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Development of Preventive Measures to Eliminate Incomplete Factors in Shoe Manufacturing Enterprises

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Abstract

This research paper describes the development of footwear to optimize the working conditions and maintain the working capacity of workers in Uzbekistan, to raise production to a higher level, to attract future young professionals to these enterprises, to provide them with harmless and comfortable jobs, to bring labor protection in line with world standards. The results of the study of unfavorable factors of production at extractive enterprises and preventive measures to eliminate are described and conclusions are given.

Keywords: *Footwear; Production; Inconvenience; Prevention; Precaution; Labor; Workers*

Introduction

At modern times, protection of the manufacturing environment from adverse factors is one of the important tasks of every state. The development of science and technology, the introduction of new modern technologies is ahead of scientific research on their impact on the human body, which in turn complicates the development of modern preventive measures in this area. The introduction of new techniques and technologies, machinery and equipment in manufacturing of modern footwear, on the one hand, increases labor productivity, facilitates the type of manual work and eliminates communication with harmful and dangerous factors, on the other hand creates previously poorly studied or not-studied production factors. At the same time, the complex of chemical and physical factors that create unfavorable working conditions has a real impact on workers' health, and even deepening can lead to serious consequences in the body. This leads to an increase in the share of mentally and emotionally strained labor, and the production of footwear is one of the most pressing issues for enterprises, reflecting the importance of mechanized type, is manual labor, along with modern technological methods (Normatova: 2020).

A large number of modern technical devices and equipment are currently used in the footwear industry, but the results of a comprehensive hygienic assessment of the factors affecting employees in the main profession in these conditions proved to be "harmful" 2-3 class 3 in terms of severity and severity of working conditions (Morgacheva: 2007).

One of the main directions of modern organization of shoe manufacturing enterprises is the introduction of new artificial and synthetic leather tanning equipment and the use of chemicals in the gluing process, which is carried out through the preserved manual labor, causing pollution of workplaces with chemicals. In this regard, chemical contamination has been highlighted by scientists as a hygienic problem as a harmful leading factor in shoe manufacturing enterprises (Gvozdev: 2003; Prokhorov: 2002).

In order to protect the health of workers in these harmful working conditions, new directions, methods of protection and labor management criteria are being developed, including raising awareness of workers on occupational safety, familiarization and training with new methods of health, taking measures to ensure employee safety (Karnaukh: 2002).

Failure to implement the above measures in a timely manner in the footwear industry leads to various pathological changes in the body of employees, functional disorders in organs and systems and, consequently, the development of general, occupational diseases. In a number of research works, cardiovascular diseases, neurological and pulmonary diseases, skin diseases, diseases caused by fatigue of visual and auditory analyzers are becoming more common as a result of the negative impact of physical, mental and emotional factors along with chemical factors (Azizova: 2020; Bogdanov: 2012; Bondarenko: 2013; Kolpakova: 2009; Kosolapova: 2013).

The aim of the study is to develop preventive measures aimed at reducing the impact of production factors on the working conditions and functional status of workers in footwear enterprises.

Research Materials and Methods

The object of the study was selected from 40 out of 520 employees of the factory "UzSalaman" in Fergana in 2015-2017, 40 key professionals.

The subject of the study were materials on the sanitary and hygienic condition of the shoe factory, the mode of work and rest, occupational hazards in the workplace, the functional status of the main systems and analyzers of the organism. Sanitary-hygienic, physiological, analytical and medical statistical research methods were used to perform the tasks.

Results and Their Discussion

The main harmful production factors in the studied production are noise, vibration, chemical organic solvent vapors, heating microclimate, animal skin dust and others. The highest levels of production noise were found in the workplace of tailors and shoemakers from professional groups (98 and 102 dBA). Production noise in the workplaces of shoemakers and assemblers is slightly lower and does not exceed the permissible level (80 dBA). According to the hygienic description of the noise, it is mainly of a permanent nature and is comprehensive, the whole work has a uniform effect on the body of the worker during the shift. When analyzing the composition of the production noise, i.e. the spectral characteristics, the most intense noise in the workplaces of shoe cutters and collectors was detected at high frequencies (2000-8000 Hz).

Another factor of the production environment in the production of footwear is the heating microclimate. The reason for the large amount of heat dissipation is the hot-wet processing of shoe parts, the lack of natural ventilation in some production facilities, the irrational placement of rapid heating equipment, the failure of ventilation equipment in some production facilities, insufficient humidification (conditioning). Due to the microclimate conditions in the sewing and assembly shops of the Fergana shoe factory, the air temperature exceeds the upper limit of the allowable sizes in the warm and cold periods of the year. For example, in the warmer months of the warm period (July, August), the average air temperature in the workplace reaches 32.2 - 36.5 ^{0}C, relative humidity up to 40% and air velocity - 0.1 m / s. In the cold periods of the year, the air temperature in the assembly shop of the shoe factory was higher than the maximum allowable temperature of 5.0 ^{0}C.

Microclimate indicators (parameters) in the workplace depend to some extent on the weather (meteorological) conditions in the environment. It was found that the ventilation and air conditioning system installed in the main workshops is not effective enough during the hot months of the year (July-August). Thus, the heating microclimate with high convection and radiant heat, relative humidity and low air movement speed remain characteristic for shoe manufacturing enterprises.

Air samples taken to determine the amount of chemical organic solvent vapors and dust in the air of workplaces showed that they exceeded the permissible amounts in the preparation and sewing shops, which are the main shops of the shoe manufacturing plant. In the technological process of shoe production, 17 chemicals were identified in the adhesives used in the shoe gluing phase: acrylonitrile, ammonia, chromic anhydride, acetone, gasoline, benzene, butyl acetate, vinyl acetate, vinyl chloride, dibutyl phthalate, xylene, styrene, acid, styrene, toluene, toluene, chloroprene, ethyl acetate. The amount of gasoline, butyl acetate, acetone, ethyl acetate in the form of vapors from chemicals is 1.5, 2, 1.5 and 0.2 times higher than the normative values in the air of the main workplaces of the preparation and sewing shops of the enterprise. Unfavorable factors of the footwear production environment include production dust, which is partly a mixture of chemical synthetic fibers, mainly organic (leather, wool, cardboard) dust. According to the research, in all shops of the shoe factory more dust particles of 5-10 μm (44.4-65.4%) were detected, and in the assessment of their quantitative indicators, it was observed that they exceeded the allowable level in the sewing and sewing shops. The highest concentrations of dust were observed in the sewing and sewing shops, with averaging 8.6 and 10.6 mg / m^3, respectively. The amount of dust blown into the air of the remaining workplaces did not exceed the allowable amount. The levels of illumination in the studied production were assessed according to the types of labor activity of the employees working in the enterprise. The main work performed by workers in the production of footwear is related to the visual work of III-IV categories, which includes high and medium precision types of work. Checking the level of lighting in the main shops of the enterprise showed that the workplaces are adequate and flat during the work shift. In the workplace, the magnitude of the mixed natural illuminance coefficient (MLC) was within the norm according to the current rule and amounted to 0.98%, compared to 1.2%.

Thus, depending on the quality and quantity of harmful and hazardous factors, the working conditions of the main occupational groups were generally assessed according to the hygienic classification of the main occupational groups: the working conditions of cutters, procurers and dressmakers from the professional groups were proved to be 1st and 2nd degree, as the 3rd class was ‘harmful’.

Sanitary and hygienic research is characterized by noise, vibration, chemical organic solvent vapors and dust above the permissible level, high temperatures in the warm season, adequate level of lighting, taking into account the professionalism and labor characteristics, forming a complex of production factors.

The next stage of the research work was to assess the functional status of the body of workers in the main workshops of shoe production. Examination of the dynamics (changes) of physiological functions of the body of workers showed the development of reactions in the body under the influence of the heating microclimate during the working day in the sewing and assembly shops of the shoe factory. This was manifested by changes in skin temperature, its indicators are often physiological changes, that is, they go beyond the normal state. These changes were observed throughout the working day, both on warm and cold days of the year. In particular, the temperature of the forehead in comfortable (pleasant) conditions was 33.3 ºC, the skin of the heel - 30.2 ºC, the skin of the palms - 32.5 ºC, the temperature of the forehead and chest in the first half of the working day was convincingly high: 1.3 on the forehead. ºC, in the chest - 1.0 ºC, in the heel - 3.0 ºC ($P < 0.05$). At the end of the work shift, an increase in skin temperature was also observed: 0.8 ºC on the forehead, 1.0 ºC on the chest, and 3.0 ºC on the heel. According to these data, a flattening of the skin temperature was detected, indicating the stress of the heat-separating mechanisms and the accumulation of heat in the body.

In the course of labor activity, workers experienced changes in the activity of the cardiovascular system (CVS) during the working day, which intensified at the end of the first and second half of the working day. A distinctive feature of the functional changes of the working organism CVS was the significant utilization of functional reserves without going beyond the norms of functional activity of the organism. During the warm period of the year, changes in YUTS were particularly evident among the workers of the assembly shop. The number of heartbeats increased to 83 beats per minute at the end of the working day, the maximum blood pressure to 118-120 mm Hg, and the minimum blood pressure to 69 mm Hg, i.e., mostly within the range of physiological changes. The stroke volume was 60.5 ml before the start of work, 62.0 ml before the lunch break, and decreased to 60.0 ml at the end of the work shift. The minute volume of blood also increased during the lunch break and returned to baseline at the end of the working day, at 5440.9 l and 4825.9 l ($P < 0.05$), respectively.

In the cold period of the year, the same workers CVS examination showed a tendency for the pulse to accelerate, raising blood pressure (AB) during the working day under relatively favorable conditions.

More serious changes were noted in the functional state of the central nervous system. However, these changes were detected in both the cold and warm seasons of the year. In particular, at the end of the working day, the rate of visual and auditory reactions increased convincingly, indicating a decrease in the functional mobility of the central nervous system. This situation was particularly evident in seamstresses and shoe collectors, whose work activities were related to visual strain. By the end of the working day, the visual response increased by 30% in collectors and by 25% in cutters ($P < 0.05$). The visual-motor response in collectors from the main professional groups of the shoe manufacturing enterprise was 30% longer than the latent period background indicators.

The functional state of the nervous system of the working organism, muscle endurance, functional state of vision and hearing analyzers were also characterized by the gradual development of fatigue with a gradual increase in fatigue towards the end of the working day. During the colder period of the year, these figures rose further at the end of the work shift, showing an average of 26% higher than the initial sizes. It was concluded that footwear workers develop a state of fatigue that is more pronounced in the second half of the work shift and in the warmer months of the year. The highest changes in the functional state of the working organism, which occur as changes in the activity of heat exchange control in the body under the influence of a warming microclimate, were noted in seamstresses and shoemakers from the main professions. In addition, regional physical loads, which determine the weight of labor, led to changes in the state of forced labor, the position of the visual analyzer of labor tension, the state of muscle endurance.

Conclusions

1. Employees of shoe factories are exposed to unfavorable production factors: rapid noise, unfavorable microclimate, dusty air.

2. Functional stress in the body of workers is characterized by the specific conditions of the production process: high-speed work, conveyor performance, irrational organization of work and rest (breaks), high noise, dust, insufficient some jobs illumination is affected.

3. Age, length of service, health status, work experience, practical skills are of great importance in the full implementation of technological operations.

4. A state of functional stress is formed in the organs and systems of the body of workers working in the sewing and sewing shops of shoe production. This has led to the early onset of signs of extreme fatigue, slowing down the adaptation process, depending on the length of service and working age due to the irrational organization of labor.

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