A functional baselayer strives to keep its wearer comfortable and dry at all times. But what happens if it becomes thoroughly soaked and saturated? The choice of fibre and the fabric structure can make a difference, depending on the activity and the environment.

Saturation point

Break into a sweat, and even the best functional baselayer can reach a point of saturation, making the garment cling to the skin and the wearer feel quite uncomfortable. Though moisture management is a basic requirement of wicking fabrics, their response, or lack thereof, to excess perspiration can be discomfiting to consumers persuaded that their technical sports clothes are designed to handle all situations.

A classic wicking textile usually pairs two types of fibres, one having hydrophobic properties, worn next to the skin, the other being hydrophilic in nature, placed on the outer side of the textile. The resulting construction is designed to draw sweat mechanically from the inside to the outer face where it will spread out and evaporate faster when in contact with air. This can be achieved by combining a conventional polyester yarn with one that has a hydrophilic finish to transfer moisture via capillarity action, leaving the hydrophobic layer as dry as possible next to the skin.

Among the many available fabrics applying this principle, Taiwan-based GAC's double-knit fabrics also take advantage of the fibres' different tinctorial affinities to create subtle tonal contrasts. For more intense uses, the company recommends knits made in blends of polypropylene and polyester. "Because of the highly water-repellent nature of polypropylene, any wetness will go straight to the outer surface of the fabric. This is a good solution for people who sweat a lot," says GAC's product manager, Cindy Ping. Among the company's newer developments, a crepe jersey with a recycled polyester face and polypropylene back is being presented at ispo 2017 in February.

There are many ways to create a push-pull effect to transfer moisture to the outer surface of a fabric, using a single fibre type or with a combination of hydrophobic and hydrophilic fibres, says Olivier Balas, CEO of France-based Balas Textile. This presents a beneficial side-effect in that "a fabric that wicks and dries fast will reduce bacteria growth." Balas Textile has recently moved to a new location near Lyon to be closer to partner companies that house its knitting and weaving machines. It has set up its own R&D lab in the new facility to develop fabrics that will then be manufactured by partners. Its current focus is to improve the hand feel of its wicking knits to enhance comfort.

The push-pull effect can also rely on a blend of a hydrophobic synthetic with a hydrophilic natural or cellulosic fibre. Wool's lasting popularity in performance clothing is due to the natural fibre's high-tech approach to moisture management. Taiwan-based Evertex Fabrinology has developed polypropylene-wool blend double-knits. "The polypropylene side worn next to the skin will offer high wearer comfort. When the wool is placed on the inside, the wearer won't feel chilly even when the fabric becomes wet," says Tony Yeh, the company's product innovation manager.

Combining synthetic and natural components is the foundation of the Dri-Release concept, a patented process that Portuguese knitter LMA has adopted in its ranges, and which is available in polyester blends with wool, cotton or Tencel. The company has taken natural and manmade fibre blends one step further with a knit made with Modal, cotton and (to wick away sweat and keep the wearer warm) polypropylene.

Bolzano-based brand Salewa has chosen Polartec Delta for its Pedroc top, a range made for speed hiking.

Daniele Moliners/Salewa

Coolmax fabrics, one of the first textiles engineered to wick moisture thanks to the channelled cross-section of the polyester filaments, have become a reference in moisture management and another classic at LMA. One of the company's latest versions is a fancy mesh made in Coolmax All Season, weighing just 70 g/sqm and which won a Textrends award at ispo Beijing in 2016. "This is one of our best fabrics for technical baselayers," says sales manager Filipa Silva Pereira.

Fewer contact points

Beyond fibre content, another way to keep the body dry is to choose a fabric with a raised texture on the inside that reduces points of contact between the skin and the textile. This type of construction will also keep a layer of air near the skin, thus providing a measure of thermal insulation to avoid post-activity chills, says Mr Balas.

When soaked, a textile with a flat surface will cling to the skin and feel clammy, Mr Yeh at Evertex points out: "Wicking spreads moisture and discomfort. A three-dimensional texture, such as a piqué knit, creates air pockets and reduces contact points with the skin." This can also be achieved by using yarns with special cross-sections that trap air, or peached surfaces that will also move moisture away from the skin. Evertex has applied this principle to a hollow polyester fibre knit that is peached on both sides. Yet another option Mr Yeh recommends is a fine rib knit made with a yarn given a DWR finish that repels water: "The ribs create channels of air pockets and the DWR yarn, a 3M technology, speeds up drying, reduces discomfort and won't cling to skin."

To wick or not to wick?

Wick away humidity and create a large surface area, these are there two main methods that will reduce clamminess, says Karen Beattie, Polartec's senior product manager. Polartec PowerDry fabrics are based on the classic push-pull system that wicks moisture to the outer surface of a textile to speed up drying. This, she says, is ideal in cold conditions because it draws wetness away from the skin. But, it can be counter-productive in warm environments, be it outdoors or in the gym. "The body sweats for a good reason, and evaporative cooling is how it gets rid of excess heat," she says.

Delta is Polartec's solution for optimising evaporative cooling in warm conditions. The concept is based on a blend of polyester and Tencel, the hydrophilic lyocell yarn keeps some moisture next to the skin and has the additional advantage of having a nice hand feel. "The hydrophobic polyester will resist wetting out and keep the oval mesh structure of the fabric open to maximise airflow. This construction operates on two levels: it gets rid of water vapour and liquid sweat, and it will not cling. A discontinuous surface can alleviate the sensation of wetness. The fabric may actually be soaked but it won't feel wet," she says.

Polartec Delta base layer fabrics are made in a blend of polyester, which won't wet out, and Tencel, which keeps some moisture near the skin. It is said to replicate the human body's natural cooling process and reduce skin cling without any chemical treatments.

YourBigStories/Polartec

Polartec will be presenting the latest developments in its Delta range this winter, offering new aesthetics and fabrics for different end-uses, including road-cycling. A pique knit has been created for more casual uses and golf clothing. A smooth-faced fabric with a discontinuous back and with Spandex, it offers 50 UPF sun protection. It targets summertime water sports and will work well in the gym, too, the company says.

Delaying the onset of sweat

For those who believe that wicking alone is not enough for a textile to avoid saturation and feel clammy, a better solution is to absorb moisture in vapour form before it condenses into liquid. Wool fibres have this ability, and it is also one of the key claims of 37.5, formerly known as Cocona, whose mineral particles increase the surface area of textiles capturing and releasing moisture vapour to maintain an optimum relative humidity (of 37.5%). Dr Gregory Haggquist, chief technical officer and company founder, maintains that a fabric doesn't need to wick as much as it needs to evaporate moisture. "[The yarn] starts to work as soon as the body starts to sweat. It delays the onset of liquid sweat. The evaporation

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French brand Rossignol has launched a Nordic ski clothing range in which both the baselayers and soft shells are made with 37.5, synthetic yarns made with particles that increase the surface area of the textile. They are also said to capture and release moisture vapour to maintain an optimum relative humidity of 37.5%.

Rossignol

process happens both on the skin and in the fabric. The minerals capture energy, turning liquid water into vapour," he says. This would be the opposite of a wicking textile that spreads moisture out. "The notion of comfort is tied to humidity within the microclimate; humidity has an impact on skin evaporation rates," he adds.

At the Performance Days show in November, Dr Haggquist presented the results of a blind study on the effect of 37.5 on core body temperature carried out at the University of Colorado. Results indicate that clothes enhanced with the company's technology can help lower an athlete's core temperature during exercise and increase efficiency, meaning sports people will consume less energy to carry out the same amount of work. "The lower core temperature means higher output. Wearing a shirt made in 37.5 will provide more cooling and extend an athlete's peak performance," he claims.

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The 37.5 yarn is not used alone but blended with another fibre, in a proportion of 34% when combined with a synthetic yarn. When combined with wool, which also absorbs moisture vapour, this can come down to 25%, the company states.

Global Merino has developed wool-37.5 blends, in which the greater surface area of the mineral-charged yarn speeds up evaporation. "Wool absorbs up to one-third of its [dry] weight in moisture without creating a feeling of wetness; this is what makes it a great option for skiing," says CEO Jose Fernandez, noting that wet wool will feel heavy. The advantage of wool is that "it keeps the wearer drier for longer and retains its insulating properties when wet." Looking to reduce touch points with the skin, the company has created a merino wool and polyester blend knit with a honeycomb structure on the back.

'Kinetic' moisture management

Italian insulation specialist Imbotex won a Performance Days Innovation prize last November for its Twins insulations that are based on a sophisticated blend of fibres. The novel ingredients in the concept are polyacrylate and high moisture-transfer polyester, which are used for the inside layer.

Produced by Toyobo Japan, the polyacrilate fibre absorbs what is known as "imperceptible perspiration", water vapour that the human body emits continuously. It is also said to convert the kinetic energy of water vapour into heat.

To further dissipate perspiration, the outer layer of the insulation is a blend of very fine hydrophobic polyester and polypropylene fibres. This multi-layered system enables the insulation to achieve high thermal values compared to traditional polyester insulation: for example, a 130 grammes per square-metre Twins filler obtained a CLO value of 3.0. The layered insulation was inspired by the company's background in mattress manufacturing where it first introduced layers made in different fibre compositions, explains Roberta Carniello, who heads the company with her sister, Stefania. Imbotex's innovative solution here again seeks to remove humidity before it permeates the textile.

The many different approaches to moisture management suggest that no ideal construction will ward off clamminess and keep the wearer comfortable. "No single performance fabric will offer the best all-around solution," says Tony Yeh. "Different situations call for different solutions," concurs Karen Beattie.

The focus on wicking alone, once considered a basic requisite, now appears to be just one of many methods to avoid the discomfort of saturated, clinging clothing.

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