EXPERIMENTAL TESTING OF THE AIR CONTROL DEVICE WITH THE HELP OF A VENTILATOR TO KEEP THE OPERATING MODE IN THE TRANSPORT OF COTTON PNEUMATIC TRANSPORT

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Abstract. *In the article, ginneries pneumatic systems are very important and the main component of ginning, more air is used in the transportation systems of different materials. The requirements for correct air measurement, airflow detection, dimensions of transport pipes, dimensions, and calculation of air fans to create the required airflow rate are determined.*

Keywords: *factory, machine, air, dry, drying, choke, feathers, cotton, lint, pressure, density, mass, pneumatic.*

ЭКСПЕРИМЕНТАЛЬНОЕ ТЕСТИРОВАНИЕ УСТРОЙСТВА УПРАВЛЕНИЯ ВОЗДУХОМ С ПОМОЩЬЮ ВЕНТИЛЯТОРА ДЛЯ ПОДДЕРЖАНИЯ РАБОЧЕГО РЕЖИМА ПРИ ТРАНСПОРТИРОВКЕ ХЛОПКА ПНЕВМОТРАНСПОРТОМ

Аннотация. *В статье рассматриваются пневматические системы зерноочистительных заводов очень важны и являются основным компонентом измельчения, в системах транспортировки различных материалов используется больше воздуха. Определены требования к правильному измерению воздуха, определению расхода воздуха, размерам транспортных труб, размерам и расчету вентиляторов для создания требуемого расхода воздуха.*

Ключевые слова*: фабрика, машина, воздух, сушка, сушка, дроссель, перья, хлопок, ворс, давление, плотность, масса, пневматика.*

INTRODUCTION

The initial processing of cotton will be in the presence of air games of wounds. This is because the air has the ability to perform functions that some technological parts cannot. It can crack and te any barrier, move, move and carry light objects with it, and determine the desired trajectory of the body. Therefore, aerodynamic equipment is widely used in modern industrial enterprises, especially in the cotton and textile industries.

With their help, workplaces are dusted, ventilated, materials are transported within the enterprise. A number of positive aspects, such as simplicity of construction and the ability to deliver the product in any weather conditions without destroying it in any complex direction, sufficient tightness, compliance with sanitary requirements, led to the widespread use of aerodynamic equipment and pneumatic transport in the industry.

In addition, pneumatic transport has the ability to dry cotton and clean it from various foreign compounds and contaminants.

Cotton ginneries use air to transport cottonseed, lint, cottonseed, and rubbish through pipes. Cotton gins, pneumatic conveying systems are the main means of transporting material from processing to another stage throughout the entire ginning plant. [1]. It can also be done by drying the material or restoring moisture, by heating or humidifying the transport air.

Pneumatic systems are very important and a key component of cotton cleaning. Cotton gins use large amounts of air for pneumatic work. It is common for a gin to use 4,248 m3 or more of air per minute in various material transportation systems. Because the dry standard air density is about 1.2 kg / m^3, a typical cotton ginning machine that uses 4,248 m^3 / min air is 305,860 kg air per hour. This air mass per hour is about 1.5 times the total mass of the material being processed per hour. Typically, more than 60-65% of the total electricity.onsumed by a ginning plant comes from pneumatic moving material.

To perform air measurements correctly, airflow determination requirements, dimensions of transport pipes, air dimensions, and calculations are often determined using fans for engines to create the required airflow rate. Air requirements for special machines are necessary to maximize the use of the machine, minimize energy costs and reduce system downtime. [2] This update of the cotton cleaning guide is provided.

Current technical data on pneumatic cotton cleaning systems. More involved than previous versions.

MATERIALS AND METHODS

The research was conducted at a ginnery in Kosonsoy district of Namangan region. In the first stage of cotton processing, pneumatic pipe equipment with a total length of 50-100 meters is used to transport cotton seeds stored in a closed bale to the drying and cleaning department.

The air velocity control table as the velocity of the moving airflow is given in Table 1 and is usually determined in m / s units. The volume of air passing through it per unit time, the transport duct is usually defined as the airflow rate represented by a cube. Meters per minute, m3 / min.

The following experimental device was prepared to test the throttles (Fig. 1).

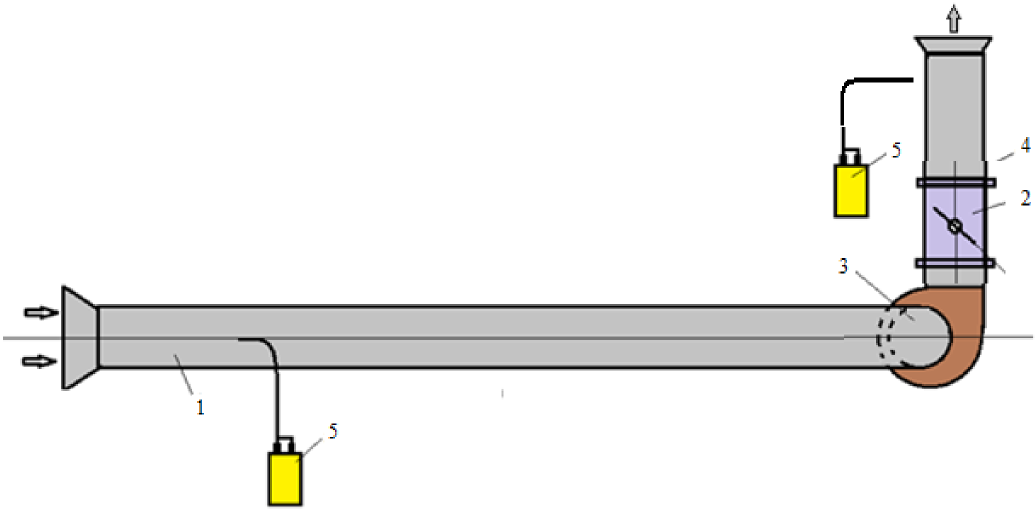

Figure 1. Experimental device scheme. 1 inlet pipe; 2drossel; 3-fan; 4 outlet pipe; 5 electronic micromanometer with Pito tube.

The following choke types were selected for use in our study (Figures 10-11).

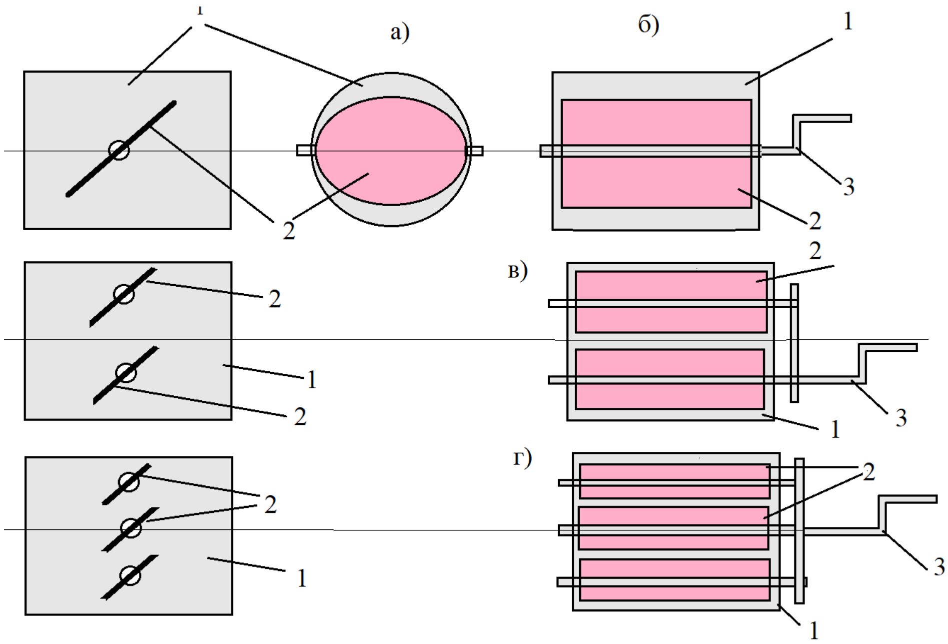

Figure 2. Schematic of a finned choke selected for the study. 1 throttle box; 2 feathers; 3 Adjustment handles.

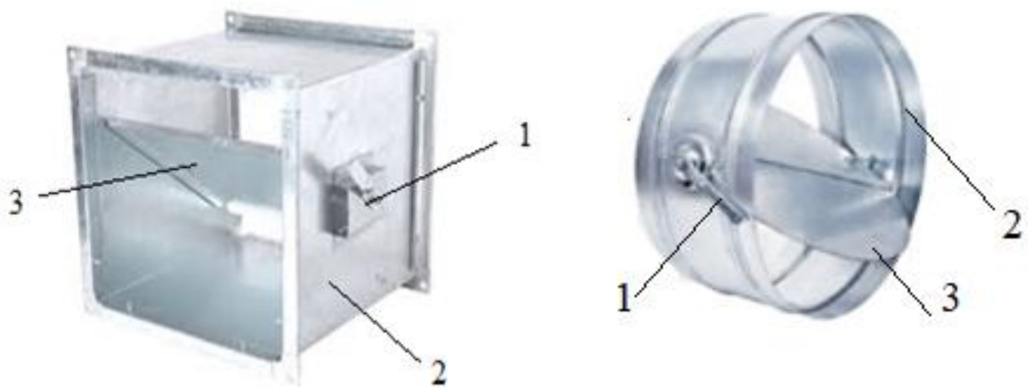

Figure 3. the scheme of the wing-moving choke 3. 1 blade 4 angles and a circular throttle general view.

All types of choke structures are made of 2 mm thick galvanized steel, fitted to a 400 mm pipe.The device consists of a horizontal pipe 1, a choke 2, a fan 3, and an outlet pipe 4, the pipe diameter is 400 mm, the fan VTs-10 electric motor has a power of 30 kW. Pipe 1 length 20 m. 1.2 meters before and 1.2 meters after the throttle, a Pito tube was inserted into the tube and it was connected to an electronic micromanometer. Measurements were performed as follows:

RESULTS

The aim of the study is to reduce air and energy consumption of the process and eliminate the negative impact on the quality of the transported product by developing and implementing a throttle design that allows uniform control of flow parameters in cotton pneumatic transport. An increase in pressure in front of the fan here leads to a further decrease in air density, while a decrease in it leads to a slight increase in air density. In this case, the effect of pressure decrease is stronger than pressure increase on density change. When the pneumosystem is completely hermetic, a change in air density also leads to a change in air flow rate.

After fan 3 was started after the airflow had stabilized, the throttle blade 2 was adjusted to the desired position, and the dynamic, static, and full pressure before and after the throttle was measured, and the results were tabulated. [3].Then, the choke 2 blades were moved to the next position and the measurements were repeated. Measurement data were included in the table.

Once the required measurements were taken, choke 2 was replaced with the next type of choke, and the measurements were made and the results obtained were tabulated. The aerodynamic drag coefficient was determined using the following equation and placed in the table:

$$l = \Delta P \frac{2L}{\rho} \frac{d}{\vartheta^2} \qquad (1)$$

Measurements were made from the initial position of the choke 2 blades - it was parallel to the vertical axis, i.e., the pipe section was rotated 20 degrees relative to the fully closed position, and was performed for every 10 degrees rotated position. The results of the experiments are presented in Table 3.1.

Determination of aerodynamic resistance of different chokes results of measurements on

Throttle barrier type	Resistance coefficient l						Constructive feature k					
	2 0 ^{0}	30 ^{0}	40 ^{0}	50 ^{0}	60 ^{0}	80 ^{0}	2 0 ^{0}	30 ^{0}	40 ^{0}	50 ^{0}	60 ^{0}	80 ^{0}
Round blade	1 50	100	62	42	25	11	0, 12	0, 20	0, 28	0, 38	0, 42	0, 70
Rectangular, with a blade	86	75	48	25	1 4	10	0, 30	0, 37	0, 45	0, 57	0, 76	0, 8 7
Rectangular, double	68	45	25	18	12	8	0, 32	0, 38	0, 46	0, 58	0, 78	0, 8 8
Rectangular, three-pointed	65	42	24	16	11	8	0, 33	0, 38	0, 47	0, 59	0, 78	0, 8 9

Looking at the results, it can be observed that in all cases, two- and three-blade chokes have the lowest aerodynamic resistance. To see the results more clearly, they are shown graphically in Figure 12.

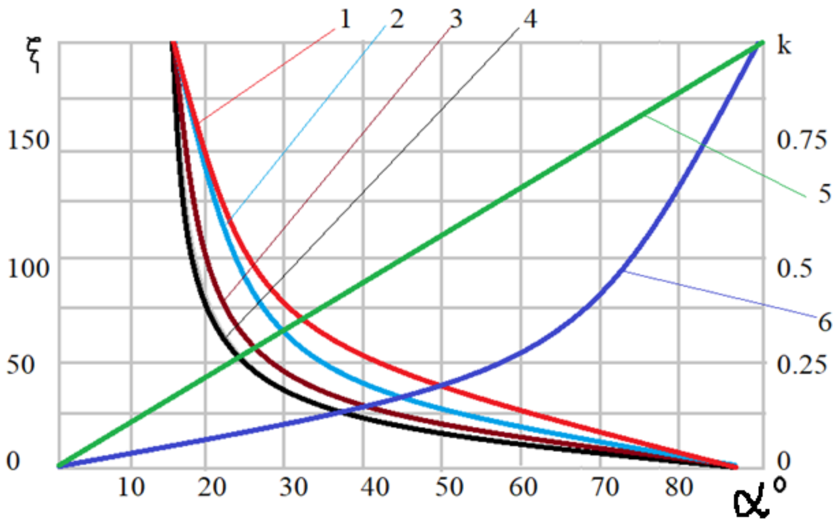

Figure 4. Aerodynamic resistance of various chokes results of measurements on detection.

1 circular in shape; 1 sheet of 2 rectangular shapes; 2 2 sheets of 3 rectangular shape; 4 rectangular 3-piece throttle indicators. It should be noted that there is a certain level of resistance even when the throttle blades are fully open. This resistance depends on the projection of the valve in the horizontal position in the vertical plane. Therefore, as the number of blades increases, so does the amount of projection and, accordingly, the coefficient of resistance[4].

All dorsals should have the same result when the blades are fully closed. An mm o Despite the same conditions, the pressure is relatively low in the fully closed position of the blades in multi-bladed chokes. This is because as the number of feathers increases, the number of cracks between them increases. Therefore, even when the feathers are completely closed, a certain amount of air passes between the feathers, and this condition causes a slight decrease in the total pressure. However, since this airflow measuring instrument is below the sensitivity limit, its performance cannot be determined. This is because multi-blade chokes cannot fully ensure the tightness of the pneumatic transport equipment. [5]. However, when the blades are completely closed, the pneumatic transport equipment does not enter the operating mode. Therefore, the inability of the choke to fully seal in the closed position is of no great practical importance. However, the greater the number of blades, the lower the reliability of the mechanical system. From this point of view, for any system, the number of operating elements in the airflow control mechanisms should be as small as possible.

DISCUSSION

In pneumatic and aspiration systems, such intermediate conditions correspond to the operating mode of the system. Another positive aspect of a large number of fins is that they can change the airflow relatively steadily. Especially in the intermediate states of the blades, i.e. when the angle of inclination is greater than zero and less than 90 degreesTherefore, this quality is a positive feature of multi-blade chokes. Based on the above considerations, it can be said that given the advantages and disadvantages of single-blade and multi-blade chokes, it is necessary to choose the throttle design in which aspect is more important for the current situation.

At the same time, during the experiments, it was observed that the simplest and most widely used circular single-blade throttle could not provide the required air pressure and speed in working conditions with high accuracy and high aerodynamic resistance. Therefore, it is advisable to use the chokes of this design only in the most impossible cases, for example, when the distance to which the choke is installed is very short and the space is narrow[6-7].

CONCLUSIONS

From the above analysis, it can be concluded that the most effective chokes for pneumatic transport systems are 2 and 3 blade constructions. Accordingly, for practical use in cotton pneumatic transport, we recommend a 2-blade choke for high pressure (6-8 thousand Ra) systems and a 3-blade choke for low (4-6 thousand Ra) pressure systems. The 3-blade throttle exhibits less aerodynamic resistance in working conditions than the 2-blade throttle. However, the construction of a 3-blade throttle is relatively complex and the durability is also relatively low. In summary, for the next study, 2- and 3-blade rectangular cut throttles were selected, and previous studies developed a throttle structure with 2- and 3-blade, screw-on fasteners that were reliable and robust, allowing airflow to be controlled even with the screw adjustment mechanism selected. (Fig. 5).

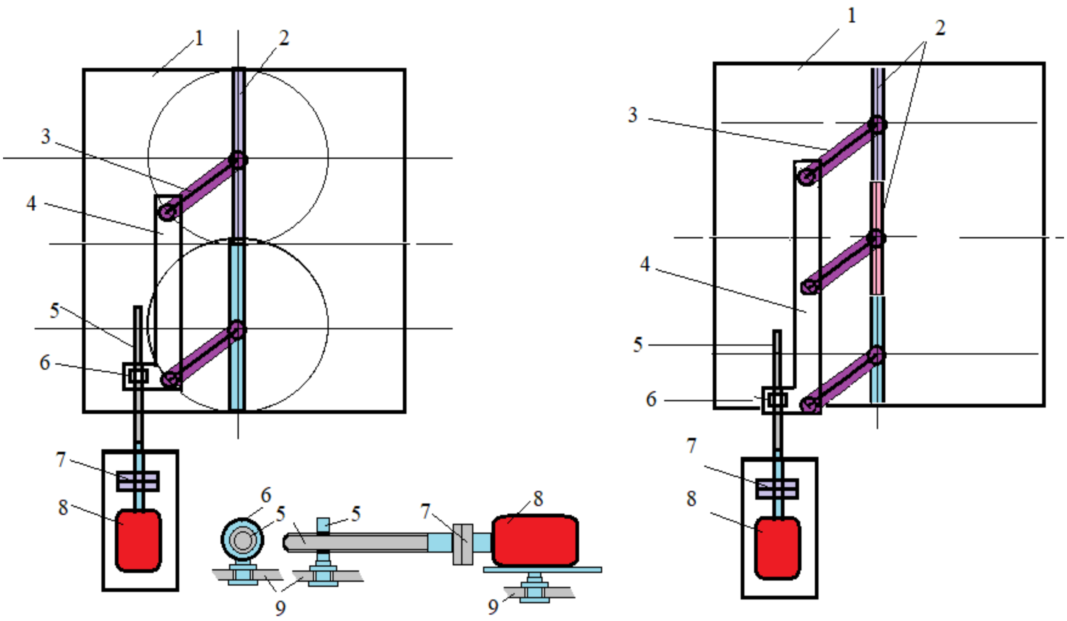

Figure 5. 2 (right) and 3 (left) parched rectangular cuts throttle structures with screw fasteners.

1 throttle box; 2 feathers; 3-handle; 4-richag; 5-screw; 6 guide nut; 7-clutch; 8-reverse electric motor; 9 base surface. The device works as follows: when the electric motor 8 is running, screw 5 rotates inside the guide nut 6 using clutch 7 and drives the lever 4. As a result, handle 3 and blade 2 are attached to its twist and block (or open) the path of airflow moving along the throttle. As a result, the pressure and flow of air flowing through the pipe will change[7-8].

Since the engine is reversed, there are 2 buttons on the control mechanism, one of which turns the engine clockwise and 2 to turn it counterclockwise. Both buttons can be used to provide the required air pressure and flow. The system also allows you to remotely and automatically control the parameters of pneumatic equipment. Variation of air density and velocity along the length of the pipe.

The results show that as the pressure of the air moving along the pipe increases, its velocity increases relatively. This is because in an environment where the pressure (here the vacuum level) is high, the force that draws air molecules to the vacuum source (fan) increases, resulting in increased air velocity and, conversely, the pressure in the pipe decreases as you move away from the fan. decreases. Also, an increase in the initial speed leads to an increase in the speed difference, and a decrease - to a decrease. Studies show that the relative change in air density due to the change in density is on average 8-9% However, experiments show that the air velocity increases significantly from the beginning of the pipe to the fan.

Practice shows that pneumatic pipes are mainly made of steel. When making a pipe, the steel tin is rounded and the two ends are welded together. To deliver airflow over long distances, pipes are connected to each other to form long trails.

The pipes are fastened to each other using welding and screw connectors (bolt-nut). There are also temporary (temporary) ways to connect the pipes. In this case, one side of the pipe is prepared with a conical end, and when extending the pipe, the first pipe end is inserted into the larger side of the second. Regardless of the type of connection, it is difficult to maintain the tightness of the connection. There are several reasons for this:

1. Poor quality of welding in the joint. As a result, holes of different sizes remain at the joints.

2. When pipes are operated for a long time, they break down, the wall becomes thinner and especially the turning points become perforated.

3. As a result of improper operation (due to impact of hard, pointed objects, crushing under the influence of heavy objects, bending), holes and cracks are formed in the pipe, as well as the shape of the pipe is distorted, leaving open spaces when connected.

4. When the pipes are connected with screw connectors, the joints are left open due to drying, breaking, spilling of the sealing material (usually rubber).

5. When temporarily connecting pipes, cracks remain at the joints as a result of incompatibility of their shapes and sizes.

As a result of long-term observations, the Cotton Science Center found that even during normal operation of the pneumatic transport equipment, air suction is observed along the length of the pipe and 3% of air is absorbed from every 10 meters of the pipe, and this amount is accepted as an indicator made. If the amount of air absorption determined by measurement is greater, the tightness of the pipe and the aerodynamic elements installed between it and the connection points shall be checked and the found holes and cracks shall be closed.

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