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CALCULATING THREAD CONSUMPTION IN THE CASE OF ASSEMBLY BY SEWING OF ADHESIVE-BACKED MATERIALS

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Abstract: *In the textiles industry, specific consumptions for each type of material are calculated based on product range, complexity, and secondary and auxiliary materials used. One of the inputs calculated beforehand is the specific consumption of thread, which depends on many factors, among which the thickness of materials to be assembled. The doubling of materials through the thermobonding process aims to give stability to surfaces or contours and to ensure a spatial shape of the product, without negatively affecting the sanogenetic and comfort parameters.*
There are cases of sewing assembly of two or more textile layers doubled by thermobonding or non-doubled, with woven or non-woven, chemicalized textile inserts. There is an increase of thread consumption for layers doubled by thermobonding with chemicalized inserts, for a single layer of the assembly or for both layers, due to the increase of the thickness to be assembled by sewing. For the assembly of two layers of non-adhesive base material, the simple seam section has an elliptical appearance. For the assembly of two layers of basic material of which one layer is doubled by thermobonding with a chemicalized insert and the second layer is not doubled, the section of the seam has a parabolic appearance. For the assembly of two layers of basic material of which both layers are doubled by thermobonding with a chemicalized insert, there is an increase in the rigidity of the part and the section of the seam has a rigid appearance. Depending on how these layers of material are assembled, doubled or not doubled with the chemicalized inserts, the thread consumption per linear meter varies considerably.

Key words: *seam stitch, thermofusing, thermobonding, thread consumption, stitch structure, stitch density, bonded assembly thickness.*

1. INTRODUCTION

Calculating thread consumption for a particular stitch density, which forms the basis of the assessment of thread requirements for the assembly of clothing, depends on the structure, thickness and flexibility of the aggregate, the fineness of the thread and the number of stitches per unit of length [1,2]. All these factors contribute to establishing the shape of the stitch along its section, this being the basic element for the calculation of thread consumption, corresponding to a particular stitch step [1,3].

2. GENERAL INFORMATION

2.1 The section of a seam stitch.

By doubling the base material with a chemicalised insert, its flexibility is also influenced, by increasing its rigidity. The section through a seam assembly of two materials doubled using a

chemicalized insert and with a thickness of more than 2 mm has a shape corresponding to rigid materials (Fig. 1) [3, 4, 5, 6].

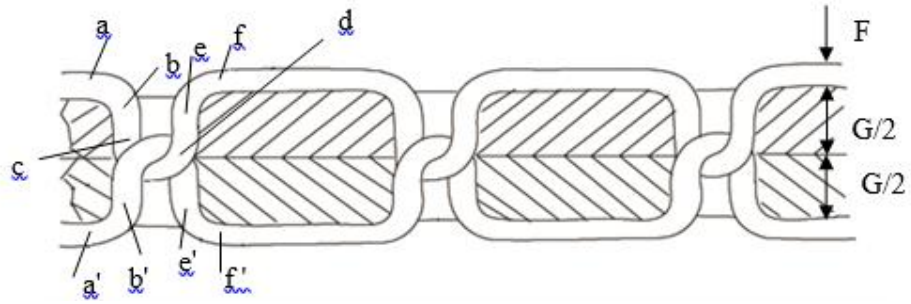

Fig. 1. *Seam stitch. Rigid structure*

Due to the increased rigidity, materials that are assembled by sewing, suffer a certain deformation in the a-b and e-f curved zones, due to the needle thread and in the a'-b' and e'-f' zones, due to the bobbin hook thread. These areas can be considered as arcs of a circle with a radius equal to the thickness (F) of the sewing thread, alternating with areas of straight line in the b-c and d-e zones.

In the case of a proper adjustment of the needle and bobbin hook tension of the thread, the braiding takes place in the middle of the thickness (G) of the assembly and the length of the threads for a seam step is equal to:

$$l_a = l_s \quad \textbf{(1)}$$

where: l_a – represents the length of the needle thread;
l_s – represents the length of the bobbin hook thread

Knowing the thickness (G) of the assembly, the fineness (F) of the thread (P) and using the geometric formulas [3,4,5], the total length (l) for sewing a seam step is:

$$l = l_a + l_s = 2\,l_a = 2\,l_S \quad \textbf{(2)}$$

$$l = 2P + 2G + 0{,}56F \quad \textbf{(3)}$$

The deformation of the materials that are assembled by sewing depends mainly on their flexibility.

For sewing two layers of material, of which only one is glued, the flexibility is greater than in the case of sewing two materials, both doubled by thermobonding.

In this case, the seam structure has a parabolic shape (Fig. 2.)

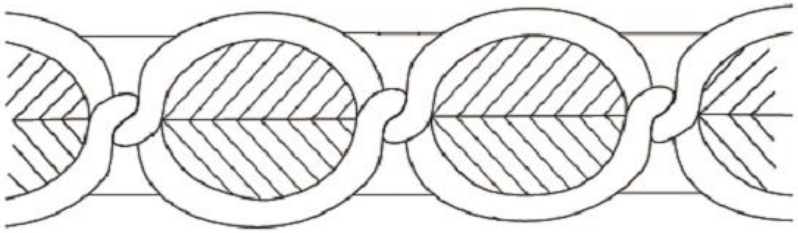

Fig. 2. *Seam stitch. Parabolic structure*

The relationship between the step size (P), the fineness of the thread (F) and the thickness (G) of the assembly is:

$$(P–F)/G>0,75 \quad \textbf{(4)}$$

In the case of assembly by stitch sewing of 2 layers that are not doubled using thermobonding, the seam structure can be considered elliptical [3-6].

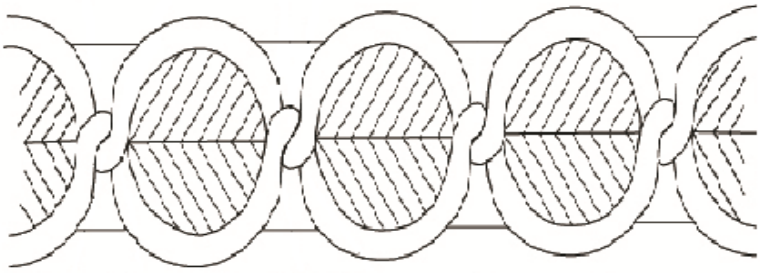

Fig.3. *Seam stitch. Elliptical structure*

In this case:

$$(P–F)/G\leq 0,75 \quad \textbf{(5)}$$

2.2. Methodology. Results.

Three samples of the base material are used, to be assembled by stitching, with a length of 1 meter. One sample consists of two layers of base material, not doubled by thermobonding. The second sample has a single layer doubled by thermobonding and the third sample has both layers doubled by thermobonding.

Seam stitching assemblies are executed in a straight line over a length of 1 meter, keeping constant the thread fineness and the step size.

Table 1: *Seam stitch thread consumption*

Type of assembly	**Assembly thickness (G) mm.**	**Fineness of the thread (F) mm.**	**Stitch step size (P) mm.**	**Stitch density(steps/ 100mm)**	**Thread length for one stitch step (mm)**	**Thread length for 1 meter of stitching (m)**
Two layers of base material, **not** doubled through thermobonding using a chemicalized insert.	0.40	0.235	2.00	50	4.431	2.26
Two layers of base material, out of which **one** is doubled through thermobonding using a chemicalized insert.	0.80	0.235	2.00	50	5.600	2.80
Two layers of base material, out of which **both** are doubled through thermobonding using a chemicalized insert.	1.20	0.235	2.0	50	6.532	3.26

3. CONCLUSIONS

In the textile industry, there are a variety of types of sewing assemblies, a variety of types of textile materials, yarn and sewing machines.

The study reveals one of the important elements of influence on the consumption of thread, namely, the thickness of the layers of the assembly. An increase in consumption of thread, using the same fineness of the thread (F), the same stich step size (P) and the same stich densty (steps/100 mm), is observed, when the thickness of the assembly increases because the layers are doubled using thermobonding or not .

The calculation of the thread requirements for the assembly of a garment product made of textile materials depends on many variables, of which the ones with the most influence are:

- manufacturing technology;
- the type of seams used and their parameters;
- the fineness of the thread;
- areas assembled using stitching, which can be doubled using thermobonding or not;
- the thickness and type of layers assembled using stitching;
- the type of machinery used for stitching.

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