Production Tests of the Developed Experimental Sample of Cotton Regenerator for Extraction of Volatles from Cleaner Waste

PhD. Kulmatov Ilkhom Tursunmuradovich
"Pakhtasanoat ilmiy markazi" JSC

ABSTRACT

The article describes the results of production studies of the developed cotton regenerator for the extraction of flakes from the waste of cotton cleaners with an improved rod drum in the production conditions of a cotton gin plant. Comparative indicators of the quality of cotton regenerators were obtained, the developed regenerator was introduced into production.

KEYWORDS: *Regenerator, cotton volatiles, quality indicators, aerodynamic and technological modes.*

According to the results of the theoretical and experimental studies carried out in order to increase the efficiency of the regeneration of raw cotton volatiles from waste, Paxtasanoat ilmiy markazi JSC developed a scheme for a new regenerator (Fig. 1), loosened clumps of raw cotton volatiles, as well as to increase the frequency of their cleaning, firstly, the supply of waste and the removal of regenerated volatiles are carried out pneumatically through holes located at the opposite sidewalls of the regenerator, and secondly, at the main saw cylinder above the slatted removing drum between the inlet and a guide bar drum is located through the outlet openings, loosening the waste entering through the inlet opening and preventing their transit through the regenerator without repeated cleaning on the main saw cylinder [1, 2].

Studies of the developed experimental regenerator of cotton fiber were carried out at the Baghdad cotton gin in the Ferghana region. The experimental sample was installed after coarse litter cleaners of the ChKh-5M brand 2 pcs and PT-10 1 pc, the waste of which is transferred to the regenerator by belt transport.

On the experimental regenerator, a variant of a bar drum and a top cover with optimized parameters carried out by experimental studies were installed: the screw pitch of the bar drum is 54 mm, the radius of curvature of the top cover is 150 mm, and the rotation speed of the bar drum is 400 rpm.

In the process of research, samples were taken: raw cotton, waste emitted after coarse litter cleaners, after an experimental cotton regenerator.

Based on the selected samples in the laboratory of the Baghdad cotton plant, analyzes were made of the quality indicators of raw cotton (moisture, weediness), cotton, and the quantity and quality indicators of cleaning waste from cleaners from large litter.

After establishing the optimal aerodynamic and technological modes of operation of the cotton separator, coarse litter cleaners and the experimental cotton regenerator, comparative tests were carried out to determine the quality indicators of cotton regenerators. In comparative tests for an existing regenerator, an option was chosen that used the existing bar drum and the top cover of the regenerator.

Fig 1.

Figure 1. General view of the developed cotton regenerator used for production testing.

During the comparative production experiments, raw cotton of the S-8290 breeding variety, the 2nd industrial grade with a weediness of 9.6% and a moisture content of 10.4% and the 4th industrial grade with a weediness of 11.4% and a moisture content of 11.2 %.

During the experiments carried out on the 2nd industrial grade, weighed small batches of cotton weighing from 4560 to 4620 kg were processed. The contamination of cotton before ginning was in the range of 0.9-1.0%. The preliminary content of cotton in the waste of cleaners from large litter was within 10% (determined in the laboratory of the plant). After each variant of the experiments, the rubbish seen after the experimental regenerator was weighed. In the laboratory conditions of the plant, the amount of released cotton in the composition of the waste was manually determined. Laboratory analyzes determined that raw cotton has a weediness of 5.6% for large litter and 4.0% for small litter.

During the experiments carried out on the 4th industrial grade, small weighted batches of cotton weighing from 4740 to 4860 kg were processed. The contamination of cotton before ginning was in the range of 1.1-1.4%. The preliminary content of cotton in the waste of cleaners from large litter was within 12%. Laboratory analyzes determined that raw cotton has a weediness of 7.2% for large litter and 4.2% for small litter.

The results of the experiments to determine the regeneration effects of the compared regenerators are shown in Table 1.

Table 1. Results of experiments to determine the regeneration effect of the compared cotton regenerators

№	Variants of experiments Regeneration effect,	% and repetition ofexperiments			Averagevalue, %	% Differenceof values
		1	2	3		
1	Control, at the 2nd grade	98,0	98,1	98,0	98,03	0
2	at the 4th grade	97,3	97,5	97,0	97,27	0
3	Project, 2nd grade	98,8	98,9	98,9	98,86	0,83
4	at the 4th grade	97,8	98,0	97,9	97,9	0,63

As can be seen from Table 1, in comparative experiments, the developed experimental cotton regenerator showed the best regeneration effects both on high and low industrial grades of raw cotton.on the 2nd grade, the regeneration effect of the experimental regenerator is 98.86%, which is 0.83% more compared to the control.

Fig 2.

Figure 2. View of the separated waste after the developed experimental regenerator

Tables 2 and 3 show the results of the experiments carried out to determine the overall cleaning effect and for large litter.

Table 2. Results of experiments to determine the overall cleaning effect of the compared cotton regenerators

№	Experiment options	cleansing effect, % and repetition of experiments			Averagevalue, %	Value difference
		1	2	3		
1	Control, at the 2nd grade	87,0	87,2	87,1	87,1	0
2	at the 4th grade	86,4	86,0	86,2	86,2	0
3	Project, 2nd grade	89,3	89,8	89,6	89,56	2,46
4	at the 4th grade	87,7	87,9	88,1	87,90	1,7

As can be seen from the results of comparative experiments, shown in tables 2 and 3, the developed experimental cotton regenerator has a higher value in terms of cleaning effects. The results of the experiments showed the advantages of indicators both in terms of the general cleaning effect and the cleaning effect on large litter of the experimental sample of the cotton regenerator by 1.7 to 2.7%, respectively. The obtained experimental data is confirmed by the type of waste emitted after the developed cotton regenerator shown in Fig.2.

Table 3.The results of experiments to determine the cleaning effect on coarse litter of compared cotton regenerators

№	Experiment options	cleansing effect, % and repetition of experiments			Averagevalue, %	Value difference
		1	2	3		
1	Control, at the 2nd grade	85,0	85,4	85,1	85,16	0
2	at the 4th grade	86,4	86,1	86,2	86,23	0
3	Project, 2nd grade	87,9	87,8	87,9	87,86	2,7
4	at the 4th grade	88,3	88,6	88,4	88,44	2,21

As mentioned above, when conducting comparative experiments, small batches of weighed raw cotton were processed, from which the weighed waste released after each variant of the experiments was separately determined. Then, in the laboratory conditions of the cotton ginning plant, the actual amounts of cotton released along with the waste of the cotton regenerator were determined. The results of the results obtained by determining the amount of cotton released along with the waste of the cottonregenerator are shown in Table 4.

Table 4. The results of experiments to determine the amount of cotton released along with wasteafter compared cotton regenerators

№	Experiment options	The amount ofcottonкг	Amountof wasteafter 2PX-M, kg	the amount ofcotton released by waste, kg	Cotton content in saw waste, %	Loss of cotton withwaste, %
1	Control, at the 2nd grade,	4560	228	6,62	2,9	0,15
2	Control, at the 4th grade	4740	317,6	6,36	2,0	0,14
3	Project, 2nd grade	4620	231	3,01	1,3	0,07
4	Project, at 4th grade	4860	325,6	5,86	1,8	0,12

As can be seen from the data in Table 4, the amount of cotton released along with the waste of the cotton regenerator in the developed variant is reduced compared to the control. As the results of comparative experiments show, during the processing of the 2nd industrial grade of raw cotton, the loss of cotton released along with waste from the developed cotton regenerator is reduced by half compared to the control indicators. This confirms the correctness of the chosen parameters of the experimental cotton regenerator.

After completion of production tests, the developed cotton regenerator was introduced and operated in the technological line for drying and cleaning raw cotton of the Baghdad cotton ginning plant in the Fergana region.

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