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Analysis of Experimental Works on Improving the Seed Selection Process

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Abstract
This article describes the method of improving the seed sorting device and carrying out experiments in the seed sorting process. As a result, advantages over the existing ones and efficiency gains from its introduction were determined.

Keywords: Cotton seeds, seed selection, sown seeds, device, waste, technical seeds, processing, fractions, construction, cleaning.

Introduction

In order to ensure the operation of the improved pneumatic seed sorting device at the required performance, a method of experimental work was developed to justify its optimal dimensions.
Experimental work on the method [1] is divided into the following stages:
1. Basis the size of the tube in the seed inlet of the seed sorting machine.
2. Seed installed in the seed sorting chamber of the device justify the dimensions of the router and the additional camera.
3. Determination of the main dimensions of the improved seed sorting device by the method of mathematical planning.
4. Development of an improved pneumatic seed sorting device testing under release conditions.
The seed cotton seed sorting device was designed by studying the existing scientific and technical problems in the SPS brand seed sorting device [2] used in seed processing technology. SPS feather seed seed sorters are designed to sort seed in a horizontal airflow. This device drops the seed from the hopper collector into the working chamber through a seed transfer device and a slide. Based on air spraying by the fan, the worker separates the seeds that have entered the chamber into fractions. The adjustment of the aerodynamic modes of the seed sorter is performed by the barriers installed in front of the suction and spraying fans. Separation of seeds into seed and technical fractions is done by adjusting the position of barriers. The main disadvantage of the device is the low sorting accuracy and the removal of seeds with the used air. In addition, the design of USM-A pneumomechanical cleaning and sorting unit [3-4], which is considered to be its analogue and successfully used for seed sorting, was studied in detail during the creation of the new device. The

principle of operation of the pneumomechanical seed cleaning device is based on the separation of seeds into waste and other fractions by suction with air flow generated by centrifugal fans, based on the difference in their speed.

Depending on the initial state of the cotton seeds, the waste mass separated by this device is 0.1-0.2% of the initial mass of the seeds. The amount of seeds (whole, broken) and fibrous material in waste is 18.5-19.6 and 11.8-55.4%, respectively. The main disadvantage of the pneumomechanical seed cleaner is the low cleaning efficiency of small debris - only 20-25%, and the need for relatively large power (12.85 kW) and the need to regularly adjust the aerodynamic working order of the device. Such shortcomings do not satisfy the requirements of the cotton ginning industry at all. The device is easy to prepare, reliable in operation, but when used together with the USM-A seed cleaning process line, it leads to excessive energy and metal costs.

Today, cotton raw materials are separated into fiber and seed during the ginning process at cotton ginning plants, and then the seed is lintered in the linting process. The seed is sent to seed and technical seed processing technology. In this process, sorting, cleaning, lintering, medication, packaging are carried out. In the process of sorting seeds and technical seeds, impurities, loose and broken seeds are mixed with air. As a result, there is a violation of the ecological condition in the territory of the enterprise, there are cases of contamination of seeds and technical seeds [5]. Taking this into account, in the newly improved seed sorting device, small impurities from the content of seed and technical seed, as well as broken and broken seeds, are prevented from being added to the dusty air.

The Main Part

The task of the newly proposed seed sorting device is to separate various small impurities, loose and broken seeds in the seed and prevent the dust from mixing with the air during the seed processing in the cotton primary processing plants during seed and technical seed sorting (Fig. 1). The improved seed sorting device increases the efficiency of catching fines, loose and broken seeds, and prevents fines, loose and broken seeds from mixing with dusty air. The improved sorting device consists of the following main parts: 1 collecting conveyor, 2 seed suction pipe, 3 seed barriers, 4 separation chamber, 5 moving drill, 6 hoppers, 7 air suction pipe, 8 dust air pipe, 9 vacuum valve.

In the new seed seed sorting device, two hoppers are installed to separate the impurities, empty seeds, and technical seeds into fractions by sucking the seed through the air, in addition, a moving seed auger is installed between the two hoppers to separate the seeds into fractions.

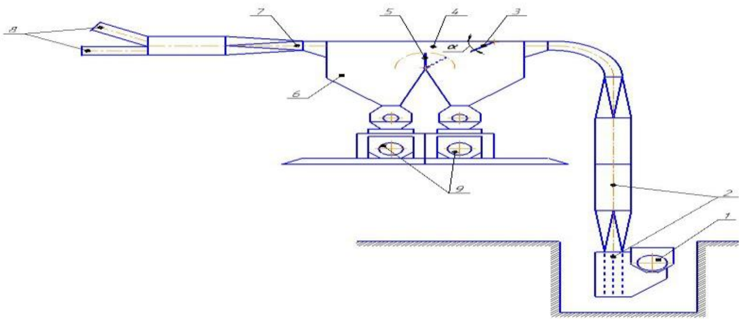

Figure 1. Technological scheme of the improved seed seed sorting device

1. collecting conveyor, 2. seed suction pipe, 3. seed barriers, 4. separation chamber, 5. moving drill, 6. bunkers, 7. air suction pipe, 8. dust air pipe, 9. vacuum valves

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The device works as follows: in the technological process of processing seeds of cotton gins, the seeds that have arrived on the collecting conveyor 1 pass through the suction pipe 2, come to the improved seed sorter and hit the seed barrier 3, and fall into the separation chamber for seeds 4. The mass passing through it (mainly waste, broken seeds and impurities) hits the moving drill 5 and falls into the technical seed chamber 6 in the direction of the drill. The tilt angle of the moving drill is changed depending on the dirt content and condition of the seed. Fractionated seeds are sent to the next process through vacuum valves 9. Seed seeds undergo cleaning and treatment processes, and technical seeds are sent to seed warehouses. Considering the first camera in this device, it is possible to separate 3 fractions in the mass of seeds, heavy bodies, seeds and technical seeds.

Experimental work

After carrying out the relevant improvement work on the improved version of the seed sorting device, preliminary experimental work on determining the limits of the main technological parameters ensuring the sorting of hairy seeds was carried out at the Jizzakh seed preparation workshop. Experiments were carried out on seeds of lintered medium fiber S-6524 selection grade, hairiness level 8.2%, 1000 seed mass 118.0 gr., mechanical damage 3.6%, contamination 1.2%, germination 92% [6-8]. Based on the analysis of the results of the preliminary experiment, the seed sorting chamber width Lk=600 mm and the length of the lower part L=450 mm, and the deviation angle of the seed barrier α=300 were accepted.

Factors included as influencing factors

x1-air velocity m/s,

x2- angle of inclination of the moving drill, degrees,

x3 – camera width mm.

To select the levels and ranges of changes of the researched factors, the values determined on the basis of previous studies and the experimental work carried out in the dissertation were used.

Seed sorting efficiency was mainly selected as the output parameters, but since the main indicator of the work process is the device performance, it was also studied as an output parameter in the planning work.

Output parameters:

Y1 – Seed sorting efficiency, (%)

Y2- Device productivity, kg/h

Table 1 lists the levels and ranges of the studied factors.

Table 1 The factors under study are the choice of change levels and intervals

Name of factors and units of measurement	Designation	Change levels			Change interval Δx
		-1	0	+1	
Air speed m/s,	X_1	14	16	18	2
Slope angle of the moving drill, degrees	X_2	10	20	30	10
Camera width, mm	X_3	400	600	800	200

In order to simplify the processing of research results, we will switch from natural values of factors to coded values.

$$x_i = \frac{x_i - x_{ai}}{I}$$

Here $x_{ai} -$ simplified value of the factor;

x_i- natural value of the i th factor;

I- range of variation.

The results of coding are included in Table 2.

Thus, after encoding, all higher levels are denoted by +1 or simply (+), lower levels by -1 or simply (-).

The working matrix of planning, that is, the matrix structure on which the experiment is conducted. For this, the standard planning matrix is used.

This matrix is filled by the calculated upper and lower levels of the factors.

Table 2 Factor values are the results of coding

№	It is varied factors	Low level coding	High level coding
1		$x_i = \frac{1100 - 1200}{100} = -1$	$x_i = \frac{1300 - 1200}{100} = 1$
2		$x_i = \frac{30 - 45}{15} = -1$	$x_i = \frac{60 - 45}{15} = 1$
3		$x_i = \frac{200 - 400}{200} = -1$	$x_i = \frac{600 - 400}{200} = 1$

Experiments are carried out strictly according to the sequence given in column 4, with the values of the parameters in the column set. The obtained results are recorded in the 5th column. The 4th column is made on the basis of a random table, and its task is to conduct tests in this order and eliminate the influence of random factors on the process being studied.

Therefore, the obtained regression mathematical model represents the studied process with sufficient accuracy (Figures 2-4).

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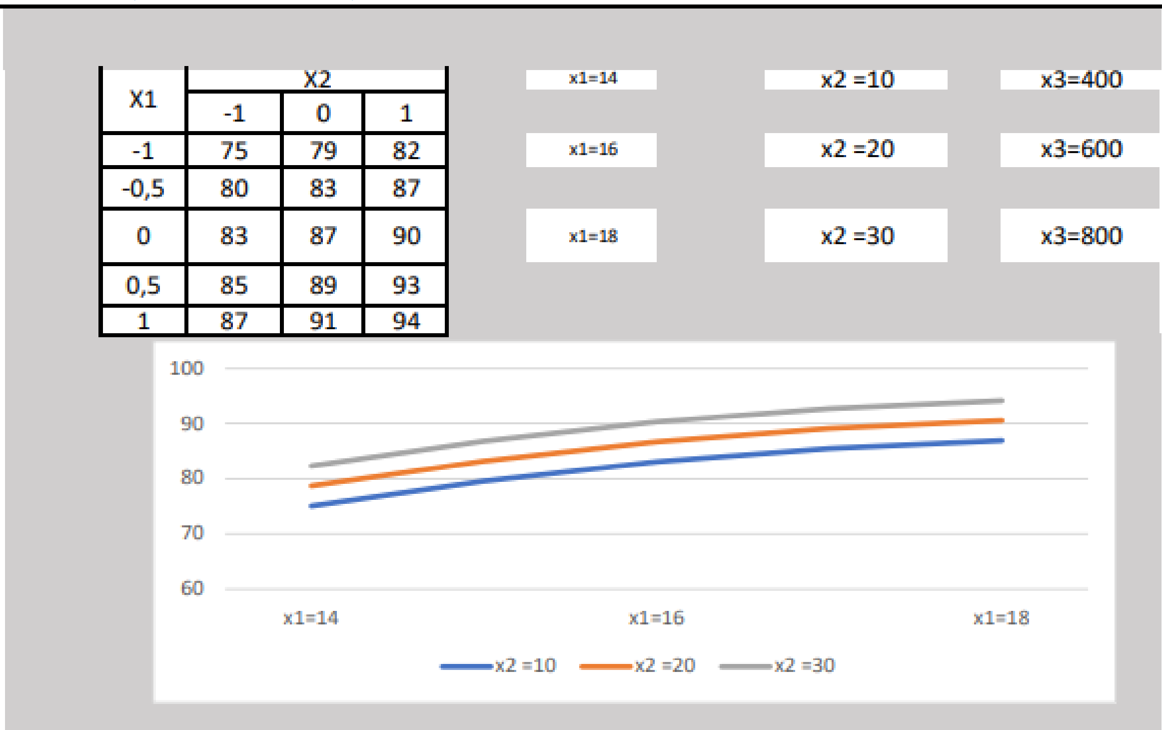
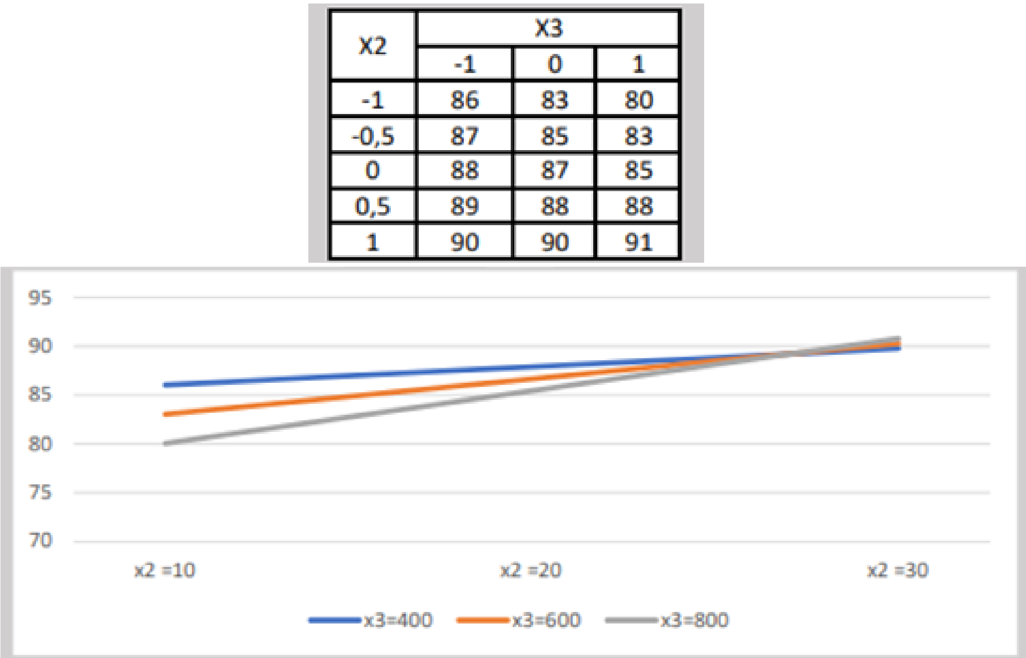


X1	X2		
	-1	0	1
-1	75	79	82
-0,5	80	83	87
0	83	87	90
0,5	85	89	93
1	87	91	94

Figure 2. Graph of effect of air velocity and moving drill values on sorting efficiency



X2	X3		
	-1	0	1
-1	86	83	80
-0,5	87	85	83
0	88	87	85
0,5	89	88	88
1	90	90	91

Figure 3. A graph of the influence of the values of the angle of inclination of the moving drill and the width of the chamber on the sorting efficiency

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X3	X1		
	-1	0	1
-1	88	88	84
-1	83	87	87
0	79	87	91
1	74	86	94
1	70	85	97

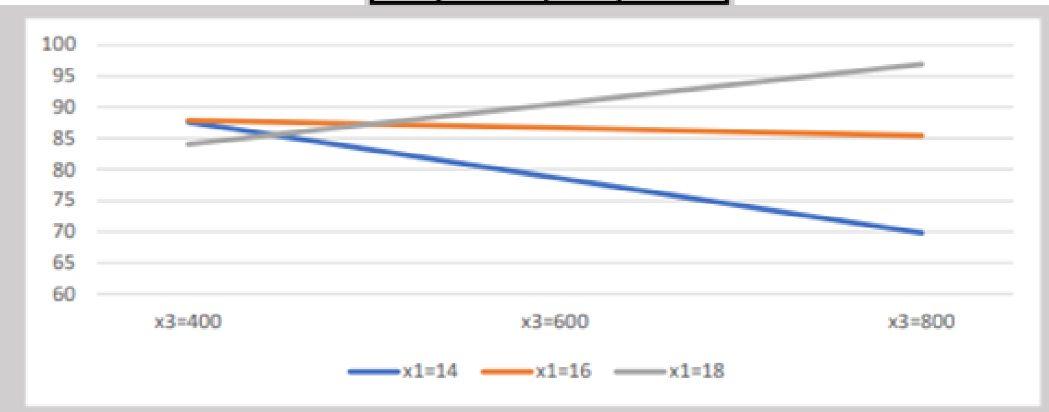

Figure 4. Graph of the effects of chamber width and air velocity values on sorting efficiency

Summary

From the above experiment, it can be seen that the greatest efficiency was achieved in seed sorting at air speed of 18 m/sec, chamber width of 600-800 mm, and tilt angle of the moving auger at 300. For the experiments, an improved scheme of the seed sorting device was developed and the width of the useful surface of the sorting chamber was reached to 1200 mm (600 mm seed chamber, 600 mm additional technical seed chamber) and at the same time it was achieved to maintain the maximum efficiency.

From the results of the experiment, it was known that the tilting of the bottom part of the tarvan ensures the correct direction of the seeds so that the seed mass coming out of the entrance of the seed sorting device takes the necessary speed and goes up along the air pipe. Therefore, in order to correctly direct the seeds to the seed sorting device under production conditions, the radius of the plow R=160 mm, the slope angle of the plow a= 600 was adopted.

References

1. Djamalov R.K. “Study of the uniformity of sowing of cotton seeds sorted on a trier using precision sowing devices” // Agriculture of Uzbekistan No. 3, Tashkent, 2000 - 2 pages.
2. Akhmedkhodjaev Kh.T., Tursunov A. “Pneumatic sorter of cotton seeds” Cotton growing and grain growing. Republican Scientific
technical journal, 2000, no. 2. pp.30-32.
3. Obidov A.A., Abudllaev A.A. Seed sorting device. Utility model patent, FAP 2022 0328.
4. Obidov A., Mamatqulov O., Sultonov M. Theoretical analysis of the movement of Cotton piece on the slope surface. International conference, 27.04.2018, Berlin, 151-156.

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5. Obidov A.A. Creation of an efficient technology of processing of ginned seeds. Doctoral dissertation, Namangan, 2020, 200 pages.
6. Akhmedkhodzhaev Kh.T., Karimov A.I., Obidov A.A. Study of the vibrational movement of cotton seeds on vibrating carriages of parallel alignment. // Journal of Textile Problems. – Tashkent, 2003. - No. 4. - P.65-67.
7. Djamalov R.K. Scientific and practical basis of creating cotton seed preparation technology. Doctoral dissertation, Tashkent, JSC "Cotton Industry Scientific Center", 2020, 200 p.
8. A Obidov, S Khamidov, I Muhammadjonova. Research removal of impurities by cleaning in the drum section of the fiber separation device. AIP Conference Proceedings 2789 (1), 2023.