VERIFICATION OF THE VALUES OBTAINED BASED ON THE THEORETICAL ANALYSIS OF THE WORKING DETAILS OF THE CRUSHER IN THE PROGRAM "SOLIDWORKS"

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ABSTRACT

In this article, the issues of creation and introduction to the production of effective technology of transportation of cotton raw materials in pneumatic transport by means of single-rate transfer with the help of a shredding machine were considered. In the research conducted under production conditions, it was found that the unevenness of the transfer of cotton to pneumatic transport is high and it changes depending on the volume density and moisture content of the cotton. To eliminate the existing problem, a theoretical analysis of making changes to the construction of piles, which have a negative effect on the quality of raw materials, was performed.

KEYWORDS: *Cotton, Pneumo-Transport, Unevenness, Volume, Density, Density, Congestion, Cotton Fibre, Seed, Damage, Working Head.*

INTRODUCTION

After the cotton raw materials grown by the farms are brought to the processing facilities, after a certain time in the gin fields, the gins are broken and transferred to the production process. Excavation of gravel areas can be done manually or with the help of a special excavator [1-4]. Hand harvesting requires life-threatening, very hard physical labour. According to the results of our studies, the process of breaking the layers of cotton and transferring the cotton to the entrance of air and cotton mixture with the help of human labour requires 6 people/hour of labour. After that, workers have to do dangerous and hard physical work. This indicates that there is still a lot of work to be done in the light industry sector. Based on our research, as a modern method, we mainly studied the method of breaking a pile of cotton with the help of a machine [5-9].

Unevenness in the transfer of cotton appears in the process of crushing and its level was determined using experimental studies. In order to determine the factors that cause inequality and to eliminate them to a certain extent, we will study the process of violation of direct dignity in a theoretical way. The research was based on the work carried out on cotton cleaning using drums with piles [10-14].

Materials And Methods

It is known that when the spinning wheel rotates, the piles hit the cotton layer with a certain force.

Due to the high negative impact of the pile belt, which is the main operating distance of the proposed ginning machine, on the seed cotton components, the machine ginning and conveying of particularly low-tart cotton is not applicable in production. As a result of the study of the influence of the working pile of the belt on fibre and seed quality indicators, the effects of enlarging or reducing the cross-sectional surface of the pile and the angle of deviation of the pile relative to the horizon were studied [13-15].

The introduction of the new construction was designed to take into account the shock force generated during the rotation of the belt. Because we will check the strength limits of the piles under the influence of forces generated during impact. For this, we will conduct theoretical calculations using the laws of dynamics.

According to the law of change in momentum, the change in momentum of two interacting bodies is equal to the impulse of force:

$$\begin{cases} m_1 v_{11} - m_{12} v_{12} = F_з t_з \\ m_2 v_{21} - m_{22} v_{22} = F_з t_з \end{cases} \qquad (1)$$

Here m_1, m_{12}; m_2, m_{22}, - the mass of the pile and the piece of cotton before and after impact; $v_{11}, v_{12}, v_{21}, v_{22}$- the initial and post-impact velocities of the pile and the cotton ball, $t_з$- impact time (duration).

Since the cotton is at rest when the shock starts $v_{11} = 0$. After the impact, the cotton begins to move with a speed equal to the speed of the pile: $v_{12} = v_{22}$. At the same time, the speed of the belt is slightly reduced when it meets the cotton, but this change cannot be taken into account, since the resistance of the cotton is compensated by the electric motor with additional power consumption. Therefore, the speed of the piles can be assumed to be constant: $v_{21} = v_{22} = \vartheta$.

After the impact, the pile starts to move together with the piece of cotton. Therefore +). And because the cotton is flexible, the pile breaks the piece of cotton in the impact area and pulls it out. Accordingly, the initial and subsequent masses of a piece of cotton can be assumed to be equal: m1 = m_{12}. Given that: $m_{22} = (m_2 m_{12}$

$$\begin{cases} m_1 \vartheta = F_з t_з \\ (m_2 + m_1 - m_2)\vartheta = F_з t_з \end{cases}$$

Accordingly, the impact force is equal to:

$$F_з = \frac{m_1 \vartheta}{t_з} \qquad (2)$$

The Solution to the Problem

The impact time starts from the time the pile is hit and continues until the piece of cotton is removed from the pile. We consider the sphere of influence of one pile to be up to half of the distance to the neighbouring pile and the pile in the next row, because, on average, a pile can affect a piece of cotton in such a circle at most. The remaining piece is affected by the next peg. It follows that at the time of impact, the peg travels a distance equal to s = = e, or the hoop must turn an angle equal to. According to the data, e = 1100/8 = 137.5 mm, or taking into account the diameter of the piles (dk = 12 14 mm), e = 130 mm = 0.13 m.$t_з \vartheta t_з \varphi = \frac{e}{R} \div$

According to the last expressions:

$$t_з = \frac{e}{v}, \quad (3)$$

Putting the expression in (2.4):

$$F_з = \frac{m_1 \vartheta^2}{e} \quad (4)$$

One of the values to be determined is the mass of the cotton ball. The productivity of the proposed machine is 10-12 tons per hour. This is in kg/sec: (1012)x1000/3600 kg/sec = 2.78 3.33 kg/sec. The equation for productivity (U) is:÷÷÷

$$U = \frac{M}{t}, \quad (5)$$

Here M is the mass of cotton, and t is time.

The belt rotation speed is 125 rev/min. The number of revolutions in seconds is 125/60 = 2.083 rpm. This indicator () is called the frequency, and it is defined as:γ

$$\gamma = \frac{n}{t}, \quad (6)$$

Here n is the number of rotations.

From (2.3.6) we find the time taken for the belt to rotate once:

$$t = \frac{n}{\gamma}, \quad (7)$$

When n = 1, $\gamma = 2.083$ rpm/sec is $\gamma = \ t = 0.48$ sec.

From (5), we determine the mass of cotton that can be transferred in any time interval at a certain work efficiency:

$$M = U \cdot t, \quad (8)$$

If we put the time in (7) into (8), we find the mass of cotton when the belt has been rotated once.

In the belt, there are 2 rows of 8 in one miller, a total of 16 pegs. The mass of cotton per pile can be found as follows:

$m_1 = \frac{U \cdot t}{k} = \frac{(2.78 \div 3.33) \cdot 0.48}{16} = (0.083 \div 0.10)$ kg or 83 ÷ 100 gr.

The belt rotation speed is 125 rev/min. The number of revolutions in seconds is 125/60 = 2.083 rpm/sec. This indicator (γ) is called the frequency, and it is defined as:

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

Here n is the number of rotations.

From (2.3.6) we find the time taken for the belt to rotate once:

$$t = \frac{n}{\gamma}, \quad (10)$$

When n = 1, 2.083 rpm $\gamma = t = 0.48$ sec.

The linear speed of the milling cutter is found as:

$\vartheta = \gamma \cdot$ = 2.083·3.14·1.1 = 7.19 m/s.πd

According to the determined impact force:

$F_3 = \frac{m_1 \vartheta^2}{e} = \frac{(0.083 \div 0.10)\ 7.19^2}{0.13}$ = 33.01 ÷ 39.26 n.

This is quite a lot of power. This force will break the seed if it is applied properly. Because, G.I. Miroshnichenko [51; According to p. 58-59], the breaking strength of the seed is 34 Newtons.÷

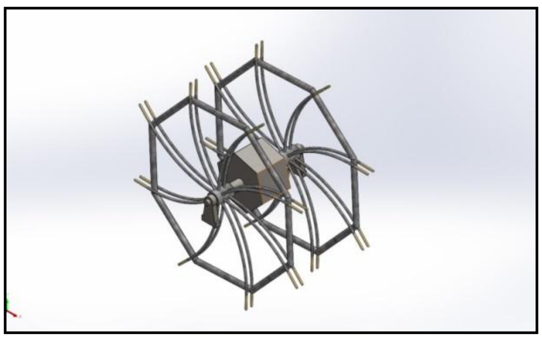

Figure 1. Newly offered double belt

Check the Obtained Values

As seen earlier, each peg hits the cotton layer with great force and removes a piece of cotton of a certain (R) radius from the pile. Of course, this does not cut off a piece of specific shapes and sizes, but its average size is still there. Our observations in the production conditions showed that the size of the cotton particles in the upper parts of the cotton pile is relatively small, and their size increases as it falls to the lower parts of the pile. The main reason for this is that the density in the pile and, due to it, the force of adhesion in the cotton increases from the top of the pile to the bottom.

These calculations confirm that even taking into account the fact that the seed is protected by the surrounding fibres and that the blow directly hits the seed, the borer has a negative effect on the initial quality indicators of the cotton raw material.

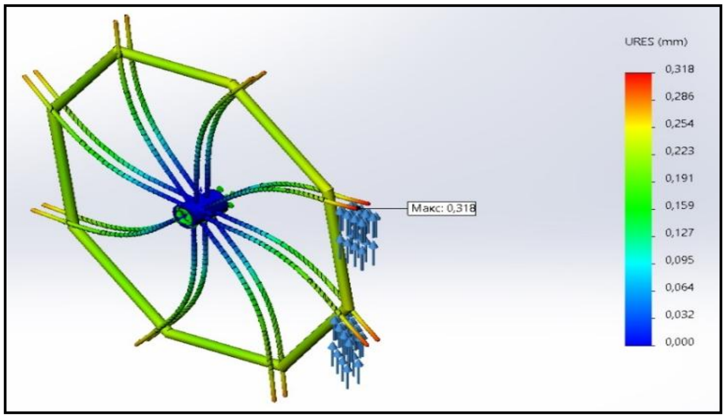

Figure 2 Bending test of the proposed belt

In the picture, the working pile was tested for bending under impact. According to it, it was observed that when we applied a force of 33 N, the working pile interacting with the cotton raw material bent by 0.318 mm (Fig. 2).

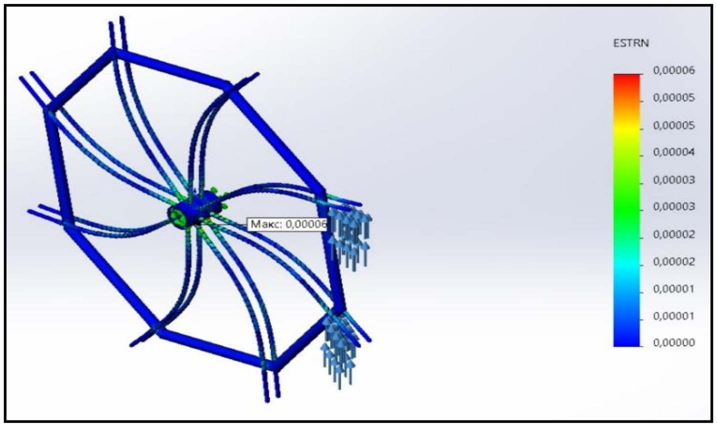

Figure 3. Deformation of the proposed belt

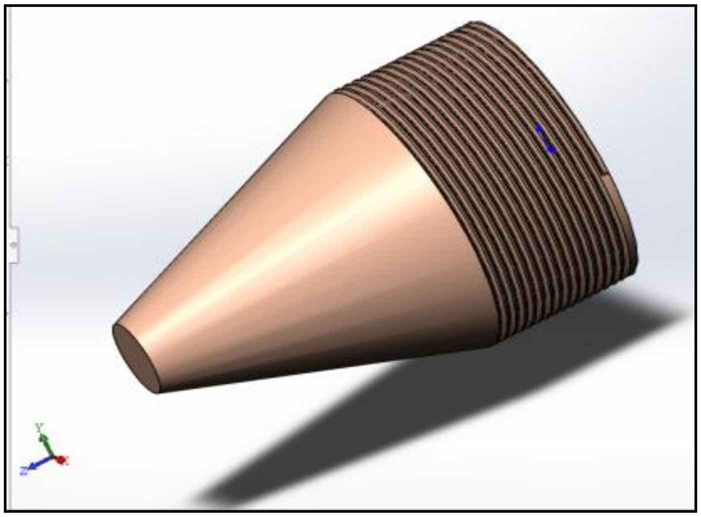

Figure 4. The bronze to be installed on the end of the belt

If the stake hits a metal or solid mineral object with such force, it will spark and create a fire hazard. At the same time, constant impact with the cotton will absorb the piles. Taking these circumstances into account, the pegs are made of non-ferrous metal alloy (bronze, brass).

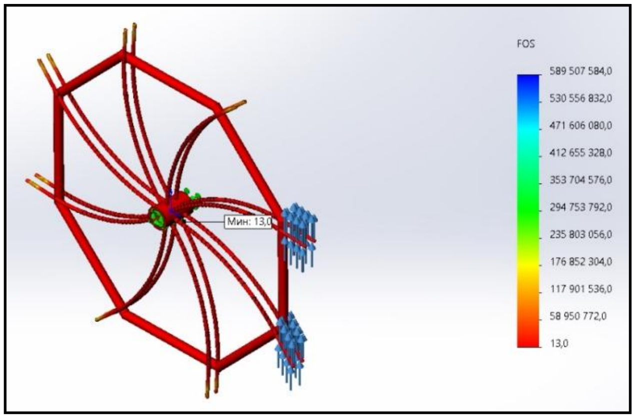

Figure 5. Testing the proposed belt for strength

Analysis of the impact of the proposed structure on the derived value of the force was checked through SolidWorks software.

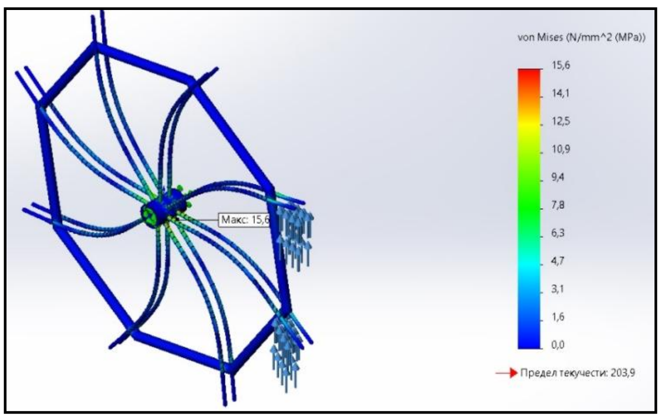

Figure 6. Belt pile strength

According to it, when we applied a force of 33 N to the piles, deformation was observed in the part of the pile attached to the base. According to it, the zinc-enriched steel with a thickness of 14 mm is subjected to a pressure of 15.6 MPa. The pile received a value 203.9 times smaller than the deformation limit. It follows that the strength of the pile is high.

The greatest stress in our shaft was ≈15.6 MPa. The largest displacement was ≈0.318 mm, and it occurred in the area marked in red, that is, in the middle of the shaft. In the same order, we can study the deformation of the shaft and the strength reserve coefficient. As can be seen from the graph, the minimum value of the strength reserve factor is 13. This is the odds for the stakes$[n]\geq 1.5\div 2.5$ should be.

CONCLUSION

One of the main problems in the process of spoiling is cotton is the uneven transfer of cotton as a result of moving in large pieces. In conclusion, it can be said that the piles of the Gharam breaker ring meet the requirements for stress, deformation and strength reserves. The geometric dimensions of the pile met the requirement for displacement. Changing the distance between the stakes will cause the fibre to be damaged when the stakes strike. Therefore, the issues of optimizing the geometric dimensions of the double belt parts remain relevant.

REFERENCES

1. Бурнашев Р., Алимова Х., Саримсаков О., Рахимов О. Буланов А. Текстильная, легкая и полиграфическая промышленности в условиях рынка. Ж. Экономический вестник Узбекистанна., 1999, №1,2, С-55-59.
2. Sarimsakov Olimjon Sharifjanovich, Turg'unov Dilmurod Umarali o'g'li, Babayeva Malika Nabijon qizi. (2021). The Velocity Distribution over the Cross Section Pipes of Pneumatic Transport Installations Cotton. *Middle European scientific bulletin*. 18. 227-232.
3. Саримсаков О. Пахтанинг пневмотранспорт қувури бошланғич қисмидаги ҳаракатини текшириш. *Инновация.* ХИТК мақолалари тўплами. Фарғона, 1998 й., Б.142-143.
4. Дусматов Д.Р., Хожиев М.Т., Рузметов М.Э. Разработка конструкции устройства для загрузки и распределения хлопка-сырца в закрытые хранилища: Республика илмий-амалий конференция материаллари "XXI аср-ёш интеллектуал авлод асри", Тошкент 2016. ТТЕСИ 29-март, 135- 136 бетлар.
5. Саримсаков О. Пахтани пневмотранспорти қувурида ҳаво босимининг ўзгариши. РИАК мақолалари тўплами. Фарғона, 2016., Б.111-113.
6. Мурадов Р. М. Саримсаков О.Ш.Мамарасулов Х.К.Пахта хомашёси учун пневмомеханик таъминлагич. ЎзР интелектуал мулк агентлигига талабнома № IAP 20160297, 13.10. 2016 йил.
7. О.Ш.Саримсаков, А.Исакжанов, Д.Турғунов. Пахта хомашёсини пневмотранспортга узатиш жараёнини назарий ўрганиш. Наманган Мухандислик-Технология Институти, "Илмий – техника журнали" НамМТИ 2017- йил том 3-4 сон 37-42 бетлар.
8. Turg'unov, D., & Sarimsako, O. (2021). Theoretical Fundamentals of Cotton Transportation to Pnevmotransport Equipment. *International Journal of Human Computing Studies*, *3*(2), 203-211.
9. Мирошниченко, Г. И. (1972). Основы проектирования машин первичной обработки хлопка. *М.: Машиностроение*, 127-201.
10. Под общ. ред. А.И.Макарова. Основы проектирования текстильных машин. М., «Машиностроение», 1976, 416 с.
11. Umarali o'g'li, T. D., Sharipjanovich, S. O., & Mahmudovich, M. B. (2021). Theoretical research of the effect of damage and air transport working parts on cotton raw materials. *Innovative Technologica: Methodical Research Journal*, *2*(12), 65-76.

12. Muqaddas Tadjibayeva, Rozakhon Nomanova. (2022). The expression of the idea of englightenment in the poetry of Hamsa Hakimzoda. *An international multidisciplinary research journal Academicia.* 11(10), 1276 p.

13. Ubaydullayev, M. M. (2021). G ‘o ‘zada defoliatsiya o ‘tkazishning maqbul me'yor va muddatlari. Monografiya.-Corresponding standards and terms of defliation of cotton. Monograph.-. Соответствующие нормы и сроки дефолиации хлопка. Монография. Zenodo.

14. Mo’minjonovich, U. M. (2022). Effectiveness Of Defoliants. *Eurasian Research Bulletin*, *8*, 9-12.

15. Ubaydullaev, M. M., & Komilov, J. N. (2022). Effect of defoliants for medium fiber cotton. *International Journal of Advance Scientific Research*, *2*(05), 1-5.