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PRODUCTION OF BLENDED YARN FROM LOCAL WOOL AND POLYESTER FIBERS USING THE "SIRO" SPINNING METHOD

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Abstract:
The article describes the process of preparing raw materials for the production of blended yarn using the "Siro" method from local wool and polyester fibers. In this case, the dependence of the product linear density on the drawing length, the number of twists, and the machine's adjustment parameters has been established. The physical and mechanical properties of the" Siro" blended yarn, numbered Ne=20, obtained as a result of the experiment, were studied.

Keywords: Statistical, analys, local, wool, fibers, country, physical, karakul, mechanical, republic, sheep, diameter, deviation, mic, variation.

Introduction

The adoption of innovative technologies in the textile industry facilitates the production of high-quality woven fabrics, knitted fabrics, and finished products manufactured from natural and chemical fibers for both consumer and technical applications. From ancient times, animal wool has served as a valuable raw material due to its functional and technological properties. In modern textile production, wool and its blends with other fibers are widely used to manufacture yarns of various linear densities, apparel and technical fabrics, carpet products, and nonwoven materials. Coarse wool is effectively utilized as a thermal insulation material in the construction of multi-storey residential buildings, owing to its low thermal conductivity and structural stability. Animal husbandry constitutes the main raw material supply sector for the wool industry, ensuring the sustainability and continuity of wool-based textile production.

Sheep are sheared once or twice a year, depending on the direction of production. For example, fine-wooled and semi-fine-wooled sheep are sheared once, while coarse-wooled and semi-

coarse-wooled sheep are sheared twice. In Uzbekistan, sheep with uneven wool composition are sheared, and coarse wool is produced from Sarodjin, Tajik-semi-coarse, Karakul, Hissar, and Jaidari breeds, but the efficient use of wool fibers has not been implemented. Today, the production of industrial yarn from local wool fibers is a pressing problem in our country [1,2]. Due to the diverse fiber composition of coarse and semi-coarse wool, and to alleviate the complexities that arise during the spinning process, it is advisable to sort these fibers by thickness. Consequently, wool fibers are classified into categories and types based on their fineness and length.

Wool fibers are divided into the following 4 groups based on their fineness.

1. Fine wool (25 μm in fineness) - consists of down fibers;
2. Semi-fine wool (fineness from 25 to 34 μm) - consists of fluff and intermediate fibers;
3. Semi-coarse wool is homogeneous and heterogeneous. Homogeneous - average thickness (up to 34-40 μm). Taken once in spring. It consists mainly of cotton, coarse fibers, and is harvested twice a year in spring and autumn.
4. Coarse wool (thicker than 40 μm) - contains all types of fibers.

Wool is divided into classes by thickness, and mixed wool into grades.

In order to compare the physical properties of wool obtained from sheep bred in the Jizzakh, Karakalpakstan, Navoi, Bukhara, and Valley regions of our republic, as well as wool fibers obtained from Merino sheep bred in Australia, the results of laboratory studies conducted using a SEM electron microscope were summarized in table 1.

Table 1. Physical properties of wool fibers

Allocated territories	Fiber Average Diameter (AFD) Micron	Standard deviation (SD)	Coefficient of variation (CV%)	Proportion of fibers with a diameter of less than 30 microns (CF%)	Staple length (SL) mm
Jizzakh	27,9mic	9,8	35,1	66,8	135
Valley	33,9mic	14,2	41,9	51,5	90
Navoi	26,7mic	5,8	21,7	80,9	85
Karakalpakstan	37mic	14,6	39,4	39,6	165
Bukhara	38,6mic	15,5	40,1	39,8	80

In the textile industry, a mixture of wool with other fibers in various proportions is widely used. Wool fabrics are classified according to their fiber composition as follows:

- pure wool fabric - 95% wool fiber;
- wool fabric - fabrics containing at least 70% wool fiber;
- semi-wool fabric - fabrics containing at least 20% wool fiber.

Fabric made from a mixture of wool with polyester and cotton fibers in various proportions is intended for men's suits. Such blended fabric differs positively from 100% cotton fabric with the same technological indicators in terms of its tensile strength and tensile strength [3].

Usually, due to the high number of passes in the technological process of producing yarn twisted by the classical method, the cost of production increases. Improving the quality of yarn is one of the ways to increase the variety of fabrics and knitted products. The production of a new type

of yarn by the “Siro” method is one of the convenient solutions to eliminate the above problems [4].

“Siro” spinning is a new spinning method, in which 2 cotton fibers are twisted separately, forming a primary yarn, and their repeated twisting together leads to a decrease in hairiness, and for the purpose of studying this situation, at the enterprise "Jizzakh jun" LLC, the fluff of wool fibers obtained from Karakul sheep was passed through a special SC-402 roller carding machine and a 5-ktex carded wool sliver was obtained [4].

For the production of “Siro” yarn, pilot experimental work was carried out in the educational laboratory of the Department of "Silk and Spinning Technology" at the TTYSI. The linear density of wool and polyester slivers delivered to the testing laboratory was determined according to the plan, and the sliver was passed through the second pass on the HSR-1000 sliver machine available in the laboratory. Based on the technical characteristics of the HSR-1000 roving machine, corresponding changes were made to the machine's parameters.

1. The linear density of the product coming out of the machine was set equal to Tout=3.2 kteks.
2. The total drawing value of the machine, entered into the computer program, was determined by using the following formula.

$$E = \frac{T_{kir} * d}{T_{chiq}} \quad (1)$$

where E-total drawing amount, T_{kir}-linear density of the incoming product, i.e.: T_{kir}=4.8 kteks, T_{chiq}-linear density of the outgoing product T_{chiq}=3.2 kteks, d-number of joints of the incoming product in the machine, d=6.

$$E = \frac{T_{kir} * d}{T_{chiq}} = \frac{5000 * 6}{3200} = 9{,}4 \quad (2)$$

3. The product output speed was selected in the range of 1000-1200 m/min.

The HSR-1000 roving machine entered values of Tkir=5 kteks into the computer program, the machine was started, and 3.2 kteks of cotton and melange roving were obtained. In order to obtain roving from wool and polyester slivers of 3200 tex obtained in the testing laboratory, the next transition was carried out on the Zinser-668 roving machine.

The sequence of actions performed is as follows:

a) The linear density of the outgoing roving was chosen to be 500 tex.
b) entered into the computer of the Zinser-668 roving machine.

The total tensile strength was determined as follows. Tkir - linear density of the incoming product, Tkir=3200 tex, Tchiq=500 tex.

$$E = \frac{T_{kir}}{T_{chiq}} = \frac{3200}{500} = 6{,}4 \approx 6 \quad (3)$$

The number of twists was determined as follows.

$$K = \frac{\alpha_t * 100}{\sqrt{T}} = \frac{11{,}9 * 100}{\sqrt{310}} = 67 \quad (4)$$

Here: α_t -twist coefficient, T-linear density [6].

In the experiment, to obtain the required linear density of the product, gear transmissions Z_6=64, Z_{NW}=39 were replaced with gear transmissions Z_6=67, Z_{NW}=33, and the above-selected, calculated values were entered into the computer program of the machine. The machine was put into operation, and the expected experimental result was achieved, that is, wool and polyester roving with a linear density of 500 tex were obtained. In the educational laboratory

of the Department of “Silk and Spinning Technology” at the TTYSI, for obtaining a new assortment of mixed “Siro” yarn, the existing compactors located in the drawing device of the Zinser-350 ring spinning machine in the laboratory were replaced with specially prepared compactors for obtaining “Siro” yarn.

The motion transfer scheme of the machine for obtaining mixed “Siro” yarn with Ne=20 on a ring spinning machine was analyzed. Calculations were performed, the drawing and twisting gears of the machine were replaced, entered into the machine's computer program, and then the results were obtained. At the same time, the physical and mechanical properties of the obtained blended yarns were determined using modern testing equipment in the “CentexUz” laboratory, and the elongation diagram of the “Siro” yarn under the action of a certain force is shown in Figure 1. Based on the above data, the elongation diagram of the "Siro" yarn mixed with local wool and polyester fiber under the action of a certain force is shown in Figure 1.

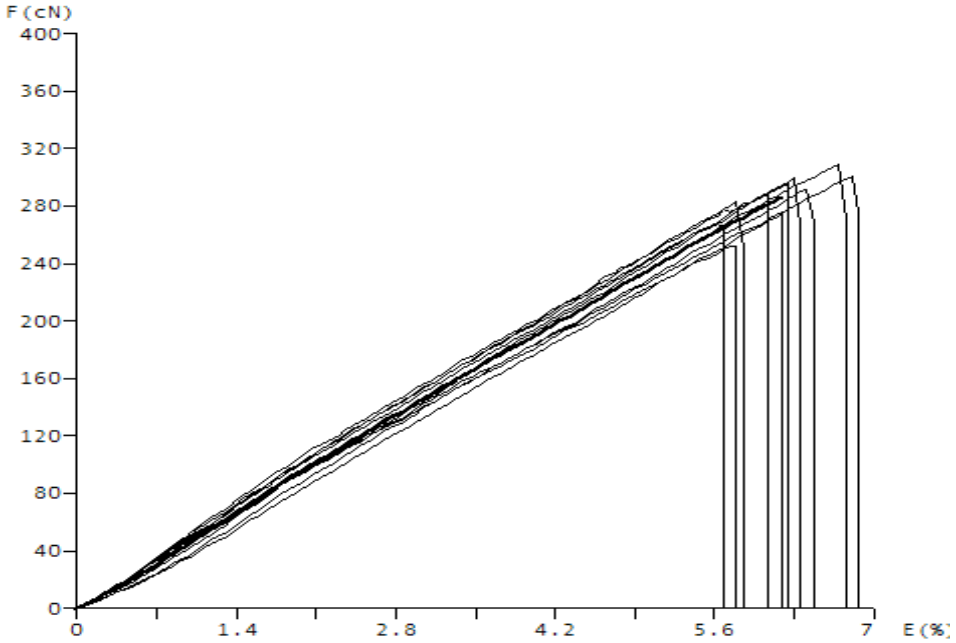

Figure 1. Diagram of elongation of the “Siro” yarn under the action of force

As can be seen from the diagram, when the yarn elongation reaches 5.46%, the maximum breaking load is 377.33 cN, and the breaking time is 3.44 seconds, an elongation along the length of the yarn is observed under the action of the applied force.

References

1. M Elmonov. “Junni o‘simlik aralashmalaridan tozalash mashinasining samarali konstruksiyasini ishlab chiqish va ishchi parametrlarini asoslash” PhD dissertatsiY. 2018 y.
2. Isakulov, V. T., Tulaganova, M. V., Yarashov, S. N. (2024). Mahalliy jun tolalarini yetishtirish, xossa ko‘rsatkichlari va to ‘qimachilik sanoatida qo‘llanilishining statistik tahlili. journal of engineering, mechanics and modern architecture, 3(6), 17-20.
3. Ismailov R.I., Davlatov R.M. Issledovaniye termicheskix svoystv modifitsirovannix sherstyanix volokon // Kompozitsionniye materiali, -Tashkent, 2015, №3, - S. 35-37.

4. Onarboev B.O., Tulaganova M.T., Isakulov V.T., Improving the sealing protection of equipment in spinning machines. International journal of advanced research in Science engineering and technology. Vol.6, issue 6, june 2019.
5. S.N.Yarashov, V.T.Isaqulov, I.A.Nabieva, M.V.To‘laganova. “Mahalliy jun tolalarini yetishtirish statistikasi va to‘qimachilik sanoatida qo‘llanilishi tadqiqoti” O‘ZBEKISTON TO‘QIMACHILIK JURNALI 2-son 2025-y. 85-b.
6. Исақулов В.Т., Бурнашев Р.З., Янги турдаги ип ишлаб чиқариш технологияси ГКНТ-2001 йил, Тошкент – 2001 йил.