RESEARCH ON THE CAUSES OF DAMAGE TO COTTON BEING TRANSPORTED IN THE AIR STREAM

Lazizbek Mekhmonaliev
Basic doctoral student Andijan Machine Building Institute
Andijan, Uzbekistan
Email: lazizbek020896@gmail.com
https://doi.org/10.5281/zenodo.13892859

The process of transportation of raw cotton in ginneries is carried out using a pneumatic transport device. In addition to the process of transporting the pneumatic transport device, cleaning of heavy mixtures and separation of air-transported cotton from the air is also carried out. A piece of cotton enters the working chamber of the CC-15A separator through a horizontal pipeline along with the air, then loses its speed due to volumetric expansion and the raw material is separated from the air. Cotton pieces moving at a certain speed hit the back wall of the separator working chamber, partially damaging the cotton fiber and seeds, and the defects in the fiber content increase.

The main cause of seed breakage and fiber damage is the large angle of rotation (150°) of the rear wall of the separation chamber and the radius of curvature R Fig. 1. The presence of a maximum bending angle (90°) at the bends of the conduit has a strong effect on fiber damage and seed breakage. In this study, the problem of reducing the force of impact is solved on the basis of theoretical conclusions and is found in the following formula.

$$P = m \bullet W \quad (1)$$

Here:

m - is the mass of the raw cotton;

W - is the acceleration of the cotton raw material.

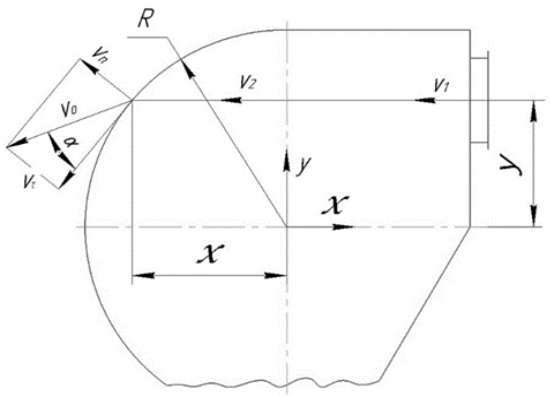

Figure 1. A directional diagram representing the rate of collision of cotton with the inner surface of the separator working chamber.

Acceleration is defined by the following expression.

$$W=\frac{V_2-V_1}{\tau} \qquad (2)$$

Here:

V_1 - is the velocity of the raw cotton at the entrance to the separator;

V_2 - is the velocity flow of the raw cotton after it is released from the air;

τ - is the time of movement of the raw cotton from the entrance to the impact.

Once the raw cotton is released from the air stream when it collides with the surface, its velocity is formed from the components of the velocities V_n (normal) and V_r (touch). The figure shows the equality of these components.

$$V_n = V_0 \bullet \sin\alpha, \qquad (3)$$

$$V_r = V_0 \bullet \cos\alpha, \qquad (4)$$

Here:

V_0 - is the absolute velocity separator after the cotton raw material hits the inner wall surface;

α - is the angle between the resulting angle of contact.

After hitting the raw cotton surface, its condition depends on the magnitude of the impact force. The impact force is directly proportional to the normal component of the velocity of the raw cotton.

Thus, to reduce the force of impact, it is necessary to reduce the angle α between the tangential component and the resulting A, the change in angle α depends on the distance X and Y, i.e., as the distance X decreases, as Y increases, α decreases. In the future, we recommend that this pattern be taken into account when designing separators.

At ginneries, one of the main types of transportation of cotton from the gin to the production shops and between shops is pneumatic transport. In addition to the many advantages of pneumatic transport over other modes of transport, there are also some disadvantages in the separation of air from the air transporting raw cotton by air transport.

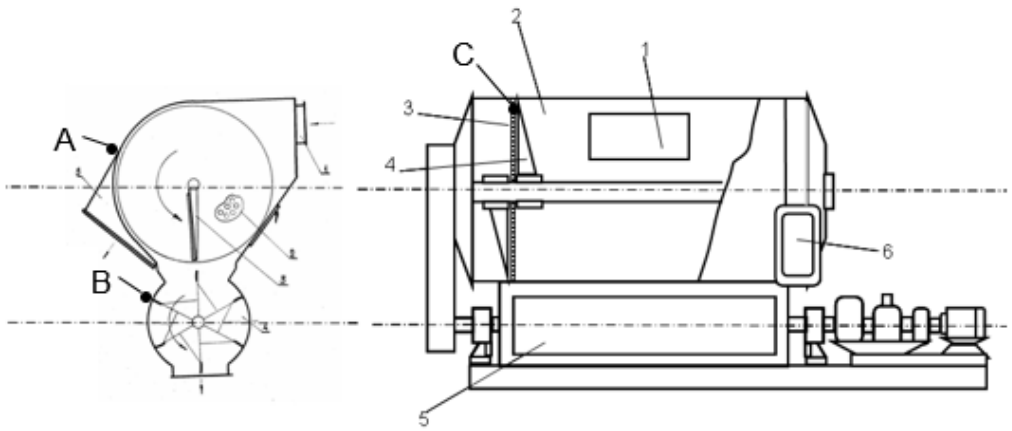

Figure 2. 1 inlet short pipe, 2 isolating chamber, 3 mesh surface, 4 nozzles,

5 vacuum valves and 6 air ducts.

When the separator is running, the main part of the cotton that enters the raw material chamber moves by inertia and falls into the vacuum valve, and a part of it hits the mesh surfaces of the discs mounted on the sides of the chamber and sticks to it. The raw material is cleaned from the mesh surface with the help of elastic scrapers. The raw material of cotton enters the gap between the elastic blade of the drum and the steel surface of the coating through the outlet network of the separator vacuum valve.

The blades of a vacuum valve drum rotating at a certain speed hit the raw cotton surface on the coating surface, resulting in the seed being crushed or broken, as well as the fibers being damaged and the defects in the composition increasing.

References:

1.Muradov R. Ways to increase the efficiency of the cotton separator: Monograph. -Tashkent: Fan, 2005. - 120 pages.

2.Muradov R. Fundamentals of increasing the efficiency of the transportation process in the technology of primary processing of cotton: Ph.D. -Tashkent, 2004

3.E.T.Shaykhov, N.Normuhamedov, A.I.Shleyxer, Sh.G.Azizov, V.T.Lev, L.X.Abdurashidova. Cotton-growing: -Tashkent: Labor, 1990. - 352 pages.

4.Hamidov S.S. "Aerodynamics". Samarkand Publishing House, 2005. pp. 48-49.

5.Manufacturer N.Ya. "Aerodynamics". M .: Science. 1984 814 p.6.Xusanov S.M. Master's dissertation "Improving the reliability of the elements of pneumatic transport devices." Namangan Institute of Engineering and Technology, 2014, 96 p.

7.Makhkamov A.M., Khusanov S.M., Muradov R.M. Imomaliyeva Sh.F. International Journal of Psychosocial Rehabilitation, The Oretic Observation of the Cotton Movement in the Operating Camera of the New Separator Vol. 24, Issue 05, 2020.

8.Akramjanov D, Mahkamov A., Imomalieva Sh., Turabboev G'. Certificate of authorship of the IMA DGU 08906 for the program "Simulation of the process of separation of raw cotton from the air flow using centrifugal force". 10.08.2020 y.

9.Akramjanov D., Mahkamov A., Xusanov S., Imomalieva Sh., Turabboev G'. Certificate of authorship from the IMA DGU 09395 for the program "Modeling of the movement of cotton pieces in a vacuum valve with a curved profile." 16.10.20020 y.