

MANAGING PRODUCTION RISKS THROUGH DIGITAL MONITORING SYSTEMS

Mohichehra Usmonovna Nematova

Bukhara District 1 Technical College Specialized Subject Teacher

Abstract

This work addresses the issues of managing production risks through digital monitoring systems. The study analyzes the role of modern digital technologies in identifying and assessing technical, technological, and human-related hazards in production processes. Furthermore, the importance of real-time monitoring systems in ensuring occupational safety, reducing accidents, and improving production efficiency is substantiated. The results of the study demonstrate that using digital monitoring systems is an effective approach for the early detection and management of risks in industrial enterprises.

Keywords

digital monitoring systems, production risks, risk management, industrial safety, occupational safety, real-time monitoring, IoT technologies, automated control, technological processes, digital technologies.

Introduction

With the technological complexity of production processes and the increasing level of automation in modern industrial enterprises, the issue of managing production risks is becoming increasingly urgent. Technical malfunctions, disruptions in technological processes, and human-related errors in the production environment can lead to significant economic losses and violations of occupational safety requirements. Therefore, ensuring industrial safety and reducing the risk of accidents necessitate integrating traditional control methods with modern digital technologies.

Digital monitoring systems are an effective management tool that allows early detection of hazardous conditions by monitoring production processes in real time and automatically collecting and analyzing data. These systems operate based on sensor technologies, IoT platforms, automated control systems, and analytical software tools, serving to predict risks and prevent their occurrence. As a result, the level of occupational safety increases, the continuity of production processes is ensured, and the overall efficiency of enterprise operations improves.

This article analyzes the scientific and practical significance of digital monitoring systems in managing production risks, their main functions, and the possibilities of their application in industrial enterprises.

Main Section

Types of Production Risks and Their Characteristics. The risks that arise in production processes are complex and multifactorial, and they can be classified into several groups based on their sources. Technical risks are associated with equipment and machinery wear, malfunctions, or improper operation. Technological risks occur when production process parameters deviate from established standards. Human-related risks are directly linked to employees' skill levels,

work discipline, and compliance with safety regulations. Additionally, environmental and sanitary-hygienic hazards also play an important role in the production environment.

Failure to identify and assess these risks in a timely manner can lead to production process disruptions, an increase in accidents, and occupational diseases. Therefore, systematic monitoring and management of risks is one of the priority tasks for modern industrial enterprises.

The Essence and Operating Principles of Digital Monitoring Systems. Digital monitoring systems are modern technological solutions designed for continuous and uninterrupted control of production processes. These systems operate by collecting real-time data through sensor devices, automatically processing and analyzing it. The collected data is visualized using specialized software platforms, and rapid alert signals are generated when hazardous situations arise.

In practice, digital monitoring systems are often integrated with IoT technologies, SCADA and MES systems, as well as artificial intelligence and Big Data analytics. Such integration allows for in-depth analysis of production conditions, forecasting of risks, and scientifically-based management decision-making.

Mechanism of Risk Management Through Digital Monitoring. The process of managing risks based on digital monitoring systems consists of several stages. First, the main sources of risk in the production environment are identified, and control indicators are established. In the next stage, data on these indicators are collected in real time via sensors and automatically analyzed.

If deviations from established norms are detected, rapid alerts are sent to operators and responsible personnel. This prevents the escalation of hazardous situations, facilitates the elimination of malfunctions, and prevents emergencies. At the same time, the collected data is used to analyze risk dynamics and develop long-term preventive measures.

Advantages and Practical Significance of Digital Monitoring Systems. The use of digital monitoring systems in production risk management provides several important benefits. First, human-related errors are significantly reduced due to the automation of control processes. Second, early detection of hazardous situations reduces the likelihood of accidents and production failures. Third, production continuity is ensured, minimizing economic losses.

These systems are particularly effective in high-risk industries such as food production, chemical and pharmaceutical industries, energy, and mechanical engineering. Their implementation increases compliance with occupational safety requirements and serves as a key factor in ensuring industrial safety.

Conclusion

The analysis shows that the use of digital monitoring systems is of significant scientific and practical importance for the effective management of production risks. These systems enable the real-time detection, assessment, and control of technical, technological, and human-related hazards in the production environment. As a result, the development of hazardous situations is prevented, and the risk of accidents and production failures is significantly reduced.

The implementation of digital monitoring systems not only ensures occupational safety and industrial security but also contributes to the continuity and stability of production processes. Furthermore, automated monitoring and analytical mechanisms expand the ability to make management decisions based on scientific data while minimizing human-related errors.

In summary, the introduction of digital monitoring systems in industrial enterprises and their integration with existing risk management systems is one of the most effective and promising approaches to ensuring production safety. Widespread adoption of this approach contributes to enhancing industrial safety and supporting sustainable development.

References

1. ISO 45001:2018. Occupational health and safety management systems — Requirements with guidance for use. International Organization for Standardization, Geneva.
2. ISO 31000:2018. Risk management — Guidelines. International Organization for Standardization, Geneva.
3. Kuznetsov A.V., Smirnov I.P. Industrial Safety and Risk Management. — Moscow: Infra-M, 2021. — 256 p.
4. Ivanov V.N. Digital Technologies in Production Safety Management // Industrial Safety. — 2022. — №4. — P. 15–20.
5. Lee J., Bagheri B., Kao H.A. A Cyber-Physical Systems Architecture for Industry 4.0-Based Manufacturing Systems // Manufacturing Letters. — 2015. — Vol. 3. — P. 18–23.
6. Xu L.D., Xu E.L., Li L. Industry 4.0: State of the Art and Future Trends // International Journal of Production Research. — 2018. — Vol. 56(8). — P. 2941–2962.
7. Karimov A.A., Rakhmonov B.T. Fundamentals of Occupational Safety and Security Management in Industrial Enterprises. — Tashkent: Fan va Texnologiya, 2020. — 180 p.
8. Jabborov S.Sh. Monitoring Production Processes Based on Digital Technologies // Uzbekistan Technical Journal. — 2021. — №6. — P. 42–47.
9. World Economic Forum. Global Lighthouse Network: Insights from Advanced Manufacturing. — Geneva, 2020.
10. GOST 12.0.230–2007. Occupational Safety Management System. General Requirements.