Labor protection of operators and workers at a machine-building enterprise

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Abstract. Improving working conditions also yields economic results: an increase in profits (due to an increase in labor productivity); reduction of costs associated with compensation for work with harmful and difficult working conditions; reduction of losses associated with injuries, occupational morbidity; decrease in staff turnover, etc. The main document in the normative and technical documentation is the normative act "Occupational safety standards system".

1. Introduction

Labor protection is a system of ensuring the safety of life and health of workers in the process of work, including legal, socio-economic, sanitary and hygienic, psychophysical, treatment and prophylactic, rehabilitation and other measures. The functions of labor protection are the study of sanitation and occupational hygiene, the implementation of measures to reduce the influence of harmful factors on the body of workers in the process of work. The main method of labor protection is the use of safety measures. At the same time, two main tasks are solved: the creation of machines and tools, when working with which the danger to humans is excluded, and the development of special protective equipment that ensures human safety in the labor process, as well as training workers in safe working practices and the use of protective equipment, conditions are created for safe work.

The main goal of improving working conditions is to achieve a social effect, i.e. ensuring labor safety, preserving the life and health of workers, reducing the number of accidents and diseases at work.

Improving working conditions also yields economic results: an increase in profits (due to an increase in labor productivity); reduction of costs associated with compensation for work with harmful and difficult working conditions; reduction of losses associated with injuries, occupational morbidity; decrease in staff turnover, etc. The main document in the normative and technical documentation is the normative act "Occupational safety standards system".

SSBT standards establish general requirements and norms for the types of hazardous and harmful production factors, general safety requirements for production equipment, production processes, protective equipment for workers and methods for assessing labor safety.

Cross-sectoral rules and regulations are mandatory for all enterprises and organizations, regardless of their departmental subordination.
Industry rules and regulations apply only to specific industries. On the basis of labor legislation, standards, rules, norms, technological documentation, etc., instructions on labor protection are being developed: general, for certain professions, for certain types of work.

2. Methods
Labor protection is a system of legal, socio-economic, organizational, technical, sanitary-hygienic and treatment-and-prophylactic measures and means to ensure safety, preservation of human health and performance in the labor process.

Safety engineering is a system of organizational and technical measures and means to prevent exposure to hazardous production factors.

Industrial sanitation is a system of organizational, hygienic and sanitary-technical measures and means that prevent exposure to harmful industrial factors.

Occupational hygiene is a medical science that studies the impact of the working environment, the nature of work on the body of the worker. The development of sanitary and hygienic standards and practical measures, the elimination of unfavorable production factors, the prevention or weakening of their influence on the human body are the main tasks of occupational health.

Electrical safety - a system of organizational and technical measures and means to protect people from harmful and dangerous effects of electric current, electric arc, electromagnetic field and static electricity.

Fire safety is the state of an object in which the possibility of a fire is excluded, and in case of its occurrence, the impact on people of dangerous factors is prevented and the protection of material assets is provided.

Workplace - a spatial area equipped with the necessary means, in which the labor activity of an employee or a group of employees who jointly perform production tasks is performed. The workplace is part of the production and technological structure of the enterprise (organization), it is intended to perform part of the technological (production) process and is determined on the basis of labor and other applicable norms and standards.

![Figure 1. The number of injuries at work (blue graphite - the number per 1000 employees, the red graph - the number of 1000 people).](image)

Working area - a space limited by a height of 2 m above the level of the floor or platform where there are places of permanent or non-permanent (temporary) stay of workers. Permanent jobs include jobs in which the worker spends more than 50% of the working time per shift or more than two hours continuously. If the work is carried out in different points of the working area, then the entire working area is considered a permanent workplace.
Working conditions - a set of factors of the working environment that affect the health and performance of a person in the labor process. Studies of working conditions have shown that the factors of the working environment in the labor process are:

- the sanitary and hygienic environment, which determines the external environment in the working area - microclimate, mechanical vibrations, radiation, temperature, lighting, etc.;
- psychophysiological elements: working posture, physical activity, neuropsychological stress, etc., which are due to the labor process itself;
- aesthetic elements: design of industrial premises, equipment, workplace, working tools, etc.;
- socio-psychological elements that characterize the so-called psychological climate.

An occupational disease is a disease caused by exposure to harmful working conditions. These include: chronic dusty bronchitis, vibration sickness, poisoning with various toxic substances, etc. Occupational diseases, depending on the severity and timing of detection, may or may not be accompanied by disability. In severe cases, they can lead to disability.

3. Results
In the process of labor, a person is influenced by a variety of factors of the production environment, which together determine one or another state of working conditions. Production factors are divided into technical, ergonomic, sanitary and hygienic, organizational, psychophysical, social, natural and climatic, economic.

Technical factors reflect the level of automation and mechanization of production processes; the most complete use of equipment and a rational organization of the workplace; the use of electronic computing and control technology; availability and serviceability of collective protective equipment, protection of hazardous areas, etc.

Ergonomic factors characterize the establishment of the correspondence of speed, energy, visual and other physiological capabilities of a person in the considered technological process; introduction of rational regimes of work and rest, reduction of the amount of information, reduction of neuro-emotional stress and physiological stress; professional selection. This concerns the speed parameters of equipment, the volume of information coming from the working bodies, the level of organization of the workplace, the convenience of the location of the controls and indicators, the design of the operator's seat, the visibility of the working area, etc.

Aesthetic factors reflect the correspondence between the aesthetic needs of a person and the workplaces (tools) and the production environment realized in artistic and design solutions.

Sanitary and hygienic factors show the state of industrial sanitation at workplaces (air quality, level of harmful substances and radiation, noise, vibration, lighting state, etc.). They must comply with the requirements of GOST, SSBT, etc.

Organizational factors characterize the mode of work and rest at the enterprise; discipline and form of work organization, provision of workers with overalls, footwear and other personal protective equipment (PPE); the state of control over the labor process and, in particular, over labor protection; quality of professional training of employees, etc.

Psychophysiological factors reflect the intensity and severity of work, the moral and psychological climate in the team, the relationship of workers with each other, etc.

Social factors include the general culture of production, order and cleanliness in the workplace, landscaping of the territory, provision of sanitary facilities, canteens, medical posts, clinics, canteens, kindergartens, etc.

Natural and climatic factors are geographic and meteorological features of the area (altitude, terrain, frequency and type of precipitation, temperature, humidity, ionization and air mobility, atmospheric pressure, etc.).

Economic factors include an increase in the technical equipment of labor: the most complete use of equipment, a rational organization of the workplace, the choice of the optimal technology. Elimination
and reduction of unnecessary expenses of working time, strict regulation of the pace and rhythm of work are also economic factors.

Working conditions depend on one or another combination of production factors and, in turn, affect productivity and labor results, the health of workers. Favorable conditions improve the general well-being, human mood, create the preconditions for high productivity, and, conversely, poor conditions reduce the intensity and quality of work, contribute to the occurrence of industrial injuries and diseases. The creation of healthy and safe working conditions is the main task of the administration of the enterprise, the employer.

4. Discussion
A person’s labor activity takes place in a certain working environment, which, if hygienic requirements are not observed, can have an adverse effect on human performance and health.

A hazardous production factor is a factor whose impact on a worker in certain conditions leads to injury or other sudden sharp deterioration in health.

A harmful production factor is a factor whose impact on a worker in certain conditions leads to illness or decreased performance.

Physical factors - moving machines and mechanisms, sharp edges, a high location of the workplace from the ground (floor) level, objects falling from a height or flying off, an increased level of harmful aerosols, gases; ionizing and other radiation; voltage in the electrical circuit; strength of magnetic and electromagnetic fields, static electricity; noise, vibration, high or low temperature, mobility, humidity, air ionization, atmospheric pressure, lack or lack of natural light, pulsation of light flux, increased contrast, direct or reflected brightness.

Biological factors include various biological objects: pathogenic microorganisms (bacteria, viruses, rickettsiae, spirochetes, fungi), as well as macroorganisms (plants and animals).

Psychophysiological factors - physical overload (static and dynamic) and neuropsychic (mental overstrain, monotony of work, emotional overload).

Chemical factors - toxic substances of various aggregates: dichloroethane, acetone, benzene, xylene, toluene and other solvents; methane, carbon dioxide, acetylene, other gases; varnishes, paints, enamels; medicines; household chemicals and many other chemicals.

Maximum permissible concentrations (MPC) of harmful substances in the air of the working area are concentrations that, during daily (except weekends) work for 8 hours or for a different duration, but no more than 40 hours per week during the entire working experience, cannot cause diseases or deviations in the state of health, detected by modern research methods, in the process of work or at certain periods of life of the present and subsequent generations.

Hazardous substances are divided into four classes according to the degree of danger: 1 - extremely hazardous, 2 - highly hazardous; 3 - moderately dangerous; 4 - low hazard.

In the national economy of the Republic of Belarus, in conditions with harmful and hazardous production factors, more than 28% of the entire labor population is employed. In industry, these jobs employ 33% of the workers, and in construction, 19%.

The main unfavorable production factors at the enterprises are: increased noise level; increased neuro-emotional stress; harmful chemicals in the air of the working area, exceeding the maximum permissible concentrations at the workplace.

The maximum permissible level (MPL) of the production factor is such a level, the effect of which, when working for a set duration during the entire length of service, does not lead to injury, illness or deviation in health status during work or in the remote periods of life of the present and subsequent generation.

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