

The weaving or knitting of patterned jacquard fabrics makes it possible to vary textures and compositions in a single textile to make seamless multifunctional clothes. After baselayers and shoes, the technology is now being applied to outerwear.

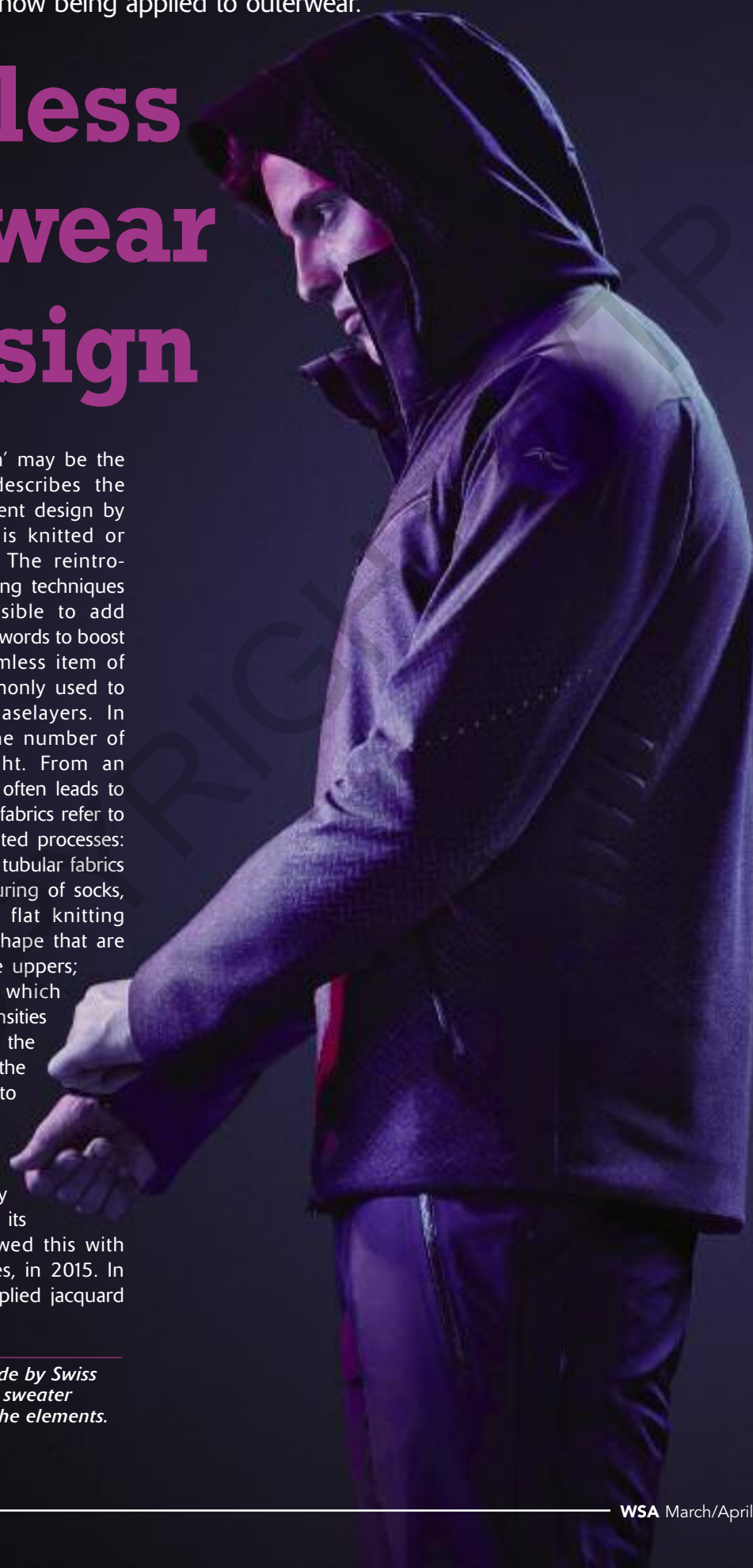
Seamless outerwear by design

‘Boosted minimalism’ may be the term that best describes the evolution in garment design by which a product is knitted or woven to shape. The reintroduction of jacquard fabric-making techniques in sportswear makes it possible to add properties and features, in other words to boost a minimalist, pared and seamless item of clothing. The process is commonly used to create body-mapped knit baselayers. In outerwear, it helps reduce the number of seams and shaves off weight. From an environmental point of view, it often leads to less waste in factories. Jacquard fabrics refer to one of several types of automated processes: circular knitting machines make tubular fabrics that enable one-step manufacturing of socks, underwear and base layers; flat knitting machines produce fabrics to shape that are now being used to make shoe uppers; and jacquard weaving, in which textured patterns or differing densities are created by modulating how the weft yarns are interwoven with the warp yarns, has been applied to technical outerwear.

This traditional textile-making technique made a prominent comeback in the sports industry in 2012 when Nike introduced its first Flyknit sneakers. It followed this with woven-to-shape Flyweave shoes, in 2015. In sportswear, The North Face applied jacquard

Freelite, a knitted ski jacket made by Swiss brand Kjus, is said to feel like a sweater while offering protection from the elements.

Kjus



weaving to performance clothing in its Fuse Uno jacket, part of its fall-winter 2014-15 collection. The near seamless mountaineering jacket was made in a single piece of fabric containing reinforced sections and lighter-weight zones. A novel piece of garment engineering, it even included a hood woven directly into the fabric. Since its launch, the US outdoor brand has presented new versions of the concept, now called FuseForm, transposing the technology from mountain jackets to running windbreakers.

Though simple enough to make, woven jacquard performance fabrics can be complicated to implement into a collection as it requires that brands and textile manufacturers work hand in hand to develop the material. Each different texture must correspond to a specific place on the garment and must ideally allow for variations in sizing. The meticulous process involves additional cost but may be compensated for by reduced sewing times.

A recent example of a woven jacquard fabric used in outerwear was on display at the ISPO 2017 booth of Japanese brand Descente All Terrain. The brand's Down Shell is made in a double texture jacquard fabric with sections made from Invista's high-resistance Cordura at the shoulders, hems and arms, Koki Ota, sales manager for the brand, told WSA. It won an ISPO Gold Award.

In recent years, fancy double-layer fabrics that form baffles during the weaving process have been developed to address the quest to reduce seaming and sewing in down jackets. One Chang, a company based in China, makes these fabrics on Japanese weaving machines, transposing its fine denier know-how to an array of fabrics with baffles of varying sizes to make puffer jackets that will not require any sewn quilting.

Knitted outerwear

While woven jacquard fabrics can help streamline a design and reduce manufacturing costs, styles that are knitted to shape have the potential to drastically reduce waste and off-cuts while offering the standard multifunctional features required for performance clothing. At ISPO in February, two examples of fully knitted high-tech ski and snowboard jackets were on show. Eager to be the first to come to market, Swiss skiwear brand Kjus released its Freelite jackets on its website in last December. "Because it is patent-pending, we needed to be the first to bring it to market," spokesperson Katharina Böhringer told WSA. In development for three-and-a-half years, the jacket is made in a stretch polyester fabric laminated to a Dermizax membrane and given a DWR treatment, like any protective jacket. This one,



An evolution of a technology first introduced in F/W 14/15, the F/W 17/18 Steep Series FuseForm Brigandine Jacket by The North Face is now paired with a Gore-tex membrane.

 The North Face

however, is said to "feel like a sweater". "Freedom of movement is a key feature of all Kjus clothing," says Ms Böhringer, pointing out that the brand built its success on its first stretch skipants, introduced in 2000. She expects the first knit-to-shape jacquard ski pants to be introduced in the brand's fall-winter 2018-19 collection. Meanwhile, Kjus is taking advantage of the technique's ability to vary knit stitches to create textural patterns.

The innovative design possibilities of jacquard weaving and knitting have not been lost on French action sports brand Picture Organic Clothing. For the past two seasons, it has developed seamless woven jacquard performance jackets under the Eno label, and it introduced its first, all knit jacquard jacket for fall-winter 2017-18. "With our manufacturing partner Ginkio, we went to see Carl Mayer, the maker of the flat bed knitting machines used by Nike, because we wanted to see if it was possible to transpose the concept to outerwear," says Julien Durant, one of the brand's three co-founders. Turns out it is possible: made in recycled polyester, the jacquard knit fabric it developed offers body-mapping features, including open-knit zones that reveal the membrane underneath and



Italian fashion group Benetton has acquired 36 Whole Garment Technology knitting machines made by Japanese group Shima Seiki to reinstall knitwear production in its headquarters in Treviso.

 Benetton

tighter knit areas delivering higher abrasion resistance. The entire jacket stretches without having any elastane. As it has fewer seams, it requires less taping which results in fewer stress points on the finished garment. The brand claims these features will make the jacket last longer, and it has patented the design.

Electronic jacquard

Shima Seiki, a Japanese maker of flat knitting machines, promotes what it calls 'Whole Garment' technology. "Unlike circular knitting, our technology makes it possible to create truly seamless products, which helps reduce manpower at production level," says Kay Chan, Shima Seiki Hong Kong marketing manager and designer. The company is targeting the athleisure market, showing items incorporating knitted-in belts and pockets, or, for more performance end-uses, padded shock-absorbing sections.

Circular-knit specialist Sidonios, a company based in Portugal, has recently brought in a new generation of electronic jacquard Mec-Mor (a division of Lonati Group that also owns Santoni) machines that it believes will enable new design possibilities. "These machines can make woven-look knits and jacquard patterns that were not previously possible," says Sidonios sales director, Bruno Sidónio. He believes they can be used to make innovative outerwear. "The key difference between flat bed and circular knitting is that circular knitting is much faster," his brother, production engineer Alexandre Sidónio told WSA. Each technique has its pros and cons, and while a circular-knit garment may require more

seaming, it may make up for this by the speedier fabric manufacturing process.

For some, jacquard made-to-shape manufacturing could help bring garment-making back to Europe, North America or Japan. "This technology is part of an evolution towards the fourth industrial revolution," says

Norwegian brand Devold won an ISPO Gold Award for its Tinden Spacer range made in merino wool with spacer knit panels to increase thermal insulation.

 Devold



Mr Durant, who envisions manufacturing Picture Organic Clothing in Europe, specifically in Germany thanks to the automated process.

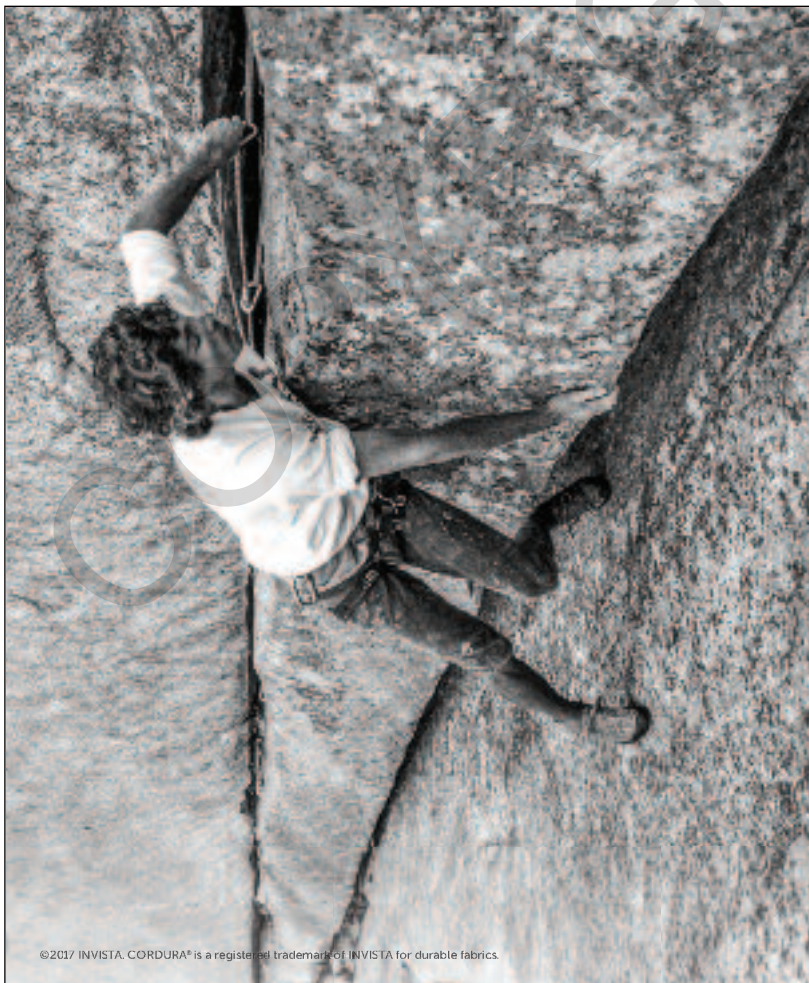
In Italy, Benetton has already made this move. The knitwear specialist acquired 36 Shima Seiki knitting machines that it is using to manufacture a range of sweaters labelled TV31100, named after the company's Treviso headquarters postcode. In Japan, Fast Retailing, the parent company of Uniqlo, has formed a joint venture with Shima Seiki, acquiring a 49% stake in a manufacturing site known as the Innovation Factory, in which Shima Seiki owns 51% of the shares. The two partners intend to develop automated flat-knit clothing.

Time will tell whether the technology will become part of a fourth industrial revolution. It is noteworthy that the revival of jacquard weaving and knitting not only calls to mind the early years of the industrial age, when Joseph Marie Jacquard invented the jacquard loom in 1804, but also Google's research into smart textiles, which it named Project Jacquard, in 2015. As the punched card mechanism invented by Mr Jacquard is said to be one of the technologies that ultimately led to the development of modern computers, one might say it has come full circle. 



Made on a Carl Mayer electronic jacquard machine, the Iceland ProKnit Lab jacket by French brand Picture Organic Clothing features advanced body-mapping features, including mesh sections to allow for added breathability.

 Picture Organic Clothing



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