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Assessment of Dust Content in the Air of Flour Milling

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Annotation: the presented article is devoted to a new and relevant direction in the grain processing industry.

The author gives a description of the main stages of the technological process of the flour-grinding industry. The analysis of the main indicators of unfavorable factors registered in the working area of production was carried out. An assessment of dustiness in the workplace is given. All stages of the technological cycle of processing grain products into flour are exposed to a complex of unfavorable factors of the production environment and the labor process.

Keywords: grain production, technological process, flour processing enterprises, air dustiness, maximum allowable rate.

Relevance. Flour preparation is the most important link in the technological process of food production and ensuring the country's food security. Modern enterprises for the preparation of flour are distinguished by a high degree of mechanization and automation of technological processes. At the same time, the work of operators of grain processing equipment is accompanied by many unfavorable factors, the leading place among which is the increased dust content of the air, leading to an increase in the number of occupational diseases, a decrease in labor productivity and disability.

The results of studies of working conditions at enterprises for the preparation of grain processing show that one of the main harmful factors is the increased dust content of the air [3].

At flour mills, industrial dust is small and light organic and inorganic solid particles that have been released into the production room from the grain mass during the movement, processing and processing of grain, as well as various bulk feed components. Moreover, dust includes not only particles suspended in the air, but also settled on the surface of equipment and building structures of buildings - airgel [1].

Dust that is in two states: in aerosol (suspended) and in airgel (settled) - can pass from one type to another. Dust passes from the first state to the second under the action of gravity, as well as electrical and centrifugal forces. Dust passes from the second state to the first under the action of perturbing forces caused by vibration, shock or air currents. [10].

In the Republic of Uzbekistan, great attention is paid to the development of the country's economy, the introduction of new modern technologies, the technical re-equipment of various sectors of the economy, which is reflected in documents such as the Laws "On labor protection" (2016), Decrees of legislative and legal "On the sanitary and epidemiological of the President of the Republic of Uzbekistan No. UP-4947 "On the Action Strategy for the Further Development of the Republic of Uzbekistan for 2017-2021" dated 01/07/2017, No. UP-4985 "On measures to further improve emergency medical care" dated 03/16/2017, No. UP-5590 “On comprehensive measures to radically improve the healthcare system of the Republic of Uzbekistan” dated 07.12.2018, and in order to

increase the productivity of the flour milling industry, the Decree of the Cabinet of Ministers of the Republic of Uzbekistan "On approval of the technical regulation on grain safety" was adopted dated August 6, 2014

The purpose of the research: The study of dust content in the flour-grinding industry, at all stages of the technological process of the flour-grinding industry for the development of the national economy and its individual sectors. Conducting an analysis of the main indicators of adverse factors registered in the working area of the production of workers in the flour-grinding industry, and developing a set of hygienic measures to improve working conditions based on indicators for assessing the working environment that affect the performance and health of a person in the process of work

Research methods. The analysis was carried out on the basis of two flour mills in the Bukhara region (Bukhorova Kogon " donmahsuloti " AJ). Subject of research: technological processes, dust and gas contamination at workplaces. Dust concentration measurements were carried out in the preparatory and grinding departments of the feed preparation plant in accordance with GOST 54578-2011 at a height of 1.7 m from the floor level. The results of measuring the concentration of dust in the air during the technological process of the production of flour and animal feed are shown in tables 1 and 2.

Results. An analysis of the measurements performed showed that the level of dust at the workplaces of operators many times exceeds the maximum permissible concentration (norm: 6 mg/m3 for grain dust and 4 mg/m3 for flour dust) in accordance with the established hygienic standards GN 0327-16 "Maximum Permissible Concentrations (MAC)) harmful substances in the air of the working area".

The main sources of dust at grain processing enterprises are impact mechanisms [3]:

- ✓ scouring machines;
- ✓ grinding machines;
- ✓ hammer mills;
- ✓ sieve machines;
- ✓ roller machines;
- ✓ screeners.[11]

Moreover, all modern domestic grain processing equipment (A1-BVG grinding machines , MPS hammer mills, A1(2) -BSO sifting machines, BSO screening machines), as well as their foreign counterparts, despite the high-quality sealing of equipment joints, are sources of increased dust due to technology features grain processing, as well as the properties of grain and flour dust.

Dust, penetrating through the leaks of equipment cases into the room air, increases its dustiness, worsens the working conditions of a person, reduces labor productivity, increases friction and wear of parts in machines, contributes to the occurrence of fires, dust explosions, etc. [4,5,6].

The composition of dust depends on its origin. Industrial dust consists of the same products and substances that are processed at this enterprise.

Grain dust consists of two parts: mineral and organic. At elevators, the dust contains up to 50% of mineral particles. Organic dust prevails in grain cleaning departments (up to 80...90%). In the grinding and peeling departments, all grain, flour or feed dust of organic origin. The sizes of dust particles fluctuate over a wide range - from fractions of a micrometer to 250 microns. Depending on

the particle size, dust is conditionally divided into coarse (from 50 to 250 microns), medium-dispersed (from 10 to 50 microns) and fine (less than 10 microns). [7,8].

Coarse dust prevails in grain elevators and warehouses, medium dust in the grain cleaning departments of flour mills and groats, fine dust (70-80% with a particle size of less than 3 microns) in the grinding and sacking departments, in the peeling departments of groats and flour mills - also fine dust. The harmfulness of dust depends on its size and chemical composition. Coarse dust is less dangerous, as it lingers on the mucous membranes of the lungs and nose during breathing. Fine dust with a particle size of less than 10 microns is the most dangerous for human health, since it can penetrate into the deep sections of the lung parenchyma [1,2].

Table 1. content indicators of these workshops in flour milling in " Bukharadonmahsuloti ", JSC mg/m ^{3}

Name of workshops	Getting Started			During work			end of work		
	Above machine	1 m closer to the machine	10 m from the machine	Above machine	1 m closer to the machine	10 m from the machine	Above machine	1 m closer to the machine	10 m from the machine
upholsterers	3.5 ±0.056	3.5 ±0.056	3.0 ±0.056	5.0 ±0.060	4.2 ±0.050	4.0 ±0.04 ***	5.4 ±0.040	4.8 ±0.037	4.0±0.02
sieving	3.5±0.054	3.5 ±0.054	3.4 ±0.051	4.6±0.05	4.4±0.0	4.1±0.051	4.6 ±0.04 ***	4.5±0.04	3.9 ±0.040
roller	4.5±0.052	4.5 ±0.052	4.4 ±0.051	4.9 ±0.054	4.9 ±0.054	4.3 ±0.05 **	5.5 ±0.047	5.35 ±0.045	4.9 ±0.040
cereals	4.2±0.05 ***	42 ±0.050	4.1 ±0.05 **	4.9 ±0.052	4.6 ±0.052	4.3 ±0.05 **	5.3 ±0.047	5.27 ±0.043	4.9 ±0.040
pickers	5.1±0.050	5.2 ±0.050	4.9 ±0.049	5.4 ±0.055	4.9 ±0.054	4.3 ±0.05 **	5.8 ±0.048	5.32 ±0.044	4.9 ±0.040
MPC according to GOST 12.1.005-88	Maximum permissible concentration of industrial dust 6 mg / m ^{3}								
	MPC according to GOST 12.1.005-88 Maximum permissible concentration of industrial dust 6 mg/m3								

The chemical composition of dust largely determines its harmfulness, which is estimated by the content of silicon dioxide (silica) SiO2.

It is obvious that the operators of grain processing equipment are constantly exposed to the negative impact of precisely fine dust. This is especially true for operators of percussion machines, as well as elevator workers when unloading grain.

Grain, flour and mixed fodder dust of industrial premises, according to a number of authors, has a very diverse effect on the body of operators. Allergenic, irritating and toxic effects were found.

Allergenic and toxic effects of grain and feed dust are due to the significant content of bacteria and fungi in its composition

The content of microorganisms in various departments of grain processing enterprises, CFU / g, 105

Type of microorganisms

Dust sampling site

Elevator, Preparatory department, Grinding department, Finished products department.

Bacteria: Pseudomonas sp. Staphylococcus sp. Streptococcus sp. Mushrooms: spergillius sp. Penicillium sp. clavicepssp.

The negative irritating and toxic effects of industrial dust on humans are determined by its total toxicological effects on various organs. Respiratory organs, skin, eyes, blood and digestive tract are most affected by dust. The increased dust content in the working area of grain processing equipment operators can explain the significant prevalence of diseases of the upper respiratory tract and lungs: pneumoconiosis, rhinopharyngitis , pharyngolaryngitis , tracheitis, bronchitis, pneumonia.

These diseases belong to the occupational group. Pneumoconiosis is found in some workers who inhale various types of dust for 5-15 years or more. Penetrating into the respiratory tract, small dust particles cause a reaction in the interstitial connective tissue, resulting in the development and progression of pulmonary fibrosis [3].

It has also been observed that industrial fine dust can penetrate the skin and into the openings of the sebaceous and sweat glands. In some cases, an inflammatory process may develop.

All of the above indicates that increased dust content in the production facilities of grain processing enterprises adversely affects the health of operators servicing grain processing equipment, which leads to occupational diseases and a sharp decrease in labor productivity.

It should also be noted that in addition to the negative impact of dust on the health of operators, there is a high probability of the occurrence of so-called dust explosions, leading to mass deaths of people and significant destruction of building structures and equipment.

The working hypothesis of this study is the proposed possibility of reducing the concentration of process dust by minimizing its components, due to the presence of a significant content of impurities of mineral origin in the processed grain material. In order not to clutter up the text, we agree to use the term "impurities" to designate mineral impurities.

The goal is achieved through the development and implementation of a new scheme for cleaning grain material from mineral impurities.

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