The ongoing challenge to provide warmth without weight is being addressed by fabric finishes that absorb or reflect heat to keep the body warm. These thermal solutions also reduce the need for thick padding.

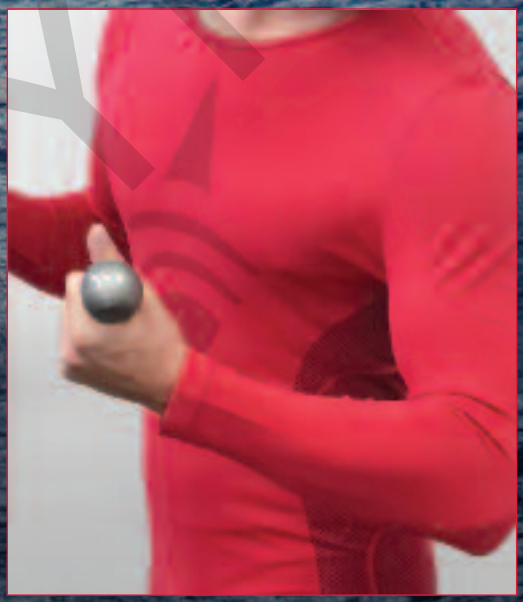
Engineering warmth into fabrics



As the puff jacket trend peaks, designers are now turning their attention to products that are closer fitting, without compromising warmth. Choosing a fabric that enhances thermal insulation is one way to address growing demand for slimmer styles.

Schoeller Technologies' Solar+ fabric finish is one option, which Swiss brand Kjus introduced in its women's skiwear range. The chemistry is based on pigments that absorb infrared rays and convert sunlight into warmth, even in low temperature weather. "A Solar+ treated fabric won't actually heat up, but it will be warmer than an untreated surface and it will limit heat dispersion," says Hans Kohn, Schoeller Technologies COO. As its name implies, Solar+ works best in sunny conditions and is not so effective in cloudy conditions. Compared to products that reflect body heat, Mr Kohn says that "the amount of energy per square metre delivered by the sun is much greater than the amount of energy per square metre emitted by the body."

The efficiency of the finish is dependent on the colour of the fabric, as lighter colours tend to reflect heat. Solar+ will therefore have a greater effect on a light-hued fabric, but it can also improve the performance of a dark fabric, says Mr Kohn. The company's ColdBlack finish offers an opposite function as it reflects infrared rays to keep the body cool.



Nilit Heat yarn is created with coffee charcoal for natural insulation to keep wearers warmer in cold temperatures.

Nilit

Solar+ can be applied to any type of fabric, and has a wash resistance of 50 washes, after which it retains more than 90% effectiveness the company says. "We believe this is sufficient for the typical lifecycle of outdoor apparel. The finish doesn't disappear, but loses some of its strength," says Mr Kohn. Produced and distributed by German chemicals company CHT-Bezema, under licence from Schoeller, the

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finish is available on a range of fabrics made by Schoeller's fabric manufacturing division, and the chemistry is also available for use by others.

Corebrid Thermocatch, by Japanese company Mitsubishi Rayon, also absorbs the sun's energy to keep the body warm and, like a Solar+ treated fabric, can be used to enhance the thermal properties of slim insulated clothing. The acrylic sheath and core fibre contains exothermic particles that absorb energy from sunlight. Since the core part is covered with acrylic, these properties remain semi-permanent after washing, the company states. At Première Vision, Naoki Soda, assistant manager at Mitsubishi Rayon, expected sales of Corebrid Thermocatch to rise with the escalating price of natural down.

Capturing body heat

The magic of textiles lies in the many ways in which its components interact with the outer environment or with the body, which, as we all know, generates heat. Nilit Heat, a new development from the Israel-based polyamide fibre producer, focuses on capturing body heat to provide additional warmth. Coffee charcoal and an oxide additive are embedded in a polyamide 6.6 yarn. "The charcoal traps heat and slows down the escape of hot air," says Nilit's marketing manager Amy Holzer, adding that it is an intrinsic function, not a topical treatment and therefore won't degrade over time. Tested against a reference fabric without the additive, a Nilit Heat knit showed an increase in warmth of 10°C. In addition, the carbonised coffee provides antibacterial properties and a deodorising effect. Made from a waste product, it also has eco-credentials. On the downside, the yarn has a brownish coffee colour.

Applying a vaporised aluminium finish to a fabric is another way to enhance its thermal properties. Italian stretch weave specialist Serates has recently launched a collection of performance fabrics that includes a reference with a 10-micron thick aluminium coating on the back. "The technology is based on aluminium ions that reflect heat back to the body, much like Mylar blankets do," says company director Matteo Ramundo. The fabrics can be taped and provide waterproofness (15,000mm water column) and breathability (500g/m^2/24 hours). "When used with a padding, apparel brands can choose a lighterweight insulation as the fabric will keep the warmth inside," says Mr Ramundo.

Japanese company Amaterrace has recently introduced a finish called Aluminium Vapour Deposition (AVD) that is applied on down-proof fabrics (24 to 42g/m^2) and to a non-woven interlining. The vaporised finish reflects infrared rays emitted by the body and prevents their escape, without compromising breathability. "Because it keeps the heat inside, it is an ideal solution for lightweight down jackets," says sales manager Akihiro Nishino.

By capturing and trapping heat, fabrics and finishes can thus play an active role in keeping out the cold. They may not achieve the same level of thermal insulation as traditional padding or down, but they can contribute to lightening the weight of performance clothing in summer and winter.

Insulate to accumulate

Consumer choice in clothing has shifted from simple thermal insulation materials to functional thermal insulation, using high-tech functional textiles to replace traditional textiles for more effective thermal insulation against cold weather.

Existing mainstream insulating functions can be divided into the following three categories:

Thermal insulation: Preventing the loss of body temperature and retaining heat against the cold using textile design, special materials or post-processing technology.

Moisture-absorbing, heat-releasing and thermal insulation: Such material absorbs body moisture and transforms it into thermal energy.

Temperature regulation (such as PCMs): These offer heat-release in cold weather and heat absorption in hot weather.

Although the three differ greatly, success is still determined by thermal loss through radiation, conduction and convection. Most of the energy in this context comes from body temperature and instead of addressing heat release, the textile sector should address thermal-insulation. The thermal-insulation coefficient of fabric is the most important factor because users will naturally perceive warmth when the energy is effectively insulated.

Artificial fibre companies have developed many innovative post-processing technologies to accomplish a better thermal-insulation effect. The latest examples include fabric with added trace metal elements and carbon materials that use the thermal conductivity of the material itself to help garments convert energy from the body into thermal energy more quickly, attaining the effect of quick temperature rise and long-lasting thermal insulation.

This technology has been extended to the 2.5-layer garments, using innovative techniques to print the additives onto one of the layers.

Information supplied by James M.C. Lee, vice-president at Formosa Taffeta, Taiwan.



Made in Schoeller Technology's Solar+, this women's ski jacket by Kjus soaks up the sun's rays to provide warmth without bulk.

Lasse Kjus

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