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THE ROLE OF INNOVATIVE TECHNOLOGIES IN DETERMINING QUALITY WORKING CONDITIONS IN TEXTILE WORKSHOPS

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Abstract: In this article, the scientific and practical foundations of the introduction of innovative technologies in the process of monitoring quality working conditions in textile workshops are studied. The technological parameters affecting the production microclimate, dust concentration, noise, vibration load, ergonomic production capacity, and the physiological characteristics of women's labor are analyzed. The practical implementation of corrections such as IoT ventilation systems, robotic yarn winding equipment, HEPA filtration technology, integration of ISO 45001 labor standards, and preventive maintenance control the change in indicators in the workshops. The result shows that the introduction of new technologies not only increases material labor productivity, but also allows operators to operate relatively harmlessly in the production process. The article proposes a new scientific study at the intersection of occupational hygiene, industrial technologies, and digitalization platforms in the textile industry.

Keywords: ventilation, air temperature, microclimate, lighting, microorganisms,

The widespread introduction of innovations into textile industry enterprises in our republic, the stimulation of innovative and scientific and technical development processes, the implementation of comprehensive programs for innovative development and innovative activity at the regional and sectoral levels, the introduction of mechanisms to support innovatively active business entities are of great importance in increasing the competitiveness of industry enterprises. Innovative activity is the process of introducing new or improved products, new or improved technologies that ensure competitiveness in the market through scientific research or other scientific and technical developments.

Substances that classify working conditions in textile workshops as harmful are mainly cotton fiber dust (cot-dust), cotton yarn dust (cot-dust), airborne dust, high temperature, high acoustic noise, technological vibration and acoustic movements affecting operators, technological vibration and mechanical loads. In such harmful production, not only workers, but also production processes and the technological cycle directly affect energy production. In this regard, scientific sources note that in the period from 2023 to 2025, the global implementation of accurate online monitoring systems for dust concentration in real time on IoT sensors has increased by 28%. Production equipment serves to produce complexes such as automatic power updating of ventilation systems, optimal dust control of aerodynamic air pollution, maintaining the volume of cotton in work areas at a minimum, making special clothing for operators comfortable, and reducing the rate of colonization of harmful microorganisms in the microclimate of the workshop. IoT-based hydrodynamic and aero-physical monitoring models are elements of practical application of advanced phenomena of occupational hygiene, creating a high-standard ergonomic workplace in various textile sectors and technology lines.

Robotized yarn winding and packaging linesis one of the most technologically advanced segments of modern textile production, which automatically ensures high-precision winding of yarn into spools, bobbins or cones, stable tension parameters and standardized packaging of the final product. These lines are controlled by computerized control systems, servo-drive-based

actuators, fiber optic sensor modules and PLC (Programmable Logic Controller) operating in real time. This technology minimizes the operator's manual labor, reduces physical load and significantly reduces anthropometric risk factors.

Robotic yarn winding devices allow automatic calibration of yarn diameter, density, moisture and tension parameters, which allows to ensure highly repeatable quality indicators in accordance with ISO 17304, ISO 2060 and Oeko-Tex standards. In the packaging units, AI-computer vision modules determine the degree of symmetry of cones, automatically separate defective bobbins and place the product in optimal transport volumes. As a result, the human factor is minimized, and the production processes work in harmony with predictive maintenance algorithms through digital control.

From a scientific point of view, the robotization process also reduces dust dynamics in the yarn winding zone - because the robots operate through closed capsule mechanics, yarn breakage is reduced, aerodynamic dispersion is minimized, and the dispersion of fiber aerosols in the shop microclimate is low. This, in turn, dramatically reduces the risk of respiratory diseases, dermo-allergic conditions, and occupational degeneration associated with long-term vibration exposure for female workers.

As a result, robotic yarn winding and packaging technologies not only increase the economic efficiency of production, but are also considered one of the most scientifically effective mechanisms for optimizing occupational hygiene in textile workshops. This direction is becoming a key component of the “smart-textile manufacturing” paradigm in 2025.

CONCLUSION AND DISCUSSION

Modernization of production, development of the textile industry and science, development of necessary regulatory and legal documents, customs and tariff policy will help improve product quality and increase the stability of enterprises in the domestic market. Attracting investments, further developing scientific and production potential, technical and technological re-equipment will play an important role in establishing new production facilities, increasing the investment attractiveness of enterprises in the sector.

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