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YARN PRODUCTION OF PRESET PROPERTIES BY SORTING OF COTTON FIBRES ACCORDING TO THEIR MATURITY

ПРОИЗВОДСТВО ПРЯЖИ ЗАДАННЫХ СВОЙСТВ ПУТЕМ РАССОРТИРОВКИ ХЛОПКОВЫХ ВОЛОКОН ПО СТЕПЕНИ ИХ ЗРЕЛОСТИ

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ABSTRACT

COTTON FIBER, MATURITY, FRACTION, DIELECTRIC SEPARATOR, TRIBOELECTRIC SEPARATOR, YARN, GRADE.

The question of irregularity of cotton fiber properties and the ways of their adjustment. This is due to the fact that the cotton balls open asynchronously and one after another on the branches. Non-simultaneous opening of cotton balls on the bush is considered as a negative phenomenon, because it leads to the formation of fiber properties and hence the irregular property of yarn made from it. Calculations resulted in the index R_{km} yarn and conclusion on the need of evaluation of before break mechanical characteristics of the yarn.

АННОТАЦИЯ

ХЛОПКОВОЕ ВОЛОКНО, ЗРЕЛОСТЬ, ДИЭЛЕКТРИЧЕСКИЙ СЕПАРАТОР, ТРИБОЭЛЕКТРИЧЕСКИЙ СЕПАРАТОР, ПРЯЖА, СОРТ

Рассматривается вопрос неравномерности по свойствам хлопкового волокна и пути их выравнивания. Это связано с тем, что коробочки хлопчатника раскрываются на плодовых ветвях неодновременно, а последовательно одна за другой. Неодновременность раскрытия коробочек на кусте хлопчатника также является отрицательным явлением, т.к. приводит к образованию неровноты по свойствам волокна и, следовательно, по свойствам пряжи из него. В результате расчетов определен показатель R_{km} пряжи и сделан вывод о необходимости оценки показателей доразрывных механических характеристик пряжи.

It is known that the cotton balls open one after another on branches of cotton cones at different times. Even in a single ball the fibers on the seeds ripen faster, which are located closer to the branches. Fibers, that are growing on the blunt end of the seed - the chalazae, they are usually longer, but less mature and therefore less stable. Thus, balls and seeds they contain are differing from each other mainly by the degree of fiber maturity. Non-simultaneous opening of the balls on the cotton bush is a negative phenomenon, as it leads to the formation of fibers with irregular properties hence the irregular property of yarn made from it. The indicators of physical and mechanical properties of the resulting yarn will have a higher irregularity, which is reducing quality of its category.

According to the yearly cotton exhibition and textile indications the quality of cotton fibers has been improving in Uzbekistan every year. Lately, in Uzbekistan mainly of cotton fibers of type 4 and 5 have been cultivated. Additionally, the possibility of production of assortment of yarn, it can be said, limited data types, i.e. the physical and mechanical indicators of yarn produced limited performance properties of data types.

To expand the possibilities of producing yarn of a higher category the device was designed for sorting out according to the degree of raw cotton fiber maturity [1, 2]. Thus, the challenge to increase the competitiveness and improve the image of the world cotton market products addressed by the selection of the most mature fibers from the raw materials in an electric field generated by a turboelectric separator [3]. For this leaflet raw cotton detachment cotton 2nd commercial grade separated into four fractions (groups), physical and mechanical properties in the fibers of which are presented in Table 1.

Table 1 – Physical and mechanical properties of the fiber

Fractions	**Exit, %**	**Breaking load, sN**	**Linear density, mtex (micronaire)**	**Coefficient of maturity**	**Breaking tenacity, sN/tex**	**Grade**
First	53,3	4,6	191 (4,85)	2,0	24,1	First
Second	21,8	4,3	180 (4,57)	1,9	23,9	Second
Third	14,2	3,6	154 (3,91)	1,7	23,4	Third
Fourth	10,7	3,5	150 (3,81)	1,6	23,3	Third
Background	100	4,1	173 (4,39)	1,9	23,7	Second

As it can be seen from the table the first fraction corresponds to the first class, and its share is 53.3 %. Breaking strength of the fiber in this group of 4.6 cN that 0,5sN (11 %) more than the original fiber (4,1sN). Maturity Ratio of the first group of fibers is 2.0, and the source has a coefficient of 1.9. The second group corresponds to the 2nd grade with a yield of 21.8 % and a tenacity of 4.3 cN, which differs from the original in 5 %. The third and fourth fractions correspond to class 3rd, respectively a tenacity of 3.6 cN and 3.5, 0.5 and 0.6 cN less than the initial fiber.

Important criteria are cotton fiber maturity and breaking load. Higher maturity and greater breaking load of the first fiber fraction is due to the fact that as a result of passing through an electric field leaflet of cotton removed less mature and weaker fibers. This phenomenon is explained of A.Rosabaev [3] that with increasing weight decreases leaflet, leaflet fiber strain and the multiplicity of electric force pressing them. This increases the elasticity of the fibers, alongside with increasing weight increase leaflet physic-mechanical properties of the fibers and seeds (maturity, grade, elasticity, etc.). Therefore, leaflet raw cotton fibers with high grade and hence less deformed greater elasticity than the fibers leaflet raw cotton low grade and less elastic. This explains the weak pressing more mature fibers leaflet and earlier, their separation from the charged surface of the separator. Note that the second fraction of the fibers may be sorted if necessary; the more mature the fibers, which is necessary to pass repeatedly through the electric field group. Thus, it is possible to regulate the proportion specified quality fibers depends on consumer demand. Therefore, reducing irregularity on the degree of maturity of cotton fibers we can achieve the production of a given yarn quality category.

To predict the rupture characteristics of cotton yarn, in particular, the index Rkm we use the formula proposed by South Indian textile research center (SITRA) [4]:

for carded yarn: for combed yarns:

$$R_{км} = 1{,}27\left(\sqrt{\frac{L \cdot R_b}{M}}\right) + 4{,}0 - 13 \cdot \frac{N_e}{150}, \text{ gf/tex} \qquad R_{км} = 1{,}27\left[\left(\sqrt{\frac{L \cdot R_b}{M}} + 4{,}0 - 13 \cdot \frac{N_e}{150}\right) \cdot \left(1 + \frac{Y}{100}\right)\right], \text{ gf/tex}$$

where L – mean fiber length, mm; R_b – relative breaking load of fiber, gf/tex; Ne –english yarn number; Y – the proportion of comb crest tow, %; M – micronaire fibers, mg/inch.

In this paper the forecasting index R_{km} carded and combed yarn linear density of 20 tex, and, with a share of 17 % tow. Used fiber cotton breeding varieties with 6524, which in its original form had an average length of 33.5 mm, the relative tensile strength of 4.1 gf/tex; micron ire of 4.39 mg / in. After sorting leaflet on the degree of maturity of its fiber average length remains unchanged. The relative breaking load and micron ire changed compared to the originally fiber that is presented in Table 1. Based on these parameters

relative prediction performed yarn breaking load using the above formulas. The results of calculation are shown in Table 2.

Table 2 – Physical and mechanical properties of the fiber and yarn indicator R_{km}

Fractions	Upper half mean length, mm	Breaking load of fiber, cN	Linear density of the fibers, mtex (micronaire)	Coefficient of maturity	Breaking tenacity of fiber, cN/tex	Yarn Rkm, cN/tex
First	33,5	4,6	191 (4,85)	2,0	24,1	17,82
Second	33,5	4,3	180 (4,57)	1,9	23,9	18,34
Background	33,5	4,1	173 (4,39)	1,9	23,7	18,50

Based on these parameters relative prediction performed yarn breaking load using the above formulas. As can be seen from the table, less mature and less durable fiber provides a more solid yarn, which is a paradoxical phenomenon. Therefore, to evaluate the mechanical characteristics of the yarn only discontinuous characteristics are not enough, in connection with which there is a need to evaluate the mechanical characteristics of the yarn parameters before rupture characteristics.

Repeated experiments were carried out, in which the leaflets raw cotton on a triboelectric separator were sorted by fractions (Fig. 1). As it can be seen, leaflets raw cotton by mass are distributed according to a successive decreasing law (167 mg, 164 mg, 158 mg, 147 mg) and fall into the corresponding cells of the received hopper.

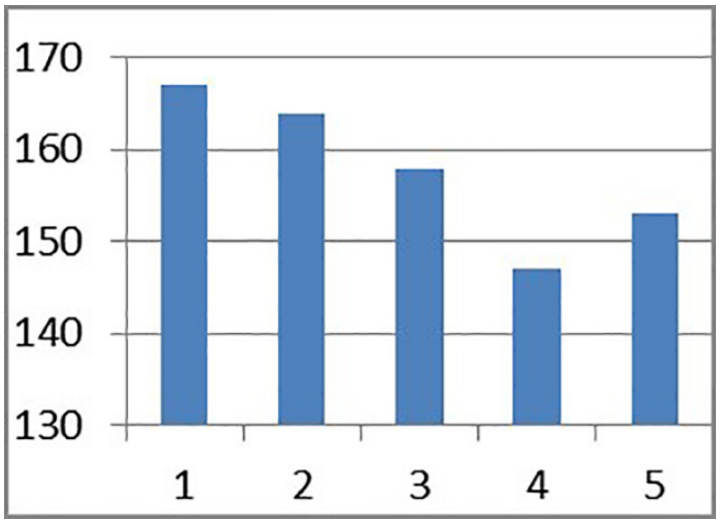

Figure 1 – Distribution of volatiles by mass

Thus, based on the prediction of yarn index it is found that for evaluating yarn mechanical characteristics additional studies are to be carried out to determine the indicators before breaking its characteristics, in particular the modulus of elasticity.

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TEXTILE WASTES AND THE AREAS OF THEIR APPLICATION

ТЕКСТИЛЬНЫЕ ОТХОДЫ И НАПРАВЛЕНИЯ ИХИСПОЛЬЗОВАНИЯ

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ABSTRACT

TEXTILE WASTE, WASTE PROCESSING, NONWOVEN FABRIC

The article gives an overview of areas of textile waste utilization and it proposes one of the options of their use as an integral component for the production of heat and noise insulation materials. The proposed option allows to obtain construction

АННОТАЦИЯ

ТЕКСТИЛЬНЫЕ ОТХОДЫ, ПЕРЕРАБОТКА ОТХОДОВ, НЕТКАНЫЕ МАТЕРИАЛЫ

В статье представлен обзор направлений использования текстильных отходов, предложен один из вариантов их использования в качестве составного компонента для производства тепло- и шумоизоляционных