At one time it was enough for the cotton industry to claim that its yarn was the best and the biggest natural fibre in the world and the preferred fabric for just about everything and anything. For some years now that has not been enough. In the world of sport and leisure, consumers demand extra performance properties. Cotton reckons it is measuring up to the demands.



Cotton: going for green, pushing performance

It's not surprising that everyone seems to take pot shots at cotton. After all, it is still the world's most widely used natural fibre and therefore a natural for others to run comparisons against. Scoring points against old king cotton is still the name-of-the-game. Depending upon whose agenda is being followed, cotton may come under attack from the eco lobby or the green lobby, the synthetic lobby or the performance lobby or even those representing other natural fibres. It must be tough being used as an industry yardstick.

At this February's Premiere Vision exhibition in Paris, the European linen industry's Masters of Linen presented an in-depth analysis of the environmental credentials of flax and cotton in the life cycle of an ordinary white shirt. As an academic exercise it was most informative but it was uncertain what the aim was.

After all, in Europe, only 120,000 hectares are used for growing flax and the total crop is 150,000 tonnes of fibre, hardly in the same league as cotton growing and production.

Furthermore, a cotton shirt and a linen shirt can both be beautiful products. There would be many prepared to debate the merits of one made from the finest Sea Island Cotton or Gossypium barbadense, compared with the finest linen shirt. Essentially the most recent research presented in Paris, the Life Cycle Assessment, showed that both had some good points, both had some negatives.

The assessment is a recognised method used to quantify the environmental impact of a product throughout its life cycle, from the growing of the crop through to the end of the finished product's life cycle, including the processing – spinning, weaving, finishing and garment manufacturing – as well as washing

and ironing by the consumer. Linen's greater ironing requirements (nine minutes as opposed to seven for the same model in cotton) were also taken into account. Lastly, the two shirts were considered to have been given away and reused in 70% of cases, and thrown away in 30% of cases, at the end of their first life cycles.

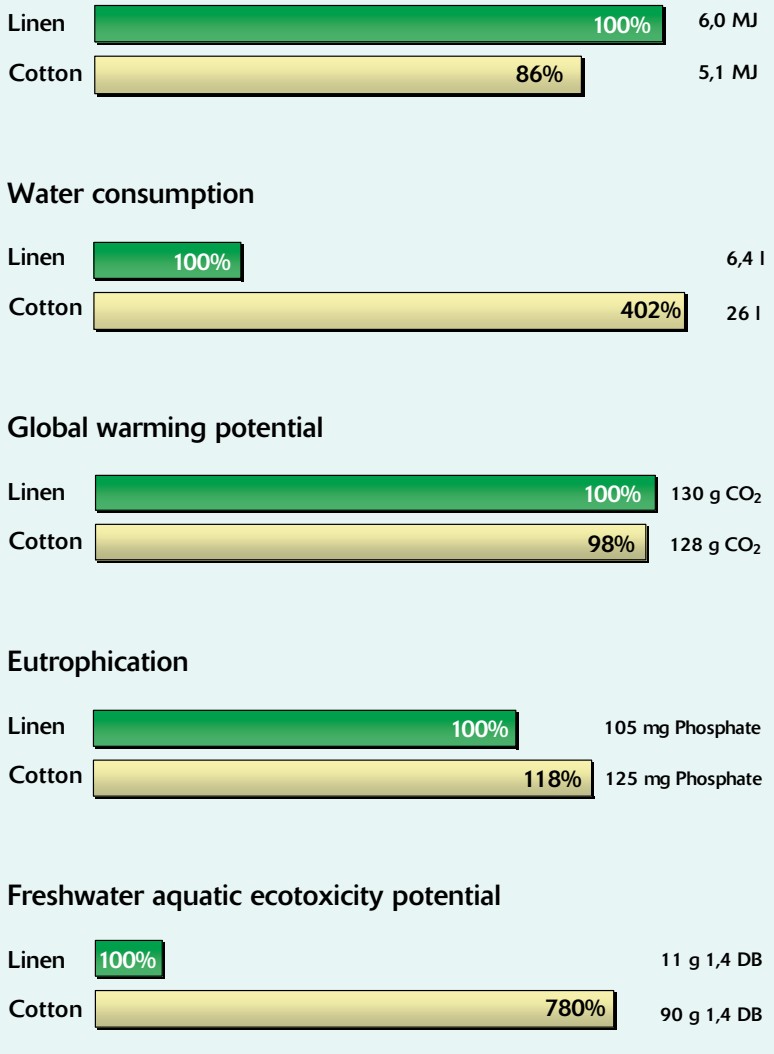
Out of the 12 potential environmental impact indicators studied, the five most important indices were the consumption of primary energy, consumption of water, global warming (another buzz word, despite the fact that between January 2007 and January 2008, we have had the sharpest drop in global temperature since records began in 1880*), water eutrophication, and the toxic risk for aquatic ecosystems. Whilst linen didn't score too well in terms of energy consumption, it scored well in the use of water (1:4). Cotton is said to require some 7,100 litres of water per kilo harvested: one British newspaper recently claimed that 27,000 litres of water were needed to produce just one cotton T-shirt! In terms of the assumed global warming, there was little to distinguish between the two. Cotton didn't score too well in terms of its effect on aquatic ecosystems because of its use of chemicals, fertilisers and pesticides, the same elements that affect water eutrophication, the indicator that tracks waste which leads to the concentration of nutrients in water. (Too much nutrient leads to greater algae growth that in turn reduces oxygen in the water.)

Another presentation in Paris was organised by Lenzing AG of Austria, whose specialty is cellulose fibre technology. The life cycle analysis featured at its Botanic Symposium focused on the comparative footprints of cotton from China and the USA, PET fibre from Western Europe, PP fibre, again from the EU, and the company's own Tencel and Modal, as well as where the company expected to be with its fibre technology by 2012. The company naturally couldn't project where the other fibres would be in terms of the overall analysis. The only certain thing is that all the other fibre producers will be working equally hard to improve their own eco standing. The detailed analysis, presented by Ms Li Shen of the Department of Science, Technology and Society at the Copernicus Institute Utrecht University, covered global warming, abiotic depletion, human toxicity, fresh water ecotoxicity, terrestrial ecotoxicity, photochemical oxidation, acidification, eutrophication, land use and water use.

The analysis covered the production of a single tonne of fibre from cradle-to-factory gate — but not to the finished product and its disposal. The data used was also based off 1995 figures but, overall, as one would have expected, cellulosic fibres came out well. The environmental benefits of Modal and Tencel were essentially their low non-renewable energy use, low GHG emissions, good land use efficiency compared to cotton, low water use, low impact on ecotoxicity and eutrophication while the drawbacks were principally their relatively high abiotic depletion and photochemical oxidation.

Again, however, there is no getting away from the fact that both cellulose and flax fibres are small in overall textile terms and that petro-based fibres and cotton dominate the world as the table clearly shows.

Linen/cotton comparative bar charts



Source: Masters of Linen

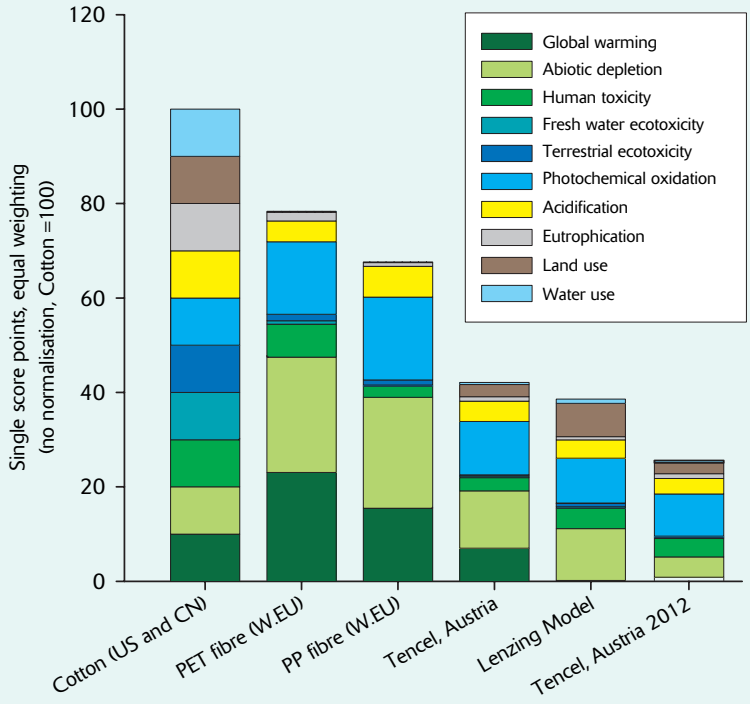
How green is your footprint?

There are moves afoot within the cotton industry to reduce the amount of water required to grow the crop and in some African countries it is only grown in moist climates so that irrigation isn't required. In the USA, satellite tracking has been introduced to identify those acres which require irrigation and those which

don't. US cotton, for instance, is very drought resistant and heat tolerant. Only 35% of cotton acres now use some form of supplemental irrigation. The other 65% survives on natural rainfall. In terms of other 'crops' required to feed and clothe humanity, other sectors use more water than cotton.

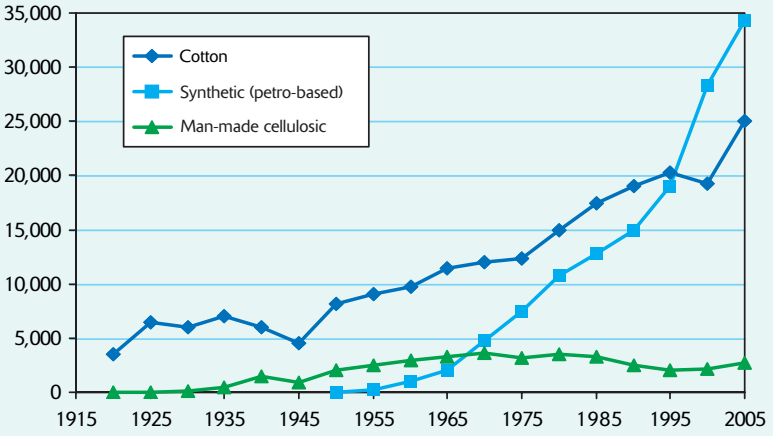
There is also a greater awareness today of the effect of chemicals and fertilisers and, no doubt, as the 'green cotton' lobby expands, there will be further improvements along the way. Globally, however, only 8.5% of all pesticides applied to crops are used to grow cotton — fruit and vegetables consume about 29% and cereal crops including corn and rice account for some 35%. Notwithstanding its critics, the cotton industry also sees itself in a green light, claiming that it is natural, renewable and sustainable. It sees any sustainable agricultural production as having to balance a growing economy, protection for the environment and social responsibility and the most sustainable choice is the one where the net effect comes closest to meeting these goals. Both conventional and organic cottons from the US meet this goal. The man-mades and synthetics also have ecological problems and cotton need not feel singled out for criticism. There is even a fair chance that growing crops has a longer-term future than a reliance on fossil fuels.

There is no room for complacency, however, as recent work done by Shirley Technologies Limited, a UKAS accredited laboratory based in Manchester, shows. A surprise finding from tests carried out in 2007 was that potentially harmful cottons originating from the USA were causing concern. Textile failures included pH, allergenic dyes and toxic heavy metals. "The main reason for failure is that some manufacturers simply don't completely wash off the fabric after the dyeing or finishing process," said Phil Whitaker of STL. "Many of the chemicals used [in manufacture] are shortcuts to enable cost-cutting and to meet tight production deadlines, and so too are the methods used to dispose of them as part of the manufacturing process: straight into watercourses and lakes."



Source: Lenzing Fibers

World fibre production 1920-2005 (kton)



Sources: USDA (2006), JCFA (2006), Ullmann (1997), Textile online library (2006)

Improving performance

So much for the ecological argument but many would claim that cotton has fallen behind in terms of performance. The cotton lobby would disagree and has been introducing research and technology to show that cotton, too, can be pretty smart.

In recent years Wicking Windows** technology — not to be confused with a computer program — was introduced by Cotton Incorporated, which claims that the treated 100% cotton fabric transports moisture vapour more effectively than any other fabric. Not only that, but cotton treated in this way also enhances its keep dry properties, to ensure dry comfort even during tough workouts.

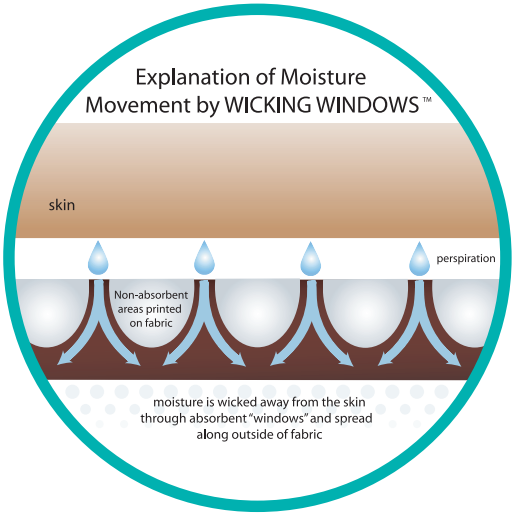
The chemical formulation for Wicking Windows is based on repellent fluorochemistry. The finish has no adverse affect to the fabric – it feels nice and soft as if nothing was applied to the fabric other than a softener. Another important step in the process is selection of a hydrophilic wicking softener. It is important to not apply certain types of softeners that would make the fabric hydrophobic which would counteract the Wicking Windows finish.

The technology stops garments from clinging to your skin, one of the negatives often aimed at cotton as clothing gets damp. According to William A. Rearick, director, textile research for Cotton Incorporated, however, "The tendency

for the fabric to cling to the skin is reduced by 50% or more [with Wicking Windows]. This is something the synthetics seldom, if ever, claim. In fact, the 'high tech' synthetic garments have a significantly higher tendency to stick to the skin when wet or damp compared to any regular unmodified cotton t-shirt."

Credit: Cotton Incorporated

From brisk walking and cycling in a local park to weight training and spin classes at the gym, activewear makers are doing their part to encourage men to reach their fitness goals, whether with classic t-shirts and sweats, or modern moisture-wicking gear. And, in recreational performance apparel, cotton appears to retain its edge.

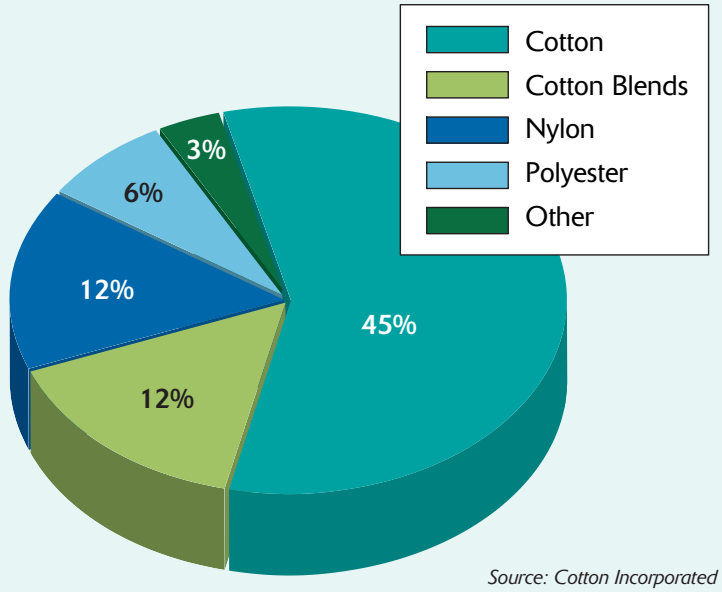


The Wicking Windows surface-treatment process is applied in a fine pattern to the inside of a garment, a 'discontinuous print pattern, so that moisture is more quickly transported to the fabric's exterior. If the treatment was applied to the entire surface of the fabric, moisture transfer would be compromised, so instead the finish creates small 'windows' through which moisture can pass and breathability is unaffected. The finish is invisible, odourless and durable. The finish is cured and bonds to the cotton, so it does not wash away with home laundering or dry cleaning which can be the case with many synthetic fabrics that have a wicking finish applied to them. Typical durability that can be expected would be about 80% after 30 home launderings. One additional benefit is that the finish can be "renewed" by ironing to bring back the original performance of the finish.

For manufacturers, cotton with enhanced wicking is significant because cotton and cottonblend activewear is the fibre most US men (57%) prefer to wear in athletic apparel, according to Cotton Incorporated's Lifestyle Monitor Survey. Thirty-five per cent of respondents say they prefer cotton because "it breathes," 32% like it because "it's comfortable," 14% say it's "soft and feels

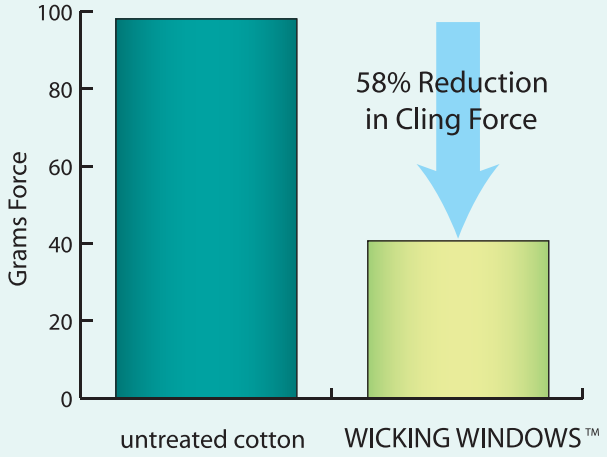
Lifestyle monitor survey

Fibre you most prefer to wear in athletic apparel.

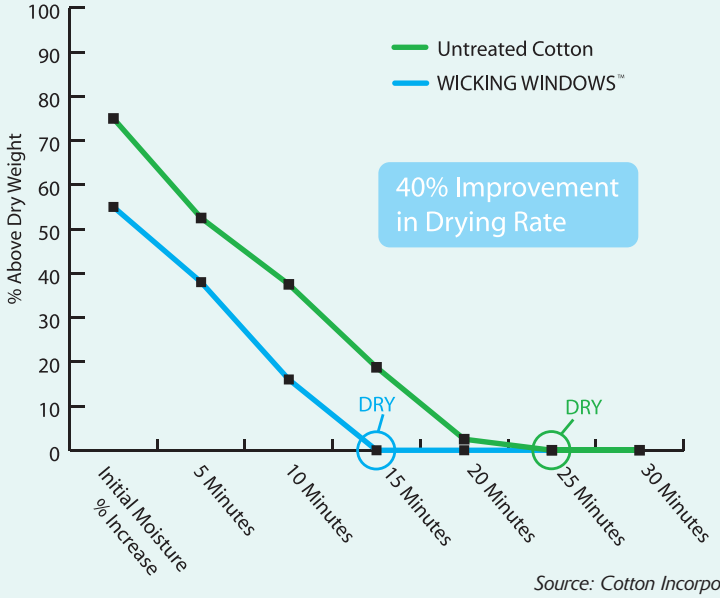


Source: Cotton Incorporated

Reduction in cling force



Drying rate



Source: Cotton Incorporated

better" and 13% like it because it's "cool and light". The research also points up some other figures of interest, which even though the research had the backing of the natural fibre, must be of some concern to other fibre producers.

In comparing cotton and polyester, cotton fibres are more absorbent, or hydrophilic, while polyester and other petroleum-based synthetics are not as absorbent, or hydrophobic. "Synthetic fabric that wicks absorbs less water, due to the thin construction and not as much due to their underlying hydrophobic nature. The drying time was much less for synthetics because they were thinner. However, the drying rate was essentially the same for all fabrics that wick," Rearick reported. When they created a thinner cotton fabric to match the usual weights used in micro fibres, a single jersey knit from 30/1s yarn, "the absorbent capacity was similar to 100% polyester of similar thickness. And drying time was similar, and in some cases, slightly less for cotton." Rearick adds. Other important performance differences were also found. "While the last 5 or 10% of moisture in cotton fabric dries slower because of its hydrophilic nature, it feels dry at a standard moisture regain of about 7.5%," Rearick explains. "But if polyester fabric contains more 2 or 3% moisture, it still feels clammy."

Prepared to pay

There is no doubt that moisture management is of importance to consumers but there are other factors manufacturers need to take into account. The Lifestyle Monitor research showed that a healthy 63% of respondents agreed that moisture management is an important feature when shopping for athletic apparel but a significant 23% rated anti-microbial as important. Consumers are prepared to pay more for these features too: 64% were willing to pay more for moisture management, and 27% eager to pay for clothes that fight odour. All of these properties work for cotton. Anti-odour treatments can be incorporated into the fabric and at least one of the mills, which have adopted this process, is incorporating an anti-microbial chemistry onto the fabric that does not adversely affect the finish. It is also worth noting that the process works well in cotton fabrics incorporating elastanes.

Major brands such as Champion and Izod have already taken up the new technology. And yet another new product coming to the market was shown at the most recent Outdoor Retailer show in Salt Lake City, aiming to capitalise on men's desire to workout in cotton, while appeasing their interest in high-tech performance features. Using Wicking Windows, SubLock Active Cotton is a line of workout wear that Ontario, Canada-based designer Regg Miller says features the same wicking capabilities of petroleum-based synthetics.

And, if your idea of performance wear comes back to the good old standby of denim jeans, there's some good news too. Considering the claims for climate change, cotton jeans can now benefit from Cotton Incorporated's Storm Denim** technology, which makes the jeans 100% waterproof while remaining totally breathable. Who said that performance and cotton didn't go together?

**There was a drop of three-quarters of one degree Celsius, temperatures were lower than their 20th century average for the first time since 1982, snow cover in Europe the greatest since 1966, Antarctic ice cover at its greatest since satellite records began in 1979 and 30% above the January average. Sources: NASA Goddard Institute for Space Studies, US National Climate Data Center and others.*

***Wicking Windows and Storm Denim are registered trade marks.*

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