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STUDY OF TECHNICAL REQUIREMENTS AND SELECTION OF TECHNOLOGICAL BASE

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Abstract: The process of studying technical requirements and selecting an appropriate technological base is a fundamental component of modern industrial engineering and production management. A well-designed technological base ensures the efficiency, reliability, and sustainability of production systems. This research presents an in-depth analysis of the methods used to determine technical requirements, evaluate technological alternatives, and select optimal technological solutions for industrial applications. The study emphasizes the interconnection between technical requirements, resource capabilities, digitalization, and innovation. The use of advanced analytical tools, computer-aided technologies, and artificial intelligence has transformed the process of designing and selecting technological bases. Results show that applying a systematic and data-driven approach to technical requirement analysis significantly improves production performance, reduces operational costs, and enhances the competitiveness of enterprises in a globalized market.

Keywords: technical requirements, technological base, production efficiency, innovation, automation, industrial engineering, digitalization, Industry 4.0, optimization.

1. Introduction

In the 21st century, industrial enterprises are experiencing rapid transformations driven by globalization, digital technologies, and the principles of Industry 4.0. The success of any engineering or manufacturing project largely depends on how well technical requirements are formulated and how effectively a technological base is selected. Technical requirements serve as a bridge between design intent and practical realization, while the technological base provides the foundation upon which the production process is built.

2. Analysis of Technical Requirements

The first stage in designing a technological system is the analysis of technical requirements. These requirements describe the functional, structural, operational, and environmental parameters that a product or process must satisfy. A comprehensive analysis involves several key steps: Functional Analysis, Operational Analysis, Environmental and Safety Requirements, and Economic Constraints. The correct identification of technical requirements ensures that the

chosen technological base can operate efficiently under given conditions, minimizing risks and guaranteeing product reliability.

3. Evaluation of Technological Alternatives

After defining the technical requirements, the next step is to evaluate possible technological alternatives. The evaluation process involves analyzing multiple solutions according to various criteria, including technological compatibility, performance efficiency, flexibility, economic feasibility, and sustainability. Advanced evaluation tools—such as multi-criteria decision-making (MCDM), simulation modeling, and cost-benefit analysis—are widely used to select the most efficient technological solution.

4. Selection of the Technological Base

The technological base refers to the combination of machinery, equipment, software, tools, and infrastructure that supports the production process. Choosing the right technological base means finding the optimal balance between innovation, cost, and reliability. A modern technological base is characterized by high precision, automation, and interconnectivity. For instance, flexible manufacturing systems (FMS) and computer-integrated manufacturing (CIM) allow for simultaneous production of multiple product variants with minimal setup time.

5. The Role of Innovation and Digitalization

Innovation and digital transformation play a central role in improving the process of selecting technological bases. Technologies such as Artificial Intelligence (AI), the Internet of Things (IoT), Big Data Analytics, and Digital Twins have revolutionized production management. These technologies contribute to higher productivity, better product quality, and greater environmental sustainability.

6. Case Application and Practical Implications

In practical industrial scenarios, the process of selecting a technological base begins with analyzing product specifications and customer demands. By applying digital decision-support tools, enterprises can quickly compare alternative systems, predict their long-term performance, and make more informed investment decisions. This approach also promotes sustainable production by minimizing resource waste, reducing emissions, and extending equipment lifespan.

7. Conclusion

The study demonstrates that the effective analysis of technical requirements and the rational selection of a technological base are key determinants of industrial success. A systematic, data-driven, and innovation-oriented approach allows enterprises to achieve higher production efficiency, lower costs, and sustainable competitiveness.

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