

APPLICATION OF RFID IDENTIFICATION IN INDUSTRY

VLADYSLAV SEMENTSOV, PhD student

VITALIY S. TSAPAR, Associate Professor, PhD in Engineering, Scientific Adviser

SVITLANA M. MOISEIENKO, Associate Professor, PhD in Philology, Language Adviser

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Rapid acquisition of large amounts of information is in high demand worldwide. The need to quickly recognize the desired object or item and track it while in motion is increasing. The ability to store essential information for future reference or transmission is also highly valued. RFID identification – radio frequency identification of objects and their movement paths – helps achieve all these goals [1].

The purpose of this study is to examine the principles, technological aspects, and areas of application of RFID identification, evaluate its effectiveness across various industries, and develop recommendations for optimizing its use to enhance automation, security, and accuracy in accounting.

RFID identification is a modern form of automatic recognition of objects, people, living organisms, and data using radio signals. The received information (ranging from a single serial number to several pages of data) is stored and can be retrieved when needed. This technology requires a radio system consisting of identifiers (so-called tags) and readers [1]. Applications of the technology include logistics, market research, prevention of illegal product supply, animal tagging, access control, and banking. The range of applications continues to expand [2]. RFID technology enhances the safety of production lines, prevents infant abduction in maternity hospitals, manages library collections, and assists athletes in orienteering. Some car models have embedded chips that allow owners to start the vehicle remotely, while in industrial settings, RFID enables higher production volumes with reduced time and financial expenditure.

A key element of the system is the RFID tag – an electronic device that receives, processes, and transmits signals. This allows for object recognition and movement tracking. An RFID tag may store a unique object identification code (EPC or UID), a password for accessing or resetting the tag's memory, and additional data such as barcode equivalents. The tags contain a chip that holds user-related information and communicates with a reader. Data exchange occurs via an antenna, and it is essential to select devices based on the specific RFID application environment [3]. In logistics and supply chain management, UHF RFID tags with an NXP chip are suitable for vehicle and goods tracking. MicroX II devices, featuring a rigid base and a memory capacity ranging from 96 to 2048 bits, can operate under high temperatures, exposure to aggressive liquids, and repeated cleaning. Their reliability has been proven in industrial applications [4].

Results of RFID Implementation:

1. Increased efficiency of production processes – The introduction of RFID has automated material flow control, reduced object identification time, and minimized human errors in logistics [2].

2. Cost reduction and error minimization – RFID implementation reduces losses due to inaccurate accounting, enhances inventory accuracy, and optimizes inventory management [3].

3. Improved traceability and security – RFID systems enhance production transparency, enable monitoring of equipment and personnel conditions, and improve enterprise security [4].

4. Optimized logistics management – RFID identification automates real-time tracking of goods, improving supply chain management and reducing delays in production cycles [2].

5. Integration with other technologies – Numerous studies confirm the effectiveness of combining RFID with IoT, Big Data, and automated enterprise management systems (ERP, WMS), fostering industrial digital transformation and supporting the development of “smart manufacturing” [3].

Overall, the results of the study confirm the feasibility of implementing RFID identification to increase productivity, cost-effectiveness and the level of automation in industrial enterprises [4].

Overall, the study results confirm the feasibility of implementing RFID identification to enhance productivity, cost efficiency, and automation in industrial enterprises [4].

The use of RFID in industry not only improves asset and material flow control but also enhances personnel and equipment safety. The large-scale adoption of RFID in the industrial sector will contribute to increased productivity, competitiveness, and the sustainability of production processes. Future research may focus on improving RFID integration with emerging technologies and analyzing its cost-effectiveness across different types of enterprises [4].

References:

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