



There is a quiet revolution rapidly gathering pace in the apparel manufacturing industry, and it would appear that 2006 could well be the tipping point in many areas as these new technologies mature and find their place in activewear.

When the common thread, is not a thread – the no-sew revolution

Archaeologists have discovered bone needles with eyes, designed to sew skins and furs together dating back 20,000 years. The earliest sewing needles made of iron come from the Celtic hill fort at Manching in Germany and date back to the third century BC. A sewing set, complete with thimble, was reported to have been found in the tomb of a minor official of the Han Dynasty (202BC – 220AD) in China. Ever since man has walked on two legs, the way that clothing has been put together has been based on the same concept: "Take two pieces of material (leather, fur, fabric, etc.), put holes into the materials, attach with another agent (twine, silk, cotton, etc.)…"

The invention of the first workable sewing machine in 1790 by Thomas Saint did nothing to change this principle. That was until the last decade. Today, from the Rocky Mountains in the USA to the beaches of south west France, garments with no stitching and no threads (well less of them at least) are being seen more and more.

The seamless generation

Much has been written about the growth in seamless apparel which was successfully developed and pioneered by the Italian company Santoni, which initially began creating its innovative technology by adapting traditional hosiery machinery in the 1980s. The business has continued to grow and has built itself a unique position in the marketplace, playing a major role in what has become an important sector in the textile industry.

However, for the purposes of this article, we are going to examine a new phenomenon which has developed in parallel with this technology in recent years. Largely as a result of the demand for even more technical apparel with 'sew-free' elements and capabilities, there has been an acceleration in the investment by both polyurethane film manufacturers and sewing machine makers to create opportunities for truly functional 'no-sew' garments. Through refitting and re-engineering traditional 'sewing' machines to be able to accommodate tapes and adhesive films, new machinery has been developed to apply heat, pressure, sound (ultrasonic) and even radio waves — all with the sole purpose of eliminating the need for a needle and thread.

What are the real benefits? Why the obsession with 'no-sew' garment technology? The question has to be asked as to whether this is just a fad, a fashion, or simply designed to create 'new' looks? Initially one of the simplest yet most

Mountain Hardwear has been incorporating welding (no-sew) technology into its outdoor equipment and sportswear since 1998.

Mountain Hardwear

profound answers to this question was given by Gaston MacMillan, a materials expert at outdoor brand Mountain Hardwear, "By joining materials together without sewing through the fabric with a needle and thread, we maintain the integrity of the fabric. In the past the industry spent years developing extremely functional fabrics, only to puncture holes in them to put them together, and then had to develop ways of overcoming the weaknesses subsequently introduced."

Mountain Hardwear has been pioneering the use of welding (no-sew) technology for some years now. It definitely does not see it primarily as fashion, although it does have appealing aesthetics. It is the company's belief that it is a method of construction that provides a means of building a better garment. (It now has over 120 products in its line that incorporate welding in some manner, in everything from sleeping bags to tents, backpacks and, of course, technical outerwear and sportswear). Its first use of welding in outerwear began in 1998 with the welding of draw-cords on jacket interiors and it quickly evolved to become a standard construction for interior pockets. This has now become a standard commonly expected in the outdoor industry. The welding of major seams—i.e. the use of welding in the construction of the seams throughout a garment—is a relatively new addition and a logical progression of the welded construction method. The first garment with welded major seams was introduced in retail stores in 2004 with two more added in 2005.

Through "maintaining the integrity of the fabric" Mountain Hardwear now knows how to construct durable waterproof seams without sewing and tape and can now make seams that will stretch as much as the fabric will allow. As MacMillan says, "Some of these seams are nearly invisible. It is great not having the seams abrading your skin. Our core customers are outdoor athletes and enthusiasts who are knowledgeable and appreciate the use of technology in the design and engineering of their gear for better performance."

When Mountain Hardwear began to explore the idea of welding major seams in garments it looked at the technologies available at the time and there were some real issues that needed to be addressed. The first major seam on the market was the overlap seam and the most common machine for welding garments was for line bonding. The overlap seam was restricted by the types of fabric that would weld a durable seam and for line bonding a tape hadn't yet been developed to really hold that seam together. To solve some of these problems, the company developed its own seam, based on a mock felled seam. The alignment of the materials allows the welded seam to affix face fabric to face fabric and with simple improvements it is also waterproof. This is the basis of its patented Z-Weld technology.

An insider's view

In the search to find a manufacturer that could manage the innovation it was looking for Mountain Hardwear came across a company in China called Common Rich Technology. Founded by Geni Hui in 1996, CRT is a company focused almost exclusively on developing no-sew garment technology. Within the factory CRT has ultra sonic, seam sealing, laser cutting and laminating machinery and some single garments produced there at the moment necessitate the use of all these technologies to provide the perfect result.

The perspective of the end manufacturer is one that is very seldom heard, and one which was quite fascinating. Geni Hui offers an eye-opening insight into the world of no-sew garment engineering. "With the variety of tapes and adhesive films now available, combined with the different machine technologies, and the demands of the end customer to use endless varieties of fabrics, each individual combination needs to be thoroughly tested every time, before any bulk production can begin And this is exactly what we do at CRT".

As with all manufacturing processes, the key to the successful production of no-sew garments lies in a combination of the quality and consistency of the fabrics and the films used, the machinery utilised to put them together and the knowledge and experience of the factory.

Another of CRT's customers had a successful time with no-sew technology at the most recent Winter Olympics in Torino, Italy, with five gold medal winners wearing the Bodytec V Bjørn Dæhlie technical wear tracksuit made by Odlo. The suits, specially created in Sensitive fabrics using ultrasonic welded seams, were worn by athletes from France, Norway and Estonia and garments were made completely using no-sew technology, meaning that the finished articles were as smooth and aerodynamic as possible, whilst offering optimum, comfort and lightness. As Odd Roar Lofterod says, "The Bodytec V lets the athlete concentrate on achieving his/her best performance without any discomfort due to the friction caused by traditional seams."

Odlo already has a track record in utilising different no-sew elements throughout its ranges having previously launched its SIS system (Seamless Insert System)—whereby padding in cycling shorts was inserted into the section that comes into contact with the saddle, using



Made with no conventional stitching whatsoever and incorporating 'Z-Weld' technology, Mountain Hardwear's Torch Jacket was named 'Backpacker 2006 Editor's Choice Award Winner'.

Mountain Hardwear

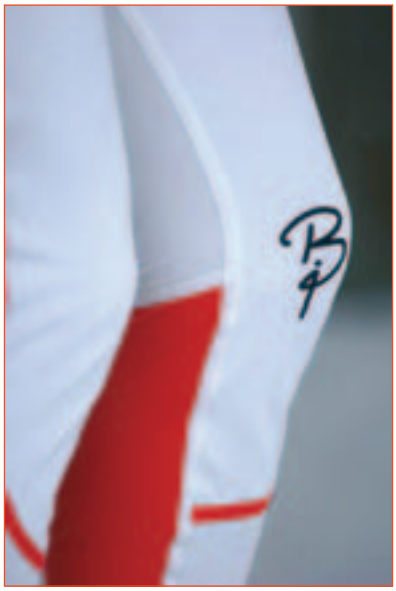
thermal bonding to the main fabric, in order to eliminate any uncomfortable friction or pressure points and thus avoiding irritation to the skin. Fully committed to the principle of optimising no-sew technology in its various forms it also launched its Unlimited by Odlo sports underwear collection last year. After four years of research with a team of biomechanics, textile engineers and sports physicians, Odlo developed a revolutionary method which made it possible to produce a totally seamless, yet functional sports bra and brief. The fabric is treated with an ultra-thin polyurethane film in strategic places on the garment, which is then bonded to another fabric under heat and pressure. After this, the final seams are then welded together using a high frequency (sonic) welding machine, to ensure that there are no conventional seams and no pressure points or rubbing on the skin.

The common thread?

Although there is a revolution occurring that is variously described as 'no-sew', 'seam free', 'seamless', or 'sew free', the reality is that the industry is currently discovering, exploring, researching and creating a variety of methods to achieve the same end result–the reduction or elimination of stitched seams in garment construction. The key to this is the ability to successfully combine two pieces of material together without a thread. Whilst this is actually being executed in a variety of ways whether it be welding, bonding, or laminating, using ultrasonic waves, heat presses, radio waves, or just pressure, one of the common themes running through this innovation at the moment is the use of polyurethane adhesive films and tapes. This is very much the "common thread, which is not a thread!"

One of the leading manufacturers in this field, which has been pioneering the development of adhesive films and tapes designed to eliminate the need for sewing, is Bemis. Its registered trademark Sewfree is being increasingly used in the construction of garments by some of the leading brands in the active sports and outdoor industries including The North Face, Helly Hansen, Columbia, adidas, Nike, etc. In reality there are several methods for constructing bonded garments using Bemis films, depending on the specific application required. For example, structural seams can be made with a stationary flat fusing press, with a continuous process using a hot-air sealer, or even with a radio frequency sealer. The result in all cases is that the elastomeric polyurethane melts and forms a permanent bond with the materials. The films supplied by Bemis are normally deposited onto a release substrate and are sold with the substrate in tact. The release paper or liner is then stripped away by the machinery used to create an overlap seam, or is removed in the final bonding of components. (Alternatively, the films can be laminated directly onto fabrics and if necessary custom slit to an individual specification.)





Odlo's Cross-country skiing garments , with sonic welded seams as worn by gold medallists at the Winter Olympics in Torino.

Odlo

Whilst seam bonding with Bemis tapes offers the opportunity to create lighter weight hems and seams in technical outerwear whilst not requiring seam tapes to be waterproof, the company has now identified a need for a method of strengthening the rapid growth of purely welded seams created with ultrasonics or laser equipment and has now introduced a new range of seam reinforcing tapes (SRTs). These come in a variety of formats for different applications – the SRT1001 for soft shell, the SRT 2002 for two-layer fabrics and the SRT 3001 and 3004 for three-layer fabrics. As Terry Davey, technical services manager at Bemis, says, "Ultrasonically line bonded seams are sleek and much less abrasive and are therefore becoming increasingly used in the technical outerwear industry, however, the seams can become weak and brittle. With this new range of SRTs superior strength can be achieved without adding bulk."

Putting the jigsaw together–Italian style!

The availability of polyurethane films and tapes as a means of replacing traditional threads has not really been in question for some time now. However, the ability of the final machine and manufacturing technology required to make this innovation a real revolution has been much slower in its realisation. Whilst polyurethane film and tape suppliers have worked very closely with machine manufacturers around the world to try and bring the technology to a level of greater commercialisation, an Italian textile solutions company has gone one step further.

Framis Italia, founded in 1979 by Luciano Salotto is one of the leading suppliers of polyurethane tapes in the world. In the past 27

years it has produced two billion metres of Framilon tape, "holding up your panties, making your bra strips invisible etc…" as it likes to point out. For the last 10 years it has also been producing tapes which are adhesive and films which have increasingly been used to make raw cut-edge garments.

In May of this year, Framis launched El Nino, a hot-air welding machine specifically designed to simplify the bonding process. Operated manually it has a motorised bonding mechanism designed to make the application of bonding tapes easier, with a laser pointer engineered to guarantee greater precision. Having taken the step of bringing together the machinery and thermo welding tapes technology into one business, in July Framis went further by launching NoSo, a hot melt welding division. "This is the result of years of experimentation in the combination of the best tape technology and the machinery designed to apply it," says Luciano Sallotto. It will be promoted as a brand to ensure that manufacturers and consumers alike understand the advantages of the technology.

"One of the greatest benefits of the technology to be launched," he declares, "is its application to stretch fabrics." Framis strongly believes that one of the greatest restrictions to date in the development of no-sew technology has been the limitation in being able to create curved stretch seams which are bonded, strong, and yet which stretch with the natural or enhanced elasticity of the materials used. The NoSo system makes this a reality.

Exploiting the benefits

Initially developed as a means for providing functional yet comfortable seam solutions in technical waterproof outerwear, the whole progress of no sew technology is building an increasing momentum in all areas of the sports and outdoor industry (as well as in the general clothing market). In addition to the traditional waterproofing seam advantages, the other real benefits of this innovation are becoming increasingly important.

Weight reduction: Already at the European Football Championships in 2004 in Portugal, Nike launched its Zero Distraction seam technology using Bemis films in order to reduce the bulk and weight in soccer shirts.

Comfort: Narrower, lighter, softer seams are beginning to be offered in garments worn next to the skin in order to provide added comfort on the body. In spring 2006 Rip Curl offered swim/surf wear with no seams for the first time, designed to offer maximum comfort with a smooth sleek fit.

Cost management: It is strongly argued that in certain forms these new technologies can actually offer unique design capabilities at reduced costs. In the case of the Odlo Unlimited sports bra, a totally sew free garment was created with engineered support and performance in two processes, flat pressing and ultrasonic welding. The real benefits of this, however, are still to come with greater commercialisation of the technology.



Garments made using Bemis's new SRT seam reinforcing tapes.
Bemis

New aesthetics: Freed from traditional seaming technology, designers are able to create new looks with new patterning capabilities. Even in its simplest form, elements of no-sew technology were seen in the St. George cross inlaid on the shoulder of the latest England football jersey by Umbro.

Where to next?

Whilst it is quite clear that the revolution is rapidly gathering pace, the full commercial reality is not quite as obvious. Anybody with a deep knowledge of the global apparel industry knows that there is much excitement about the possibilities of these new ways of making products, in markets as diverse as sportswear and ready-to-wear, lingerie and leisurewear. There is a growing demand and clamour from brands and retailers to be able to buy items made this way, yet there is still a real shortage of manufacturing facilities capable of providing volume production on a grand scale.

These are exciting times yet, as is so often the case, it is the old story of the 'chicken and the egg'. Whilst buyers want the innovation and many vendors want to make it, there is much investment needed in new machinery, equipment and training to make the revolution a reality. Although there may be no real urgency at this stage, the buyers and vendors with the courage to take the risk and embrace what is happening could be the real winners in a revolution which has been 20,000 years in the making.