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THE INTERACTION OF THE COTTON PIECE WITH THE PILES OF THE SCRABBLE COTTON DRUM

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THE INTERACTION OF THE COTTON PIECE WITH THE PILES OF THE SCRABBLE COTTON DRUM

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Abstract. *This article presents the results of an analytical study of the process of loosening and cleaning raw cotton from small debris by pileging working bodies of purifiers, on the basis of which directions for further research were chosen to optimize the parameters of the developed pile drum with spherical piles and rubber strips.*

Cotton entering production contains impurities. The processes of loosening and cleaning the fiber shreds are key in the initial stages of ginning, as they prepare the raw cotton for ginning and directly affect the reliability, productivity of these processes and the quality of the resulting fiber.

Weed impurities are divided into large and small. Weed impurities larger than 8 mm are classified as large debris. Weed impurities are located, as a rule, on the surface of the structural particles of raw cotton, and inside the lobules and flakes, having weak varying degrees of adhesion to the fiber. The efficiency of cleaning raw cotton from impurities largely depends on its qualitative characteristics: the selected cotton variety, humidity, industrial grade, fiber length, residence time of impurities in raw cotton, th e nature of the litter and other indicators. Drum cleaners are used to separate small impurities from raw cotton.

Key words: *weeds, loosening, cleaning, intensity, impact, main part.*

Annotatsiya: *Ushbu maqolada paxta xomashyosini tozalagichlarning ishchi organlarini takomillashtirish orqali mayda ifloslikdan tozalash va tozalash darayonini tahliliy o‘rganish*

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natijalari keltirilgan bo‘lib, ular asosida ishlab chiqilgan foziqli baraban parametlarini optimallashtirish va keyingi tadqiqotlar uchun yo‘nalishlar tanlangan.

Ishlab chiqarishdagi paxta tarkibida iflosliklar mavjud. Chigitli paxtani titish jarayonlari paxta tozalashning dastlabki bosqichlarida asosiy hisoblanadi, chunki ba paxta xomashyosini tozalashga tayyorlaydi va bu jarayonlarning ishonchliligi, unumdorligi va hosil bo‘ladigan tola sifatiga bevosita ta’sir qiladi.

G‘o‘za qobiqlari, chanoq po‘stloqlari va yovvoyi o‘t aralashmalari katta va kichik iflomliklarga bo‘linadi. 10 mm dan katta bo‘lgan begona iflosliklar yirik iflosliklar sifatida tasniflanadi. Yovvoyi o‘t aralashmalari qoida tariqasida, paxta xom ashyosining strukturaviy zarrachalari yuzasida va tolaga ichida turli darajadagi yopishish darajasiga ega bo‘lakchalar va tolalar ichida joylashgan. Paxta xomashyosini aralashmalardan tozalash samaradorligi ko‘p jihatdan uning sifat ko‘rsatkichlariga bog‘liq: tanlangan paxta naviga, namligiga, sanoat naviga, tola uzunligiga, paxta xomashyosida aralashmalarning turish vaqtiga bog‘liq. Ushbu iflosliklarni paxta xom ashyosidan ajratish uchun qoziqli barabanlar xizmat qiladi.

Kalit so‘zlari: *paxta, iflosliklar, titish, tozadash, intensivlik, ta’sir, jinlash, mayda.*

Аннотация: *В данной статье приведены результаты аналитического изучения процесса разрыхления и очистки хлопка-сырца от мелкого сора колковыми рабочими органами очистителей на основании которой выбрана направления дальнейших исследований по оптимизацию параметров разработанного колкового барабана со сферическими колками и прорезиновыми планками.*

Хлопок, поступающий в производство, содержит сорные примеси. Процессы разрыхления и очистки клочков волокнистой массы являются ключевыми на начальных этапах джинирования, поскольку они обеспечивают подготовку хлопка-сырца к джинированию и напрямую влияют на надежность, производительность этих процессов и качество получаемого волокна.

Сорные примеси делятся на крупные и мелкие. Сорные примеси размером более 8 мм относятся к крупному сору. Располагаются сорные примеси, как правило, на поверхности структурных частиц хлопка-сырца, так и внутри долек и летучек, имея слабую разную степень сцепленности с волокном. Эффективность очистки хлопка-сырца от сорных примесей в значительной степени зависит от качественных его особенностей: селекционного сорта хлопчатника, влажности, промышленного сорта, длины волокна, времени нахождения сорных примесей в хлопке-сырце, характера сора и других показателей. Для выделения из хлопка-сырца мелких примесей служат барабанные очистители.

Ключевые слова: *хлопок, сорные примеси, разрыхления, очистка, интенсивность, воздействие, джинирования, мелких.*

Introduction

The processes of loosening and cleaning shreds of fibrous mass are key to the initial stages of ginning, since they prepare raw cotton for ginning and directly affect the reliability, productivity of these processes and the quality of the resulting fiber.

One of the main goals of studying the processes of loosening and cleaning is to improve the quality of cleaning raw cotton. The main means of loosening and cleaning cotton are: geometric parameters: the size of the distribution between the weed grids and the drum piles; number, shape, length, pointedness, quantity piles; number of reels; pin density (number of pins per unit area); weed lattice density (number of holes per unit length). These options determine volume workspace.

The dissertation of R.Z.Burnashev is devoted to the issues of cleaning raw cotton [1]. He conducted a theoretical and experimental study of the mechanical technology of processes for cleaning raw cotton from small debris. Studied interaction particles cotton with working bodies cars

A number of works are devoted to describing the interaction of raw cotton scraps with the working parts of cleaning machines [2, 3] Kh.I.Ibrogimov, R.V.Korabelnikov determined the parameters of the piles (number of rows of piles, friction coefficient per piles) that ensure the capture and retention of cotton particles [2]. The same authors identified the parameters of the movement of cotton particles along the pile: the time of movement of the particle along the pile, the time the particle leaves the pile, the relative speed of the particles along pile V moment right away [4].

Let us present the main results in the field of studying distributions of characteristics scraps. One of the first known works is the work T.A.Frolova [5], who studied changes in the distribution of fibers along length before And after scrabbling transition.

Similar work was carried out by Japanese researchers [6, 7], in which has carried out a large amount of research on transitions, changes distribution fibers By length, By content tough weed impurities.

A study on the distribution of cotton fiber scraps was also carried out by the Spanish researcher

A. Barella, who in his article [8] placed a series of distributions and determined their compliance with known laws distributions. It was proven that the distribution of the mass of large shreds is well described by the logarithmic normal law. As the pieces divide the modal value of the distribution approaches zero, and the distribution is practically no different from exponential.

In the fundamental work of 1941 by A. N. Kolmogorov [9], a mathematical model process multi-stage crushing particles And received the limiting distribution of particle mass as the number of fissions tends to infinity. It has been proven that this limiting distribution is logarithmically normal distribution regardless from primary distribution masses particles.

Research methods

The work uses a brief theoretical analysis of the process of loosening and cleaning raw cotton from impurities to select the direction of further research for the developed pileging drum with spherical piles and rubber strips for the purifier of raw cotton from small debris.

Results and discussion

The interaction diagram of the loosening drum pile and the raw cotton fly is shown in Figure 1. The fly consists of two connected parts with conventional masses m_1 and m_2, concentrated at points *A* and *B*. *Under the influence of the pile, a force P* arises, which acts on point A tangentially to the trajectory of the fly. The force *P* can be decomposed into two components: P_1, directed along the line *AB*, and P_2 , directed perpendicular to *AB*. Force P_1 tends to stretch the fly, What provides loosening his And Maybe bring To division his by two. A force P_2 strives rotate mass m_1 around masses m_2. What may lead to lighting volatiles [10, 11, 12].

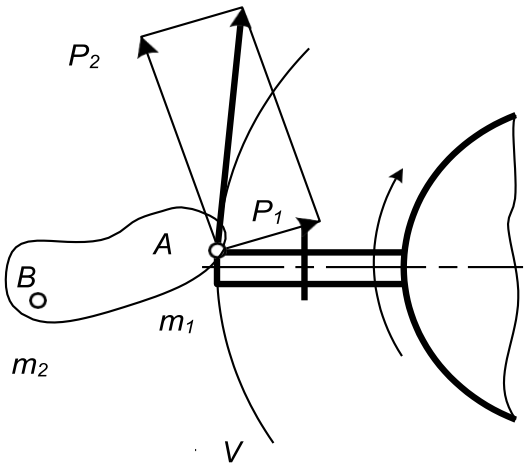

Figure 1. Scheme of interaction between the splitter of the loosening drum and the fluff of raw cotton

Intensity impact workers organs on flyers determined according to the formula:

$$S_p = \frac{nM \cdot 1000}{Q} \quad (1)$$

Where *n* – rotation speed of the tuning drum, r/s;

M – number of piles on the pile drum;

Q – quantity served in raw cotton machine, kg/s.

In [13] defined complex index impact workers organscleaner for raw cotton, taking into account the speed and power parameters of these effects. For cotton gin cars from small litter complex index determined next way:

$$K_0 = K_{во} K_Д \leq [K_0] \quad (2)$$

Where $K_{во}$– coefficient of influence of one pinning section of a fine cleaner litter;

$K_Д$ – dynamic impact coefficient;

$[K_0]$ - permissible value comprehensive indicator.

Impact coefficient of one pile section of a fine litter cleaner determined B_y formula:

$$K_{во} = n_б Z_K N_{\tau\eta}, \quad (3)$$

Where $n_б$ – rotation frequency of the tuning drum, s^{-1};

Z_K – number of rows of piles per drum;

N – number of drums in the machine;

τ – time of passage of raw cotton one cleaner drum, s;

η – coefficient taking into account the ratio drum linear speeds and raw cotton.

In [10], the dependence of the effect of cleaning the fibrous mass on various technological and raw material factors, proposed by was considered and improved F. Leifeld:

$$Э_а = M \cdot C \cdot S_в \cdot P, \quad (4)$$

Where:

$Э_а$ -absolute effect cleaning fibrous masses from weedy impurities, %;

M – coefficient depending on the design of cleaning machines;

C – coefficient, dependent from totality properties material, temperature- humidity conditions and technological production conditions;

$S_в$ -percentage content of weeds and hard impurities in the fibrous material at the entrance to the eyesstylish car;

P -factor, taking into account productivity and load cleansing machine lines.

The dynamic impact coefficient is calculated as follows:

$$K_Д = \frac{1}{1-\frac{P_{ср}}{P_к}}, \quad (5)$$

where:

P_{avg} – average force blow;

P_{to} – critical force blow.

So way, complex index for cleaner small litter equal to:

$$K_o = n_b Z_K N_{\tau\eta} \frac{1}{1-\frac{P_{cp}}{P_K}} \leq [K_0], \quad (6)$$

The index maybe be used for forecasting quality of processed raw materials when designing new technological chain schemes cleaning cotton.

Expression for law movement particles:

$$Z_2 = V_0 t - \frac{V_0}{\omega_0} \sin \omega_0 t, \quad (7)$$

Where:

V_0 – speed pile;

ω_0 – circular frequency own fluctuations particles.

Condition departments weedy impurities from particles:

$$m_c V_0 \omega_0 \geq Q_{cz}, \quad (8)$$

where: m_c – weight weedy particles;

Q_{cz} *is* the component of the force of fixing the weed particle on the surface of the cotton in the direction of the OZ axis.

Quantities cotton at the entrance to the opening and cleaning machines let's denote Q (kg/s). Time stay cotton cleaner, if pile drum takes 1/2 her surfaces, is:

$$t = \frac{1}{2n}, \quad (9)$$

where n - speed rotation drum, r/s

While the cotton is in the purifier, under the influence of the impact forces of the working parts, impurities are released, due to which the mass of cotton shreds changes. As a result of the loosening process, the density of the cotton changes. The differential equation of motion of a weed particle looks similar:

$$z = \frac{S_0}{m_i \omega_0} \sin \omega_0 t, \quad (10)$$

where S_0 – pulse instant forces; m_i – weight flyers; ω_0 – angular frequencyown vibrations of the fly.

Conclusion

Thus, there are many factors that influence the effectiveness processes of loosening and cleaning cotton shreds. Because fibrous flow V gap between the tuning drum and a weed fence It has random density varying over a wide range, then the stability and stationarity of this flow, which is directly reflected in the uniformity of the output flow depends on the dynamics of the operation of the purifier tuning drums.

In conclusion, we can say that many researchers have examined the process of loosening and cleaning fibrous material from impurities, and established patterns of efficiency of the cleaning process from various parameters of the working body. However, these conclusions were made for a specific case and for cleaners with specific parameters of the working bodies. When changing the parameters, for example, of the pile drum of a raw cotton cleaner from small debris, it is necessary to clarify its effect on the process of loosening and cleaning raw cotton.

Based on the above-described direction of our research, we chose to optimize the main parameters of the developed peking drum with spherical piles and rubber strips for the raw cotton cleaner from small impurities.

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RESEARCH ON AN IMPROVED COTTON CLEANER UNIT

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Abstract. *This article analyzes the results of changes to the working parts of a cotton cleaning unit from small and large impurities. It is known that the UXK installation uses continuous cleaning technology, that is, the cotton entering the purifier is cleaned in all its cleaning sections and then transferred to another process. In these sections, pieces of cotton wool from the separated waste are regenerated in a separate drum. Existing purifier suppliers use a manually operated mechanical system to monitor its performance. These factors do not make it possible to control the cleaning process when the quality indicators of cotton change. When processing cotton, the inability to control the efficiency of the cotton ginning process and the frequency of ginning does not allow obtaining fiber with the same quality indicator. This causes technological difficulties when processing cotton fiber in further processes.*

Taking these shortcomings into account, an improved technology for the UXK treatment plant was developed. In this technology, once the cotton contamination reaches the recommended level of contamination before ginning, the ginning unit is removed from the ginning unit by a controlled section into five parts and transferred to the next process. This control technology allows you to change the cleaning process depending on the initial contamination of the cotton.

Key words: *cotton, cleaning, combined, mineral impurities*

Аннотация. *В данной статье проанализированы результаты внесения изменений в рабочие органы агрегата очистки хлопка от мелких и крупных примесей. Известно, что на установке УХК применяется технология непрерывной очистки, то есть поступающий в очиститель хлопок очищается во всех его секциях очистки, а затем передается на другой процесс. В этих секциях кусочки ваты из отделенных отходов регенерируются в отдельном барабане. Существующие поставщики очистителей используют механическую систему с ручным управлением для контроля ее производительности. Эти факторы не дают возможности контролировать процесс очистки при изменении качественных показателей хлопка. При переработке хлопка невозможность контролировать эффективность процесса хлопкоочистки и частоту джинирования не позволяет получить волокно с одинаковым*

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