DURABLE WATER REPELLENCY - STUDY PHASE I

Georgina Burman

EXPECTATIONS OF DURABLE WATER REPELLENT FABRIC FINISHES

Face fabric with durable water repellent finish (DWRF) = sheds water
Dear Readers,

In October 2012 Greenpeace released a two part report called “Chemistry for any Weather” which claimed that fabric finishes used on outdoor clothing contained chemicals that are hazardous to the environment and human health. These substances of concern are called per-fluorinated chemicals (PFCs) and are traditionally found in durable water repellent (DWR) fabric finishes because of their water, oil and soil repellent properties.

The durable water repellents (DWR) currently available on the market can lead to residues of per-fluorinated chemicals (PFCs) in products themselves. Durable water repellent based on C8 technology is the strongest chemical bond and is considered a persistent, bio-accumulative and toxic (PBT) substance and has since been detected around the world in the food chain, drinking water, animals and human blood.

In light of these resent scientific findings, the Outdoor industry is working on new environmental friendly durable water repellent solutions and a change of finishes for their jackets. The Association of the German Sporting Goods Industry (BSI), the Outdoor Industry Association (OIA) and the European Outdoor Group (EOG) are supporting the Outdoor companies on this path and initiated the “Durable Water Repellant (DWR) Project”. As part of this project a survey about the expectations of the end users and brands was conducted in cooperation with the School of Fashion and Textiles De Montfort University, Leicester, United Kingdom. The Results of this survey are presented to you in this magazine.
Objective

Identify if brands’ requirements regarding repellency technologies are in line with customers’ needs and demands.

A questionnaire was created to indicate if better communication is needed towards the customer about the home treatment of garments, explanation of function and also regarding sustainability aspects such as longevity. This will assist in developing recommendations for brands on how they can adjust durable water repellent technologies, marketing to the customers’ behaviour and typical life-cycle of garments.

The questionnaire was split into two jacket types in order to collect a data set which is more specific to the jacket end purpose, function, care and longevity. Additionally, this enabled the end user and brand to be more detailed when answering the questions.

Distribution Method

The brand questionnaire was distributed by the European Outdoor Group (EOG), Outdoor Industry Association (OIA) and the Association of the German Sporting Goods Industry (BSI) through internal communications. The end user questionnaire was distributed by industry representatives and their brand members using social media platforms, newsletters and other direct communication methods such as customer distribution lists. Both of the questionnaires were distributed worldwide in the United Kingdom, Germany, Scandinavia and United States of America. The chosen distribution methods were successful and yielded a substantial amount of data.
Results of the Questionnaire

The end user questionnaire was live for a total of 6 weeks and received a total of 1200 responses. Due to this high response count, data from the United Kingdom and Germany was selected only for this study, which included 699 responses. The brand questionnaire was equally successful and received a total of 53 responses from all over the world. This large collection size meant that the credibility of the questionnaire findings became more valid and the data collected is more likely to be an accurate representation of the overall population.

In order for brands to adjust their marketing behaviour to customers, they must ascertain an up to date customer profile which reflects the population of end users within the outdoor industry. As part of the end user questionnaire, personal data was collected on the end user to assist in developing a relevant customer profile. The following figures indicated the end users gender, age, country of residence, expenditure and end use.
End User Profile

Gender Demographic

As seen in figure 1 the typical end user is male with 79% of respondents confirming this. Less than one quarter of the population sample was female which suggested that women are less proactive in participating in outdoor activities. This data also suggested that it is primarily the male end user who purchases outdoor products and is responsible for providing the home treatment.

Country of Residence

Figure 2 represents the country of residence percentage breakdown of total end users. The graph indicated that over 70% of the respondents were from Germany and less than 30% were from the United Kingdom. This data also reflects the number of samples collected from each country. It is apparent that more samples were collected from Germany compared to the United Kingdom. This is due to the high number of German industry representatives and brands located in Germany, compared to the United Kingdom. This could not have been prevented by the researcher and so will be taken into consideration throughout the analysis stage.

Age Demographic

Figure 3 indicated that more than half of the end users are aged between 25 and 44 years old. 25% of the sample population are aged between 45 and 60 years old or over and 14% are aged between 18 and 24 years old. Furthermore this indicated that end users who are aged between 55 and 65 or over, are less likely to participate in outdoor activities compared to the rest of the age groups.
End User Profile

**What is your gender?**
- Female: 29%
- Male: 71%

100% = 699 Total Responses

**Country of Residence**
- Germany: 71%
- United Kingdom: 29%

100% = 698 Total Responses

**What is your age?**

- 18-24: 14%
- 25-34: 33%
- 35-44: 27%
- 45-54: 17%
- 55-64: 6%
- 65 or over: 2%

100% = 699 Total Responses
End User Profile

Expenditure

Figure 4 indicated how much the end user typically spends on an outdoor jacket. The graph suggested that the end user spends £50 more on an insulated jacket compared to a non-insulated jacket. For example, approximately 70% of end users spend between £100 and £250 on an insulated jacket compared to 60% of end users who spend between £50 and £200 on a non-insulated jacket. This could be due to the intended activity for which the end user uses the jacket. For example, the end user may spend more on a jacket intended for snow sports compared to a jacket intended for walking or casual use.

![Graph representing the typically expenditure on outdoor jackets](image)

Furthermore figure 5 and 6 compared the expenditure and age range, and indicated that end users aged between 25 and 44 years old spend the most on outdoor jackets compared to all other age groups. This in turn related back to the same age group being the majority sample population. The graph also showed trends between age groups on both jacket types. For example, end users who are aged between 55 and 60 years old or over both spend the least amount on both jacket types. This again correlates with the sample population mentioned earlier in figure 3.
How much do you typically spend on a non-insulated jacket? (Split by age range)

![Graph showing expenditure on non-insulated jackets by age range.](image)

100% = 698 Total Responses

*All currency in Euros was converted to Sterling Pounds at an exchange rate of 0.82.*

Figure 5: Graph representing the typically expenditure on non-insulated jackets, split by age range.

How much do you typically spend on an insulated jacket? (Split by age range)

![Graph showing expenditure on insulated jackets by age range.](image)

100% = 698 Total Responses

*All currency in Euros was converted to Sterling Pounds at an exchange rate of 0.82.*

Figure 6: Graph representing the typically expenditure on insulated jackets, split by age range.
End Use

Figure 7 and 8 displayed the end use per jacket type. It can be said that there is a correlation between both graphs, indicating that both rambling and casual use categories are the most popular outdoor activities amongst end users for both jacket types. However, the graphs showed differences between jackets such as insulated jackets being commonly used for snow related sports. This is logical seeing as insulated jackets provide warmth and water repellency, which is required for snow related sports. Additionally it is also interpreted that off road motor, water and caving related sports are the least popular activities undertaken by end users.

For what main purpose do you use your non-insulated jacket?

![Graph representing the end use for non-insulated jackets](image)

Figure 7 Graph representing the end use for non-insulated jackets
For what main purpose do you use your insulated jacket?

Figure 8 Graph representing the end use for insulated jackets
Comparison between End User and Brand Results

In order to identify if better communication is needed towards the end user about the home treatment of garments, explanation of function and also sustainability aspects such as longevity, an in-depth analysis and comparison was undertaken on the end user and brands expectations of durable water repellent fabric finishes. The following section displayed both the end user and brand questionnaire findings and identified recommendations where necessary.

End Use

The response count indicated that there are some variances between activities such as rambling, snow and casual related sports. It can be interpreted that the brand did not anticipate that the majority of end users use their outdoor jacket primarily for casual use. For example, the data suggested that there is a staggering 30% difference in results on non-insulated casual use and a 20% difference in results on insulated casual use.

The brand response count was much lower than the end user with regards to skiing related sports for non-insulated jackets. For example, the brand anticipated that 2% of end users use their non-insulated jacket for skiing related sports. Whereas 26% of end users actually state they do use it for this sport. Additionally, there are some key differences with regards to insulated jackets end purpose. For example, 76% of brands anticipated that end users use their insulated jacket for rambling related sports, whereas 87% of end users actually suggested they do use it for this sport. Overall these points indicated that the brand does not have a clear idea of the end use for their outdoor jackets.
Finding out the importance of each function from the end user will assist brands in tailoring their durable water repellency technologies and finding greener chemistries, by giving them an indication as to what properties in a jacket are the most and least important. This section of the questionnaire was deemed the most important part, including longevity and the home treatment of garments.

Figures 11 to 14 displayed how important each function is to the end user and brand. As mentioned earlier, brands are struggling to find a suitable alternative to fluorocarbon based durable water repellents as many do not offer oil, soil and dirt repellency functionality. The results showed that for both jacket types the end user and brand suggested that this function is the least important out of all the categories, ranking it below 20%. In addition to this, the end user suggests that out of both jacket types the oil, soil and dirt repellency function was the least important for an insulated jacket.

Both the brand and end user were in agreement that warmth and durability were the most important functions for an insulated jacket, followed by wind resistant. However with regards to a non-insulated the brand and end user were in disagreement. For example, the end user ranked water repellency as the most important function, followed by durability and wind resistant. Whereas the brand on the other hand suggested that durability, water repellency and abrasion are the most important properties for a non-insulated jacket.

Both the brand and end user were in agreement that warmth and durability were the most important functions for an insulated jacket, followed by wind resistant.
Furthermore, the graph indicated other discrepancies such as the difference in opinion with regards to the importance of the quick drying functionality. For example, the end user ranks this function highly compared to the majority of brands who suggested that this is a fairly important and useful property for a non-insulated jacket.

Graphs representing end users jacket properties

100% = 671 Total Average Responses

100% = 628 Total Average Responses
Comparison between End User and Brand Results

Graphs representing brands best-selling jacket properties

How important do you consider the below properties to be, with regard to your best-selling non-insulated Jacket?

![Graph 1](image1)

How important do you consider the below properties to be, with regard to your best-selling insulated Jacket?

![Graph 2](image2)
Weather Conditions

It is important for brands to be aware of the weather conditions in which their customers wear their jackets, as this will ultimately compromise the durability of the durable water repellent finish and affect the longevity of the garment itself.

As seen in figures 15 and 16 there are no clear discrepancies between the brands' expectations and the end users' actual results. The only anomaly present indicated that on average 18% of end users wear their non-insulated jacket in mild/dry and hot/wet weather conditions. Perhaps this relates to global warming or a change in climate history, where spring and summers are becoming increasingly wetter.

Overall the graphs suggested that both the brand and end user agree that non-insulated jackets are primarily worn in mild/wet weather conditions and insulated jackets are predominantly worn in cold/dry weather conditions.

Figure 15 End user wear conditions for outdoor jackets
Additional to this, end users were asked if they wear a rucksack with their jacket. The graph demonstrated that half (50%) of respondents either always or occasionally wear a rucksack with their jacket. These results indicated that the durable water repellent (DWR) may be compromised if not re-impregnated regularly, as it will of course abrade overtime with use. Furthermore, this will impact the longevity of the garment, so there may be discrepancies between the brands perceived lifetime and end users intended use results.
Comparison between End User and Brand Results

Longevity of Garment

It is clear to see from figure 17 that 62% of end users intend to wear their jackets between 4-5 years. This is followed by 47% who intend to wear their jackets between 2-3 years. In comparison with Figure 18, which displayed the brands perceived lifetime, the brand indicated that they expect their jackets to last double the lifetime of which end users suggested. Additionally, there is some correlation between the two graphs, where the brand and end user agree that they expect/intend to use their insulated jacket for longer, compared to their non-insulated jacket.

Figure 17 Graph representing how many years in total, do you intend to use your jacket?

---

Important

The brands indicate that they expect their jackets to last double the lifetime than the time end users suggested.

Figure 18 Graph representing the perceived lifetime of your jackets.
An additional graph indicated the number of hours worn per day by the end user. The response count demonstrated some correlation between each jacket type. The graph suggested that the majority of end users (60%) wear their jackets between 1-4 hours per day. An additional 26% of end users wear their jackets between 3-6 hours per day and the rest wear their jackets between 6-12 hours per day.

Furthermore the end user was asked how many months is the jacket in use per year. The graph demonstrated that the majority of end users (36%) wear their non-insulated jacket all year round, whereas 64% of end users wear their insulated jacket between 1-6 months per year.
Home Treatment — Washing

The following question asked the end user how often they wash their jackets at home. The graph suggested that on average 35% of end users wash their jacket once a year, followed by on average 25% who wash it twice a year. Furthermore it indicated that a staggering 22% of end users never wash their jacket. Due to these results, it is anticipated that the end user does not re-impregnate their jacket frequently.

The graph also highlighted some key discrepancies between the jacket types. For example, the end user washes their non-insulated more frequently than their insulated jackets. Perhaps these results are related to section “Longevity of Garment” which suggested that insulated jackets are worn between 1-6 months per year and thus do not require washing as frequently, compared to non-insulated jackets, which are worn all year round.

**Figure 19 Graph representing frequency of washing per year by end user**
Additionally, the brand was asked the same question but 80% of brands indicated that they do not recommend a frequency of washing guidelines. However the small percentage of brands who did give a recommendation, suggested that end users wash their jackets either once a year or every other month. It could be said that there is some correlation between the brand and end user as 35% of end users wash their jackets once a year and 10% of brands also suggested this.

Additionally, this question was open ended so that brands could state their recommendations, if they had any. In total 11 out of 51 brands answered and suggested the following:

<table>
<thead>
<tr>
<th>Washing Recommendation</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do not wash frequently</td>
<td>1</td>
</tr>
<tr>
<td>Wash frequently as required</td>
<td>5</td>
</tr>
<tr>
<td>Wash when DWR is compromised</td>
<td>1</td>
</tr>
<tr>
<td>Wash when soiled</td>
<td>4</td>
</tr>
<tr>
<td>Grand Total</td>
<td>11</td>
</tr>
</tbody>
</table>

22% of end users never wash their jackets. 
80% of brands indicated that they do not recommend a frequency of washing guidelines.

As seen in figure 21, brands recommended that end users should wash their jackets at either 30 °C or 40 °C. However as indicated in figure 22, over 75% of end users primarily wash their jackets at 30 °C, which is the lowest temperature setting category. It is interpreted that consumers are perhaps afraid of damaging the durable water finish by washing at a higher temperature and feel they are not being environmental friendly. However by consumers not washing at a high temperature, they are removing fewer bacteria, not unclogging the pores full of dirt and oil and are preventing the water repellent finish from being re-energized. If the water repellent finish is not re-energized the water repellency will be compromised, and therefore so will the longevity of the garment. Additionally the garment requires heat activating through other methods such as tumble drying and ironing. It is interpreted that the majority of end users do not follow the care instructions and therefore do not provide the home treatment required.
Comparison between End User and Brand Results

**Figure 21** Graph representing the temperature setting which end users wash their jacket

**Figure 22** Graph representing brand washing temperature setting

**IMPORTANT**

The majority of end users do not follow the care instructions and therefore do not provide the home treatment required.

Furthermore, the end user and brand was asked about the type of wash cycle used/recommended. It is apparent that the most popular wash cycle used by the end
user is delicate and easy care. Similarly brands recommend washing on a delicate or normal cycle.

The end user and brand was asked about the type of detergent recommended and used. The graph suggested that the majority (55%) of brands recommend that end users wash their jackets using a specialist cleaning agent, which is non-detergent based in order not to affect the water repellent coating on the fabric. All other brands who answered the question did not make a recommendation.
The graph indicated that on average 58% of end users use specialist detergent, 26% use non-biological and 16% use biological. This data demonstrated that the end user is not entirely clear on what type of detergent to use and does not understand that the finish may be compromised if using a detergent based cleaning agent. Additionally, the end user may not be aware of the finish on the product and so the brand may need to make this a customer facing topic in order to educate the end user of the home treatment required. Furthermore, these results may reflect why the end user only intends to use their jacket for 4 to 5 years because the longevity of the jacket is reduced if incorrect home treatment is not provided.

Additional to this question, the end user was asked to specify what type of specialist detergent they use when washing their jacket. The results showed that a total of 147 out of 393 respondents used Nikwax detergent, which is fluorocarbon-free. This suggested that the typical end user is using a fluorocarbon free product on a fluorocarbon finish.

As seen in the graphs to the right, the end user and brand was asked if they use/recommend a fabric conditioner when washing their jackets. These results showed correlation between both the end user and brand. For example, nearly 100% of respondents indicated that they do not recommend/use a fabric conditioner when washing their jackets.
Tumble Drying

Figure 23 indicated that over 70% of end users do not re-energize their jackets through tumble drying. However figure 24 showed that 65% of brands recommend that end users should tumble dry their jackets on a low heat setting. Perhaps this is why end users only intend to use their jackets for 4-5 years because the longevity of the finish is be reduced if it is not tumble dried after washing. Additionally this could be a prime example of where brands are not effectively communicating to the end user about re-energizing the durable water repellent (DWR) through heat activation.

Lack of communication: 70% of end users do not re-energize their jackets through tumble drying even though 65% of brands recommend that end users should tumble dry their jackets.
The brand and end user was also asked for how long they tumble dry their jackets for, as this also has an effect on the performance of the water repellent finish. The graph showed that 60% of brands do not recommend a length of time, however the small percentage that did, suggested for 30 minutes. Similarly, the majority of end users did not state a time and so the small percentage that do, said they tumble dry their jackets between 30 and 60 minutes. It therefore could be said that there is some correlation between the end user and brand, however there is still lack of communication in the area.
Ironing

Figure 25 indicated that on average 92% of end users do not iron their outdoor jackets and the minority who do, iron on a low heat as recommended by more than half of the brands (Figure 26). The data also suggested that on average 23% of brands recommend that end users do not iron their jacket. This data seems rather contradicting as many outdoor retailers like Jack Wolfskin suggest otherwise. This indeed is an area of concern because similar to tumble drying, the durable water repellent and longevity of the jacket will compromised if the finish is not re-energized and re-impregnated as many retailers recommend. This is a prime example of where brands need to collaboratively provide clear care instructions to end users to improve the product life-cycle and sustainability aspects such as longevity.

![Graph representing end user iron temperature setting](image)

*Figure 25 Graph representing end user iron temperature setting*
Comparison between End User and Brand Results

Figure 26 Graph representing brands iron temperature setting recommendations

On what heat setting do you recommend to iron your jackets?

100% = 51 Total Responses

Temperature Setting

- Non-Insulated Jacket
- Insulated Jacket

BRAND
Re-impregnation

In order to see how regular end users re-impregnate their jackets, they were asked after how many wash cycles, do they re-impregnate their jackets. As seen in figure 27, on average 29% of end users do not re-impregnate their jackets. However the small minority, who do re-impregnate after washing, do so after 1-3 washes. The brands were asked the same question and the results indicated that 62% of brands do not recommend a guideline. However on average 8% of brands demonstrated that end users should do so either after every wash cycle or after every 10 or more wash cycles. This suggested two extremes, so it could be said that the outdoor industry itself does not have a clear idea on when the end user should re-impregnate their jacket. GO Outdoors recommends re-impregnating a water repellent garment every 4-6 months depending on usage. A strict and collaborative guideline needs to be put in place by brands in order to send a clear message to end users.

This suggests that the outdoor industry itself does not have a clear idea on when the end user should re-impregnate their jacket. A strict and collaborative guideline needs to be put in place by brands in order to send a clear message to end users.
Comparison between End User and Brand Results

**Figure 27** Graph representing end user number of wash before re-impregnating

**Figure 28** Graph representing brand recommendations on number of wash before re-impregnating
Additionally, the end user and brand were asked what type of re-impregnation method they typically use/recommend, as this has an effect on the breathability of the water repellent jacket. As seen in the graphs below, 41% of end users use either a spray or wash-in method. The other end users stated that they do not re-impregnate and therefore could not select a method. Similarly, on average 40% of brands said that they recommend either a spray or wash-in method. Additional background research on “A Guide to Waterproofing and Durable Water Repellents” suggested that sprays are best suited for coatings, whereas wash-in treatments work best with membranes (GO Outdoors). Both primary and secondary research indicates that there are contradicting recommendations and guidelines provided by outdoor brands.

Furthermore the end user and brand was asked about the type of re-impregnation products they use/recommend for their jackets. 201 out of 303 end users said that they use Nikwax products and 8 out of 16 brands said they recommend Nikwax products too (see table 29 and 30 for all results). This data demonstrated that Nikwax is the favoured brand by the end user.
The end user was asked if they knew whether the re-impregnation products contained fluorine. The results showed that 60% of the end users did not know and only 5% indicated that the products did contain fluorine. The brands however, indicated that nearly half of their re-impregnation products are fluorine-free, which is positive. However the other 50% of brands suggested that either some or all of their products do still contain the hazardous substance. This data demonstrated that the customer is unaware of the chemical substance used in re-impregnations products and is therefore unable to select a product according to the existing factory applied finish and thus provide the appropriate care for the garment.
Additional primary research demonstrated that the outdoor brands currently use various types of durable water repellent technologies on their jackets. For example, Berghaus use a fluorocarbon fabric finish based on C6 technology and Klattermusen and Fjallraven both use wax based finishes. These finishes require different home treatment but the brand fails to educate the end user in this area and on the existing finish applied to the jacket, so that they can provide the correct home treatment. Furthermore brands are recommending re-impregnation products which contain different chemicals compared the factory applied finish and thus it affects the performance of the jacket. For example, Paramo uses fluorine based technology on their jackets but they recommend Nikwax re-impregnation products for their jackets, which are fluorine-free. Customers are unaware that wax finishes are not as good as the original as they will dirty quicker and require frequent washing and retreatment.

The brands were also asked if they are working on any alternative technologies to fluorine based finishes. The results suggested that 21 out 53 brands said that they were either already successfully using green chemistry or are still working on finding alternatives (as seen in figure 31). The most common alternative amongst the brands was paraffin wax, silicon and dendrimer based finishes.
Comparison between End User and Brand Results

<table>
<thead>
<tr>
<th>Respondent Name</th>
<th>Alternative DWR Technologies</th>
</tr>
</thead>
<tbody>
<tr>
<td>No disclosure</td>
<td>Bionic finish</td>
</tr>
<tr>
<td>No disclosure</td>
<td>We’re trying wax based, silicon based, dendrimers, fat mod based technologies.</td>
</tr>
<tr>
<td>Helly Hansen</td>
<td>PU</td>
</tr>
<tr>
<td>Paramo</td>
<td>We use Nikwax Analogy fabric and Nikwax care products which need no fluorine based technologies either in manufacturing or maintenance.</td>
</tr>
<tr>
<td>Mammut</td>
<td>Waxes, dendrimers</td>
</tr>
<tr>
<td>No disclosure</td>
<td>Dendrimers, but no secure process yet.</td>
</tr>
<tr>
<td>Lowe Alpine</td>
<td>We currently use fabrics from Sympatex that have a bionic finish that is fluorine free, which could be an option for reproofing. As a company we are researching into different options.</td>
</tr>
<tr>
<td>Ortovox</td>
<td>Paraffin</td>
</tr>
<tr>
<td>Klättermusen</td>
<td>Dendrimers and paraffin wax are used by us successfully on many items. Replacements for the remaining C6 DWRs are being tested, using various technologies.</td>
</tr>
<tr>
<td>Berghaus</td>
<td>Most of our products use C6 DWR Chemistry. If we use C8, it will be well below 1 micrograms or classed as 'non-detectable'. We are always researching into alternatives available...have yet to find one that will repel oil/dirt and with good durability. Performance is important to our brand and customers. You have to weigh it up...is retreating more often more damaging to the environment? I would like to add to question #14. It all depends on the use of the jackets - wear time, is the jacket used heavily with a rucksack?...sometimes you would not need to retreat the jacket until after 10 wash/dry cycles, I have answered as minimum of 5.</td>
</tr>
<tr>
<td>Schoeffel</td>
<td>Pic-free in any version, with focus on the best performance.</td>
</tr>
<tr>
<td>REI</td>
<td>Investigating all options to hopefully find something as good as fluorine-based technology.</td>
</tr>
<tr>
<td>Salewa/Dynafit</td>
<td>Dendrimers</td>
</tr>
<tr>
<td>Dead Bird</td>
<td>Right now only C6 will do the job and we already miss C8! Non-PFC finishes are not yet ready for prime time, but we follow with interest.</td>
</tr>
<tr>
<td>Maser Sport</td>
<td>Dendrimers, Polyurethane and Paraffines</td>
</tr>
<tr>
<td>Fjällräven</td>
<td>Wax and dendrimers</td>
</tr>
<tr>
<td>No disclosure</td>
<td>Any without fluorine.</td>
</tr>
<tr>
<td>No disclosure</td>
<td>Wax, dendrimers, silicone, own secret product!</td>
</tr>
<tr>
<td>Haglöfs</td>
<td>Non insulated: Have not found a good PFC-free DWR. Insulated: we are using a PFC-free DWR (dendrimer) on some where there is not a need for a very good DWR.</td>
</tr>
<tr>
<td>NAU</td>
<td>None can achieve the standard we need yet.</td>
</tr>
<tr>
<td>VAUDE</td>
<td>Dendrimer, Hydrocarbon Paraffin</td>
</tr>
</tbody>
</table>

**Figure 31 Brand alternative durable water repellent (DWR) technologies**

21 out 53 brands said that they were either already successfully using green chemistry or are still working on finding alternatives.
Performance

The end user was equally satisfied with the performance of both jacket types with 95% confirming this. However 5% of the end users indicated that they were not satisfied due to the following reasons:

<table>
<thead>
<tr>
<th>Unsatisfied Reason</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaks</td>
<td>13</td>
</tr>
<tr>
<td>Not warm</td>
<td>2</td>
</tr>
<tr>
<td>Poor design</td>
<td>1</td>
</tr>
<tr>
<td>Poor fabric quality</td>
<td>7</td>
</tr>
<tr>
<td>Poor fit</td>
<td>3</td>
</tr>
<tr>
<td>Poor water repellency</td>
<td>11</td>
</tr>
<tr>
<td>Soils quickly</td>
<td>1</td>
</tr>
<tr>
<td>Too heavy</td>
<td>1</td>
</tr>
<tr>
<td>Unbreathable</td>
<td>9</td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td><strong>48</strong></td>
</tr>
</tbody>
</table>

It is clear to see that the main reason why the end user is not satisfied with the performance of their product is because of poor water repellency. As mentioned earlier, it is apparent that the average end user does not provide the required care for their water repellent jacket and so the durable water repellent is compromised and thus the longevity of the jacket is reduced.

Furthermore the second most common reason for being unsatisfied is due to poor breathability. This is due to a number of reasons such as not washing the jacket to remove any dirt and/or oil which can clog up the finish. If the end user does wash their jacket it could be due to them using the wrong cleaning agent and so it clogs the pores of the jacket in much the same way as dirt. Background research also suggested that a spray on re-impregnation method should be used on a jacket with a durable water repellent coating, as the wash-in products have proven to clog or damage the finish, which in turn makes it un-breathable and uncomfortable for the wearer.
Customer Awareness

As part of the primary research stage of this study, the end user was asked if they were aware of any environmental impacts around fluorine based durable water repellent finishes, in order to gauge an understanding of their breadth of knowledge. As seen in figure 33, the results indicated that approximately 23% of end users are aware of some the environmental impacts which include the following:

<table>
<thead>
<tr>
<th>Impacts</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accumulates during manufacture</td>
<td>5</td>
</tr>
<tr>
<td>Bioaccumulative</td>
<td>18</td>
</tr>
<tr>
<td>Carcinogenic</td>
<td>9</td>
</tr>
<tr>
<td>Chemical pollutant</td>
<td>5</td>
</tr>
<tr>
<td>Detectable in humans</td>
<td>1</td>
</tr>
<tr>
<td>Do not degrade</td>
<td>28</td>
</tr>
<tr>
<td>Harmful to animals</td>
<td>4</td>
</tr>
<tr>
<td>Harmful to aquatic life</td>
<td>10</td>
</tr>
<tr>
<td>Harmful to environment</td>
<td>11</td>
</tr>
<tr>
<td>Harmful to humans</td>
<td>21</td>
</tr>
<tr>
<td>Harmful to ozone layer</td>
<td>9</td>
</tr>
<tr>
<td>Promote infertility</td>
<td>1</td>
</tr>
<tr>
<td>Toxic</td>
<td>11</td>
</tr>
<tr>
<td>Water pollutant</td>
<td>8</td>
</tr>
<tr>
<td>Persistent</td>
<td>8</td>
</tr>
<tr>
<td>Harmful to wildlife</td>
<td>1</td>
</tr>
<tr>
<td>Promotes cancer</td>
<td>8</td>
</tr>
<tr>
<td>Grand Total</td>
<td>159</td>
</tr>
</tbody>
</table>

Only 159 respondents answered this question, which meant that a total of 540 respondents were unaware of the hazardous substance and its impacts. This is understandable as many brands do not readily communicate information around the finish type because many customers may be put off by this. However due to the substance being phased out by 2020 and replaced with greener alternatives, outdoor brands will need to inform the customer of this change as it may impact the performance and durability of the garment.

---

**IMPORTANT**

Approximately 77% of end users are unaware of the hazardous substance (fluorine based durable water repellent finishes) and its impacts. This is the case because many brands do not readily communicate information around the finish type.
Brand Marketing Approach

As seen in the table below, the brand was asked about how they intend to communicate the change of finish and market fluorine-free jackets, when the end user is not aware of environmental impacts around fluorine based finishes. The results suggested that 50% of brands intend to communicate via the product swing tag, care label and on their website. A total of 14% of brands said that they will use a form of media including social networking platforms, television advertisements, press releases and interviews. 8% of brands indicated that they will hold a workshop with the retailer and provide further training for their employees. 8% of brands said that they would have a sales launch and provide in-store signage. Furthermore, 10% of brands said that they will build awareness through marketing campaigns, which includes all of the above and more. Interestingly, 4 out of 51 brands stated that they do not intend to communicate the change of finish and market fluorine-free jackets because they believe that it is not a customer facing topic. However they suggested that this may change in the near future. A list of brands who took part in questionnaire can be found in the table below.
Conclusion of Questionnaire Results

Due to the end questionnaire receiving a total of 699 responses and the brand questionnaire receiving a total of 53 responses, the conclusions that can be drawn from the questionnaire are likely to be representative of a population. The questionnaires were highly successful in collecting data on the expectations of durable water repellent finishes in the outdoor industry and assisted in identifying if better communication is needed towards the customer about the home treatment of garments, explanation of function and also regarding sustainability aspects such as longevity.

Firstly, the end user questionnaire was able to establish a customer profile to assist brands in adjusting their marketing behaviour. Primary research found that the typical end user is male and is aged between 24 and 44 years old.

The end user collectively spends on average between £50 and £200 on a non-insulated jacket and is willing to pay £50 more for an insulated jacket. It was also apparent that the end user predominantly uses both jacket types for rambling, hiking, trekking, mountaineering and casual related activities.

A comparison on the brand and end user questionnaire was able to establish key differences and similarities on the end use, functionality and home treatment of water repellent jackets.

Key findings indicated that the end user intends to use their jacket for a total of 4 to 5 years, which is half the life time recommended by the brands. The results suggested that the majority of end users do not provide the required home treatment such as washing, re-impregnating, tumble drying and ironing to ensure the water repellent finish is re-energized and to improve the performance and
longevity of the garment. Furthermore the end user is not aware of the type of factory applied finish on their current garment, so they are unable to provide the correct home treatment.

It is also apparent that the end user is not aware of the environmental impacts around fluorine based finishes or the change in technology. Therefore outdoor brands will need to adjust their marketing behaviour to further educate the end user on the new technology and on how they can provide the correct home treatment for their water repellent garment.
Recommendations for the Outdoor Industry

Recommendations

It is recommended that outdoor brands undertake a broad range of communication methods in order to educate the end user on the change in durable water repellent technology and the home treatment required.

**Marketing Approaches**

1. **Labelling**

Brands need to collectively provide in-depth care instructions on both the swing tag and care label to assist the end user in providing the required home treatment. The care information needs to include the following:

- Treatment prior to washing (if applicable)
- The number of wash cycles (1 or 2 to ensure detergent is removed)
- The type of wash cycle and temperature setting
- The type of cleaning agent
- The drying temperature setting and length of cycle or alternatively lay in the sunlight
- The ironing temperature setting
- The type of factory applied finish on the garment
- The type of re-impregnation product
- Garment and finish functions
- Intended end use (if applicable)

Additionally the care symbols must be relevant to each country as they may vary according to the type of washing and tumble drying machine. This could be achieved if brands collaborated with laundry manufacturers to establish the type of care symbols used on the machines. Furthermore brands could collaborate with re-impregnation suppliers to ensure that their products are consistent with the
finish already applied to the garment, to ensure that the performance and longevity is not compromised in any way.

2. Informative Videos
It is recommended that brands collectively release videos explaining the change in technology and on how the alternatives may differ in performance and durability. They could also create demonstration videos on how to identify when a water repellent finish is compromised and on how to wash, dry and retreat a garment. These videos could be displayed in-store, on their website and on the brands social media platforms in order to reach a wide audience.

3. Social Media Platforms
Brand can communicate directly with their customers by using social media platforms such as blogs, forums, twitter and Facebook. It will enable customers to ask any questions they have around the change in technology or home treatment and thus enable the brands to understand any problems with their water repellent garments. This is a cost effective way, which will target a broad spectrum of customers and allow for customers to contact the brand 24 hours a day.

4. Website
It is also recommended that brands run a full advertising campaign on their website to inform their customers of the changes in technology. They can include relevant press releases and social responsibility reports which assist the customer in understanding the challenges and limitations of eliminating per-fluorinated substance from the product life-cycle. It is also advisable for brands to include in-depth product specifications online which include details on the finish type and the home treatment required. Furthermore, outdoor brands could also incorporate a
live chat room where customers are able to ask questions around their garments end use, functionality, home treatment and finish technology.

5. Workshops with retailers
Brands will need to inform their employees in-store of the changes in technology so that they can then communicate with customers about the change also. This method of communication will provide the employees with in-depth information around the alternative finishes and will highlight any differences in performance and home treatment. It will also enable the employees to answer any questions which the customers may have around the new finishes. For example, the employees may be faced with disgruntled customers who are unhappy with the change in technology or are concerned about the difference in performance.

6. Sales Launch
There is likely to be a lot of anticipation around fluorine-free garments and so it would beneficial for brands to have a sales launch both in-store and online. This could include promotional offers and information displayed on the change in technology. Brands should use this opportunity to focus their marketing on their technologies being environmentally friendly and to catalyse positive change in the outdoor industry.

7. Retreatment Tool
Brands could develop a retreatment tool which calculates the use and wear and informs the end user if the garment requires retreating or not. The tool would be formed of various questions which the customer would need to thoroughly answer in order to get a result. This could be useful as there are no set guidelines on when the end user should retreat their garment. It would also
be useful for brands to understand the typical wear, end use, longevity and performance of the garment. The retreatment tool would be advertised online and in-store and incorporated into the brands website in order to reach a wide audience.

8. Feedback
It is imperative for brands to get feedback on the performance of their water repellent garments, especially now that the finish will be changing. The brands should encourage their customers to fill out a feedback form or survey regularly, so that they can understand the key issues around their garments performance. This will also enable them to understand if they are meeting the customers’ needs and demands and they can adjust their technologies where necessary. Brands could use customer distribution lists, social media and newsletters to gather this vital information from their customers.
Disclaimer: Small updates and corrections to the source material were made in the process of creating this brochure.
Pictures: pixabay.com, © gpointstudio - Fotolia.com