



TEXTILES AS ENGINEERED SOLUTIONS

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Textiles are the unsung heroes of our everyday lives. Innovative problem-solvers — experts tackling some of the world's biggest challenges to provide comfort, convenience, protection and utility — personify the industry. From aircraft engines to automotive fabrics and athletic wear, American textile industry ingenuity is improving the performance of a wide array of products.

LIGHTER ENGINES

When you think of fibers, you might initially think of natural options like wool or cotton. You might also think of synthetic fibers like polyester or nylon. But what about carbon fiber? Carbon fiber is tightly woven throughout our daily lives but often goes unnoticed except to trained eyes.

A leading carbon fiber manufacturer is Connecticut-based Hexcel Corporation. Beginning with its PAN (polyacrylonitrile) precursor production site in Alabama, Hexcel manufactures carbon fiber with a focus on composite materials that reinforce plastics to help build structures.

“Hexcel is continuing to develop fiber and technology in product forms that meet the needs of those wanting to go faster, stronger and lighter,” said Tom Haulik, sales director of carbon fibers.

Rockets, airplanes and Formula One race cars are just some of the high-tech structures supported by Hexcel's miraculous fiber. Carbon fibers can either be woven into broad goods and then used to reinforce plastics, like in a car panel, or braided and compressed into a tube to form objects like hockey sticks and golf club shafts.

Another amazing application involves the aircraft industry. While most air passengers would assume their seats are made from textiles, they may not realize an engine made from textile parts is propelling them to their destination, thousands of feet in the air. Aircraft engine components using carbon fiber are woven into 3D structures and then infused with resin. These high-strength carbon fibers create a remarkably lightweight, durable and reliable engine that is also fuel efficient.

SAFER LANDINGS

Frequent fliers rely on a powerful engine to take off but need reliable brake discs to make a safe landing. For example, the carbon brake pads that bring your plane to a stop on the runway are created with Pyromex®, a textile from Toho Tenax manufactured in Tennessee. Instead of a metal-based disc, these highly efficient and durable brakes start as a carbon fiber-based felt fabric, which the manufacturing process transforms into a black, brick-shaped brake for aircrafts.

This incredible textile is produced without additional Bromine/haline compounds, making Pyromex® ideal to meet regulatory requirements for flame resistance on one hand and environmental health on the other. The Limiting Oxygen Index (LOI) of Pyromex also is much higher than other organic flame-resistant fibers, making it a durable alternative. Pyromex is widely used in welding blankets, fleece insulation and carbon brake applications to help keep passengers safe.

SMARTER APPAREL

In today's world, our phones double as a personal assistant, personal trainer, grocery list and talking watch. Convenience is king, and smart products are becoming more deeply immersed in our culture and everyday lives. Groundbreaking smart textiles are no exception.

We intuitively know apparel serves many purposes: it shields us from the elements and serves as a form of personal expression. But some clothing is engineered to deliver even more user benefits.

Pulcra Chemicals, a global manufacturer of specialty chemicals for fiber, textiles and leather with U.S. operations in South Carolina, makes sure clothes do more than simply provide function or fashion. The company's Skintex® technology embeds microcapsules filled with high-grade ingredients into fabric during the chemical finishing stage of production. The contents of those microcapsules then are slowly released onto the wearer's skin.

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For example, yoga pants are popular activewear. Yoga pants made with Skintex micro-encapsulated, high-grade lotions and vitamins applied to the fabric provide moisturizing effects throughout the day. Looking forward to a relaxing evening? Pajama pants enhanced with Skintex release a micro-encapsulated aromatherapy with the light scent of lavender to create a calming effect before the start of a hectic week.

Besides making consumer products more luxurious, Pulcra's Skintex line is also having a humanitarian impact.

"The Skintex MR1111 blanket is a special, non-woven fabric that we treat with insect repellent," said Troy Massey, Skintex business manager. "This is not your typical, cozy blanket, but a product that is used outdoors. Hunters often use it as ground cover. With the recent Zika outbreak and the ongoing malaria battle in Sub-Saharan Africa, we used our Environmental Protection

Agency-registered Skintex MR1111 blankets to make an impact. We donated 11,000 blankets to school children in Tanzania to help fight malaria. We also sent Skintex MR1111 blankets to Rio with some U.S. Olympic athletes including members of the swim, taekwondo and water polo teams. We're continuing our efforts to help with this outbreak because it is still a big issue."

MORE VERSATILE, SUSTAINABLE FINISHES

Schoolchildren learn about three states of matter: solid, liquid and gas. But what about the fourth state of matter, plasma?

If energy is applied to a gas, it becomes ionized and goes into an energy-rich plasma state. Plasma is all around us; for example, polar lights in the Arctic and Antarctic skies show plasma in its natural form.

APJeT, a textile technology company located in North Carolina, is using plasma to revolutionize the way fabrics are finished, the point in production when chemicals are applied to improve a fabric's look, performance and feel.

Called the "wet process" because of its water-based nature, the worldwide textile industry uses trillions of gallons of water to finish fabrics each year. Water scarcity and quality degradation are major global concerns, but APJeT's plasma technology is eliminating the need for water in the fabric finishing process. Compared to the wet process, the company's sustainable plasma solution also significantly reduces chemical consumption.

Innovators at APJeT are harnessing the power of plasma to create engineered solutions for a variety of applications:

- Protective fabrics for military ballistics and defense
- Outdoor soil- and water-repellent fabrics
- Non-woven fabrics used in diapers and disposable medical garments
- Automotive fabrics that reduce staining and soiling
- Film membranes that create scratch-resistant surfaces and protective coatings for electronics

"Our process is a complete paradigm shift in how textiles are produced and finished," said President and CEO John Emrich. "Our post-finishing process solution eliminates the need for water, ovens and high energy. This technology allows APJeT to apply durable, performance-enhancing finishes to anything including films, silks, polyesters, cotton and polypropylene, and it's changing the way we think about the finishing process in our industry."

Today, American textiles are transforming countless products from massive aircrafts to needle-thin fibers to create smarter, more durable solutions. By devoting itself to the relentless hunt for engineered solutions and seamless processes, the U.S. textile industry is solving problems worldwide. 🚀