

Labor Health and Safety of Personnel Exposed to Traffic and Industrial Noise

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ABSTRACT

The results of the study of the problem of occupational health and safety of personnel exposed to traffic and industrial noise are presented. It is shown that the impact of transport and industrial noise causes increased health risks and requires the implementation of a set of measures to protect and ensure the safety of personnel exposed to such impact. At the same time, the modern system for ensuring the safety of personnel exposed to traffic and industrial noise requires improvement aimed at minimizing health risks caused by such exposure. Attention is focused on the need for the combined use of individual and collective means of protection against noise and the formation of personalized recommendations for the protection and labor safety of personnel exposed to traffic and industrial noise.

Keywords: Labor protection, Labor safety, Labor economics, Labor potential, Acoustic safety.

1. INTRODUCTION

The need for practice to increase the distance of transportation and the volume of transported goods necessitates an increase in the engine power of vehicles, which inevitably leads to an increase in the intensity and exposure time of the generated noise impact [1-3]. According to modern data, more than two million Russians work under conditions of increased acoustic load [5-7]. This leads to the fact that diseases of noise etiology occupy the first place in the structure of occupational and work-related diseases [8-10].

A significant contribution to solving the problems of occupational health and safety of personnel exposed to traffic and industrial noise was made by E.I. Denisov [1, 7], O. Hahad [2], S.P. Dragan [3, 6, 18], S.K. Soldatov [12, 14, 20], A.I. Komkin [10], V.B. Pankova [11, 17], L.V. Prokopenko [13], V.N. Zinkin [15, 22, 24], G. Pouryaghoub [26], J. Wang [28], A. Kurabi [29] et al.

The noted negative dynamics is due to both man-made processes and deficiencies of legislation in the field of noise control, the use of ineffective anti-noise,

insufficient effectiveness of measures aimed at creating safe living conditions for specialists and the population exposed to noise [11-13].

Since transport and industrial noise contains in their spectrum mainly infrasonic and low frequencies, the application of sanitary rules and norms of SanPiN 2.2.4.3359-16 leads to the fact that almost the entire spectrum of transport and industrial noise turns out to be abnormal, which, of course, contributes to an increase in occupational and production-related morbidity [14-16].

The above circumstances determine the relevance of the development and implementation of measures for the protection and safety of labor of personnel exposed to transport and industrial noise [17-19].

In most cases, the most acceptable way to ensure the acoustic safety of personnel is the technology of individual and collective protection against noise [20-22].

2. MATERIALS AND METHODS

To characterize the occupational health and safety measures for personnel exposed to traffic and industrial noise, a questionnaire survey, dispensary examination and tone audiometry were carried out for 184 people of the aerodrome workers and the population of the aerodrome area for three years. The age of the subjects ranged from 26 to 64 years, the duration of work and / or residence in conditions associated with exposure to traffic and industrial noise, before the start of observation was at least five years.

The examination of the ENT-organs included the study of complaints and anamnesis, external examination and endoscopy according to the generally accepted method, as well as testing of hearing acuity. The audiometric study was carried out in a specially equipped room using an MA-31 audiometer. In the studied socio-professional groups, the indicators of morbidity with temporary disability were also analyzed: the number of cases of primary morbidity, cases and days of labor losses.

The study of medico-biological effects of the impact of acoustic vibrations on the human body is traditionally based, first of all, on the indicators of their intensity, as well as the temporal and spatial organization. In the interests of taking into account the share of these components, as well as determining the percentage and duration of each of their noise levels accompanying the life of the population, a study of their temporal and probabilistic characteristics was carried out.

To quantitatively characterize constant noise at workplaces, we used the sound level (US) (L_A), measured in dBA, and the sound pressure level (SPL) L , measured in dB, in octave bands with geometric mean frequencies of 2; 4; 8; 16; 31.5; 63; 125; 250; 500; 1000; 2000; 4000 and 8000 Hz.

Ultrasonic (L_A) in dBA, equivalent sound level (L_{Aeq}) in dBA and maximum sound level (L_{Amax}) in dBA were used as characteristics of variable noise (except for impulse noise).

The characteristics of the impulse noise were ultrasonic (L_A) measured in dBA, the equivalent (in energy) sound level (L_{Aeq}) in dBA and the maximum sound level (L_{Amax}) in dBA.

For a comprehensive characteristic of acoustic safety, an integral indicator has been developed - the coefficient of acoustic safety [30].

3. RESULTS AND DISCUSSION

Traffic and industrial noise, being a general biological irritant, affects all organs and systems of the body, but it especially adversely affects the hearing organ [20-22].

When exposed to noise, specific physiological changes in the auditory analyzer develop, depending on the specific conditions of life: the level and nature of the noise, the duration of its exposure, the individual properties of a person and many other factors that cannot always be taken into account. Long-term cumulative noise exposure causes increased risks of the development of persistent morphological and functional changes, called "noise sickness" [1-12].

It was confirmed that the key role in the development of noise sickness belongs to the intensity of noise - this determines the high information content of the synthesized acoustic safety factor. At high noise levels, hearing loss prevails, and at low levels, neurovascular disorders prevail.

The nonspecific effects of traffic and industrial noise are primarily manifested by changes in the central nervous, cardiovascular and endocrine systems, shifts in metabolism, and a decrease in the overall resistance of the organism.

The revealed nonspecific reactions of the central nervous system manifested themselves in the form of a moderately expressed syndrome of neurasthenia, less often in the form of a syndrome of vegetative-vascular dysfunction (neurocirculatory dystonia), deterioration of the adaptive systemic reactions of the body.

That is, the direct and indirect (through sensory systems) action of traffic and industrial noise leads to the development of pathological changes in the central nervous, cardiovascular, respiratory, digestive and immune systems, the organ of hearing and the formation of a complex multicomponent symptom complex.

Comparison of the incidence of the group exposed to traffic and industrial noise with the control group (the population of the same area, not exposed to such exposure) showed an increased incidence. The disease structure is dominated by diseases characteristic of both the effect of noise - diseases of the ear organs, blood circulation, nervous system, digestion, and infrasound - diseases of the skin, eyes and respiratory organs.

That is, prolonged exposure to traffic and industrial noise in workplaces creates an unacceptably high health risk. Diseases identified in the population exposed to such an impact have a pronounced relationship with living conditions based on an assessment of occupational risk, which makes it possible to classify diseases of the hearing organ as occupational diseases, and diseases of the respiratory system, eyes, digestion, nervous system, circulatory organs and skin - to professionally caused diseases.

The foregoing makes it necessary to improve the means of individual and collective protection against transport and industrial noise (anti-noise). Moreover, the protective properties of anti-noise must correspond to

the real levels of transport and industrial noise, which requires the implementation of a system of hygienic monitoring of living conditions by the acoustic factor.

It is obvious that the maximum effect of protection against traffic and industrial noise can be achieved only with the complex application of collective and individual noise suppression systems.

Active noise cancellation means are potentially effective – however, traffic and industrial noise are broadband high-intensity (their energy is dispersed over a wide spectral range), which significantly reduces the potential for realizing active noise cancellation. Therefore, we consider the use of modern high-tech noise-absorbing materials and the use of technologies that provide the possibility of implementing personalized hygienic monitoring of living conditions by the acoustic factor as a priority direction for improving anti-noise.

4. CONCLUSION

Thus:

the impact of traffic and industrial noise causes increased health risks and requires the implementation of a set of measures to protect and ensure the safety of personnel exposed to such effects;

a modern system for ensuring the safety of personnel exposed to traffic and industrial noise requires improvement in order to minimize the health risks associated with such exposure.

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