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HYGIENIC ASSESSMENT OF WORKING CONDITIONS OF THE SINTER OPERATOR OF THE METALLURGICAL ENTERPRISE

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Introduction. The metallurgical industry is one of the developed industries in Ukraine, whose enterprises are located mainly in four regions of the country: Donetsk, Zaporizhia, Luhansk and Dnipropetrovsk [1]. At the workplaces of metallurgical workers there are harmful production factors of various nature, which can lead to occupational and work-related pathology [2, 3]. Therefore, the study of working conditions in the workplace of metallurgical workers remains a topical issue and needs attention.

The aim of the study: hygienic assessment of the working conditions of the sinter operator of the metallurgical enterprises.

Materials and methods. A study of working conditions at 44 workplaces of sinter operators of a metallurgical enterprise for 2011-2020 years. The study of factors of the working microclimate was carried out using the device ECOTENSOR-MK (Ukraine), the number of studies of working microclimate - 180 measurements, the level of infrared radiation - 30 measurements), air pollution of the working area of workers was carried out using a gas analyzer PALLADIUM-3M-01 – 1005 research, the study of working noise and vibration was conducted using a noise and vibration analyzer S-LIGHT and OCTAVE 110A - 50 studies.

Assessment of working conditions of sinter operators (II b category of severity of work, medium weight) was carried out in accordance with the "Sanitary norms of the microclimate of industrial premises" 3.3.6.042-99 and "Hygienic classification of labor on the indicators of harmfulness and danger of production environment, severity and intensity of the labor process" (approved by the order of the Ministry of Health of Ukraine № 284 from 08.04.2014)

The results obtained.

The functional responsibilities of the sinter operator include conducting the technological process of sintering the charge and burning pellets, regulating the supply of materials to the sintering and firing carts, regulating the sintering machine, preparation of the charge, moistening, feeding and loading it into the sintering machine, detection and troubleshooting, carries out minor repairs of the equipment. One of the main harmful factors of the production environment in the manufacture of sinter and pellets is the dust factor associated with the open transportation of bulk materials, its

pouring and operation of equipment. The composition of the dust formed in the process of making the agglomerate includes iron, iron oxide, quartz, coal and other impurities.

Hygienic assessment of the industrial microclimate found that the average air temperature in the warm period of the year was $33,75 \pm 1,49$ °C and ranged from 21,5 to 43 °C, which exceeds the maximum allowable level by 12 °C, the average relative humidity was $34,11 \pm 2,76$ %, the speed of air movement in the workplace ranged from 0,3 to 1,7 m/s with an average of $0,61 \pm 0,8$ m/s, which exceeds the maximum allowable level by 1,36 times,

Thus, the working conditions at the workplace of the sinter operator according to the indicators of the production microclimate in the warm period of the year belong to the 3rd class of the 4th degree of harmfulness, which affect workers during 82,9 % of the duration of the work shift (Table 1).

Table 1

Working conditions according to the indicators of the production microclimate in the workplace of the sinter operator

Factors (warm period of the year)	Min.	Max.	Average, $M \pm m$	MAL	Class of working conditions
Air temperature (°C)	21,5	43	$33,75 \pm 1,49$	20–22	3.4
Infrared radiation (W/m^2)	142	1852	$1014,13 \pm 157,68$	≤ 140	3.1
Air humidity (%)	11	51	$34,11 \pm 2,76$	40–60	2
Air velocity (m/s)	0,3	1,7	$0,61 \pm 0,08$	0,2–0,5	3.1

As a result of the assessment of working conditions according to the indicators of chemical nature, it is established that iron agglomerate, sulfur dioxide, carbon monoxide, ammonia, nitrogen dioxide, manganese oxide, iron oxide are present in the air of the working zone of the sinter operator. It is established that the working conditions of the sinter operator according to the content of industrial dust (iron sinter) belong to the 3rd class of the 3rd degree of harmfulness (exceeds the maximum permissible concentration by 11,5 times). Due to the presence in the air of the working area of nitrogen dioxide, carbon monoxide, sulfur dioxide, which have a unidirectional effect, working conditions belong to the 3rd class 1 degree of harmfulness, the content of iron oxide - up to 3 class 1 degree of harmfulness (exceeds the maximum allowable concentration 3 times). (Table 2).

Table 2.

The content of harmful substances in the air of the working area and assessment of working conditions of sinter operator

Harmful substances in the air of the working area	Concentration, mg/m^3			MPC, mg/m^3	Class of working conditions
	Min.	Max.	Average, $M \pm m$		
Iron agglomerate	3,0	243,1	$45,9 \pm 4,76$	4	3.3
Sulfur dioxide	0,7	5,7	$4,86 \pm 0,16$	10	2

Carbon monoxide	4,9	19,2	7,53±0,29	20	2
Ammonia	1,0	9,1	5,1±0,23	20	2
Nitrogen dioxide	0,2	1,2	0,62±0,06	2	2
Manganese oxides (aerosol disintegration)	0,08	0,17	0,08±0,005	0,3	2
Iron (III) oxide (in terms of iron)	15,2	20,58	17,74±0,38	6	3.1

The noise on the work place of the sinter operator is not constant and ranged from 74,2 to 94,6 dBA, which exceeds the maximum allowable level by 14,6 dBA (3.2 class of working conditions), the average noise level was 86,5±4,1 dBA.

The equivalent corrected level of total vibration at the sinter operator workplace ranged from 69,1 to 98,6 dB with an average of 85,08±8,03 dB, which refers to working conditions to class 2 (permissible).

The difficulty of the sinter operator, in connection with the forced working posture more than 30 % of the duration of the work shift, the number of forced inclinations over 300 (332 per shift), in terms of static load on the muscles of the torso and legs (263124 kg*s), refers to 3 class 2 degree of harm. The intensity of the sinter operator is characterized by three-shift work, 8-hour working day and long-term monitoring of the technological process (70 % of the work shift), which refers to working conditions to the 3rd class 1 degree of harm.

Conclusion.

Working conditions of the sinter operator at the metallurgical enterprise according to the "Hygienic classification of work..." are harmful and belong to class 3.4, which have a very high degree of suspected of occupational risk: industrial microclimate (3.1-3.4 class), air content of dust and chemicals in the working area (3.1–3.3 class), the level of industrial noise (3.2 class), the severity and intensity of work (3.1–3.2 class), which can contribute to the emergence of occupational and industrial pathology and require a detailed study of morbidity of workers in this category.

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