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Working Conditions Of Employees In Electroplating Shops

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Abstract: The results of a comprehensive assessment of working conditions at workplaces in electroplating shops are presented, and the determining factors of the production environment are identified. The working conditions of the main professions are compared with regulatory values. It has been established that, when performing a comprehensive assessment of working conditions for employees in electroplating shops (sections), it is necessary to take into account the equipment and hand tools used, as well as the duration of exposure near operating equipment.

Keywords: Electroplating shop (section), professions, noise, vibration, dustiness, gas pollution, microclimate parameters.

INTRODUCTION:

The working conditions of employees in electroplating shops (sections) are determined by a set of production environment factors. The main ones include noise, vibration, dustiness, gas pollution, microclimate parameters (air temperature and velocity, intensity of infrared radiation), as well as the severity and intensity of the labor process. Considering the diversity of technological processes and types of industrial equipment, along with a significant amount of labor-intensive manual operations, it is necessary to implement measures to improve working conditions, reduce occupational injuries and diseases. Therefore, technological processes and industrial equipment used, characteristics of work in terms of severity and intensity, as well as other factors that define particular electroplating shops, sections, and workplaces must be taken into account.

METHODS

The assessment of the specified parameters was carried out based on the results of conducted studies, as well as using the results of workplace certification for working conditions at enterprises and organizations [1–3]. Additionally, similar data published in literary sources were considered [4–10].

In electroplating shops, the main working professions include electroplater, bath adjuster, etcher, metal coating and painting equipment technician, and inspector of metal coating operations. The professions of employees in electroplating shops are listed in Lists No. 1 and No. 2 (providing the right to an early retirement due to work under special working conditions).

The results obtained from the assessment of working conditions were used to determine the employee's right to: early retirement due to work under special working conditions; additional leave for work in harmful and/or hazardous conditions; reduced working hours for types of production, shops, professions, and positions in harmful and/or hazardous conditions, which provide the right to shortened working hours; and increased wages through the introduction of compensation for work in harmful and/or hazardous conditions.

The assessment of production environment factors, as well as severity and intensity of the labor process,

was performed by comparing the measured and researched actual values with hygienic standards.

The class of working conditions at workplaces of the studied professions for each production factor, as well as for indicators of severity and intensity of the labor process, and the overall assessment, was determined based on the Sanitary Rules and Regulations "Hygienic Classification of Working Conditions", according to which working conditions are divided into four classes:

• optimal working conditions (Class 1) – optimal and permissible conditions are classified as safe;

• permissible working conditions (Class 2);

• harmful working conditions (Class 3) – exert an adverse effect on the worker's body and/or their offspring;

• hazardous working conditions (Class 4) – pose a threat to the worker's life, with a high risk of acute occupational diseases, including severe forms.

Results and Discussion.

Harmful working conditions, depending on the degree of deviation of production factors from hygienic standards and the severity of changes in the worker's body, are divided into four degrees of harmfulness:

• Degree 1 of Class 3 (Class 3.1) – characterized by production factors whose levels deviate from hygienic standards and whose impact causes functional changes in the body;

• Degree 2 of Class 3 (Class 3.2) – characterized by production factors whose levels deviate from hygienic standards and cause persistent functional changes in the body, which in most cases lead to increased work-related morbidity;

• Degree 3 of Class 3 (Class 3.3) – characterized by production factors whose levels deviate from hygienic standards and can lead, as a rule, to the development of occupational diseases of mild and moderate severity;

• Degree 4 of Class 3 (Class 3.4) – characterized by production factors whose levels deviate from hygienic standards and under which severe forms of occupational diseases may occur.

Based on a comprehensive hygienic assessment of working conditions, the category of occupational risk is determined (Table 1). Occupational risk analysis is carried out according to the results of the assessment of working conditions and the health status of employees, with the aim of forecasting and timely identification of work-related diseases, reducing the severity of chronic pathology, and justifying preventive measures.

Table 1

Classes of working conditions and categories of occupational risk

Class of working conditions	Category of occupational risk
Optimal – 1	No risk
Permissible – 2	Negligible (tolerable) risk
Harmful – 3.1	Low (moderate) risk
Harmful – 3.2	Medium (significant) risk
Harmful – 3.3	High (hard-to-tolerate) risk
Harmful – 3.4	Very high (intolerable) risk
Hazardous – 4	Extremely high risk to life

The actual values of production factors at workplaces during the performance of individual technological operations, as well as the volume and duration of the work performed, vary significantly. Therefore, after comparing each parameter of working conditions with hygienic standards, the class of working conditions was determined in accordance with the

Sanitary Rules, Regulations, and Hygienic Standards "Hygienic Classification of Working Conditions" (Table 2).

It was taken into account that the hazard class for each production factor was determined considering the volume and duration of the work performed (if the duration exceeds 50% of the shift, the class remains; from 10% to 50% – it decreases by one class; less than 10% – it decreases by two classes). Analysis of the time spent near operating equipment, based on time-motion observations, made it possible to determine the actual (average) value and also to obtain the actual hazard class of the working conditions.

The overall assessment of working conditions by class (degree) was conducted based on the evaluations of all production environment factors, taking into account the duration of exposure, severity, and intensity of the labor process. The overall class and degree of harmfulness were determined by the highest class and degree among all factors. If there are three or more production environment factors belonging to Class 3.1, the overall assessment of working conditions corresponds to Class 3.2. If there are two or more production environment factors belonging to Classes 3.2, 3.3, and 3.4, the overall assessment is set one step higher.

Table 2

Classes of working conditions for employees based on the actual values of production factors

Factors of Workplace Labor Conditions	Working conditions class (exceeding permissible values)			
	3.1	3.2	3.3	3.4
noise, dBA (Maximum Permissible Level = 80)	up to 5	up to 15	up to 25	up to 35
vibration: general (MPL = 50 dB) localized (MPL = 76 dB)	up to 6 up to 3	up to 12 up to 6	up to 18 up to 9	up to 24 up to 12
dust (exceeding the Maximum Permissible Concentration, times)	1,1-2,0	2,1-5,0	5,1-10,0	more than 10,0
harmful substances (exceeding the Maximum Permissible Concentration, times)	1,1-3,0	3,1-10,0	10,1-15,0	15,1-20,0
air temperature (exceedance in °C)	up to 4,0	4,1-8,0	more than 8,0	
airflow velocity (exceedance, times)	up to 3,0	more than 3,0		
intensity of thermal radiation (MPL = 140 W/m³)	141-350	351-2800	more than 2800	

The workplace of a galvanic operator is assessed by a set of production factors that determine the working conditions in the area. These factors include: the noise level (class 3.1 due to the operation of technological equipment in use), air dust concentration (class 2), the presence of harmful substances in the air of the working zone (class 3.1 when harmful substance concentrations exceed the maximum permissible limits), and the microclimate (class 3.1 due to increased relative humidity near the galvanic baths).

According to the severity of the labor process, the above-mentioned profession is assessed as class 3.1 (forced torso bending when hanging and removing

parts from hooks or placing them into baskets), while the intensity of the labor process corresponds to class 2. The overall assessment of working conditions at the galvanic operator's workplace is class 3.2, which grants employees the right to an early retirement pension for work performed under special working conditions according to List No. 2.

The set of production factors determining the working conditions at the workplace of a bath adjuster includes: the noise level (class 3.1), air dust concentration (class 2), the presence of harmful substances in the air of the working zone (class 3.1 when the concentration of harmful substances exceeds the maximum permissible limits and the worker remains in such conditions for more than 50% of the shift), and the microclimate (class 3.1 due to increased relative humidity).

According to the severity of the labor process, the above-mentioned occupation is assessed as class 3.1 (periodic presence—up to 50% of the shift—in an uncomfortable and/or fixed posture), while the intensity of the labor process corresponds to class 2. The overall assessment of working conditions at the workplace of the bath adjuster is class 3.2, which grants employees the right to an early retirement pension for work performed under special working conditions according to List No. 2.

The workplace of an etcher is evaluated by a set of production factors that determine the working conditions in the area. These factors include: the noise level (class 3.2 due to the operation of shot-blasting and sandblasting units located near the etching room), air dust concentration (class 2), the presence of harmful substances in the air of the working zone (class 3.1 when the concentrations of harmful substances exceed the maximum permissible limits and the worker remains in these conditions for more than 50% of the shift), and the microclimate (class 3.1 due to increased relative humidity in the etching room).

According to the severity of the labor process, the above-mentioned occupation is assessed as class 3.1 (forced torso bending when taking and placing parts into containers), while the intensity of the labor process corresponds to class 2. The overall assessment of working conditions at the etcher's workplace is class 3.2, which grants employees the right to an early retirement pension for work performed under special working conditions according to List No. 2. If the etcher performs metal etching in solutions containing harmful substances of hazard classes 1 and 2, or carcinogens, then he may be entitled to an early retirement pension for work under special conditions according to List No. 1, provided that the comprehensive assessment of working conditions is determined as class 3.3.

The set of production factors determining the working conditions of a metal coating and painting equipment technician includes: the noise level (class 3.1 due to the operation of technological equipment as well as sanding machines, drilling machines, and hand tools), the level of local vibration when working with hand tools (class 2, due to the short duration of exposure), air dust concentration in the working area (class 2), the presence of harmful substances in the air of the working zone (class 2, with a possible class 3.1 if harmful substance concentrations exceed the maximum permissible limits and the worker remains in these conditions for more than 50% of the shift), and the microclimate (class 3.1 due to increased relative humidity).

According to the severity of the labor process, these professions are assessed as class 3.1 (periodic presence—up to 50% of the shift—in an uncomfortable and/or fixed posture). According to the intensity of the labor process, all the professions under consideration are assessed as class 2. The overall assessment of working conditions for these professions is determined as class 3.2.

The set of production factors determining the working conditions of a metal coating work inspector includes: the noise level (class 3.1 due to the operation of technological equipment and the use of sanding machines, drilling machines, and hand tools), the level of local vibration when working with hand tools (class 2 due to the short duration of exposure), air dust concentration in the working area (class 2), the presence of harmful substances in the air of the working zone (class 2, with a possible class 3.1 if harmful substance concentrations exceed the maximum permissible limits and the worker remains in these conditions for more than 50% of the shift), and the microclimate (class 3.1 due to increased relative humidity). According to the severity of the labor process, the above-mentioned professions are assessed as class 3.1 (periodic presence—up to 50% of the shift—in an uncomfortable and/or fixed posture). According to the intensity of the labor process, all the professions under consideration are assessed as class 2. The overall assessment of working conditions for these professions is determined as class 3.2.

Table 3 presents the results of studies on the parameters of the production environment and the comprehensive assessment of working conditions for employees in galvanic shops. The table includes the

classes of working conditions based on the actual values of production environment factors, the duration of exposure to these factors, and the indicators of severity and intensity of the labor process. Considering that galvanic shops employ a significant number of technological processes, the table provides averaged classes of working conditions.

Table 3.

Classification of Workplaces by Working Conditions in Galvanic Shops

Occupations of Employees	Class of Working Conditions at Workplaces (taking exposure time into account)							
	production factors							
	Noise	vibration	dust	harmful substances	microclimate	Difficulty of the work process	Intensity of the work process	Overall assessment
galvanic operator	3.1	-	2	2 (3.1)	3.1	3.1	2	3.2
bath adjuster	3.1	-	2	2 (3.1)	3.1	3.1	2	3.2
Etcher	3.2	-	2	2 (3.1)	3.1	3.1	2	3.2
metal coating and painting equipment technician	3.1	2	2	2 (3.1)	3.1	3.1	2	3.2
metal coating work inspector	3.1	-	2	2 (3.1)	3.1	3.1	2	3.2

During the workplace certification of the above-mentioned professions, it is necessary to carry out especially thorough photo-chronometric observations of working time, since employees of these professions spend the workday in various areas of the galvanic shop, where production factors with absolute values corresponding to different classes of working conditions are present.

Thus, a comprehensive assessment of working conditions at workplaces in galvanic shops can be conducted objectively only if all stages of the technological processes used, the types of equipment involved, the time spent in different conditions, and the impact of the entire set of production factors, as well as the severity and intensity of the labor process, are taken into account. This will make it possible to objectively determine the employee's right to an early retirement pension for work under special conditions, the right to additional paid leave for work under harmful and/or hazardous conditions, the right to a reduced working time schedule, and the right to increased wages through allowances for work under harmful and/or hazardous conditions. It will also allow the development and implementation of measures to improve the working conditions of employees.

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