HEALTH RISK FACTORS WHEN APPLYING LOW-TEMPERATURE PLASMA TECHNOLOGY

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The problem of ensuring safe working conditions and protection of workers ' health is particularly relevant in the introduction of plasma nanotechnology, which in recent years has been widely introduced in various industries of high-tech engineering, powder metallurgy, electronics, etc. [1, 2].

Objective: to determine health risk factors in the technological application of low-temperature plasma.

Materials and methods. Hygienic assessment of working conditions was carried out and health status of 678 workers using plasma technologies was studied: operators engaged in plasma spraying (group 1), cutting (group 2), surfacing (group 3); work experience up to 5 years (inclusive) and 6 – 10 years.

Results. Unfavorable factors in technologies using low-temperature plasma are intense noise (up to 120 dBA) and toxic dust - gas mixtures including ozone (from 0.8 to 7 MPC), nitrogen oxides (from 0.3 to 2.0 MPC) and a highly dispersed aerosol (particle size up to 1 µm) consisting of melted particles of the initial powders and condensate of metal vapors and their compounds (3-and 6-valent chromium, iron oxide, Nickel, copper and zinc oxide).

Medical examination revealed functional disorders in the autonomic nervous and cardiovascular systems, disorders of sound perception of the neurosensory nature of the auditory analyzer, reflecting a certain tension of adaptive processes in the body of workers. The frequency of inflammatory and dystrophic changes in the respiratory tract was 61.6; 35.5 and 25.0% in groups 1, 2, 3, respectively. With increasing experience, there was an increase in the frequency of subatrophic changes in group 1 to 60.3%, group 2 – 27.1%, 3 – 24.9%.

Discussion. Working conditions of workers using plasma technologies are characterized by the combined effect of intense noise and toxic dust and gas mixtures including ozone, nitrogen oxides and highly dispersed aerosol consisting of metal nanoparticles and their compounds. The impact on workers of nanoparticles causes rather early development of nonspecific pathological changes in various organs and systems of the human body and is aggravated by the influence of related factors of physical and chemical nature. The nature and degree of severity of clinical and functional changes depends on the specific combination, levels and duration of exposure factors.

Conclusion. The research results can focus on the development and selection of safer equipment, justification of measures to protect the health of workers engaged in production with the technological use of plasma.

References

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