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HYGIENIC ASSESSMENT OF MICROCLIMATE INDICATORS OF SPINNING PRODUCTION

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Abstract
In order to minimize the adverse impact of working conditions on workers in the spinning industry, the labor protection and safety services of the spinning industries, under the supervision of the bodies of the committee for sanitary and epidemiological welfare and public health, must implement a set of measures to improve (or optimize) working conditions. According to Sanitary Rules and Norms №0324-16, the air temperature in workplaces during the warm period of the year should not exceed 31°C with a relative humidity of no more than 55% and a mobility of 0.3 - 0.5 m / sec. To protect the body of workers from unfavorable microclimatic indicators (excess heat, low levels of RHV), spinning shops must be equipped with modern climate control mechanisms for regulating the temperature and humidity conditions.

Keywords. Microclimate indicators, spinning production, working conditions, occupational hygiene.

Introduction

In the world, the textile industry is one of the important industries for the economy of every country. Workers in the textile industry are exposed to a number of chemicals, including dyes, solvents, optical brighteners, finishing agents, and many natural and synthetic fiber dusts that are harmful to their health [7]. One of the factors affecting the technological process in textile enterprises is the microclimate in the enterprise [5].

According to the International Labor Organization (ILO), more than 2.3 million people worldwide suffer from occupational accidents and diseases every year, and thousands of people die every day from occupational accidents [2]. Textile processing generates a large amount of waste, including hazardous liquid, gaseous and solid waste [8]. The number of workers employed in the textile industry worldwide is about 60 million, and in the textile and knitwear industry of Uzbekistan, this figure is 76.8 thousand, more than 70% of whom are women [3]. There is a sufficient amount of work by foreign researchers devoted to studying the impact of working conditions on the health of employees of textile enterprises. The production factors affecting the morbidity of textile workers in Ethiopia, Pakistan and India (dust, high noise, hot microclimate and low lighting) were assessed [6,9].

A number of scientific studies are being conducted around the world to study the impact of harmful factors in production on the health of workers, including on the example of spinning enterprises. In this regard, studies aimed at studying the following unfavorable production factors in spinning enterprises, including cotton dust (sorting shop), heating microclimate, production noise, lack of lighting, working day density (86-90%), forced state of the body and assessment of bacterial contamination of the air, sanitary-hygienic, physiological, immuno-microbiological aspects, are of particular scientific importance [1]. Almost all workers are exposed to production hazards that can lead to pre-pathological and pathological states of the body, including occupational diseases.

The purpose of the research is to assess the working conditions of the workers of the spinning enterprise and to develop preventive measures.

Materials and methods of research. The research was carried out in the Bukhara production cluster of Ark Eco Textile LLC from 2022 to 2023. Ark Eco Textile LLC is located in Bukhara, Bukhara region, with a total usable area of 20 thousand m2. The following factors were studied in the workplaces of the main workshops (spun, carding, spinning and processing): microclimate indicators (air temperature, relative humidity and air velocity), lighting, dustiness and industrial noise. Measurements were carried out in the spun, carding, spinning and processing workshops before, during and after work.
One of the leading factors of the production environment is the microclimate indicators, the measurement was carried out on the machine, at a distance of 1 m from the machine and at a distance of 10 m from the machine. The microclimate indicators were assessed in accordance with the Decree of the Government of the Republic of Uzbekistan No. 0324-16 [4]. Temperature, relative humidity and air velocity were measured at a height of 1.0 m from the floor or work platform when working in a sitting position, and at a height of 1.5 m when working standing. To measure temperature, air humidity and air velocity in spinning workshops, a digital thermohygrometer "TKA-PKM" (66) "METEO" made in Russia was used. For all categories of work, the change in air temperature along the height of the workplace is allowed up to 3°C. Air temperature changes horizontally in the workplace, as well as during the shift, are allowed up to 4 ° C for light work, up to 5 ° C for medium work and up to 6 ° C for heavy work.

Research results. The work performed by workers at the spinning mill is classified as category IIb (energy expenditure from 200 to 250 kcal/hour, the labor process is associated with walking, lifting small weights (up to 10 kg) and is accompanied by moderate physical exertion).
The results of the microclimate research of the examined sexes are shown in Figure 1. The average air temperature from the beginning to the end of the working day was 28.9 to 36.5℃ in the carding shop, 28.4 to 32.5℃ in the carding shop, 29.9 to 33.3℃ in the spinning shop, and 29.7 to 36.1℃ in the processing shop (Table 1). According to Sanitary rules and regulations No. 0324-16, the optimal air temperature is 22-24℃, and the upper limit of the permissible temperature for permanent workplaces is 30℃, and for non-permanent workplaces is 31℃.

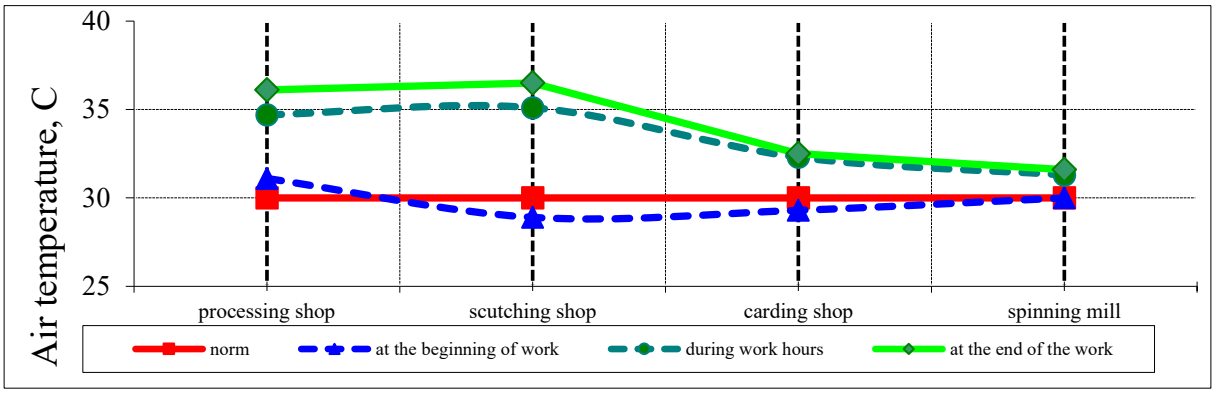

Figure 1. Air temperature (°C) in the workshops of Ark Eko Tekstil during the warm season

Therefore, according to the "air temperature" indicator, working conditions in various spinning workshops inspected in the summer period of the year do not meet hygienic standards, the air temperature significantly exceeds the norm, in the hot season the air temperature is considered unfavorable for spinning and is one of the harmful production factors. The relative humidity of the air in the processing and combing workshops during the hot season of the year does not meet hygienic standards during work and at the end of work, it is lower than the norms.

The study of the relative humidity of the air showed that in the combing workshop at the beginning, during work and at the end of work it is on average from 35.6 to 50.7%, in the carding workshop from 45.1 to 57.8%, in the spinning workshop from 42.5 to 54.8%, in the processing workshop from 22 to 45% (Table 1). According to Sanitary rules and regulations No. 0324-16, the optimal relative humidity level for work of medium difficulty IIa in the warm period of the year is 40-60%.

Table 1 Relative humidity (%) in the Ark Eko Tekstil workshops during the warm season

Workshops	Relative air humidity, %		
	Near the machine	1 m from the machine	10 m from the machine
	at the beginning of work		
Processing	45,7±0,30	51,2±0,18	44,2±0,26
Scutching	49,8±0,22	50,6±0,22	45,0±0,22
Carding	55,7±0,19	55,6±0,19	57,6±0,27
Spinning	53,6±0,29	54,3±0,21	54,2±0,24
	during work hours		
Processing	28,4±0,24*	28,9±0,16*	28,8± 0,32*
Scutching	36,2±0,21*	37,9±0,2*	44,4±0,21
Carding	51,7±0,15	53,4±0,17	51,3±0,21*
Spinning	54,1±0,19	54,9±0,21	48,5±0,17
	at the end of the work		
Processing	22,5±0,25*	21,8±0,21*	22,3±0,44*
Scutching	30,6±0,15*	29,7±0,28*	35,6±0,18*
Carding	47,4±0,35*	47,4±0,35*	46,5±0,15*
Spinning	54,8±0,24	54,6±0,32	45,1±0,15*

In the inspected workshops, air mobility was not significant (Table 2) and different indicators were observed from the beginning to the end of the working day: in the processing workshop from 0.02 to 0.21 m/s, in the carding workshop from 0.02 to 0.28 m/s, in the carding workshop from 0.02 to 0.19 m/s, in the spinning workshop from 0.02 to 0.06 m/s (According to Sanitary rules and regulations No. 0324-16, the optimal air mobility in the hot season does not exceed 0.3 m/s, the permissible is 0.4-0.7 m/s).

Table 2 Air velocity (m/s) in the Ark Eko Tekstil workshops during the warm season

Цех	Air movement speed, m/sec		
	Near the machine	1 m from the machine	10 m from the machine
	at the beginning of work		
Processing	0,03±0,01	0,12±0,01	0,02±0,01
Scutching	0,02±0,01	0,03±0,01	0,04±0,01
Carding	0,02±0,01	0,04±0,01	0,04±0,01
Spinning	0,03±0,01	0,03±0,01	0,02±0,01
	during work hours		
Processing	0,02±0,01	0,02±0,01	0,07±0,01
Scutching	0,07±0,01	0,16±0,01	0,09±0,01
Carding	0,21±0,01	0,06±0,01	0,04±0,01
Spinning	0,12±0,01	0,04±0,01	0,03±0,01
	at the end of the work		
Processing	0,02±0,01	0,02±0,01	0,21±0,01
Scutching	0,08±0,01	0,28±0,01	0,14±0,01
Carding	0,10±0,01	0,19±0,01	0,02±0,01
Spinning	0,01±0,01	0,06±0,01	0,04±0,02

In order to minimize the negative impact of working conditions on employees of spinning enterprises, the labor protection and safety services of spinning enterprises should implement a comprehensive set of measures to improve (or optimize) working conditions under the supervision of the Committee for Sanitary and Epidemiological and Public Health. In order to protect the body of workers from unfavorable microclimate indicators (excessive heat, low relative humidity), spinning enterprises should be equipped with modern climate control mechanisms to regulate temperature and humidity conditions. According to Sanitary rules and regulations 0324-16, in the hot season, the air temperature in workplaces should not exceed 31°C, relative humidity 55%, and mobility 0.3-0.5 m/sec. During the cold and transitional periods of the year, the air temperature should be 22-24°C, the relative humidity should be 40-60%, and the air velocity should not exceed 0.2 m/sec.

Conclusion

Thus, in accordance with Sanitary rules and regulations No. 0141-03 "Hygienic classification of harmful and dangerous indicators of working conditions, severity and intensity of labor processes", the working conditions of workers at the Ark Eko Tekstil spinning mill belong to class 3 of the 3rd level in terms of the set of production factors (dustiness, noise, microclimate, lighting, noise, severity and intensity of labor processes)..

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