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COMPARATIVE ANALYSIS OF THE PROPERTIES OF SIRO YARN SPINNED BY NATURAL AND CHEMICAL FIBERS

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ABSTRACT

In this article are study, Siro-spun yarns were produced from cotton and chemical fibers, and the properties of the yarns were studied. Siro spun yarns from a blend of cotton and polyester (50% / 50%) fiber, cotton and bamboo (50% / 50%) polyester and bamboo (50/50%) fiber, were produced separately and compared on physical and mechanical performance. Parameters such as yarn unevenness (U%, CVm%, CV10m), Siro yarn hairiness and tension were tested and analyzed.

KEYWORDS: *Carded Yarn, Siro Yarn, (Zinser-351), Yarn Quality Parameters, Linear Density, Count.*

INTRODUCTION

Today in the spinning mills in the creation of a new range of yarn from a mixture of natural and chemical fibers, as well as the development of resource-saving technology, full use of the technological capabilities of the ring spinning machine installed in spinning mills, import substitute, competitive provides extensive use in the production of woven knitted products that can meet the requirements of domestic and foreign markets.

The technological possibilities of ring spinning machines were studied, efficient use of local raw materials. Due to the improvement of the technology of spinning cotton and chemical fibers by the "Siro" method, as well as the production of high-yield yarn, improving yarn quality, reducing technological processes in spinning mills, the introduction of the Siro method will increase labor productivity by 25-30%.

Siro spun yarns from cotton and chemical fibers are characterized by abrasion resistance, high strength, and low hairiness.

The quality of regular yarn produced by the classical method, the unevenness of the yarn and the elongation at break, as well as the abundance of technological advances lead to an increase in the cost of yarn.

The method that bypasses these processes a bit is Siro as a method of spinning, technical technological processes, electricity, number of transition, a reduction in labor costs is achieved.

The sequence of technological processes of the classical and Siro methods is shown in Figure 1 [1,2,3,4].

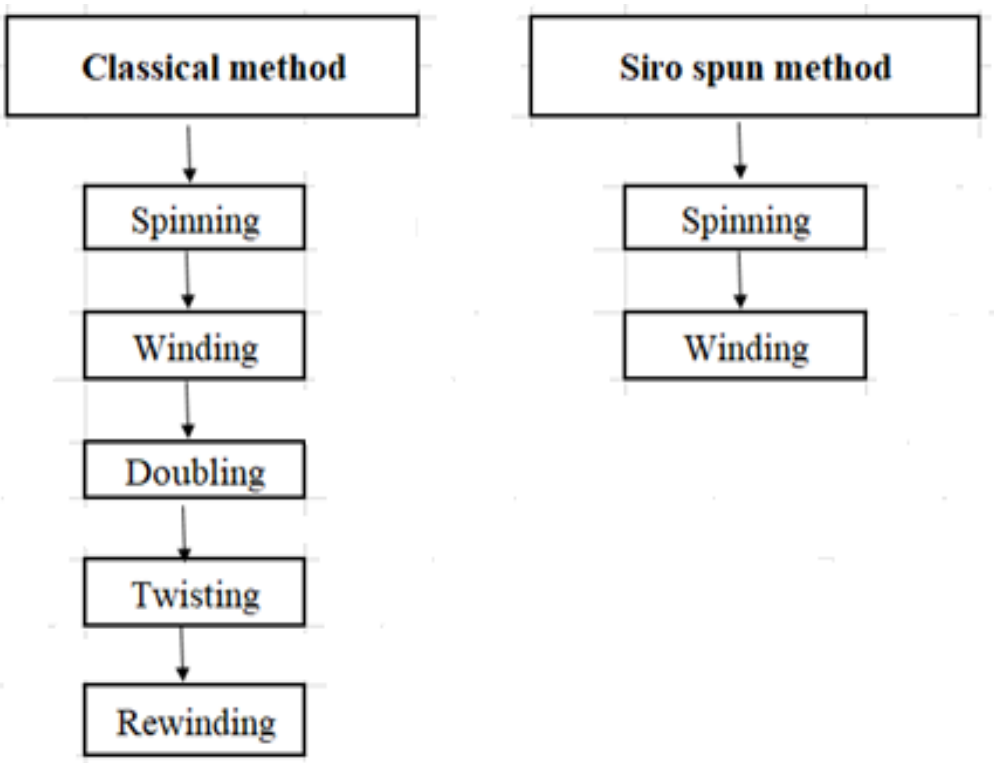


Figure 1. Technological sequence of production of classical yarn and Siro yarn.

The research of domestic and foreign scientists has allowed to create and implement a number of new twisting machines. VTS Volkman (FRG), Yantra (NRB), Savio (Italy), Rieter (Switzerland), Marzolli (Italy) and other companies, is carrying out this work [5,6].

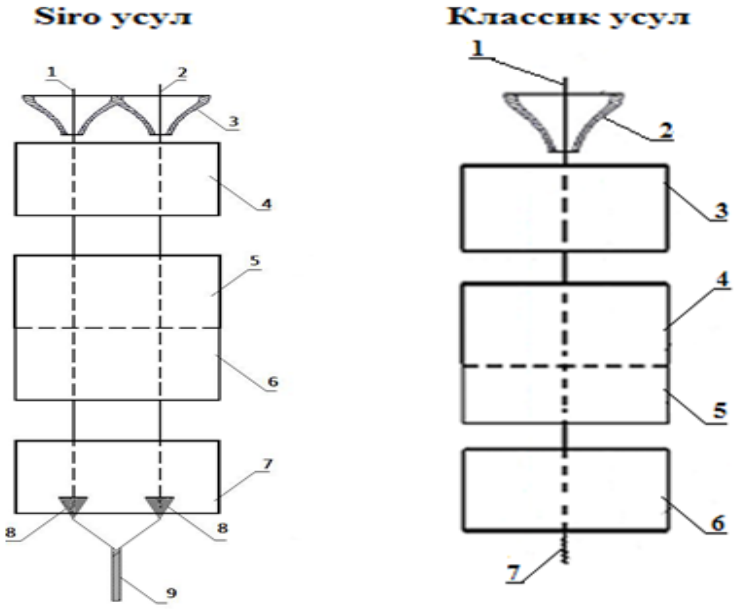


Figure 1.1. **Figure 1.2.**

1-Cotton and chemical fiber yarn;1 Chemical fiber roving;

2 Single-eyed densifier;2-Cotton fiber roving;

3- Unwanted crushing roller 3-Two-eye densifier;

4 -The belt crushing roller; 4- Incoming crushing roller;

5- Belt transmission cylinder;5 Belt crusher;

6- Exhaust crushing roller; 6 Belt transmission cylinder

7-Spun yarn; 7-Spinning crushing roller;

8 twisting triangle;

9 Spun yarn

Siro spinning technology was first developed in 1947 by Nesler A.M. was suggested by, however, this method was not widely used due to the lack of a reliable means of controlling the breaks in one of the two sliver of the spun yarn [7,8].

The SIRO spinning method was invented by CSIRO laboratories in 1975-76 and commercialized in 1980.

A brief spinning plan for the production of Siro spun yarn from a blend of cotton and polyester (50% / 50%), Cotton and bamboo (50% / 50%),polyester and bamboo (50/50%) was developed and is presented in Table 1.

The first experimental work was carried out by JV Osborn Textile,

100% polyester, 100% bamboo and 100% cotton in the blowroom department during the test, 1) 70% of Porlok-2 4-type 1-grade fiber, and 2) Sultan variety 4-type 2-grade cotton fiber 30% mixed and carded sliver was obtained.[9,10].

Experimental tests of quality indicators of the carding sliver were carried out in the training and production laboratory of the department "Spinning Technology"[11]. A plan for spinning the experimental test results was developed. According to the plan, the technological parameters of the car were re-adjusted.

TABLE 1 BRIEF SPINNING PLAN OF COTTON AND CHEMICAL FIBERS (50/50) MIXED YARN SPINNING OF JV "OSBORN TEXTILE" JV LLC

№	Technological equipment item	Linear density of the output, tex	Doubling count d	Draft count E	Twisting count		Delivery speed		Efficiency, %	Theoretical productivity kg / h
					α_t	K bur/m	V m/min	n min^{-1}		
1	Card C 60	5363	1				165		0.90	60
2	Draw frame 1 transition SB-D 45	5363	6				500		0.85	150
3	Draw frame II transition RSB-D 35	5100	8	8,36			500		0.85	150
4	Roving frame Zinser-668	900	1	5,65	8,7	29		1100	0.90	0,9
5	Spinning frame Zinser-350	32	2	45,38	32.63	730		15480	0.90	0,022

The linear density of cotton mélange, polyester, bamboo, 0-pass shearing fibers delivered to the test laboratory was determined according to the plan, and experiments were conducted on the equipment available in the laboratory[12,13]In this transition, based on the technical characteristics of the HSR-1000 draw frame machine, the parameters of the machine were changed accordingly. Then, on a RSBD-45 draw frame machine, 500 tex linear density sliver were obtained and the figures are given in Table 1.1, 1.2.

TABLE 1.1 PROPERTIES OF COTTON FIBER (RESULTS TESTED IN HVI)

№	Fiber on process	Stapel	Length, inch	Mic	Streng t, cH/tex	Rd	+b	Trash count	SFI, %	Unifo rmity , %	Elon gatio n, %
1	Cotton fiber in bale	36,0	1,12	4,6	28,33	75,90	9,10	3,0	4,30	83,00	6,86

TABLE 1.2 NUMBERS OF COUNT OF COTTON, POLYESTER, BAMBOO YARNS

Items	Number of count, ktex
100% , cotton fiber	5.0 ктех
100%, polyester fiber	5.0 ктех
100%, bamboo fiber	5.0 ктех

Before entering the selected and calculated values in the Zinser-668 spinning machine into the machine's computer program, the total elongation constant of the machine was changed and the total elongation variable gears were replaced, and the calculated values were entered into the machine's computer control screen.The machine was started and the expected result was obtained from the experiment, ie Ne 0.65, linear density 500 tex cotton polyester, linear density 900 tex fibers from bamboo fibers.

TABLE 1.3. NUMBER OF COUNT OF COTTON, POLYESTER, BAMBOO YARNS

Items	Roving count
100% , cotton fiber	Ne0.65
100%, polyester fiber	Ne0.65
100%, bamboo fiber	Ne0.65

Sequence of technological processes in Osborn Textile JV

- BDT-019 automaticaly bale opener;
- BLBO condenser;
-Blow room line by Trutzschler;
- DK-803 carding machine;
- 1-VOUK draw frame machine at 0 passage;
- HSR-1000 draw frame machine;
- Zinser-668 roving machine;
- Zinser-350 ring spinning machine;

In order to obtain the "Siro" spun yarn on the Zinser-350 ring spinning machine, the movement scheme of the machine was analyzed, the machine's elongation and cooking gears were replaced,

the corresponding calculations were performed, entered into the computer program and the results were obtained.

The densifiers installed on the spinning machine's drafting zone were replaced with specially designed densifiers to form the Siro yarn. Siro cotton yarn and chemical fiber yarn were sent to the two-eyed spinner separately, and the flyer coming out of the stretcher was separated and twisted by means of a twisting triangle.

The quality of Ne 18 Siro yarns obtained as a result of the experiment was determined on modern test equipment in the laboratory of Bakan Tex LLC and JV Osborn Textile.

TABLE 1.4. NUMBER OF SIRO YARNS MIXED FROM COTTON, POLYESTER, BAMBOO FIBERS

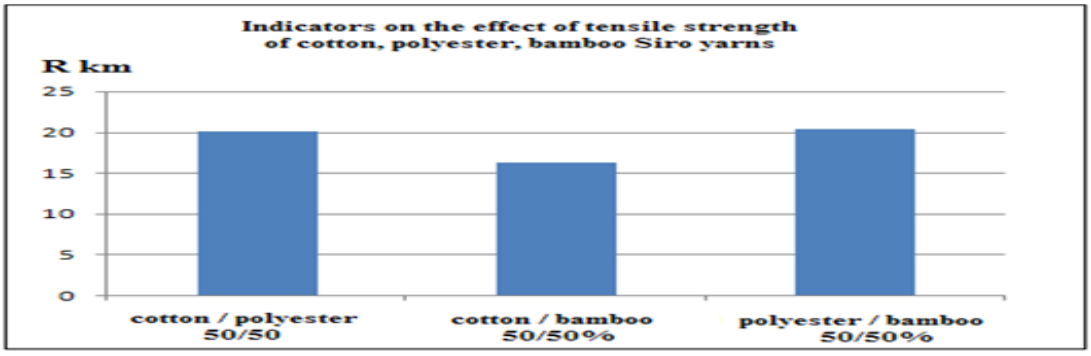
Items	**Yarns count**
Cotton/polyester50/50	Ne 18
Cotton/bamboo50/50	Ne 18
Polyester/bamboo50/50	Ne 18

Physical and mechanical properties of Siro yarns obtained from a mixture of cotton and chemical fibers (yarn number (Ne), number of twists (T / m), tensile strength (cN / Tex), Uster% (Cv), yarn thinness (-50%), yarn thickness (+ 50%), number of nepses (+ 200%), yarn hairiness (H) and yarn thickness) are given in the tables and figures below.

TABLE 1.5 PHYSICAL AND MECHANICAL PROPERTIES OF SIRO YARNS OBTAINED FROM A MIXTURE OF COTTON AND CHEMICAL FIBERS

	Item name	Cotton/polyester 50/50	Cotton/bamboo 50/50	Polyester/bamboo 50/50
1	R_{km}	20,06	16,29	20,30
2	CV/(R_{km})	6,78	5,95	6,57
3	E	7,29	7,06	14,68
4	CV(E)	6,57	9,58	5,48
5	PP	658,0	534,6	666,04
6	CV(PP)	6,78	5,95	6,57

Figure 1.3



In this research work, cotton / polyester (50/50%), cotton / bamboo (50/50%),polyester / bamboo (50/50%) mixed Siro baked yarns were produced on a ring spinning machine made of 100% cotton, 100% polyester, 100% bamboo fibers, Siro yarn strength , were compared in terms of friction resistance, unevenness, hairiness, and tensile strength. The physical and mechanical properties of the obtained Siro spun yarn were studied. The effect of the raw material on the properties of the spun yarns, the number of yarns, the twisting coefficient and the distances between the yarns were studied. The effect of the raw material on the physical properties of the yarn was found to be statistically significant. Cotton-spun yarn from a mixture of cotton / polyester (50/50%) was found to have better quality performance than cotton / bamboo, cotton / viscose mixed fiber Siro-spun yarn.

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