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DEVELOPMENT OF MEASURES TO REDUCE THE IMPACT OF HARMFUL AND HAZARD FACTORS ENCOUNTERED IN HIGH-TECHNOLOGY ENTERPRISES

The complexity of problems that face the occupational safety and health system requires the use of researches and conclusions of many branches of science which are related to the problems of creating the safe working conditions. The aim of occupational safety is the occupational accident prevention and personal injuries reducing. Harmful and hazard occupational factors encountered in high technology machine-building enterprises are considered in this paper. These factors and the influence of each of them on a person are studied and classified. The most hazard factors and the factors that a person confronts most often are detected. The influence of harmful and hazard occupational factors is analyzed. And by way of this analysis we get the information about what kinds of occupational diseases and injuries a person meets directly. The occupational safety measures are proposed and considered and the problems and ways of solution are detected. Tabl.1, ref. 3.

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INTRODUCTION

Problem statement in a general view. One or a series of hazard and harmful factors can affect a worker while working in the workplace. Safety of various processes can be determined by its quantity and hazard level individually. Occupational safety is determined by the safety degree of individual processes.

Hazard is a productive factor the impact of which leads to a personal injury or other sudden health deterioration under certain conditions. If the productive factor leads to a disease or work decrement it is considered harmful (DSTU (National Standards of Ukraine) 12.0.002-80).

Depending on the exposure level and time the harmful factor can be hazard. DSTU 12.0001-74 "SSS (Safety Standards System). Occupational Hazard and harmful factors. Classification" provides a classification of working condition elements. They are divided into 3 groups: physical, chemical and psychophysical elements.

Purpose of the study. To consider some measures to improve working conditions in modern production in order to make them more effective to prevent injuries. To accomplish an integrated approach for the implementation of these measures in the overall production management system creating a sub-system safety management.

MAIN FINDINGS

At the high technology enterprises work is accompanied by the influence of a number of hazard and harmful factors:

- physical - increased static electricity, electromagnetic radiation, increased electric and magnetic fields intensity, insufficient light of the workplace or increased light intensity;
- psychophysical - physical (static) and neuropsychic overstrain, work monotonicity, emotional overstrain.

Following hazard and harmful productive factors can affect a worker while working in the enterprise:

- moving machines, vehicles and mechanisms;
- unprotected moving parts of machinery, machines and industrial equipment;
- falling equipment products, tools and materials during;

- impulse wave (explosion caused by the rupture of a vessel containing a pressurized liquid);
- a pressure fluid jet, which flowing out the vessels and conduits;
- increased slipping (due to icing, wetting and oiling the surfaces, on which the operating personnel moves);
- higher levels of gas and dust pollution;
- high or low surface temperature of machinery, equipment and materials;
- high or low temperature, humidity and air motion;
- higher level of noise, vibration ultra and infrasound;
- high supply voltage, closing of the circuit may occur through the human body;
- higher level of static electricity;
- sharp edges, burrs and roughness on the surfaces of equipment and instruments;
- absence or shortage of natural light;
- lack of light of the working area;
- reduced object contrast in comparison with the background;
- direct glare (production area floodlighting, headlight beam of vehicles) and reflected glare (due to spilled water and other liquids on the surface of production areas);
- increased pulsation of light flux;
- higher levels of ultraviolet and infrared radiation;
- chemical substances (toxic, irritant, sensitizing, carcinogenic, mutagenic, that affect human reproduction);
- chemical substances that penetrate into the body through the respiratory system, the gastrointestinal tract, the integumentary system and mucous membranes;
- pathogenic microorganisms (bacteria, viruses, fungi, protozoa) and waste products;
- overstrain (static and dynamic) and neuro-psychological factors (emotional overstrain, analyzer overstrain, mental strain, work monotonicity).

The levels of hazard and harmful factors must not exceed maximum permissible values specified in the sanitary standards, regulations and normative and technical documentation.

Hazard factors that affect the working conditions of workers are in Table 1.

Table 1

Hazard factors that affect the working conditions of workers

Work conditions elements	Specification
Air composition	Dust content
Amount of air	Noise
Meteorological conditions (small scale climate)	Air temperature Air humidity Air velocity
Illumination	Natural lighting Artificial illumination
Sanitary factors	Provision of standard sanitary conditions Provision of production area
Psychophysical factor	Working conditions and recreation work monotonicity

Fire hazard is a possibility of fire development in any process. It should be noted that there is not a hazard fire. If it does not threaten human life and health, it causes property damage.

Toxic combustion constitutes the greatest threat to human life, especially while indoor fire.

A flame - is an extremely harmful factor of fire, but occurrences of its direct impact on people are rare enough. A flame temperature can be 1200-1400 °C during a fire, and people who are in the fire area may have burns and a sensation of pain.

Smoke is a large number of the smallest particles of unburnt products that are in the air. It causes intense irritation of the respiratory system and mucous membranes. In addition the evacuation of people slows in a smoke-filled room due to visibility reduction, and sometimes it is quite impossible to carry out it.

Destruction of building structures occurs due to loss of load-carrying ability under the influence of heat and explosions. At the same time people can get significant mechanical injury, be found under the rubble of the building.

Depending on the type of the fire hazard of production processes all manufactures are divided into five categories:

I Category A - combustible and flammable liquids; products that explode and burn in contact with water, oxygen, air and with each other;

II Category B - dust, fibers; flammable liquid that forms explosive mixtures in contact with dust and vapor;

III Category C - combustible and nonflammable liquids; solid combustible substances and materials;

IV Category D - incombustible substances and materials in the molten or glowing state;

V Category E - incombustible substances and materials in cold condition.

Methods of fire suppression:

1. Cooling of the combustion zone or the reacting agents;
2. Isolation of a substance from the combustion zone;
3. Dilution of air or combustible substances with non-combustible substances;
4. Inhibition of combustion by explosion.

Fire-suppression substances are water; foam; inert and non-combustible gases; extinguishing powder; sand.

Carriers of hazard and harmful factors can be: objects of work, products of work, implements, energy, environment, flora, fauna, and people.

The factors are represented by not only the parameters but also the influence aimed to the specific object. In order to determine the possibility of factor influence on person the following should be known:

- factors that effect on the body and a type of influence;
- a level of influence on a person during the stable functioning in extreme cases and its effects (due to actual damages);
- a principle of negative effect reduction in order to eliminate the probability of risk which may lead to undesirable consequences for the person;
- control conditions and capability of operating factors and the environment and situation.

When performing any work it is necessary to know and observe safety regulations and fire regulations.

The voltage that is above 44V DC and 36V AC is life threatening. Before start of work you must check the accuracy of device (units) connection paying special attention to the conformity of supply voltage with that marked on the case of devices (units) and while using DC – to the polarity when connecting to a power source.

When performing any work it is necessary to pay special attention to observation of the following rules:

- the cases of all devices and units, the supply voltage of which is higher than 40 V DC and 36 V AC must be effectively grounded
- any work related to replacement of parts and components, should be made by the specialist and only after switching off the device and unit;
- In case of deflagration or response of automatic tripping circuit breaker, as well as in case of detection of any disturbances in device (systems) work, you must immediately stop operating and off-stream;
- know the location of fire extinguishers and be able to use them;
- keep electric equipment, workplace in working condition and clean;
- switch off all devices and light when leaving the room to.

It is strictly forbidden:

- start working without safety induction with an obligatory mark in the logbook;
- use failed devices and units;
- violate the operating rules for devices and units that are noted in the operating manuals and certificates;
- leave unattended operating devices, units and heaters;
- plug in devices and equipment with removed case (panel);
- touch a unit control block with wet hands or objects;
- do any operations with current-conducting parts without using protective outfit;
- smoking in unauthorized places;
- obstruct doorway and access to fire-extinguishing equipment.

Conclusions

The scientific analysis of occupational injuries proves that they occur mostly due to loss of strength and reliability of the working equipment, dangerous state of the system "man-machine-environment" and a number of technical factors. The technical factors are primarily engineering reliability (design flaws, technological and operational violations, destruction of machinery parts under the influence of corrosion and corrosion cracking), the organization of occupational safety and health management (documentation, legal norms, standards of operation safety, methods of training, etc.), sanitary conditions in the buildings and in the workplace (harmful substances in the work area, industrial lighting, noise, vibration, ionization, electromagnetic, ultraviolet, laser radiation, etc.).

This problem is solved using the achievements of science and technology which directly or indirectly provide occupational safety and health, as well as sociology, law and economics, industrial aesthetics, ergonomics, engineering and social psychology, physiology. These disciplines are included in the set of sciences that study person in the course of employment.

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