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Research of the Opportunity for the Production of OE Yarns from Regenerated Fibrous Waste

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ABSTRACT: The article investigates the influence of the share content of the card sweeps, flat strips and combing noil in a mixture on the quality indicators of a yarn of linear density of 49.2 tex. From the analysis of the obtained data, it can be concluded that with an increase in the share of waste in the working sorting, the specific breaking load and elongation of the yarn decrease, the number of defects in the appearance of the yarn and its breakage on spinning machines increases.

KEY WORDS: regenerator, regenerated fibrous waste, card sweeps, flat strips, combing noil, open end spinning, yarn quality.

I. INTRODUCTION

Today, Uzbekistan is carrying out large-scale work aimed at developing an important strategic industry - the textile industry. For ensuriy the release of high-quality competitive products, technical re-equipment and modernization of textile enterprises, introduction of new innovative technological processes and means of production automation are carried out. A powerful impulse that opened up new opportunities for improving the industry was the Decree of the President of the Republic of Uzbekistan Shavkat Mirziyoyev "On the Program of Measures for the Further Development of the Textile and Clothing and Knitting Industries for 2017-2019" [1].

At textile enterprises of the Republic of Uzbekistan one of the promising areas of resource saving and increasing yarn production is the rational processing of spinning cotton waste.
Research institutes and laboratories of spinning factories have developed a large number of technologies that allow yarns with different percentages of different kinds of waste to be obtained. For the most part, these technologies allow to obtain linear density yarn from 100 to 200 tex using low-grade cotton fiber up to 50% of cotton waste of various types.

Insufficient attention was paid to technologies for obtaining yarn linear density 50-70 tex from waste, which was primarily due to the limited capabilities of the process equipment installed at spinning mills of the Republic. At present, cotton spinning mills of the Republic are 100% equipped with technological equipment from Rieter, Marzoli, Truetzschler and Zinser.

II. THEORETICAL PART

Traditionally, most cotton waste in its purified form is sold to other enterprises for use as furniture wool. The development of a technology for yarn production with a maximum percentage of waste investment will allow organizing their efficient processing and gaining additional profit from the sale of yarn.
Based on these prerequisites, the goal of the research is to develop a technology for producing a yarn of 49.2 tex of linear density from 100% regenerated cotton spinning waste. This type of yarn is most in demand in the production of technical fabrics and knitwear.

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To solve this problem, complex studies are needed to study the properties of waste, develop sorting, optimize and select rational equipment operation parameters for all technological transitions.

III. EXPERIMENTAL PART

The possibility of producing a 49.2 tex (Ne 12) linear density yarn on an R-35 rotor spinning machine (Rieter) from a 100% mixture of fibrous waste was investigated. The mixture was compiled to align the properties of the fibers. Waste regenerated by modern technology was mixed: st 7/11 (card sweeps and strips) and st 16 (combing noil).
The effect of the proportion of regenerated fiber in the blend on the quality of the yarn was studied in three variants:

1 variant – st 7/11 - 40% st 16 - 60%
2 variant – st 7/11 - 50% st - 50%
3 variant – st 7/11 - 60% st 16 - 40%

The physicomechanical properties of the regenerated fibers, determined on the HVI 1000 and AFIS RPO 2 devices, are given in table 1. Table 1 also shows the weighted averages of the fibers in the mixtures under study.

Table 1. Indicators of physical and mechanical properties of fiber in waste and work mixes

№	The name of indicators	waste		The composition of the mix		
		St 7/11	St 16	7/11-40% 16-60%	7/11-50% 16-50%	7/11-60% 16-40%
	According to HVI 100					
1	Crimpiness , SCI	56	28	39,2	42,0	44,8
2	Micronaire, Mic	4,83	4,0	4,33	4,42	4,5
3	Degree of maturity Matio	0,87	0,84	0,852	0,855	0,86
4	Upper Half Mean Length UNML, mm	25,3	21,3	22,9	23,3	23,7
5	Evenness in length, U %	74,6	67,2	70,2	70,9	71,6
6	Short Fiber Index, SFI %	27,9	39,8	35,0	33,9	32,6
7	Strength, Str, gf/tex	22,8	21,6	22,08	22,2	22,32
8	Elongation, Elq, %	7,7	7,6	7,64	7,65	7,66
9	Trash Count, Tr Cnt	216	11	93,0	113,5	134,0
10	Trash Area, TrAr %	1,7	0,06	0,72	0,88	1,04
11	non-fibrous impurity contamination rate, Tcd	8	1	3,6	4,5	5,2
	According to AFIS RPO 2					
1	Linear density, mtex	190	157	170	174	177
2	Degree of maturity, Mat	0,82	0,79	0,80	0,81	0,89
3	Mean Length, mm L(w)	21,4	13,9	16,9	17,7	18,4
4	Modal length UQL, mm	28,3	17,7	21,94	23,0	24,1
5	Length 5% of the longest fibers, mm	31,9	22,5	26,3	27,2	28,2
6	Evenness in length, %	74,2	55,1	50,7	49,7	48,6
7	The content of short fibers SFC(w),%	19,0	49,7	37,4	34,4	31,3
8	General trash, unit/gram	972	585	740	779	817
	including:					
	fibrous nepses, unit/gram	665	507	570	586	602
	non-fibrous nepses, unit/gram	307	78	170	193	215
9	The average size of non-fibrous impurities, micron	1,392	1,202	1,04	1,30	1,32

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From table 1 it can be seen that the Upper Half Mean Length UNML of the regenerated waste of st. 7/11 is 4 mm higher than the fibers of st. 16. Higher uniformity in length (74.6% versus 67.2% for st. 16 fibers). The strength of st 7/11 fibers is 1.2 gf / tex higher, and the content of short fibers is 1.42 times lower (according to HVI) and 2.6 times lower (according to AFIS) than in the waste of st. 16.

The advantage of waste st. 16 is their softness, elasticity, low linear density and low degree of trash. The number of weed impurities with a diameter of 0.25 microns and more (TrCnt) is almost 20 times lower, and the index of non-fibrous impurities (Ted) is 8 times lower.
The processing of raw materials was carried out according to the technological chain of modern equipment of the company Rieter (Switzerland), specially designed for processing mixtures of 100% waste.

The semi-finished product and yarn of all variants were produced on the same technological equipment, on the same spinning rotors sequentially.
The efficiency of using fibrous waste in pneumatic spinning was evaluated by the following indicators:

- defects in the appearance of the yarn;
- physical and mechanical properties of yarn;
- breakage in spinning.

To assess yarn quality indicators, modern laboratory equipment from Uster was used.

The results obtained when testing the yarn were evaluated by comparing with the standards of technical documentation and standards of Uster Statistics.

Breakage of yarn was recorded during the time of removal.

49.2 tex (Ne 12) linear density yarn from the draw sliver of each option was sequentially produced on an R-35 pneumatic spinning machine.

Unevenness of the yarn of three options for the section and defects of its appearance are determined on the device USTER TESTER 5-S400. The results are shown in table 2.

Table 2. Yarn appearance defects

№	The name of indicators	options		
		1	2	3
1	Share content st 7/11, %	60	50	40
2	Unevenness in cross section, % - linear, U_m - quadratic, C_m	10,57 13,34	10,88 13,75	11,12 14,08
3	The ratio C_m/U_m	1,262	1,264	1,266
4	The variation coefficient for 1m segments, %	6,07	6,55	7,78
5	Thick places (-50%), units/km	1	1	2,5
6	Thick places (+50%), units/km	25,0	27,5	32,5
7	Neps (+200%), units/km (+280%), units/km Total neps, units/km	297,5 40 337,5	260 25,0 285	207,5 22,5 230
8	Hairiness (H)	6,84	7,02	7,29

From table 2 it can be seen that the linear unevenness of the yarn (U_m) across the yarn cross section of all the options is quite good and meets the requirements of the 50-60% USER-Statistics level, which is explained by the cyclic addition effect in the rotors of the modern R-35 rotor spinning machine. However, quadratic unevenness (Cm) is significantly higher and corresponds to the level of 60-75% Ust. The mass distribution of the yarn over the section is asymmetric: C_m (U_m=1,262-1,266) instead of 1.25 with a normal distribution, which may be due to the instability of the sliver opening process. The instability of the opening process is caused not only by the unevenness of the feeding sliver, but

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also by the unequal fineness of the mixed fibers, which causes unevenness of their supply to the rotor. From table 1 it is seen that the linear density of the fibers of st. 7/11 190 ktex, st. 16 - 157 ktex. From table 3.16. it can be seen that the linear unevenness of the yarn over the cross section and 1m sections decreases with an increase in the proportion in the mixture of a more uniform waste 7/11 in the properties, but the purity of the yarn is reduced by about 15-20% for every 10% increase in st. 7/11.

The average results of the indicators of the main physical and mechanical properties of the yarn of the three options are given in table 3.

Table 3. Indicators of physical and mechanical properties of yarn

№	The name of indicators	options		
		1	2	3
1	Share content st 7/11, %	60	50	40
2	Linear density of yarn, tex	49,2	49,2	49,1
3	Coefficient of variation of linear density, %	1,71	1,82	1,9
4	Breaking force, cH	462,48	450,18	438
5	Coefficient of variation of breaking force, %	9,5	10,54	11,53
6	Breaking tenacity, cN/tex	9,4	9,15	8,92
7	Elongation %	6,12	6,10	5,90
8	Work to break, N/Cm	7,81	7,58	7,14
9	Breakage per 1000 spindles/hour	26	35	42
	per 1000 km/yarn	5,82	7,84	9,41

The linear density of the yarn and the coefficient of variation in linear density are defined on the Uster Autocorter 5. Strength indicators and related indicators are defined on Uster Tensorspid 4.

One of the most important indicators on the basis of which the yarn is evaluated is the breaking tenacity and unevenness in strength. From table 3 it can be seen that the breaking load of the yarn increases and the unevenness in strength decreases with an increase in the share of st 7/11. Quality Score (Po / C1) when changing the proportion of st 7/11 from 40 to 60% increased from 0,77 to 0,989.

IV. CONCLUSIONS

By changing the proportion of components, one can find the optimal combination of yarn purity with its physical and mechanical properties.

REFERENCES

[1]. On the program of measures for the further development of the textile and clothing and knitwear industry for 2017-2019: Decree of the President of the Republic of Uzbekistan of December 21, 2016, No. PP-2687 // Collection of Legislation of the Republic of Uzbekistan - 2016-No. 51-c. 584
[2]. Khan, K. R., Hossain, M. M. & Chandra, S. R. Statistical Analyses and Predicting the Properties of Cotton/Waste Blended Open-End Rotor Yarn Using Taguchi OA Design. International Journal of Textile Science. 2015, 4(2), pp. 22-35.
[3]. Hassani, H., Tabatabaei, S.A., Semnani, D. Determining the Optimum Spinning Conditions to Produce the Rotor Yarns from Cotton Wastes. Industria Textila. 2010, vol.58, pp. 259-264.
[4]. Polyakova D.A. Waste cotton industry. M .: Legprombytizdat. 1990, 206 p.