Cotton keeps growing... and improving

If today, before reading this, you went out into the countryside, or even round the parks, to do your 10,000 steps the chances are you were wearing a lot of cotton. It might be argued that this is not performance activity, but on the other hand the outdoor industry is working hard to find ways to get the young and the obese, indeed everyone, taking regular daily exercise of 10,000 steps or more. In this space where active wear is classed as "total sports apparel" cotton is the dominant fibre.

T-shirts constitute the largest category grouped under total sports apparel and is a $14.5 billion market (in the US). We know that most T-shirts purchased in general are 100% cotton. The role cotton plays is that it is preferred by most consumers in the US for general wearing apparel but also for routine exercise. The most common exercise activities are walking and jogging. Most consumers wear regular cotton T-shirts for these activities because cotton naturally has a good balance of absorbency and other moisture management properties. These properties make it comfortable, including during these most common health conscience activities that are done by the biggest segment of the market. At the gym, an informal survey recently published showed that cotton was clearly the fibre of choice for a variety of reasons.

As Alex Williams wrote recently in the New York Times: "But a visit to the gyms, running trails and basketball courts of New York City tells a different story: cotton - plain-old, baggy, Rocky-on-the-Philly-streets cotton - is still king. Even the most well-heeled urban professionals seem compelled to fall back on machine-faded cotton tank tops, billowy fleece sweats like their grandfathers might have worn in gym class during the Eisenhower era, and even plain white T-shirts that would, in another time, have been known as undershirts."

At a time when new technology is all around us, natural fibres have been making a comeback. Yet the rush to merino for active wear and linen for casual wear has sometimes appeared to leave cotton on the sidelines as a high volume commodity bulking up the low end of the market. This is an image beginning to change. At Columbia Sports for example (see panel pg. 39) Mark Koppes told *WSA*, "Our customers have always responded to cotton in our



Cotton lint is the name for the raw fibre of cotton.
Cotton USA

sportswear line and we see that trend continuing." Indeed the touch and feel of cotton is what most synthetics aspire to.

Cotton is one of the world's oldest fibres. No one knows exactly how old it is. Scientists searching caves in Mexico found bits of cotton bolls and pieces of cotton cloth that proved to be at least 7,000 years old. They also found that the cotton itself was much like that grown in America today. In the Indus River Valley, in Pakistan, cotton was being grown, spun and woven into cloth around 3,000 years BC. At about the same time, natives of Egypt's Nile valley were making and wearing cotton clothing.

Cotton was first spun by machinery in England in 1730. The industrial revolution in England and the invention of the cotton gin in the US paved the way for the important place cotton holds today.

The importance of cotton

Today, the world uses more cotton than any other fibre, and cotton is a leading cash crop for much of the world. It is a part of our daily lives from the time we dry our faces on a soft cotton towel in the morning until we slide between fresh cotton sheets at night. It has hundreds of uses, from blue jeans to shoe strings. Clothing and household items are the largest uses, but industrial products account for many thousands of bales.

All parts of the cotton plant are useful. The most important is the fibre which is used in making cotton cloth but the seed and other parts produce a wide variety of by-products from cotton seed oil through to materials for the plastic, pharmaceutical and paper industries. In general the fibre is about 80% of the value, making cotton as a textile the primary reason for farmers to grow the crop.

Cotton grows in warm climates and most of the world's cotton is grown in China, the US, India and Uzbekistan. Other leading cotton growing countries are Brazil, Pakistan and Turkey. It got itself a doubtful reputation as a result of its demands on fertiliser, pesticide and water, albeit the problems that have so damaged the Aral Sea had a lot more to do with incompetent Soviet-era management than any inherent problems with the crop.

Organic cotton finds its place

For the product developer one of the big issues of the last few years has been to decide on the role of organic cotton in the mix. While strongly promoted by NGO's such as Friends of the Earth and given much credibility by highly thought of, early adopter, environmentally friendly brands this is clearly a story with two sides. According to Allen Terhaar, the Executive Director of the Cotton Council International,



Denim is a rugged cotton twill textile traditionally coloured blue with indigo dye.
Cotton USA

"There is a role for organic cotton but in terms of meeting the overall world demand its value is limited. To get all the organic cotton needed too much land would be required and the outcomes would be unpredictable." He prefers that producers look more to sustainable cotton growing methods such as those being used in Australia and the USA.

Certainly the uptake in the third world of what is known as GM or transgenic cotton has been growing very quickly. China, India, South Africa, as well as the USA, are the big users but it is the accelerating use by third world farmers that has caused the surprise. The most commonly used Bt cotton produces Bollgard, which is resistant to the bollworm as a result of the addition of DNA from a bacteria commonly found in the soil. Using this adjusted cotton increases yields as well as avoiding the use of pesticides.

One of the problems appears to have been that the well-intentioned NGO's took a position that modified seeds were entirely a conspiracy by transnational businesses to control and exploit the third world, and that the crops would create environmental and health problems without creating any clear benefits. Now that some time has passed and we are starting to see peer reviewed research it looks like the balance of evidence is moving in favour of the modified seed. Certainly farmers in India and South Africa re voting by changing over at an increasing rate, and according to Terhaar those using these new strains reduce the pesticide used, appear to be seeing a rise in beneficial insects, and because you do not have to till, there is less chance of erosion.

Fifty years of polyester

The real battle for cotton is the fight against synthetics, especially polyester. Polyester was first commercialised in 1953 and has grown to such pre-eminence in the fibre world that like cotton it tends towards the commodity. While the two products are fighting for the same space in the market, in their production they are quite diverse. Polyester is low in labour content and high in energy utilisation, whereas cotton is very much labour intensive. It is argued that the production of cotton fibres consumes about 40% less energy than the production of polyester fibres, even if feedstock values of non-renewable resources, such as crude oil and natural gas used as polyester raw-materials, are included in the energy consumption. Cotton cultivation requires fossil fuel for agricultural machines, irrigation, ginning and baling as well as water for irrigation. With regard to energy, polyester users can see some interesting responses. Unifi has developed a unique manufacturing technology to create the world's only first-quality polyester yarn made from 100 per cent recycled materials. The production of Repreve reduces energy consumption and conserves petroleum-based resources by offsetting the need to produce virgin polyester.

From the start polyester has been taking market share from cotton and other synthetic fibres. Competition can also be seen between man-made fibres. Man-made fibres made from natural cellulose – like cupro, acetate and viscose – have tended to be replaced by synthetic fibres, especially polyester. In the sector of technical products, especially for non-wovens, polypropylene has been replacing polyamide fibres for cost reasons. Right now the balance appears to be returning to the natural fibres.

The lists of properties of cotton that make it so important for active wear are many:

- ***Fibre properties***: Fine, soft; single fibres; low friction; humidity absorption; skin-and body-friendly; high wet modulus and dye ability.
- ***Process ability:*** Finest yarns possible; maximum productivity; highest processing speeds and temperature stability.
- ***Fabric properties:*** Soft; humidity absorption; no electrostatic load; hygienic washability; easy to dye and optimal physiological properties.

The main advantages of polyester by comparison are strength, higher elongation, and uniformity of fibres, low density, and the possibility to tailor fibre properties for specific applications. The raw materials do not include trash, dust and foreign matter (problematic contamination of cotton) and man-made fibres do not include short fibres. The fabrics are more uniform, easy to care for and their weight is lower compared to cotton. Possible colour variations, brightness, and many fashion effects are positive assets as well.



Meeting the challenge of synthetics

Cotton answers the challenges in two ways. The first is the steady development of forms with new properties. This is exemplified by Wicking Windows which is explained for *WSA* by Bill Rearick of Cotton Inc. "The concept here is to move moisture from the inside of the fabric to the outside, thereby keeping the inside of the fabric dryer and the skin dryer. At the same time the garment has an increased drying rate so that it dries faster, and it holds less moisture to begin with. An added benefit, which is generally not found in sports apparel made of other fibres, is that the cling or tendency for damp or wet garments to stick to the skin is substantially reduced. We do this by changing the surface energy of the inside of the fabric."

In addition they have a new and highly effective abrasion resistant technology for both wrinkle resistant (WR) and non-WR cotton apparel. The names of these developments in the WR area are the Tough Cotton technology and the endure finish. The Tough Cotton technology, for example, can increase the tensile and tear strength of wrinkle resistant cotton by about 20%, with an increase in abrasion resistance of 200% or more.

This is relevant as in the work-wear and military sectors cotton remains very important. Indeed recently the US military has banned various garments made of thermoplastic fibres such as polyester due to safety issues during exposure to fire or high heat. It has been known for many years that thermoplastic fibres will melt into the skin and exacerbate burns and need to be removed surgically. Nurses and stewardesses have recommended not wearing polyester or nylon, for example when flying or anytime there is a chance of exposure to fire or heat that may cause burns, for that reason. Rearick adds, "We have new fire resistant (FR) technology for cotton as well as excellent FR cotton processes that have been available for many years. FR cotton is preferred over inherently FR synthetic fibres whenever comfort is a consideration."

One of the great features of cotton is its adaptability and versatility. If cotton is required to be stiff this can be produced, and if needed soft it can be made 'off the scale'. When it comes to softness there is a whole range of properties and verbal descriptions that are used. "It is a bit like the Eskimos having 200 words to describe snow. By combining physics and chemistry, cotton can be made soft, really, really soft."

If you cannot beat it, join it

According to Cotton Inc., research has demonstrated that the average consumer can really tell the difference between 100% synthetic, 67/33, 50/50, 33/67, and 100% cotton. However by blending cotton and man-made fibres it becomes possible to combine the positive properties of both. Elastic yarns and fabrics, lightweight fabrics, and easy-care properties are in the focus of consumer demand.

According to Anton Schenek of Fachhochschle Reutlingen, Reutlingen, Germany, the positive properties of cotton on the other hand have the same importance. To make the point the skin and body friendliness of cotton has not yet been achieved by man-made fibres. Humidity absorption and related low electrostatic load, air permeability of fabrics, hygienic behaviour, washability at higher temperatures and biological neutrality are key important properties for consumers.

In the future cotton will become more and more a blending partner of man-mades, offering those special properties that come from nature that man finds it hard to copy, even after 7,000 years of trying. Allen Terhaar recognises that while polyester may have surpassed cotton in terms of volume it still fights to emulate the qualities and properties of cotton and, by continuing to raise the bar, cotton is out to keep that distance.

Outdoor adventures with Columbia



The Outdoor market is complex and in this discussion with Mark Koppes, General Manager of Men's Apparel at Columbia Sportswear Company, *WSA* uncovers some of the current issues and trends in sportswear. Some of his comments:

"For our sportswear line natural fibres are not a new thing and we have always offered natural fibres. Cotton is the most common fibre in the line.

"Consumers respond to apparel with a soft cotton-like hand or feel. When we want to do a performance fabric in polyester, consumers still want it to feel like cotton.

"Natural fibres are breathable and lend well to blending with synthetic fibres to create performance fabrics. Our customers have always responded to cotton in our sportswear line and we see that trend continuing. Cotton helps enhance moisture management and adds quick-dry function to performance fabrics.

"We are researching the feasibility of using organic cotton and are currently evaluating options and pricing. We are not involved in a debate per-se, but we are currently researching the feasibility and interest by our consumers.

"Everyone enjoys the outdoors in their own personal way and Columbia Sportswear offers a variety of apparel, footwear, equipment and accessories. Our objective is to make a consumer's outdoor adventures the best they can be in any weather conditions. For instance, looking at future goals for apparel, we have apparel wired for sound and garments with ultrasonic welding that will decrease the weight of the garment without sacrificing waterproof breathability. We are using new fabrics that keep you warmer than ever but are lighter and less bulky so they perform better and we'll look into supplemental heating systems for extreme cold weather conditions. We will also continue to explore the use of nano (and other) finishing technologies to enhance wicking, reduce odour, minimise wrinkling, provide insect repellency, sun protection, etc.



"Key growth drivers are: international expansion; footwear and sportswear; distribution channels such as department stores and speciality footwear; improving retail sell-throughs by winter purchase displays and enhancing the retail experience and licensing."

Columbia's Montbovon Tee (above) and Trail to Travel Long Short (left) are both based on a cotton synthetic blend.

Columbia