



Fibres afoot

Some of us are content if we find a matching pair of socks to put on in the morning, but for the serious athlete, and for manufacturers, socks have become an essential piece of sporting apparel, affecting both performance and comfort. As a result of this, the manufacture of socks has become an exact science. As athletic footwear has progressed so have socks, so much so, that socks are now viewed as an integral element in sports footwear. This trend towards technical socks is far from a fashion-driven move, after years of research it has been proved that the way socks fit and the fibres used to produce them have a direct effect on the health and comfort of our feet. But how far has sock technology advanced and to what extent do the socks available on the market really affect performance? Some companies argue that natural fibres are the most effective way to protect feet from moisture and abrasion, whilst others claim that synthetic fibres, especially polypropylene, are the way forward. So with so many socks on the market which way should consumers and producers jump...or run or hike?

Why technical socks?

In the past, socks were often ignored in technical terms. Whilst many years ago people became aware of the importance of wearing the correct sport specific footwear, this would often be

teamed with a standard white polyester or cotton sports sock. Wearing the correct sport specific socks can help to reduce the pressure caused by impact through cushioning, support muscles and tendons, regulate the skin temperature and function, and stabilise ligaments and tendons. However, wearing socks can cause problems in itself. Blisters are often caused by a moisture build up in the sock which can soften the skin on the foot pads and lead to abrasion, but developers have now designed socks that offer moisture management and regulate temperature to reduce this 'side effect' of wearing shoes and socks.

 X-Socks

The science of socks

Thorlo is generally regarded as the pioneer in the development of technical socks that actually 'fit' the foot. Having carried out extensive research for 17 years, Thorlo has come up with seven elements of comfort, which the company uses to evaluate the varying demands of different activities. These demands are then considered in the selection of yarns and fibres for socks designed for different sports, according to: posture, shear, pressure, temperature, moisture, stimulus and circulation. As a result of



this, Thorlo holds fast to the belief that one fibre, which historically has been wool, is not sufficient to meet the demands of all ranges of temperatures, climates and activities. Thorlo believes that synthetic fibres such as Coolmax, Thermolite, Thorlon and Nylon all offer benefits in moisture management, drying time, strength and resilience that wool simply cannot match. Hence, the company selects and blends different fibres in its socks to offer different levels of protection around the foot, specifically designed for a range of environments and activities. To achieve the best results, Thorlo specifies the weight, grade and construction of every yarn they use. These are then carefully blended to deliver precise performance and construction in each area of the foot to give the best possible protection and comfort. So is science the future?

One development that cannot be ignored is polypropylene. In recent years it has come to the forefront for many sock producers due to the lightness of the fibre and the thermoregulation and moisture management properties it offers.

One yarn manufacturer, Italy's Borio Fiore, produces two polypropylene-based yarns for use in sock manufacture. The company's Isofil is said to guarantee the wearer freedom of movement due to the fact that it is produced from polypropylene, the lightest fibre known to man. With a specific gravity of 0.91 g/cm³, making it even lighter than water, it can be knitted into light and soft fabric. Isofil is said to be 160 times less absorbent than cotton and eight times less than polyester. With its low thermal conductivity, it protects the sportsman from external temperatures and reduces the dispersion of body heat,

therefore regulating body temperature effectively. Combined with the moisture management properties of the yarn, it allows the feet to remain warm without overheating.

However, although Biore Fiore extols the properties of this synthetic fibre, the company's latest yarn melds the synthetic with the natural. Filactive, is a two-ply yarn made of combed cotton and the worsted spun polypropylene, Merkalon. This combination of nature and science improves abrasion resistance, increasing the durability and comfort of socks; provides balanced thermoregulation in all temperature ranges; and offers a soft, light and natural handle. It is also safe, as the polypropylene produced by Biore Fiore is Oeko-tex certified, completely anallergic, odourless, and free from harmful chemicals.

The right mix

This melding of nature and science, natural and synthetic fibres is also adopted in Optimex's Dri-Release fabric. It feels like cotton but through a patented blend of natural and synthetic fibres, it keeps the feet dry, comfortable and odour-free. Whilst the natural fibres absorb moisture, wicking it away from the skin, the synthetic fibres repel moisture, forcing it through the sock to the exterior where it can evaporate. In drying-time tests Dri-Release dries four times faster than cotton, whilst still offering the soft handle associated with the natural fibre. With an embedded Freshguard treatment, it also eliminates odour, leading to dry, fresh feet.

Optimer has taken the partnership of natural and synthetic one step further with its Dri-Release wool. This new fabric provides the warmth and wicking

X-socks employs a wide range of design features to promote comfort and control temperature.

 X-Socks

properties of wool – without the weight and itch – and the benefits and convenience of synthetic fabrics.

X-Socks has taken the concept of melding different fibres further still. X-Socks work on the basis that the foot is at its optimum in the barefoot state as it is designed with cushioning in the correct places, so whilst using the latest available technology, the company has tried to emulate the most basic state, bare feet. The developers have done this through the design and the materials employed, combining natural fibres with state-of-the-art technical, synthetic fibres in different areas of the sock.

Improved fit in socks has arguably been one of the most important developments in sock technology in recent years and X-Socks has invested a great deal in researching the ultimate design and fit for performance socks, which goes some way to explain the complex design of the product.

X-socks incorporate a plethora of design features in order to maintain comfort and temperature including:

- The shin area of the sock incorporates a shin protector which acts as a shock absorber, reducing pressure points and the risk of bruising and scrapes.
- A patented air conditioning channel manufactured from fine knit mesh provides an air flow system providing ventilation for the foot and leg, conducting the air between away from the footbed via the inside surface of the foot.

- An x-cross bandage across the top of the foot and around the ankle and an instep protector cushion stabilise the ankle area and instep without restricting movement.
- A toe protector provides warmth, shock absorption and padding.
- Airflow ankle pads protect the ankle and assist in the exchange of air.
- An anatomically-shaped left and right footpad with an air conditioning channel follows the foot's anatomy and supports and cushions the feet where required.
- Rod type padding on the leg of the sock reduces pressure and absorb impact.
- A channel system on the outer sole regulates temperature and conducts moist and overheated air up to the air conditioning channels.

All very hi-tech so far, and that's just the form! The fibres used in X-socks are another aspect. Here, once again, different fibres are used in different areas of the sock in an attempt to provide the ultimate in comfort and performance. This is where the natural really does meet the synthetic. X-socks incorporate up to 11 different function specific yarns. Silver remains an important element, due to its unparalleled moisture management and anti-odour properties. X-socks uses silver Nodor, which has a tightly woven surface made of 99.9% pure silver. This is integrated into the sole of the sock so that moisture cannot be absorbed and is instead drawn away to the outer layer of the sock where it can evaporate.

Other function specific yarns incorporated into X-socks are: Mythlan, an extremely lightweight self-contained micro-fibre that is pH balanced and does not allow bacteria to take hold, it can circulate air freely and allows a high level of temperature regulation; Robur, a multi purpose hollow-bodied fibre which actively breathes and remains elastic; Hires, a micro-fibre combination with cotton that is soft and non-abrasive, allowing ventilation, absorption, elasticity and impact absorption; Durawool, that offers the qualities of natural wool with the advantages of synthetics; Calesco, a multi-chamber hollow fibre yarn surrounded with cotton that promotes air circulation; Nano Core uses an air-Corebe, a very light and heat isolating yarn that allows the foot to maintain its normal 37°C temperature; Airgo Tex, a flexible yarn that allows a good fit; and Dry in Seconds, a functional yarn that quickly absorbs and dissipates moisture. If all that was not enough, X-socks are also waterproof on the outside, so whilst moisture can escape out of the sock, it is not able to enter the sock from the exterior.

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Back to nature?

But is technology and complicated science the way forward or are the tried and tested natural fibres still in the running? According to some, in the eco-friendly environment we live in today, natural materials can still meet the performance demands of today's consumer. Paiho, a Taiwanese company has just launched a new range of socks using bamboo. The company pitches its new product as being produced from a "natural material from an unpolluted environment". It uses four-year old bamboo which has long been recognised for its warmth, odour resistance and circulatory properties that is carbonated into charcoal.

The most traditional material by far must be wool, but can one really say that the fibre produced by SmartWool is still a truly natural product? According to SmartWool, socks were in fact the catalyst for improving on natural wool. Peter and Patty Duke began developing more comfortable and convenient wool socks after being disappointed by the wicking properties of the synthetic socks on the market at the time. Ten years on and SmartWool's merino wool with its soft, strong and shrink-free fibres has become well-known for its comfort, moisture management, breathability, and temperature regulation and the company has recently launched a smart fit system for socks.



Thorlo socks incorporate different panels to offer varying levels of support and protection.



Smart Fit incorporates three components: an elastic ankle brace to hold the sock in place at the Achilles and prevent it from sliding down into the shoe; a four-way contour flex zone located at the intersection of the top of the foot and ankle which allows for maximum movement without bunching, slipping or sagging; and an elastic arch brace that is designed to hold the sock to the foot offering stability and support.

These components have been integrated into SmartWool's Adrenaline line and many of SmartWool's ski socks. The Ski Racer sock was developed in response to bootfitters demands for thinner ski socks without compromising on comfort. Smartwool has also introduced sport specific socks for cyclists and runners.

New Zealand company, Canesis, has taken the idea of wool one step further melding nature and technology in its heated socks. In conjunction with Australian Wool Innovation, a woolgrowers' company, they have developed a "smart wool" that mixes a natural wool with a conductive fibre to produce smart socks that are heated. The socks are heated by a small battery which will produce warmth for up to four hours at a time, illustrating just how far the partnership between nature and science can really go.

It seems that many manufacturers are moving towards this trend of mixing the natural and synthetic in order to exploit the benefits of both. One such company is Switzerland's Hermann Bühler AG that has introduced SwissCotton Silver, a natural yarn with functional characteristics!

SwissCotton Silver is a blend of 90 – 95% high-quality cotton and X-Static, a Polyamide fibre coated with pure silver. The X-Static silver fibre delivers antimicrobial, anti-odour, antistatic and

therapeutic characteristics. In addition, X-Static's conductive properties help regulate temperature; it's warm in winter and cool in summer.

Sock technology has inarguably progressed in leaps and bounds over the last decade. Loose fitting, itchy socks are most definitely and thing of the past thanks to developments in fit and fibre technology. But whilst synthetic yarns and fibres have undoubtedly transformed technical socks, there is still a place for natural fibres in sock manufacture, due to their wicking and thermoregulating properties and handle. It is the melding of synthetic and natural that has been the real breakthrough in

performance socks. By combining the two, developers have managed to produce sport specific socks that can now offer the wearer a level of thermoregulation and moisture management that was never achievable through purely natural or purely synthetic products. It seems that by combining science and nature sock manufacturers have taken a big step towards developing the perfect sock. But, as with many advances in technology, there is often a downside. In the case of socks, it seems that one has to have a doctorate in science to be able to understand the label and appreciate the extraordinary list of ingredients. 

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