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Study and Assessment of Working Conditions, Lifestyle and Health Status of Workers

Abdurakhimov Bobirjon Abdunabi o'g'li
Tashkent Medical Academy. Tashkent, Uzbekistan

Annotation: According to the scientific research data, as a result of studying the technological process of copper production enterprises, workers are exposed to harmful and dangerous factors during the day in the main workplaces, and among them dusty and gassed air, meteorological factors were found to be the leading ones. In addition, production factors can have different effects in the warm months of the year, that is, one will increase the negative effect of the other factor.

Material and methods. Dustiness of the air in the main workplaces - 180 (unit of measurement), Assessment of the gas content of the workplace air - 180 (unit of measurement), Measurement of noise and vibration levels - 180 (unit of measurement), Measurement of industrial microclimate parameters - 360 (unit of measurement) , measuring the weight of work and determining labor cost indicators.

Results. It is known that when studying the effect of dust on the body, its small size has a great hygienic value. Because small ultramicroscopic dust enters the alveoli of the lungs and causes long-lasting respiratory disorders. When the dust dispersion was studied, the dust generated during the processing of rocks, 41.1% — smaller than 2 μm, 35.0%, — 2 to 5 μm, 16.6%, — 5 to 10 μm, and 7.3% — 10 and was found to be more than μm in size. Noise is a mechanical by nature of origin, wide-ranging, permanent influencing factor by spectral composition. The time of direct interaction of mining workers with noise is 6-7 hours in a 7-hour work shift. The highest level of noise was detected in drilling and blasting sections, and the highest spectral composition in the permanent workplaces of drillers is 500 Hz, 1000 Hz, 2000 Hz and 4000 Hz. Observed at frequencies of Hz. The microclimate conditions obtained in the main workshops showed that during the summer season, the average outdoor air temperature during the day ranged from 24.4 to 34.00C, relative humidity from 33.0 to 35.3%, and the air speed reached 0.97 m/s. The average relative humidity of the air varies from 30.3 to 30.9%, and the speed of air movement was 0.21-0.36 m/s. Since melting furnaces are a source of infrared radiation, the thermal radiation measured at workplaces has been found to rise from 1,665 to 1,385 W/m. Summary. The study of the working conditions of the main workplaces in the technological process of production workshops provided the basis for identifying harmful and dangerous factors in them. a high level of dustiness and gassiness was detected in the production workshops, and according to the hygienic classification of working conditions, it was assessed as "harmful" of class 3 from 1 to 2; due to physical factors production noise and vibration, a high level of mechanical noise was detected in drilling and blasting sections, and local vibration was detected in workers working in perforators, based on this, the occupational conditions were assessed as 3 class "harmful" from 1 to 2 chi levels.

Conclusion. The study of the working conditions of the main workplaces in the technological process of production workshops provided the basis for identifying harmful and dangerous factors in them. a high level of dustiness and gassiness was detected in the production workshops, and according to the hygienic classification of working conditions, it was assessed as "harmful" of class 3 from 1 to 2; due to physical factors production noise and vibration, a high level of mechanical noise was detected in drilling and blasting sections, and local vibration was detected in workers working in perforators, based on this, the occupational conditions were assessed as 3 class "harmful" from 1 to 2 chi levels.

Keywords: working conditions, air gasification, dust, noise, vibration, microclimate indicators.

The most important indicator of public health is the health of the working population, which determines the quality of labor resources, labor productivity, and the value of the gross domestic product. Maintaining and strengthening the health of the working population is one of the most important social reasons that must be addressed by the state policy, because the country's socio-economic development and national security depend on it (6,7,12). According to the experts of the International Labor Protection Organization (ILO), the mining and metallurgical industry is considered as a unique sector, in which workers are affected by harsh working conditions, harmful and dangerous production factors. (3,7,9,10). The working conditions of the employees of the copper production factory are characterized by a number of unfavorable production factors, mainly high levels of dust, aerosols with a fibrinogenic effect, strong noise, vibration and unfavorable microclimate, the severity of work, the levels of which significantly exceed hygienic standards(14,15,16).

Harmful and dangerous working conditions, occupational and production-related diseases, accidents and medical-social and economic damages caused by a high level of disability are one of the important problems of occupational hygiene and health. (1,2,4). In the Republic of Uzbekistan, great attention is paid to the protection of the healthy population, which especially applies to economic sectors with unfavorable factors of working conditions, which have a negative impact on the main contingent of workers. According to the statistical data of the Scientific Research Institute of Sanitary, Hygiene and Occupational Diseases, the level of occupational disease of workers in the metallurgical industry (per 10,000 people of working age) is significantly higher than in other sectors of Uzbekistan (8,11).

The amount of dust in the work area is combine drivers and support operators of cleaning complexes can reach tens and hundreds of mg/m3 (5,6). A comparison of the scientific literature data on the study of the working conditions of workers working in copper production enterprises with the prevalence of disease by disease classes and their levels may be pathogenetically related to the factors of the working environment.

The purpose of the study. Study of the technological process and working conditions in the main shops of the copper smelting and beneficiation enterprise, as well as identification of harmful factors of production.

Material and methods. In accordance with the set goals and tasks, comprehensive scientific research work was carried out in several stages in 2018-2022.At the first stage of the research, foreign and national literature, official statistical data, regulatory and legal documents related to the topic were studied, and the program, plan, goals and tasks of the research were formed. As a result, the observation object, units, subject and primary medical documents were selected, and research methods were determined.

balance (Ohaus PAG214), stopwatch, measuring tapes were used.

Research results. According to the scientific research data, as a result of studying the technological process of the copper production enterprises, harmful and dangerous factors affect the employees during the day in the main workplaces, among them dusty and gassed air, meteorological factors were determined. In addition, production factors can have different effects in the hot months of the year, that is, one of them increases the negative effect of the other factor.

The dustiness of the air in the main workplaces showed that, taking into account silicon dioxide (SiO2) in its content, the highest indicators were set in the grinding workshops and exceeded the hygienic standards (rocks containing more than 10% silicon dioxide, in addition to lead, lime and other dusty materials). . When the dust dispersion was studied, the dust generated during the processing of rocks, 41.1% — smaller than 2 μm, 35.0%, — 2 to 5 μm, 16.6%, — 5 to 10 μm, and 7.3%

— 10 and was found to be more than μm in size. Thus, the dust found in workplaces consists mostly of ultramicroscopic dust. The concentration of dust containing up to 10% of free silicon dioxide in the main workplaces of the copper production enterprise was 7.2 mg/m3, and in the workplaces of drilling mechanics - 3.9-7.8 mg/m3. The occupational groups most often exposed to dust included: miners, OTM and GROZ machinists, drillers, drilling machinists. (table 2).

Amount of dust in the main workplaces and their hygienic assessment

Professional groups	Dust amount, mg/m³			Class of working conditions
	Min-max	M (medium)	±δ	
Miners (dry).	91,3 ±24,8	34,88±10,7	10,18±4,81	3.2-3.3
Miners (with damping)	8,5 ± 3,4	4,3 ± 1,8	4,1 ± 0,8	3.1
Drills (with water spray)	5,6 ± 1,43	4,28 ± 1,36	4,14 ± 1,32	3.1
OTM, GROZ machinists	9,53 ±2,16	6,76 ± 1,86	4,76 ± 1,76	3.1
Drilling machinists	10,5 ± 3,1	6,75 ± 2,45	5,58 ± 1,85	3.1
OZR SanQvaM №0294-11 "HYGIENIC NORMS. PERMITTED QUANTITY OF HARMFUL SUBSTANCES IN THE AIR OF THE WORKING ZONE (REM)" — 4.0				

Thus, a group of grinders was found in the grinding workshop with the most harmful working conditions in terms of the level of dustiness of the working air (class 3.2 — 3.3). One of the main reasons for air pollution with dust is the fact that crushing devices, mills, elevators, bunkers are considered, and it is not possible to completely hermetically seal them.

Thus, the degree of dustiness of the air of the working zone of different professions during technological operations is not the same.

Effects of noise and vibration in workplaces

The mechanisms and devices used during technological processes in mining require the workers to be affected by noise and vibrations to varying degrees. The drivers of auto transports working in the mine are affected by a high level of noise. Taking this into account, noisy drilling is one of the leading factors of unpleasantness in production. Noise is a mechanical by nature of origin, wide-ranging, permanent influencing factor by spectral composition. The time of direct contact of mining workers with noise is 6-7 hours in a 7-hour work shift.

The highest level of noise was detected at the drilling and blasting sites, and the highest spectral composition was observed at the frequencies of 500 Hz, 1000 Hz, 2000 Hz and 4000 Hz.

Production noise was determined at the permanent workplaces of vehicle drivers, masters of drilling rigs, and its total equivalent level was 14-21 dBA higher than the specified hygienic standards (class 3, level 2).

In the rest of the workplaces, noise did not deviate from the standards in terms of spectral composition and general equivalent level or increased insignificantly (class 3, level 1).

Noise tests have shown that the noise affecting the drivers of motor vehicles (excavators, mobile vehicles, drilling rigs) in mechanization work is equal to 89 dBA (3 class 1 level). In these workshops, the noise from drilling equipment increased to 94 dBA (class 3 2 level), dump trucks - 89 dBA (class 3 1 level).

In addition to noise, the vibration factor also affects workers. The vibration is included in the local vibration due to the fact that the personnel working with the perforators, drilling rigs are more exposed to the hands.

Observations showed that the local vibration indicators exceeded the RED by 3.4-7 dB at low and medium frequencies, and the overall vibration exceeded the RED by 3-13 dB.

Local vibration affects workers on average 21.4 -34.3% of the time during the shift. During the drilling process, if it lasts from 2 to 8 hours during the shift, its effect is manifested in 56% of cases.

The noise is constant, wide-band, up to 28 dB higher than YQD on all spectrums and up to 22 dB on evaluations. Spectral description of noise when working with different OTMs is presented in table 2.

2 table Sound pressure level when working with OTM (according to measurement data with instruments)

Name of the device	Sound level pressure, dB, frequency, Hz									Evaluative level
	31,5	63	125	250	500	1000	2000	4000	8000	
LF -12	102	94	91	90	91	88	86	82	80	94
LF -7	110	108	112	100	106	96	101	98	97	112
RED SQ 2.2. 4/2.1.8. 562 -96	107	95	87	82	78	75	73	71	69	80

Taking into account the climatic conditions of our republic, we have many hot days, and summer days are characterized by dry hot weather. The average annual air temperature is +13.20C, the maximum daytime temperature is +480C, and the minimum is 330C. Relative humidity does not exceed 20%. There is a constant north-easterly wind, which in turn creates a high degree of dustiness. During the work, workers are directly affected by meteorological conditions, and since the work is done in the open air, they face a heating microclimate in summer and a cooling microclimate in winter.

The average temperature of the air in open areas in the warm period is 39.40C, the relative humidity is 19%, and the air speed is 5.2 m/s.

Since all the work in the mines is done outdoors, the drivers are also exposed to the hot microclimate.

In addition, meteorological factors in production workshops and in individual workplaces are often very variable and depend on meteorological factors of the external environment, power of heat-dissipating sources in production rooms, heat-dissolving and heat-absorbing units. Also, the location of workplaces also depends on the presence of windows in workshops and their sizes.

The microclimate conditions obtained in the main workshops of AGMK in the warm period of the year showed that during the summer season, the average outdoor air temperature during the day is from 24.4 to 34.00C, relative humidity is from 33.0 to 35.3%, air speed is 0.97 m/s did

Due to the high speed of air movement in the cold period of the year, the average air temperature showed -18.70C. Air temperature in the workplaces of perforators and drillers varied from -26 to +100C during the cold period. It showed an average temperature of -80C with a relative humidity of 32% and an air velocity of 5.2 m/s. Accordingly, according to the hygienic classification, working conditions correspond to 3 classes and 3 levels.

Conclusion: Studying the working conditions of the main workplaces in the technological process of all shops of the copper production enterprise provided the basis for identifying harmful and dangerous factors in them. The following factors affect the body of workers in a production facility:

- a high level of dustiness and gassiness was detected in the production workshops, and according to the hygienic classification of working conditions, it was assessed as 3rd class "harmful" from the 1st to the 2nd level;
- due to physical factors production noise and vibration, a high level of mechanical noise was detected in the drilling and blasting sections, and local vibration was detected in the workers working in the perforators, based on this, the occupational conditions were assessed as 3 class "harmful" from 1 to 2 chi levels;
- drillers are exposed to local and general technological vibration while working on self-propelled drilling rigs (SDRs) used for drilling spurs.
- the amount of nickel, copper, cobalt, nitric oxide, sulfuric acid vapors from chemical factors in the air of the main professional groups was determined, of which the amount of copper and cobalt did

not exceed the REM, but the amount of nitrogen oxide was found to be 2.96-4.8 times more than the REM;

- a mixture of copper dust, lime dust, and silicon-preserving dust affects the body together with sulfuric acid and metal vapors in the air of the workplace;
- professional groups participating in the copper enrichment work process, grinding workshops, flotation and flotation workshops, "Cu-Mo" concentrate selection and drying workshop, copper smelting and electrolysis workshop, as well as in intermediate processes, i.e. sulfuric acid workshop, refining workshop; it is recommended to give free milk and milk substitutes to workers of waste processing facilities (SanQvaM 0184-05);

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