

DETERMINATION OF THE OPTIMAL ROTATION FREQUENCY OF THE SUPPLY CYLINDER OF THE SEWING LINEN PICKING MACHINE

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Abstract. *This article presents the results of research on the extraction of recovered fiber from sewing scraps on a pinching machine of the company "SHANDONG SHUNXING MACHINERY" of the enterprise "EUROAZIA ALLIANCE TEX" LLC. The article presents experiments on determining the effective operating parameters of the feeding device for separating sewing scraps into fibers and obtaining recovered fiber, and describes the optimal values of the rotation frequency of the feeding cylinders of the pinching machine. The dependence of the staple length of the fiber, the amount of unrefined scraps and the amount of separated waste on the diameter of the feeding cylinders of the pinching machine when separating sewing scraps into fibers was studied. Sewing threads are our main tool in making clothes and assembling their details. It is of great importance to save raw materials, recycle textile waste and obtain recovered fiber, and produce quality products from them. Our initial research has shown that the efficiency of separating the shreds into fibers depends on the density of the fabric, the type of weave, and the type of fiber and yarn used.*

Keywords: *Pinch, sewing shears, textile shears, regenerated fiber, supply cylinder, fiber, shear rate, breaking strength.*

Аннотация. *В статье приведены результаты исследования получения восстановленного волокна из отходов швейного производства на щипальной машине фирмы "SHANDONG SHUNXING MACHINERY" в ООО "EUROAZIA ALLIANCE TEX". В этой статье описывается, как разделить швейную нить на волокна и провести эксперименты для определения эффективных рабочих параметров подающего устройства при получении регенерированного волокна,*

а также как найти оптимальные значения скорости вращения подающих роликов шпульной машины. Изучены зависимость штапельной длины волокон, количества неразволокненных частей выкровок и отходов от диаметра питающего цилиндра шпульной машины при разволокнении швейных выкровок. Швейные нитки наш основной инструмент при изготовлении одежды, прикреплении ее деталей. Экономия сырья и переработка текстильных отходов имеет большое значение для производства качественной продукции. Предварительные исследования показали, что эффективность разделения разрезов на пряжи зависит от плотности ткани, типа плетения, типа пряжи и типа используемой пряжи.

Ключевые слова: *Зажим, швейные ножницы, текстильные ножницы, регенерированное волокно, подающий цилиндр, волокно, скорость среза, прочность на разрыв.*

Introduction. In the world, great attention is paid to saving raw materials, obtaining recycled fibers from textile waste, and producing high-quality products from them. One of the promising directions for the development of the textile industry of our republic is saving raw materials, obtaining recycled fibers from textile waste, and producing yarn, fabric, and knitted products from them. Sewing threads are the main tool in the manufacture of clothing and the assembly of its details. The assortment of sewing threads is diverse and is classified according to their properties, raw material composition, and structure.

It is possible to work with three gurus (natural, artificial, mixed). These methods are applied to twisted yarns, elemental yarns and mono yarns. The structure of the sewing thread is different from the others (the color of the stitches, the texture). Schuningdek sewing threads are used to build raw materials (molasses thread, lavsan thread, nylon thread, ipak thread).

Sewing threads are classified according to their conventional designs as follows: - by use (clothing, footwear, weaving, embroidery.) - by thickness (Trademark) - by structure (use of right and left twists with the number of additions of 3, 4, 6, 9 and 12) - by fiber composition (cotton, linen, silk, chemical fibers) - by finishing and appearance (dull, shiny, soft or hard dressed, mercerized) - by coloring (white, black and colored). The requirements for sewing threads and thread products are formed based on the need to use them.

Sewing threads must meet the following requirements: - must be uniform in linear density. The thread must pass freely through the eye of the needle and the stitch must not be visible on the fabric - the stitch must be strong and have a high breaking strength so that thread breaks are minimal during sewing - must be soft, a thread with excessive stiffness does not stretch well and causes the formation of a lumpy stitch -

must have high elasticity so that it does not break on the sewing machine and the stitch is durable - must be balanced, a 1 m long thread should not twist and wrap when it is free - the thread must be clean, defects, knots, and fluffy areas are not allowed to remain on the thread due to insufficient cleaning of the weft. Considering that the properties and degree of fineness of the recovered fibers obtained by combining the scraps largely depend on the operation of the combing machines, in particular the process of separating them into fibers, it is important to improve the processing technology. The rational use of textile waste allows saving primary raw material resources, expanding the range of manufactured products, reducing the cost of production and the amount of waste, and creating resource-saving and waste-free production technologies.

To this end, it is advisable to study the process of fiber recovery from secondary raw materials and waste based on theoretical research.

Obtaining high-quality recycled fibers and adding a certain amount of them to the mixture makes it possible to reduce the cost of the yarn being produced.

The properties and degree of fineness of recovered fibers obtained from sewing waste depend largely on the operation of the combing machines, in particular the process of separating them into fibers.

By determining alternative values of the diameters of the supply cylinders and their rotation frequency, it is possible to obtain high-quality recovered fiber. The selection of alternative operating parameters of the supply device ensures high efficiency of separation of shreds into fibers, reduces the separation of unscratched fiber fragments into waste, and maintains the staple length and firmness of the fiber. As a result of the use of alternative modes, it is inevitable to obtain significant economic benefits by increasing the efficiency of technological equipment, reducing electricity, raw materials and labor costs. Considering that the properties of recovered fibers obtained by shredding shreds and the degree of shredding mainly depend on the operation of the shredding machines, in particular, the process of separation into fibers, it is important to improve the processing technology.

Purpose of the experiment. The main purpose of the study is to determine the effective operating parameters of the device for separating sewing waste into fibers and obtaining recovered fiber. The purpose of the study is to determine the effective operating parameters of the device for separating waste into fibers and obtaining recovered fiber. By determining alternative values of the diameters of the device's supply cylinders and their rotation frequency, it is possible to achieve high-quality recovered fiber.

The main goal of the research is to preserve the staple length and cooking coefficient of the fibers when separating sewing waste into fibers and obtaining recovered fibers, reduce the discharge of incompletely separated pieces of waste into

waste, ensure high efficiency of separation into fibers, and determine the rotation frequency of the supply cylinders for obtaining recovered fibers.

By determining the optimal values of the rotation frequency of the supply cylinders of the pinching machine, it is possible to obtain high-quality recovered fiber. Factors affecting technological processes can be quantitative and qualitative. Selecting the optimal operating parameters of the supply device ensures high efficiency of separation of cuttings into fibers, reduces the separation of unspun fiber fragments into waste, and achieves preservation of the staple length and strength of the fiber.

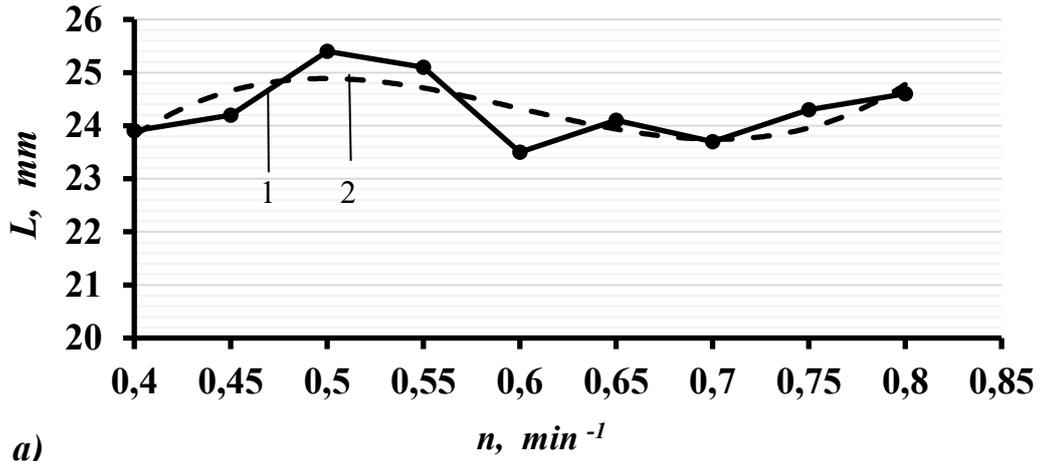
Preliminary studies have shown that the efficiency of separating scraps into fibers depends on the density of the fabric, the type of weave, the type of fiber and yarn used. By designing the experiment, all factors are varied simultaneously and their interactions are also evaluated.

Experiments were conducted on the processing of sewing knitwear scraps and obtaining recovered fiber on the first pinching machine of the company "SHANDONG SHUNXING MACHINERY" of the enterprise "EUROAZIA ALLIANCE TECH" LLC. Based on the results of the experiment, the quality indicators of the recovered fiber from scraps, the efficiency of separation into fibers, the amount of lint and the amount of waste were determined.

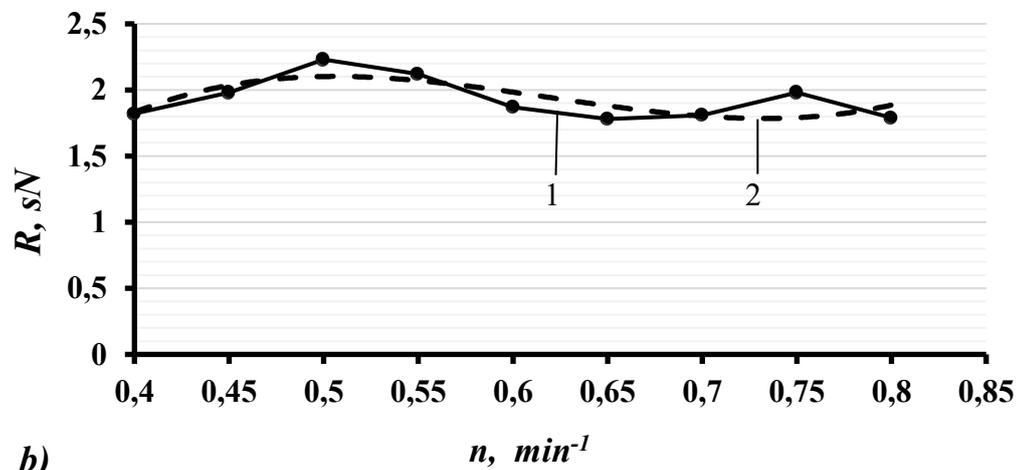
Based on the experimental results, the experimental parameters were approximated and a third-order mathematical model was obtained that expresses the dependence of the staple length, breaking force, and fiber separation efficiency of fibers recovered from cuttings on the rotation frequency of the first supply cylinder.

Based on the obtained models and experimental results, experimental and computational curves of the above-mentioned relationships were constructed (Figure 1).

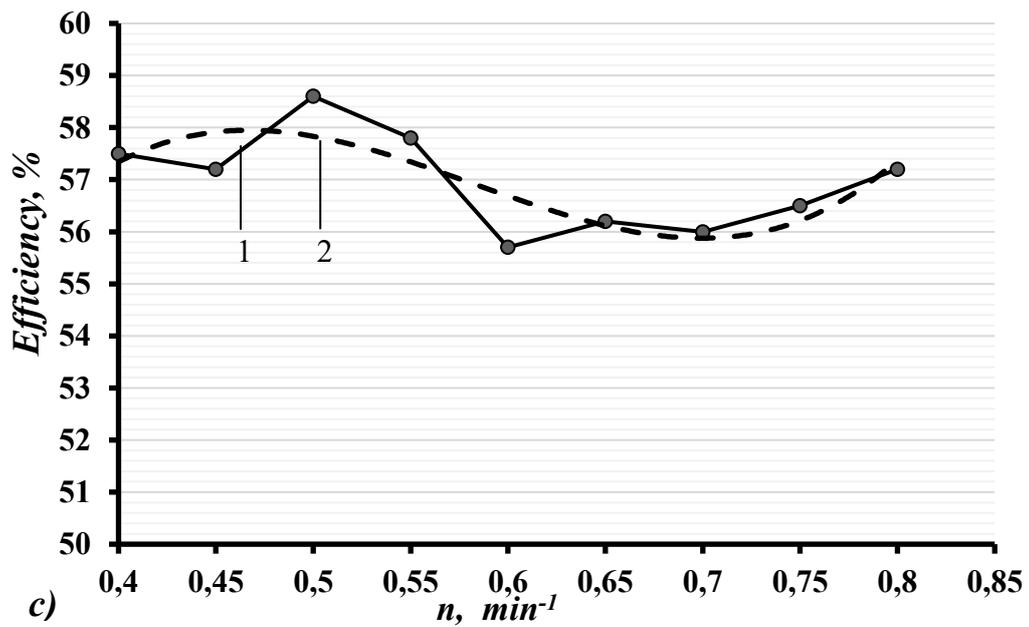
Experimental results. By obtaining high-quality recovered fibers and adding a certain amount of them to the mixture, it is possible to reduce the cost of the yarn without reducing its physical and mechanical properties. The results of the conducted research have shown that moving the shreds at low speeds in the feeding zone of the pinching machine and careful processing in a technological mode with a low rotation frequency of the pinching drum ensure a satisfactory separation of sewing shreds into high-quality fibers.



a)



b)



c)

Graph of the dependence of the staple length of fibers recovered from cuttings (a), breaking strength (b), and fiber separation efficiency (c) on the rotation frequency of the supply cylinder.

1- practical curve, 2- theoretical curve.

Conclusion. Experiments were conducted on obtaining recovered fiber from sewing scraps, and the optimal values of the rotation frequency of the supply cylinders of the pinching machine were determined. The best physical and mechanical properties of recovered fibers, the efficiency of separation into fibers and the maturity coefficient, are achieved when the rotation frequency of the first supply cylinder is $n_1=0,50 \text{ min}^{-1}$; the rotation frequency of the second supply cylinder is $n_2=0,55 \text{ min}^{-1}$.

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