

Effect of sewing machine and thread type on the quality of leather garments

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Abstract:

Sewing Machine is one of the most important factors affecting the quality of the clothing industry. Also, leather garments require special care during sewn. The purpose of this paper is to study sewing leather fabrics Techniques to reach the highest degree of quality and efficiency of sewing leather and the efficiency of functional and aesthetic appearance of clothing and age consumer. And by identifying some of the research variables ,there was two leather type (sheep natural leather – Pu **artificial leather**), the skin of sheep is the most commonly used types of leather in the field of leather garments. There was a comparison between **two types of sewing machines** (Ordinary sewing machine – leather sewing machine) and using two types of thread (polyester – nylon). Then we examined leather using a number of test methods like thickness, tensile strength, abrasion and seam pucker according to standards. . Tests took place into conditioned atmosphere of 21°C and 65% RH. Comparisons have been made between the two different types of sewing machines and also between the two different thread types this was done with reference to seamed lines' durability, efficiency and appearance. In conclusion we was able to determine the best quality to sew leather garments in terms of identifying the type of sewing machine-the type of sewing thread To suit every type of leather in this test.

Keywords:

- **Leather**
- **artificial leather**
- **natural leather**
- **ordinary sewing machine**
- **leather sewing machine**
- **sewing thread**
- **seam.**

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1-Introduction:

Animal skin that has been processed to retain its flexibility, toughness, and waterproof nature is known as natural leather, leather is made by processing the skins of animals slaughtered in the meat processing industry, and hence the majority of skins tanned are those of sheep and goat. Animal skins are converted to leather in an eight step process as follows: (1)

Step 1 - Unhairing the animal skins are steeped in an alkali solution that breaks down the structure of the hair at its weakest point (the root) and so removes the hair. (1)

Step 2 - Liming the hairless skin is immersed in a solution of alkali and sulphide to complete the removal of the hair and to alter the properties of the skin protein (collagen). The collagen becomes chemically modified and swells, leaving a more open structure. (1)

Step 3 - Deliming and Bateing The skin structure is then opened further by treatment with enzymes, and further unwanted material is removed.

Step 4 - Pickling The skins are then treated with acid to preserve them for up to two years

Step 5 - Tanning This is the most chemically complex step. During tanning, the skin structure

is stabilized in its open form by replacing some of the collagen with complex ions of chromium. Depending on the compounds used the color and texture of the leather changes. When leather has been tanned it is able to 'breathe' and to withstand 100oC boiling water, as well as being much more flexible than an untreated dead skin.

Step 6 - Neutralizing, Dyeing and Fat Liquoring The leather is then treated with alkali to neutralize it and so prevent deterioration, and then dyed. This involves fixing a variety of compounds onto the chromium, as that is the most reactive site present. Once the leather is dyed, it is treated with reactive oils that attach themselves to the fibrous structure, improving suppleness and flexibility. (1)

Step 7 - Drying Water is removed from the leather, and its chemical properties stabilized.

Step 8 - Finishing A surface coating is applied to ensure an even color and texture, and to improve its ability to wear. Suede leather is also buffed at this point to give it its distinctive finish.(1)

Leather is used for various purposes including clothing (e.g. shoes, hats, jackets, skirts, trousers and belts), and as a furniture covering. It is produced in a wide variety of types and styles and is decorated by a wide range of techniques.

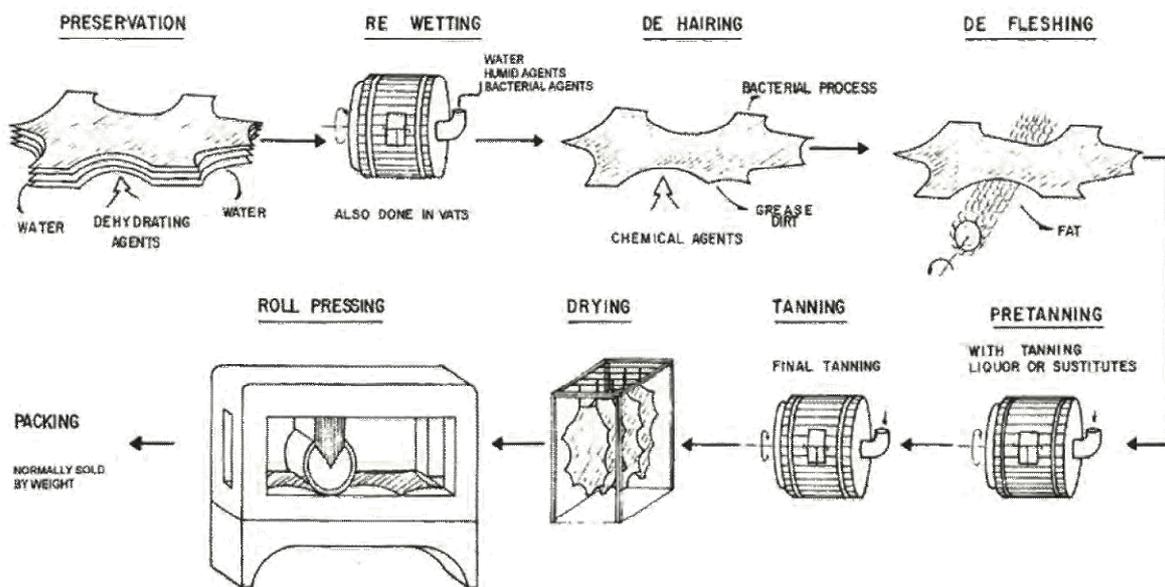
(2) Synthetic leathers, at times made from plastics, are often used in clothing and fabrics. Artificial leather is marketed under many names, including "leatherette", "faux leather", and "pleather". Artificial leather making includes a cloth inner or basic layer having a number of longitudinal and lateral filaments coupled together and formed by a thread applied with a wax outer layer. Artificial leather can be made from several processes. Some of the common ones include direct coating process, transfer coating process, and wet process. (3)

Direct coating process: This was the original technology used to manufacture artificial cloth. In this process the plastisol was directly coated to a woven fabric before passing through the oven and then embossed.(3)

Objective:

The purpose of this paper is to study sewing leather fabrics techniques to reach the highest degree of quality and efficiency of sewing leather and the efficiency of functional and aesthetic appearance of clothing and age consumer

The Process



Fig(1).Tanning process (2)

Table 1: Summary of leather used for clothing manufacture	
Origin of leather	Type of leather
Sheep and lamb	Nappa
	Suede
	Double-face
	Chamois
	Skiver
Cow	Nappa
	Nubuck
	Split
Goat and kid	Full grain and suede
Pig	Full grain and suede
Exotic and fur-bearing animals	For example snake and mink
Kangaroo	Nappa mainly

Table (1) leather used for clothing manufacture (4)

Sewing leather

Sewing leather and fur do not differ too much from sewing other types of material. The key to sewing leather is to always try your stitch on a piece of scrap before you start the actually sewing and then make sure having good pattern accurate for the piece that will be sewing. The reason this is so crucial is that once that stitched leather, if there is a mistake and need to undo the stitch, the leather will be weakened and will be a lot of holes.

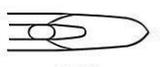
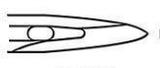
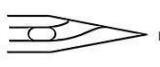
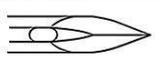
The use of specialized leather sewing machine makes sewing leather garments much easier. Because the leather sewing machine is equipped to deal with any kind of leather thickness .but the ordinary sewing machine suit with small leather thickness.(5)



Fig(2).Sewing holes(5)

When using ordinary sewing machine. we should use special press foot and special needle .Must adjust stitch knitting to suit skin type, it is that depending on the thickness of the leather, Obviously, the thicker the seam will be, the longer that need to make the length of the stitch. If the stitch is too small, what happens is that the leather is punctured too close together, causing tears.(6)

Plastic presser foot, for hard-to-feed fabrics, this foot is molded of a special resin for easy sewing of fabrics that might stick to a metal foot such as Ultra suede, faux suede, vinyl, imitation leather.

Systems	Point style	Seam appearance
 134 S	 Narrow cross point	
 134 LR	 Reverse twist point	
 134 PCL	 Narrow wedge point	
 134 D	 Triangular point	

Fig(3).Needles and seams shapes(6)



Fig(4).Teflon presser foot(6)

Thread that is 100% polyester or nylon but does not use cotton or cotton blend because the chemicals in the leather from the tanning will cause the thread to rot.

Artificial leather can be hand sewn or machine sewn. Hand sewing requires leather needles and special kind of threads. Light weight artificial leather may be stitched on home Machine needles of artificial leather sewing machines but for medium and heavy weights heavy duty industrial sewing machine are suitable. (7)

Avoid skipping of stitches by machine: Sew from the fabric (wrong side) whenever possible. A teflon foot on sewing machine will also help as it allow the fabric to move properly for sewing foam, plastic, plastic coated fabrics, leather and imitation leathers.

The foot feeds over the fabric without sticking. A leather needle may solve the problem. If it is must to sew on the right side, place tissue paper on top of the fabric to help the machine feed the fabric properly.

Although Pu is backed in a knit, you should not use a ball point needle, because it will tear ugly holes in the Polyurethane. Instead, use a sharp size 11 in your machine for seam construction and topstitching. Use a "leather" needle to baste in zippers.

Leather needles are heavy weight needles designed with a razor tip to cut through leather and leather-like fabrics that resist normal needle piercing. This makes them a terrific choice for machine sewing through both Pu and zipper tape in a single line of stitching. (4)

NEEDLE POINTS

The needle point is determined by the fabric weight and its structure.

- *Round points* have a conical shape designed to spread the yarns without breaking them; they are used for most woven materials and are known as Sharps or Universal needles.
- *Micro point* needles have come to be with the invention of microfiber fabrics and coated materials. These are built with sharper points and more slender shafts to pierce the yarns of

finer woven fabrics. Perfect to use with lightweight faux suede, neoprene, and other such synthetic microfibers, etc. Micro points will also work well on slick materials such as plastics, and will create nice even stitches for edge stitching.

- *Cutting points* have sharp cutting edges; they are used to slice through the material such as natural leathers, suedes, and vinyls.(8)

2. Experimental work

2.1. Leather type:

Two types of leathers were examined:

- sheep natural leather
- Pu **artificial leather**.

The following table illustrates the tested leathers types

Table (2) Leather types

Leather type	Thickness(mm)	Weight(gm/m ²)	Stiffness(mg. cm)
sheep natural leather	0.8	356	430
Pu artificial leather	0.7	425	2521

Table (3) Sewing process conditions

Seam types:	Superimposed seam
Needle number	14/90
Stitch density per inch	6 stitches per inch

2.2. Sewing machine types

Two types of sewing machine with the same motor power:

- Ordinary sewing machine: Juki DDL-87001 Straight Stitch Sewing Machine
There are several different types of sewing machines available for use in industrial material making and for at-home use. In this paper used juki Industrial sewing machine.
- Leather sewing machine: Juki LS1341 Cylinder Bed Lockstitch Machine
Machines for sewing leather are designed to handle heavy-duty thread and sturdy materials. In this paper used juki leather sewing machine

2.3. Thread type:

Using two types of thread:

- polyester No. 60/3
- nylon No. 60/3

2.4. Experimental tests

A number of tests, determining performance and function were used. All tests were done in conditioned atmosphere of 20°C ± 2 and 65% ± 2 RH.

Testing seams included seam strength, seam pucker evaluation; mass loss due to abrasion and seam thickness was measured on stitched line. Seam slippage was tested using tensile tester, where three samples from each leather type was

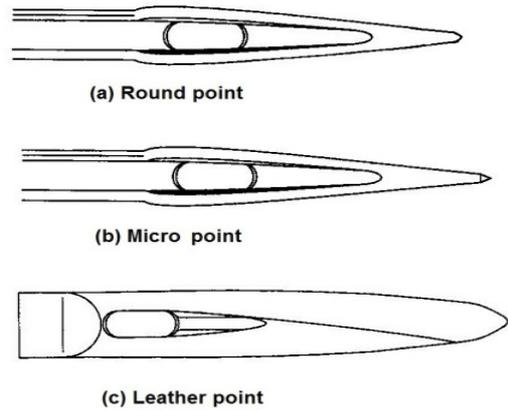


Fig (5).Needles points (8)

tested according to BS (3320:1988) , sample size 10cm lengthwise and10cm across. Seam pucker has been evaluated, according to AATCC 88B:1978 .the stitching ratings, using three experts in the leather. Abrasion test was conducted, on all examined seams, by means of Martindale BS (5690) for a number of cycles, 100 cycles; mass loss was achieved before and after abrasion process. Abrasive paper was used as abrading instead of standard fabric, with 12 KP load on top of abraded sample. Stitched line was placed in middle of the 3.2cm circular sample needed for abrasion test. Thickness of seams obtained from average of five readings for each leather.



Fig (6).Juki Ordinary sewing machine:



Fig (7) .Juki leather sewing machine

3. Results and Discussion

3.1. The effect on seam slippage (tensile strength):

Table (4) effect of sewing machine and thread type on seam slippage (tensile strength)

Leather type	Ordinary sewing machine		leather sewing machine	
	Nylon	polyester	nylon	Polyester
sheep natural leather	22	21	27	25
Pu artificial leather	14	12	18	15

- As shown in fig. 8 and table (4) that there is different seam slippage when using the two types of sewing machine with the two types of leather, that sheep natural leather has higher tensile strength (more durable) than Pu artificial leather.
- Sewing with leather sewing machine given

higher tensile strength than the ordinary sewing machine .especially when we used the sheep natural leather.

- Using nylon sewing thread was better than polyester thread in this test when we used the natural sheep leather, but when we used pu artificial leather given lower tensile strength.

3.2. The effect of sewing machine and thread type on seam pucker

Table (5) The effect of sewing machine and thread type on seam pucker

Leather type	Ordinary sewing machine		leather sewing machine	
	Nylon	polyester	nylon	Polyester
sheep natural leather	5	4	5	5
Pu artificial leather	4	3	5	4

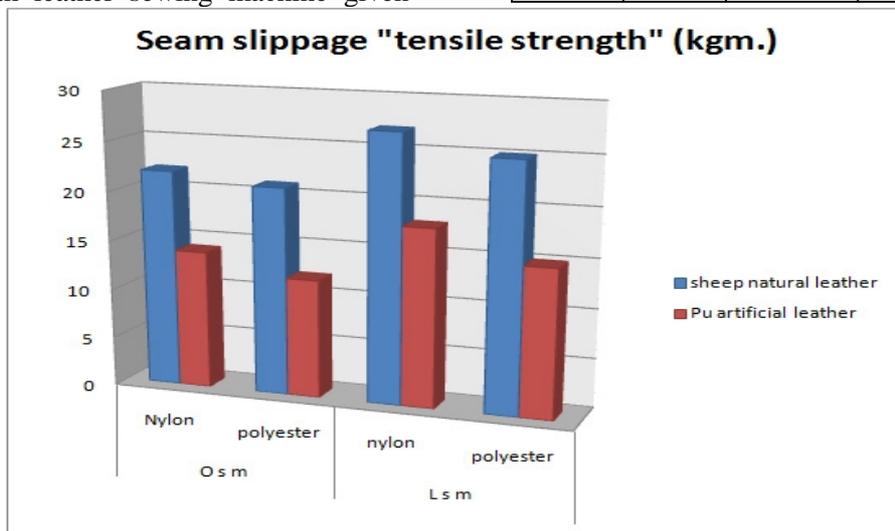


Fig (8). Seam slippage "tensile strength" of leather types

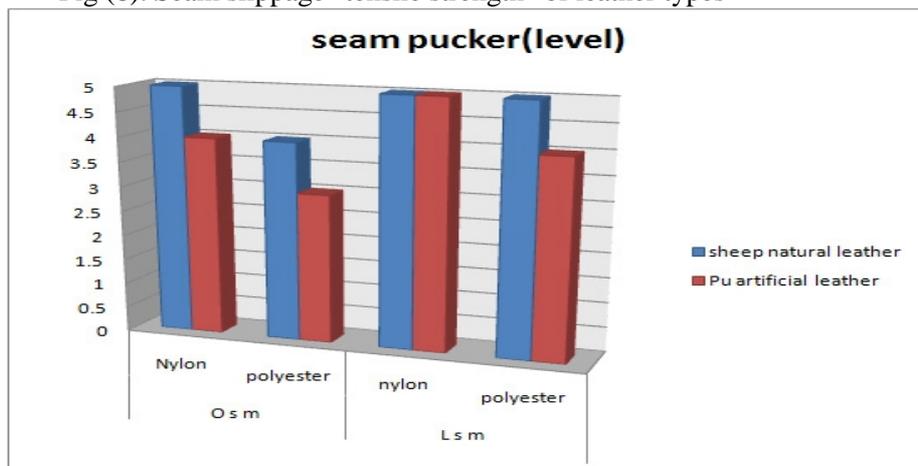


Fig (9). Seam puckers of leather types

- As shown in fig. 9 and table (5) when we used sheep natural leather with leather sewing machine, it wasn't any seam pucker, using polyester or nylon thread. But sewing

polyester thread with pu artificial leather with ordinary sewing machine has seam pucker.

- Sewing Sheep natural leather with ordinary machine and polyester thread given little

pucker. especially with polyester thread

- Using nylon thread did not give any seam pucker with sheep natural leather. It means that nylon thread better than polyester thread when sewing leather.

3.3. The effect of sewing machine and thread type on seam abrasion

Table (6) The effect of sewing machine and thread type on seam abrasion

Leather type	Ordinary sewing machine		leather sewing machine	
	Nylon	polyester	nylon	polyester
sheep natural leather	3.4	3.5	2.9	3.2
Pu artificial leather	7.8	8.1	6.9	7.3

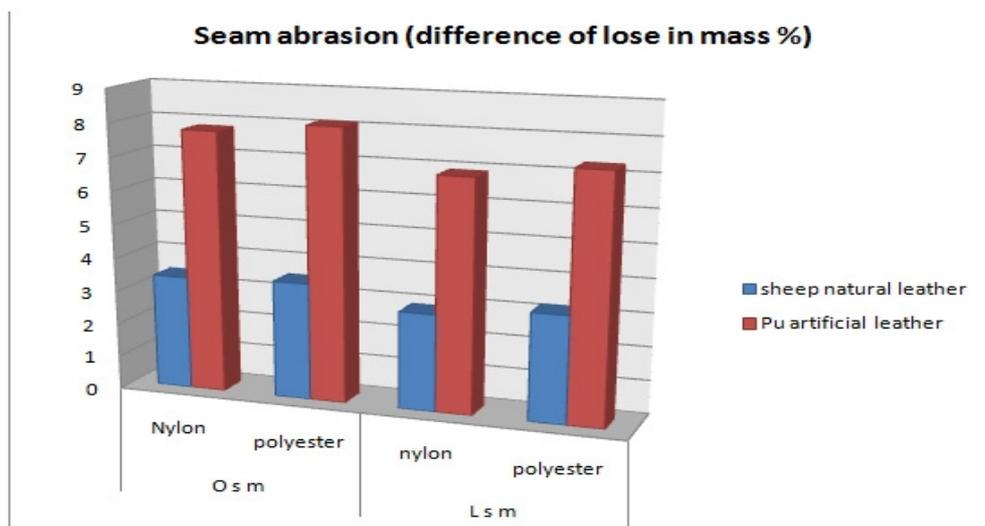
- It is clear that sheep natural leather with leather sewing machine using nylon thread has the less seam abrasion, but pu artificial leather with ordinary sewing machine using polyester thread has the higher seam abrasion.

- Sheep Natural leather is more abrasion resistance (smaller difference of lose in mass %) than pu artificial leather.
- As shown in table (6) and fig.10 using nylon thread with leather sewing machine and sheep natural leather has the best abrasion resistance, polyester thread with ordinary sewing machine and pu artificial leather is the lowest.

3.4. The effect of sewing machine and thread type on seam thickness

Table (7) The effect of sewing machine and thread type on seam thickness

Leather type	Ordinary sewing machine		leather sewing machine	
	Nylon	polyester	nylon	polyester
sheep natural leather	2.9	2.8	2.6	2.7
Pu artificial leather	2.2	2.1	2	1.9



Fig(10). Seam abrasion of leather types

- As shown as table (7) and fig (11), it was found that seam thickness of Sheep Natural leather is more than pu artificial leather. This can be attributed to the higher stiffness of Sheep Natural leather.
- As can be seen from the above table there was a low effect of sewing machine and thread type on seam thickness.
- Polyester thread with leather sewing machine and pu artificial leather has the smallest seam thickness.
- Polyester thread with sheep natural leather and ordinary sewing machine has the biggest seam thickness. because of its high stiffness.

Conclusion

- Using nylon thread in sewing leather is better

than using polyester thread; Sewing machine type has a significant effect on seams properties. leather sewing machine is better than the ordinary sewing machine Because it specializes in sewing leather.

- There is a direct relationship between leather stiffness and seam thickness, Pu artificial leather has higher tensile strength than Sheep Natural leather, Pu artificial leather is more abrasion resistance than sheep natural leather.
- Sewing Sheep natural leather with ordinary machine and polyester thread given little pucker, but using nylon thread did not give any seam pucker with sheep natural leather. Using nylon thread did not give any seam pucker with sheep natural leather.

- using nylon thread with leather sewing machine and sheep natural leather has the best abrasion resistance, polyester thread with

ordinary sewing machine and pu artificial leather is the lowest.

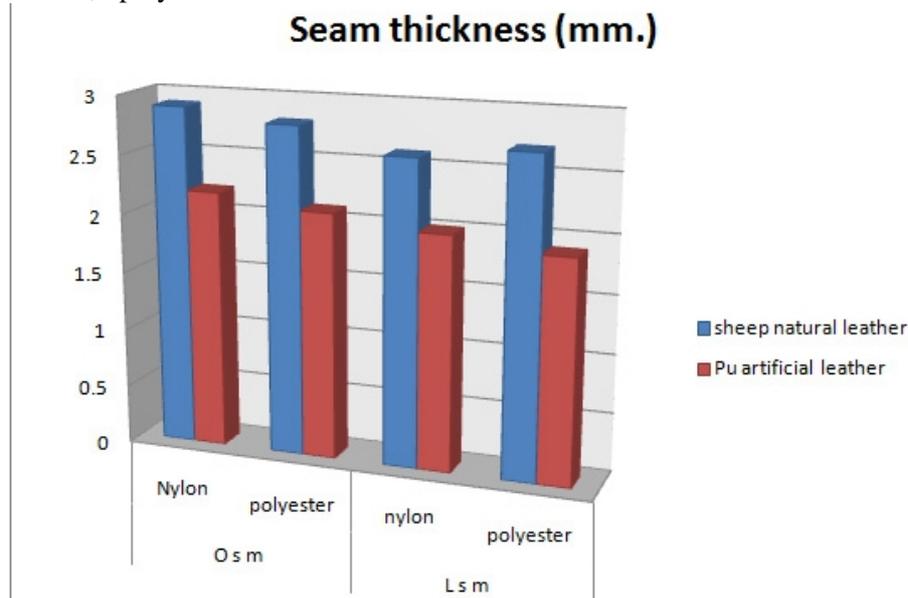


Fig (11) . Seam thickness of leather types

- Therefore the author recommends using leather sewing machine which is more suitable to all types of leather and all thickness.
- Choosing the right leather type and sewing machine type avoids seam pucker.
- Selecting the suitable thread type for sewing leather garment is an important factor to achieve high quality leather products.

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