Changes in product unevenness during different spinning process stages

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Abstract: In this scientific article, research work was carried out on product unevenness during the passes of the spinning process, and the results are presented in figures.

Keywords: spinning process, cotton fiber, linear unevennes, quadratic unevennes, roving, sliver, yarn

Currently, based on market economics, research work has been conducted to determine the unevenness of sliver and roving in the spinning process. For this purpose, samples of sliver and roving were taken from various spinning process stages, and their unevenness indicators were determined in the laboratory (Table 1).

Table 1

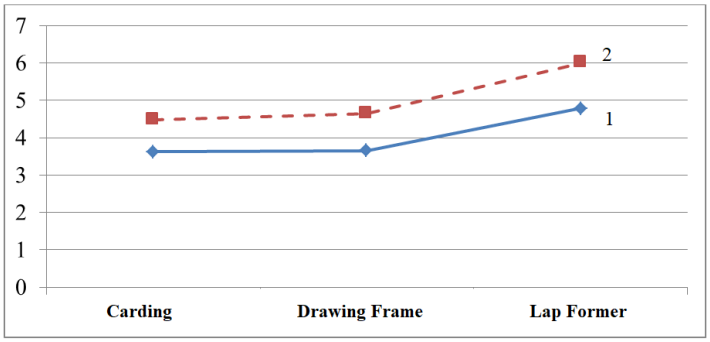
Changes in product unevenness during different spinning process stages

No.	Products	Mixture composition, %		
		4-I-30%, 5-I-70%	4-II-60%, 5-I-40%	4-I-60%, 4-II-40%
1.	Carding machine sliver			
	U_m Linear unevenness, %	3.62	3.22	3.19
	CV_m Quadratic unevenness, %	4.47	4.08	4.02
2.	Drawing frame sliver			
	U_m Linear unevenness, %	3.64	3.65	3.46
	CV_m Quadratic unevenness, %	4.64	3.46	4.38
3.	Lap on the lap former			
	U_m Linear unevenness, %	4.78	4.39	4.57
	CV_m Quadratic unevenness, %	6.00	5.49	5.69

Based on the research results, graphs showing the influence of various mixture compositions on the quadratic unevenness of raw materials during the spinning process stages were constructed in Figures 1, 2, and 3.

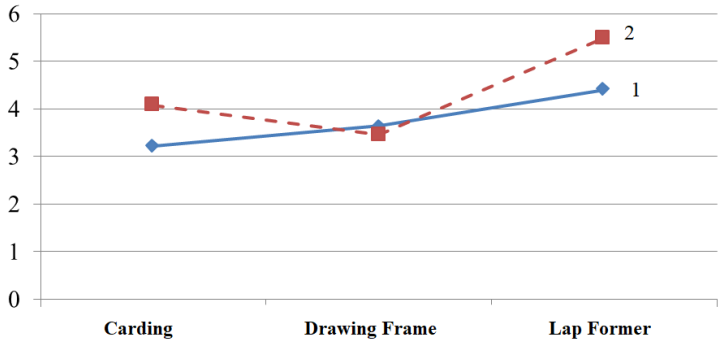
Analyzing the research results, we observe that in the 4-I-30%, 5-I-70% mixture, the linear unevenness of the sliver on the carding machine is 3.62%, and the quadratic unevenness is 4.67%. The linear unevenness of the sliver on the roving machine is 3.64%, and the quadratic unevenness is 4.64%. The linear unevenness of the web on the sliver combining machine is 4.78%, and the quadratic unevenness is 6.0%. In the 4-II-60%, 5-I-40% mixture, the linear unevenness of the sliver on the carding machine is 3.22%, and the quadratic unevenness is 4.08%. The linear unevenness of the sliver on the roving machine is 3.65%, and the quadratic unevenness is 3.46%.

The linear unevenness of the web on the sliver combining machine is 4.39%, and the quadratic unevenness is 5.49%. In the 4-I-60%, 4-II-40% mixture, the linear unevenness of the sliver on the carding machine is 3.19%, and the quadratic unevenness is 4.02%. The linear unevenness of the sliver on the roving machine is 3.46%, and the quadratic unevenness is 4.38%. The linear unevenness of the web on the sliver combining machine is 4.57%, and the quadratic unevenness is 5.69%.



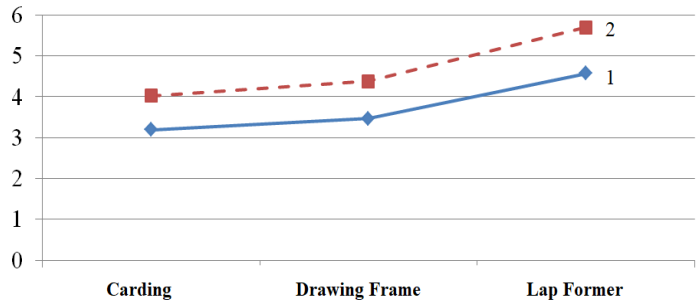
Spinning process stages

Figure 1. Changes in product unevenness for mixture composition 4-I-30%, 5-I-70% across spinning process stages. 1-linear unevenness; 2-quadratic unevenness.



Spinning process stages

Figure 2. Changes in product unevenness for mixture composition 4-II-60%, 5-I-40% across spinning process stages. 1-linear unevenness; 2-quadratic unevenness.



Spinning process stages

Figure 3. Changes in product unevenness in the 4-I-60%, 4-II-40% mixture throughout the spinning process stages. 1-linear unevenness; 2-quadratic unevenness.

As evident from the test results, the product unevenness throughout the spinning process stages is observed to be higher in the 4-I-30%, 5-I-70% mixture compared to other mixtures.

Analyzing the unevenness of spinning products is highly complex. There are numerous types of unevenness in spinning products: those that occur in the initial stage of spinning, those that change in subsequent stages, and new types of unevenness that are added during the process.

The unevenness of yarns, comprising several components, influences the unevenness at various stages of spinning production. Different types of irregularities are interconnected.

Testing and controlling product unevenness in spinning production is of great importance, as it determines the causes and timing of unevenness.

In spinning machines, the higher the frequency of yarn breakage during winding and forming, the greater the yarn unevenness.

As a result of increased thread breakage, worker engagement increases, leading to a decrease in machine productivity.

In conclusion, it was found that in various blends throughout the spinning process, after the carding machine, the linear unevenness of the product increased from 3.19% to 3.62%, and quadratic unevenness from 4.02% to 4.67%. After the roving machine, the linear unevenness of the product increased from 3.46% to 3.65%, and quadratic unevenness from 3.46% to 4.64%. After the roving combining machine, the linear unevenness of the product increased from 4.39% to 4.78%, and quadratic unevenness from 5.49% to 6.00%.

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