Original Article

The Main Harmful Factors Of Flour Milling Production

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DOI: 10.47750/pnr.2022.13.S09.143

Abstract

Summary: The presented article is devoted to the new and relevant the direction in the grain processing industry.
The author gives a description of the main stages of the technological process of the flour milling industry. The analysis of the main indicators of unfavorable factors registered in the working area of production is carried out. An assessment of the microclimate, noise, and illumination in the workplace is given. All stages of the technological cycle of processing grain products into flour are affected by a complex of unfavorable factors of the production environment and the labor process.

Keywords: flour milling, microclimate, maximum permissible concentration, lighting, processing, technology.

Relevance:

Grain processing production occupies a predominant place among the spheres of the national economy, is the main supplier of grain products for the population, animal feed. At the beginning of independence, a reasonable strategy is being implemented in the country in the field of grain production development aimed at meeting the needs of the population. The President of the Republic of Uzbekistan, in order to increase the productivity of flour milling and continuously provide the population with bread products, issued UP-4947 of 2017, modernization and progressive development in the field of agriculture are planned. In the grain production system, the introduction of liberalization reform both in general and in particular. Permission has been given for sale on the trading exchange without restriction. The task of rational use of nature's gifts, environmental protection and reduction of public spending is set. A resolution was adopted to provide grain to the population of Uzbekistan on their own. Oblige the Ministry of Agriculture with the Ministry of Technology and Communication Development to monitor and monitor the cultivation of grain and sowing. To ensure the continuous development of grain production, it is necessary. raise the level of grain yield . Implement the cluster method. To double the land plot for wheat crops,. [1,2] increase grain productivity by 1.7 times. .Along with the improvement of production processes, it is necessary to improve the working hygiene conditions of the milling industry. Occupational hygiene by protecting flour mill workers from harmful factors, reduces occupational risk at work is not only the answer to solving social problems, but also questions to strategic categories. Employees of grain processing production working at all stages of the technological process of processing grain products are exposed to a complex of unfavorable factors of the production environment and the labor process. In developing countries, a relatively large number of people are employed in agricultural processing industries, and this creates the problem of exposure to plant dust (grain, cotton, tobacco, tea) it's more serious there (WHO 1993).[3,4,5]

Grain dust can also lead to the development of chronicbronchitis. Studies show that the component of grain dust responsible is endotoxin, which activates the complement leading to inflammation of the bronchi. A significant relationship was found between dust exposure and respiratory hyperreactivity. This may lead or be a predisposing factor to subsequent chronic irreversible airflow obstruction. The symptoms suggestive of chronic bronchitis or chronic productive cough were it was found in 29% of workers exposed to flour dust at a flour mill. Workers exposed to flour dust have a predominant cough, shortness of breath, wheezing and chest tightness were between 8% and 13%,

but there was 20% for rhinitis. Flour dust is also known to cause lung fibrosis, and two cases of mixed dust have been reported of fibrosis in a poorly ventilated flour mill Settings. Grain and flour processors and loaders can be exposed to grain, which can be colonized by various microorganisms (e.g., Sitophilus granarius) that are easily aerosolized. They are also at increased risk of infection for storing ticks and fungi. This exposure can lead to pneumonitis hypersensitivity. In occupational respiratory diseases, spirometry is one of the most important, widely used, basic, effort-dependent pulmonary functional test (PFT) and can measure the effects of restriction or obstruction of lung function.[6,7,8,9]

It was also established that the main factors forming harmful working conditions were industrial noise, unfavorable microclimate and the severity of labor, which is caused by a high physical dynamic total load involving the muscles of the arms, body and legs, maintaining uncomfortable and forced working poses, constant movement in the maintenance area of equipment and process control. Categories of suspected occupational health risk of employees according to the guidelines of the SanPiN RUzN 0141-03 are estimated from medium (significant) risk to high (intolerable), depending on the type of work performed. Dustiness of the working area air with grain dust and flour dust was determined as a priority risk factor for the health of flour mill workers. When assessing occupational risk according to periodic medical examinations, a reliable causal relationship of an average degree between factors of working conditions and respiratory diseases has been established, which indicates their professional conditionality.

The primary barrier to any environmental impact is the skin and mucous membrane of the upper respiratory tract, especially in persons working in conditions of complex, combined, combined influence on the body of unfavorable production factors. It is known that in flour milling, the main source of microbial air pollution is the product processed in this workshop: grains and when loaded for sales. This pollution begins with the first process along the technological chain, i.e. [10,11,12]

In the industry under consideration, the country has carried out huge structural changes aimed at further deepening economic reforms, creating new and modernizing existing production facilities, creating favorable conditions for attracting foreign investment, increasing the volume and expanding the range of products that are in demand and competitive on the world market. According to the conditions of gradual modernization of production facilities, the relevance of studying the complex impact of factors of working conditions on the health of workers, including morbidity, resistance of the body and the microflora of the skin of workers, determining the permissible length of service and the development of measures to optimize working conditions, is increasing.

MATERIALS AND METHODS To carry out research work on the topic comprehensive study of occupational hygiene of workers of the milling industry and to obtain reliable results, work was planned taking into account the ethical aspects of the work, a certain amount of research was carried out, the object and subject of the study were correctly selected, as well as the number of observations was sufficient for statistical analysis. In this regard, we considered it appropriate to elaborate on the design, scope, materials and methods of this study.

The study of the work was carried out in 3 stages.

Stage 1. Summarizing the purpose and task of the study, the scope and object of research were chosen, observing all the principles of evidence-based medicine. A descriptive method was chosen to recognize the problem and confirm the hypothesis. This method is used to identify new health-related problems, to monitor changes in data over time, as well as to search for the etiology of diseases. This descriptive method helps in forming a hypothesis about morbidity. In the presented work, the hypothesis of the method of differences was applied, since the prevalence of diseases among employees of the same enterprise varies depending on the degree of employment, constancy and frequency of their physical work.

Representativeness, i.e. the correspondence of the characteristics of the sample of patients to the general characteristics of the population, was also taken into account. This concept determines the possibility of generalizing the data obtained taking into account a specific sample from the entire analyzed general population under study.

Stage 2. Based on the above concepts of evidence-based medicine, sanitary and hygienic laboratory studies were carried out to determine and assess dustiness, gas contamination and illumination, noise, temperature, humidity, workplaces of flour mill workers from 2020 to 2022.

Stage 3. At this stage, all the materials received were thoroughly analyzed, systematized and prepared for statistical analysis. Then the data were subjected to statistical processing using methods of variational statistics. At the same time, attention was paid to the reliability of the results, obtaining reasonable conclusions and practical recommendations based on them.

The work determined such factors as: temperature, humidity, illumination, gas contamination, dustiness and noise in the workshops. 126 measurements were carried out for each factor and a total of 1,296 studies were conducted. Measurements were carried out at the beginning of work, during work and at the end of the working day at all stages of the technological process in the departments: forming (elevator), cleaning, grinding (mill), sorting, screening (movers),.The study failed on the basis of SanPiN RUzN 0141-03 are assigned to the second and third degree of harmfulness (classes 3.2 and 3.3).

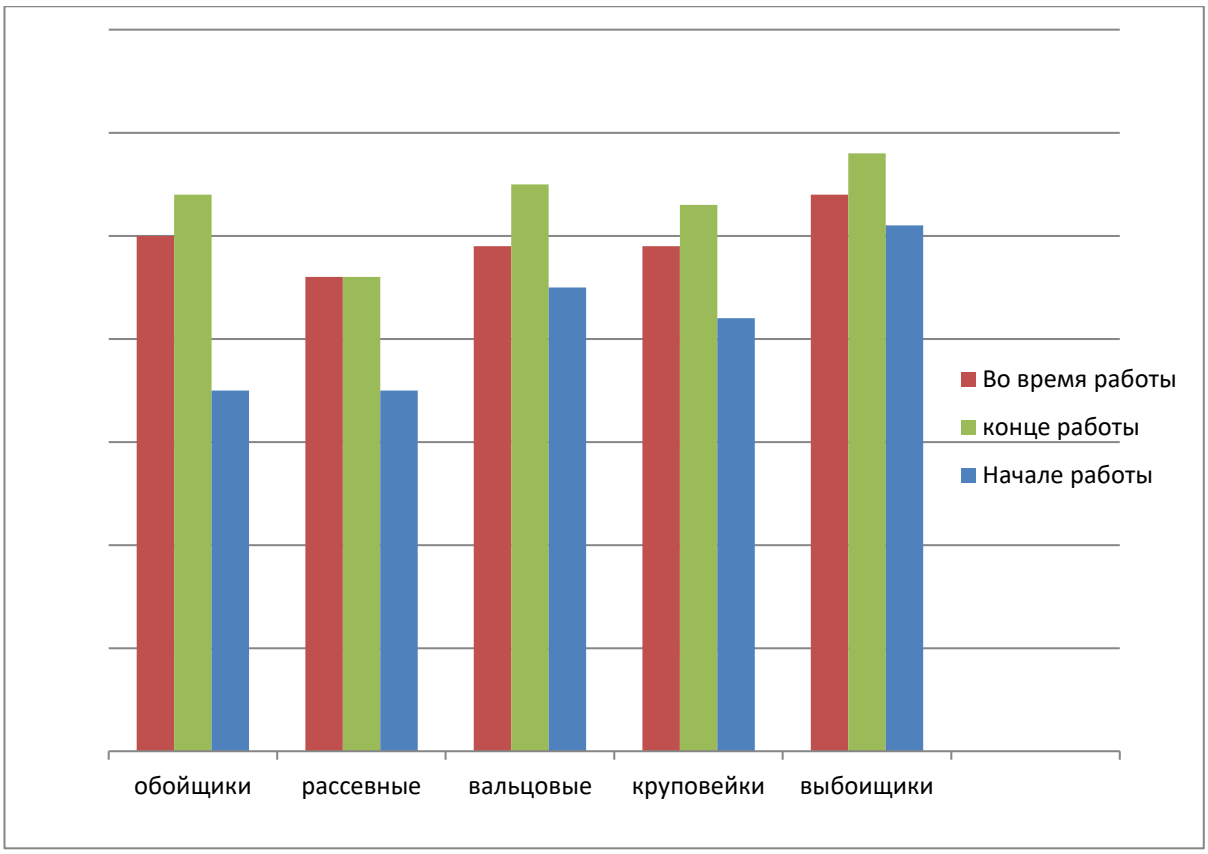
We carried out control of dustiness of the air of the working area of flour milling production on the basis of SanPiN RUz No. 0293-11 “sanitary and hygienic permissible concentrations of dustiness of the air ”, GOST 12.1.005-88 “Assessment of sanitary and hygienic permissible levels of the chemical composition of the room air.” measurements of dust content in the air of the flour mill were made at all stages of the technological process. The air intake was taken in the working zone at the breathing level, the place of permanent residence (1 m closer to the machine) and not a permanent place of work (10 m from the machine.) at the beginning of working hours, in the middle of work, after finishing work. Determination of dustiness of air is carried out: measurement of dustiness by methods based on preliminary deposition, i.e. by weight or optical, radioisotope or piezoelectric methods. The measurement was carried out by a special device "PRIZ-2"

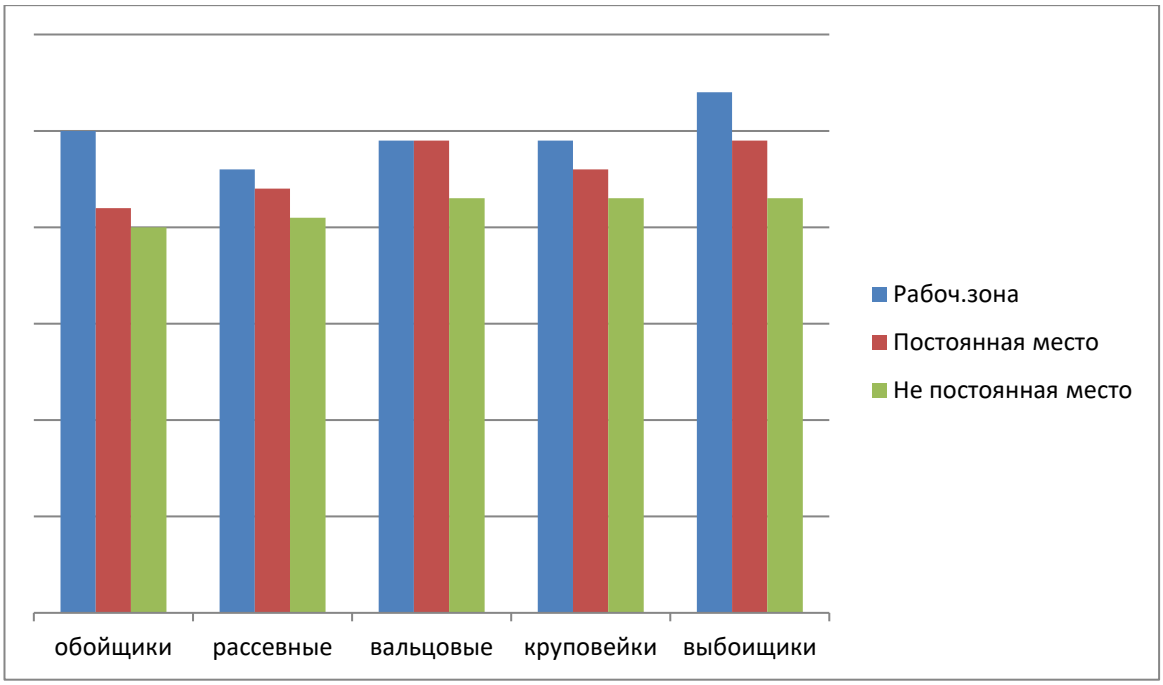
Results of the study

The measurement is designed for each analysis in the air of the working area, i.e. taking into account its quantitative content, which, with daily (except weekends) work for 8 hours or for another duration, but not more than 40 hours a week, during the entire working experience, cannot cause diseases or deviations in health.

Dust content indicators of these workshops in flour milling production in mg/m3

Name of workshops	at the beginning of the work			During operation			end of work	
	Above the machine	1 m closer to the machine	10 m closer to the machine	Above the machine	1 m closer to the machine	10 m closer to the machine	Above the machine	1 m closer to the machine
upholsterers	3,5 ±0,056	3,5 ±0,056	3,0 ±0,056	5,0 ±0,060	4,2 ±0,050	4,0 ±0,04***	5,4 ±0,040	4,8 ±0,037
seedings	3,5±0,054	3,5 ±0,054	3,4 ±0,051	4,6±;.:0,05	4,4±0,0	4,1±0,051	4,6 ±0,04***	;.4,5±0,04
roller	4,5±0,052	4,5 ±0,052	4,4 ±0,051	4,9 ±0,054	4,9 ±0,054	4,3 ±0,05**	5,5 ±0,047	5,35 ±0,045
krupoveyki	4,2±0,05***	42 ±0,050	4,1 ±0,05**	4,9 ±0,052	4,6 ±0,052	4,3 ±0,05**	5,3 ±0,047	5,27 ±0,043
the selectors	5,1±0,050	5,2 ±0,050	4,9 ±0,049	5,4 ±0,055	4,9 ±0,054	4,3 ±0,05**	5,8 ±0,048	5,32 ±0,044
ПДК асно ГОСТ 005-88	The maximum permissible concentration of industrial dust is 6 mg/m3							



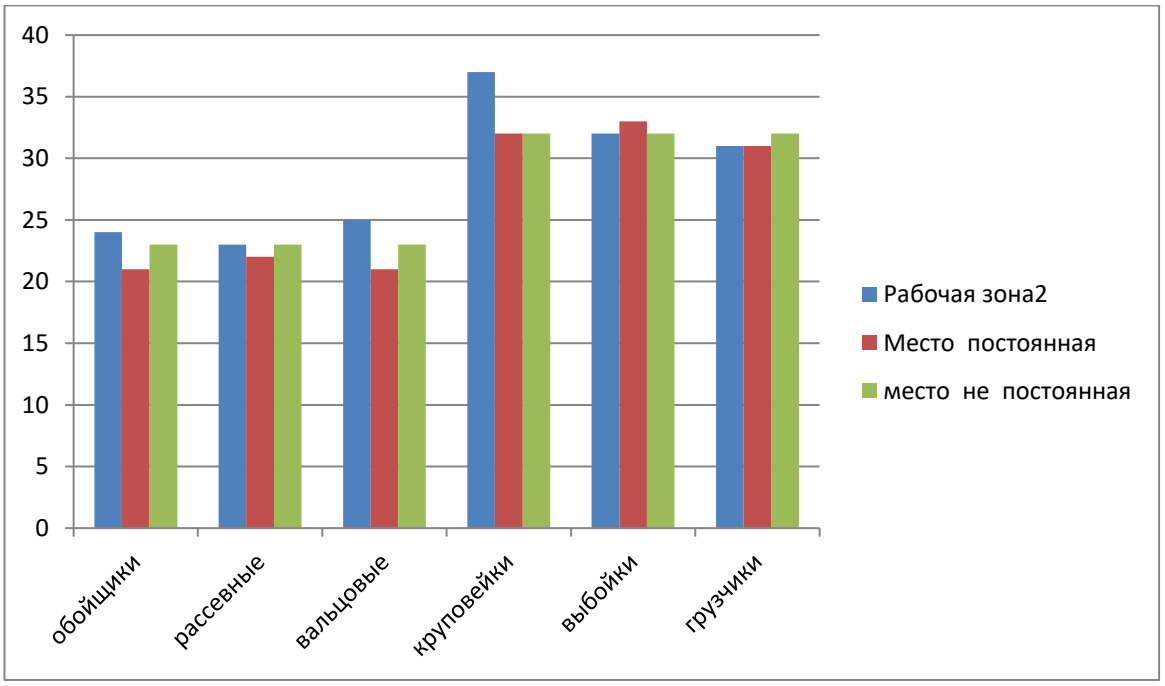


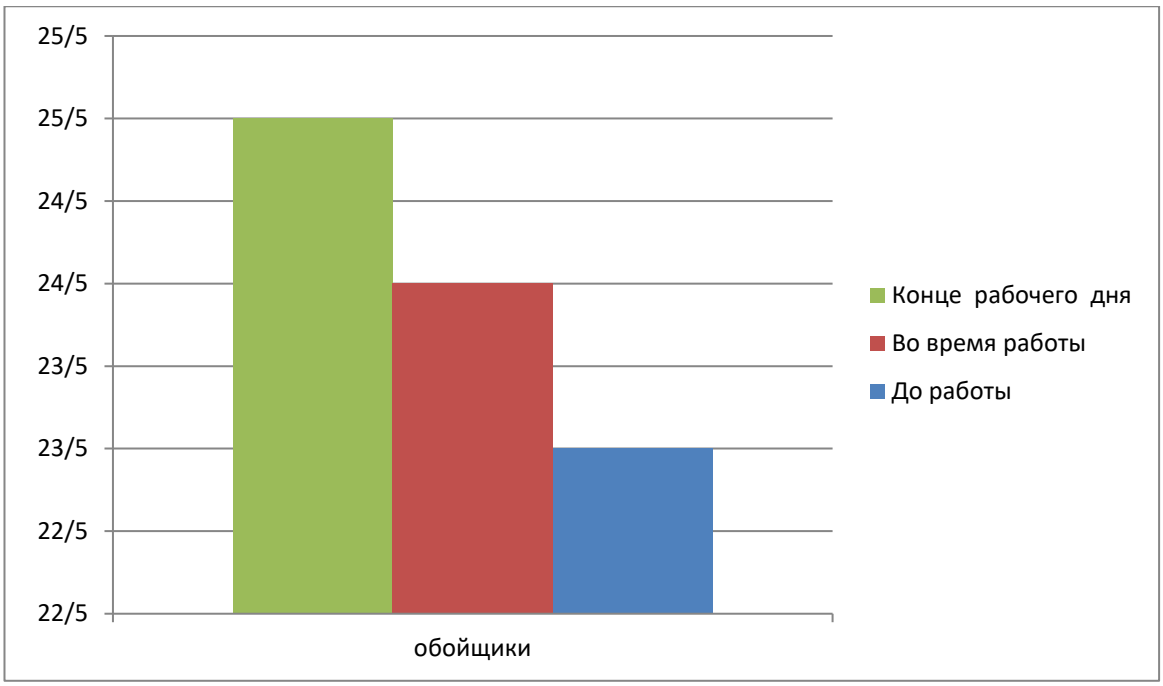
In the table, the dust level shows that before work, during work and at the end of work. The dust content of industrial premises ranged from 0.6 to 4.4 mg/m3, since the maximum dust content of these premises according to GOST 12.1.005-88 is allowed up to 4 mg/m3, in the roller shop these data ranged from 4 to 5 mg/m3. In the loaders' workshop, the dustiness of the premises ranged from 4 to 4.5mg/m3. In the sampling shop, dustiness in the working room was observed from 4 to 4.5mg/m3.In the screening shop, these data ranged from 3 to 4.6 mg/m3.In the upholsterers shop, the dustiness of the premises ranged from 3.5 to 4.5mg/m3 (see Table[6,7,8].

labor, unfavorable microclimate and lack of labor, which created a high dynamic physical load, with manual work and with the participation of the musculoskeletal system of the body, the workplace were carried out in the warm and cold season of the year during the shift at the beginning, end and middle of the working day, taking into account temperature loads at all stages of the working area. Based on SanPiN RUz No. 0324-16 “SanPiN of microclimate of industrial enterprises” The results of the research showed that a thermometer was used in the work to measure the temperature in the appropriate range of the microclimate of the air in the workplace a special device alcohol thermometer

Indicators of temperature data of workshops in the flour mill "Bukharadonmakhsuloti in the warm period of the year, ° C

Name of workshops в	at the beginning of the work			During operation			end of work		
	Working area	permanent Place	a non-permanent place	Above the machine	1 m closer to the machine	10 m closer to the machine	Above the machine	1 m closer to the machine	10 m closer to the machine
upholsterers	24,5 ± 0,44	23,5 ± 0,42	23,2 ± 0,4***	24,2± 0,44	23,5± 0,42**	24,2± 0,44	23,5± 0,42**	23,3 ± 0,42	22,5± 0,36
seedings	23,5 ± 0,42	23,5 ± 0,42	23,5 ± 0,42	24,2± 0,44	24,7± 0,45	25,7± 0,45	23,5± 0,42	23,5 ± 0,42	22,7± 0,38
roller	25,5 ± 0,45	23,7 ± 0,42	23,5 ± 0,4***	25,5± 0,43	25,2± 0,4**	24,2± 0,4**	23,5± 0,42	24,2 ± 0,44	22,7± 0,38
krupoveyki	37,2 ± 0,50	32,2 ± 0,46	32± 0,46	37 ± 0,49	37 ± 0,49	36 ± 0,48	33,2± 0,47	32± 0,46	32 ± 0,46
the selectors	32 ± 0,4***	32± 0,46	31,7 ± 0,46	33,7± 0,4**	34 ± 0,48	34 ± 0,48	32 ± 0,46	32± 0,46	32 ± 0,46
upholsterers	31± 0,46	31± 0,4***	31± 0,46	34 ± 0,48	34 ± 0,48	33,3± 0,4**	33 ± 0,46	32± 0,46	32 ± 0,46
Hygienic standard according to SanPiN RUz No. 0324-16	Optimal temperature at permanent workplaces:22-24 °C Permissible temperature at permanent workplaces:4-5 ° C								





The results of the studies showed the temperature level in the general, washing department within the normal range. On the upper floor of the production at the upokovchik , in the packaging department, the temperature exceeded the norm by 1.5 times in the work area, in a permanent workplace for 1-2 times during work.At the end of the working day, there was a rise in temperature in the room by almost 1.7 times,

On the basis of the SanPiN RUz No. 0325-16 “Sanitary norms of permissible noise levels in the workplace”, measurements were made of the noise of workplaces above the machine, 1 m closer to the machine and 10 m from the machine. According to the measurement results, the following data were obtained: the noise source was the washing machine mechanisms, generators, transport movements, grinding machines in the roller shop. The noise encountered in the milling industry has a constant wide-band character, the height and frequency are dependent on the desired function of the type of equipment.Especially exceeding the maximum dose is observed near the washing and rolling machine, reaching from 88 dBA to 96 dB, also during work and at the end of work, noise in production facilities is reached up to 96.7 dBA, since at permanent places where workers spend more than 50% of the time, in the main workshops located on the production site, according to the SanPiN RUz No. 0325-16 is allowed up to 80 dBA. (see table 1.)

Noise indicators of these workshops in silk-winding production in Bukhara Diamond Silk, dBA

Name of workshops	at the beginning of the work			During operation			end of work		
	Above the machine	1 m closer to the machine	10 m closer to the machine	Above the machine	1 m closer to the machine	10 m closer to the machine	Above the machine	1 m closer to the machine	10 m closer to the machine
upholsterers	84±1,0	84±1,0	82±1,0	85,75 ±1,0	85,75 ±1,0	81±1,0	55,75 ±1,0	55,75 ±1,0	82±1,0
seedings	84,75	84,75	82,75	84,75	84,75	82,75	84,75	84,75	82,75

	±1,8	±1,8	±1,8**	±1,8	±1,8**	±1,8	±1,8	±1,8	±1,8
roller	86,75 ±1***	86,75 ±1,4	85,75 ±1***	88,75 ±1,4	88,75 ±1,4	86,75 ±1,4	84,75 ±1,4**	84,75 ±1,4	83,75 ±1,4
krupoveyki	85,25 ±1,3	85,25 ±1,3	84,25 ±1,3	86,25 ±1,3	86,25 ±1,3	84,25 ±1,3	86,25 ±1,3	85,25 ±1,3	84,25 ±1,3
the selectors	80,25 ±1,2	80,25 ±1***	75,25 ±1,2	75,25 ±1***	75,25 ±1,2	74,25 ±1,2	75,25 ±1,2**	75,25 ±1,2	74,25 ±1,2
Remote control according to SanPiN RUz No. 0325-16	Remote control of equivalent sound level at the category of severity of work of moderate severity II 80 dBA								

CONCLUSIONS The main reasons for the formation of unfavorable sanitary and hygienic working conditions are: the operation of outdated equipment, its imperfection, irrational planning solutions, lack of personal protective equipment, unsatisfactory sanitary and household services.The general assessment of the working conditions of flour mill workers, carried out taking into account the combination of factors of the production environment and the labor process, corresponds to harmful working conditions of the 2nd and 3rd degrees (classes 3.2 and 3.3), depending on the type of work (Table 2).

Based on the results of a quantitative assessment of the exposure of production factors (by classes of working conditions) in accordance with the criteria of the manual P 2.2.1766-03, an occupational risk assessment was performed based on the definition of the category of the alleged occupational risk. It was found that the a priori health risk of flour mill workers from exposure to harmful factors of working conditions ranged from medium (significant) to high (intolerable) depending on the technological stage of grain processing.

Hygienic assessment of working conditions and occupational health risks of mill workers employed at various stages of the production process workers are exposed to unfavorable factors of production, which level of harm depends on the workplace, time and the nature of the work performed. The main leading harmful factors are dustiness. [13].

Flour dust has an organic nature is formed during the cleaning and grinding of grain into flour. Aerodynamic values of small and large particles with a size of 0.5mK-10 mK.The concentration of dust varies depending on the nature of the work performed and the workplace. The analysis of the dustiness of the milling industry shows an overestimation of the maximum permissible dose by 1.5 times throughout the entire working process, the average degree of causal relationship of respiratory diseases with work was 38%.. A characteristic unfavorable production factor in flour milling, which can have a harmful effect on the health of workers, is the production noise generated by machines and mechanisms, transport equipment and ventilation systems [15, 16]. The noise recorded in the working area of flour mill workers is constant, broadband, its levels depended on the type of equipment. The highest noise levels (104.0 ± 0.72 dBA) exceeding the maximum permissible level in the entire audible range of the spectrum, with the exception of the frequency of 63 Hz, were recorded at the workplaces of workers in the grinding department at roller machines. The noise levels generated by compressor units operating the pneumatic transport for in-shop product movement reached 101.8 ± 0.48 dBA with an excess of the remote control at frequencies of 63-8000 Hz. In the grain cleaning department of separators, wallpaper and washing machines, sound levels ranged from 87-95 dBA with an excess at frequencies of 250-8000 Hz. In sound-proofed process control booths, noise levels did not exceed the remote

control (80 dBA). The calculated equivalent sound levels for a work shift, taking into account the time spent by employees in the equipment service areas, exceeded the remote control by no more than 5 dBA and corresponded to harmful working conditions of the 1st degree - class 3.1 (see Table 1). A general vibration was recorded in the grinding department, the corrected level of which did not exceed the remote control (class 2).During the cold season, a cooling microclimate was formed in the working rooms of the mills. The lowest air temperatures of the working area were observed on the upper floors in the production rooms of the wallpaper department. The temperature dropped to 8 °C, which was 7 °C below the permissible values for the category of work (Pa) characteristic of flour milling apparatchiks. At the same time, the average equivalent air temperature, taking into account the duration of stay of employees in rooms with a cooling microclimate, was 11.9 ° C (13.8 ± 1.11), which characterized the working conditions as harmful to the 1st degree (class 3.1) In all rooms in all periods of the year, an increased air velocity was observed - up to 1.4-1.6 m/s (at a rate of 0.2-0.4 m/s), which could aggravate the effect of low air temperature, causing the formation of peripheral neurovascular disorders, hypertension, respiratory diseases and diseases of the peripheral nervous system [17].

Based on the conducted research, priority measures have been identified to reduce the occupational health risk of flour milling workers, including, first of all, measures to improve the technological process and equipment. Due to the fact that at the present stage in the milling industry it is impossible to completely eliminate the dustiness of the working environment, preventive technical, sanitary, hygienic and medical preventive measures are of particular importance. First of all, these include: maximum automation and sealing of equipment, control of dust levels of the working environment, strict compliance with the deadlines for current and major repairs of equipment, rationalization of work and rest modes (time protection). An important role belongs to the timely production and implementation

periodic medical examinations, therapeutic and preventive and rehabilitation measures. Countermeasures are proposed, such as the use of personal protective equipment by employees, such as masks, respirators, long-sleeved clothing, gloves and shoes, in order to minimize the risk of accidents, the use of PPE should be provided by the owners of flour mills. The technological facility must be designed in such a way that there is a proper mechanical system for opening the gate of the receiving hopper. It is necessary to build underground pits of reasonable height or design grain receiving pits on the ground to feed a large amount of wheat at once in order to reduce the constant impact of dust on the worker. The tank in which the final products (flour and suji) are collected and packed must be closed in such a way as to prevent the dispersion of flour in the environment. Simultaneous packaging and production should be avoided, increasing the size of tanks for collecting final products without compromising supply and demand.

Организация среди работников мукомольной промышленности проведения инструктажа по правилам безопасности труда, требования ведение трудового процесса в рабочей зоне и ознакомление подвергающимся вредными факторами во время работы ,в последующем проведением аттестации. .Обеспечить охрану труда. Снижение распространения неблагоприятных факторов, создание комфортабельных условий для работников производства путем усовершенствования технологического процесса ,модернизация оборудования, автоматизация управление процесса работа.

Обеспечить регулярный мониторинг за технологическим процессом работы ,своевременный ремонт оборудования ,соблюдение техники безопасности.Минимизация влияния вредных факторов на здоровья работников на месте работы формирующихся в рабочем процессе(запыленность ,шум, микроклимат ,освещенность) с применением общих и индивидуальных средств защиты более современного типа.

Соблюдать работниками мукомольного производства технику безопасности и санитарное - гигиенические правила в процессе работы.

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