Theoretical Studies Conducted in the Study of Dusty Air Content, Which is Fiber-Containing Waste

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Abstract: *The article describes how to create a new simulation, that is, a model of dust Cyclones, coming out of the machines at the initial processing of cotton. Ciklon can detect the centrifugal force and gravitational forces acting on the inner surfaces at moderate speeds and moving dust hao particles of different sizes. A theoretical study on the composition of powdered air is presented.*

Key words: *Dust air, cyclone, dynamic analysis, dust particles, simulation - new modeling, CFD method, Reynolds equations, Navier-Stokes equation.*

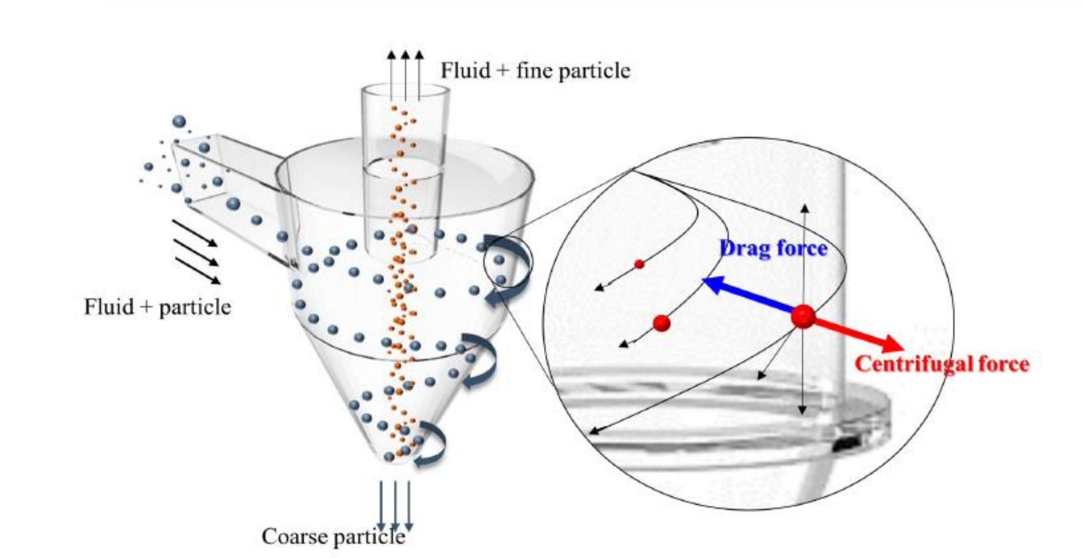
At all stages of the initial processing of cotton, a large amount of dust is released, which pollutes the air of dust production buildings and the atmosphere. Cyclone separators are widely used in the cleaning of dust particles, they are cleaned from large dust particles in size from 50 microns (10^{-6}).

Cyclones were first used in industry to separate solid substances from gases, and this is still the most widely used. The oldest cyclone is the cyclone account, which was built in the USA in Knickerbocker around 1885 years

At present, all the main elements of the most commonly used type of dust cyclone are contained in this cyclone. The fact is that cyclones in cotton refineries are created for the separation of solids from technological air currents, particles moving at high temperatures and under great pressure [1]. Centrifugal forces arise when the air flow inside the cyclone turns into an Archimedes spiral. Under the influence of these forces, the dust particles hit the outer wall, its velocity decreases, falling to the bottom of the cyclone, and the purified air rises upward with a reduced speed and flows out of the cyclone into the atmosphere.

The development and analysis of ways to increase the efficiency of new modeled cyclones based on dynamic analysis of the movement of harmful impurities in the air stream during the cleaning of cotton is an extremely urgent problem. De-pollination and improvement of atmospheric air purification systems should also be carried out without delaytirib [2 ,3]

In the CFD method, it is possible to compare the forces generated on the inner surface of the cyclone in the separation of impurities from the dust air composition Figure 1. Air conditioning was adopted as a continuous motor, while dust air particles were perceived as dispersants, and all digital simulations were carried out using a limited-volume CFD code.



1-picture. In the CFD method, dust is the forces generated on the inner surface of the cyclone when separating impurities from the air

The statistics of the effectiveness of cleaning by monitoring the amount of dust particles in the cyclone dust mite and the collisions between the walls, outgoing dust particles were obtained. When simulated using the program, the average static pressure of the air on the surface at the inlet and outlet is controlled until it is constant. For Cyclone separators, it is possible to model speed pulsation and increase the cleaning efficiency.

$\rho \frac{\partial \bar{u}_j \bar{u}_i}{\partial x_j} = \rho \bar{f}_i + \frac{\partial}{\partial x_j}\left[-\bar{p}\delta_{ij} + \mu\left(\frac{\partial \bar{u}_i}{\partial x_j} + \frac{\partial \bar{u}_j}{\partial x_i}\right) - \rho\overline{u_i u_j}\right]$. (1)

$J(f) = \int_a^b F\left(x_1, f(x), f^{`}(x)\right) dx$

(2)

$$\frac{\partial F}{\partial f} - \frac{d}{dx}\frac{\partial F}{\partial f^{`}} = 0$$

When dusty air flow in cyclones is considered an isothermic and turbulent flow that does not compress

$u_i = U_i + u_i^{'}$, (3)

$\frac{\partial U_i}{\partial X_i} = 0$ (4)

$\rho U_j \frac{\partial U_i}{\partial X_j} = -\frac{\partial U_i}{\partial X_i} + \frac{\partial}{\partial X_j}\left[2\mu S_{ij} - \overline{\rho u_i^{'} u_j^{'}}\right]$ (5)

The mean values of the Reynolds equations can be expressed in terms of mass stored and expressed through the Navier-Stokes equation. In Bunda, the dust particles (4) and (5), as shown in the formula, are represented by (3) equality when the ui rotates to the average value and u_i^′ vibration of the speed of the moment.

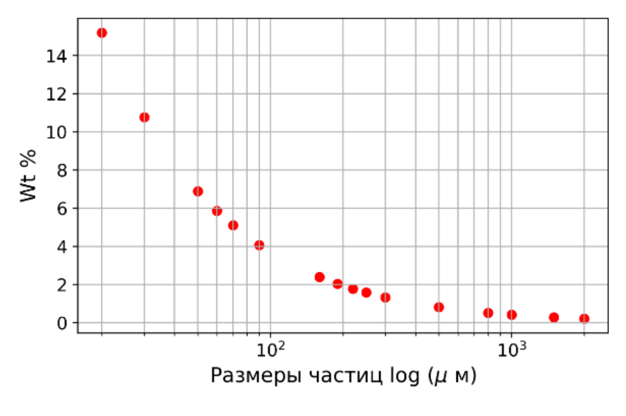
Here $\tau = -\rho\overline{u_i^{'} u_j^{'}}$, x_i – position, t – Time, ρ– constant dust density, P – average static pressure of dusty air, l – molecular viscosity of dust, τ_{ij}- Reynolds Stress tensor, and S_{ij} – average tension level Tensor.

The turbulent dust formed on the inner surface of the cyclone can be represented by air and the resulting pressure by the components of the Reynolds. The amount of strongly circulating dusty air currents inside the Cyclones will depend on the change in temperature and the regular change in other sizes [7].

Simulation of cyclones in a new design, modeling, development of various constructions of cyclones is carried out after a large number of calculations.

Depending on the properties of cotton dust, the amount of dust released from the technological equipment in the production workshops depends on the type, humidity and pollution of the cotton pulp; in the process of processing cotton paste of low grade, dust emission will be the strongest. 2-the picture shows the powder composition of cotton raw materials (III grade is hand-dialed," Namangan-77 " grade)

The calculation of the efficiencyadorlik and the volume train of the cyclone can be determined by the way of a large number of particles of different sizes (the limited size of the cyclone implies the volume of the dust mite, for which the cleaning efficiency is 90%). The disagreement in the extimulation of efficiency of cleaning small dust particles can be explained by the mechanism of cleaning particles. Large dust particles have relatively large inertia and are characterized by centrifugal force, while the effect of turbulent dispersion on large dust particles is not so high.



2-picture. Dust emission in the process of processing low-grade cotton poppy

The turbulent dispersion of dust particles, which is hostile as a result of turbulent vibrations of the dust air phase, has a significant effect on the cleavage of tiny particles. Since dust particles are very small (for example, 0,5-6,8 microns), the effect of instantaneous vibration and the turbulence rate of small dust particles can not be ignored.

Taking into account the turbulent distribution of small dust particles by combining the traiyaiya equations for separate particles using instantaneous velocity of dust air, $u_i = U_i + u_i^{'}$. dressing the equation will do. Provided that the Turbulent vortex is subjected to the probability distribution of Gauss with the help of the values of the pulsating velocities that affect it upwards over time and their interdependence:

$$u_i^{'} = \zeta\sqrt{\overline{u_i^{'}u_j^{'}}} \quad (12)$$

ζ here is usually a random number distributed, and $\sqrt{\overline{u_i^{'}u_j^{'}}}$ is the average Square value of the value velocity pulsation.

Dust particle training in the cyclone has a great effect on the relative magnitude of the centrifugal forces and gravitational forces acting on the particle. At the same time, as a result of the turbulent vibrations of the dust air phase, the internal resistance force acting on the dust particles becomes noticeable, and the dust particle exerts a centrifugal force as it grows smaller. From the results of the simulation it can be seen that accurate simulation of speed pulsation is the main requirement for the efficiency of Cyclone cleaning, especially the separation of small dust particles.

Conclusion

1. The performance of the cyclone was optimized by changing its configuration.
2. Comparative experimental studies were carried out to study the different effects of geometric configurations on Cyclone performance for the optimal range of Cyclone geometric measurement ratios.

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