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Research of Technology for the Production of Yarn from Natural and Chemical Fibers

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ANNOTATION: The article examines the technology of production of mixed fiber yarns, analyzes the technological processes and quality indicators of the production of spun yarns from silk, cotton and lavsan mixed fibers.

The study found that compared to 100% cotton yarn, the maximum tensile strength increased by 25% and the relative strength by 20%. These figures showed an increase in the quality of the yarn obtained from the mixed fibers.

KEYWORDS: silk, cotton, polyester, fiber, blend, spinning, technology, spun yarn, quality indicator.

I. INTRODUCTION

Globally, the share of chemical fibers in the production of textiles is high, while the share of natural fibers is lower than that of chemical fibers. However, the demand for natural fibers and products made from them is growing. This is due to the fact that the products meet high sanitary-hygienic requirements and requirements for textile fibers, the manufactured products have a glossy and good appearance. There are several types of natural fibers. But their number is less [1-2].

Therefore, the use of a mixture of natural and chemical fibers is an urgent task. The peculiarity of the technology of production of mixed fiber yarns is that in all processes it is important to pay special attention to the properties of each of the fibers in the mixture. The production of mixed fiber yarns requires specific technological processes.

In choosing the technology, the main goal of scientific research is to achieve the maximum level, while retaining the properties of each fiber in the fiber.

II. METHODOLOGY

Nowadays, synthetic fibers made of polyester fibers are widely used. But it is possible to make raw materials with natural properties by mixing these synthetic fibers with natural fibers.

In terms of heat resistance, polyester fibers are superior to all known natural and synthetic fibers. Polyester fibers are resistant to abrasion, exposure to light, the action of concentrated solutions of alkalis. Technical polyester fibers are used in the manufacture of conveyor belts, ropes, filter materials and other materials for conveyors and various mechanisms. Used in the manufacture of textile yarns (crimped, melanin, etc.), knitwear, various fabrics.

Each link in the polystyrene macromolecule is a high-molecular compound bonded to a cross-linked ether group, from which polyethylene terephthalate is the raw material for the production of lavsan fiber. This polymer is the



product of polycondensation of ethylene glycol with terephthalic acid. In some countries, lavsan is obtained not from terephthalic acid, but from the product of its interaction with methyl alcohol - dimethyl terephthalate.

About 75% of the fibers produced from polyesters are staple fibers, and the rest are technical and complex yarns. Lavsan fiber is the most resistant to temperature changes, non-wrinkle, shrinkage, resistant to light, weather and sunlight radiation, microorganisms and exposure to sunlight. The relative tensile strength of Lavsan fiber is 57 sN-tex, elongation is 18-28%. It softens at 160-170 °C and melts at 260 °C. However, its specific disadvantages are low moisture absorption, poor dyeing, and the fact that the ends of the fibers are rounded and twisted at the edges of garments made of it, resulting in poor fabric quality, abrasion resistance [3-4].

For this reason, research has been conducted to develop a technology for obtaining yarn by stacking polyester fibers with silk and cotton fibers.

Our country is a world leader in the production of cocoons and its processing, the production of silk products, the availability of cotton fiber.

Natural silk and cotton fibers are widely used in textile enterprises in the country. These natural raw materials are used to produce yarn and quality finished products.

Such defects are almost non-existent in fibers derived from polyester fibers and polyesters with a different chemical structure. When Lavsan fiber is mixed with silk and cotton fibers, the breaking strength of fabrics and products made from it increases, and their resistance to light and weather increases. Such defects are almost non-existent in fibers derived from polyester fibers and polyesters with a different chemical structure. When Lavsan fiber is mixed with silk and cotton fibers, the breaking strength of fabrics and products made from it increases, and their resistance to light and weather increases.

Physical and mechanical properties of lavsan fiber

No	Indicators	Units of measurement	Values
1	Linear density	mteks	167
2	Breaking force	cH	5,44
3	Modal length	mm	35,4
4	Staple length	mm	36,3
5	Fiber length	mm	34,9
6	Elongation	%	36,2
7	Coarse and sticky fibers	%	0,019
8	Uncut fibers	%	0,087
9	The number of curls in 1 cm	the end	8
10	Relative tensile strength	sN / tex	32,6

Polyester fibers are resistant to the effects of dilute acids and alkalis, even at high temperatures, organic solvents at room temperature do not affect it, and oxidants do not affect it even at high temperatures.

Machines used to process cotton in the snow system are used to mix natural fibers with chemical staple fibers. However, for the technological process to run smoothly and well, it is necessary to take into account some properties of chemical staple fibers [5-6].

In the processing of natural fibers, the correct selection of the sequence of technological processes, regimes and parameters is of great importance. With this in mind, we aimed to produce a new range of three-component polyester, silk and cotton yarn yarn. As a result of scientific research, the technology of spinning yarn in mixtures of silk fiber waste and cotton fiber, polyester is being developed.

Silk waste is divided into several types due to its appearance in different technological processes: long, short and mixed; rich and low fiber, dry or wet, clean or dirty, parallel, tangled. The linear densities of the fibers can range from 0.18 to 0.33 tex, and their lengths from 0.1 to 1.5 m, sometimes up to 500 m (in defective cocoon shells).

Polyester, silk and cotton fibers vary in length, and the processes of aligning them are important.

Cotton fiber grown in the country is mainly medium fiber. The length of the fibers is up to 32-37 mm, but due to the different lengths of the fibers obtained from silk waste, they are stapled.

It is advisable to use the staple method of cutting and stretching.

Stacking was carried out along the length of the cotton fiber. Mixing was carried out according to the quantity. Stapled silk fibers are blended in the proportions of silk 15%, polyester 17% and cotton 68%. The fibers are emulsified and left to rest for 8 hours. When the emulsified fiber dries and reaches the normalized humidity, it ensures that the mixing, aerodynamic cleaning, pneumatic fiber distribution, scraping, spinning process and spinning process go smoothly. Fiber moisture is an important factor in spinning.



Silk and cotton fiber absorb moisture quickly and lose it quickly. The property of changing the moisture content of a fiber is called its hygroscopicity.

Fiber moisture is calculated as follows: $W = \frac{m_d - m_k}{m_k} \cdot 100$ [%]; usually composite fibers humidity

$W_T - 8 \div 12$ % will be.

m_d - initial mass of silk and cotton fiber, g;

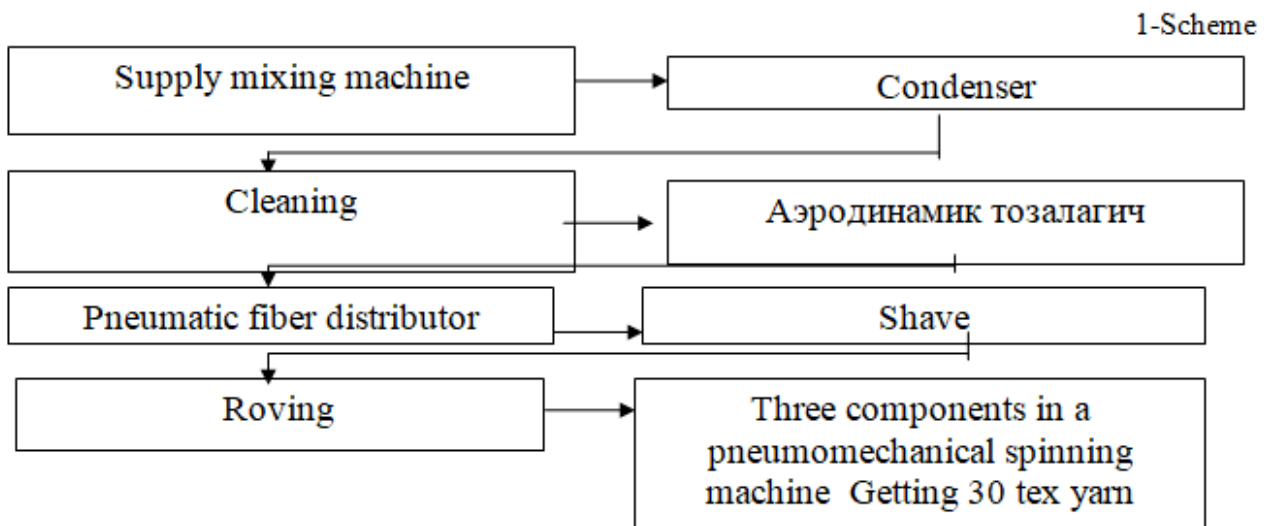
m_k - the mass of the mixed fibers after drying; g;

When the moisture content of the fibers is normal, they are transferred to the next process, which in turn ensures a good spinning process [7].

Production of yarn from mixed fibers is carried out on the basis of the following technological sequence.

III. RESULTS AND DISCUSSION

Production of yarn from a mixture of natural and chemical fibers sequence.



Quality indicators of yarns spun from mixed fibers

Table 1

Total evaluation	-N- Number of experiments	-X- The average value of the results obtained	-S- Deviation	-CV- Variation coefficient	-Q(95%)- 95% probability of confidence	-MIN-	-MAX-
Elongation (Fmax)	10	8,91 %	0,37	7,49	0,85	4,68	5,33
EAR; 1% Fmax	10	8,99 %	0,37	7,41	0,85	4,74	5,41
Maximum force	10	389,18 cN	16,40	4,98	33,25	272,87	300,13
Work to break	10	478,31 cN*cm	44,05	11,40	101,74	344,19	432,07
Tenacity	10	13,97 cN/tex	0,50	4,98	1,15	9,41	10,35
Count	1	30,00 tex					
Time to Rupture	10	3,31	0,23	6,95	0,53	3,11	3,56



IV.CONCLUSION

The results showed that compared to 100% cotton yarn, the maximum tensile strength increased by 25% and the relative strength by 20%. These figures indicate an increase in the quality of the yarn obtained from the mixed fibers.

Spun yarn can be used in products of the textile industry, weaving, knitting, and special industries.

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