

TECHNOLOGY, MACHINE-BUILDING, GEODESY

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**PRODUCTION ENVIRONMENT AND EMPLOYEES' LABOUR ACTIVITY FACTORS
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At present oil refining and petrochemical industries are the most stable operating sectors of the economy ensuring population and national economy demands for fuel and energy resources. However the vast majority of substances used in the refining and petrochemical industry have harmful (toxic) and carcinogenic properties. The main directions in ensuring a safe production environment for people are the hygienic regulation of harmful factors, socio-hygienic monitoring of working conditions and workers' health with the appropriate science-based development and implementation of environment quality control system and the prevention of harmful factors impact on the basis of effective public health supervision and implementation of preventive activities.

In recent years, human health maintenance in the workplace can be referred to one of the major problems of humanity. It depends not only on social and economic factors, but also largely on the state of the production environment. In connection with the increase of air pollution in the working area, the problems of human health protection have been and remain rather acute, since half of the Belarusian population live and work in the industrialized cities.

It is known that the working environment of refineries is formed under the influence of a number of concurrent factors, which have different material nature, and peculiar features of effects on the human organism. Human labour activity is connected with the exposure of a variety of production environment factors, severity and intensity of the process. Hygiene labour conditions are determined by the production process organization, the equipment used the degree of automation and mechanization, which specify the spectrum and intensity of production factors exposure. It is repeatedly proved that the adverse production factors have a negative impact on the health of workers.

In the development of norms and standards of working conditions factors each factor is considered separately (without taking into account the simultaneous exposure of other factors on the worker). Therefore the usage of single assessments of individual working conditions factors can significantly distort the real impact of the labour conditions on the employee. For example the combined action of noise and temperature increase, vibration and temperature reduction and many others. The combined effects of factors of working conditions on the worker, as we know, can be manifested in the form of potentiating (disproportionate exposure intensification), the summation of independent action effects, as well as in the weakening of the final effect. Thus, workers' health damage is attributed to the complex influence of production environment factors.

To assess the working conditions at the workplaces of auxiliary departments we used and analyzed workplaces certification maps on working conditions for major blue-collar occupations of department №5 «Repair and assembly shop», department №9 «Energy supply shop» and department №46 «Transport department» of JSC «Naftan», Novopolotsk. The ground for the selection of research subjects is the fact that at refineries it is also necessary to pay attention to auxiliary departments since the cumulative impact of harmful production factors adversely affects the health of workers.

Certification of workplaces and complex hygienic evaluation of working conditions at the auxiliary departments of the refinery plant enabled to identify groups of factors, each of which individually or in combination could adversely affect the health of workers:

- physical: noise, infrasound, vibration, microclimate, lighting, EMF, UV radiation, thermal radiation, dust and aerosols;
- chemical: harmful substances - manganese in welding aerosol, iron oxide, ozone, carbon monoxide, saturated hydrocarbons C1-C10, benzene, toluene, acids, hydrogen sulfide, methyl ethyl ketone, nitrogen dioxide, hydrogen fluoride.
- psycho physiological: emotional stress (degree of responsibility for the personal activity outcome, the significance of errors, your own life risk degree, the degree of responsibility for the safety of others); working stance (squatting position, kneeling, work in an awkward constrained or sloped posture); physiological discomfort (PPE), sensory load (duration of focused observation).

The analysis of the results of workplaces certification showed that the working conditions of workers under study in accordance with SanPin RB 13/02/2007 «Hygienic classification of working conditions» range from allowable 2nd class to harmful 3rd Class of 1- 4 degrees.

Optimal working conditions (class 1) are such conditions that preserve workers' health and create the background for maintaining a high level of working efficiency.

Acceptable working conditions (class 2) are characterized by such levels of production environment and working process that do not exceed the hygienic standards for workplaces, and possible changes in the functional state of an organism arising under their influence recover during the regulated rest or by the beginning of the next shift and do not adversely affect the near and the long-term health status of workers and their offspring. Optimal and acceptable conditions of work are referred to safe ones.

Harmful working conditions (class 3) are characterized by the presence of harmful industrial factors going beyond the hygienic standards and having adverse effects on the organism of the worker and / or his offspring.

1st Degree of Class 3 (3.1). Working conditions are characterized by such deviations of harmful factors levels from hygienic standards that cause functional changes, restoring usually during a longer (than the beginning of the next shift) interruption of contact with hazards and increase the risk of health damage.

2nd Degree of Class 3 (3.2). The levels of harmful factors causing persistent functional changes and leading, in most cases, to an increase of production conditioned morbidity (which is manifested by increased morbidity with temporary disability and, above all, by such diseases that reflect the state of the most vulnerable organs and systems for the given harmful factors), the appearance of initial symptoms or mild (without loss of labour capacity) forms of occupational diseases arising after prolonged exposure (often after 15 years or more).

3rd Degree of Class 3 (3.3). Working conditions are characterized by such levels of harmful factors, the effects of which, as a rule, lead to the development of occupational diseases of mild and moderate severity (with the loss of labour capacity) in the period of the labour activity, the growth of chronic (work-related) pathology, including elevated levels of morbidity with temporary disability.

4th Degree of Class 3 (3.4). Working conditions are characterized by such levels of harmful factors, under which severe forms of professional diseases and high level of general morbidity with temporary disability may arise.

The conducted analysis of certification materials of working conditions shows that workers are exposed to a number of harmful and hazardous working factors, the main of which is undoubtedly the chemical one.

Workers' working conditions of the most common specialties of department number 5 «Repair and assembly shop» of JSC «Naftan» (electric and gas welder, turner, heat-treater at HFC units, grinder, sharpener) refer to harmful conditions of the 3rd class 2-3 degrees. Arc manual welder works under the conditions of the highest degree of danger 3.4 according to chemical factors.

Working conditions of the electrician of repair and installation of electro equipment at department number 9 «Energy supply shop» of JSC «Naftan» are referred to harmful 3rd Class 1 degree; workers' of department number 46 «Transport department» of «Naftan» (bulldozer operator, excavator operator, front loader driver) work under 3rd Class 2nd degree harmful conditions.

There are harmful chemical substances of 2nd, 3rd, 4th hazard classes (class of substances is determined by the MPC) in the working area air of the considered departments. Conducted researches have shown that under steady flow of the technological process, the concentration of harmful substances at the departments №5, №9 and №46 does not exceed the MPC. Deviation from the hygienic standard MPC is department №5 for arc manual welder. The MPC data are reflected in Table 1.

Table 1 – Chemical factors of production area at department №5 JSC «Naftan» Novopolotsk

Factors and indexes of production environment	Arc manual welder				
	nitrogen dioxide	carbon monoxide	hydrogen fluoride	manganese in welding aerosol	iron oxide
Hygienic standards (MPC, MPL)	2	20	0,5	0,1	6
Actual values	2,81	35,87	1,36	6,19	19,5

Despite the fact that the concentration of harmful substances in the working area air does not exceed permissible concentration, combined with adverse physical factors of production area they can adversely affect the health of the workers of the investigated enterprise. Their influence is diverse and lies in the violation of the nervous, hematopoietic, cardiovascular, digestive, immune and other systems' functioning.

It should also be taken into account that prolonged exposure to noise with levels above 80 dB, which is typical of each specialty, can lead to impairment of hearing – professional bradyacusia.

Auxiliary departments workers' contact with hazardous and harmful occupational factors at the refinery enterprise affects the health and has an impact on the state of the main physiological functions of the body.

Taking into consideration that chemical substances having negative impact on the organism of the refinery workers are the part of raw materials and finished products, it is not possible to exclude them from the technological cycle. It is necessary to develop recommendations and actions to improve working conditions, to prevent occupational diseases and reduce occupational traumatism at the refinery.

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