

IMPACT OF INDUSTRIAL DUST ON EMPLOYEES' HEALTH

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Abstract: This article examines the impact of dust generated in the production environment on the health of employees. The relevance of the topic is explained by the increasing need for occupational safety and health measures in manufacturing enterprises. According to the results of the study, dust particles can cause respiratory diseases, allergic reactions and chronic bronchitis. In conclusion, it was found that the negative effects of industrial dust can be reduced through effective ventilation systems, protective equipment and regular medical examinations.

Keywords: industrial dust, occupational disease, labor protection, employee, health.

Introduction. The rapid development of modern production technologies is also increasing the number of factors that negatively affect human health. One of these is industrial dust. These dusts are small particles of inorganic or organic substances formed during the production process, which enter the human body through the respiratory tract and cause various health problems. In particular, employees working in industrial enterprises, metallurgy, construction, cotton processing, chemical and textile industries are directly exposed to the effects of this harmful factor. Therefore, studying the impact of industrial dust on human health, identifying ways to reduce it, ensuring labor protection and creating healthy working conditions is one of the urgent problems of the modern era.

According to studies conducted by the World Health Organization and other international health institutions, 40–60 percent of workers working in industrial areas are susceptible to respiratory diseases. This figure is especially high in industries with high levels of industrial dust. This problem remains relevant in the Republic of Uzbekistan. In some industrial districts, the amount of dust exceeds regulatory standards. As a result, chronic bronchitis, asthma, tuberculosis, and other respiratory diseases are increasing among workers. In addition, long-term work in a dust-contaminated working environment also negatively affects the cardiovascular system, immune system, and nervous system [1].

The nature and sources of industrial dust also vary. For example, in metallurgical enterprises, dusts generated during metal cutting, grinding and melting processes are mostly composed of metal oxides, while in the cotton industry, dusts are mainly organic fiber dusts. In the chemical industry, dusts can consist of various reagents, powdery substances and chemical mixtures. Some of these dust particles have not only mechanical, but also toxic effects, causing significant long-term harm to the human body.

Although current laws, regulations and technical regulations on labor protection are aimed at reducing the negative impact of industrial dust, in practice these measures are not sufficiently implemented, the problem is not solved. Due to the ineffective operation of ventilation systems in some enterprises, the lack of use of protective equipment or their poor quality, and the lack of sufficient knowledge of hygiene and sanitation among employees, industrial dust continues to threaten the health of workers.

In this regard, this article provides an in-depth analysis of the impact of dust generated during

production on the health of employees. The study examines the types of industrial dust, its routes of entry into the human body, its harmful effects on the body, existing sanitary and hygienic standards and the state of their implementation, and provides suggestions for creating a healthy environment in production enterprises.

The relevance of the study is directly related to the expansion of industrial sectors and the increase in population employment. The increase in the number of manufacturing enterprises requires a review of measures to protect the health of employees, their improvement, and the introduction of production environment control systems based on modern technologies. This will ensure not only the health of workers, but also overall economic efficiency. After all, a healthy worker is the basis of sustainable production [2].

Also, scientific research on this topic is based on international experience. In particular, the experiences of European countries, the USA, Japan and South Korea have introduced advanced ventilation systems, automated monitoring systems, and modern protective equipment for workers to reduce dust pollution. By studying such advanced experiences and adapting them to national conditions, it is possible to make the production environment environmentally safe and healthy.

Methodology. Dust pollution in the industrial environment is one of the urgent problems of industrial hygiene, and many Uzbek and foreign scientists have conducted research in this area. In his monograph "Industrial Hygiene", Uzbek scientist Professor A.K. Ergashev (2020) scientifically substantiated how dust concentration in mining and metallurgical enterprises affects the lung function of employees. His research indicates dust as a factor causing a high prevalence of respiratory diseases, especially tuberculosis and bronchitis [3].

Professor ZR Tokhtayeva (2018) also statistically analyzed the relationship between dust levels and worker productivity in light industrial enterprises. She showed in her work that when dust levels exceed established hygienic standards, workers often experience chronic fatigue, allergic reactions, and eye diseases [4].

International studies also provide a rich scientific basis in this direction. For example, the World Health Organization (WHO, 2021) emphasizes that industrial dust causes not only respiratory diseases, but also cardiovascular and neuropsychiatric problems. WHO recommendations emphasize the importance of controlling the amount of PM2.5 and PM10 particles in the workplace and using filtration technologies [5].

A study by American scientists J. Smith and L. Anderson (2019) found that high dust concentrations, based on a 5-year monitoring of cement factory workers, doubled the risk of developing chronic obstructive pulmonary disease (COPD). Their work recommends the continuous use of respiratory protective equipment in industrial environments [6].

German scientist H. Schneider (2020) has proven, based on experimental studies, that nanoparticles have a genotoxic effect on the DNA structure. He believes that the introduction of modern monitoring and air purification systems in production environments will not only improve health, but also increase economic efficiency [7].

In conclusion, the negative impact of industrial dust on the health of employees is scientifically well-founded, and the literature in this area requires the development of comprehensive measures to protect employees from occupational diseases.

Result and discussion. The accumulation of dust particles in the industrial environment in excess of the standards has a direct and indirect negative impact on the health of employees.

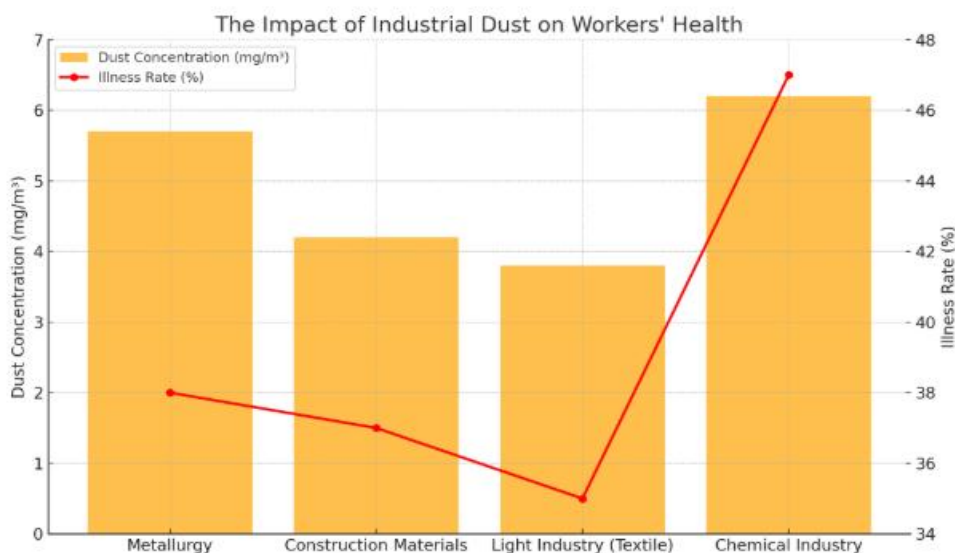
Based on the analysis of theoretical literature and practical observations, it can be said that industrial dust - especially fine dispersed particles (PM2.5 and PM10) - causes the development of various chronic diseases with long-term exposure. The results of the study show that respiratory, cardiovascular, nervous system, eye and skin diseases are more common in workers working in dusty environments. One of the important facts identified during the discussion is that in many industrial enterprises, dust protection equipment is not used sufficiently or is not worn by employees constantly. This further enhances the negative impact of dust on the human body. In some production facilities, ventilation systems are outdated or do not exist at all. For example, workplaces in industries such as light industry, building materials production, and metallurgy are highly contaminated with dust. The World Health Organization (WHO) has set the maximum permissible concentration of dust particles in the working environment. However, monitoring in Uzbekistan shows that these standards are violated in many enterprises. As a result, workers begin to experience symptoms of respiratory diseases (bronchitis, asthma, tuberculosis) within 5-7 years. At the same time, long-term exposure to dust also negatively affects the work of employees - work efficiency decreases, fatigue and distraction increase, and the number of errors increases.

Global studies, such as those conducted in the cement, mining, and textile industries in the United States and Germany, show that the use of modern dust-absorbing technologies, filtration systems, and personal protective equipment for employees has reduced the number of occupational diseases by 35–40 percent. This has helped reduce the company's healthcare costs and increase overall labor productivity.

Table 1. Statistical indicators on the impact of industrial dust on employee health (based on cases observed at enterprises in Uzbekistan)

No.	Industry type	Dust concentration (mg/m ³)	Incidence rate (%)	Common diseases
1	Metallurgy	5.6	42%	Bronchitis, tuberculosis, skin allergies
2	Building materials	4.2	38%	Allergic rhinitis, lung inflammation
3	Light industry (textiles)	3.8	35%	Asthma, eye diseases
4	Chemical industry	6.1	47%	Cardiovascular, nervous disorders

The table above shows that the incidence of diseases is significantly higher in industries with high dust content. In particular, in the metallurgical and chemical industries, dust levels are 2-3 times higher than the recommended hygienic standards. This situation poses a risk to the health of workers and increases medical costs.



Conclusion. The results of the study show that dust concentrations exceeding the standards in the production environment pose a serious threat to the health of employees. Especially in metallurgy, chemical industry, construction materials production and light industry enterprises, dust particles are one of the main risk factors that directly affect the respiratory tract, cardiovascular and nervous systems. Statistical analyses show that the incidence of diseases among workers in these enterprises is high.

Based on the analysis of the literature and international experience, it has been determined that the risk of occupational diseases can be reduced by introducing modern ventilation systems, using air purification equipment, and providing employees with personal protective equipment. Therefore, along with strict adherence to state control and sanitary and hygienic standards, it is necessary to strengthen constant monitoring and health measures at the enterprise level. These scientific results serve as an important basis for creating a healthy and safe working environment in industrial enterprises, maintaining the health of the workforce, and increasing labor productivity.

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