THE EFFECT OF COTTON FIBER MICRONAIRE INDICATOR ON YARN UNEVENNESS

Kazakova Dilafruz Erkinovna
PhD, Associate Professor of Jizzakh Politechnical Institute.

Samiyeva Nuriniso Baxtiyorovna
Master of Jizzakh Politechnical Institute

Rakhmonkulova Visola
Student of Jizzakh Politechnical Institute

Abstract

This article presents a study of the effect of cotton fiber micronaire on yarn unevenness. For this, a LOT was prepared in 3 variants. In these LOTs, in the 1st variant Porloq-4, in the 2nd variant An-bayaut-2 and in the 3rd variant Sultan selection (type IV, I-grade) cotton fibers were used. Given that the quality of yarn obtained from fibers with a micronaire value of 4.5 (Porloq-4) is close to the quality level of the Uster requirements (50%), it is recommended to include fibers with this micronaire in the mixture.

Keywords: fiber, yarn, type, variety, micronaire, unevenness, tensile strength, knot, linear density.

Introduction

The textile industry has a special place in the economy of our country and now structural reforms are being carried out in the use of textile raw materials. On the basis of the decisions taken by our government, the task is set to "... ensure the stability of the national economy and increase the share of industry in GDP, doubling the production of textile products ..." [1]. In carrying out this task, it is important to study and introduce into production the technology for processing new varieties of cotton fiber.

Cotton fiber, which is a component of textile fibers, is the most valuable raw material. Cotton fiber products are superior to other textile products due to their hygroscopicity and high environmental requirements. Determining the properties of this fiber that meets the highest requirements and its proper use is an important task.

Cotton fibers are divided into types and industrial varieties in accordance with Uz RST 604-2016. Fibers are divided into nine types according to their physical and mechanical properties according to the standards set by staple length, linear density and specific tensile strength (grades I and II). Types 1a, 1b, 1, 2, and 3 are fine fibers, and types 4 and 7 are medium fibers [2].

Each type of cotton fiber is divided into five grades according to the color and maturity coefficient of the samples approved in the prescribed manner.

Depending on the type and navigation, cotton fibers differ in basic properties such as staple length, micronaire and specific tensile strength. These indicators provide quality indicators of its products. The raw material used in the spinning process, the fiber must meet certain requirements. Technological parameters of cotton fiber - physical, mechanical, geometric properties ensure the strength of the yarn obtained from it. Therefore, today it is necessary to use modern measuring systems that work with high accuracy in determining the fiber.

Research Methodology

Cotton spinning enterprises around the world, as well as many spinning mills in Uzbekistan, use the international standard "USTER Statistics-2018" to determine the length of the fiber and the upper half mean length (UHML, mm), strength (Strength, g / tex), fiber fineness or degree of maturity (Micronaire), color reflection (Rd), yellowness (+ b), Spinning Consistency Index (SCI), impurity (Trash,%), short fiber index "12 mm long fibers" (SFI,%) , [3,4] are compared by fiber knots or defects (Neps), and then a selection is made from fibers whose indicators are close to each other. In this way, the required quality of the yarn is achieved in all respects.

At present, the Uzbek spinning mills have modern laboratories HVI (High Volume Instrument), AFIS (Advanced Fiber Information Systems) (Switzerland), MAG Premier Tester (India), MIKRONAIRE KMA (Japan), Zellveger Uster (Germany), MESDAN (Italy). The mixture is formed on the quality indicators of cotton fiber determined in the equipment [5].

Results and Discussion

The main quality indicators of cotton fiber yarns with different microns were analyzed at the controlled enterprise. LOT was prepared in 3 variants for bining. In these LOTs in the 1st variant Porloq-4 IV-type, I-sort, in the 2st variant An-bayaut-2 IV-type, I-sort and in the 3rd variant Sultan selection IV-type, I-sort cotton fiber were used (Table 1).

Table 1 Micron air indekes the main properties of Ne 27/1 (21.7 tex) yarn

Name of indicators	Unit of measure	Uster-statistics-2018 (50%)	N_e 27/1		
			1- variant (mic 4.5)	2-variant (mic 4.7)	3-variant (mic 4.8)
Linear density	teks	21,7	21,7	21,7	21,7
Linear density unevenness	%	1,0	0,5	0,7	1
Number of in twists	b/m	800	900	900	900
Unevenness in twists	%	3,50	3,3	3,5	3,7
Breaking strength	cN	358	360	355	350
Unevenness in breaking strength	%	7,8	5,5	6,5	7,0
Relative breaking strength, (Rkm)	cN/tex	16,9	17,0	16,3	15,5
Elongation at break, E	%	5,48	5,5	5,2	5,0
Elongation unevenness	%	7,25	5,5	6,5	7,0
Uster unevenness, (U)	%	12,83	12,50	12,75	12,85

As can be seen from Table 1, the yarn quality index is close to 50% of the Uster requirements when the average micronaire index of the fiber in the mixture is 4.5. The defects of the yarn (thin-thick places and knots) show an increase in the yarn obtained from a mixture of 4.7 and 4.8 microns of fiber. This is due to the high fiber content of the micronaire. The analysis shows that the physical and mechanical properties of the yarn were improved when the number of fibers in the cross-section of the yarn with a linear density of 21.7 tex was up to 360 (Mic 4.5). Figure 2 shows an increase in linear unevenness (CV%) and twist unevenness (CV%) of yarn produced from a mixture of fibers with a micronaire index of 4.7 to 4.8 (Ne 27).
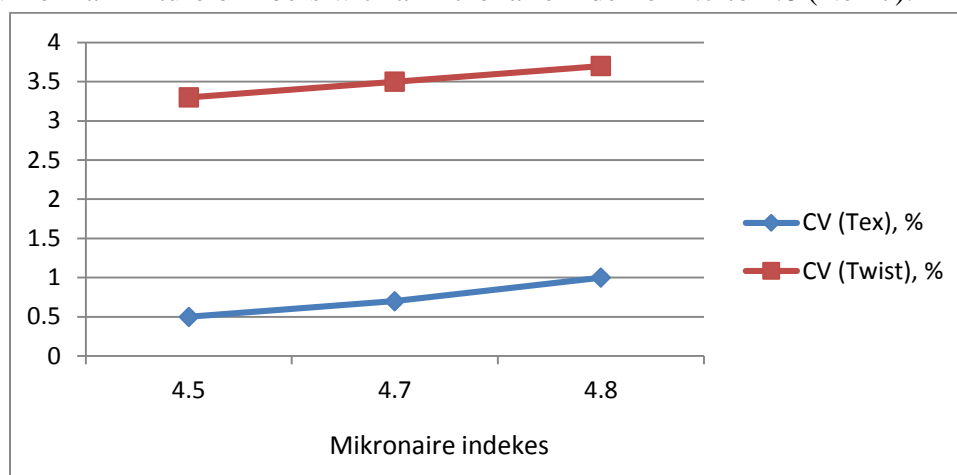

Figure 2. CV (T) is the linear density of the micronaire
CV (K) is the unevenness of the twists

We know that a yarn with a low linear density inequality will perform well on all irregularities. An increase in the micronaire value of cotton fiber between 4.7 and 4.8 led to an increase in the unevenness of the yarn properties, i.e., in terms of linear density, tensile strength, elongation at break, and unevenness (U,%). (Figure 3).
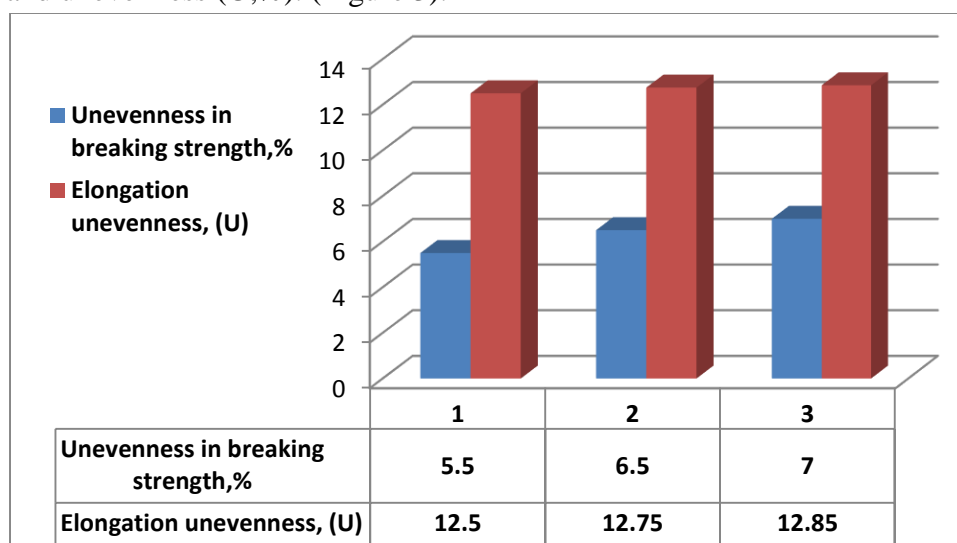

	1	2	3
Unevenness in breaking strength,%	5.5	6.5	7
Elongation unevenness, (U)	12.5	12.75	12.85

Figure 3 Breaking strength and Unevenness on the Uster

Conclusion

In order to use the physical and mechanical properties of cotton fiber to improve the properties of the yarn during the spinning process, the effect of micronaire parameters on the quality of the yarn was analyzed. According to the results of the study, in the LOT of 3 variants of the control enterprise, the linear density, tensile strength, elongation irregularities in the yarns obtained from 4.7 and 4.8 microns of yarn increased compared to the yarn spun from 4.5 microns of cotton fiber. Since the quality of the yarn obtained from fibers with a micronaire of 4.5 is close to the quality level of the Uster requirements (50%), it is recommended to include fibers with this micronaire in the composition of the mixture.

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