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THEORETICAL FOUNDATIONS OF THE INTERACTION OF A COTTON TUFT WITH A SCREW CONVEYOR AND A MESH SURFACE

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Abstract: This paper presents a theoretical study of the motion of a cotton piece in a screw cleaner and the impact forces generated during its interaction with screw spikes and a mesh surface. The impact impulse is analyzed as a function of the initial velocity of the cotton piece, the rotational speed of the screw, and the tilt angle of the spikes. Theoretical calculations show that at a screw rotational speed of 180 rpm and a spike tilt angle of $\alpha_1 = 8^\circ$, the impact impulse reaches its minimum value. An increase in the impact force leads to a higher number of broken seeds in seed cotton. In addition, the proposed screw cleaner combines the cleaning and drying processes, which contributes to an increase in the overall operational efficiency of the equipment.

Key words: screw cleaner, cotton piece, impact force, screw spike, mesh surface, theoretical calculation, rotational speed, tilt angle.

Annotatsiya: Ushbu maqolada vintli tozalagichda paxta bo'lagining harakat jarayoni hamda uning vint qoziqlari va to'rtli sirt bilan o'zaro ta'siri natijasida yuzaga keladigan zarba-impuls kuchlari nazariy jihatdan tadqiq etilgan. Zarba impulsi paxta bo'lagining boshlang'ich tezligi, vintning aylanish chastotasi va qoziqlarning og'ish burchagiga bog'liqligi aniqlangan. Nazariy hisob-kitoblarga ko'ra, vintning aylanish chastotasi 180 ayl/min va qoziqlarning og'ish burchagi $\alpha_1 = 8^\circ$ bo'lganda impuls kuchi minimal qiymatga ega bo'ladi. Impuls kuchining ortishi chigitli paxtada shikastlangan chigitlar sonining ko'payishiga olib keladi. Shuningdek, taklif etilayotgan vintli tozalagichda tozalash jarayoni quritish jarayoni bilan birlashtirilgan bo'lib, bu uskunaning umumiy ish samaradorligini oshirishga xizmat qiladi.

Kalit so'zlar: vintli tozalagich, paxta bo'lagi, zarba kuchi, vint qoziqlari, to'rtli sirt, nazariy hisob-kitob, aylanish chastotasi, og'ish burchagi.

Аннотация: В статье выполнено теоретическое исследование процесса движения хлопкового комка в винтовом очистителе, а также ударно-импульсных сил, возникающих при его взаимодействии с винтовыми колышками и сетчатой поверхностью. Определена зависимость величины ударного импульса от начальной скорости хлопкового комка, частоты вращения винта и угла наклона колышков. Результаты теоретических расчётов показывают, что при частоте вращения винта 180 об/мин и угле наклона колышков $\alpha_1 = 8^\circ$ ударный импульс принимает минимальное значение. Увеличение ударного импульса приводит к росту количества повреждённых семян в семенном хлопке. Кроме того, в предлагаемом винтовом очистителе процесс очистки совмещён с процессом сушки, что способствует повышению общей эффективности работы оборудования.

Ключевые слова: винтовой очиститель, хлопковый комок, ударная сила, винтовые колышки, сетчатая поверхность, теоретический расчёт, частота вращения, угол наклона.

INTRODUCTION

The study of the laws governing the motion of raw cotton along a mesh surface under the action of pegs makes it possible to assess both the cleaning efficiency and the degree of seed damage. When a cotton tuft moves along the surface of a mesh screen, it is subjected to impact–vibration impulses that facilitate the separation of impurities. However, an excessive increase in impact–vibration impulses leads to damage to cotton seeds. Therefore, determining the optimal parameters of the screw dryer and cleaner is of great importance for calculating the limiting values of impact–vibration impulses [1–8].

It is known from studies conducted on the working elements of cleaning machines [9–10] that when the peripheral speed varies from 4.71 to 19 m/s, the highest cleaning efficiency is achieved in the range of 7.85–11.5 m/s.

LITERATURE REVIEW

Raw cotton cleaning processes have been extensively studied due to their significant impact on fiber quality and seed integrity. Research shows that the interaction between cotton tufts and the working elements of cleaning machines is accompanied by impact–vibration impulses, which play a key role in impurity separation [1–3]. At the same time, excessive impact loads lead to seed damage and deterioration of technological properties of seed cotton [4]. Fundamental studies based on classical mechanics and impact theory have provided theoretical tools for analyzing collision processes in technological machines. The works of Panovko and Vulfson established the principles for determining impulse forces, restitution coefficients, and vibration effects during short-term impacts, which are widely applied in the analysis of cotton-cleaning equipment [5,6]. Studies on machines for primary cotton processing indicate that the rotational speed of working elements and their geometric parameters significantly influence cleaning efficiency. It has been established that within an optimal range of peripheral speed, effective impurity separation is achieved without excessive seed breakage, whereas deviation from this range results in either reduced cleaning efficiency or increased mechanical damage [7–9].

Research devoted to mesh surfaces shows that they actively participate in the dynamic interaction with cotton tufts, generating additional impact impulses. The inclination angle of pegs and the rotational speed of the screw substantially affect the magnitude of these impulses and, consequently, the degree of seed damage [10,11]. Despite numerous studies on drum and vibration cleaners, the interaction of cotton tufts with screw-type cleaners in combination with mesh surfaces remains insufficiently investigated. This necessitates further theoretical analysis aimed at determining optimal design and operating parameters to minimize impact impulses and improve cleaning efficiency [12].

RESEARCH METHODOLOGY

When the speed is lower than 7.85 m/s, a decrease in cleaning efficiency is observed. Seed breakage occurs when the speed exceeds 11.5 m/s. However, in our studies, the higher rotational speed of the peg screw requires additional investigations for the newly proposed design. Figure 1 [a–b] shows the force diagrams acting on seed cotton as it moves along the peg screw and the mesh surface.

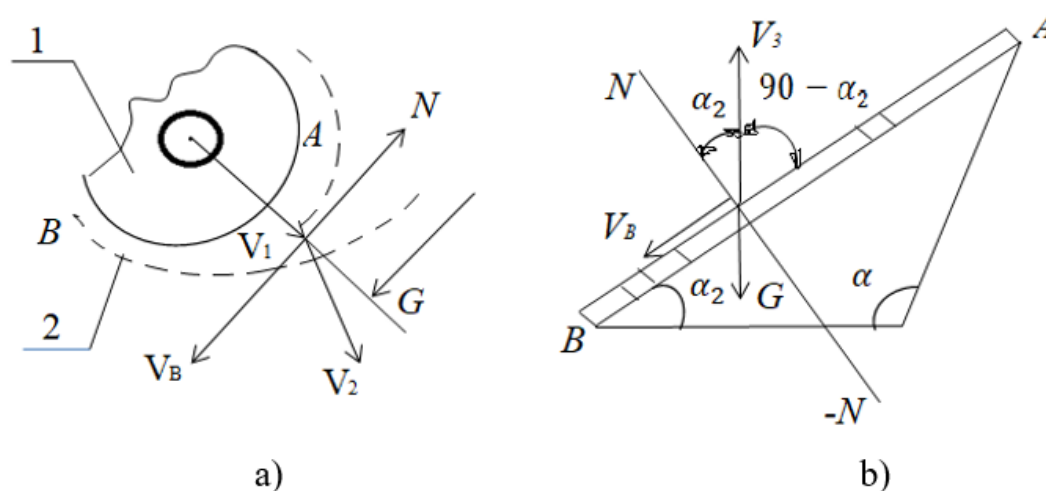


Figure 1. Process of cotton tuft motion in a screw conveyor

- a) Scheme of the interaction between a cotton tuft and a screw peg
- b) Scheme of the interaction between a cotton tuft and a mesh surface

ANALYSIS AND RESULTS

When a cotton tuft moves along a mesh surface, it receives impact–vibration impulses from the pegs and the screen, which results in the separation of fine impurities. In order to determine the impact impulses, first, the velocity of the cotton tuft along the surface of the peg drum and its direction are determined. At the initial stage, the cotton tuft has a circumferential velocity V_v . While moving along the mesh screen surface, the cotton tuft is pressed against the screen by the force. Taking into account that the cotton tuft is moved along the mesh screen surface by the action of the peg, the velocity of the cotton tuft is determined as follows.

$$V_v = \sqrt{\frac{(C_1 V_1^2 + G \sin \alpha) e^{-2 \frac{C_1 y_2}{m_A}} - G \sin \alpha}{C_1}} \quad [1]$$

y_2 – the length of segment AB; let us assume $y_2 = 55 \text{ mm}$.

If the time of motion of the cotton tuft along section AB is taken as $T_1 = \frac{y_2}{V_B}$ then the impulse exerted by the peg drum can be expressed in the following form.

$$m_1 \bar{V}_1 - m_2 \bar{V}_2 = \int_{t_1}^{t_2} P dt - \int_{t_1}^{t_2} F dt \quad [2]$$

Using impact theory,

$$S_{zarb} = \bar{S} = \int_{t_1}^{t_2} \bar{F} dt = \bar{F}_{yp} \tau \quad [3]$$

$$S_{erkin} = \int_{t_1}^{t_2} \bar{p} dt = \bar{P}_{yp} \tau$$

Here: τ – duration of the impact process.

Considering that the deflection S_{zarb} is very small relative to the impact force, equation (2.7) can be written as follows:

$$S = m \bar{V}_1 - m \bar{V}_2 \quad [4]$$

In most screw cleaners, the rotational frequency of the screw is variable and primarily depends on the work efficiency. Studies conducted on the proposed screw cleaner have shown that when the rotational speed of the screw varies and the work efficiency ranges from 6 to 8 tons, ω is within the range of 12–24.6 rad/s. In this case, the initial velocity of the cotton piece can vary within $\vartheta = 2.8\text{--}4.8 \text{ m/s}$, and the screw diameter is $d = 400 \text{ mm}$.

From equation (4), if the velocities are known, it is possible to determine the impact impulse forces acting on the seed cotton from the screw spikes and the mesh. For this, we use Newton's second law.

Based on Newton's second law, the equation of motion for the system between the initial and final states can be written as:

$$\bar{U}_{Bv} + m_p \bar{U}_{\pi} = m_v \bar{V}_B + m_p \bar{V}_{\pi} \quad [5]$$

Where U_v and U_p are the initial velocities of the screw spike and the cotton piece, and V_v and V_p are their velocities in the final state. Projecting both sides of the vector equation (5) onto the N axis gives:

$$m_v \bar{U}_{BN} + m_p \bar{U}_{\pi N} = m_v \bar{V}_{BN} + m_p \bar{V}_{\pi N} \quad [6]$$

From this, the coefficient of restitution for the collision of the two bodies can be determined as:

$$K_T = \frac{|\bar{U}_{BN} - \bar{U}_{\pi N}|}{|\bar{V}_{BN} - \bar{V}_{\pi N}|} = - \frac{\bar{U}_{BN} - \bar{U}_{\pi N}}{\bar{V}_{BN} - \bar{V}_{\pi N}} \quad [7]$$

If $\bar{V}_{BN} > \bar{V}_{\pi N}$ then:

$$\bar{U}_{\pi N} - \bar{U}_{BN} = K_T (\bar{V}_{BN} - \bar{V}_{\pi N}) \quad [8]$$

Solving equations (2.8) and (2.11) together, we obtain:

$$\bar{U}_{BN} = \bar{V}_{BN} - (1 + K_T) \frac{m_{\pi}}{m_B + m_{\pi}} (\bar{V}_{BN} - \bar{V}_{\pi N});$$

$$\bar{U}_{\pi N} = \bar{V}_{\pi N} + (1 + K_T) \frac{m_B}{m_{\pi} + m_B} (\bar{V}_{BN} - \bar{V}_{\pi N});$$

Using the equation of momentum change, the impact impulses can be expressed as:

$$S_{BN} = m_B (\bar{U}_{BN} - \bar{V}_{BN});$$

$$S_{\pi N} = - S_{BN} \quad [9]$$

Substituting $\bar{U}_{\pi N}$ from (2.12) into the expression, we obtain:

$$S_{BN} = - S_{\pi N} = m_B \bar{V}_{BN} - (1 + K_T) \frac{m_B m_{\pi}}{m_B + m_{\pi}} (\bar{V}_{BN} - \bar{V}_{\pi N}) - m_{\pi} \bar{V}_{\pi N} \quad [10]$$

$$\frac{m_n}{m_n}$$

Considering that m_n - is very small, equation (2.13) can be simplified as:

$$S_{nN} = - S_{nN} = - \overline{m_n} (1+K_B)(V_{BN} - V_{nN}) \quad [11]$$

From Figure 2.3, taking $V_{BN} = V_B$ va $V_{pN} = V_v \sin \alpha_1$, equation [11] can be rewritten as:

$$S_{nN} = m_n (1+K_B)(V_B + V_v \sin \alpha_1) \quad [12]$$

The average force exerted on the cotton piece by the screw spikes can be calculated using the following equation:

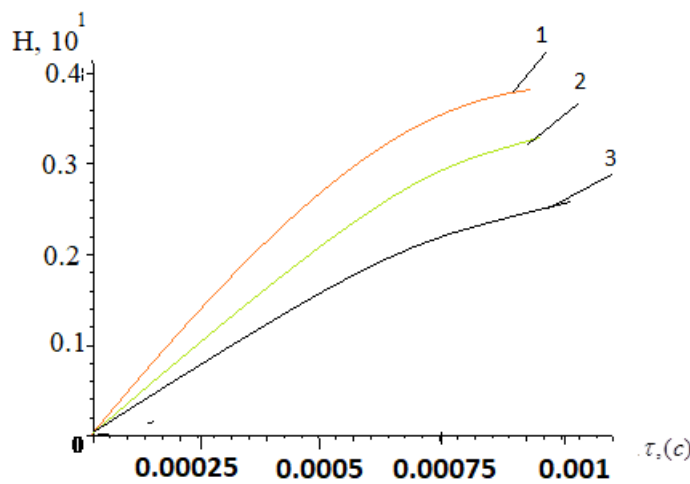
$$F_{\bar{y}p} = \frac{S_{nN}}{\tau} \quad [13]$$

Thus:

$$F_{o1r\tau} = m_n (1 + K_B)(V_B + V_v \sin \alpha_1) \quad [14]$$

By solving this equation using the given values, we can obtain the graph of the impact force of the screw spike on the cotton piece as a function of the rotational frequency of the screw (Figure 2.4).

Here; $m = 0.65g$; $V_B = 2.8 \div 4.8$ m/c; $K_B = 0.3$; $\alpha_1 = 8^\circ$:



1- $n=360$ ay/min, 2- $n=270$ ay/min, 3- $n=180$ ay/min.

Figure 2. Force of the screw spike on the cotton piece

From the graph, it can be seen that increasing the rotational speed of the screw leads to an increase in the impact force acting on the seed cotton. According to the literature, it is recommended that the impact force on a cotton piece should not exceed 3–4 N. An increase in the impact forces may lead to a higher degree of seed breakage.

The graph also shows that the minimum value of the impact force corresponds to $n=180$ rpm. Similarly, high impact forces during the collision of the cotton piece with the mesh can cause seed breakage and damage to the fibers.

Therefore, a theoretical study of the process of the cotton piece striking the mesh is important when determining the design and operational parameters of the proposed screw cleaner. It is known that the impact force of a cotton piece on the mesh depends on the angle of the spike and the rotational speed of the screw.

The velocity of the cotton piece approaching the mesh can be expressed as follows:

$$v_3 = \sqrt{\frac{G}{C_1} - \frac{G - C_1 V_2^2}{C_1 e m}} \quad [15]$$

Here, u - is the distance between the mesh and the cotton piece. Impact impulse of the cotton piece on the mesh.

$$S_N = F_{\dot{y}_p} \tau = m_p V_3 (1 + K_B) \cos \alpha_2$$

Considering that the impact impulse depends on the velocity of the cotton piece and the angle α_2 equation (16) can be solved using the recommended values, yielding the following relationships.

$\alpha_2 = 8 \div 24$ grad $m_1 = 0.65$ g here [16] from the formula, $V_3 = 3.9$ m/s It is determined by calculation.

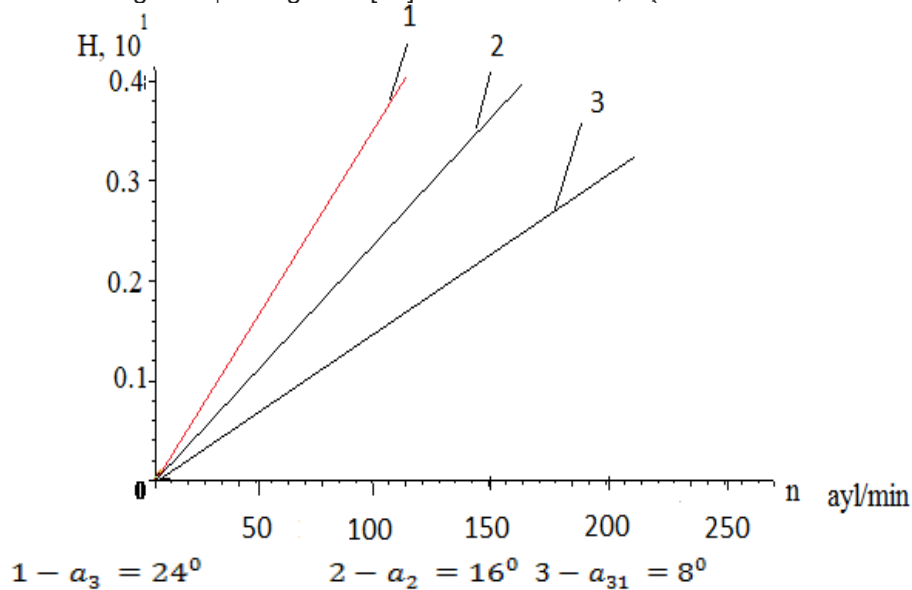


Figure 3. Graph of the dependence of the impact impulse force on the tilt angle of the spike during the collision of the cotton piece with the mesh

CONCLUSION AND SUGGESTIONS

From the graph, it can be seen that the impact force of the cotton piece on the mesh depends on the tilt angle of the spiked drum. When the minimum tilt angle of the screw spike is $\alpha_1 = 8^\circ$ the minimum impact impulse corresponds to the maximum rotational speed of the screw. In conclusion, the theoretical study shows that at a rotational speed of 180 rpm and a spike tilt angle of $\alpha_1 = 8^\circ$ the impact impulse on the cotton piece is minimal. It can also be observed that increasing the rotational speed and the tilt angle of the screw spike leads to an increase in the impact impulse. This, in turn, increases the number of broken seeds in the seed cotton. In the proposed screw cleaner, the cleaning process is carried out simultaneously with a drying process. This additionally enhances the cleaning efficiency, as it occurs under the influence of a hot air flow acting in the working zone.

REFERENCES

1. Rasulov, R. X. (2023). Ochistka khlopka-syrtsa vibratsionnym metodom. Universum: Tekhnicheskie nauki, 3(108), 119–122.
2. Vulfson, N. I., & Kolovskiy, M. Z. (1968). Nelineynye zadachi dinamiki mashin. Mashinostroenie.
3. Panovko, Ya. G. (1970). Osnovy prikladnoy teorii kolebaniy i udara. Mashinostroenie.
4. Mirosnichenko, G. I., et al. (1972). Osnovy proektirovaniya mashin pervichnoy obrabotki khlopka. Mashinostroenie.
5. Bugaenko, G. A. (1999). Osnovy klassicheskoy mekhaniki. Vysshaya shkola.
6. Djuraev, A., et al. (1993). Dinamika sistemy privodov tekhnologicheskikh mashin. Adabiyot.
7. O'zpxatasanoat aksiyadorlik uyushmasi. (2008). Paxtani dastlabki ishlash bo'yicha ma'lumotnoma (15–98-betlar). Voris.
8. Qozokov, S., & Muradov, R. (2023). Paxta tarkibidan iflosliklarni tozalovchi mashinalarni takomillashtirish bo'yicha olib borilgan ilmiy tadqiqotlar tahlili. In Farg'ona politexnika instituti xalqaro ilmiy-texnikaviy anjumani ma'ruzalar to'plami (26–27-aprel). Farg'ona.

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