

The Influence of Sewing Thread to the Seam Wrinkle

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Abstract:

The paper has an overview of the theoretical basis of seam wrinkle, the factors affecting seam wrinkle. Among the factors affecting seam wrinkling, sewing thread is the most important factor affecting seam quality and garment product quality. Because if the sewing thread is good, the quality of fine stitches will be smooth, the seam will be less prone to wrinkles.

Keywords: Seam wrinkle, sewing

1. Introduction

In the garment industry, various techniques have been tried but none has been successful by sewing by machine thanks to the needle and thread. In order to have a beautiful and durable tight seam which helps the garment to achieve the aesthetic and quality required, good sewing thread is one of the most important parts of the sewing industry. The researchers believe that the needle temperature can rise to 350°C, which is higher than the melting point of PES fibers, so the sewing thread must be protected so that it can move in the sewing machine as smoothly as possible when forming. Very good seam work, for beautiful thread products. Today, most garment manufacturers always use core thread with polyester core and yarn or cotton or polyester. These threads can be used appropriately with almost all types of sewing equipment and avoid chemical degradation and abrasion.

Cotton thread has cool properties when sewing. It is not stretchy and easy to sew, especially when sewing rough or demanding fabrics where sewing with polyester threads will experience heat problems in the needle, which can only flow or deform, creating seams. weak, broken needles and broken thread is not a good product. The quality of fabric alone is not enough to create a high quality garment product. Converting two sizes of fabric into garments (clothing) with three dimensions requires a lot of links to produce beautiful products.

The properties of the thread play an important role in determining the sewing capacity of the thread. In modern apparel manufacturing processes, the sewing speed is quite high, so the criteria for sewing thread selection become more stringent. In a 1-needle lockstitch machine with a speed of 5,500 stitches / minute, with each stitch having 2 up-and-down movements, the needle has moved by 11,000 times / minute, equivalent to about 10.5 miles / hour. However, the thread not only follows the running distance of the needle, but also bypasses the hook (boat + sueit) and pull tightly. If it is assumed that the movement distance of the magnetic needle (the top of the needle above) is the opening of the needle when the needle at the top is down through the fabric, the throat phate goes around the hook, returning, tightening is twice The movement of the needle only moves at 20 mph.

In the garment manufacturing industry, manufacturers often face increasing pressure to remain competitive in the global market. Competitiveness is mainly based on productivity and quality. One of the factors that reduces the aesthetic value affecting the quality of the product is seams. This is a well-known issue that has attracted the attention of many researchers around the world and in Vietnam. This problem has been brought to the forefront by the increasing requirements for the quality of garment products. The seam wrinkle is one of the most important criteria in the product quality control in the industrial sewing industry. There have been many studies to limit and overcome the phenomenon of seams, but in practice production is still one thing that businesses are very interested in. In the practice of teaching sewing techniques to sewing technology students, there are some

common errors in which seam errors often occur when making the item: shirt, pants, shirt Jacket in the training process because students do not know how to handle to minimize wrinkles.

Seam crease is a phenomenon that affects the quality of sewing products in general. There are many factors that affect seam wrinkling such as: the composition and structure of the fabric, the thread, processing conditions, technology parameters and sewing equipment, etc. In the context of this article, focus on studying the influence of some basic criteria: sewing thread, equipment, fabric structure, bending stiffness of sewing fabric affect seam wrinkle and solutions to overcome such phenomenon.

2. Literature review

2.1. Creased seam concept

From the point of view of the seam quality criteria, between the awareness of the deformation of the fabric on the seam and the theory of material strength, can be defined:

Seam creases are ripples, wrinkles or creases in the fabric, or a number of small creases that run back and forth that appear during the sewing of pieces of fabric. [1]

Seam crease is a phenomenon where the fabric is deformed and bent by the seam to create continuous creases of one or more layers of fabric joining the sewing link from stitch to stitch along the seam. [2]

Creasing occurs when sewing on multiple fabrics when stitching two or more pieces of fabric together vertically. In fact, some wrinkled products not only appear on the surface of the fabric in the vicinity of the seam after sewing but also after washing as well as in the process of using the product due to fabric or thread deformation under the mechanical, physical and chemical effects.

Wrinkle phenomenon when sewing appears for two reasons:

- Due to the relative movement between the layers of fabric on the seam or the overlap of the lower fabric compared to the upper fabric or the slip of the upper fabric layer against the lower fabric layer.

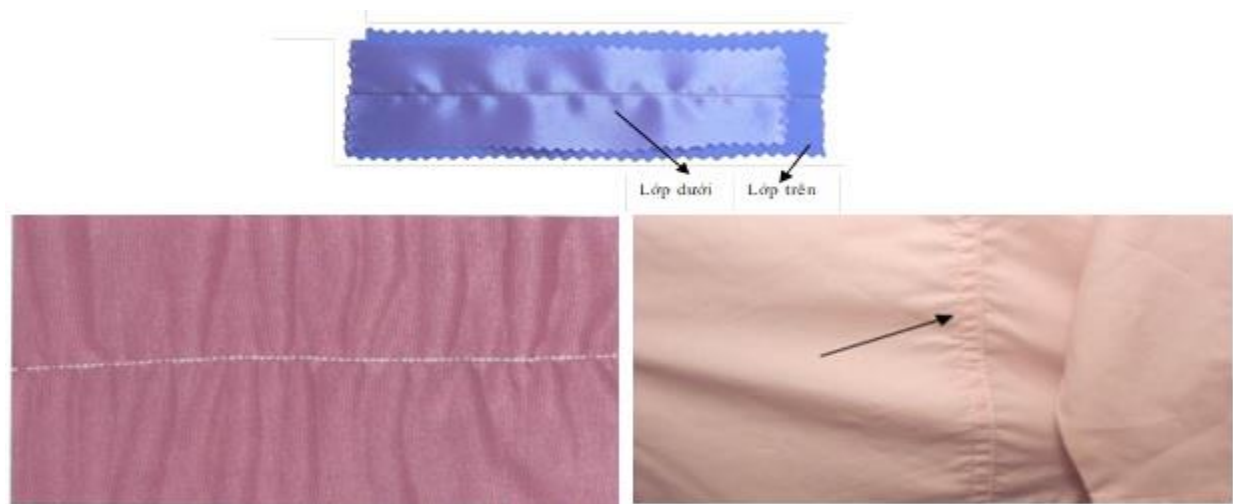


Figure 1. Movement of the lower layer of fabric compared to the upper layer during sewing

- Due to the interaction between the thread and the fabric during sewing and using the product, the stretched thread will impact the fabric at the stitch, causing the fabric to be bent and compressed.

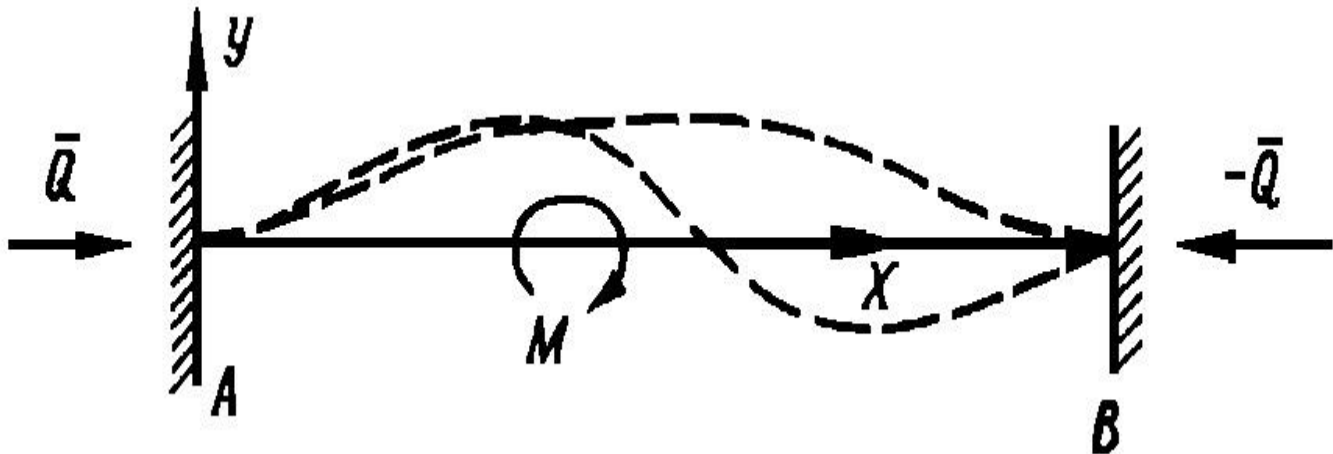


Figure 2. Force diagram on the fabric between two needle puncture holes. The fabric is controlled by sewing thread, leading to wrinkling

2.2. Method of measuring seam wrinkles

Currently to determine the wrinkle of the fabric on the seam, using two common methods are objective and subjective measurement methods. Subjective measurement is performed on the basis of observing a pattern of seamed fabric and comparing it with a set of standard images to determine the wrinkle level of the seam after washing. Objective measurement method is shown on the basis of receiving wrinkled pattern images (taking a sample image with a digital camera or scanning with a laser scanner), standardizing images, citing wave characteristics Wrinkle training and evaluation of wrinkle level by artificial neural network algorithm.

The AATCC (American Association of Textile Chemists and Colourists) method is published as a standard and widely used around the world. Process of measurement using AATCC standard:

- The sample is washed with a load of 1.8 kg on an automatic washing machine with a washing powder of 0 ÷ 5 times.
- Afterwards, transfer the sample to a dryer or hang to dry and place in standard conditions for 2 days.
- The sample is placed on an inclined board with the stitch in the direction of the bottom.
- Three testing staff standing in front of the sample 1.2 m away from the sample conducted an independent evaluation of each sample by comparing the wrinkles on the sample with the standard images and then assigning the number (grade) of the most appropriate standard image to the foreign of the test piece. The standard image consists of 5 levels.

A standard set of photos produced by AATCC to evaluate whether actual seams on the product are acceptable or not. The standard of 5 levels indicates the change in wrinkle level of fabrics on the seam, from 1 to 5, level 1 is the worst and level 5 is the best. This method assesses the flatness of the seam on the fabric after washing, based on the observation of laboratory personnel in a dark room with specified conditions. The disadvantage of this method is that the experimental results depend on the observations of the observers. Sewing fabric samples must adhere to standard washing principles. The evaluation uses standard light and vision by comparing fabric samples with the corresponding standards.

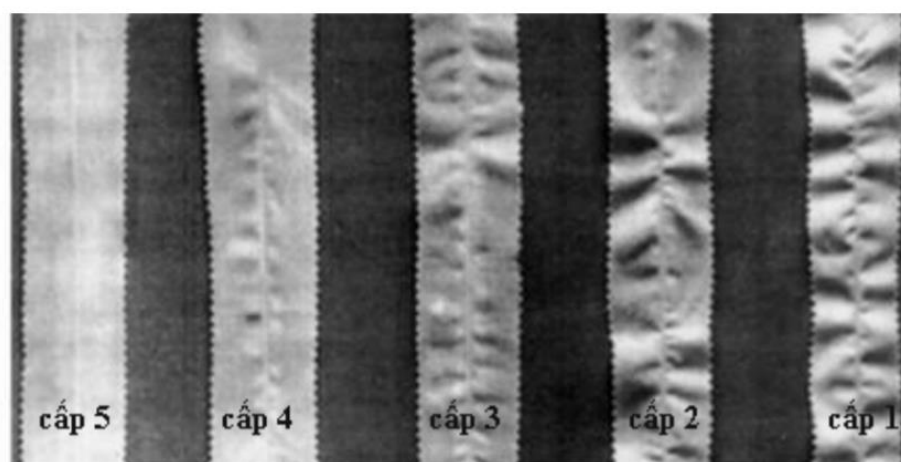


Figure 2. AATCC seam flat level

The method of measuring the absolute deformation of seam wrinkles (3D scanner)

Use the KONICA MINOLTA RANGE7 contactless 3D scanner to scan the surface of the experimental sample.

3. Factors affecting seam wrinkle

3.1. Thread

The mechanical and physical properties of the thread that affect seam wrinkle include: Elasticity, thinness, friction resistance, uniformity and dimensional stability, etc. If thread tension is set When the sewing thread is too high, the thread tension increases, as does the thread elasticity. After sewing is finished, the tension of the thread decreases, the elastic extension disappears causing the thread to contract sharply, which causes more seam wrinkles.

In the sewing process, for low-count threads (rough threads), a high tension is required to create the stitch. This will increase the risk of wrinkling due to tension. So the thinner the thread, the more beautiful the seam.

On the other hand, the materials are tightly structured. If the thread count is low (rough thread), when piercing through the fabric, it will cause dislocation of large fibers, causing the fabric to ripple, causing natural wrinkling.

(Tested on seam flat measuring kits according to AATCC 88B-2001 standards)

3.2. Device

Sewing equipment that directly affects seam quality is a factor that influences seam wrinkling.

Sewing equipment includes: Machine needle, presser foot pressure, fabric displacement mechanism, machine speed, ...

3.2.1. Machine needle

In addition, the binding relationship between the thread tension and the stitch density has the greatest effect on seam wrinkle. This has also been the researchers give specific results on how to adjust the thread tension, stitch density. In the project of Dr. Phan Thanh Thao, proved that with some sewing flatness gauges according to AATCC 88B-2001 standards, some materials reduce the tension of the thread thread by 1g force, the seam wrinkle decreases. go. When increasing the density of stitches to 1 stitch / cm, the seam wrinkle on the fabric will decrease. When reducing 1 needle count, the seam wrinkle on fabric 1 decreases. When the sewing speed is

reduced to 1 rpm, the seam wrinkle on the fabric decreases. When reducing the thread tension and increasing the stitch density at the same time, the seam wrinkle in the fabric decreases. When reducing the thread tension and reducing needle count at the same time, the seam wrinkle in the fabric will decrease. When reducing the thread tension and reducing the sewing speed at the same time, the seam wrinkle in the fabric decreases.

In order for the seam to have the best quality, the needle, thread and fabric must match. When the needle pierces the fabric, resistance causes the fabric to deform. The degree of displacement of the yarn when the needle penetrates depends on the density, weaving pattern, and yarn count and sewing thread. For very fine fabrics and special treatment, very little movement is allowed on both sides of the warp and weft. Therefore, the distance between the yarns caused by needles will be more limited, so the drift will occur less.

Need to use the best needle for sewing thread size, if the needle is too large compared to the thread and the fabric will leave holes in the fabric surface after sewing to lose the aesthetics of the product, otherwise reduce the durability of the seam, if Use of needles that are too small compared to the thread and fabric will be able to break the needle during sewing and break the thread when sewing, the seam is skipped, reducing stitch durability. Therefore, the sewing needle must be selected for fabric and the most suitable thread.

Some fibers (silk, nylon) are more flexible in nature than others (cotton, linen). It is indispensable that fabrics made from flexible fibers are easier to poke. Tightly structured fabrics may not have enough room for the yarn to move easily and penetrate the needle. In such cases, it is important to select the shape of the needle tip. Some fabrics can be best sewn with needles that can penetrate the yarn without damaging the yarn. When sewing leather or similar materials, it may be necessary to have a needle cut into the material during each needle prick.

The movement of the warp and weft is more caused by the needle than by the sewing thread. Damaged needles can cause a lot of damage to the fabric along the seam. Therefore, it is necessary to always check the needle before sewing and select the needle shape suitable for the fabric to be sewn.

3.3.2. Presser foot force, cloth displacement mechanism, machine speed

The presser foot pressure is considered to be the factor that influences the sewing speed and the displacement of the fabric layers during sewing. Higher sewing speed requires higher presser pressure. The speed of stitch formation affects the needle thread tension value. The needle thread tension increases as the stitch speed increases. This affects the seam quality.

In addition, when sewing fabric is moved under the effect of gear bar, presser foot. Because the presser foot is stationary, the gear bar moves in orbit, if the speed of sewing increases, leading to an increase in the speed of cloth movement by the gear bar will affect the movement between the layers of fabric, affecting the wrinkled seam.

In the same sewing condition, the coefficient of friction of the fabrics is the same, changing the presser foot compressive force results in a change in the friction force between the gear bar and the presser foot with the fabric layers, causing the amount of fabric displacement. change. The value of presser foot compressive force on single-needle sewing machines with thin and medium needle sewing varies from 10,40 (N); sewing of thick fabrics varies between 10,60 (N)

The results of the combined force analysis appeared in the upper and lower layers of sewing fabric, showing that: The lower fabric is compressed, so the upper fabric is stretched and the stretch is longer. The lower layer of fabric therefore is often agglomerated with the upper layer of fabric, the upper layer of fabric is subject to irregular movements of the fabric and the resistance of the presser foot occurs due to the friction between the two upper layers of fabric and the presser foot. The force preventing this movement is the friction between the upper and lower layers of fabric.

Machine speed is also a factor that directly affects the quality of stitches, in fact showing that at the speed of 5000 rpm the stitch formation process and the cloth feeding system have a great influence on the shape of the upper seam. fabric. Higher sewing speed requires greater presser pressure. The speed of stitch formation affects the needle thread tension value measured at the tops of the various measuring positions.

From the empirical results of the topics show that, with the same thickness of the fabric, the same technological parameters and equipment but when sewing thin, slippery, shiny fabric (Example: non-silk 100% polyester, silk fabric , 100% nylon fabric, ..) seams are wrinkled more than thick fabrics, blended fabrics, or fabrics with porosity (eg spun polyester, nylon blended fabric, etc.)

For example, for non-silk fabrics of 100% polyester, 100% nylon, the thread tension has the greatest effect on seam wrinkles, while in non-silk fabrics with spandex elasticity, the stitch density has the greatest impact on wrinkles. seam.

Non-silk fabric of 100% polyester, when increasing the density of stitches, the seams will be less wrinkled, but for non-silk fabrics with elasticity, the lower the density of stitches (the larger stitch length), the less wrinkle.

Other technological parameters and equipment such as needle count and sewing speed have the same effect on the seam wrinkle of both fabrics, meaning that the needle count is small and the sewing speed is low, it is limited. seam wrinkles.

3.3. Flexural stiffness of the fabric

The crease waves of the fabric often appear randomly at any point on the seam and spread around in a direction perpendicular to the seam. In fact, because the layers of fabric at the seam position are often thicker than the adjacent seam, the wrinkle deformation is often smaller than at the location of the seam.

Thus, the wrinkle deformation of the fabric on the seam is closely related to the flexural stiffness of the fabric and its ability to resist deformation under the effect of the compressive force of the sewing thread.

The flexural stiffness of the fabric is characterized by its elastic modulus of flexure (gl / cm^2) depending on the stiffness of the fibers and fibers that form the fabric, depending on the fabric structure. When the fabric has a large hardness will resist bending properties. As the fabric thickness increases, the fabric stiffness will increase significantly. With soft, thin fabric, the modulus of elasticity for bending of small fabric, and in contrast to thick hard fabric, the modulus of elasticity for bending of large fabric. One point to note is that, with soft fabrics, small elastic modulus prone to shrinkage, their wrinkle coefficients are not great. For hard fabrics, the large elastic modulus will not be compressed and covered by the thread tension at the stitch, in which case their wrinkle coefficients are large, the fabric less wrinkled.

The structure and properties of the fabric have a direct effect on the creasing of the fabric by the seam. Some fabrics used today tend to shrink and naturally wrinkle, usually popolin fabrics (woven pattern), woven linen. The characteristic of this material is the horizontal floating point structure usually by the warp / weft ratio of 2: 1 or by the use of weft with faster density.



Figure 3. Seam wrinkle phenomenon

Fine woven fabrics, too thin component yarns, elastic blends or fabrics that have been treated with plastic are easily crumpled and wrinkled by seam due to their tight structure. If the fabric is woven thick close to the critical density, the fabric made from thin yarns may not have enough room to accommodate an additional sewing thread, so the thread pulls the woven threads. If the fabric is woven from stiff spinning yarn or special finishing fabric. Stitches along a straight line will deflect and push the skewed yarn aside or the fibers that cause traction are the cause of the fabric being wrinkled by the seam, especially this phenomenon increases when sewing at high speed.

4. Measures to overcome seam wrinkles

Thin and thin fabrics are often difficult to sew, as they are easy to wrinkle when sewing. During sewing or shortly after sewing, the fabric shrinks vertically causing wrinkles. The removal of wrinkles by the method of a fixed or fixed seam has a temporary meaning. After the first wash, the wrinkles will return. In order to propose the most effective measure to eliminate seam wrinkles, it is important to analyze the cause of seam wrinkles. Basically, there are 3 main causes: Wrinkling due to the sewing thread tension is too large; Creases due to fabric displacement and Creases due to movement of yarn on fabric when the needle thread is threaded through.

Choosing the right thread only means: Only small to fit reasonably with the fabric. Little elasticity.

Choose the needle that matches the fabric, thickness of the material, and thread count.

It is recommended to use a machine with a cloth feeding device, or a cloth-mounted roller (The machine has a separate fabric feeding mechanism: with elastic fabric).

Adjusting the sewing machine to be checked:

The intensity of the presser foot. The height of the teeth put cloth.

It is recommended to use a plastic screw type with easy slip.

Minimize thread tension.

Try to reduce the engine speed with thin, smooth fabric.

Use a throat plate with a small needle hole diameter.

Adjust the thread tension as low as possible, then adjust the needle thread tension to equal the thread tension to ensure that the sewing thread is between two layers of fabric. Adjust the stitch length appropriately.

When sewing, keep the fabric tension at both front and back of the needle.

For non-silk fabrics from polyester synthetic fibers, leather material, smooth can use NS needle surface treated with a layer of AUS Ceramic plating that has anti-wrinkle and heat-reducing effect of the needle, minimizing (about 45 %) resistance when penetrating the fabric. With slender thin fabrics can be reinforced anti thread seam.

Above are some basic factors that significantly affect the phenomenon of seam wrinkling including: thread, stitch density, presser foot pressure, sewing speed, fabric material, etc. Simultaneous effect of the elements this to the seam crease. From these reasons, some solutions have been proposed to minimize and overcome seams in the sewing process, this will be a reference for students in the Sewing Technology industry to better understand the phenomenon. wrinkling seams and processing methods in the sewing process to improve productivity and quality in learning as well as practicing industrial production.

5. Conclusion

The distortion of textile materials during processing is one of the most important problems that manufacturers in the textile industry have faced over the years, especially with unstable materials like yarns. fabric, the problem is much more difficult in determining the cause, proposing solutions and more importantly assessing the quality of textile products.

Research results show that the sewing threads with different mechanical properties cause various seam wrinkles. In addition to the impact of sewing thread depends on the machinery that affects the seam wrinkle.

In the article, the author compared the factors that influence the thread and fabric parameters to the seam wrinkle. However, due to the limited mechanical time, the subject did not mention subjective factors in the processing process such as: sewing speed, surrounding environment (such as temperature, humidity, dust ...). affect the deformation of the fabric causing seam creases. Not to mention the process of use such as wearing, washing the stitches pressed into the fabric to make the bar subject to periodic load.

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