

A new Environmental Chamber at WL Gore's headquarters in Maryland will help the company test new ideas for using its membrane technology in footwear and apparel.

Persistence pays off for Gore

Last year was the fortieth anniversary of the commercial breakthrough of the waterproof, breathable membrane technology Gore-Tex. Chief executive of its manufacturer, WL Gore, Terri Kelly, says the anniversary was a milestone to be proud of. She explains: "Not many organisations last 40 years. I'm humbled and feel an incredible responsibility for taking forward the company's values and making them work in the very different environment we have today."

She explains that, when WL Gore started out in 1958 it had a "limited portfolio" in electronics, but that with the "incredible invention" of expanded polytetrafluoroethylene (ePTFE), which recently retired company chairman Bob Gore discovered in a laboratory in the basement of his home in 1969, the company was able to put new divisions, including fabrics, on the map. "We made mistakes, and it took a long time, longer than people think, to make it into a viable business," the chief executive says. "It took us until 1993 to achieve return on the investment in Gore-Tex, but we persisted."

WL Gore's new Environmental Chamber in Elkton, Maryland, can emulate between 85% and 95% of all the environments on earth.

WL Gore

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Recently retired chairman Bob Gore, who discovered ePTFE by accident.

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Tent intent

WL Gore's position is that its development of ePTFE paved the way for a long list of innovations in protective footwear and apparel, but the breakthrough came when it was used in 1976 in a two-person tent produced by Seattle-based outdoor brand Early Winters. Before this, bigger-name brands, including REI, The North Face and Eddie Bauer had turned the technology down.

In the early days, the membrane required seam-sealing by hand but subsequent generations of Gore-Tex were easier to use and, by 1982, the product was ready for the footwear market; the membrane technology started to go into bootees to make outdoor and workwear shoes and boots more waterproof. "Now we are working with the top five global athletic footwear brands," says the leader of WL Gore's fabric division, Christian Langer, "and we also have long-term partnerships with all the leading outdoor and workwear brands. By long-term partnerships, I mean that we are not just in and out; we have common principles and we have been working together for ten, 20 and in some cases 30 years. We understand the human body and we understand how shoes, garments and gloves work."

All the world's a testing lab

This understanding informed the planning and construction of a new testing laboratory, the Environmental Chamber, that WL Gore formally opened at its Elkton, Maryland, technical fabric and lamination plant in late 2016. Its aim is to use the facility, which the company says can replicate between 85% and 95% of all the environments on earth, to prove new products can perform in real-world conditions before they are brought to market. The laboratory can simulate temperatures of between -50°C and +50°C, relative humidity levels of between 5% and 98% and windspeed of between 0.4 and 10 metres per second. "One really unique aspect is that the chamber can simulate natural solar radiation," explains Matthew Decker, who is the company's technical leader on comfort. "There is nowhere else in the world that can do this. It matches the effects of the sun as closely as has ever been done. At its maximum intensity, 1,100 watts per square-metre, it's the equivalent of being on the face of Mount Everest at noon. We can put in a time and a place on earth and it will simulate the conditions there."

Complexities of comfort

The facility includes a rain tower, inside which temperatures can vary between 5°C and 25°C, while the wind-speed range is between 0.4 and 5 metres-per-second. It's not just about the moisture. Mr Decker explains that how much rain penetrates a shoe or a garment depends to some extent on other climatic factors, too. Comfort is a highly complex subject, and the company's investment in the Environmental Chamber is part of its effort to "use science to make better product".

When it comes to footwear, though, one of the challenges that WL Gore faces is that, in spite of the advances of technology, most shoe manufacture is still highly dependent on manual processes, which means there is a risk of damage to materials and technology, including a Gore-Tex membrane at each stage. Phil Smith, who works on footwear research and development for WL Gore, has said he believes the rise of automation in footwear manufacturing could help performance shoe brands eliminate defects in their products. He emphasises that the high number of steps involved and the large number of hands each product can pass through increase the possibility

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Left: Chief executive, Terri Kelly, says that although the first commercial application of Gore-Tex was 40 years ago, it took until 1993 for the company to achieve a return on its investment.

Right: Matthew Decker, WL Gore's technical lead on comfort, says the Environmental Chamber is part of the company's effort to "use science to make better product".

WL Gore

for error. In his opinion, increasing use of automation can help reduce these errors and, therefore, reduce the number of defects in shoes that consumers buy for their waterproof, breathable functionality.

"This is still quite a traditional industry," Mr Smith explains. "Typically, a running shoe with Gore-Tex goes through 138 different steps in production. This makes mistakes and damage to the membrane material possible. But automation is making more and more inroads, as we have seen in recent developments at Reebok, Nike, adidas, Under Armour and so on. It's my view that if the automated process is set up correctly it should make it easier for problems of this kind to be eliminated and there could also be automated checking of each product during the manufacturing process."

Lightweight and comfortable

Bob Gore, the inventor of the company's membrane technology, likes advances in the use of it. He explains that he discovered ePTFE while he was trying to make a cheaper version of plumber's tape, to reduce the material content of the product to increase margins. His tests led him to conclude that the polymer became stronger when stretched, resulting in a tough, micro-porous material that could be used in many applications. "Gore is about doing things, not talking," he says. "We test a lot, we discover things, we move on and try something else. That's the spirit we want to encourage and we have a set of values that allows us to do that."

Some footwear manufacturers may be able to resist, for now, the move towards automation, but none of them is able to ignore brands' demands for lighter shoes and for footwear that consumers can wear in multiple environments. It is three years since WL Gore announced a new solution for shoes, Surround, that it said represents its most significant innovation in footwear since its launch of Extended Comfort around 15 years ago. Surround provides breathability below as well as above the foot. It works by means of a new construction that consists of five components: ventilation outlets in the side of the upper, a layer of the existing Extended Comfort membrane technology underneath the upper material, a breathable, removable insole, its new form of the membrane technology Surround underneath the insole, and finally a Surround 'spacer' component underneath that.

Surround came to market at the time the athleisure trend was building strongly, affecting footwear as much as clothing. In its most recent results, footwear group Stella International, for example, said fashion footwear contributed 42% of its total revenue (revenues of $1.5 billion from sales of 52.9 million pairs of shoes of all kinds) in 2016, compared to a share of 46% in 2015. Casual footwear's contribution also fell, to 29% of the total last year compared to 32.5% the year before. However, Stella said athleisure is now an important driver for growth. Last year, sales of shoes in this category accounted for 24% of revenues, whereas the corresponding figure in 2015 was 16.9%.

It seems that this is also a feature of what's happening in the world of work shoes now. German workwear brand Haix, a user of Gore-Tex, says end-users of its shoes and boots now expect and rely on footwear that is not only equipped with the necessary safety features but is also comfortable and looks good. With this in mind, it developed the Haix Black Eagle range, which weighs just under 500 grammes per boot (including protective toe-cap) and is, according to Haix, "one of the lightest products in the field of protective footwear".

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