample Preparation Laboratory, Advanced Separation Laboratory, Spectroscopy and Spectrometry Laboratory, Complex Thermal Analysis Laboratory. LpSA was accredited to ISO 17025 in July 2021, currently having all the necessary resources to carry out its core business.

The analyzes that are done in the laboratory are: determination of pesticides, determination of heavy metals, determination of antibiotics in food, being sensitive methods that require extraordinary attention to detail.

From the analysis performed, it turned out the conditions of the standard SR EN ISO 17025: 2005 are met.

Comments on the implementation of the requirements of the above standard are:

- the management staff and the technical staff have the authorization and the necessary resources to carry out the tasks;
- there are detailed policies and procedures regarding the performance of laboratory tasks;
- the management system of the laboratory is adequate to its activity system;
- within the laboratory, there is a quality manual and a policy statement;
- there are procedures for analyzing requests, offers and contracts;
- periodic internal audits are performed in the laboratory;
- by means of an devices, the laboratory supervises, manages and records the environmental conditions as needed by the relevant specifications (laboratory humidity must be approximately $45 \pm 10\%$);
- the methods developed in the laboratory are adequate and efficient;
- the laboratory is equipped with the necessary equipment to perform the activity correctly;

- each piece of equipment is calibrated before it is put into service;
- there is a form for reporting the results obtained in the laboratory;
- the staff is properly qualified and trained, constantly participating in specialized courses.

The importance of this laboratory can be identified in the following concrete example of the last analysis performed in the accredited laboratory of the UPB faculty.

Specifically, the synthesis of a magnetite that has been loaded with an active substance called curcumin. Curcumin is a substance that has an anticancer, antioxidant activity and can be used to treat bone cancer. The idea of the analysis was to note that the active substance can be released on a regular basis over a longer period of time. After loading the material, it was introduced into a solution called SBF (simulated body fluid), taking samples at intervals to observe the evaluation of the curcumin released on the functional support. This analysis was performed by a UV-VIS spectrophotometer. Biocompatibility was taken into account. In this accredited laboratory, in vitro tests with antimicrobial purpose are also performed for dressings, wounds, burns.

For the part of the uncertainty that may appear in the examination samples, the cause-effect diagram is used to detect all sources of uncertainty that may affect the sample from several points: environmental conditions (t° , humidity), instruments used (pipette), method analysis, etc.

The following figure shows the cause-effect diagram for identifying origins of uncertainty in the food safety laboratory.

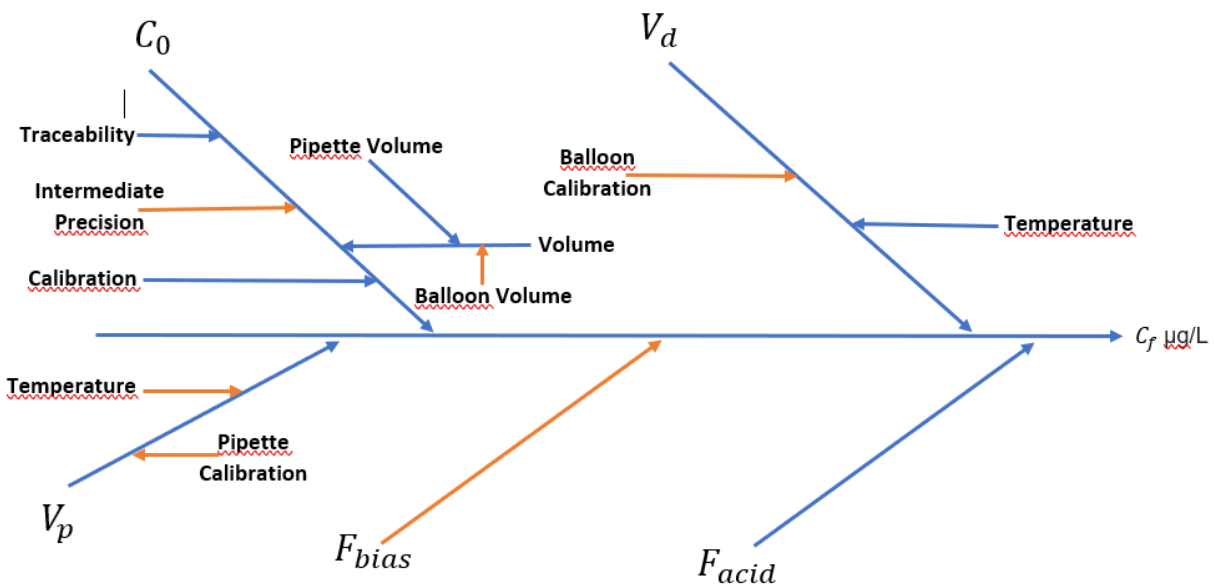


Figure 1. Ishikawa diagram-Identifying sources of uncertainty when analyzing evidence

F_{bias} =bias factor; F_{acid} = acid factor; V_p =initial test volume;

C_0 = concentration read on the calibration curve; V_d = the volume of the volumetric flask used for dilution.

3.2. Implementation of the requirements of the standard SR EN ISO 17025: 2005 in laboratory of analysis and testing in constructions within ICECON

The Research Institute for Equipment and Technologies in Construction (ICECON S.A.) operates in the field of technologies and equipment for mechanization of works and installations, conducting scientific research in construction.

Examples of RENAR accredited tests performed at ICECON S.A.

- determination of burglary resistance;
- fatigue test;
- test for resistance to repeated compressive loads;
- test at high stresses in the mechanical joint with a small number of cycles;
- determination of flue gas emissions (O₂, CO, CO₂) and flue gas temperature;
- determination of frost-thaw resistance for concrete;
- determination of plastic deformation capacity - Bending test;
- shear test;
- determination of the mass per unit area;
- determination of the film thickness;
- determination of bending and compression strength;

The case study conducted at ICECON S.A. was largely based on the list of quality system documents, which includes system procedures and test procedures.

Regarding the ISO 17025: 2005 standard documentation, the requirements are successfully met, the analysis shows that the quality management system is established in conformity with the conditions of the standard, the processes and all applications required by the management system are defined, process interaction has been identified, criteria and methods needed to ensure efficient operation and process control have been established, Quality Management System documentation covers quality policy and quality objectives prepared, quality book, reported processes required for the system, there is a manual quality prepared and maintained, management review is documented.

In the laboratory, the deformation of an elastic body was observed, during the compression test on wood.

The result reached is the determination of the maximum compression limit ($\sigma_a = 100 \text{ daN} / \text{cm}^2$) with the help of the Hooke curve present in the following image.



a.

b.

Figure 2. Compression test of wood

a. Hooke's curve

b. Compression test

4. Results

Within the two laboratories, the requirements of the SR EN ISO 17025: 2005 standard are correctly implemented according to the RENAR accreditation body.

The main document contained by accredited laboratories for laboratory operation in conformity with SR EN ISO 17025: 2005 is the quality manual containing procedures for any laboratory activity, operational procedures (sampling and handling of test / sampling objects, validation of methods and assessment of measurement uncertainty, etc.), management procedures (document control, non-compliant product, etc.) and technical procedures (determination of food ores, determination of food pesticides, etc.).

The results of the latest test in the food safety lab are aimed at treating bone cancer with a substance called curcumin.

The results of the ICECON laboratory are for obtaining the maximum limits of compression on wood for constructions.

The results of two accredited laboratories must be clear, concise and validated by the staff of the institution.

5. Conclusions

In order to carry out the work, the next steps have been taken:

- creating a checklist according to the standard SR EN ISO 17025: 2005 analyzing all sections;
- submission of applications to various institutions for a positive response in an accredited laboratory;
- waiting for approval from the institutions for the realization of the scientific work;
- two institutions were receptive to the analysis;
- the first accredited laboratory in which the analyzes were made about the conditions of standard SR EN ISO 17025: 2005 is the "Food Safety Laboratory" within the Polytechnic University of Bucharest after the same standard has been applied in the "Test of resistance to repeated compressive loads" within the Institute research for construction mechanization equipment and technologies;
- the questions from the checklist made in line with SR EN ISO 17025: 2005 were pertinent so the answers of the staff from the accredited laboratories were clear and concise;

Within the RENAR accredited laboratories where the scientific work was performed, a series of activities took place, as:

- visualisation of test reports;
- observing different procedures, from “Complaints handling” to “Metrological equipment and traceability”;
- making a comparison between the food safety laboratory within the Polytechnic University of Bucharest and the laboratory for testing the resistance to repeated compressive loads within the Research Institutes for Equipment and Technologies in constructions;
- studying the implementation and performance of the SR EN ISO 17025: 2005 standard through the checklist made;
- learning how to perform a procedure for an operation;
- understanding how the quality management is implemented in an accredited laboratory and the steps taken to accredit a laboratory;

6. Bibliography

[1].*** www.consultanta-certificare.ro/iso/acreditare-laborator accesat la data de 12.05.2022 .

[2].*** Standardul SR EN ISO 17025:2005 “Cerințe generale pentru competența laboratoarelor de încercări și etalonări”.

[3].*** <https://www.renar.ro/>.