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Analysis of FLUFF in the Process of Lintering of Seeds

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Abstract: *based on the analysis of the lintering process technology of the adults, the main factors influencing the growth of the residual seeds were identified. Methods for determining the mean weight values in a continuous stream were used to automatically regulate the fluff level.*

Keywords: *seed, fibre, analysis, lintering process, seed fluff, measurement, control.*

Introduction

Linting of cotton seeds proceeds under certain operating modes of the machine, which ensure the receipt of the seed of a given amount of subsidence, damage and debris. At the same time, certain features of technological processes and physical and technological properties of the incoming pubescent seeds for lintering, such as uneven feeding with seeds ΔQ , the density of the seed roll ρ_c in the section of the working zone, the bluntness of saw teeth Δh and change in the angle of the working edge of the tooth $\Delta \alpha$ lead to violation of the established mode. As a result, the process proceeds with insufficient or excessive removal of lint, which affects the omission of the obtained sowing seeds. Proceeding from this, the operator's task is to determine the arising disturbances in the process control.

At present, the organoleptic method used in production makes it possible to determine the approximate state of the seed shedding process. Since the method is very imprecise, the operator takes samples several times and visually averages the subsidence rate, and then applies the solution to control the operation of the machine. A qualitative assessment of the work of linters is given in the laboratories of the plant in isolation from the technological process (within 2-3 hours).

Materials and methods

Naturally, the described method is not suitable for the control system, and therefore many specialists make an attempt to create instrumental control of seed drop as the main indicator characterizing the operating mode of linters. To take appropriate measures to control the machine, it is necessary to have a characteristic of the transient operating modes of the linter organs that affect the linting process. Since the above methods are not suitable for taking dynamic characteristics in a continuous process, a new method for determining the weighted average of the degree of subsidence in a continuous flow was used for this

purpose. When determining the weighted average index of subsidence in a continuous technological process, a special sampler is used [1,2], which makes it possible to form a continuous flow of seeds with a smooth surface immediately after they leave the linter.

The study of the features of the impacts made it possible to subdivide them into signals that have a deterministic character (from blunt saw teeth Δh and from a change in the angle of the working face of the tooth Δd) and signals that are random (from the uneven density of the seed roll ρ_c in the working area and from unevenness seed nutrition ΔQ). These types of disturbances have been sufficiently studied by JSC Pakhtasanoatilm from the point of view of their influence on the seed drop rate, but the dynamic characteristics of transient processes that occur when the linter operating mode is restored are not fully represented. At the same time, it was established using these materials. That the omission rate may vary depending on feeding conditions and the position of the seed comb. For this, the creation of technical means is envisaged, allowing: to change the position of the seed comb; the intensity of nutrition (elimination of unevenness); direction of movement of seeds, depending on the quality of processing. To link the transient process with the steady-state, which has natural oscillations in the technological process (due to unevenness, physical and mechanical properties, etc.), it is necessary to consider the linter as a control object and give an analytical description of the characteristics of the steady process [3-6].

This process can vary from the initial conditions, which are determined by the properties of the processed seed, by the state of the machines, etc. A characteristic feature of the operating conditions of domestic equipment for primary processing of cotton is a high load, combined with the desire to maximize its capabilities, in which the machine operates at the maximum permissible mode. Passing the upper limit under such conditions leads to a noticeable decrease in the quality of the products.

Linter, as a regulated object, has its own specific features, one of which is a qualitative change in the regulated environment during the stay of seeds in the working chamber.

Results and discussion

A qualitative change in the controlled environment, affecting the nature of the change in the controlled parameter (omission), the continuous drift of the density of the seed roll due to the overlapping of the saw blades are specific features of the linter.

Even when processing a raw material that is relatively homogeneous in terms of quality indicators, the linting mode periodically changes as a result of replacing the saw cylinder, leading to a change in the average value of the controlled parameter due to an increase in the amplitude of fluctuations in the density of the seed roll. In addition, the unevenness of the natural physical and mechanical properties of the processed seeds, their supply by the feeder and the presence of various random factors significantly affect the controlled parameter, i.e. the drooping of the cotton seeds coming out of the machine.

It should be noted that the process of regulation in the facility depends significantly on the capacity of the linter. Linter capacities PMP-160 and 5 LP vary depending on the movement of the apron with the seed comb. Changing the working chamber contributes to a more favourable course of the control process due to a decrease in the deviation of the density of the seed roll from the set value, therefore, to a smaller decrease in the quality indicators of linting.

Uneven feeding is caused by fluctuations in the level of seeds in the feeder shaft, linear and volumetric density of the seed flow coming from the gin shop and uneven feeding of seeds by the feeder drum. The supply of seeds by the working bodies of the linter is uneven, both in time and along the length of the machine at the feed drum 20.13%, at the levelling drum - 16.48%. The coefficient of variability of the linear speed of rotation of the seed roller is 9.6%.

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