

in Vitebsk State Technological University. The production of the prototypes was made at RUE «Slutsk Belts». Previously lost technology for the creation of belts was recreated on modern weaving equipment.

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A COMPARATIVE ANALYSIS OF STRENGTH PROPERTIES BETWEEN BONDING AND SEWING KNIT FABRICS

СРАВНИТЕЛЬНЫЙ АНАЛИЗ ПРОЧНОСТНЫХ СВОЙСТВ КЛЕЕВЫХ И НИТОЧНЫХ СОЕДИНЕНИЙ ИЗДЕЛИЙ ИЗ ТРИКОТАЖА

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Key words: *bonded seam, thermoplastic tape, strength, elasticity, hemming, seaming.*

Ключевые слова: *клеевой шов, термопластичная пленка, прочность, растяжимость, подшивание, стачивание.*

Abstract. The strength and elasticity of the textile bonded and sewing seams was analyzed. Mechanical properties of single fold hemming both of bonded and sewing seams were examined as well as bonded and sewing plain seams.

Thermoplastic polyurethane tape was transferred from the base of silicone to knitted fabric using 160 °C temperature and 40 N pressing force. Knitted pieces bonded together by two different bonding machines and sewn together by coverstitch sewing machines.

Аннотация. Проанализированы показатели прочности и растяжимости клеевых и ниточных швов при соединении текстильных материалов. Исследованы механические свойства подшивочных и соединительных клеевых и ниточных швов.

Термопластичная полиуретановая тесьма переносилась с силиконовой основы на трикотажную деталь при температуре 160 °C и усилии прижима 40 Н. Детали из трикотажа соединялись посредством двух различных термоклеевых машин, а также сшивались на плоскошовной машине.

Sew free technologies such as adhesive bonding, hot melt fusing, ultrasonic welding and laser welding use to replace sewing in various garment manufacturing processes. New promising developments in the design, technologies and equipment of the textile thermodynamic bonding increase its role in the garment manufacturing. Besides functional properties (comfort, usability, and durability) seamless garment has design aesthetics. Sew free bonding applies for waterproof clothing, sportswear, home healthcare, illness prevention, citizen medicine and so on.

This technology introduces new properties of clothes however it has difficulties with practical implementation. Knitted wear manufacturers are still at the early stage of understanding the potentialities provided by this technology. So at the sewing factory “Milavitsa” implementation of the new production process of knitted underwear came up against bonding limitations. There are needed a different equipment for adhesion depending on operation conditions; there is no universal machines for realization thereof. Although adhesive technology well-known and widely used at fusing and seam sealing sewing processes, it has own limitations and disadvantages thus practically never used at a cloth assembling.

Glue creates an adhesive connection of the joining parts and forms a composite material whose properties are different from initial materials. There are technologies for such methods of adhesive activation as hot wedge, hot air, high-frequency currents, ultrasound and laser beam. Strength and stiffness of bonded seams depends on type of loads and possible deformations of glue joints, stretching or shifting in particular. An optimal characteristic of glue joints is achieved by shifting loads; they have superior mechanical strength there.

Used adhesive tape consists two layers, one is heat activated fusing tape and one is siliconized paper. Heat activated (hot melt) adhesive tape has a strong holding power after a definite coaction of pressure and temperature during some time. The siliconized paper prevents the gluing of tape to a bonding machine’s transport roller. The bonding process occurs herewith in two stages. At first the tape is glued to one

piece, then an operator removes the paper and glues second piece from the back side of the tape.

Bonding microprocessor controlled machines used for making knitted fabrics for sportswear, underwear, swimwear, casual wear, thermal wear and the like. The gluing process is carried out at not high temperature (usually $<200\text{ }^{\circ}\text{C}$) to avoid deformation of knitted products.

The produced seam has aesthetic properties, high extensibility in all directions, lack of needle punctures, smaller thickness.

Two types of joints both of bonded and sewing were made and analyzed as shown in Fig. 1. Bonded hemming seams (a) were produced on 335.32 Macpi bonding machine with switch-off side trimming device. A single specimen comprises knitted fabric folded upon itself to forming overlapping edge. An adhesive film is interposed between the overlapping edge. The force was applied along the seam by the tensile test of material specimens. Sewing hemming seams (b) were produced on MF-7500 Juki coverstitch sewing machine. The force was applied in the same direction as in the previous case. A single specimen of bonded flat seam (c) comprises two layers fabric and adhesive film, interposed between them. The shifting force was applied according to the scheme. Sewing flat seams (d) were produced on the same sewing machine.

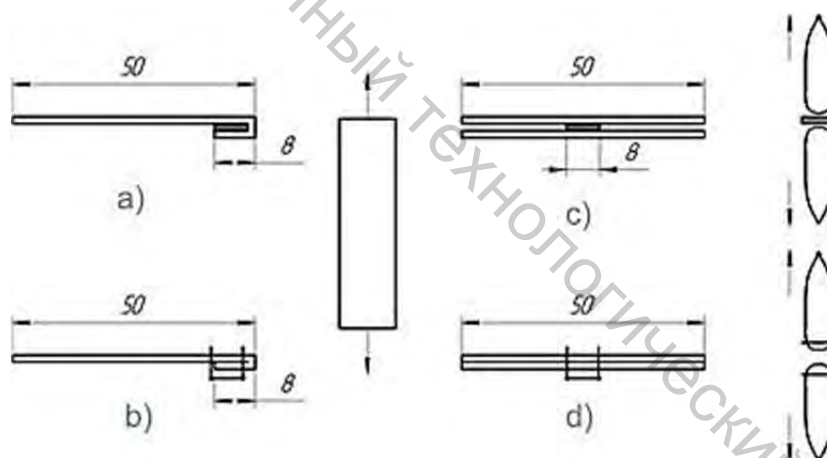


Figure 1 – Used joints and schemas of their tensile testing:
 a) bonded hemming seam; b) sewing hemming seam; c) bonded flat seam;
 d) sewing flat seam

At first, the thermoplastic film was glued on the fabric at temperature $160\text{ }^{\circ}\text{C}$ and pressing force of 40 H. Then the siliconized paper was removed immediately after gluing. After that the second fabric was glued at the same temperature and by the same pressing force. Tensile test was carried out using electronic universal testing machine TIME WDW-20E. The clamping length of specimens was 100 mm. Statistical processing of experimental data was carried out. The appearance and consumer properties of bonded seams are much better than similar sewing seams, although performance of the bonding operation is lower. For comparison, maximal speed of bonding machine is 0,82 m/min whereas maximal speed of sewing machine is

23,4 m/min. Of course, such speed of sewing operation not achieved usually, but the difference is significant.

The results of experimental studies show that bonded hemming seam stronger than similar sewing seam by 64,3 %. Bonded flat seam stronger than similar sewing seam by 41,7 %. It is depends on high strength of the used thermoplastic film. The elasticity of sewing seams is higher in both cases.

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OPTIMIZATION THE PROCESS OF DISCRETIZATION DURING OBTAINING OF COMBINED FIRE-RESISTANT ELECTRO CONDUCTIVE YARN

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Key words: *heat-resistant yarn, electrically conducting yarn, Arselon, antistatic effect.*

Ключевые слова: *термостойкая пряжа, электропроводящая пряжа, Арселон, антистатический эффект.*

Abstract. This article is devoted to optimizing the discretization process in the production of electrically conducting heat-resistant combination yarn. Derringer's partial desirability functions are used to solve a multi-criteria optimization problem - select the type of card clothing for the discretizing drum that will provide the best combination of physical-mechanical properties in this type of yarn.

Аннотация. Данная статья посвящена оптимизации процесса дискретизации при производстве электропроводящей термостойкой комбинированной пряжи. Функция частичной желательности Дерринжера