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Analysis of Harmful Mixtures in the Air Flow During Cotton Cleaning

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Annotation: The article discusses how to clean dusty air released from dust, dusty air from air extracted from dust extractors and pneumatic transport installations, and dust and contaminants before release into the atmosphere. It also examines the separation of harmful impurities in the air flow from various machines during the initial processing of cotton. The reasons for and solutions for minimizing the large-scale dust emissions that occur during the whole primary processing of cotton. These emissions can impair working conditions for workers and employees and increase their risk of developing occupational diseases, including silicosis, as well as minimize air pollution in production facilities and the surrounding air. Initially, dusty air is coarse, moderate, and water purification efficiency percentages are provided.

Key words: Seed cotton, dusty air, cyclone, dynamic analysis, dust particles, pneumatic transport, conical cyclone, mineral fractions, air circulation speed.

INTRODUCTION. Large amounts of dust are released at all stages of the initial processing of cotton, which pollutes the air in the production facilities and the atmosphere, worsens the working conditions of workers and employees, and can lead them to occupational diseases, especially silicosis. The issue of decontamination of ginneries is of paramount importance due to the growing pollution of machine-picked cotton. Today, with the widespread introduction of machine picking, the ginning industry needs not only to improve the technological process of receiving, storing and processing cotton, drying, cleaning and processing, but also to improve dehumidification and air purification systems. measures should be taken.

At a time when the world is doing a lot of research to keep the environment clean, the dusty air coming out of the ginneries of the Republic also leads to a certain amount of environmental degradation. Today we need to pay serious attention to the issue of dusty air purification. To solve this problem is to choose a cleaning technology, taking into account its composition in the cleaning of dusty air entering the dust collectors, that is, firstly: to create an environmentally friendly cotton ginning plant; secondly, one of the important tasks is to carry out targeted scientific research in areas such as the development of effective technology for the treatment of residual dust by trapping fibrous waste that is emitted into the waste [1].

In cotton mills, a certain amount of dust is released from the cotton during the initial processing of seed cotton. According to health norms, the amount of dust in each cubic meter of air should not exceed 10 mg / m^3, and the amount of dust emitted into the atmosphere from factories should not exceed 150 mg / m^3. In ginneries, this condition requires that each machine be cleaned before releasing harmful dusty air into the atmosphere [2]. Powder from seed cotton consists of these organic and mineral fractions, the organic fraction consists of crushed particles of cotton branches, leaves and stalks, and crushed fiber fragments. The mineral fraction consists of particles of soil, sand and other bodies that are added to the cotton during harvesting.

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At the beginning of the technological process scheme, ie during transportation and cleaning of seed cotton, mainly mineral dust is separated from it, and at the end of the technological scheme, ie during ginning, lintering, fiber cleaning and pressing, mainly organic fraction of dust is separated. 10 ... 20% of the dust released in the pneumatic transport system is the organic fraction, 80 ... 90% is the mineral fraction, and at the end of the technological scheme, ie 80 ... 90% of the dust from the gin and linter condensers is the organic fraction [2].

The amount of dust in the air around the process machines and in the production shops depends on the type of cotton seed being processed, its moisture and contamination. given the percentages of magnitude and quantity [3-5].

The size and percentage of dust particles Table 1

№	Size mkm	The amount of dust particles,%
1	0-50	4
2	50-70	11
3	70-90	12
4	90-160	13
5	160-190	9
6	190-250	13
7	250-500	12
8	500-1000	14
9	1000-1500	5
10	2000 and more	7

Local absorption of dust is the main method, as dust is released from all the machines used to perform technological processes in cotton mills.

Each vacuum cleaner is characterized by a dust holding capacity (%) determined by the following formula:

=G1G2·100,

where G_1 is the amount of dust in the exhaust air; G_2 is the amount of dust held by the dust collector.

The dust holding capacity of each vacuum cleaner can also be determined by the following formula:

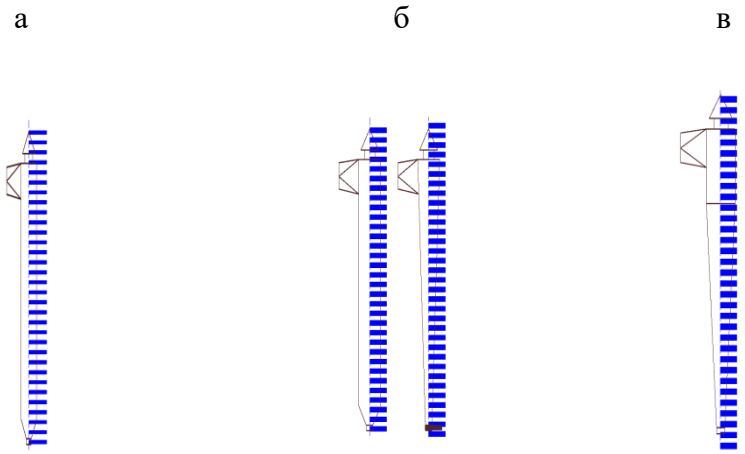
=d1-d2d1·100,

where d_1 is the dust content of the air entering the dust trap; d_2 is the dust content of the air coming out of the dust collector.

In cyclones, the air is cleared of large dust particles larger than 50 mkm (10^{-6}). When the air flow inside the cyclone turns in the form of an Archimedean spiral, centrifugal forces are created, under the influence of which the dust particles hit the outer wall and fall to the bottom of the cyclone. rises rapidly from the cyclone to the atmosphere. However, it should be noted that today these cyclones, invented in the late XIX century, are obsolete, and the development and analysis of the forecast to increase the efficiency of newly modeled cyclones based on dynamic analysis of the movement of harmful compounds in the air stream during cotton ginning is very important. Although cyclone separators (later "cyclones") were manufactured in the late 19 th century and were obsolete, they are still the most popular cleaners today and have very few analogues. In fact, it is the invented cyclones that are designed for extreme temperatures, pressures, and solid particle loads due to the many capital investments and maintenance-free operation, the absence of moving parts, high reliability, and the advantages of separating existing solids from process gas streams. is an analogue, a copy [6-11].

A conventional cyclone consists mainly of a cylinder equipped with a tangential inlet, a dust chamber, and a vertical outlet pipe in a conical cleaning vessel, commonly referred to as a vortex finder. The flow of dusty air in the process enters the cyclone at a very high angular velocity tangentially, so that the flow begins to rotate and changes its direction downward from the top of the section of the cone.

Therefore, the dust particles are collected in a dust collection chamber attached to the bottom of the section of the cone, and the dust-free air is directed upwards and exits the cyclone through a vortex trap (Fig. 1).



a. cylindrical; b) conical; c) cylindrical-conical.

Figure 1. Schematic of a single-flow dust collectors

Cylindrical dust collectors are not currently used. This is because the airflow that enters it begins to circulate based on the centrifugal force. As the number of rotations increases, it is unable to deliver dust particles to the wall as the airflow velocity decreases. As a result, dust particles cannot reach the dust trap wall, which reduces the cleaning efficiency.

ЦС type dust collectors have high cleaning efficiency when they enter the cone dust collectors, but one of their main drawbacks is that when the dust air stream entering the dust collector vertically enters the dust separator chamber, the air flow hits the sloping side of the cone. the aspiration to the upper part occurs. This force prevents the airflow from moving in a spiral, resulting in a loss of force that spirals the separated dusty air and causes a sharp decrease in the cleaning efficiency of the dust collector. In general, for static dust collectors to work effectively, the static drop in air pressure must be carried out in a uniform manner, a situation we can also see in the following research paper. The change in pressure definitely depends on the geometric size of the dust collector copy [12-16].

In addition, the speed of the air depends on the power consumption of the fan, which creates the pressure of the air entering the dust collector.

RESULTS. High humidity in the system and humidity of dust particles moving in it increase the likelihood of clogging of air purifiers and can lead to a loss of reliability of its use. According to the principle of operation of cyclones, as the speed of the air entering it increases, the dust holding capacity of the cyclone increases, and at the same time the resistance of the cyclone increases. The circulation speed of the air inside the cyclone is normal when it is 14 ... 18 m / sec, and the dust holding capacity is 94 ... 97%.

Based on the conducted analytical analyzes, it is necessary to pay great attention to the issue of separation of their constituents in the cleaning process today with an in-depth study of the dust content. In particular, to date, the analysis of existing dust air purification technology and the operation of existing equipment shows that no scientific and practical research has been conducted on the process of cleaning dusty air, taking into account the fractional composition.

Although the basic design of cyclones is very simple, their flow physics is very complex due to the three-dimensional nature of the flow, high turbulence, strong anisotropy and interaction between

liquid, dust particles and the surrounding wall, and has not been fully studied even after decades of research.

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