IMPROVEMENT OF COTTON REGENATOR

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Abstract
The research in this paper aims to improve machine productivity and cleaning efficiency by improving the cotton regeneration machine after the decontamination process. An improved regenerator was proposed for research and the optimal parameters of the working bodies were determined.

Keywords. Cotton, cotton gin, regenerator, impurities, enterprise, saw drum, plank drum.

Enter. Today, the increase in the amount of cotton pieces in the waste, which is separated from the technological equipment for cleaning cotton from large impurities in cotton ginning enterprises, causes them to be burned with waste. That's why 1RX cotton regenerator is installed for each cleaning system in enterprises.

It was observed that one of the main disadvantages of the used regenerators is their efficiency, the low efficiency of cleaning separated cotton pieces, and the passing of waste and cotton pieces through the colognes as a result of the air hitting the colostrums from the middle pipe of the waste cotton supply. Due to the excessive contamination of the cotton coming out of the regenerator, if it is re-added to the cotton coming to the cleaning system, the negative effect on the overall quality of the received fiber will increase. [1-2].

It is necessary to strengthen the cleaning of separated cottons in the regenerator, taking into account the need to bring the level of contamination to the same state in order to add the piece of cotton separated from the regenerator to the cotton in the flow.

Brushes are replaced several times a season due to wear of the brushes of the separating brush drums of the 1RX cotton regenerator. In addition, wear varies between brushes, causing the brushes to become less efficient at removing cotton from sawing drum saws. Therefore, using a drum with a rubber plate instead of a brush drum to separate the cotton from the saw teeth is considered a solution to the problem of constantly changing the brushes. The separating drum of the 2RX-M cotton regenerator, developed by "Pakhtasanoat Scientific Center" JSC, is made of rubber-plate. It was recommended to replace the separating brush drums of 1RX cotton regenerators with rubber-plate drums [3,4,5,6]. Based on these recommendations, some changes were made to the design of the unit to increase the cleaning and separation efficiency of 1RX type cotton regenerators used in cotton ginning enterprises. Figures 1, 2, 3. It was observed that the 1RX regenerator was fed from both ends of the waste cotton sawdust drum,

and air was drawn from the middle, resulting in a reduction of cotton pieces in the waste. In this case, when the waste cotton is divided into two parts during its movement in the air duct, it is easier to clean it by dividing it into small pieces towards the saw drum. Our next change is that the slats of the drum with the separator plate are installed at an oblique angle along the axis to the center of the drum, so that the cotton is removed from the saw tooth and directed towards the center. In order to reduce the amount of cotton particles coming out of the regeneration drum into the waste, the distance between the columns of the lower column grid is reduced.

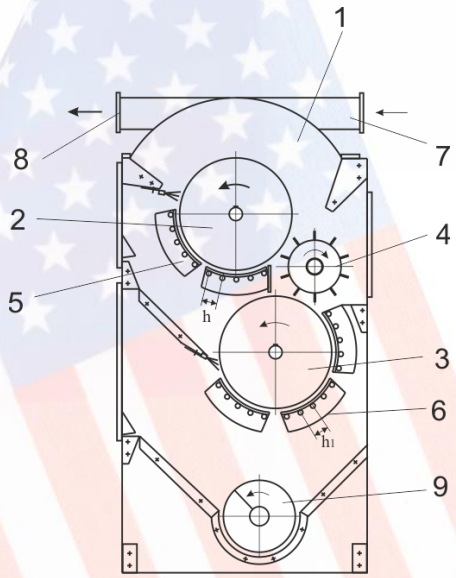

Figure 1. Construction of an improved cotton regenerator
1-Pneumatic supply, 2-main cleaning saw drum, 3-regeneration saw drum, 4-separating plate drum, 5-6-colossal grid, 7-waste cotton inlet pipe, 8-cleaned cotton outlet pipe, 9-waste auger.

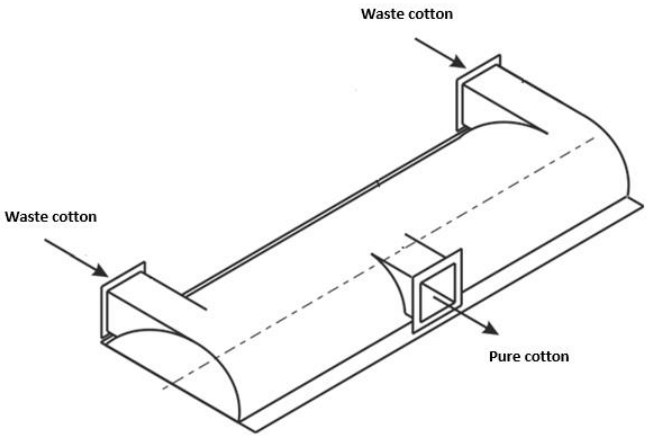

Figure 2. Scheme of the top cover of the regenerator

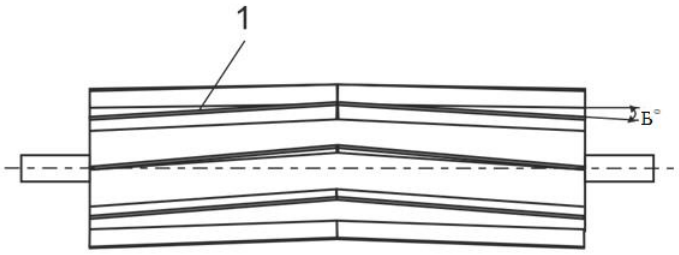

Figure 3. Improved rubber-plate separation drum. 1-rubber-plates

At an air speed of 2 m/sec, the cotton waste passes through the inlet pipe 7 to the main saw cylinder 2, is attached to the saw teeth and enters between the columnar grid 5, the distance between the columns is 40 mm. To separate the cotton from the saws of saw drums, the slats of the slatted drum are located at an angle b slope from the center of the drum to the edge.

Thus, when the slatted drum rotates, it simultaneously separates the cotton from the saw drum 2 and the regeneration drum 3, in addition, the cotton

Due to the fact that it slows down its movement by creating an air flow against its direction, the cotton is cleaned many times. Therefore, the cleaning efficiency increases.

Cleaned cotton raw material is separated by a slatted drum 4 and sent to a cylindrical pneumatic feeder, where the cotton raw material moves slightly along the axis of the drum 2 under the influence of air currents along the axis generated by the outlet pipe, that is, the cleaned cotton is separated by a slatted drum and moves along the axis of the feeder and exit pipe is added until it reaches the line and is removed from the cotton cleaner.

Contaminants, as well as separate columns of cotton pieces, fall from the grid 5 with an interval of h=40 mm and enter the drum 3 with regeneration saw to separate the cotton pieces from the waste along the inclined path. The grid 6, which is at a distance of h1 between the colosniks, does not allow the cotton pieces to join the impurities.

The cotton pieces separated by the rubber-plate drum 4 are returned for further cleaning by the main saw drum 2. The impurities that have fallen through the colosnik grate are taken out through the auger 9.

The slats of the rubber-slatted drum are positioned at an angle b towards the center of the drum, which allows the sawing drums to clean the cotton pieces several times.

Methods of conducting experiments. In order to carry out experiments on the improvement of the cotton regenerator, a rubber-plate separation drum was prepared for the 1RX cotton regenerator at the cotton ginning plant. Prepared rubber sheets and drum are shown in Figure 4.

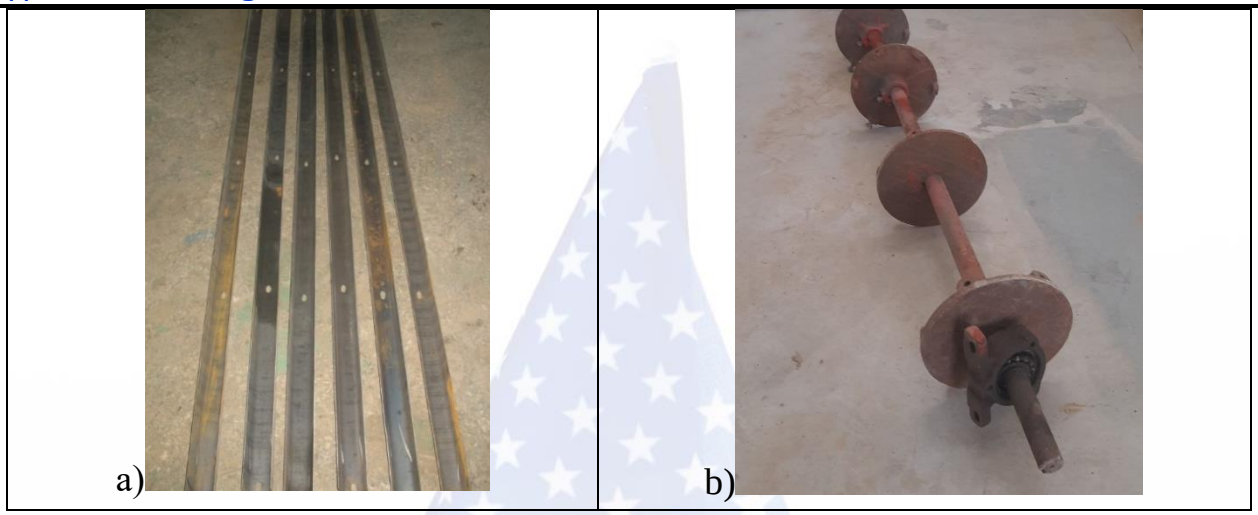

Figure 4. Planks prepared for the experiment (a) and drum frame (b)

The planks were split in two in the middle to harden them at an angle towards the center of the drum. Prepared rubbers were used to level the joints of the ends of the planks. The 1RX regenerator has a separating brush drum with a diameter of 300 mm, which is numbered to accommodate plates instead of brushes.

The following experiments are carried out in the improved 1RX cotton regenerator.

1. Determining the number of plates in the separating rubber-plate drum.
2. Determining the angle of deviation of the separating rubber plates towards the center of the drum axis.
3. Determination of the rotation speed of the separating rubber-plate drum.
4. Determining the distance between the rubber drum plates and the saw.
5. To study the effect of the distance between the colosniks of the lower saw drum on the amount of cotton pieces in the waste.

Analysis of experimental results. In order to obtain highly accurate results and avoid errors in the processing of research and research based on the generalization of statistical information collected during the use of machines in the laboratory and production in real conditions, one of the currently widespread methods is processed by the method of mathematical statics [7-8]. Loginov B.V. in determining the effectiveness of the planed drum for separating cotton from sawdust. The formula [9-10] is used:

$$K = \frac{Q_c}{Q_c + Q_o} 100 \quad (1)$$

Here, Qc is the amount of separated cotton;

The amount of cotton remaining on the surface of the saw drum.

One of the tasks of processing experimental results in a mathematical statistical method is to find some values. Sufficient information about the experiment can be obtained with the following characteristics: average value - $\bar{x}$; average deviation (mean square deviation) – S; standard error (average error) – $S_{\bar{x}}$; coefficient of variation - V.

One of the most commonly used methods is the arithmetic average, which is the sum of the values of all options divided by their number.

$$\bar{x} = \frac{x_1 + x_2 + x_3 + \cdots + x_n}{n} = \frac{\sum x}{n} \quad (2)$$

One of the most important indicators of statistics is the standard deviation,
the variant describing the dispersion of the value in relation to the average value is calculated, the formula of the arithmetic progression of the average.

$$S = \sqrt{\frac{\sum(x - \bar{x})^2}{n - 1}} \quad (3)$$

here,
x is the value of a separate option;
x¯ – arithmetic mean;
n- number of options;
The mean squared deviation describes the variation of the variant with respect to the mean value (ie, the variability of the variation).
The standard deviation value is usually used to compare the same coefficient of variation.

$$V = \frac{S}{\bar{x}} \cdot 100\% \quad (4)$$

Summary. The data of the obtained statistical analysis is expressed in a graphic form. With the help of EXM, we can find using special functions in Microsoft Excel in MS Windows XP operating system.
Analysis and calculation of experimental results was carried out on a computer with a special program.
Multifactorial experiments were conducted based on the mathematical planning method to justify the sizing of the cotton regenerator. Secondary planning methods were used for this.
In this case, the hypothesis of homogeneity of variance with the same number of repeated experiments was fulfilled using the Cochrane criterion, and the significance of the regression coefficients was fulfilled with the Student's criterion at the requirement of 95% confidence level.
The adequacy of the process model, i.e., the suitability of the regression equation for describing the optimization parameter, was checked by the Fishery-F test. If the model is adequate, the condition Fxis.<Ftabl is fulfilled.

Used Literature

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