Competitive Apparel

Sally Gray

While athletes are training, pushing their finite bodies to accomplish apparently infinite objectives, similar competition presses on in the chemistry lab. Corporations are battling for position in the textile niche of sports apparel.

Sports garments today take their first breath of life in the chemistry lab. And there are dragons breathing fire over this competitive race—dragons from China, Taiwan and India where abundant labourers enable these countries to dominate the textile industry because the rest of the world cannot compete with their low-priced fabric. Daily news reports of Canadian textile businesses closing their doors only serve to shape the remaining open doors. Survivors in the fabric industry are creating niches for themselves on the market by adding value to fibres not found in textiles from China.

"China produces huge volumes of simple fabrics," says Sebastian Couture, long-time member of the Canadian textile industry. "We do the opposite. We specialize in small and customized orders ready in a short turn-around time." Couture is the R&D manager of Filspec Inc., a manufacturer of specialty natural or synthetic yarns and threads in Sherbrooke, QC. He speaks with enthusiasm about the changes in the industry.

"There is a trend toward natural fibres and eco-friendly products," he says. "There are an amazing number of fibres. Their combinations and properties are endless."

Technical is "in"

Technical sports apparel is a growing niche in the textile industry. Take swimsuits for example. Speedo's Aqualab has recently set the sports world abuzz with a swimsuit every competitive swimmer has to have—even at the cost of $550. Indeed, Canada's 400-metre medley relay swim team shaved an astounding three seconds from their previous national mark when they donned their new Speedo LZR Racer swimsuits for the first time at the CN Swim Trials in Montréal, QC, last month. These full-length swim suits jump-started athletes to set new records around the world since their introduction in February of this year. The lightweight polyurethane fibre is more drag-resistant because the seams are bonded by ultrasonic welding, allowing water to flow more easily over them. The suits also have built-in areas of compression causing swimmers' muscles to work more efficiently.

Sports shops patronized by the average active Canadian offer a bedazzling array of different fabrics with specialized qualities. Gone from the sports retail outlets are the standard cotton-poly T-shirts. In their place are technical tees—high performance garments for athletic wear, constructed from both natural and synthetic fibres. The chemistry lab is indeed the saviour of Canada's textile industry. It's also the source of solutions for consumers demanding comfort, style and environmentally friendly products.

Lululemon Athletica's founder, Canadian Chip Wilson, is a self-declared textile technology guru. He delights in combing the world for new materials from which he can produce exciting new textiles. He has found plenty for the manufacturers of his athletic clothing. Soy and cow's milk are two renewable resources now being explored for textile use. "Soyacel" products are already on the market—light, breathable, sturdy and soft. Protein in oil from pressed soybeans is liquefied and extruded into long fibres that are cut, processed and spun. Fibre from cow's milk has been produced as well, but there are challenges in finding ways to fix dyes into this textile at reasonable cost using eco-friendly processes.

Expect to see more and more bamboo apparel on the racks. It's biodegradable, absorbent, very soft, and has a cooling effect in hot weather. Bamboo apparel boasts some natural anti-bacterial properties. Carbon is good for filtering away moisture, and the bamboo fabric is developed through a carbonization process that invests the material with attributes that wick away perspiration. Bamboo is easy to grow, and the material doesn't produce static. But this technical fibre has down sides. Though renewable, the bamboo has to be broken down in an energy-intensive process that requires large amounts of water. Although technical fibres offer an alternative to petroleum-based textiles,, in some cases eco-friendly processing methods of the various raw materials for these technical fibres have yet to be developed.

A useful fibre for clothing called Lyocell is purported to be an eco-friendly cotton alternative to other technical fibres. Better known by the trade name Tencel®, it is produced from cellulose, the main material in plant cells. Wood pulp is dissolved in N-Methylmorpholine N-oxide to create a solution called "dope," which is pushed through a spinneret to form individual cellulose fibres. The new fibres are washed, the chemicals are retrieved from the water, and they are recycled. There is little byproduct. The cellulose fibres are softer than cotton, strong, and absorbent—characteristics they share with other cellulosic fibres such as cotton, linen, ramie and rayon. Lyocell is renewable, though trees grow slowly, but buyers beware. Other less eco-friendly fabrics, such as bamboo, can pose as Lyocell and no one can tell the difference, even under a microscope. All the cellulose fibres look the same.

Eco-friendly athletes

To a consumer concerned about environmental degradation, the heralding of organic cotton fibres for athletic garments is a step forward. Mountain Equipment Co-operative, manufacturer and retailer of athletic clothing in Canada and abroad, has been a leader in the movement to "go organic" in cottons. In the last few years, they have converted all their MEC-brand cotton clothing to an organically grown alternative. In 2005, they were among the top 25 global buyers of organic cotton fibre. They purchased 129,300 kg of raw material in that year and boasted about their avoidance of the use of 42,600 kg of synthetic fertilizers, pesticides and defoliants as a result. Other corporations are looking into

Speedo LZR Racer swimsuits out-performed expectations at the CN Swim Trials in Montréal, QC.

the same alternatives, but there are difficulties. Cotton gins are used to separate fibres from seeds, and the gins have to be thoroughly cleaned before processing organic cotton so the residual pesticides in the standard cotton won't be transferred on to the raw, organic cotton. That costs. Good, fast dyes are not all environmentally friendly. The use of massive amounts of fresh water in the processing of organic cotton is another area for concern.

Merino sheep herds in New Zealand and Australia are renowned for their very fine wool. Thanks to the merino sheep, wool is enjoying a revival today in the sports apparel industry. Long-sleeved t-shirts made of Merino wool don't hang around for long at outlets like Fresh Air Experience In Regina and St. Albert, SK. Selling quickly at $90, the tee is worn as a snug base layer along with the $85 pants that will debut this fall. The wool's popularity is based on the excellent thermal and moisture-wicking properties, but also, surprisingly, for its softness. Measured in microns, the average diameter of a wool fibre found in the warm woolies that great-grandma used to wear was 25 scratchy microns and up. The super fine wool fibre from the Merino sheep measures about 17 microns. Wool has an antibacterial property, and will absorb 35 percent of its weight in body moisture, quickly releasing it as vapour.

Catherine Heggtveit is the eastern Ontario representative for Sugoi Cycle Clothing Ltd., a Canadian-based manufacturer and distributor of athletic clothing. According to Heggtveit, summer marathon runners report finishing a race cool and dry while wearing short-sleeved Merino wool tees.

"Wool has a climate control property," says Heggtveit. Ask the sheep! It is biodegradable and comes from a renewable resource, features that keep the green crowd happy. And one final advantage of the fine wool is tighter weaves that improve the garment's ultraviolet (UV) protection.

Cotton alternatives

Two ancient textiles, hemp and ramie maintain their position on the racks of today's sports clothing stores. Hemp fibre, produced from the Cannabis plant family, is three times stronger than cotton and can be easily grown organically in most places. The hemp textile tends to be naturally resistant to mould, bacteria, heat and ultra-violet light. Most hemp grown for textiles is now produced in China, but the clothing for athletic wear is found in Canada. It is characteristically breathable, durable and soft. Egyptian mummies wrapped in ramie, and the fabric is also found in sports shops today. It comes from the stem of a very prolific, but not prickly, member of the nettle family. It is strong, resistant to insects, light, bacteria and mildew and is easily dyed. It holds its shape and doesn't shrink. However, ramie fibre can be stiff, it wrinkles easily and is low in elasticity.

Photo courtesy of Speedo™

Sweet synthetics

New innovations in the synthetic fibre industry are also pleasing athletes. Petroleum-based polyester of the past did not absorb body moisture, but held it against the skin. New wicking features have been developed to deal with this disadvantage through channels created in the polyester as it extrudes from the liquid stage into a thread. Microscopic grooves in the thread allow the moisture to be channeled away from the skin and then absorbed and wicked away by a thin layer of a different fabric, usually wool or cotton, which is wrapped around the central polyester thread. Polyester threads have the advantage of being very fine compared to natural fibres, affording the addition of a second fibre and still resulting in a lightweight fabric.

Mountain Equipment Co-op has made strides toward using recycled polyester, using yarns made from industrial polyester waste and recycled plastic bottles. These yarns use as much as 75 percent less crude oil than virgin fibres, and, as the MEC Web site points out, they divert waste from landfills into useful stuff. MEC stores provide deposit bins for recycled clothing. If the garment has lost life, recycle it into new life. There is a 15 percent cost to such eco-friendly recycled polyester, but the industry is flexing its innovative arm, working on solutions. There is a cost to not recycling as well—the petroleum-based products are not biodegradable.

Textiles made from synthetic fibres have also suffered from problems with odour due to microbial accumulation from sweaty athletes. The odour doesn't wash away easily. Introducing silver into the fibres acts as a natural anti-bacterial agent. Martin Filteau, vice-president of Textile Technology Centre Group (CTT) in Saint-Hyacinthe, QC, is co-inventor of a process to introduce silver into fibres. He and Dominique Tessier, chemist and researcher with CTT Group, are responsible for a new process, SilverClear®. First motivated by the medical need for a wound dressing that would control bacteria, the two developed the now patent-pending process using nanotechnology. Figure 1 shows a new, non-toxic antimicrobial silver solution that is made of nano-sized, slightly soluble, silver salt crystals that can be applied in different finishing processes such as spraying, dip-coating, padding and thin film deposition to form a durable antimicrobial polymer coating. Silver has been used since ancient times as an antimicrobial agent. Silver vessels were used in the desert to store water and keep it pure.

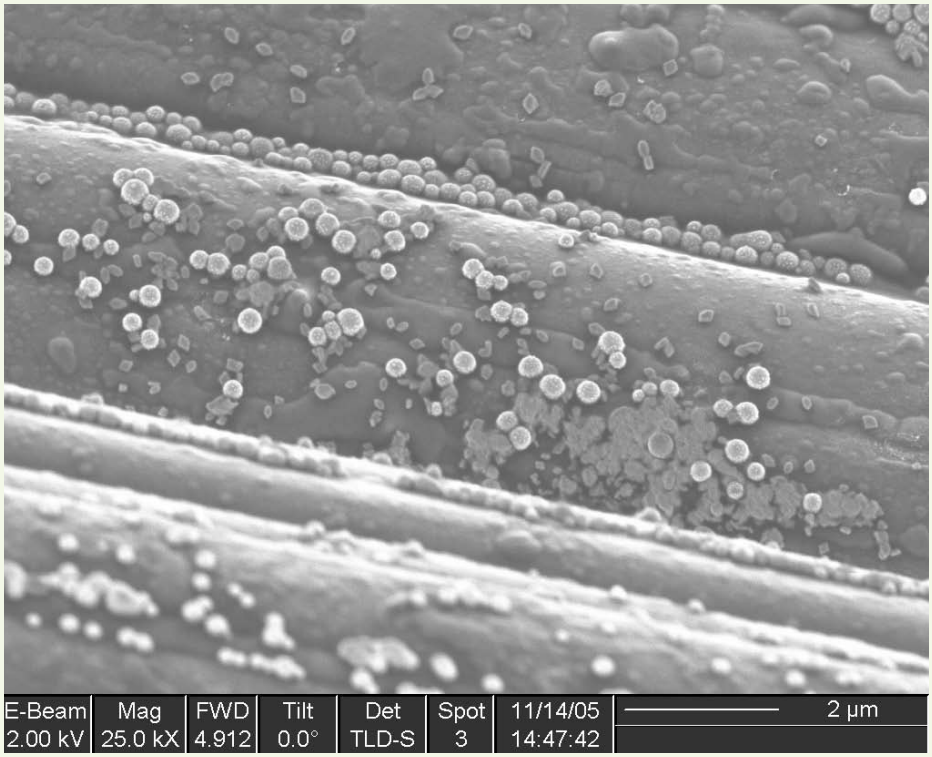

Figure 1

Different antimicrobial processes using silver have been developed for textiles. Concerns about silver, its cost and conductivity, become insignificant because of the small quantity used in textiles. Increased cost for a metre of fabric for sports wear is just cents, for example. Costs for medical bandages are considerably higher, but new nanotechnologies have reduced even that cost significantly.

Garments that fit and apparel that protects

In the last three years, André Gaudreau has seen a trend toward fabric that stretches more and more to accommodate moving bodies while maintaining style and comfort.

Gaudreau, president of Shefford Textiles Ltée says the demand has led to increasing use of elastic fibres such as spandex . The polypropylene olefin, or elastic, doesn't absorb moisture, but a thin filament of spandex wrapped in a different, absorbing fibre, produces elastic body-fitting threads that keep the body dry.

Contrary to popular belief, most summer clothing offers poor protection against UV rays. Most lightweight fabrics have a UV protection factor (UPF) of less than 15—lower than a conventional sunscreen. As concerns about melanoma increase, the textile industry is responding with better dyes and tighter weaves and also with new technologies to improve the sun protection values of lightweight clothing. One such technology, Rayosan, can be carried out in fabrics by the dyer or finisher. Clariant Chemicals Ltd. offers two products—a paste that is a reactive UV absorber that bonds with fibres and doesn't easily wash out after repeated launderings; and a liquid for polyester fibres that can be applied alone or with dyes by exhaust and gives a very high UVR protection of fabrics.

Clearly the chemistry lab is enabling the sports apparel industry to meet many of the specialized needs of today's athletes. The industry has created a niche for itself in the competitive world of textiles—a development that promises to support athletes in their various competitions.

Sally Gray is a freelance writer and editor, specializing in science, technology and agriculture.

Photo courtesy of CTT Group