MINIMIZING NEEDLE HEAT

Introduction

Today, most high-speed industrial sewing machines sew at very high speeds from 4,000 to 10,000 stitches per minute. Also, the most common sewing threads used for the manufacturing of apparel or non-apparel items are either polyester or nylon that have been produced using a melt-spinning process. Many of the fabrics being sewn are made from synthetic fibers that can be impacted by excessive heat. Some needle holes that appear to be needle cuts are actually caused by excessively hot needles. In this bulletin, we will discuss what causes needle heat and what can be done to minimize needle heat.

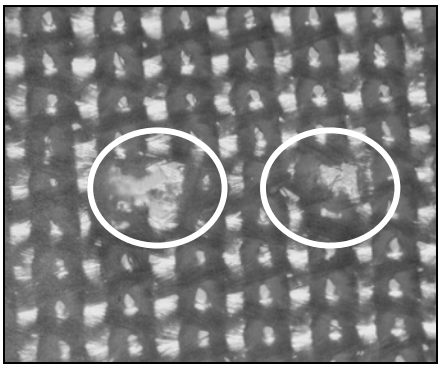

Figure 1. Needle Holes Caused by Needle Heat

What Causes Needle Heat?

The friction between the needle blade and the fabric creates needle heat. The following factors can have an impact on the amount of heat that is generated:

- Fabric thickness
- Fabric finish or density
- Fabric color or density (darker colors normally are worse than lighter colors)
- Sewing machine speed
- Needle contact surface
  - Needle Size or diameter
  - Needle length
  - Type of needle blade
  - Type of needle finish

Needle heat is usually more of a problem when sewing either synthetic threads and / or synthetic fabrics and can cause excessive thread breakage and / or damage to the fabric being sewn. Generally, needle heat will cause thread breakage when the operator stops sewing after a long run and the thread comes to rest in the needle eye….NOT during sewing. The result is that the polyester or nylon thread melts and breaks. Both polyester and nylon have a melt point of approximately 485°F or 252°C. Whenever the needle reaches a temperature higher than the melt point of the thread, the thread will melt. Needle thread breakage due to needle heat can be detected by checking the end of the thread to see if there is a hard nodule where the thread melted and re-solidified.

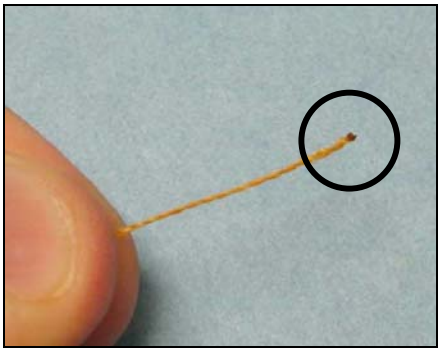

Figure 2. Thread Breakage Due to Needle Heat (Note Nodule on End of Thread)

American & Efird puts a thread lubricant on the thread to help minimize needle heat and give the thread good frictional characteristics to set a uniform balanced stitch. Usually, larger sizes of thread that are sewn into to heavier weight garments have a heavier lube application to protect the thread against needle heat.

Ways of Minimizing Needle Heat

1. Use a smaller diameter needle whenever possible. A smaller diameter needle will definitely minimize needle heat and may be the solution in marginal situations.

2. Use a “ball eye” needle. A “ball eye” needle is where the diameter across the eye is generally .003 or .004 inch larger than the blade diameter, therefore, it opens up a larger hole, minimizing the friction on the needle blade. Many needle manufacturers even have an “oversized ball eye” needle in some classes of needles that are commonly used for sewing heavy fabrics.

3. On leather, vinyl, and other homogeneous fabrics, use a needle with cutting edges like a diamond, triangle, or wedge point. These needle point types actually cut through the fabric minimizing the penetration resistance and needle heat. Cutting point needles are not recommended for woven or knitted fabrics used for making apparel due to fabric damage.

4. Try needles with special low friction surfaces. Most needles have a low friction chrome plating, however, there are other special needle coatings like Teflon or Tungsten that will minimize the friction between the needle and the fabric.

5. Use needle coolers or devices that blow compressed air on the needle during sewing. This requires the availability of compressed air and lines carrying this air to the sewing machines. Machines should have control switches that conserve the consumption of compressed air and only supplies air on the needle during sewing.

6. Use a cotton wrapped polyester corespun thread like A&E’s D-Core. The cotton wrapper acts as an insulator protecting the thread from the heat.

7. Ask you thread supplier if they have products available with heavier lube levels. The danger of using excessively high lube applications is finish migration in to the seam.

8. Equip the machine with a needle positioner that positions the needle down after long high-speed runs. This allows the fabric to help dissipate heat and hopefully prevents the thread from melting; however, it can cause more needle holes on synthetic fabrics.

9. Slow the sewing machines down to an acceptable level to minimize thread breakage due to needle heat.