Selecting the Correct Sewing Thread

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Though it is often invisible and comprises a very small portion of the retail selling price of a product, sewing thread is an integral component of the garment. Typically, the cost of thread is less than *5%* of the retail selling price. Since the vast majority of seams in a garment are held together by sewing thread, it is important to recognize that *50% of the responsibility* of the garment's performance is dependent on sewing thread.

Some sewing problems that result from improper thread selection include breakage, skipped or irregular stitches and seam pucker. The properties of the sewing thread determine how compatible it will be with the fabric. The various properties of thread which are discussed below are interrelated. Changing one property such as the fiber type can affect one or more of the other properties—adversely affecting garment quality, performance and/or manufacturability.

Sewing Thread Properties

The most important properties of sewing thread that impact quality, performance and manufacturability are: thread color, strength, uniformity, fiber type, finish, size, twist, shrinkage, elasticity, elongation and structure. The importance and impact each property has on quality and manufacturability are reviewed in the following text. The importance of thread inventory will also be discussed.

- **Thread Color**
  - Thread color impacts quality. The hue, shade and luster should all be considered. The highest quality garments utilize a thread color that matches the dominant color in the fabric. For the best match, usually a slightly darker thread color from the dominant fabric color is selected. To save on cost basic colors such as black and white can be used in areas that are not visible.
  - Although it can be costly to order different colors of thread for each fabric and maintain an inventory, correct color selection denotes quality. Apparel manufacturers of low-cost garments often use whatever thread they have available.
  - Dyes should be fast to laundering and light. If the dyed thread fades over time, the visual appearance of the garment may be adversely affected. The thread should not bleed or crock onto the fabric.
- **Thread Strength**
  - Thread strength is critical to the durability of the stitches and seams. Repeated breakage due to weak thread during garment assembly can be devastating to production schedules and result in weak seams; however, stronger thread is not always better.
  - The two most important aspects of strength are tenacity and loop strength. The appropriate tenacity and loop strength should be determined when choosing thread.
  - Tenacity is defined as below:

$$\text{Tenacity} = \frac{\text{Maximum tensile force}}{\text{Linear density (tex)}}$$

Tensile force is the force recorded at the moment of thread rupture.
Linear density = thread weight (grams) /thread length (1000 meters)

Thread ranges from 18-80 tex or 18 grams/1000 meters and 80 grams/1000meters. Some of the more common are tex 40 used for high strength areas and tex 27 for general sewing.

- In ordinary garments, the thread tenacity should be compatible with fabric strength—never stronger. If the sewing thread is stronger than the fabric, the fabric will rip before the thread breaks. Ripped fabric is more challenging to repair than a ripped seam. However, for high performance products, such as seatbelts and parachutes and airbags in a car, you never want the thread be the weak link.

- Loop strength is the load required to break a length of thread which is looped through another length of the same thread. This test is a good indicator of stitch strength.

- **Thread Uniformity**
  - It is natural to have some amount of variation within the thread; however, it is crucial that the number of thick and thin areas be minimized. Thick places can have an adverse effect on sewing. Thick thread can't pass freely through the thread handling components of the sewing machine which may lead to thread breakage during sewing. Thin areas in the thread can be weak and cause the thread to break either during the sewing process or during wear.

- **Thread Fiber Type**
  - Although sewing thread can be made from any fiber, most threads are made from polyester, nylon, cotton or rayon. Silk and linen are also used but the high cost of these fibers limits them to specialized uses. The fiber choice is in large part dependent on the end use.

  - Polyester and nylon provide strength and chemical resistance. The high strength may be too strong for some fabrics. Nylon has higher tenacity and abrasion resistance than polyester, making it well suited for applications requiring fineness, high strength and flexibility.

  - The strength of nylon is adversely affected by prolonged exposure to both the visible and the ultra-violet components of sunlight. Polyester is only affected by ultra-violet components. UV inhibitors can be applied to avoid strength degradation.

  - Cotton is not as strong and is more susceptible to abrasion than polyester or nylon of the same thickness. Cotton can be mercerized (treated with caustic soda) to increase the strength. Cotton is also less resistant to chemicals.

  - Cotton threads have excellent sewability and are stable at high dry temperatures and therefore less affected by hot needles during sewing.

  - The strength of cotton is adversely affected by prolonged exposure to both the visible and the ultra-violet components of sunlight.

  - Rayon is comparatively weak but dyes very well and has high luster. Cotton and rayon have higher moisture absorption characteristics than nylon or polyester which can lead to rot in hot humid climates.

- **Thread Finish**
  - A variety of finishes can be used to improve the sewability of sewing thread, for example—lubricants reduce friction and improve the lubricity of the thread. Glacing (also referred to as glazing in some texts) increases strength and abrasion resistance. As mentioned earlier, mercerizing can increase the strength of cotton.

- **Thread Size**
  - Heavy fabrics require coarser threads and lighter weight fabrics require finer threads. Assuming the thread fibers are the same, the heavier the thread, the stronger the thread. Heavier threads are subject to abrasion because more surface area is exposed.

  - Heavier threads may also cause displacement puckering (structural jamming). As the needle penetrates the fabric, the threads displace the yarns near the stitch hole. If the thread is too thick, the displacement can cause puckering. The higher the fabric count and the thicker the thread, the greater the chance for

displacement puckering. To minimize displacement puckering, the finest possible thread should be used.

- **Thread Twist**
  - Most threads have a Z twist or twist in the left-hand direction as opposed to an S twist which twist in a right-hand direction. Z twist is the most common twist direction used in sewing.

  - Ply security refers to the way the yarns are plied or twisted together. Ply security affects the stability of the thread. The amount of twist is crucial. Too much twist will cause the thread to be twist lively, resulting in kinking and snarling. Twist lively thread causes the needle thread loop to twist away from the loop-taking device during sewing causing skipped or mal-formed stitches. Too little twist will adversely affect the strength of the thread.

- **Thread Shrinkage**
  - Shrinkage is the amount by which a thread contracts under the action of washing or heating. It is expressed as a percentage of its original length. Sewing thread shrinkage should be compatible with fabric shrinkage. If the sewing thread has a higher shrinkage than the fabric, seams may pucker when exposed to water and heat.

- **Thread Elasticity and Elongation**
  - Elasticity is the amount the thread will recover to its original length after being extended by a set amount. Elasticity is especially important in stretchy knit fabrics because the thread needs to have a high elasticity as well as a degree of stability. Two events may occur with a thread that has poor recovery. Poor thread recovery will result in loose stitches and cause seams to grin or have poor coverage**.**. An unstable thread may elongate and recover too much, causing seam pucker that is similar in appearance to shrinkage pucker.

  - Elongation is a test method which measures the amount by which a thread can be extended until it reaches its breaking point. Both properties are important when assessing seam stretch.

- **Thread Structure: Spun, Core Spun and Filament**
  - Spun threads are composed of staple fibers. A variety of fibers can be used; however, the most common fiber is polyester. Two to six single spun threads are plied together. Spun threads are strong, have good elasticity and abrasion resistance.

  - Core spun threads consist of a strong polyester or nylon filament surrounded by a spun fiber, usually cotton or polyester. Several single core spun threads are usually twisted together. Core spun threads tend to have less seam distortion and puckering than spun threads. Seam distortion and puckering can occur when the needle penetrates the fabric—especially in tightly constructed fabrics. As mentioned under "Thread Size," thicker threads displace the fabric more than finer threads. Because of the strong synthetic filament core, core spun yarns can be finer and stronger than spun yarns, therefore creating less distortion and puckering.

  - A cotton wrapped core provides strength and comfort. In addition, core spun threads which utilize cotton are ideal for garment dyeing 100% cotton apparel. After sewing a garment constructed with a core spun thread that utilizes cotton, the garment can be dyed in one dye bath because both the thread and the fabric are dyed with the same dye. In general, core spun threads have better sewability than spun threads. Core spun threads are typically stronger than spun threads of the same size. In addition, the twist can be backed out of spun yarns during sewing, making them weaker.

  - Filament threads can be either monofilament or multifilament.

A monofilament thread consists of a clear single nylon filament similar to fishing line. Monofilaments are relatively inexpensive. Due to their partial translucent color, these threads are inconspicuous in garments of any color. Manufacturers that use monofilaments as opposed to dyed threads spend less time changing thread and rethreading new cones. The use of monofilament threads minimizes time spent inventorying threads, and reduces

the amount of inventory space needed.

Monofilament thread is very strong—too strong for many fabrics. It has a high resistance to abrasion. Monofilaments are stiff and very slippery, making them difficult to handle. When a monofilament breaks it quickly unravels and the end can irritate the wearer's skin. For these reasons monofilament threads are confined to end-uses such as low-end garments and occasionally hems.

Multifilament threads consist of a number of filament yarns twisted together. Multifilaments may also be bonded together to form a cohesive bundle. This type of thread is often utilized in upholstery and shoe products where high strength is required. .

Multifilaments can be texturized to make them look and feel more like spun yarns. Texturizing gives them more coverage, stretch and makes them more comfortable to the wearer. The increased stretch makes texturized multifilaments especially suitable for sewing knit fabrics. Texturized multifilaments are also less apt to unravel than untexturized threads. Both texturized and untexturized threads are more prone to snagging during sewing and wear than spun or core spun threads.

- **Sewing Thread Inventory**
  - Careful selection of sewing thread is crucial. It is also important to correctly inventory thread. Sewing thread is put on color coded cones. The color of the cone indicates thread specifications such as size and fiber type. In some situations, thread gets put on the wrong cone color. For example, if the necessary number of cones is not available, cones might be broken down to make more cones. Often the incorrect cone color is used to wind thread on—negating the meaning of the color code. This practice can result in incorrect thread inventory and ultimately incorrect thread usage. This can have a detrimental effect on manufacturing and ultimately on garment quality.

Conclusion

A high quality sewing thread that is uniform in its characteristics and dimensions can be used on a variety of machines and with a variety of fabrics. It is important to note that certain machines can accommodate a wider variety of thread sizes. For example, on the lockstitch and chain stitch machines, the needle and bobbin thread size do not necessarily need to be the same. Finer thread is less expensive than thicker thread; therefore using finer thread can save money.

On a lockstitch machine, a smaller or weaker thread can be used on the bobbin than on the needle because there is less stress on the bobbin thread during loop formation. However, because there is a 50 to 50 load-bearing ratio between the needle and bobbin threads, using two different sizes of thread can adversely affect seam strength—resulting in a weaker seam. A smaller thread could be used on the bobbin if something other than seams were being sewn. Examples include embroidery and button holes.

On the chain stitch machine, there is generally about a 60 to 40 load-bearing ratio between the needle and the looper threads—that is, more looper thread is used in loop formation. For this reason, a smaller thread can be used on the looper on a chain stitch machine—resulting in a monetary savings.

Thread failure can often lead to product failure. Thread is not only vital to the performance of the garment, but it also affects the ease with which the fabric is sewn. Sewing thread must be carefully selected to ensure garment quality and the ease with which the product can be manufactured. When selecting sewing thread, all properties need to be considered. The way in which the various properties are inter-related should also be considered when selecting thread. To ensure quality, the physical properties of the thread, the fabric and the desired end use properties of the product all need to be taken into account.

It is important to remember that one of the best resources for a sewn product manufacturer is the thread manufacturer. Thread manufacturers have competent technical personnel and laboratories that help with thread selection as well as troubleshooting problems that might arise during sewing.

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