

Change in fiber length during the spinning process

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Abstract: In this article, research work was carried out on the change in the staple mass length of cotton fiber at spinning mills, and the results were illustrated.

Keywords: spinning mill, cotton fiber, staple mass, quadratic irregularity, yarn

The geometric properties of cotton fiber include its length and linear density. This is considered one of the most important indicators and is one of the main spinning properties that determine the quality of the yarns obtained from them. Because the longer the cotton fiber, the thinner, smoother, smoother, and stronger the threads are obtained from it. Long fibers are used to produce fine and standard-strength yarns, while short and coarse fibers produce thick and low-quality yarns with high unevenness that do not meet quality requirements. It is known that the better the fiber's length, fineness, strength, and other basic properties, the stronger and higher the quality of yarn obtained from such fiber. Consequently, it is possible to obtain thin threads with normal strength from long fibers. For the production of fine yarn, less fiber is consumed, as a result of which the economic efficiency of using fibers is high.

According to the results of a number of research works, it is known that if the length of cotton fiber is increased by 1 mm, the strength of the resulting yarn increases by 3-4%. This indicator is especially important for medium-staple cotton. Therefore, maintaining the natural length of cotton fiber in the production process is of great technological and economic importance. Conversely, even if the length of cotton fiber decreases by 1 g at cotton ginning or spinning enterprises, the spinning ability of the fiber decreases, resulting in a decrease in the elongation at break per 1 km of yarn obtained from it.

Even if the length of cotton fiber in spinning mills decreases by a certain amount, it negatively affects the quality of the yarn obtained from it. For example, in spinning mills, even a decrease in fiber length by 0.5 mm negatively affects the economic indicators of the enterprise.

Scientific research was conducted on the change in the staple mass length of the fiber during the spinning process. For this, samples were taken during the process of obtaining yarn from various impurities at the spinning mill, the staple mass length was determined, and it was compared with the initial sample.

Based on the obtained research results, histograms of the influence of various mixture compositions on the staple mass length and the quadratic unevenness of the fiber along the length of the spinning process were constructed in Figures 1 and 2.

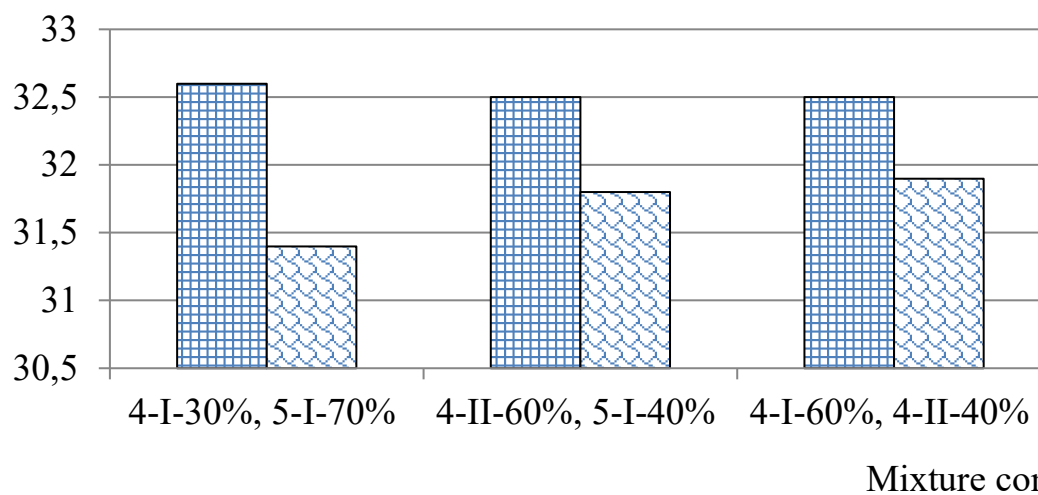


Figure 1. Influence of the mixture composition on the change in the staple mass length of the fiber during the spinning process.

■ - bales of cotton;
 ■ - after spinning.

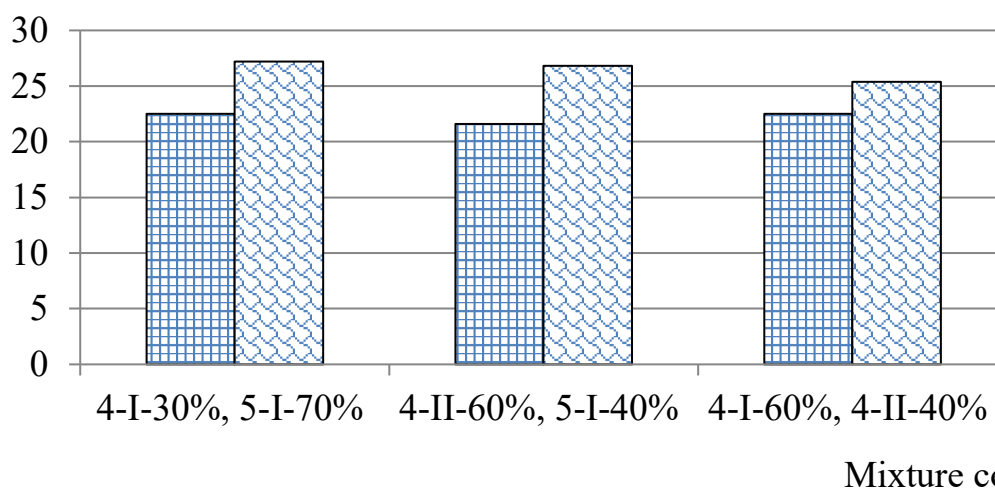


Figure 2. According to the processes of the spinning process change in the quadratic irregularity along the length influence of mixture composition.

■ - bales of cotton;
 ■ -after spinning.

If we analyze the indicators of fiber length and quadratic unevenness by length during the spinning process, then the length of the cotton fiber in the 4-I-30%, 5-I-70% mixture decreased by 3.7% after the spinning process, i.e., by 0.8 mm, the quadratic unevenness by length increased by 17.3%, the length of the cotton fiber in the 4-II-60%, 5-I-40% mixture decreased by 4.2% after the spinning process, i.e., by 1.1 mm, the quadratic unevenness by length increased by 19.4%, the length of the cotton fiber in the 4-I-60%, 4-II-40% mixture decreased by 2.9% after the spinning

process, i.e., by 0.7 mm, the quadratic unevenness by length increased by 11.4%. As can be seen from the research results, the staple mass length of cotton fiber decreased more in the 4-II-60% and 5-I-40% mixture compared to other mixtures.

To obtain high-quality yarn at spinning mills, it is first necessary to correctly select the type of yarn. In addition, the amount of defects and waste in the composition of cotton fiber also plays a large role. For example, the higher the amount of impurities in the fiber composition, the more it negatively affects the quality of yarns obtained from it.

The main reason for the decrease in the staple mass length of the fiber during the spinning process is that the increase in mechanical damage to this fiber negatively affects not only the length of the fiber, but also the quality indicators of the yarns obtained from it. In conclusion, it was established that the staple mass length of the fiber in various mixtures decreased from 2.9% to 4.2% after the spinning process, and the quadratic unevenness along the length increased from 11.4% to 19.4%.

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