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# Study of Physical-Mechanical Properties of Mixing Yarns

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**ABSTRACT:** The article presents the results of experiments to determine the quality indicators of yarn produced from natural and chemical fibers on a ring spinning machine.

**KEYWORDS:** cotton / polyester blended yarn, roving, twist, yarn, coefficient twist, linear density, uneven yarn, quality, strength, weaving yarn. breaking force, breaking elongation

## I. INTRODUCTION

In recent years, the Republic of Uzbekistan has increased imports of finished products, increasing the consumption of natural fibers and their rational use, processing of natural fibers mixed with chemical fibers, production of mixed assortments of yarns of different linear densities, interdependence of their physical and mechanical properties. is considered in many scientific studies [1,2].

Products made from mixed fiber yarns have a number of advantages: mechanical strength increases, resistance to abrasion and repeated bending improves, elasticity, resistance to chemical reagents (acids, alkalis), shape stability in wet and dry conditions [3,4].

However, the hydrophobicity or roughness of the products (or rather the added fibers) can lead to a number of shortcomings if the mixing percentages and composition of chemical and natural fibers are not selected correctly: hygroscopicity is reduced, the sanitary and hygienic properties and coloring of shirts and bedding products deteriorate, the hairs on the surface of the fabric are rounded and its quality deteriorates.

An important way to expand the range of products is to make yarn from a mixture of natural and chemical fibers, and from it to get fabrics, knitted fabrics and finished knitted products. [5,6].

## II. ANALYSIS OF EXISTING FILTERING MATERIALS AND RESEARCH RESULTS

In solving these problems, it is important to study the physical and mechanical properties of mixed fiber yarns, the study of the preservation of consumer properties. The production and use of polyester fibers is widespread in various industries, including the textile industry, due to its high physical and mechanical properties, the ability to replace other types of fibers, low cost, the possibility of mixing with natural raw materials. The quality of a textile product largely depends on the properties of the yarn [7,8].

The object of scientific research is mixed yarns containing 50/50, 70/30 fibers of cotton and polyester, as well as 100% polyester yarn. Semi-finished products made on the basis of the spinning plan of the foreign enterprise "OSBORN TEXTILE" are obtained and are shown in Table 1. Experimental yarn samples were spun on a spinning machine Zinser-350 in the laboratory of the department "Spinning Technology".

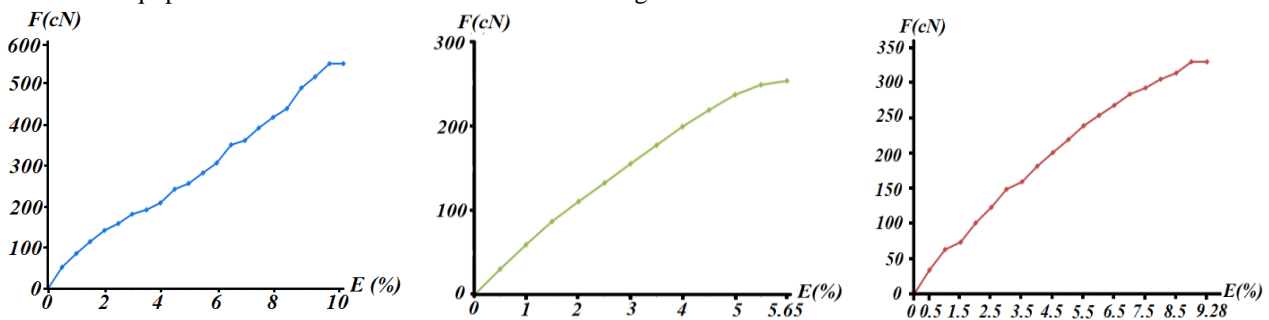
Table 1  
 LLC "Osborn Textile" foreign company 20% 100% polyester, cotton-polyester (50/50%, 70/30%) a brief spinning plan of mixed yarn spinning

№	The name of the machine and brand	Outgoing product linear density, tex	Number of additions	The amount of stretching E	The amount of Kooking coefficient		The speed of the extracting working body		UTC	Theoretical productivity kg/h
					$\alpha_t$	K t/m	V m/min	n min <sup>-1</sup>		
1	Carding machine C 60	5363	1				185		0.90	60
2	Draw frame 1SB-D 45	5000	8	8			500		0.85	150
3	Draw frame II RSB-D 35	5000	8	8			500		0.85	150
4	Roving F-15	663	1	7.54	11.6	42.5		1250	0.90	0,9
TITLI in the educational laboratory of the department "Spinning technology"										
5	Spinning G 35	20	1	45.4	41.8	937		17000	0.90	0.022
	Spinning G 35	20	1	45.4	32.4	730		17000	0.90	0.022
	Spinning G 35	20	1	45.4	37.9	850		17000	0.90	0.022

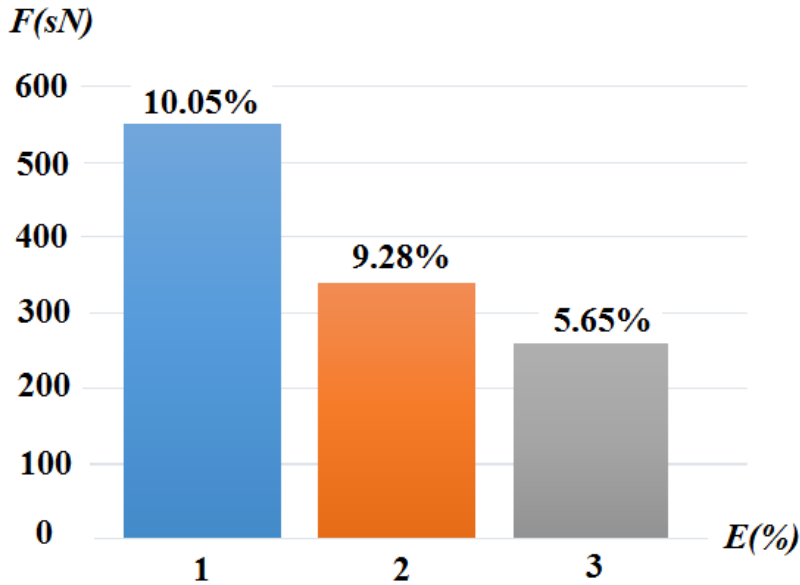
In the training laboratory of the Department of "Spinning Technology" TITLI in the preparation of yarn samples on the Zinser 350 ring spinning machine, the technological parameters of the machine were reworked and the twist of yarn made of 100% polyester fiber based on the above spinning plan k = 937 t/m, 50/50% or cotton / polyester blended yarn twist k = 730 t/m and 70/30% cotton / polyester blended yarn twist k = 850 t/m, 20 tex yarn samples were taken from a mixture of three different fibers.

### III. EXPERIMENTAL RESULTS

In this case, the yarn obtained by the method of ring spinning was tested in the laboratory "CENTEX.UZ" on the test equipment Statimat-C and obtained the following.



1-Picture. Graphs of breaking elongation  
 a-100% polyester yarn; b-70/30% cotton / polyester mixed yarn;  
 c-50/50% cotton / polyester mixed yarn.



2-Picture. Elongation histogram of polyester and composite yarn samples in breaking force and breaking elongation

1-100% Polyester yarn, 2-50 / 50 cotton / polyester mixed yarn, 3-70 / 30 cotton / polyester mixed yarn

IV. CONCLUSION AND FUTURE WORK

Table 2  
Quality indicators of 100% Polyester yarn, 50/50 % and 70/30 % cotton / polyester mixed yarn

Name of indicators	100% polyester		50/50 % cotton / polyester		70/30 % cotton / polyester	
	Average $\bar{X}$	Coefficient of variation -CV-	Average $\bar{X}$	Coefficient of variation -CV-	Average $\bar{X}$	Coefficient of variation -CV-
breaking elongation	10.05%	6.24	9.28 %	10.26	5.65 %	5.61
breaking force	547.92 sN	10.22	330.14 sN	5.84	253.17 sN	1.17
tenacity	28.24sN/ tex	10.22	20.62sN/t ex	5.84	15.32sN/t ex	1.17

From Table 2 above, it can be seen that the breaking elongation in yarn spun from 100% polyester fiber is 10.05% greater than the breaking elongation 50/50, 70/30 cotton / polyester yarn 9.28%, 5.65% at break, but the breaking force is 50/50, In 70/30 cotton / polyester yarn, 330.14 sN, 253.17 sN, we see that 100% polyester yarn has a goodhardness of 547.92 sN.

The tenacity of yarn spun from 100% polyester fibers is higher than that of other yarns.

In addition to the above-mentioned important parameters of yarns in spinning mills, the coefficient of variation of breaking force of the yarn is also very important in the CV. This allows for less thread breakage during the weaving process. The less the threads are cut, the more quality fabric is made. We can increase or decrease the percentage of chemical fiber depending on the product we produce. The quality and cost of our required product can be controlled by the percentage of chemical fibers in the yarns produced.

Table 3



**Tenacity values given in Uster Statistic 2018**

100 % Polyester	Average -X- sN/tex			Coefficient of variation -CV-		
	5%	50%	95%	5%	50%	95%
	39.3	33.1	28.6	7.7	9.6	12.0
50/50 Cotton/polyester	Average -X- sN/tex			Coefficient of variation -CV-		
	5%	50%	95%	5%	50%	95%
	22.4	19.5	16.8	7.6	9.2	11.0
70/30 Cotton/polyester	Average -X- sN/tex			Coefficient of variation -CV-		
	5%	50%	95%	5%	50%	95%
	19.9	17.0	14.2	7.4	8.8	10.3

Thus, according to the results of the experiments, the tenacity of 100% polyester, 50/50% cotton / polyester, 70/30% cotton / polyester blend yarns was compared with the Uster Statistic-2018 standard. Based on this, the tenacity of 100% polyester yarn was lower than the standard Uster Statistic-2018, but when we obtained a blended yarn mixed with natural fiber cotton, these figures met the requirements of the Uster Statistic-2018 standard.

That is, the tenacity of 50/50% cotton / polyester blend yarn is less than 5% class greater than 50% class and the tenacity of 70/30% cotton / polyester blend yarn is more than 95% class 50% class is less than 50% class. will give. The CV coefficient of variation mixed yarns is lower than the Uster Statistic 2018 standard. This means that the unevenness of the breaking force is good.

In conclusion, the blending of polyester chemical fibers with cotton fiber has resulted in improved yarn quality and expanded yarn range, as well as yarn for garment products that meet the general requirements of consumers.

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