



Fabric durability and UV protection

Kathlyn Swantko looks at some established and newer properties of fabrics demanded by today's consumer.

The functionality offered in performance fabrics has expanded as fabric technology has evolved. And, product development innovators continue to do their best to fulfill the increasing demands of consumers. Two properties at the old and new ends of the technology spectrum are durability and UV protection.

Durability is one of the original and most basic of performance qualities, while UV Protection is one of the newer innovations just beginning to gain momentum in performance apparel for the outdoor and fitness market.

The durability of fabrics refers to the ability of fabrics to retain their shape, dimensional stability, and appearance through wearing and washing cycles. Durability encompasses such properties as abrasion resistance, tensile strength, and resiliency, and largely depends on the fiber content and fabric construction.

Tensile strength is a prime quality in

fibers used to make durable fabrics. Abrasion resistance, or the ability of a fiber to resist wearing away by friction or rubbing, is another important aspect of durability. As is resiliency, which is the ability of a fiber or fabric to hold its shape, and spring back when crushed or wrinkled. The fibers with the highest tensile strength and with good to excellent abrasion resistance, include nylon, polyester, polypropylene, and aramid. So not surprisingly, the most popular performance fibers currently used for durability in knitted performance fabrics are polyester, nylon, and polypropylene, or blends made with one of these fibers.

In general, filament yarns and long-staple yarns produce stronger, smoother, more serviceable fabrics. However, they also tend to cost more than less durable yarns made from short-staple fibers. The serviceability and durability of a fabric are also not necessarily determined by the length of staple alone, because fibers and

blends differ in their ability to resist tearing.

The construction of the fabric can also impact the durability of a fabric. One characteristic associated with knitted fabrics is that they may exhibit elongation tendencies, which may or may not be desirable. Many times, the quality of a knitted garment is based on its ability to maintain its shape, and minimize elongation.

Plain and twill weaves tend to make the most durable woven fabrics, and are often used in garments, such as denim jeans, sportswear items, and school uniforms, where durability is a major concern. Some of the cutting-edge knitted fabric developments in the areas of durability are associated with the military /protective clothing and industrial markets, through the use of such aramid fibers as Nomex and Kevlar.

In knits, the tightly knitted constructions, produced on fine gauge knitting machines, provide the most durable knitted fabrics. Of particular note, Kronfli Spundale Mills, a Vernon, California, based circular knitter, has recently introduced its new Finiano collection of durable polyester microfiber knits, which are produced on 40 cut circular machines. The fabric contains 63 wales per inch and 8,000 to 10,000 knitted loops per inch, which enhances the hand of the fabric and dramatically improves its resistance to pilling, even if rubbed with sand paper.

Some testing has been done, and some prototype garments have been developed, containing a small percentage of aramid fibers blended with cotton for use in woven denim bottomweight fabrics as an application in board sports, and rock climbing apparel. However, with the exception of some limited usage in sports specific athletic shoes, these sportswear apparel programs have never really developed into anything significant, and nothing has crossed over into the knitted sportswear apparel as yet.

UV protection in fabrics

In the days before high-tech performance fabrics, the level of UV protection provided by a fabric was dependent on two factors: 1) The type of fiber used in the garment (At the high end of the spectrum were the manufactured fibers, and at the low end

were the natural fibers.); and 2) the density of the fabric. The tighter the weave or knit, the better it's ability to block UV rays.

Before talking about UV protection, it's necessary to clarify the difference between SPF and UPF ratings. SPF is the Sun Protection Factor provided by liquid lotions or creams, such as sunscreens and sunblocks. The UPF is a term describing the sun protection provided by fabrics, and it indicates the level that a fabric can block UV rays from reaching the skin. Both SPF and UPF share the same scale range from 0 to 50+. The minimum protection established by the American Dermatology Association is SPF15. From this minimum standard, individuals should take into consideration their skin sensitivity, family history of cancer, current medications being used, etc. to determine the proper amount of protection.

For comparison purposes, the Skin Cancer Foundation has rated the fabric in a standard cotton t-shirt as UPF7. When the t-shirt gets wet from water or sweat, the UPF level drops by about 50%, to a UPF3.5. This is one reason UV protective fabrics are generating more and more interest, coupled with the increased awareness of skin cancer risks.

Esther Okamura, director for Solarwear, a Toronto, Canada, based sun-protective apparel manufacturer, explained the advantages of incorporating the sun block into fabrics. She said, "Most sun block fabrics begin at about UPF 30 and go up from there. In addition, most UV blocking performance fabrics provide consistent UV block, wet or dry, while the standard t-shirt loses about 50% of its sun blocking ability when wet. Finally, unlike lotions or creams, the sun block in fabrics doesn't need to be reapplied every two hours."

Other acronyms associated with UV Protection are UVA, and UVB. According to Derek Gunn, polyester product development for Unifi, creator of Mynx UV protection polyester and nylon yarns, UVA is the longer wavelength band of UV radiation (UVR) that penetrates the skin more deeply, degrading the skin's elasticity, causing aging. UVB is another band of UVR that penetrates the top layers of the skin, causing sunburn. UVB also accelerates skin aging and can cause damage to eyes, and are the main cause



These two polyester shirts use Mynx UV protection yarn from Unifi



of skin carcinomas.

Okamura compared the Solarwear's cotton garments to the untreated cotton t-shirt. She explained, "Solarwear markets products under the SolarBABY and IMIX tradenames. These garments are 100% cotton, and have passed US government FDA's stringent tests for garments providing UVA and UVB blockage. Specifically, these test stipulate consistent 95% blockage of UVB for off-white colors and 99% blockage for black and olive colors, both wet and dry. We guarantee that throughout normal wear and care, your Solarwear garment will consistently

block UVA and UVB rays at a level of SPF (UPF) 40+ for up to 100 washings."

UV protection in fabrics can be incorporated into the yarn, using Unifi's Mynx UV, or it can be applied to the surface of the fabric as a finish, like the Solarwear apparel. No matter which method is used, there appears to be an increasing interest in this type of added performance to apparel products for children, outdoor apparel, activewear (i.e. tennis, golf, and running apparel), and swimwear.

Currently no standard exists for acceptable UPF ratings, however things could be changing. Nicole Nelson, product development manager for Unifi Inc. stated, "As consumers become increasingly more skin and health conscious, we see this evolving towards a standard, and an accepted requirement for UPF in apparel. Unifi's Mynx UV products are at 50+."

Gunn added, "From a marketing standpoint, there has been some consensus among Unifi's direct customers that a fabric needs a UPF rating of at least 30 to make 'marketing sense'. Unifi feels that there is great potential for UV protective fabrics, thanks to continued concern over global warming and people's propensity to be outside when the weather is nice. Additionally, more skin cancer cases are diagnosed each year, which means consumers will continue to seek ways to mitigate UV damage to themselves and their families."

UV standard needed

Interest in apparel that offers UV protection is growing, but the lack of a common standard on the protection offered is holding back faster growth, says a new report.

Before the 1990s, consumers were largely unaware of the role of clothing in UV protection and therefore showed little interest in this performance feature, according to a recent report from Performance Apparel Markets.

Now, however, there is growing demand for casual and active apparel which can block the sun's rays without hindering the wearer's enjoyment of outdoor pursuits. Fabrics with higher levels of sun protection should therefore have a competitive edge in an increasingly health-conscious age.

Unlike most other performance features, however, UV protection in clothing can not be seen or felt and many people do not understand what it does. This is not helped by the fact that there is currently no legislation requiring the testing and labelling of apparel fabrics used to block UV radiation. Only when this is in place will the market for UV protective fibres and fabrics really take off, says the report.

The report also covers ways of improving UV protection in apparel, classification standards for UV protective clothing, the market for UV protective clothing, key producers and their products, and an outlook for the segment.