

# TECHNOLOGICAL BREAKTHROUGH OF COTTON CLEANING ENTERPRISES FIBER WASTE

Khodjiyev Muksin, *Guliston State University Republic of Uzbekistan*

Abbazov Ilkhom, *Jizzakh Polytechnical Institute Republic of Uzbekistan*

Makhkamov Iqbol, *Ferghana Polytechnical Institute Republic of Uzbekistan*

Karimov Javlon, *Guliston State University Republic of Uzbekistan*

Rajapova Marguba, *Jizzakh Polytechnical Institute Republic of Uzbekistan*

**Abstract:** *This article describes the changes in fiber waste from the technological flow in ginning plants, how much it changes in the stages of the technological process. The dust released in the drying and cleaning shop is only 5-7 mg/m<sup>3</sup> of dust, which is less than the air in the building where the drying equipment is located. Large dispersed dust particles separate even at high humidity and sink to the surface of the building without being able to spread. In drying units, dust emitted in conjunction with an atmospheric drying agent causes discomfort. Although this dust is coarsely dispersed, it escapes in the dryer along with the air stream and settles near the roof of the building and near the drying shop. The amount of dust emitted was found to be 500-600 kg per day. In the ginning unit, the released dust is released into the atmosphere from the cotton pneumatic transport system, which is formed in the air in the drying and cleaning shop, as well as in the cleaning of cotton in the cleaning machines. It is a dusty fiber with less mineral fractions. The fine fractions are mainly composed of crushed dirty particles. It was found that only one ginnery produces 150-350 tons of fibrous waste per year, depending on the type of cotton, 5-6 tons of non-recyclable waste, 70-90% of non-recyclable waste is organic waste. It serves as a raw material for the use of waste as feed for livestock in agriculture. The results of scientific research conducted at the enterprise "Zarbdor Pakhta Tozalash" JSC in Jizzakh region to determine the amount of waste from ginneries have been processed.*

**Keywords:** *Fiber waste, drying, cleaning, ginning, mineral waste, organic waste, variety, air flow, cotton.*

## I. INTRODUCTION

At all stages of the initial cotton processing, a large amount of dust is emitted, which can pollute the production facilities and the ambient air, which can worsen the working conditions of workers and employees and cause them to develop occupational diseases, including silicosis. The issue of dehydration of ginneries is of paramount importance due to increased pollution of cotton harvested cars. With the increasingly widespread introduction of machine-picking, the cotton ginning industry needs immediate action not only to receive, store and process the cotton, but also to improve the process of drying, purifying and refining, as well as improving the dust and air purification systems. should be increased.

All atmospheric air is divided into two types of process and aspiration: the first comes from the process equipment and the other from the exhaust systems.

In the technological processes of the ginneries, air transport is transmitted to the garment drying and cleaning shop. Depending on the location of the workshops at the ginneries, it will have two or three reloading points, which are independent sources of dust. The highest pollution in these points is 1200-1500 mg/m<sup>3</sup>. High-humidity low-grade cotton can be subjected to a large amount of dust leakage after drying. The dust emanating from the cotton pneumatic system is predominant with fine dispersion particles, mainly loose particles [1].

Most of the dust from the process of ginneries comes from pneumatic vehicles in the transportation of cotton and fiber.

## II. LITERATURE REVIEW

The first air carrier was used in 1893 by Dorfman [2] to unload grain from ships. The device's operating efficiency is small and consumes a lot of energy.

Nevertheless, it has been widely used in Europe for grain production. This is because airborne machines have a number of advantages over mechanical carriers.

Pneumatic transport has also been successfully used in grain processing, chemistry, and construction [3]. The development of science and technology has expanded the scope of pneumatic transport equipment. In particular, the emergence of new ways of transporting material in boxes and pneumatic transport [4] opened new prospects for this area.

In the cotton industry, pneumatic transport has been used since 1929. The first research of cotton pneumatic transport was carried out by Boris Levkovich. Later on, Bayduk made a major contribution to his development. He is the author of experimental studies on the interaction of cotton with air in pneumatic equipment, air and material resistance of pneumatic transport, material movement along horizontal and vertical pipes, radius of pneumatic transport, energy consumption in air transport [5].

Advances in scientific research so far have helped to improve the air transportation process, and, thanks to the use of many technical solutions created by scientists, the technical and technological parameters of the Cotton Vehicles have significantly improved. However, the development of science requires constant improvement of technology and technology.

## III. RESEARCH METHODS

Therefore, it is necessary to know the amount of air absorbed from each of the machines and equipment of the technological process (Table 1).

**Table 1: The volume of air absorbed from the main process equipment of ginneries**

Equipments	Equipment suction location.	The volume of absorbed air (m <sup>3</sup> /s)	Output tube diameter, mm
Cleaners ChX-5	The rear wall of the equipment	0,4	160
OBM-A fiber waste cleaner	Dirty with dirty unloading the screwdriver from the hole	0,25	140
Gin			
4DP-130	From the supplier	0,2-0,25	125
Roll DV1M	From the supplier	0,2	125

	From 6 screws to linters	1,4	285
	From 6 screws to linters	1,8	355
Elevator			
For cotton	From the lower thigh of the elevator	0,2	130
For seeds	from the bottom leading drum surface	0,2	130
For waste	150 mm away	0,25	130

The dust from the ginneries' machinery disperses the air into the environment and pollutes it.

The dust from the dry-cleaning shop is less than 5-7 mg/m<sup>3</sup> of dust in the indoor air where only drying machines are located. This is due to the high moisture content of the cotton into the dryers, which prevents the separation of fine dust from the mass. Large disperse dust, even in high humidity, decomposes and fails to disperse in the building.

Drying compartments cause dustiness in the drying compartments with an air drying agent. This dust, even with a rough dispersion, sits in the dryer along with the gas flow to the roof of the building and the ground near the drying shop. The amount of dust emitted is 500-600 kg per day [7].

The current of the existing drying dews mines the speed of the drying agent moving from 1.3 to 2.5 m/s (depending on the performance of the drying drum and the humidity of the cotton drum). This velocity is higher than the rotation rate of some cotton fibers and dirty impurities and ensures that particles of up to 5 mm in width are penetrated to the roof.

The dust in the compartment is the air that is emitted from the cotton pneumatic system, which is an indispensable dust in the dry-cleaning shop, as well as the dust generated by cleaning machines. It is powdery, with less fractional mineral fractions. The small fractions consist mainly of crushed dirty particles.

Powdered air is also isolated from aspirate systems of gin suppliers, which absorb absorbed air or polluted air from pollutants. This absorption system can be included in the aspiration of the cotton distribution screw.

Technical seeds from the linting zone are transmitted to temporary storage facilities with tape or screwdriver. They contain dust in the form of short fibers and cotton seeds. Low-grade seeds have more dust than the first type. This is explained by the fact that the low cotton seeds and shell are not very durable and are easily damaged by the working bodies of technological machines. Exactly refers to cotton seeds with high moisture content, which are heated and then rapidly dried. Thus, the proper storage of cotton at the cotton processing points prior to its processing at the ginneries determines the sanitary conditions of production. The main properties of the dust on the seeds are similar to that of the lint air in the liner shop.

At the cotton mill, the dust content of the process changes during the process. At the beginning of the initial cotton processing, dust is released from the air, which contains large amounts of mineral fractions. In subsequent cotton processing - fiber and fibers are more concentrated in the dust, such as cotton seeds, leaf slices and other parts of cotton, as well as fibers. At the end of the technological process, for example: linting, pressing units, separation of seeds and complete dehydration shop, the dust that is released into the air will usually contain fibrous particles mixed with the seeds.

Cotton mixes vary in composition and size. Waste, dirty and dusty process is carried out in all technological processes of cotton processing - starting with air transport and

finishing with the main case. Waste containing up to 14% of fiber material is considered to be irreplaceable waste and is not used.

Cotton, fiber, lint and industrial waste are the main air exits in the ginneries.

In order to identify problems that can make it difficult for cotton gin dusting, it is necessary to determine the fiber content of the powders in each process.

#### IV. RESULTS AND DISCUSSION

As far as we know, dirty mixing machines consisting of mineral and organic fractions that have been extracted from cotton in the Waste Waste Machines also contain immature seeds (dead) and immature single seeds.

At the ginneries cotton fiber is continuously collected and processed by air transport to the processing area of a particular lot. Fiber wastes are processed for a particular type of fiber waste in a specialized plant for processing fiber waste according to the most advanced technology.

Purified fiber wastes are penetrated into penco-jute bags by types, types, varieties and groups using a screwdriver inserted into the design of the fibers.

Fiber waste cases are stored in the recycling department until pressed. Fiber 'waste is collected by hydraulic presses of a separate linearization unit with a mass of about 220 kg of waste of one type, type, grade or group according to the concentration.

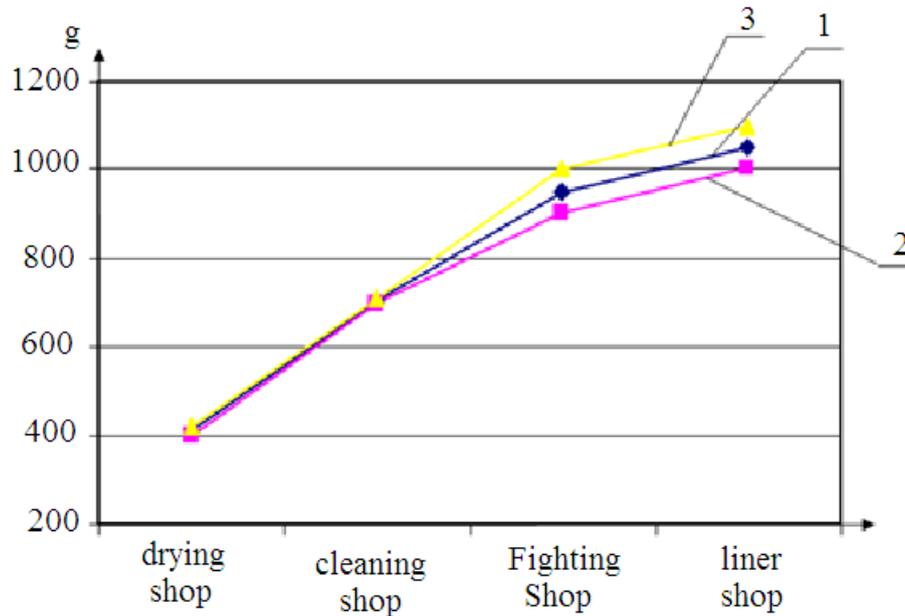
Research conducted by the Republican Scientific Center for Cotton Industry allowed to determine the optimal amount of dust to be removed from the process equipment. In the course of the cotton harvesting process, a large amount of waste is emitted in all technological processes, either waste or secondary raw materials (fiber waste) or irreversible waste. It is found that only one cotton gin industry produces 150-350 tonnes of waste per year by industry type, irreversible emissions amount to 5 - 6 tonnes, and 70-90% of non-organic waste. It serves as a feedstock for the use of animal waste in feeds for agriculture [8].

Researches have been carried out at the Karasuv, Tashkent, Mustaqillik and Ginnery factories in the Tashkent region and the Metan cotton ginneries located in the Republic of Uzbekistan (Figure 1) to determine the amount of emissions from the ginneries (Fig. 1).



**Figure 1. Deterrence of fiber waste from VZP-type dust collector at the Metan Cotton Ginning Plant in Samarkand Region.**

According to the results of research. For each technological process of the ginneries, the amount of fiber discharged by pneumatic transport is kept on a 1x1 mm grid (Fig. 2).



**Figure 2. The amount of fiber waste that comes out of the ginneries within 30 minutes.**

1. Methane; 2. Karasuv; 3. Plants of Mustaqillik. drying shop

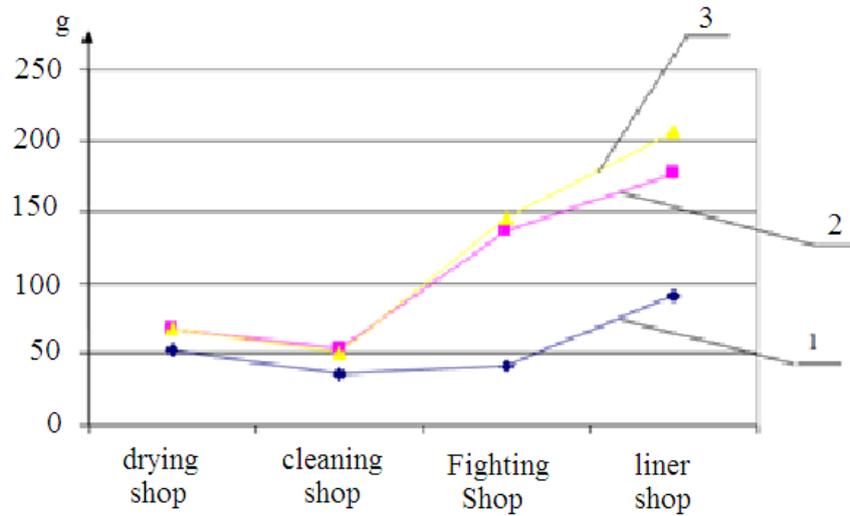
It turns out that at the beginning of the process of cotton ginneries, the amount of fiber waste in the drying shop is 400g. Fiber emissions from the assembly and fitting shops range from 900 to 1200 g, which in addition to economic damage also causes damage to the atmosphere [6].

Scientific studies on the determination of fibrous emissions from dust traps into the atmosphere are when the dusting hole of the dust retainer is closed by a grid 1x1 mm (Fig. 3).



**Figure 3. Deterrence of fibrous waste from the Karasuv ginnery.**

Fiber emissions from the dust trap into the atmosphere are captured by each of our companies and analyzed in Figure 4.



**Figure 4. Fiber emissions from dust traps into the atmosphere within 30 minutes.**

1. Methane; 2. Karasuv; 3. Plants of Mustaqillik.

As can be seen from the graph, the initial stage of the technological process is the amount of fibrous waste emitted within 30 minutes from the drying shop, 400 g, from the cleaning shop this figure is 600 g, in the welding shop 900 g and in the liner shop 1000 g. This shows that the amount of fibrous emissions in the Karasu, Mustaqillik and Metan ginneries is higher than the emissions within 30 minutes. By keeping these fibrous waste, first, reducing the damage to workers and surrounding communities, and secondly, we will have the opportunity to re-use waste emissions, and thirdly, the efficiency of the dust collectors used at the enterprise will increase [9].

The dust captures of the dust holders and the air and exhaust holes were placed on a 1x1 grid and held for 0.5 hours in the fibrous, mineral and organic dust contents of the dusty air. The results of the experiments are presented in Table 2.

**Table 2.: The amount of fiber waste from a ginnery**

Technological processes	Dust cleaning from accessing equipment dusty waste before mass, gram.	Dust cleaning equipment from the dust collector hole dusty discharge mass, gram.	Dust cleaning equipment to the atmosphere from the exit hatch dusty waste mass, gram.
2SB-10 drying drum	400	300	100
Cleaning of UXK flow	700	550	150
4DP-130 Gin equipments	900	700	200
5LP Linter equipment	1000	750	250

## V. CONCLUSIONS

Analysis shows that up to 20-30% of the dust particles in the air are absorbed into the air, causing pollution to the atmosphere. So, we need to take measures to collect fiber. Currently, cotton ginneries are continuously collecting fibers from the bottom of the dust collectors through sacks during the cotton processing of a particular installment.

Fiber wastes are collected by hydraulic presses of a separate linearization unit with a mass of about 220 kg of waste of one type, type, grade or group. This requires hard work.

From the results we can see that the waste from the ginneries is high in fiber content. If this equipment is developed, it may also increase the efficiency of cleaning dust collectors. In addition, technological waste can be retained and reused as a waste.

## REFERENCES

- [1] Usmankulov, A. K. (2014). Experimental research of thermophysical properties of the raw cotton and its components. *Izvestiya Vysshikh Uchebnykh Zavedenii, Seriya Tekhnologiya Tekstil'noi Promyshlennosti*, (1), 33–36.
- [2] Galitsky R.R. *Equipment for grain processing enterprises*. Moscow., Kolos, 1982, 288 pp.
- [3] V. Kuznetsov, S. Denisov. *Pneumotransport of woodworking enterprises*. Bratsk State Technical University. Bratsk., 2007.
- [4] K. Hoganson, D. Gross. PatentUSA. Variable speed drive for pneumatic transport system. US 7,950,879 B2. 05/31/2011.
- [5] Baydyuk P.V., Khozhiev M.Kh. Methodology for determining hydraulic pressure losses in a horizontal working pipeline of a pneumatic conveying system for raw cotton. // *R.Zh. Cotton industry*. 1992. No. 2.C. 8-9.
- [6] Ilkhom, A., Muksin, X., Orof, A., & Ruxsora, K. (2019). The composition of releasing passion of dusty in the process of pat. *International Journal of Engineering and Advanced Technology*, 8(3 Special Issue), 279–283.
- [7] Usmankulov, A. K., Sadikov, F. S., Norboev, U. A., & Abbazov, B. T. (2020). Improvement of the method of heat calculation of the drum dryer for cotton-raw. *International Journal of Advanced Science and Technology*, 29(7), 2117–2127.
- [8] Muksin, K., Ilkhom, A., & Javlon, K. (2019). A new technology for dust removal from cotton processing. *International Journal of Recent Technology and Engineering*, 8(3), 583–586. <https://doi.org/10.35940/ijrte.B2073.098319>
- [9] Abbazov, I., Sarimsakov, O., Khodjiev, M., & Mardonov, B. (2018). Effective Cleaning of Cotton Waste Produced at Cotton Cleaning Factories. *American Journal ASCIT Communications*, 5, 22-28.
- [10] B. Sapaev, A.S. Saidov, I.B. Sapaev. p-n junctions obtained in  $(Ge_2)_x(GaAs)_{1-x}$  varizone solid solutions by liquid phase epitaxy//*Semiconductor Physics, Quantum Electronics & Optoelectronics*, 2005. V. 8, N 4. P. 33-34.
- [11] Sh.A. Mirsagatov, I.B. Sapaev. Photoelectric and Electrical Properties of a Reverse - Biased p-Si/n-CdS/n<sup>+</sup>-CdS Heterostructure//*Inorganic Materials*, 2014, Vol. 50, No. 5, pp. 437–442.

## AUTHORS PROFILE



Khodjiev Muksin Tadjievich was born on November 29, 1957 in Kokand, Ferghana region, in the educated family. In 1975 he entered the Tashkent Institute of Textile and Light Industry. He began his career at the Scientific Laboratory of Cotton Initial Processing from 1980. In 1989, he began his career in the Technology of Textile Materials and Pre-Raw Materials Processing Specialist Candidate of technical sciences. 1998 PhD in technical sciences on textile materials technology and initial processing of raw materials was. Today Rector of Gulistan State University.

	<p>Abbazov Ilkhom Zapiroovich was born in 1986 year in Ishtikhon District of Samarkand region. In 2005 he was admitted to the Tashkent Institute of textile and light industry on the basis of a state grant. Since 2011, the new road began to work as a metal worker in the cotton cleaning enterprise. Since 2014, assistant of the Department "Technology of initial processing of natural fibers" of the Tashkent Institute of textile and light industry. In 2018, 05.06.02 – doctor of philosophy in technical sciences (Ph. D.) in the specialty "Technology of textile materials and preliminary processing of raw materials". Now associate professor of the Department "Technology of light industry" of Jizzakh Polytechnic Institute.</p>
	<p>Ikbal Makhkamov was born in 1993 in the Fergana region of Uzbekistan. In 2013 he entered the Tashkent Institute of textile and light industry on a contract basis. In 2017, she entered the master's program of the Tashkent Institute of textile and light industry on the basis of a state grant. In 2019 he graduated from Tashkent Institute of textile and light industry with a master's degree. Currently he is an assistant of the Department "Technology and equipment of light industry" of Fergana Polytechnic Institute.</p>
	<p>Karimov Javlanbek Djumabaevich was born on April 8, 1989 in Boyovut district of Syrdarya region. On September 1, 1996 he was enrolled in the first class of the 42nd secondary school Nodira in Boyovut district. Graduated from the school with honors and in 2009 received the state grant of "Technological machines and equipment" of the Tashkent Institute of Textile and Light Industry. In 2013, he graduated from the Institute with excellent marks and became a teacher at the College of Light Industry. He is currently working as a teacher at the Department of Agricultural Processing Technology of Gulistan State University.</p>
	<p>Rajapova Marguba was born in 1978 in Forish district of Jizzakh region. In 1994 he was admitted to Jizzakh Polytechnic Institute, majoring in Light Industry Technology. In 1999 he started working as a master of industrial training at Jizzakh Light Industry. In 2001, he worked at the Jizzakh Light Industry Company as the head of the "Light Industry Technology" department, a teacher of special sciences. He is currently an assistant at the Department of "Light Industry Technology" Jizzakh Polytechnic Institute.</p>