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Information converter of seed pubescence based on software tools for the use of improved process control systems of linking

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Abstract. The technical process of linting and preparing raw cotton for processing, when it is subjected to a series of sequential operations, which ultimately affect the indicators characterizing both the quality and quantity yield of the finished product. The purpose of the work is to increase the efficiency of the production process of lintered cotton seeds, which consists in reducing the yield of substandard cotton seeds and reducing the consumption of energy and natural resources, by including in the process control system of the genie-linter shop of the local automatic control system (ACS) of the lintering.

1. Introduction

Large-scale changes have been implemented in the economic sphere, the most important step of which was the introduction of free conversion of the national currency, which primarily provides conditions for Uzbekistan to fulfill its obligations and repatriate the income of foreign partners, increase the investment attractiveness of the country.

Completely new principles and mechanisms for the formation of the State Budget have been introduced, measures have been implemented to ensure the transparency of its revenues and expenditures. Measures have been taken to improve the efficiency of state asset management and the use of unused reserves aimed at increasing the revenue side of the budget. A completely new procedure for the formation of state development programs of the Republic of Uzbekistan has been approved, providing at the first stage - the development and approval of long-term (for 10-15 years) sectoral, regional and targeted development concepts, at the second stage - the creation of sectoral, regional and target project portfolios, at the third stage - the formation of state development programs.

The growth of national competitiveness, increasing the efficiency of domestic enterprises on world and domestic is the goal of the economic policy of any state.

World experience shows that the implementation of cluster policy leads to an increase in the competitiveness of the territories and production complexes of the country.

At the present stage, an urgent problem in the development of intersectoral relations in the agro-industrial complex is the formation of clusters. In cotton growing, this problem is especially important because of the underdevelopment of intersectoral interactions and the lack of effective links between science, production, processing and marketing.

In 2000, the sown area decreased by 25.7% compared to 1985, and the gross cotton harvest - by 30%, respectively. In 2001, the size of the sown area was determined at 1435 hectares, the gross harvest - at 3.9 million tons with a yield of 27.3 c / ha.

At the same time, and this seems to be the most important, the optimization of resources, the emerging transition from extensive to intensive use of them led to the fact that in the 1999-2000 season, with a decrease in the volume of raw cotton production by 0.9% compared to the indicator of the 1996-97 season, the yield of flax fiber increased by 8.2%. Accordingly, while yields decreased by 1.4% over the same period, flax fiber production increased by 7.7%.

Comparing the indicators of cotton production in the country with the indicators of other world producers, we can say that Uzbek cotton has certain results in terms of profitability. This potential can be increased only by intensifying production and increasing yields.

Previous studies have not studied the analysis of the physical and mechanical properties of technical cotton seeds and, on this basis, the technological process of processing raw cotton at the stage of preparing cotton seeds for production, transient modes in the system that occur during the start-up and shutdown of individual machines in the battery, changes in equipment performance, random processes occurring in the system, the establishment of critical modes technological installations under changed conditions as a result of the appearance of substandard seeds. Without addressing these issues, it is not possible to develop means of monitoring and maintaining the operating modes of installations in which the cotton ginning industry is in urgent need.

This year, the work is aimed at the use of an information converter for the pubescence of cotton seeds in a continuous stream, conditions for controlling pubescence, software development, etc.

The ever-increasing needs of the national economy in agricultural raw materials require a large volume of production of cotton products and better processing of it in order to prepare high-grade raw materials.

To obtain high-quality seed material, a gentle regime is established throughout the processing site of raw cotton, fiber and lint. At the same time, the productivity of the technological line for all breeding varieties of raw cotton is reduced by 15 - 20%, respectively, the consumption of electrical energy increases by 10 - 15%.

Currently, depending on regional and climatic conditions, sowing is carried out with both pubescent and bare seeds. In the process of lintering, the pubescence of the seed material is brought to a regulated value by double treatment.

The correct organization of the technological process and its approximation to optimal conditions are closely related to obtaining high-quality, timely information about the course of processing processes, i.e. controls must timely transmit information about the actual state of the product.

2. Methods of research

The quality of the process of preparing cotton seeds for sowing is determined indirectly by the residual pubescence of cotton seeds, the determination of which is one of the control operations in the technological process of primary processing of cotton.

Currently, the following methods can be used to control pubescence: organoleptic, chemical, acoustic, optical. Consider the features of the implementation of each of the above methods.

Modern saw linters do not provide uniform removal of the lint from the surface of the seeds. This is due to a number of features described above, which should be identified by the operator-worker and take appropriate measures.

Quality control of the lintering process is carried out mainly by determining the pubescence of the outgoing seeds from the linter. Currently, there are no sufficiently accurate express methods for

determining pubescence. The development of methods for determining pubescence goes in two directions; one is commercial, based on a metrological one-time assessment of the absolute value of the desired value. This uses a method for determining pubescence according to GOST 21820TZ-76-laboratory chemical method. This method has high accuracy, but is very long, which allows us to judge only the quality of already treated seeds after 2-Z h. It is almost impossible to use these data to regulate the process.

The essence of all optical methods and analysis of the surface state of materials is as follows. The light flux, more than certain parameters, interacts with the object being analyzed. The flux transformed as a result of the interaction is measured, for one or another changed parameters it can be judged on the quality of the surface, and by calibrating the measured parameters according to the data of direct measurements and quantitative changes the basic parameters of the light flux carrying the necessary information, are: intensity (integral), polarization. Methods based on the corresponding measurement are called photometric and polarimetry.

When considering the optical properties of pubescent cotton seeds, it was noted that due to the irregular shape of the surface of the multiplicity of "fibers", the light falling on this surface in a parallel beam is reflected and refracted at numerous microscopic sites at various angles and leaves in all possible directions, that is, it becomes diffusely scattered. The surface of the seed itself is smooth and, with some assumption, can be considered to be directionally reflective. [2]

On the basis of this method, an optical installation is known for determining the degree of pubescence of cotton seeds, the principle of the action of which is based on the property of the underbelly to change the degree of polarization of the light reflected from the sample. The studied seeds are loaded into a ditch, in which the analyzed sample is somewhat compacted when the surface is leveled by hands. The sample prepared for measurement is placed in a measuring chamber that excludes poster illumination and is illuminated polarized light. According to the maximum and minimum degree of depolarization of the light flux reflected from the seeds, the pubescence of cotton seeds was calculated according to the well-known formula. At the same time, the time spent on determining the pubescence, taking into account the preparation of the sample of the ditch, was 10...15 minutes for three measurements.

The study of optical control methods has shown that the use of both methods is possible in conditions that exclude posterior illumination, and for the qualitative determination of pubescence, it is necessary to compact the sample in the ditch and level its surface. It should be noted that both methods are acceptable only for laboratory analysis of pubescence and the time of sampling, delivery of the sample to the laboratory and the results of the determination of pubescence to the operator, which is 10 to 15 minutes, are not excluded. The value of the "dead time" when using optical methods for laboratory control of pubescence was reduced to 20-30 minutes, but this value also suits modern production (Fig. 1 a, b).

3. Results of researches

A developed and tested converter of cotton seed pubescence (Fig. 1a.) allows you to build a closed automated control system (ACS) of continuous action from this parametr in the seed stream. Without touching the internal device of the feedback element, such a SPG can be represented as shown in (Fig. 1b).
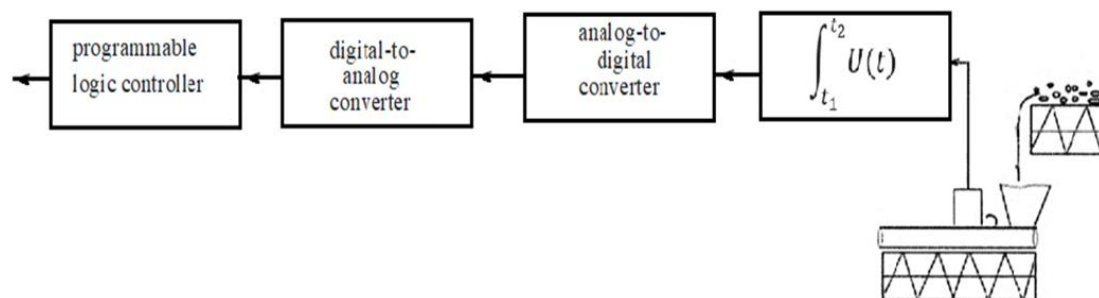
Figure 1a. Technological scheme of application of the measuring transducer of the pubescence of cotton seeds on the stream.
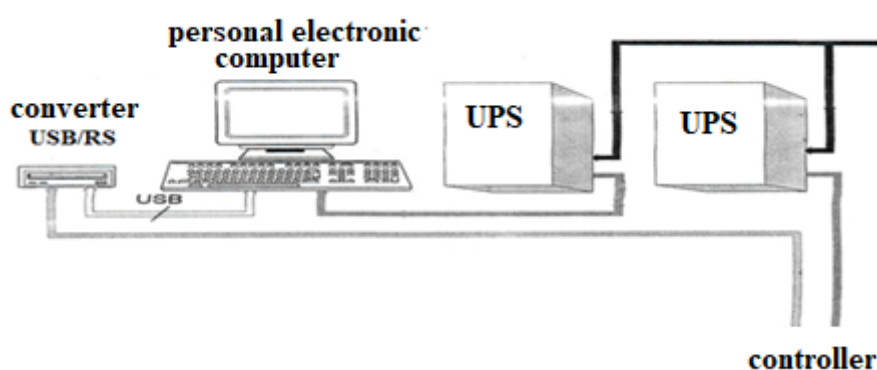

Figure 1b. Technological scheme of application of the measuring transducer.

On the basis of the technological scheme of the measuring transducer of seed pubescence on the stream, a functional scheme for monitoring the degree of pubescence of seeds by the polarimetric method was developed (Fig. 2)
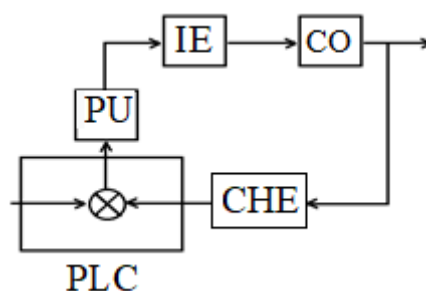

Figure 2. Functional scheme for monitoring the degree of pubescence of seeds.

Figure 2 shows the following symbols: PLC - programmable logic controller; PU - transforming device, IE - executive element, CO - control object (linter), CHE - sensing element (photometric sensor)

Based on the conducted research, an algorithm for the model of the system of automatic control of the degree of pubescence of cotton seeds based on the digital photo sensor BH1750 was compiled, which is given below:

4. Conclusions

To automate the process of browsing, the applied methods of automation of pubescence control and means that allow to control separately the parameters that make an error in the results of determining the degree of pubescence, such as weediness, humidity, temperature, are analyzed. To automate the lintering of seeds in the technological flow, the need to compensate for the overall influence of these factors was revealed.

It is established that in most cases the methods of and

devices based on the use of optical phenomena, which was the basis for the theoretical substantiation of the method of pubescence control with compensation for errors from the influence of secondary factors.

The proposed method and information converter for determining the degree of pubescence of hopchatnik seeds makes it possible to develop a technological scheme and technical means of a continuous flow line for automatic control of the quality indicators of cotton seeds and fiber.

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