

From Wool to Wear



In New Zealand, the word “engineering” mostly conjures images of bridges, buildings and bulldozers. But given the display of merino-based textile innovations at New Zealand Fashion Week in September 2010, and our global reputation as a wool-producing nation, maybe textile engineering is something we should take seriously.

Six new wool-based textiles presented at Fashion Week illustrate the industry’s exciting potential. Four are AgResearch innovations, while the others originated from New Zealand-based companies Gimono Ltd and Levana Textiles.

Gimono Ltd designs, makes, markets and sells performance fightwear. “About five years ago we approached AgResearch to assist us with the development of a fit-for-purpose textile for high-performance martial arts apparel,” Director, Lavinia Calvert, says.

“We knew what functional and aesthetic characteristics we wanted, although we didn’t have preconceived ideas of how to achieve that. We had already done a great deal of market

research into industrial and other fabrics but hadn’t found anything that fully met our specification, so we decided to create our own. But we are not scientists or textile specialists – so we commissioned AgResearch to provide contract research and development (R&D) to develop the textile we wanted.”

Gimono’s advantage, she says, was being able to challenge the scientists, to ask the silly questions. “And we did have lots of questions. We continually pushed the envelope throughout the development process and challenged the team at AgResearch to help us find solutions to some of the technical obstacles that appeared along the way. Had our frame of reference matched that of the scientists

however, we may not have achieved the same outcome.”

“In my view, New Zealanders are generally very good at the ideas part of technology, but where we often don’t do so well is turning those ideas into commercially viable outcomes. The best solutions happen when you combine a good understanding of the problem you’re trying to solve with good science or engineering.”

Ms Calvert says the difference between the old fabric from which traditional martial arts uniforms are made and the new textile is like comparing the All Blacks’ current uniform with what they wore 50 years ago. “That is an indication of how revolutionary our new ‘Fortitude’

fabric is. It is a world first for fightwear – but it also took a lot of trial and error to get it right.

“Although the AgResearch team will tell you our fabric achieved ‘accelerated development’, for us as a small commercial enterprise it was a long process. The AgResearch team was excellent, but in our experience commercialising a textile is actually very difficult and time-intensive. The R&D alone took over two years, and then it took a further two years to commercialise it. But what we have now is a high-tech, high-performance fabric that we are using in all our fightwear products.”

The market potential for Gimono Ltd includes over 70 million martial arts participants worldwide. “The best thing for us is that no one else is doing anything like what we are doing in terms of specialist textile development to suit the comfort and performance needs of our market.”

Levana Textiles also approached the AgResearch team to access locally based facilities and technical expertise for its growing merino-based compression garment market.

“We are a well-established textile company specialising in circular-knitted fabrics. Our focus is on the high-performance textiles market, particularly medical textiles such as compression fabrics,” Development Manager, Marie Snell, says.

“Levana is part of a wider group of companies involved in all aspects of fibre and garment production.”

AgResearch is helping Levana Textiles develop a range of “high-tech” fabrics, besides the high-performance merino and synthetic blend compression textile showcased at Fashion Week.

Ms Snell says taking an entirely fresh approach the fashion designers produced a high-fashion swimwear garment from the material. “Woolen swimwear ... certainly wasn’t a use we had envisioned, but that has been one of the exciting benefits of the collaboration.

“We recognised that demand for a user-friendly compression fabric has been increasing as the population ages,



Surinder Tandon with wool sheeting. Image courtesy of AgResearch.

and this was further highlighted by the personal experiences of some staff with their own elderly relatives. The merino-based fabric we have developed with AgResearch can be worn for much longer between changes without odour or microbial growth on the skin becoming a problem – partly due to merino’s hygroscopic quality (its ability to absorb and desorb moisture from skin or the surrounding environment). And it has the next-to-skin softness that makes all merino products so comfortable.”

Of the new textiles showcased at Fashion Week, AgResearch’s Dr Surinder Tandon says the main reason the new textiles are merino-based is because AgResearch has an established history of undertaking wool research and development. And while noting some merino wool textile developments are directly applicable to other materials, he sees a growing appreciation of wool and wool-blend textiles for their superior

aesthetic performance and comfort over synthetic and cotton alternatives.

“Current textile research focuses on fine and next-to-skin apparel – which must be prickle-free. Merino for next-to-skin apparel has a much finer fibre diameter (19 micron or finer) than other wools, which means protruding fibres are less prickly than larger diameter wools. Fibre diameter is also directly related to fibre bending stiffness ... a fibre with twice the diameter of merino will be 16 times stiffer, so will be much more coarse and more prickly to wear.”

Around 75 million kilograms of merino wool is sold annually around the globe for next-to-skin apparel applications, and this figure is growing as new technology adds variety, value and product differentiation for consumers.

Two Fashion Week designs showcased bi-coloured fabric produced in a single, rather than traditional double, dyeing application. This involves a special dye-

resist chemical being applied all over one side of the fabric, or in a screen-printed or freeform pattern. For this new process, the chemical has been specifically developed for wool, although it can potentially be tailored to the specific molecular characteristics of other fibres. The chemical bonds to certain sites in the wool fibre at a molecular level. This means two dye types can be combined in a single dye bath, which creates efficiencies as the usual two-step process is simplified into a one-step process. The result is a colourfast fabric with "good handle and drape". As it has been adapted from existing manufacturing processes, the technology is easily transferable to commercial-scale production.

Traditionally, wool has been limited to a muted "basic" dye palette because it couldn't hold bright dyes. For the new "bright wool", the textile's fibre is chemically modified to accept acrylic dyes whilst retaining the wool's natural drape, softness, and durability. The resultant textile has applications in sportswear and high-visibility protective clothing.

A new anti-odour and antistatic next-to-skin fabric also has potential sporting and outdoor-wear applications. It evolved from a research programme to develop lightweight, breathable, machine-washable, and quick-drying next-to-skin textiles that stay fresh during wear. Treated with a new chemical finish providing anti-odour and antistatic properties, the active chemical binds to the wool fibres so it won't leach out over time. This treatment binds better to wool, is wash-fast, and is quicker to complete than existing processes.

"We source fabric substrate from New Zealand companies to experiment with dyeing and finishing, and we sometimes develop and produce new yarns, fabrics, dyes and dyeing processes ourselves," Dr Tandon says.

"But the next step – commercial development – is something we cannot do all ourselves, and this is where the designers and manufacturers have been very helpful."

Besides colour and texture, textiles fashion focuses on end-user functionality.

The new or enhanced performance attributes are what ultimately help the fabric to become fashionable.

"When we first showed these textiles to the designers in 2008, they were very interested. We have since had interest from others wanting to incorporate our fabrics into forthcoming ranges, and from chemical suppliers, and fabric and garment manufacturers," Dr Tandon says.

"But the next step really is for commercial partners to pick them up and commercialise them."

Modern apparel research focuses on sustainable production processes, including reduced energy and water use, and the use of more environmentally friendly or biodegradable raw materials and chemicals. "We try to incorporate these, and it is also rewarding when processes improve as an indirect consequence of a particular textile outcome being sought," Dr Tandon says.

"For example, the novel dyed fabric requires only one dyeing process instead of the traditional two, achieving significant savings in water and energy use. And the anti-odour fabric, which feels fresher for a longer wear time, is machine-washable and quick-drying, generating energy savings for the consumer and avoiding the need for solvent-based drycleaning."

The ultimate success of these textile innovations is something only time will reveal.

Both Gimono and Levana have retained intellectual property rights for their textiles, and are growing niche global markets based on the AgResearch-assisted innovations.

But as Dr Tandon says, "The ultimate satisfaction is to see our new textiles in shop windows and on people in the street. To see it evolve from the lab into something useful is the perfect outcome."

✉ WRITER Karen Wigglesworth

