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THE IMPACT OF LIGHTING CONDITIONS IN MACHINE-BUILDING WORKSHOPS ON THE FUNCTIONAL STATE OF WORKERS

Xaytbayeva Z. M.
Xadjayeva U. A.
Umedova M. E.
Tashkent State Medical University

The machine-building industry is characterized by high precision, continuous attention, and complex technological operations. During turning, milling, pressing, and assembly processes, workers often handle small parts, fast-moving mechanisms, and operations requiring complex visual control. Therefore, lighting conditions are considered one of the leading factors determining not only work comfort but also the functional state of workers.

The results of international and local scientific studies show that when lighting levels do not meet established standards, visual strain, rapid fatigue, and the frequency of production errors increase. According to scientific sources, 80–90% of the information perceived by humans is processed through the visual analyzer. Under insufficient lighting conditions, the visual system operates in a compensatory strain mode, which leads to rapid fatigue of the central nervous system and a decrease in work capacity. In machine-building workshops, such conditions may result in an increase in technological errors and occupational injuries.

Lighting conditions and visual analyzer activity. According to literature analysis, in machine-building workshops with low illuminance levels, the strain on the visual analyzer increases significantly. This condition is explained by constant tension of the eye muscles, the need for frequent refocusing, and difficulties in distinguishing contrast. Studies indicate that when illuminance does not comply

with standards, workers experience visual fatigue and decreased attention more rapidly.

Central nervous system and overall functional state. Lighting conditions affect not only the visual system of workers but also the functioning of the central nervous system. Working under poor-quality lighting is associated with rapid fatigue, a decrease in reaction speed by the end of the work shift, and psycho-emotional strain. Scientific studies report that in workshops with optimal lighting, workers' functional state is more stable and labor productivity is higher.

Comparative effects of artificial and natural lighting. Natural lighting is biologically favorable and supports circadian rhythms. However, due to the structural characteristics and technological layout of machine-building workshops, natural light is often insufficient. Artificial lighting allows control of illumination levels, but when improperly organized, glare effects and uneven lighting may negatively affect functional state.

The analysis confirms that lighting conditions in machine-building workshops are a significant hygienic factor determining the functional state of workers. The obtained data are consistent with previously conducted ergonomic and physiological studies, demonstrating that visual strain and rapid fatigue predominate under insufficient lighting conditions.

Additionally, the reviewed sources emphasize that optimal lighting conditions reduce the risk of production errors and occupational injuries. This highlights the necessity of considering lighting in the machine-building industry not only as a technical issue but also as a hygienic and physiological problem.

The literature review on the impact of lighting conditions in machine-building workshops on the functional state of workers allows the following conclusions to be drawn:

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- Lighting conditions directly affect the activity of the visual analyzer and the central nervous system, thereby determining the functional state of workers.
- Under lighting conditions that do not meet established standards, rapid fatigue, decreased attention, and reduced labor productivity are observed.
- The combination of natural and artificial lighting is the most optimal hygienic solution for stabilizing functional state and improving occupational safety in machine-building workshops.

The scientific assessment and optimization of lighting conditions in machine-building workshops remain an integral part of protecting workers' health and increasing production efficiency.

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