

Laboratory equipment management system with certification control function in Electrotechnical Institute laboratories

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Abstract— The paper presents the design and functional assessment of the LabManager system, a web-based application supporting laboratory equipment management, certification control and reporting in research laboratories. The solution centralizes information on laboratories, devices, users, certificates, work records and reports. Particular attention is paid to the supervision of calibration and certification dates, which is essential for measurement reliability and for maintaining compliance with PN-EN ISO/IEC 17025 requirements. The article describes the system architecture, user roles, data model, reporting workflow and practical benefits of implementation in electrotechnical and power-electronics laboratories.

Keywords— *laboratory management system, equipment certification, calibration, ISO/IEC 17025, SQLite, UML*

I. INTRODUCTION

Modern research laboratories utilize increasingly complex measurement equipment, diagnostic stations, and specialized testing systems. This is particularly true for electrical and power electronics laboratories, where testing of power supply devices, power electronic converters, high-frequency systems, GaN/SiC technologies, and electrical power equipment is conducted. In such an environment, the technical efficiency of equipment and the accuracy of documentation directly impact the quality and repeatability of results.

Traditional record-keeping methods, based on paper documentation, spreadsheets, or independent records maintained in individual laboratories, do not provide sufficient control over the equipment lifecycle. The dispersion of information makes it difficult to quickly determine the device status, its usage history, and certificate expiration date. This problem becomes particularly significant during quality audits and accreditation procedures.

Purpose of this article is to present the LabManager system as a tool supporting the digitization of laboratory processes. The system enables data centralization, certification control, work registration, user management, and report generation.

II. THE IMPORTANCE OF INSTRUMENTATION SUPERVISION

Laboratory equipment management should be considered a fundamental element of a laboratory's quality system. Even minor measurement deviations resulting from outdated calibration, device damage, or incorrect device identification can lead to incorrect interpretation of test results and questioning the results of commercial trials and type tests. Therefore, the laboratory should have mechanisms in place to clearly determine which devices are functional, which require inspection, and which should not be used in testing procedures.

Linking the device's technical data with documentation confirming its metrological condition is particularly important. The PN-EN ISO/IEC 17025 standard emphasizes the importance of equipment supervision, measurement traceability, and documenting technical activities. An IT system does not replace quality procedures, but facilitates their implementation by automatically monitoring deadlines, archiving documents, and quickly preparing reports required during audits.

Implementing LabManager also has organizational implications. With a large number of laboratories, users, and devices, manually tracking certificates is time-consuming and error prone. The application enables the assignment of responsibility, recording of work history and analysis of resource utilization, which improves operational security and process transparency.

III. LABMANAGER SYSTEM OVERVIEW

LabManager is a web-based application designed to support laboratory infrastructure management. The system includes modules: management dashboard, laboratories, equipment, certification, personnel, work records, reports, documentation, and backups. This separation of functions simplifies operation and allows users to quickly navigate to the area relevant to their tasks.

Production version of the system can use PHP and an SQLite database, while the demo version can run as a browser-based application without installation. SQLite usage reduces