

Know Your Fibers: The Difference Between Cotton and Polyester

In the latest installment of our [Know Your Fibers](#) series, we take a look at two fiber stalwarts: cotton and polyester. Most people know that cotton is a natural fiber and polyester is a man-made synthetic fiber. However, these fibers have other differences as well. Today we'll look at the properties of these two fibers individually.

Cotton Processing

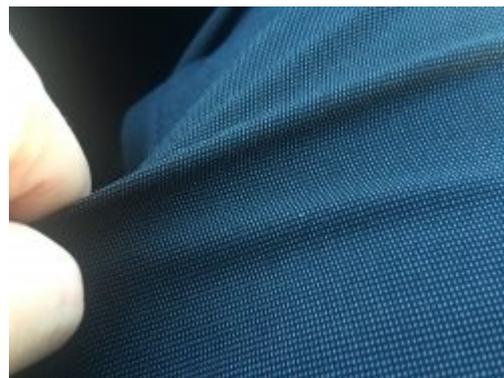
Grown on plants that are planted annually, [cotton fibers](#) are composed of the polymer cellulose. The fibers have a hollow opening called the lumen in the middle that run the length of the fiber, and when the boll opens and the fiber dries out the lumen collapses. This causes the fiber to form twists (convolutions) so it is shaped like a straw that has had the air sucked out of it, leaving it twisted. Nature coats the fibers with waxes to protect it from the rain when the bolls open; therefore, cotton is naturally hydrophobic (water repellent). But cotton is known for its absorbency, which means the fiber must be wet-processed to remove the waxes. This is what ultimately makes the fiber absorbent. This can be done after the fibers have been spun into yarn (textile mills) or in fiber form ([purification process](#)). To produce absorbent cotton nonwoven fabrics, the latter is done because many times these fabrics do not have the strength to withstand wet processing.

Cotton Properties

Cotton is comfortable and breathable. It will wick sweat away

from the body so one doesn't get a wet, clammy feel. Moisture vapor is free to transfer through the fiber to lower the humidity between the fabric and the body, which gives one a cool feeling. Cellulose is flammable and will burn, but it can be treated to make it flame-retardant. While the strength (tenacity) of cotton is 3.0-5.0 grams/denier when dry, cotton has a very unique property in that its strength increases when wet to 3.3-6.0 grams/denier. In the fiber world the strength of cotton is considered moderate to above average. Cotton also has a length distribution, meaning there are different lengths of fibers present. The value used to classify cotton length is the average of the fiber lengths present. Cotton has a natural moisture regain of 8.5% at standard temperature and humidity conditions. Cotton is a sustainable and biodegradable fiber.

Polyester Processing



Polyester (polyethylene terephthalate) pellets or chips are synthesized from petroleum-based products. Polyester is thermoplastic, meaning it can be melted and reformed. These pellets are melted and the melted polymer is forced through small holes (spinnerettes). On the exit side of the spinnerettes, the continuous filaments (fibers) solidify. The size and shape of the hole dictates the shape and diameter of the fibers. The fibers are solid polymer; there are no void spaces inside the fibers. These continuous filaments—called “tow”—can be cut to any length (no length distribution, all fibers have the same length) to produce staple fibers for use in textiles and nonwovens, or they can be left as a continuous monofilament, which resembles fishing line.

Polyester Properties

Being a fiber derived from oil, polyester is water-repellent, and therefore not absorbent. The moisture regain is only 0.4% at standard temperature and humidity conditions. For this reason polyester fabrics do not absorb sweat and can give one a moist, warm, clammy feel. Polyester fibers typically have a low level of wicking, and strength can vary greatly because it can be controlled by how much drawing (stretching) occurs during production. It can go from 2.5 grams/denier to 9.5 grams/denier. These strengths are considered moderate to very high. Higher fiber strengths will produce stronger fabrics. Since it is produced from petroleum, polyester is not considered sustainable and it is not biodegradable.

Now You Know

Keep in mind that cotton and polyester can be blended together to produce fabrics that exhibit properties that couldn't be achieved using the fibers alone. But separately, each has its advantages and disadvantages. Really, that's the goal of our Know Your Fibers series: to let you, the reader, determine which fiber, based on its properties, is the best choice for you.