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IMPROVEMENT OF METHODS FOR ASSESSING HARMFUL DUST IN PRODUCTION PROCESSES

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Abstract. The article discusses methods for assessing harmful dusts generated during industrial activities and suggests ways to improve them. Harmful dusts can have a serious negative impact on the health of workers and the environment, so the importance of their accurate assessment and control cannot be underestimated. The main types of dusts, including physical, chemical and biological, and their impact on health are described. Existing methods for assessing harmful dusts, such as the gravimetric method, risk assessment, toxicological studies and biological monitoring, are considered. The article also suggests innovative approaches to improving assessment methods, including the introduction of real-time monitoring, automation of analysis, multivariate measurements and preventive measures to reduce dust generation. It is expected that the implementation of these methods will improve workplace safety and reduce risks to worker health.
Key words: hazardous dusts, production processes, dust assessment, gravimetric method, toxicological studies, biological monitoring, risk assessment, real-time monitoring, analysis automation, multivariate measurements, preventive measures.
Annotatsiya. Maqolada ishlab chiqarish jarayonida hosil bo'ladigan zararli changlarni baholash usullari ko'rib chiqilib, ularni takomillashtirish yo'llari taklif qilinadi. Zararli changlar ishchilarning sog'lig'iga va atrof-muhitga jiddiy salbiy ta'sir ko'rsatishi mumkin, shuning uchun ularni aniq baholash va nazorat qilishning ahamiyatini past baholash mumkin emas. Maqolada changlarning asosiy turlari, jumladan, fizik, kimyoviy va biologik changlar va ularning sog'liqqa ta'siri ta'riflanadi. Zararli changlarni baholashning mavjud usullari, masalan, gravimetrik usul, xavf tahlili, toksikologik tadqiqotlar va biologik monitoring ko'rib chiqiladi. Shuningdek, maqolada baholash usullarini takomillashtirishga oid innovatsion yondashuvlar, real vaqt monitoringini joriy etish, tahlilni avtomatlashtirish, ko'p parametrli o'lchovlar va chang hosil bo'lishini kamaytirish uchun oldini olish choralarini qo'llash taklif qilinadi. Ushbu usullarni joriy etish ish joylarida xavfsizlikni oshirish va ishchilarning sog'lig'i uchun xavflarni kamaytirishga yordam beradi.
Keywords: harmful dusts, production processes, dust assessment, gravimetric method, toxicological studies, biological monitoring, risk analysis, real-time monitoring, analysis automation, multi-parameter measurements, preventive measures.

Introduction. Harmful dusts generated during production can have a negative impact on both the health of workers and the environment. These dusts are generated in various industries, including construction, chemistry, metallurgy and food industry. Therefore, the assessment of harmful dusts and the improvement of their prevention methods is an important task not only to ensure safety in the workplace, but also to protect the environment. This article reviews existing methods for assessing harmful dusts and suggests ways to improve them.

Types of harmful dusts and their negative impact. Dusts of various physical and chemical characteristics are generated during the production process. The main types of dust include:

Physical dust. Formed as a result of mechanical processes such as crushing, grinding, cleaning, etc. This dust can enter the body through the respiratory tract.Химическая пыль.

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Formed as a result of chemical reactions, the use of pesticides, paints, solvents and other substances. It often has a toxic effect. 1. Biological and bacterial dust. Harmful dusts formed during biological processes (for example, in the food industry) can be hazardous to health.

Fig. 1. Industrial dust. Obtaining objective information about harmful factors

The harmful effects of dust on the body can lead to respiratory diseases (such as asthma, bronchitis, silicosis), cancer, allergic reactions and other serious health problems. Therefore, it is important to regularly assess and control air pollution in the workplace.

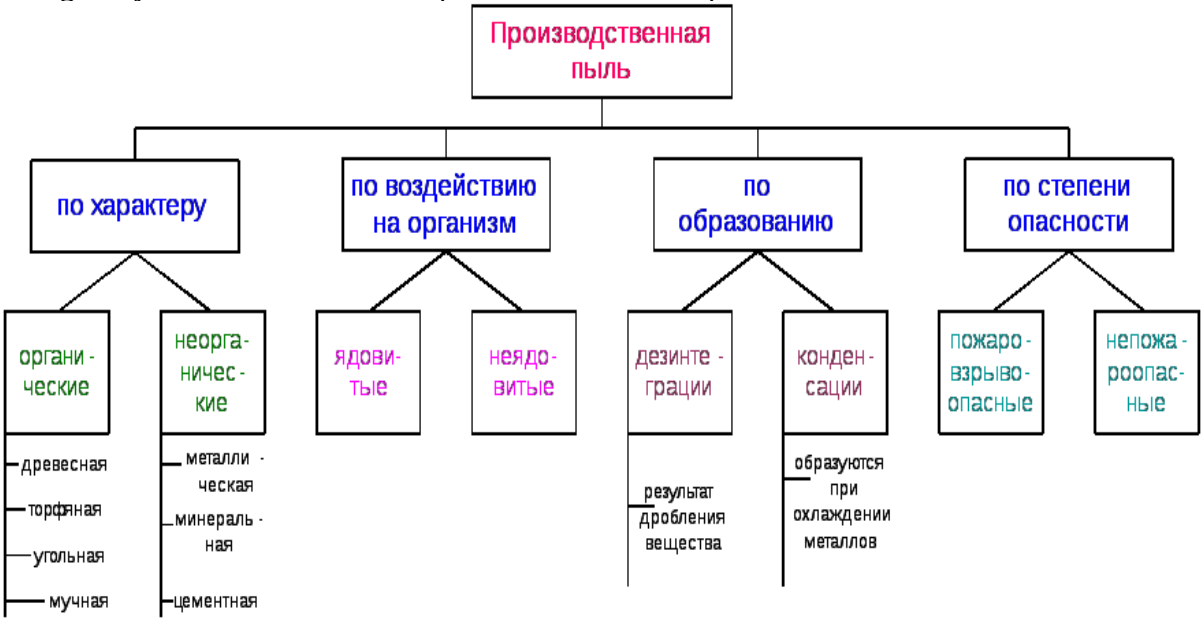

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Fig.2. Concept and classification of dust

Methods for assessing harmful dusts. There are several methods for assessing harmful dusts in production processes. Each of these methods has its own characteristics and limitations, but for effective assessment it is recommended to use them in combination.

1. Air samples (gravimetric method). In this method, a special filter is used to collect dust. The filter collects dust from the air, and then measures its mass, which allows you to determine the concentration of dust in the air. However, this method is limited to measuring the mass of dust and does not provide information on the chemical composition of the dust.

2. Risk Assessment. Risk assessment involves analyzing two main factors: hazard and exposure. This takes into account the chemical composition of the dust, its concentration and routes of entry into the body. The risk assessment method allows a comprehensive approach to analyzing the impact of harmful dusts.

3. Toxicological studies. Toxicological studies are conducted to study the toxicity of dust in laboratory conditions. This method allows you to analyze the effect of chemical components of dust on the body, for example, when inhaled. Toxicological studies can be conducted both in the laboratory and in the field.

4. Biological monitoring. Biological monitoring includes monitoring the health of workers, as well as measuring the concentration of harmful substances in the blood or respiratory tract. This method allows tracking the accumulation of toxic substances in the body of workers.

Таблица 1.

Диаметр, мкм	Скорость оседания, м/с	Смещение, м
0,1	$8{,}71 \cdot 10^{-7}$	$3{,}70 \cdot 10^{-5}$
0,2	$2{,}27 \cdot 10^{-6}$	$2{,}01 \cdot 10^{-5}$
0,4	$6{,}85 \cdot 10^{-6}$	$1{,}30 \cdot 10^{-5}$
1,0	$3{,}49 \cdot 10^{-5}$	$7{,}43 \cdot 10^{-6}$
2,0	$1{,}29 \cdot 10^{-4}$	$5{,}06 \cdot 10^{-6}$
2,5	$1{,}98 \cdot 10^{-4}$	
4,0	$5{,}00 \cdot 10^{-4}$	
10	$3{,}03 \cdot 10^{-3}$	
20	$2{,}20 \cdot 10^{-2}$	
40	$4{,}71 \cdot 10^{-2}$	
100	$2{,}47 \cdot 10^{-1}$	

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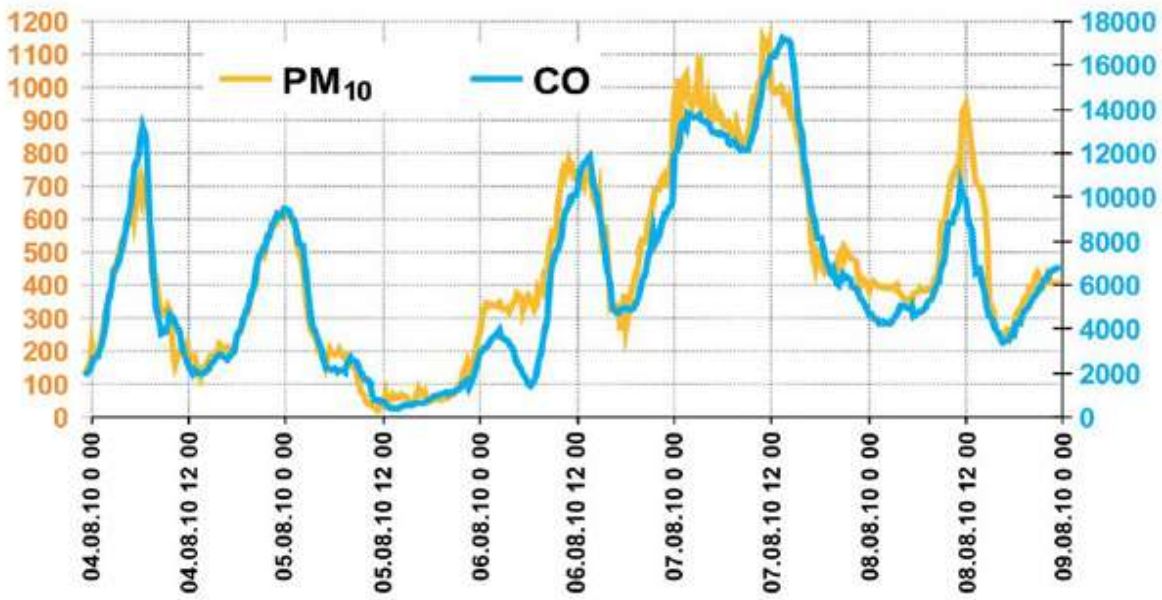

Fig. 3. Average concentrations (μg/m3) of PM10 and CO.

Improving methods for assessing harmful dusts. Several innovative approaches can be used to improve the assessment of harmful dusts in the production process.

1. Implementation of real-time monitoring. Modern sensors allow monitoring dust levels in the air in real time. Such sensors, for example, laser spectroscopes, can accurately measure the number of particles in the air, which allows for the prompt identification of potential threats.

2. Automation of analysis. Modern analytical technologies, such as artificial intelligence and machine learning, allow for the automation of the dust analysis process. This allows for the rapid processing of data and the identification of hazards affecting the health of workers.

3. Multivariate measurements. The assessment of harmful dusts can be significantly improved if not only the physical characteristics of the dust are taken into account, but also its chemical and biological composition. A multivariate approach allows for a more accurate assessment of health risks.

4. Preventive measures to reduce dust. The most effective way to reduce the negative impact of dust is to prevent its formation. This can be done by upgrading ventilation systems, using filters to remove dust from the air, and automating dust collection at workplaces to prevent its spread.

Conclusion. Assessing and preventing harmful dusts plays a key role in ensuring worker safety and protecting the environment. Improving assessment methods, implementing modern technologies, and innovative approaches will help improve air pollution control, improve working conditions, and reduce health risks.

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