Research Capacity of the Fiber of Long Fiber Separating Drums from Waste Fibers Composition

Obidov Avazbek Azamatovich,

Candidate of Technical Sciences, Associate Professor, Namangan institute of engineering technology, Uzbekistan

Matkarimov Kamoliddin Juraboyevich,

Candidate of Economical Sciences, Associate Professor, Namangan institute of engineering technology, Uzbekistan

Sultonov Mirzaolim Mirzarahmatovich,

Researcher, Namangan institute of engineering technology, Uzbekistan

Boboyev Utkirbek,

Researcher, Namangan institute of engineering technology, Uzbekistan

Abstract: *In given article are presented results of fibers dependencies capacity garnitures of withdrawable drum, device of separation of long fibers from composition lint and other filament enterprise wastes.*

Keywords: *cotton fiber, short fibers, cotton seeds, long fibers, alloy metal tape, separating, regenerators, separation equipment, saws, linter*

In spinning production of the textile industry, the technological properties of cotton fiber are traditionally evaluated on the basis of its stack diagram. The highest point of the diagram corresponds to the length of the most frequently encountered fibers in cotton samples and is called modal lengths and determined by L_m. The medium length in the fiber group of 3-4 mm in length is called staple length and is determined by L_{st}. The length corresponding to the length of all fibers in the diagram is called the medium length and is determined by L_{me}. Depending on the modal and staple lengths, spinning technology will determine the composition of the equipment and parameters of their adjustment. It is important to note that until the third quarter of the 20th century, the cotton fiber of cotton was more than 20 mm longer, and by the 1970s the spinning technology and equipment enlarged to 14 mm, and in the following years to 12.7 mm. Short fibers that are considered unsuitable for spinning are considered loose.

In ginneries, the fibers that are capable of spinning on the lint-free liner also go to through press. Long fibers in the wax are caused by the fact that the machines are not completely separated from cotton fiber. Typically, untreated seeds are usually removed from the mass by using a regenerator, and then dumped into the gin machine. However, this reduces the productivity of the workpiece and leads to an increase in seed deficiency. As a result, the quality of the fiber also deteriorates. It is also unlikely that the slimed cotton fiber will be completely separated from the total mass. That is why most of these seeds go back without changing the gin machine camera. For this reason, most ginneries do not use regenerators and they are shipped to the highly purified seed linter machine and long fibrous wipes are removed from the seeds together. As a result, nappa can form long spinning fibers. This, in turn, leads to the loss of the precious textile raw material and its deterioration, and, on the other hand, the deterioration of the quality of the wool structure due to its loss of uniformity.

The presence of long fibers in the fabric makes it harder to recycle in the chemical industry, and usually involves cutting down long fibers. This leads become to additional costs [1].

In order to eliminate these defects, reduce the fiber loss and improve the quality of the wool, the 1st level linter machine was proposed to install a device that would remove long fibers from the composition of the air-lubricant mixture on the pneumonic path. It is recommended that the device be made of a brush drum that separates the drum and longer fibers, which have a linear velocity greater than air velocity, covered with a headlamp type with a thread less or alloy metal tape(YAMAL) and holding long fibers [2].

Properly selecting the type and geometric parameters of the separating drum garniture will help to improve the length of the fiber separation process. However, the geometric parameters of the separating drilling rig are not theoretically valid. However, the geometric parameters of the garniture are the main factor determining the two generalized parameters that ensure the technological process of separating the long wax: the ability to hold the fiber and maintain the fiber. The fiber capability of the garniture is the unit, which is defined as the size corresponding to the surface of the dividing drum.The holding ability of the garniture is the ability to withstand the fall and fall of the fibers loaded on it in a certain way. The greater the capacity of the fiber on the surface of the drum or the greater the free space, the greater the better the passage of the finger gloves from the teeth to the brush drum in the separation drum, and the low retention capability. The long-haul separation equipment is similar to that of the workgroup and the technology

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used in the crawler. The ability of the array and the needle to grasp the fibers for the scrubbing machine worker [3] has been studied in the study.

In the study, some conclusions have been made for these indicators: the radius of the rotation of the teeth, the height of the tape base, the lateral corners of the tooth, the angle of the inclination and the central portion of the cone portion and so on. The following is a question of determining the ability to fit and hold the fiber, taking into account all the geometric parameters and drum sizes of the arrays and the needles. As the separating drum machine is close to the main drum, and the ability to detect and maintain the fiber, unless it differs in its design. We use the method suggested by A.Ashpin and A.Mukhiddinov [3,4].

The fingerprint of the garniture, the free space of the garniture that corresponds to the drum surface is V_{cb}, the volume of the unit surface and the height of the garnitureV_h and the volume of the garniture are defined as V_r:

$$V_{cb} = V_h - V_г \qquad (1)$$

We accept a drum surface of 100 mm² per unit surface. The V_h volume can be found using the following formula:

$$V_h = 100 \cdot h \qquad (mm^3/mm^2) \qquad (2)$$

So: *h*- Height of the garniture, mm.
The headband size of the ribbon (1-Figure) can be calculated as follows

The size of the ribbon-shaped garniture with the ribbon, $V_г$ (1 -Figure)can be calculated as follows:

$$V_г = V_1 + V_2 \qquad (3)$$

In this: V_1 - 100 *mm²* the size of the toothbrush on the square.

V_2 - 100 *mm²* the size of the strip of tape made of the drum surface on the field. V_1 is determined by the following formula::

$$V_1 = V_0 P_s = V_0 \frac{100}{S \cdot t} \qquad (mm^3/mm^2) \qquad (4)$$

So: V_0 - The size of a single tooth with a saw blade;

P_s - The density of teeth of the garniture, which is a single surface (100 mm2) the number of teeth.

S - bandage band, *mm;*

t - number of teeth, *mm.*

As a result of the accurate calculation of the size of a single band of saws, the following values were obtained from us:

$$V_0 = \frac{1}{4}\left[K_{11}h_2^2(K_{12}b_1 + b_2) + K_{12}K_{13} \cdot c^2 b_1\right]$$

$$(mm^3) \qquad (5)$$

So: $K_{11} = \frac{2a_1}{h_2} + tg\beta_1 - tg\beta$;

$$K_{12} = \frac{h_2}{h - h_1}; \quad K_{13} = K_{14} + K_{15}.$$

$$K_{14} = \left[\frac{2(1+\sin\beta)}{\cos\beta} - \frac{\pi}{2} - \beta\right] \cdot \left[2 - \frac{r}{h_2}(1+\sin\beta\right];$$

$$K_{15} = \left[\frac{2(1-\sin\beta)}{\cos\beta} - \frac{\pi}{2} + \beta_1\right] \cdot \left[2 - \frac{r}{h_2}(1-\sin\beta_1)\right]$$

;

According to Figure 1 in the image of the YAMAL thread:

h - the height of the garniture;

h_1 -The height of the outlet portion of the tape band;

h_2 -the height of the spindle teeth;

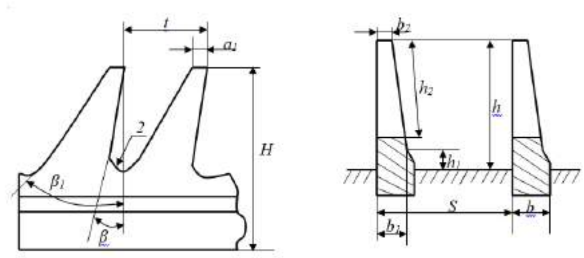

Figure1. *The scheme to calculate the size of the garniture in the form of a solid metal tape saw.*

a_1 - Width at the tip of the spindle;

b_1 - saw tape width of the teeth;

r - rounded radius of the saw blade;

β - Slope angle of a saw blade;

β_1 - slope of the back edge of the articular teeth.

We put (5) to (4) into the following:

$$V_1 = \frac{100}{4St}\left[K_{11}h_2^2(K_{12}b_1 + b_2) + K_{12}K_{13}r^2 b_1\right]$$

(mm³/mm²) (6)

The size of the array ribbon part from the drum surface V_2:

$$V_2 = \frac{100}{2S}\left[bh_1 + b_1(h - K_{12}h_2)\right]$$

(mm³/mm²) (7)

So:

b - width of the tape band

We(6) and (5) to (3) and make algebraic modifications easier for calculation:

$$V_r = \frac{100b_1}{2S}\left[K_1 h - K_2 h_2 + K_3 b + K_4 r\right]:$$

(mm³/mm²) (8)

So the coefficients are as follows:

$$K_1 = 1 + K_{12},$$

$$K_2 = K_1 + \frac{b_2 h_2}{2tb_1}K_{11},$$

$$K_3 = \frac{2h_1}{b_1},$$

$$K_4 = K_{12}(K_{11}h_2^2 + K_{13}r^2 - 2 + h_1)\frac{1}{2tr}$$

In these formulas, the geometrical resolution of the array ribbon corresponds to the values shown in (Figure 1).Now we find the volume on the uneven garniture unit (Figure 2).

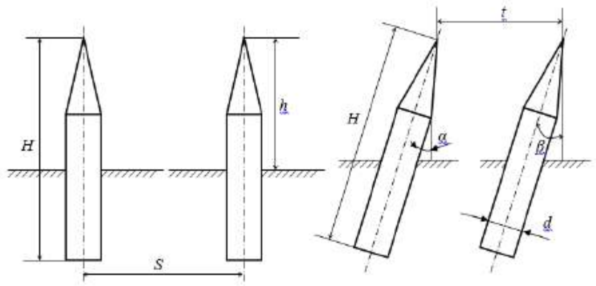

Figure 2. *The volume of the helical gear unit on the surface.*

If the head restraints have a cylindrical part:

$$V_r = \frac{100\pi d^2}{12St}\left(\frac{3h}{\cos\beta} - \frac{d}{tg\alpha}\right)$$

(mm³/mm²) (9)

In this:

d -Needle diameter;

α - Slope angle of the side edges of the needle cone.

If the needles do not have a cylindrical part, then the cone shape will be formed:

$$V_r = \frac{100\pi h^3 \sin^2\alpha}{3St\cos\alpha(\cos^2\beta - \sin^2\alpha)}$$

(mm³/mm²) (10)

In this:

t -Step of the garniture pins;

when the teeth are drilled with a drum, that is $\beta = 0^0$, Then the formulas (9) and (10) will have the following appearance::

$$V_r = \frac{100\pi d^3}{12St}\left(\frac{3h}{d} - \frac{1}{tg\alpha}\right)$$

(mm³/mm²) (11)

$$V_r = \frac{100\pi h^3 \sin^2\alpha}{3S + (1 - \sin^2\alpha)} - \frac{100\pi h^3 tg^2\alpha}{3St}$$

(12)

We put (2) and (8) to (11) and we get the free space of the interlocked garniture:

$$V_{cb} = 100\left[h - \frac{b_1}{2S}(K_1 h - K_2 h_2 + K_3 b + K_4 r)\right]$$

(mm³/mm²) (13)

Similar to the first drum for the needle drum:

$$V_{cb} = 100h\left[1 - \frac{\pi d^2}{12tS}\left(\frac{3}{\cos\beta} - \frac{d}{htg\alpha}\right)\right]$$

(mm³/mm²) (14)

For second-hand ignition garniture:

$$V_{cb} = 100h\left[1 - \frac{\pi d^2 \sin^2\alpha}{3St\cos\beta(\cos^2\beta - \sin^2\alpha)}\right]$$

(mm³/mm²) (15)

Suitable for the right ignition headphones:

$$V_{cb} = 100h\left[1 - \frac{\pi d^2}{12St}\left(3 - \frac{d}{htg\alpha}\right)\right]$$

(mm³/mm²) (16)

$$V_{cb} = 100h\left[1 - \frac{\pi h^2 tg^2\alpha}{3St}\right]$$

(mm³/mm²) (17)

As can be seen from the formulas (13) - (17), the fiber of both types of headphones depends primarily on the height of the teeth. The greater the heights, the greater the fiber capacity. With these formulas, the empty volumes of several types of intermediate and needle-masts have been found. The results of the calculations show that *tSo* is a similar pattern of change in the fiber capacity of the intermediate and the needle garniture. For example, the results for the ignition garniture shown in Table 1 also show that the bonding of the fibrous V_{cb} to the needles in the longitudinal direction S is a significant indicator. According to the plan data, the curves shown in Figure (3) clearly illustrate this.

Table 1.

№	The velocity of the Velcro strips, mm	The fiber capacity of the garniture is mm3 / mm2			
		Slanting needle		Direct needle	
		Variant 1	Variant 2	Variant 3	Variant 4
1	1,0	276,14	275,56	278,21	278,02
2	1,5	284,09	283,71	285,47	285,35
3	2,0	288,07	287,78	289,11	289,01
4	2,5	290,45	290,22	291,28	291,21
5	3,0	292,04	291,85	292,74	292,67

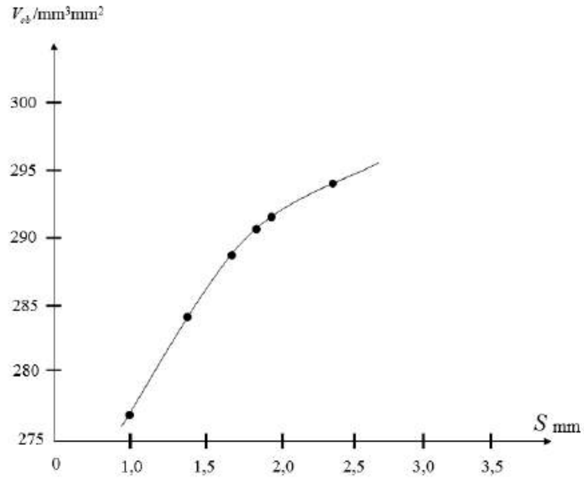

Figure 3. *A graph of the headband fibrous intensities dependent on the valve strokes*

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