UDC 677.072.32

DISPERSION ANALYSIS OF THE EFFECT OF AUTOGENOUS ABRAISON ANGLE ON WEAR RESISTANCE OF SEMI-RIGID YARN

ДИСПЕРСИОННЫЙ АНАЛИЗ ВЛИЯНИЯ УГЛА САМОИСТИРАНИЯ НА ИЗНОСОСТОЙКОСТЬ ПОЛУШЕРСТЯНОЙ ПРЯЖИ

Valieva Z.[1], Makhkamova Sh.[2], Temirov Sh.
Tashkent Institute of Textile and Light Industry, Uzbekistan
e-mail: zulfiya-valieva-76@mail.ru[1], shoira-0218@mail.ru[2]
Валиева З.Ф.[1], Махкамова Ш.Ф.[2], Темиров Ш.И.
Ташкентский институт текстильной и легкой промышленности, Узбекистан

Keywords: wool yarn, linear density, abrasion angle, wear resistance, dispersion analysis.
Ключевые слова: шерстяная пряжа, линейная плотность, угол истирания, износостойкость, дисперсионный анализ.

Abstract. This article presents the results of the study of the resistance to autogenous abrasion of half-grained yarn at various values of the abrasion angle. Based on the results of the studies, a dispersion analysis was carried out, which makes it possible to graphically cite the effect of the abrasion angle on the wear resistance of wool yarn and give formulas for the functional dependence of the abrasion angle degree on the number of cycles.
Аннотация. В данной статье приведены результаты исследования стойкости к самоистиранию полушерстяной пряжи при различных значениях угла истирания. По приведённым результатам исследований проведён дисперсионный анализ, что даёт возможность графически привести влияние угла истирания на износостойкость шерстяной пряжи и приведены формулы функциональной зависимости градуса угла истирания на количество циклов.

One of the integral parts of the national economy is the textile industry, and within its framework, one of the most multivendor is woolen production.

The processes of primary processing of wool and spinning are the most important at the preparatory stages of spinning production, from the point of view of a complex irreversible effect on many characteristics (properties) of fibers.

One of the important properties of textile materials is their resistance to abrasion, since it allows to predefine the wear resistance of products made from them. The abrasion resistance of the filaments depends mainly on their fibrous composition and structure.

Research work was carried out in the conditions of the Centexuz laboratory. The objects of study in this work were: half-grained yarn with different PAN fiber content: Samples 1–50 % wool + 50 % PAN; Samples 2–70 % wool 30 % PAN.

To measure the resistance of threads to abrasion Universal PPI device was used for self-cleaning testing of different types of yarn. Any abrasion angle that can be set on the device ranges 0–120°. The principle of operation of the device is that the bar has a reciprocating motion; rubbing of thread against thread occurs in area of loop crosshairs, which is formed by special filling of the thread. The yarn in this case is both a sample and an abrasive.

Carriage speed (80 cycles per minute) is set by turning handle located on device rear wall to position corresponding to specified speed. Depending on the purpose of the study, the speed of the carriage can be changed. After that, the device is switched off by pressing the stop button. Establish a mobile level by means of the lock screw on the angle of attrition 90°, and the counter – on zero by means of dumping handles. Suspensions with lower clamps are installed in filling position, for this purpose handle is turned on side wall of device clockwise until click. Conduct tests. Threads 6 are filled into device clamps taking into account direction of final twist. A thread 0.5 m long is unwound from the package.

One end of the thread is brought into upper clamp and clamped, and the second end of the thread envelopes guide bushing and bushings located on movable plate. As a result, a loop of two is formed on the bushings thread sections; besides, loop crosshairs should be on the same level with the central risk of the bar. The free end of the thread, enveloping the guide roller, is passed through the lower clamp, and then enveloped with this end pin on the preload lever, on the right end of which there is a load providing the preload of the thread. Lifting the pin to horizontal position, lower clamp jaws are clamped. The weight of the preload is selected depending on the linear density of the yarn. Actual thread load is calculated by formula:

$$P_{act}=13P^{/}/5$$

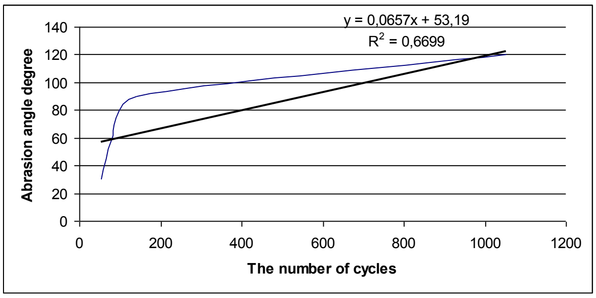
where $P^{/}$ – preloading thread, cN.

The thread load is set at 1 cN/tex. If the working load is higher than the actual load, the missing load is installed on the suspension. After that, suspensions with weights are brought to operating position by turning the handle located on the side wall of the device counterclockwise; at that suspensions hung on tested threads. A movable plate is installed at working abrasion angle 90°. The crosshairs of the loop when the bar is installed at the working abrasion angle must coincide in level with the central mark of the bar. Switch on the sound toggle switch, and then press the "Start" button to start electric motor. In this case, the carriage will start to reciprocate and the thread will rub at the place where the loop is formed. After one of the threads is broken, which is signaled by the sound signal, and the motor stops, the segments clamped in the upper and lower clamps are removed from the bushings of the movable bar and allow them to sag freely in the vertical position so that they cannot prevent abrasion of the remaining threads. Start the motor again by pressing the start button. These operations are repeated until all 10 yarns have been tested. After all the 10 strands are broken, the clamps are released from the rest of the tested strands. This finishes the test cycle of one filling (10 threads) and the instrument is ready for the next filling. In total, at least 50 tests are carried out.

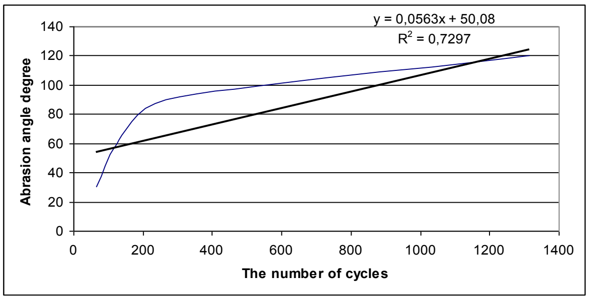
A dispersion analysis was carried out of the angle effect during self-destruction on the number of cycles of hemispherical yarn with a different PAN fiber content.

Table 1 – Influence of the angle during self-abrasion of semi-woolen yarn on the number of cycles

№	Yarn Name	Angle at self-destruction			
		30^0	60^0	90^0	120^0
1	50 % wool +50 % PAN fiber	66	124	265	1314
2	70 % wool +50 % PAN fiber	54	80	140	1053



Samples 1



Samples 2

Figure 1 – Graph of the dependence of the angle of abrasion of semi-woolen yarn on the number of cycles

Samples 1 – 70 % wool 30 % PAN; Samples 2 – 50 % wool + 50 % PAN

Testing yarn samples for autogenous abrasion using instruments and PCBs, it was obtained that as the abrasion angle increases, the number of sustained cycles increases with the linear dependence.

References

1. Woods, H. J. Journal of the Textile Institute. – Proc., 1964. – 55, 2. – № 9. – 13 p.
2. Koritsky, K. I. Fundamentals of designing yarn properties. – M. : Gizlegprom, 1963. – 246 p.
3. Razumeev, K. E. Design of woolen combed ribbons and yarns on the basis of instrumental determination of the properties of unwashed wool : Diss. ... doct. tech. sciences. – M. : MSTU im. A.N. Kosygin, 2003. – 315 p.
4. Koritsky, K. I. Fundamentals of designing yarn properties. – M. : Gizlegprom, 1963. – 246 p.
5. Razumeev, K. E. Design of woolen combed ribbons and yarns on the basis of instrumental determination of the properties of unwashed wool : Diss. ... doct. tech. sciences. – M. : MSTU im. A.N. Kosygin, 2003. – 315 p.
6. Razumeev, K. E., Rashkovan, I. G. Classification of mixtures of woolen and combed wool yarn production, refined and harmonized with the new classification

of domestic sheep wool in accordance with GOST 30702-2000 // Sheep, goats, wool business. – 2002. – № 4. – Pp. 6–15.
7. Razumeev, K. E. Measuring the length, strength and position of the break point of a staple of unwashed wool // Sheep, goats, wool business. – 1998. – № 4. – Pp. 30–32.