

Hygienic Assessment of Labour Conditions in the Main Occupations of Underground Mines

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Abstract The article presents the data of studying the influence of a complex of production harmful factors on the health of workers in the mining industry, which currently remains a priority task of public health and is an urgent problem. Hygienic assessment of working conditions of workers in the main occupations of underground mines. The working conditions of the main occupations of 240 workplaces of underground subdivisions of the mines Razvedochnaya, Kayragach, Semguron and Samarchuk, where 649 people are employed, were studied. Assessment of the level of industrial vibration by the corrective equivalent level showed an excess at the workplaces of the tunnelling machine operator - 115 dB, loading machine operator, loading and delivery machine operator, drilling rig operator - 114 dB, compressor unit operators - 112 dB (with the norm 101 dB). The results of hygienic studies have shown that in the process of labour activity of miners there is an impact of a complex of unfavourable production factors, the leading of which is noise-vibration, reaching maximum intensity in miners of the underground mines under study.

Keywords Underground mines, Main occupations, Workers, Vibration

1. Introduction

Unfavourable conditions of industrial environment against the background of socio-economic well-being have a negative impact on the state of health of the working population of the republic. In workers of mining industry [2,5], especially underground mines in the structure of general pathology the leading place belongs to diseases of cardiovascular system [4,9]. In terms of prevalence, severity of course, complications, cardiovascular diseases are one of the main causes of disability, disability, premature death of men of working age [10,13].

Currently, the pathogenetic relationship and prognostic significance of diseases of the cardiovascular system caused by exposure to harmful industrial factors are insufficiently studied [7,12]. Interest in the study of interorgan connections in the pathology of a number of diseases does not lose its relevance [3]. Despite a considerable number of works devoted to this problem, the issues of causal relationships between the factors of industrial environment and the development of cardiovascular system pathology in workers of mining industry remain poorly studied [1,6].

Consequently, the study of the influence of a complex of production harmful factors on the health of workers in the

mining industry remains a priority task of public health and is an urgent problem [8,11].

Purpose of the study: Hygienic assessment of working conditions of workers in the main occupations of underground mines.

2. Materials and Methods

The working conditions of the main occupations of underground subdivisions of the mines Razvedochnaya, Kairagach, Semguron and Samarchuk were studied. A total of 240 workplaces were studied, where 649 people work. Of all employees 433 people work in underground conditions in contact with harmful production factors exceeding the norm.

The main professions working in conditions of exposure to dust, chemical (nitrogen oxide, sulfur dioxide, carbon oxide) and physical factors (noise, vibration, increased atmospheric pressure), unfavourable meteorological factors, severity and tension of the labour process are tunnellers, loading machine operators, loading and delivery machine operators, explosion operators, fasteners, drilling rig operators, underground miners.

To study and assess the impact of a complex of production factors on the organism of workers, the occupational groups were selected, which were affected by the most harmful and hazardous factors of the production environment: 7 occupational groups Exploration mine (283 people) Kairagach mine 7 occupational groups (177 people), Semguran

mine 4 occupational groups (70 people) and Samarchuk mine 6 occupational groups (119 people), a total of 649 workers. Labour conditions of these workers were studied in different seasons of the year with identification of the main production factors. In the dynamics of the working day, measurements were made of the parameters of dustiness and contamination of the air of the working zone, noise and vibration, severity and tension of the labour process.

Studies on acoustic characteristics of permanent and non-permanent noise, parameters of local vibration at workplaces were carried out with the help of the device VSHV-003 MZ in accordance with the SSBT GOST-12.1.050-86 'Methods of noise measurement at workplaces'. Hygienic assessment of the measured noise and vibration levels for compliance with their permissible levels for permanent and non-permanent workplaces of production premises was carried out in accordance with SanPiN RUz #0325-16 'Sanitary norms of permissible noise levels at workplaces' and SanPiN RUz #0326-16 'Sanitary norms of general and local vibration at workplaces'.

General assessment of working conditions by class and degree of harmfulness was carried out in accordance with the 'Methodology for assessment of working conditions and certification of workplaces by working conditions', SanPiN RUz № 0141-03 'Hygienic classification of working conditions by indicators of harmfulness and danger of factors of the industrial environment, severity and tension of the labour process'. Occupational risk was determined in accordance with the 'Methodological Guidelines for the development of occupational risk prediction model and preventive measures for workers' health'.

3. Result and Discussion

We studied the working conditions of the main occupations of underground subdivisions of the mines Razvedochnaya, Kairagach, Senguron and Samarchuk. A total of 240 workplaces were studied, where 1103 people work. Of all employees, 649 people work in underground conditions in contact with harmful production factors exceeding the norm.

To identify harmful production factors, to establish the level of these factors, 53 workplace attestation cards (2018), protocols of laboratory-instrumental measurements performed within the framework of scientific research of the laboratory of diagnostics, treatment and prevention of occupational diseases of the Research Institute of Sanitary Hygiene and Occupational Diseases of the Ministry of Health of the RUz were analysed.

The main professions working in conditions of exposure to dust, chemical (nitrogen oxide, sulphur dioxide, carbon oxide) and physical factors (noise, vibration, increased atmospheric pressure), unfavourable meteorological factors, severity and tension of the labour process are tunnellers, loading machine operators, loading and delivery machine operators, explosion operators, fixers, drilling rig operators, underground miners.

Vibration on all machines has a broadband character, with maximum energy at low frequencies of 2-4 Hz. The drivers of the loading machine driver and the driver of the loading-delivery machine are affected by the general transport-technological vibration, which corrected equivalent levels of vibration velocity for the working shift were 107 and 107.2 dB exceeding the MPL (with the norm - 101 dB). On the vertical axis Z the maximum level, which is observed in octave bands 2-4 Hz and exceeds the MPL by 6 and 6.2 dB.

At the working chair of the drilling rig operator, the corrected equivalent levels of vibration velocity for the working shift were 106 dB, respectively, exceeding the MPL of general vibration of category 3a - technological - 9 dB with the standard - 92 dB. The highest measured levels of vibration velocity were observed during drilling work on Z axis - 124, 119 dB - in octave bands of frequencies 4 and 8 Hz and on X and Y axes - 98-101 dB in octave bands of frequencies 16 and 31.5 Hz (Table 1).

The estimation of industrial vibration level according to the corrective equivalent level showed the excess at the workplaces of the tunnelling machine operator - 115 dB, loading machine operator, loading and delivery machine operator, drilling rig operator - 114 dB, compressor unit operators - 112 dB (with the norm 101 dB) (Table 2).

Table 1. Level of general vibration at workplaces of main occupations underground mines

Measurement location	Measurement points and conditions	Axis	Vibration velocity levels, dB in octave frequency bands Hz						Adjusted adjusted values
			2	4	8	16	31,5	63	
Workplace of the profession of loading machine operator	in the driver's seat when loading	Z	123	114	108	107	107	107	107
		X	96,7	100,9	100,2	101,9	105,9	105,7	103,2
		Y	80,5	92,5	95,5	105,5	112,6	107,1	98,6
Workplace of the profession of loading and delivery machine operator	in the driver's seat when loading	Z	123,2	114	108	107	107,2	107,2	107,2
		X	98,5	102,7	102	103,7	107,7	107,5	105
		Y	80	92	95	105	112	106	98,1
Workplace of the drilling rig operator profession	in the operator's seat when drilling	Z	124	119	108	106	106	106	106
		X	86	95	100	101	101	101	101
		Y	81	90	95	98	101	96	96

Table 2. Level of local vibration at workplaces of the main occupations of underground mines

Profession	Axis	Vibration velocity levels, dB in octave frequency bands, Hz							Adjusted adjusted values
		8	16	31,5	125	250	500	1000	
Traveller	Z, X, Y	116	115	112	112	112	112	112	115
Loading machine driver	Z, X, Y	115	114	111	111	111	111	111	114
Loading machine operator	Z, X, Y	115	114	111	111	111	111	111	114
Drill rig operator	Z, X, Y	115	114	111	111	111	111	111	114

Depending on the machines and mechanisms used, workers may be affected by local vibration transmitted to the hands when holding the tool, or general vibration - with its transmission to the whole body through the floor, seat. When drilling, tunnellers are exposed to local vibration exceeding the MPL by 3 dB. In a number of professions there is a combined effect of broadband noise, general vibration of the workplace and local vibration on the controls (loading machine operator, loading and delivery machine operator, drilling rig operator). It is important to emphasise that when operating different mining machines and mechanisms, vibration levels and the nature of its impact on the worker are significantly different.

4. Conclusions

The results of hygienic studies have shown that in the process of labour activity of miners there is an impact of a complex of unfavourable production factors, the leading of which is noise-vibration, reaching maximum intensity in the miners of the underground mines under study.

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