

Research of the Characteristics of Shaped Threads Obtained by a New Method

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Abstract: The article analyzes the research conducted on the technology of obtaining shaped threads. The properties of shaped yarns obtained by heat treatment of spun yarns were studied. Chemical and artificial yarns were taken as raw materials, and they were given different twists on a double twisting machine. The properties of the obtained shaped yarns such as elongation, twist retention, volume and linear density were investigated and the variation diagrams were made for the obtained assortments.

Keywords: chemical yarn, artificial yarn, twist, blown yarn, shaped yarn, volume, elongation.

I. Introduction

In the economy of many developed countries in the world, the textile industry occupies one of the leading positions. These countries include China, USA, Portugal, Germany, England, and India. In addition, considering the size of the economy of these countries, light industry contributes significantly to the gross domestic product and the total employment of the working population. In order to achieve the economic indicators of the state that allow it to successfully compete in the world market, it is necessary to expand the scale of production, expand the technical base of existing enterprises, and expand new types of assortment.

In recent years, the rapid development of the textile industry of Uzbekistan, the attention paid to the technical base of the enterprises, and the demands placed on the assortment of products produced by the enterprises make it possible to conduct healthy competition in the world market. The textile industry is one of the industries that is developing every year. The introduction of new production technologies, the use of high-efficiency, modern machines and equipment ensures high efficiency of work in textile enterprises and increases the volume of industrial production. For many years, our republic exported textile raw materials. To date, the export of textile raw materials has been banned, and the export of finished textile products has been consistently promoted. For example, the fact that Uzbekistan will import cotton fiber for the first time in 2021 is a clear proof of this. It can be seen that day by day our textile enterprises are more and more willing to produce and export finished textile products, rather than raw or semi-finished products. The decisions and decrees of the President of the Republic of Uzbekistan regarding the textile sector are a significant motivation and reason for this [1].

Among the natural raw materials of the textile industry, such as cotton, silk, wool, and hemp, chemical fibers are also widely used. As a result of the sharp increase in the world's population, the sharp reduction of land areas, and the increasingly changing climatic conditions, not only natural fibers, but also chemical fibers are used as raw materials for textile enterprises. In addition, this is due to the cheapness of chemical fibers, ease of use, superiority of some properties over natural fibers.

II. Methodology

In order to reduce the cost of the finished product in our republic and abroad, yarns are obtained by mixing chemical yarns and fibers close to the properties of natural silk. Researches were conducted in order to determine the technological and physical-mechanical properties of the obtained yarns [2-6].

A number of foreign, Russian and Uzbek scientists have worked on the assortment of woven yarns, methods of their production, expansion of the assortment of shaped and textured yarns, and classic and new methods of their production [7-9].

In our research work, we have researched new methods of obtaining sugar yarns from chemical yarns. In addition to the classic method of obtaining shaped threads, new methods were also researched. One of the most successful methods is the heat treatment method, in which the chemical yarns are subjected to heat to obtain shaped yarns.

Polyester, polyamide and viscose fibers, which are artificial and synthetic threads, were taken as raw materials. These fibers are interwoven, i.e. polyester + polyamide, polyester+viscose, and they are given different twists, i.e. 100 tr/m, 150 tr/m, 200 tr/m, 300 tr/m, 400 tr/m. The yarns were initially made by adding FADIS thread to the winding machine. In this machine, polyester + polyamide and polyester+viscose yarns were added. The added yarns were twisted on a Volksmann type VTS-07/-08/-09 dual-cooking machine. The physico-mechanical parameters of the obtained spun yarns are presented in Table 1 [10].

Table 1. Physico-mechanical parameters of spun yarns

Indicators	Linear density, tex	Number of turns, tr/m	Breaking strength, sN/tex
polyester + polyamide	18,5	102	14,67
	18,7	157	15,37
	18,85	205	16,69
	18,9	310	17,91
	19,01	401	19,98
polyester+viscose	16,04	105	8,65
	16,25	148	9,73
	16,5	209	10,98
	16,62	312	12,08
	16,7	407	13,91

III. Results and Discussion

The blown yarns wound on the bobbin were wound from the bobbin to the tow on the MT-85 rewinding machine. The yarns in the form of kalava were processed at different temperatures for different processing durations and their properties were studied [11-14]. Heat treatment of polyester+polyamide and polyester+viscose woven yarns was carried out at temperatures of 400, 600, 800 and 900C for 5, 15, 20 and 30 minutes, and the results of the studies are presented in Table 2.3.

Table 2. Mechanical results of polyester+polyamide spun yarns after heat treatment

Indications	polyester+polyamide				
	Linear density, tex	21,5	21,44	21,31	21,13
Number of turns, br/m	102	157	205	310	401
Elongation, %	16,4	14,7	13,1	11,8	10,8
Preservation of torsion, %	220,3	218,7	200,2	185,6	170,8
Volume, %	8,085	8,164	8,242	8,281	8,321

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Table 3. Mechanical results of polyester+viscose spun yarns after heat treatment

Indications	Полиэфир+вискоза				
Linear density, tex	17,57	17,72	17,86	17,61	17,56
Number of turns, br/m	105	148	209	312	407
Elongation, %	9,6	9,1	8,3	6,0	5,2
Preservation of torsion, %	86,7	74,9	70,4	58,1	49,8
Volume, %	7,025	7,104	7,222	7,261	7,300

From the analysis of the tables, it can be seen that when polyester+polyamide yarns were heat treated, the elongation properties of the obtained shaped yarns changed by 16,4-10,8%, twist retention by 220,3-170,8%, and bulkiness by 8,085-8,321%. Polyester+viscose shaped yarns had 9,6-5,2% elongation, 86,7-49,8% twist retention, and 7,025-7,300% volume change. Variation diagrams of the properties of heat-treated yarns were made.

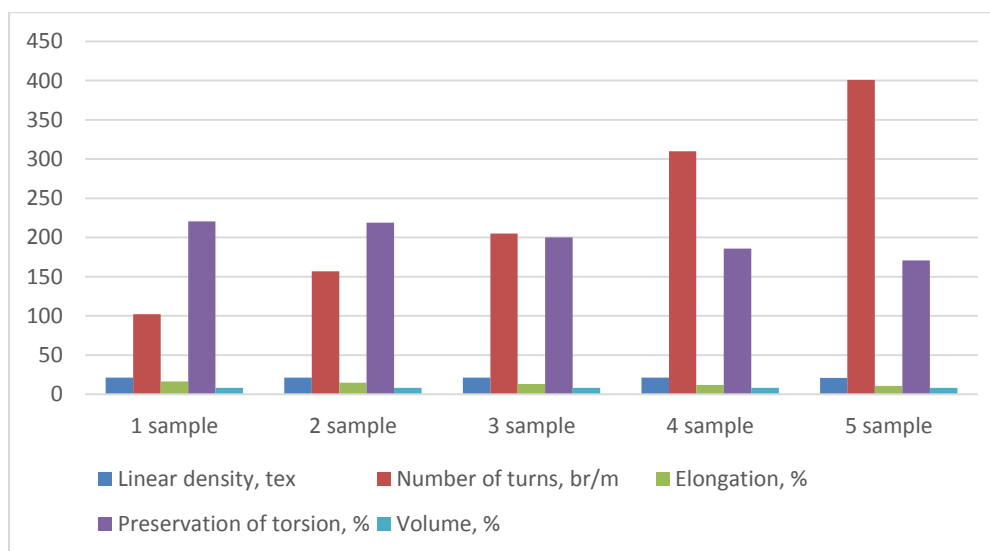


Figure 1. Diagram of changes in properties of polyester+polyamide woven yarns after heat treatment

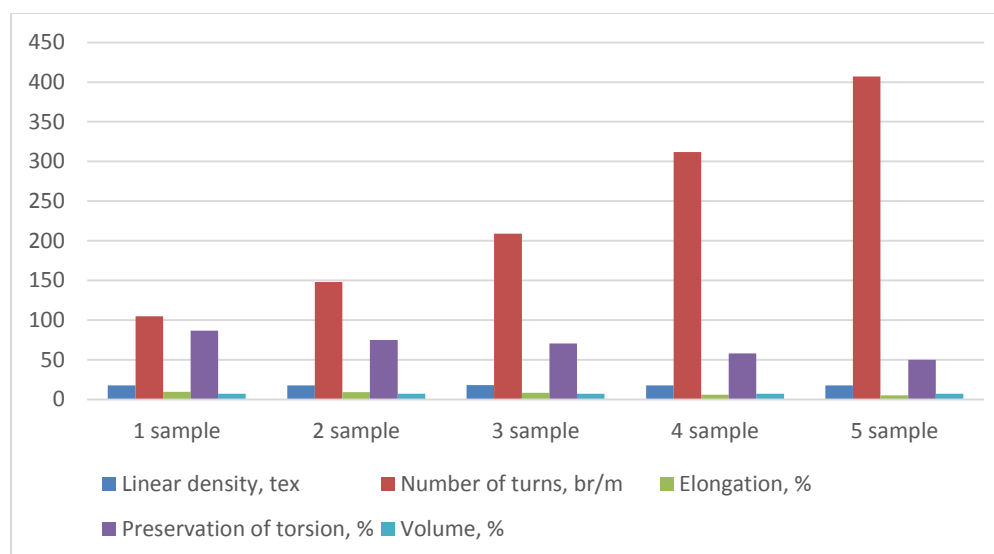


Figure 2. Diagram of changes in properties of polyester+viscose spun yarns after heat treatment

As can be seen from the diagrams in Figure 1, 2, in the shaped yarns obtained from the heat treatment of polyester+polyamide and polyester+viscose yarns, the elongation of the yarns and the characteristics of the preservation of twistiness decreased with the increase in the number of twists given to the yarns. with, the degree of contraction in the threads decreased. In addition, it was observed that the linear density of the yarn increased as the elongation of the yarns increased.

IV. Conclusion

In conclusion, the physico-mechanical parameters of the blown yarns prepared to obtain shaped yarn were studied and their linear density and breaking strength were observed to increase with the increase in the number of twists of the blown yarns. When the resulting blown yarns were heat-treated to form a yarn, the increase in twist in the yarns reduced the elongation and twist retention of the yarns, leading to a decrease in the characteristic properties of the shaped yarns. Man-made and synthetic yarns have been found to shrink from heat treatment and are directly affected by time and twist. When the effect of the number of twists on yarn shrinkage was studied, it was observed that the yarn shrinkage decreases with the increase in the number of twists. Therefore, it can be seen from the results of studies that it is appropriate to give the yarns 100 and 150 tr/m when obtaining shaped yarns from chemical yarns. It turned out that it is also possible to obtain shaped threads by applying heat treatment.

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