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Analysis of the Physico-Mechanical Properties of the Fiber in the Sliver of the Spinning Chambers

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Annotation

In this article, the physical and mechanical properties of fibers that have passed through the pneumomechanical spinning machine discretization process have been studied. The results are carried out on modern equipment, the obtained values are analyzed in the form of histograms and conclusions are given.

Keywords: Radius, Friction, Angle, Friction Force, Sampling, Speed, Fibers, Fiber Complex

Improving the quality of consumer goods is becoming a permanent and urgent task, the solution of which contributes to a further increase in the living standards of the population [1,2].

The release of high-quality competitive products based on the use of high, economical technologies is also the most important task of the textile industry. The quality of textile products depends to a large extent on the uniformity, purity and strength of the yarn. They can be achieved through the introduction and use of modern equipment operating on more advanced technological principles [3,4,5].

In recent years, the pneumo-mechanical method of spinning has received the greatest distribution and industrial application. In many countries, the share of pneumomechanical yarn reaches 70-80%. The yarn of the pneumomechanical spinning method is used in the production of terry and shirt fabrics, handkerchiefs, tarpaulins, canvas, knitwear, upholstery and furniture fabrics, etc.

It can be seen from the table that with an increase in the intensity of the impact of the headset of the sampling drum on the cotton fiber, its damage is noted - the number of short fibers in the sliver increases in all variants, which is confirmed by the data obtained both on HVI and USTER AFIS. Graphically, this can be seen in Fig.1. However, this damage is not equivalent.Содержание коротких волокон в хлопковом волокне, использованном для экспериментальных исследований –8,2 %. При однозаходной навивке содержание короткого волокна в хлопковой мычке увеличивается на 4,9-25,6-51,2 % (с увеличением частоты вращения дискретизирующего барабанчика). При двухзаходной навивке увеличение составляет 2,4-7,3-12,1 %, при трехзаходной навивке 2,4-4,9-9,8 % (по данным USTER AFIS) [6,7,8].

The index of short fibers according to HVI is the lowest with two-start winding and is at a sampling drum speed of 6000 min^{-1} and at -9.73%, 6500 min^{-1}-10.3%, 7000 min^{-1}-11.3%

The unevenness of the fibers along the length is lower in the variants with a sampling drum rotation speed of 6500 min^{-1} characterized by an index of uniformity along the length on the HVI device.

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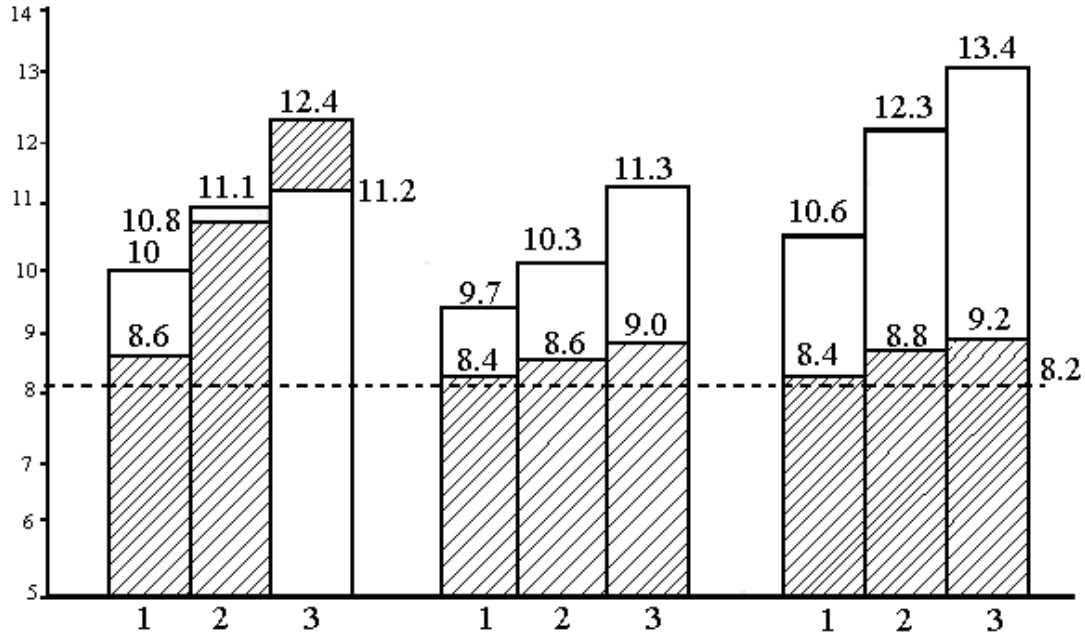

where, 1-6000 min^{-1}; 2-6500 min^{-1}; 3-7000 min^{-1}

▨ - content of short fibers, % according to USTER AFIS

▭ - short fiber index, % according to HVI

---- - the content of short fibers in cotton fiber is 8.2%

Figure 1. Content of short fibers in cotton sliver

Fibrograms were obtained on the HVI device and combined in one figure. The length of the fibers in inches is plotted along the y-axis, and the percentage of their mass is plotted along the y-axis [9,10,11].

Optimal is the two-way winding of the headset on the sampling roller. The top average length (the average length of the longest fibers that make up 50% of the total mass) increases to 1.070 inches (27.2 mm), while with a single winding, the top average length is 1.051 inches (26.69 mm), with a three-start -1.046 inches (26.56 mm) i.e. an increase in the upper average length with a two-start winding by 0.51 mm, compared with a single start.

Analyzing the composition and content of defects in cotton sliver, (see table 4.4) it can be seen that 48-64% of the total number of defects are neps (nodules), 32-50% small litter, less than 500 microns in size, 0.4-1.5 % skin with fiber, and not more than 1% large litter, larger than 500 microns [12,13].

There is a decrease in contamination with an increase in the intensity of the impact of the discretizing drum.

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