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METHODS OF DETERMINING THE EFFICIENCY OF THE COTTON REGENATOR IN THE CLEANING PROCESS

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Abstract: This article describes the technology of cleaning cotton from large impurities and the working process of the regenerator machine, which separates cotton raw material from the wastes released from the devices. In addition, in the study, if the real value of the regenerator's cleaning and regeneration effects is low, it is recommended to check the technical condition of the regenerator and correct the detected defects, as well as to reduce the consumption of air from the pneumatic supply of the regenerator.

Keywords: Cotton raw material, coarse impurities, fine impurities, supply roller, regenerator, cleaning, separator, pile drum, brush drum, efficiency

The scientific research carried out on the development of the technology for cleaning cotton raw materials from various impurities corresponds to the contribution of the leading scientific centers and higher educational institutions of the world with a developed textile industry. As a result of these scientific and research works, significant scientific achievements were achieved by improving the technology and equipment of cotton raw material cleaning, including: in the US company "Lummus" the automation systems of the technological processes of cotton raw material cleaning machines were developed, in the USA and Australia, the effective cleaning of cotton from large and small waste was developed. technologies were created. In Uzbekistan, large-scale research is being carried out in this direction, including Tashkent Institute of Textile and Light Industry, Pakhtasanoat Scientific Center JSC, Namangan Institute of Engineering and Technology, new machines for these technologies were developed based on theoretical and experimental research. . Creating cotton cleaning machines and technologies in the world, including in Uzbekistan, creating a large number of regulatory systems for cleaning cotton raw materials, creating effective technologies for cleaning cotton from foreign impurities, and technological designs of working bodies of cleaning machines, effective low-emissions for cleaning researches are being conducted on the development of working bodies.

The results of the analysis of modern scientific research on cleaning cotton showed that they were studied in two directions - cleaning cotton from small heterogeneous impurities and cotton from large heterogeneous impurities.

Cleaning of cotton raw material from large impurities in enterprises is one of the most important processes. In the process of processing raw cotton, cleaners whose main working body is a drum with a saw are used to remove large impurities - cotton bolls, cotton stalks and leaves [1-2]. In cotton ginning plants, cotton is cleaned in two main saw drums in the saw cleaner CHX-3M2 (Fig. 1), and the cotton pieces with large impurities

from these drums are cleaned and separated in one regeneration drum and added to the main cotton flow.

This machine works as follows: the cotton is transferred to the pile drum 2 with the help of supply rollers 1, and with the help of it, it is hit on the mesh surface 3 and cleaned of small impurities. Cotton sawing drum 5 transferred from the pile drum is pressed against the teeth of the saws with the help of fixed brushes 4, and the colosniks are cleaned by hitting them 6. The cleaned cotton in the first sawing drum is separated by the separating brush drum 7 and transferred to the second sawing drum. Cleaned cotton is separated from the machine with the help of drum 7 and transferred to the next process. The mixed cotton pieces separated in the first and second sawing drum are cleaned in the regeneration sawing drum.

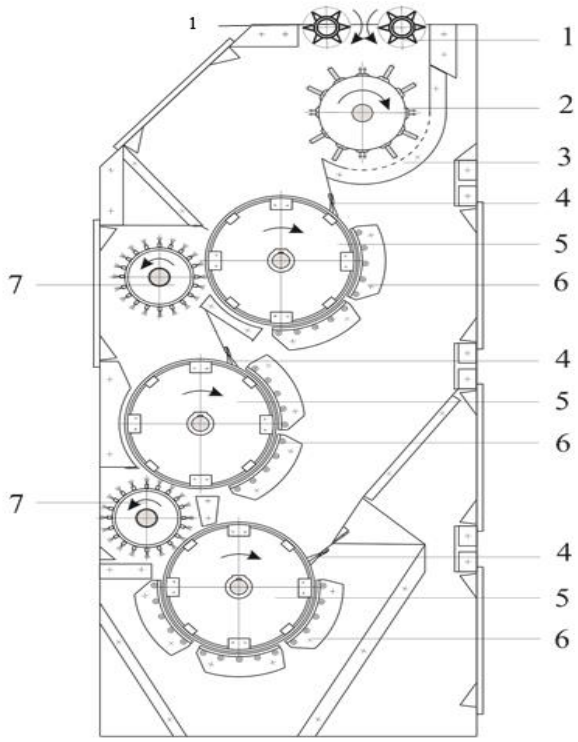

Figure 1. CHX-3M2 large dirt cleaning machine
1- supply rollers; 2- pile drum; 3- mesh surface; 4- compacting brush; 5- saw drum; 6- fence with columns; 7- brush separating drum.

In the regeneration drum, the cleaned cotton is added to the general cleaned cotton using the separating drum 7 with a brush. Analysis of operation of the CHX-3M2 machine and its operation together with other cleaners, that is, cleaners that remove small dirt, showed that the effect of the mesh surface installed in this cleaner for cleaning small dirt can be covered in the subsequent stages of cleaning. With this in mind, the CHX-3M2 cleaner was improved and the CHX-5 cleaner was created [3-4]. In this cleaner, instead

of a mesh surface, a grid consisting of triangular blades has been installed to increase the absorption of cotton. The pile drum is closer to the saw drum in relation to the vertical axis. CHX-3M2 and CHX5 cleaners have the same number and shape of columns. In the direction of movement of the first sawing drum, 10 pieces of colosniks are installed, and in the direction of movement of the second sawing and regenerating sawing drum, 15 pieces of round shaped colosniks with a diameter of 20 mm are installed. The efficiency of the CHX-3M2 and CHX-5 cleaners is adjusted by the number of revolutions of the supply rollers and is 2-3 t/h. The average overall cleaning efficiency of CHX cleaners is 60-65%.

In the 90s of the last century, instead of PLPX-type flow lines, UXK-type cotton cleaning units were introduced. it is cleaned and cleaned of large impurities with a sawed drum on the colosnik grid. Separated impurities fall into a common hopper and are removed from it through an auger equipped with a loading tube with braking valves. As a result, the load on the regenerator increases by 2-3 times as a result of the mixing of small and large impurities. Under the influence of the needle, small impurities are added to the fibers of the raw cotton material and become difficult to separate. As a result, the cleaning efficiency of the RX type regenerator decreases by 50%, and the pollution of regenerated airfoils increases by 70% during the cleaning of cotton raw materials. In this case, as a result of mixing the regenerated cotton with the raw material sent for cleaning, it becomes difficult to clean the small dirts that are difficult to clean, and the quality of the fiber decreases by one or two classes.

Recommendations on separate processing of cotton raw materials and regenerated cotton fibers produced in 1995 and included in the technological regulation in the future [5] are not implemented in all enterprises for various reasons. Following these recommendations, the quality of raw cotton fiber can be improved by one grade, but the quality of the fiber will decrease by one or two grades due to regenerated fibers.

In order to determine the reasons for the decrease in the cleaning efficiency of the RX type regenerator, we will analyze its scheme presented in Figure 2 [6-7].

Kegenerator with pneumatic supply 1, semi-cylindrical inlet 2 and outlet 3 nozzles with main 5 located above the cleaning section 4, regenerating saw drums 6 with sliding brushes 7,8 and colossal brushes 9,10, separating brush consisting of a woven drum 11, an auger 12 and a tube 13 with a valve connected to them

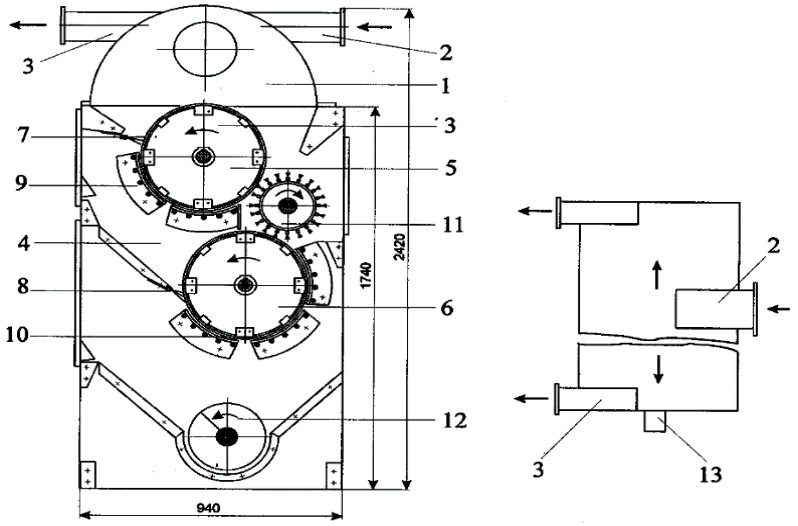

Figure 2. Scheme of regenerator type RX, which regenerates cotton raw materials from the waste of cleaning facilities:
1-pneumoprovider; 2,3-incoming and outgoing nozzles; 4th cleaning section; 5,6-main and regeneration drums; 7.8- sliding brushes; 9,10-colossian bars; 11-separating brush drum; 12-screw for removing impurities; 13-valve tube.

Inlet 2 and outlet 3 nozzles are located on the same level in height, tangentially to the semi-cylindrical shape of the supplier. The inlet nozzle 2 is connected to the middle part of the pneumatic supply in width, and the outlet nozzles 9 are connected to its side walls. The outlet nozzles 3 are connected to the pipelines to the condensers or the cotton separator to the pipe of the pneumatic conveying device, which conveys it to the cleaning device, and the inlet nozzle 2 is connected to the pneumatic supply 1 to the walls of the pipeline, which conveys the waste of the cleaning device (the pipelines are not shown in the picture).

The RX type regenerator works as follows. The air generated by the fan is diluted through the condenser or separator connected to the outlet nozzles 3 (not shown in the picture) and distributed in the cleaning section 4 of the pneumosupply unit 1. Then, through the pneumatic supply 1, the dilution of the air spreads to the pipe connected to the inlet pipe 2, and the air is sucked in from the open side. Thus, the regenerator is under dilution.

According to the data in the passport, 1.1 m^3/s of air enters the pneumatic supply 1 through the inlet pipe 2, and another 0.4 m^3/s of air is sucked in due to the non-tightness of the regenerator body, that is, the pneumatic the total consumption of air passing through blower 1 is 1.5 m^3/s.

During the initial operation of the cotton ginning enterprise, the fiber seeds (leaves) regenerated and separated from the waste are collected in special chambers, and after the production of this batch of cotton, they are fed to the drying drum or the main part of the

cleaning unit. After that, they are cleaned of all small impurities as much as possible. In this case, it is advisable not to send the regenerated cotton to sawmills during the cleaning [8].

To collect regenerated cotton, a chamber with a surface area of 30-30 m2 and a height of 3-4 m is organized in the cleaning shop or near it, and a KVM or KVVB condenser is installed on its top. The suction pipe of the condenser is connected to the discharge pipe of the regenerator. When CHX machines are used as a regenerator, the suction pipe is installed in front of its connection.

If it is not possible to bypass the saw cleaners in the processing of regenerated cotton, it is necessary to process it in the cleaners until the fiber seed in the waste separated from them stops.

During the repair of cleaning workshops of cotton ginning enterprises, UXK type cotton ginning aggregates are installed in whole or reduced form (at the same time, the number of sections and pile connections are selected based on technological conditions) as a supplement to the existing, worn or damaged equipment.

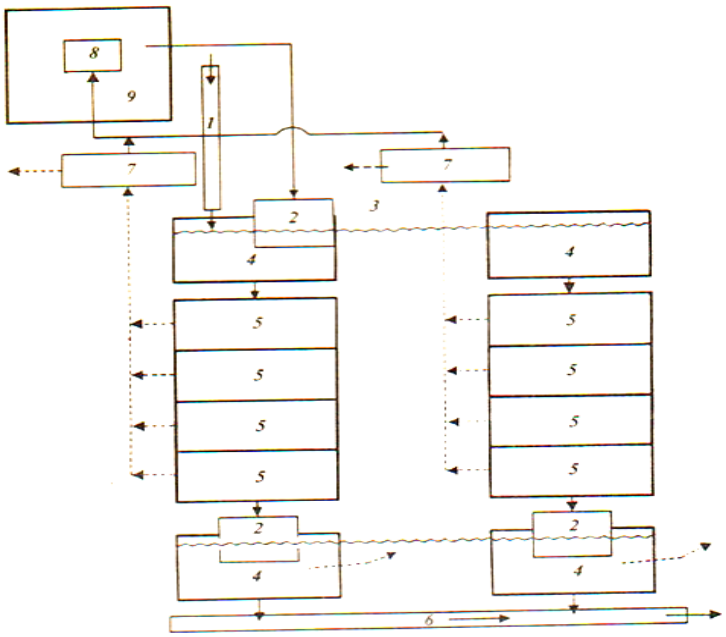

Figure 3. Technological diagram of a set of flow line equipment
1 - TXL-600B belt conveyor; 2 - SS-15A separator; 3 - SHX brand auger; 4 - 1XK cleaner; 5 - 1XP cleaner; 6 - 8TXSB horizontal belt conveyor; 7 - 1RX regenerator; 8- KVM type condenser; 9- collecting chamber.

In order to increase the efficiency of cleaning cotton from small impurities, a 1XK type of small impurities cleaner is installed at the head of the UXK section. At the same time, the number of saw sections should be reduced to two-three in the UXK aggregate, and to four-five in the 3UXK aggregate (Fig. 3). In the repair of cleaning workshops, it is

proposed to install two upgraded UCHX-5 cleaners in one row instead of 3-5 CHX-5 (CHX-ZM2) in equipment with a series of components, their performance is 12 t/h. It is effective up to 10,000 and provides a decrease in the amount of fibrous seeds in cotton waste. Before the separators, line holders are placed to catch heavy waste in the system of pneumatic conveyors that deliver cotton to the complex of cleaning equipment. The plan and sequence of cleaning of medium-fiber cotton in pile and saw cleaners (sections) should be according to its class, type and pollution, and should be carried out in accordance with normal cleaning selection and difficult cleaning selections.

In some cotton ginning enterprises, the proposed cotton ginning plans cannot be implemented to a certain extent. In this case, it is necessary to implement a plan that is closer to the proposed plan. If the number of big dirt cleaners introduced in series is small, it is advisable to install small dirt cleaning equipment next to the above-mentioned cleaners. At the same time, CHX saw-type scrapers will be replaced by 1XK pile scrapers. If the number of pile cleaners is small, the number of saw cleaners can be increased. The productivity of the set of cleaning equipment of a single-row cotton ginning enterprise is 12 t/s for 1st class I-IV grades and 2nd class I-III grades of cotton, 9 t/s for 2nd class IV grade and 3rd class I-V grades of cotton. s.

The efficiency of an individual cleaner or a group of cleaners or a general cleaning process is determined by the following formula:

$$K = 100(C_1 - C_2)/C_1 \qquad (1)$$

where: S1, S2 - amount of fiber seed in cotton waste before regenerator and after regenerator, in percent.

The cleaning and regeneration effects of the regenerator should be as specified in the passport. If their real value is low, it is necessary to check the technical condition of the regenerator and to correct the detected defects, and also to reduce the air consumption from the pneumatic supply of the 1RX(RX) regenerator as much as possible. In addition, it is necessary to check the presence of fiber seeds in the waste of cotton cleaners and take measures to reduce them.

The loss of cotton materials with regenerator waste (cotton fiber seeds, free fiber, lint) is determined as a percentage of the weight of cotton being cleaned by the following formula:

$$K_c = \left[1 - (1 - K_1/100)(1 - K_2/100)...(1 - K_n/100)\right] \qquad (2)$$

Here: K1, K2, K3 — cleaning efficiency of cleaners.

In order to use the formula (2), it is necessary to determine the cleaning efficiency of the equipment from the sequence used in the technological process. Each cleaner or cleaning effect can be compared with those specified in the passport, the efficiency of the entire technological process is required to be within the specified range [20-21].

The cleaning efficiency of cotton cleaner waste regenerators is determined based on formula (1) as follows:

$$K_R = 100(S_1 - S_2)/S_1 \qquad (3)$$

where: S1, S2 - amount of fiber seed in cotton waste before regenerator and after regenerator, in percent.

The cleaning and regeneration effects of the regenerator should be as specified in the passport. If their real value is low, it is necessary to check the technical condition of the regenerator and to correct the detected defects, and also to reduce the air consumption from the pneumatic supply of the 1RX(RX) regenerator as much as possible. In addition, it is necessary to check the presence of fiber seeds in the waste of cotton cleaners and take measures to reduce them.

The loss of cotton materials with regenerator waste (cotton fiber seeds, free fiber, lint) is determined as a percentage of the weight of cotton being cleaned by the following formula:

$$P = S_2(C_1 - C_2)/(100 - S_2) \qquad (4)$$

here: S2 - fiber seed or free fiber in regenerator waste, the amount of fiber, in percent; S1 - S2 waste before cleaning and after cleaning the cotton supplied to the regenerator, in percent.

Summary. In the study, if the real value of the cleaning and regeneration effects of the regenerator is low, it is recommended to check the technical condition of the regenerator and to correct the identified defects, as well as to reduce the air consumption from the pneumatic supply of the regenerator. A formula was given to determine the loss of cotton materials (cotton fiber seeds, free fiber, lint) with regenerator waste in relation to the weight of the cotton being cleaned.

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