

Some environments have proved too demanding for PFC-free water repellency finishes on jackets and other outdoor garments.

Arc'teryx/Jordan Manley

Five years after an environmental campaign focused on the problem of polyfluorinated chemicals in durable water repellency solutions for outdoor garments, the industry's search for viable, high-performance alternatives is far from over.

PFCs: a debate still soaked in controversy

The question of how to make outdoor clothing resistant to rain and snow while remaining breathable, all while having as little impact on the environment as possible, continues to cause brands, manufacturers and their suppliers considerable concern. Campaign group Greenpeace began questioning the use of per- and polyfluoroalkyl substances, or polyfluorinated chemicals (PFCs), as a means of endowing garments with durable water repellency (DWR) functionality in 2012. Five years on, the arguments continue to rage.

Greenpeace first called for an end to the use of all polyfluorinated chemicals in DWR applications in its research report called 'Chemistry For Any Weather'. In it, it took seven prominent outdoor brands to task for bringing to market jackets and other products that, when tested for Greenpeace, showed "noticeable concentrations" of PFCs. Its initial criticisms focused on the presence of perfluorooctanoic acid (PFOA). PFOA is not an ingredient that manufacturers deliberately add in the making of their water- and oil-repellency finishes, but is a substance that appears as a by-product of the synthesis that takes place in the making of some of the chemicals that outdoor brands traditionally used. These chemicals were based on perfluoroalkyl chains with eight carbon atoms, hence the frequently used name C8.

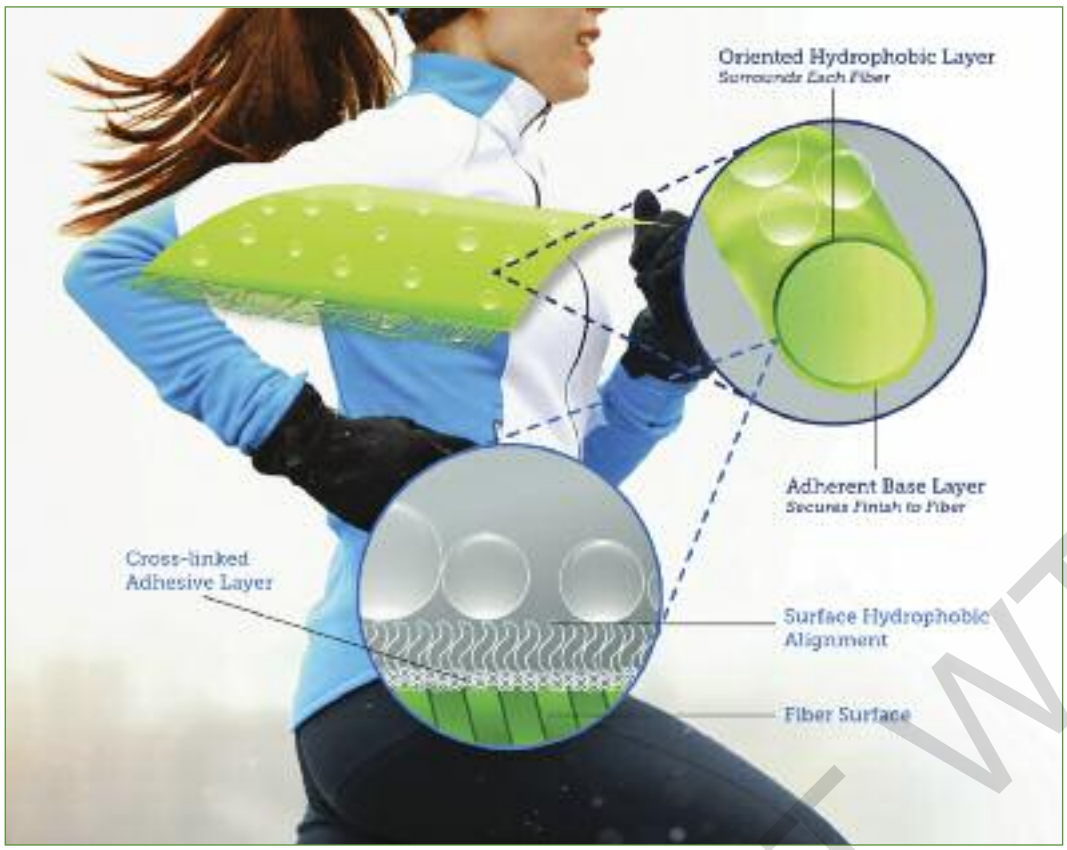
By the time the campaign group published its 2012 report, work had already been ongoing for years to use shorter C6 chains to make DWR finishes.

Excellent but unacceptable

One of the brands that Greenpeace set out to 'name and shame' (a tactic it seldom hesitates to deploy), Patagonia, has explained very clearly the reasons for the C6 work, saying: "The DWR we used as a standard for years was a long-chain (C8) fluorocarbon-based treatment that is highly effective and extraordinarily durable. Unfortunately, its by-products are toxic and persist in the environment, a combination that makes it unacceptable despite its excellent performance. Governments around the globe have now required chemical companies to stop making C8 DWR, so every high-quality outerwear supplier has been searching for alternatives of comparable performance."

The long and the short of 'Chemistry For Any Weather' is that Greenpeace finds no PFC-based

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Bolger & O'Hearn has launched Altopel F3, describing it as "an environmentally sound waterproofing finish for textiles".

Bolger & O'Hearn

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Commitment to quit

While Vaude and Jack Wolfskin quickly committed to quitting their use of PFCs, Mammut was another of the 'named and shamed' that expressed reservations at the time about the alternative technologies, telling us: "As an absolute alpine sports brand our clients demand the highest performance of our garments. At the moment there is simply no way around some of these PFCs at equal product quality. This is an issue of the whole outdoor industry and everyone is working on new solutions."

Hydrophobic coating

Massachusetts-based textile chemicals developer Bolger & O'Hearn is one of the industry suppliers that has been grappling with the problem. It has launched Altopel F3, describing it as "an environmentally sound waterproofing finish for textiles". Senior technology manager, Frank Keohan, explains that Altopel F3 is a fluorine-free technology that provides repellent finish functionality by applying a hydrophobic coating to the individual fibres. This works much better than the traditional method of immersing fabric in a pad bath. "The repellent effect of our F3 solution is extremely durable to home laundering," Mr Keohan says. "It bonds well to the surface of polyester, cotton, nylon and other fibres and, thanks to the nature of the ingredients, gives a strong water-repellency effect."

Away from the gaze of publicity that the 2012 Greenpeace report generated for the brands it highlighted, others in the outdoor industry realised they had to react too. The first enquiry Bolger & O'Hearn received about a move away from PFCs came the following year when Dick's Sporting Goods asked about it. Work on Altopel F3 was already under way and the first commercial order for it came from Polartec in December 2013. Sales have grown year on year and now the technology ships to customers in Europe, Asia and the Americas.

Sales manager Shawn Honeycutt explains that the company has "one foot on each rock" because it also makes C6-based DWR solutions.

But he says Altopel F3 can already deliver the same functionality as "low-level C6", and Frank Keohan insists that work to improve the PFC-free technology further, to bring it even closer to the performance of C6, continues.

For brands as well as mills

Its work in addressing the burning question of the use of PFCs has brought other interesting changes to Bolger & O'Hearn. "We've begun to direct our efforts towards brands," Shawn Honeycutt confirms. "Normally, we'd have had the conversation at mill level before, but in the last five years that's changed. The world has changed. We don't yet have the brand recognition we'd like to have and we are aware that the brands know some of our direct rivals well, but we're five years smarter and we're learning all the time. We're small, but we have taken initiatives such as putting up solar panels and now one-third of the energy we use is offset by that. We are also bluesign-accredited and that's something that has given us a better understanding of what's going on in the world."

Holy Grail

So far, at least, there is still no Holy Grail, which would be a PFC-free solution that can deliver the DWR functionality required for a jacket a serious climber can wear in all weathers in an environment such as the Alps. However, as Greenpeace itself has pointed out, it will still be progress if brands cease to use PFCs in garments that they have typically been over-specifying. In 2015, the organisation told us that it was not uncommon to see consumers wearing high-spec jackets to ride a bike around the city, making it clear that jackets for these customers ought not to need the same DWR capability as ones that will genuinely be required to protect wearers in harsh mountain conditions. Bolger & O'Hearn agrees that the principle of refraining from using PFCs where the level of protection they provide is surplus to what's really required is a good one. "A major US brand will make a big splash with our C6 technology with a soft launch for fall 2017," says chief executive Shaun O'Hearn, "but we know there isn't going to be one solution for all. We do think there is a need to have alternatives. We need leaders and brands that are willing to be leaders and can make great strides; they could reduce their PFC usage by up to 90%. They have to want to make it work, but if they do, we can help them. We want to work with them and to form a partnership linking us, the brand and the mill."

He explains that partnership is the best way to drive through change and avoid pitfalls. It may be tempting for brands or garment manufacturers to think that they can make a new collection for, say, autumn-winter using the same technology and techniques as for spring-summer. But fabric matters, Mr O'Hearn insists, and if you change the weight of the fabric you use or the fibre mix, you will need to adjust your DWR treatment accordingly; continuing to work with your supplier is the easiest and quickest way to make that adjustment, he contends. "We've been to lots of mill trials and most are receptive," he says, "but some of the biggest sometimes seem resistant." A joint-effort with the brand will usually be the best way to break down any resistance.



Athlete Christian Gisi running in the Alps, protected by a Mammut Rainspeed jacket.

Mammut

More research

Philippa Hill is in the process of completing a PhD at the University of Leeds and has chosen to focus her research on repellency in outdoor apparel. She has contributed to a paper that will appear in peer-reviewed scientific journal *Chemosphere* in August, in which she quotes detailed laboratory research she and her colleagues have carried out.

This research shows, according to (soon-to-be) Dr Hill, that while non-fluorinated finishes provided no oil repellency, all finished fabrics tested demonstrated a high level of resistance to wetting. The paper goes on to say that several non-fluorinated repellent fabrics provided similar water repellency to C6 and even C8 technology.

Her conclusion is that PFCs for outdoor apparel are over-engineered; she contends that "significant

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environmental and toxicological benefits" can be achieved by switching to non-fluorinated finishes and that brands and manufacturers can make this switch "without significant reduction in water-repellency performance".

Alternative controversy

If this suggests viable alternatives to PFCs are possible, it's important to say that some alternative technologies have sparked their own controversies. Patagonia said in 2015 that it has questioned the environmental impact of the raw materials of some PFC-free alternatives. It said at the time that some of these products contain palm oil. Greenpeace International's website contains 23 pieces of news that relate to PFCs. The corresponding number for palm oil is 267. According to the campaign group, palm oil production is linked to deforestation in south-east Asia and the destruction of peatland areas, to the exploitation of plantation workers, to child labour, and to fires on land dried out to prepare it for new palm oil plantations (the fires are important causes of pollution and of endangerment to animals, including orangutans). At the OutDoor 2017 exhibition in Friedrichshafen, one major outdoor brand reported that, in laboratory tests it has commissioned, more than 30% of the PFC-free durable water repellency solutions used in garments on display at the show contained palm oil.

"It's not so easy to make progress," Bolger & O'Hearn's Shawn Honeycutt concludes, "and there is still a steep hill to climb, but we want to keep making progress. We have a new version of our technology out this year, with mill trials starting soon. We hope that, maybe, we can help some people turn a corner."



Greenpeace could have a valid criticism when it says that consumers of outdoor clothing have been wearing over-specified, over-engineered garments for activities such as riding a bicycle around town.

Vaude



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