



Using the Jacquard method of weaving, an almost unlimited range of patterns, textures and colours can be incorporated in each upper design.

ALL CREDITS: LENZI EGISTO

Precision weaving

Lenzi Egisto has been weaving textiles for over one hundred years and during that time has created a totally integrated design and manufacturing system that is capable of producing extremely advanced and complex woven materials. The key factor in the company's ability to do this has been a large and sophisticated R&D department, combined with a manufacturing capability that includes advanced weaving and bonding techniques. The result has been a range of highly successful safety materials for many industries and end uses.

A good example of this is a material developed for hunters and the military to resist snakebite. Snakes' fangs are extremely sharp and capable of penetrating all conventional woven materials. Two years of research produced the answer which, although a complex material, was one that did provide effective protection against both snakebite and also knife wounds.

It comprises a woven Kevlar fabric coated with a layer of polyurethane and carborundum. An extra layer of carborundum platelets is then applied to the top surface in a formation similar to the scales of a snake's own skin.

A further example is the L-Protection woven insole material introduced in 2002 which has had a major impact on safety footwear. This replaced conventional steel protective insole plates with six layers of tight weave fabrics, three of 100% Kevlar and three of polyester HT. These six layers were coated with PU resin enriched with a ceramic (Silicon Carbide - SiC) and then laminated together. The resulting material was lighter, more flexible and offered better protection in that it could be cut to the precise shape needed to match the shoe bottom so that there were no gaps where a sharp object might penetrate. The product has since been modified into a more economical – though still high performing – 100% polyester insert. It

is this ability to come up with novel solutions to difficult problems that is Lenzi's great strength.

PERSPAIR

The latest innovation is Perspair, a unique concept whereby the design for an upper is incorporated into a woven material and only needs cutting out and seaming at the back. It again takes full advantage of various technologies developed at Lenzi to give special high tech features suitable for use in climbing boots and safety footwear or, from an aesthetic design aspect, even the humble sneaker.

The method of manufacture used here is based on Combo Technology, a resin-free method developed by the company which bonds fibres together. This system, originally developed for mountain boots, produces maximum breathability, high abrasion resistance and great durability. Independent tests have shown excellent mechanical performance, with tear strength in



Perspair is supplied in roll form with the upper design woven in rows.

excess of 300N in the warp direction and 200N in the weft, against recommendations for high demanding footwear of 60N in the warp direction and 40N in the weft. Abrasion resistance was similarly shown to be extremely good.

CUSTOMER DESIGNS

The Jacquard method of weaving used enables customer designs to be produced using pdf or dxf formats. These are woven in up to four groups, each of which will cover three shoe sizes. The customer can choose from a selection of weaving structures, indicating their preferred texture and colour for each individual area of the design. The material is woven either exactly, or as closely as is technically possible to these instructions.

The finished material is supplied in roll form with the uppers running lengthwise (warp) and for sizes EU 37 and over four across (weft). Smaller sizes will have more rows depending on actual upper size. The upper and tongue can be placed either together or separately; the latter makes final die-cutting easier. It is also essential if its laminated structure is different from that of the upper.

Some of the special fibres used by Lenzi, such as 3M retro reflective threads for visibility, Kevlar or Dyneema for reinforced areas and Hypertek ultra abrasion resistant thread for built-in toe protection, can be incorporated in custom-made vamp designs. Thanks to seamless technology, a membrane can be laminated directly to the reverse side of the vamp for water resistance

JACQUARD PROCESS

The Jacquard process developed in the early 19th century made it possible to automatically produce unlimited varieties of woven patterns. The term 'Jacquard' refers to the control mechanism that is added to a weaving loom that automates the way it creates the individual pattern. The machines operate using a continuous roll of punched cards where the location of the holes determined the final woven pattern. They were usually small and relatively slow to operate due to the downtime involved in changing card rolls between different designs.

The advent of electronic control in 1983 has increased Jacquard machine output capacity significantly as there are no card chains to change, just a quick switch from one design file to another. CAD design has also allowed almost infinite versatility in terms of pattern, type of thread and colour combinations. This modern digital technology has also made Jacquard weaving more flexible in terms of batch size and made the Perspair woven upper system a practical reality.

or, alternatively, Lenzi's own L-System interlining for bacterial protection in the finished shoe.

While Perspair will not be suitable for many types of footwear, it certainly offers some real possibilities for specialist footwear producers aiming at the extreme sports and certain

sections of the safety markets. Bearing in mind the minimal cutting and stitching involved, plus the possibility to use a sewn-in-sock construction combined with direct bottoming using PU, would make the automated production of such footwear in higher cost economies a viable proposition. 



Minimal cutting and stitching combined with a sewn-in-sock construction makes Perspair well suited to automated manufacturing systems.