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IMPROVEMENT OF PROPERTIES OF SEMI-WOOLEN YARN

УЛУЧШЕНИЕ СВОЙСТВ ПОЛУШЕРСТЯНОЙ ПРЯЖИ

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ABSTRACT

WORSTED YARN, SOFTENING FINISHING, SOFTENER, YARN STIFFNESS, YARN BREAKING LOAD

The article discusses the technology of softening finishing for the semi-woolen yarn in order to improve its quality indicators and application characteristics. The results of experimental studies to determine the type of finishing agent for softening worsted yarn used in knitwear production are presented.

АННОТАЦИЯ

КАМВОЛЬНАЯ ПРЯЖА, УМЯГЧАЮЩАЯ ОТДЕЛКА, МЯГЧИТЕЛЬ, ЖЕСТКОСТЬ ПРЯЖИ, РАЗРЫВНАЯ НАГРУЗКА ПРЯЖИ

В статье рассмотрена технология умягчающей отделки полушерстяной пряжи с целью повышения ее качественных показателей и потребительских свойств. Приведены результаты экспериментальных исследований по определению вида аппретирующего препарата для умягчающей отделки камвольной пряжи, используемой в трикотажном производстве.

The worsted yarn produced at Slonimskaya WSM Company is designed for the production of a wide range of knitwear: hosiery, gloves, underwear, hats, shawls, scarves, etc. This yarn has always been in demand among consumers, as it has good physical, mechanical, and hygienic properties.

Moreover, in recent years, consumers' demand for the quality of worsted yarn has increased significantly. This is explained by the fact that after dyeing the yarn becomes stiffer and does not always meet the requirements of the new range of knitwear and customer requests. This situation sets the task of developing new

technologies to give yarn and knitwear the required softness of the neck, crease resistance, dimensional stability, pleasant feeling when worn, and the ability to maintain original appearance after washing [1].

The most rational way to ensure the necessary properties of worsted yarn is to use methods of softening of the finishing of this yarn with special chemical dressing preparations [2].

The best way is to carry out finishing treatment at the dyeing stage, using the dyeing equipment available at the enterprise facilities.

During the study, one of the main tasks was to select the most suitable dressing agent for worsted yarn.

For the research, the following types of softeners were selected, differing in their performance, stability, optimal conditions of action, and shelf life: Savinase 16L, Intex-M, Belfasin 44, and Alfalinabt-200.

Savinase 16L is an enzyme preparation based on proteolytic enzymes for various technologies for refining wool, including for partial targeted destruction of the cuticle. As a result of complete or partial destruction of the scaly layer (cuticle) of the woolen fiber due to a decrease in their frictional properties, the woolen fabric acquires a soft, silky neck.

Alfalinabt-200 is added at the end of dyeing to make the yarn soft and airy. This preparation is suitable for all types of yarns and has a high softening effect, it gives the yarn softness, airiness, and smoothness at the same time, and a very good antistatic effect.

Belfasin-44 is a preparation for the treatment of textiles made from almost all types of fibers. It is recommended for finishing. It easily penetrates the very core of fibers or fabrics, imparting greater inner softness.

Intex-M is added at the end of dyeing to make the wool yarn soft and reduce creasing. The solution has a good penetrating ability and is evenly distributed in the fiber structure, which provides good physical and mechanical properties of the yarn, gives the products softness, bulk and fullness.

The working solution of the softener is prepared by dissolving it in water using compressed air injection or any conventional mechanical stirrer.

A semi-woolen worsted yarn with a linear density of 31 texx2 of the following composition: woolen fiber – 70 %, and acrylic fiber – 30 %, was subjected to a softening finish.

Using these preparations, samples of worsted yarn were processed after the dyeing process, followed by drying. Each sample was examined according to two parameters [3]:

- loss of yarn mass after softening treatment;

- the stiffness of the yarn.

To estimate the quality of the yarn produced after softening treatment, the following method was used. From the grey yarn and the yarn that underwent softening finishing, samples of knitted fabric with a size of 160x30 mm were produced. The production of prototypes was carried out on a class 10 knitting machine.

Weight loss is determined by weighing knitted fabric samples, and flexural stiffness is determined using standard textiles. For this, the following dependency was used:

- on the stitch post

$$EI(s) = 42046 \times mc / Ao, \mu N \times cm^2, \quad (1)$$

- on the stitch line

$$EI(p) = 42046 \times mp / Ay, \mu N \times cm^2, \quad (2)$$

where mc, mp – the mass of five samples, cut out respectively in the direction of the column or row, g;

A – is the function of relative deflection.

The stiffness coefficient was determined by the dependence:

$$K_{EI} = K_{EI(s)} / K_{EI(p)} \quad (3)$$

The research results are presented in Figures 1, 2.

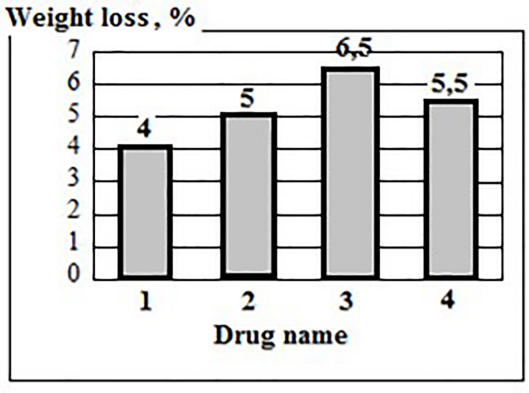

Figure 1 – Weight loss of knitted fabric samples after treatment with different preparations: 1 – Savinase 16L, 2 – Belfasin 44, 3 – Intex-M, 4 – Alfalina BT-200

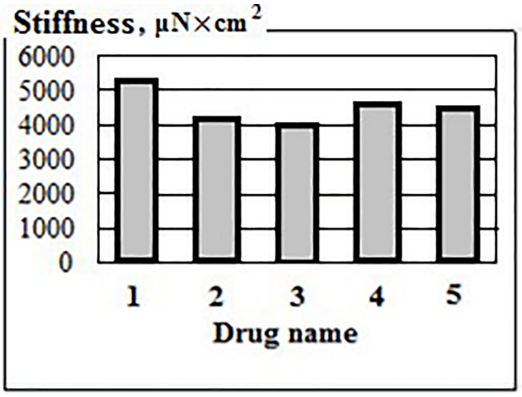

Figure 2 – Stiffness of the base and prototypes of knitted fabric, processed: 1 – without finishing, 2 – Alfalina BT-200, 3 – Intex-M, 4 – Savinase 16L, 5 – Belfasin 44

From the data received, it can be seen that the Intex-M solution showed the best result in the finishing process: the weight loss of the knitted fabric is 6.5 %. This solution effectively removes impurities without damaging the fiber-forming substance.

In addition, a significant increase in the bulk of the fabric is observed due to the increase in the crimp of the wool fiber after enzymatic treatment.

Rigidity studies have also shown that knitted fabrics produced from yarns treated with Intex-M have the greatest softness. This result is confirmed by the organoleptic evaluation of the softness of the knitted fabric.

Thus, a preparation was identified that is most suitable for softening worsted yarn, which is recommended for introduction into the production process at Slonimskaya WSM Company with the aim to conduct a set of studies in order to optimize the parameters of the technological process of the final yarn finishing.

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