Request for Proposal

Technical Assistance & Research on Durable Repellency Technologies for the Outdoor and Fashion Industries

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Zero Discharge of Hazardous Chemicals Workgroup
European Outdoor Group
Outdoor Industry Association
Association of the German Sporting Goods Industry

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1.0 Introduction

1.1 Purpose and Background

The Zero Discharge of Hazardous Chemicals (ZDHC) Workgroup, European Outdoor Group (EOG), Outdoor Industry Association (OIA), and Association of the *German Sporting* Goods Industry (BSI) are collaborating to initiate this Request for Proposal (RFP) to solicit proposals from universities, research institutes, technical consultancies, and test laboratories to provide technical assistance, research and analysis to support the efforts of these groups to eliminate chemicals and materials from their products that may contain or degrade into long-chain perfluoroalkyl acids (PFAAs) such as perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate PFOS, or to eliminate fluorinated repellency chemistries entirely using safer alternatives.

This RFP addresses durable repellency technologies, to include water, oil, and soil repellency and stain release technologies (which we refer to in this document as 'repellency technologies'), in the outdoor and fashion industries, which we define to include apparel, footwear, and equipment (and refer to in this document as 'the industry.')

In 2011, the Zero Discharge of Hazardous Chemicals (ZDHC) Programme formed to catalyse positive change in the discharge of hazardous chemicals across the product life cycle. The coalition now includes brand members adidas Group, C&A, Esprit, G-Star Raw, H&M, Inditex, Jack Wolfskin, Levi Strauss & Co., Li Ning, M&S, New Balance Athletic Shoe, Inc., NIKE, Inc., and PUMA SE.
In their 2011 Roadmap they committed to *'By the end of 2012, we will confirm, or set timelines for the elimination of products that are associated with PFOA and PFOS. This program will initially focus on replacing C8 fluorinated water repellent chemistry with alternative technologies including short-chain fluorochemical water repellents approved by global regulators (e.g. fluorotelomer-based C6 technology).'*

In August 2012, the ZDHC brands collaborated with the Outdoor Industry Association (OIA), the European Outdoor Group (EOG), and representatives from the chemical industry to identify the opportunities, challenges and limitations for eliminating repellency technologies associated with PFOA and PFOS. A research report 'Durable Water and Soil Repellent Chemistry in the Textile Industry' was developed (Appendix A) and released on the ZDHC website.

The research report referred to above found that:

- Repellency technologies containing short-chain fluorinated chemistries are currently promoted by the chemical industry as viable alternatives to long-chain chemistry.
- Short-chain fluorinated chemistries are associated with substances that may be of concern, particularly in cases where their use can result in widespread dispersion in aquatic environments.
- The move from fluorinated to non-fluorinated repellency technologies is more challenging than the move from long-chain to short-chain chemistries.
- There is limited information available on alternatives to long-chain repellency technologies, particularly on performance, with much of the information being provided by the chemical industry.

- In-depth research into non-fluorinated DWR alternatives is required.
- Future research should include:
    - Investigating the practical application of non-fluorinated DWR finishes on textile products;
    - Identifying if non-fluorinated repellency technologies meet the requirements of the textile industry including meeting defined performance levels; and
    - Investigating the environmental and potential human health impacts of the alternatives.

In addition, the collaborating organizations developed a set of discrete 'use cases', which establish specific categories of fabric and their performance requirements, including water- and oil-repellency, stain and soil release, abrasion-resistance, fabric breathability, durability and usability after several washing cycles, etc. (see Appendix B). This information can form the basis of a technical assessment or testing program to determine whether specific alternative repellency technologies could provide the required performance.

The industry and the chemical industry are working together to establish a shared understanding of the apparel industry's needs, including the necessary use cases, performance requirements, and sustainability criteria of chemical products.

The industry recognizes that there is a strong call to move away from per- and polyfluorinated chemistry. However, since the move from fluorinated to non-fluorinated repellency technologies is challenging, the industry must conduct further research on the performance and safety of alternatives, for all uses and performance levels.

1.2 Project Objectives

The objectives for the work funded under this RFP are to:

- Identify the full spectrum of short-chain fluorinated and non-fluorinated alternatives to long-chain fluorinated polymer-based options, that can meet the requirements of the outdoor and fashion industries (to include apparel, footwear and equipment), for water, oil, and soil repellency and stain release.

- Gather and assess the scientific information on the benefits and risks to humans and to the environment of existing short-chain and non-fluorinated polymer repellency technologies.

- Gather and assess the scientific information on the benefits and risks to humans and the environment of moving from long-chain to short-chain and/or to non-fluorinated chemistries, including use phase considerations (frequency of washing, re-impregnating and influence on the longevity of the finished product).

- Document the work done in this project, including the successes, challenges, and lessons learned, so that it can become a model framework/process for the industry to collectively and proactively address other classes of chemicals moving forward.

- Determine the feasibility, for specific market segments and product categories' functional repellency requirements, of: (a) eliminating fluorinated repellency chemistry entirely through the use of safer alternatives with stated functionality, and (b) eliminating long-chain fluorinated compounds; to include a broad list of requirements for success, and barriers to elimination, for specific market segments and product categories.

- Where there are gaps in non-fluorinated repellency technologies for specific requirements, launch a study to research and develop new technologies to fill these gaps.

- Ensure that the data developed in the work of this RFP are transparent, fully documented and cited, with data gaps identified, so that the data can be validated and utilized beyond this contracted work for future assessments.

- Establish a specification for, or create a database to house the information generated in this project and ensure that the information is accessible to the industry to make informed decisions. This may mean leveraging an existing information system. This should be done such that anti-trust rules are not violated.

- Generate information that will allow outdoor and fashion brands and suppliers to knowledgeably identify chemicals of concern in alternative repellency technology chemistries or other classes of chemistries, and establish appropriate environmental control and/or timelines for phase-out and/or replacement of those chemicals.

- Develop tools and guidelines to support the move from long-chain to short-chain and/or to non-fluorinated chemistries (i.e. template for purchasing conditions, feasible and reliable analytical verification methods)
- Ensure that the results of the work under this RFP are results-oriented, pragmatic, business-effective and credible.

- Allow that project findings can potentially be used as inputs to developing pieces of legislation (e.g., REACh; and company and product footprinting within Europe).

1.3 Definitions

Refer to the definitions section in the report in Appendix A for key terms used in this RFP.

2.0 Scope of Work

This RFP seeks to engage an organization, or team of organizations, to conduct the following work, which is organized into nine projects.

Projects are numbered only to distinguish one from another. The project sponsors may decide to initiate work on these projects sequentially or concurrently.

Project 1. Creation of a categorization scheme for products in the outdoor and fashion industry that currently require repellency

Create a categorization scheme for use by brands individually, and for the research in this RFP, that will allow performance data for non-fluorinated and short-chain technologies to be mapped onto it, to assist brands in predicting which types of repellency technologies will be suitable for their products.

The categorization scheme should take into account the array of market sectors, product categories (to include apparel, footwear and equipment), and fabric types currently requiring or using repellency technologies. Market sectors could include: outdoor apparel, school uniforms, men's suits, men's shirts, etc. Product categories could include: rain jackets for day hiking, rain jackets for high altitude, rain jackets for cycling, etc.

The scheme should incorporate the fabric scheme (referred to as "Use Cases") already developed and included in the Use Case Table in Appendix B, as well as other information contained in the table on repellency performance requirements and test methods. In addition, individual brands may provide their own product categorizations schemes, which may be suitable for incorporation into the scheme created here.

Deliverable: Categorization scheme for apparel, footwear and equipment products in the outdoor and fashion industry that currently require repellency, for use in feasibility assessments of alternative repellency technologies.

Project 2. Development of guidance for brands and suppliers on substitution of repellency technologies in their products

This project has three tasks:

Task 2-1. Develop strategic guidance on how to effectively implement a chemical substitution process by utilizing different hazardous and risk assessment tools. This guidance should take into account and build on existing frameworks and examples for substituting chemicals, such as SUBSPORT and alternatives assessment guidance such as the IC2 Guidance for Alternatives Assessment and Risk Reduction.

Task 2-2. Develop guidance on how to conduct performance testing of repellency technologies. Guidance should include, but not be limited to the following aspects:

- Which specific standardized tests are appropriate for specific types of performance/textile/ product combinations;
- Tests should reflect initial performance as well as representing wear by the consumer;

- Establish correlation of the proposed test methods to DWR performance in the field and over the course of use (simulating washes, abrasion, contamination);
- Ensure use of best available techniques;
- Whether tests should be done in laboratories or factories;
- Important testing parameters; and
- Testing protocols for chemical testing of repellency technologies.

Task 2-3. Develop guidance on how to conduct environmental and human health assessments of alternative repellency technologies. This guidance should take into account and build on existing frameworks and processes for chemical hazard assessment, such as the OIA/ZDHC Programme's Chemical Hazard Assessment Guidance document (in Appendix C), as well as exposure/risk assessments from a life cycle perspective, because substitutions may require trade-offs with other impacts, such as water or energy use or wastewater treatment.

Deliverable: A guidance document for brands and suppliers to assist them with assessment and decision-making on alternative repellency technologies for their products, taking into consideration existing ZDHC Joint Roadmap work

Project 3. Development of recommendations for collaboration between brands on repellency technology assessments

This project has two tasks:

Task 3-1. For the activities addressed in Project 2, Tasks 2-2 and 2-3 – performance testing and environmental and human health assessments of alternative repellency technologies, respectively – assess and recommend whether it would be feasible, efficient and appropriate for brands to do this work collaboratively. The following factors should be among those considered for this assessment:

a. Anti-trust requirements;
b. Pre-competitive vs. competitive research areas;
c. Need for research to be focused on brand/product line specific issues vs. general research on, e.g., environmental and human health assessments of alternative repellency technologies;
d. Willingness of brands, suppliers of repellency technologies, and other companies in the industry's value chain to participate in these types of collaborations;
e. What type of organization might take the lead in a collaboration; and
f. What role the chemical industry could/should play in such a collaboration.

This assessment should consider existing frameworks and examples of collaboration between brands to assess alternative technologies, such as the Green Chemistry & Commerce's Council's model for companies and universities to collaboratively evaluate safer alternatives to toxic chemicals, the Toxics Use Reduction Institute's industry collaboration model for performance testing of alternative technologies; as well as government led programs such as the U.S. EPA Design for Environment Program's Alternatives Assessments and the U.S. EPA Cleaner Technologies Substitutes Assessments.

Deliverables:

1. An assessment of the advantages and disadvantages for brands to collaborate on performance testing;
2. An assessment of the advantages and disadvantages for brands to collaborate on assessing the potential environmental and human health impacts of alternative repellency technologies.

Gate: The sponsoring organizations will review the deliverable from Task 3-1 and determine whether to proceed to Task 3-2.

Task 3-2. Develop a recommended model for (1) collaboration on performance testing and/or (2) an assessment of the potential environmental and human health impacts of alternative repellency technologies.

Deliverables:

1. A recommended model for collaboration on performance testing; and/or
2. A recommended model for collaboration on an assessment of the potential environmental and human health impacts of alternative repellency technologies.

Project 4a. Identification and collection of performance data for non-fluorinated repellency technologies

This project has two tasks:

Task 4a-1. Identify and characterize the full spectrum of commercial and pre-commercial non-fluorinated repellency technologies.

Characterization should include:

- Description of the technology, including whether it falls into categories such as:
  - Stearic acid-melamine chemistries
  - Silicone chemistries
  - Dendrimer technologies
  - Nano-material technologies
  - Waxes
  - Urethanes
- Identification of the class of chemical constituents;
- Type of textile finishing application method used to apply (foulard, spray, etc.);
- Commercial availability in brands' sourcing markets to date and as indicated by supplier;
- Availability of performance test data, test methods used, whether performance testing was 3rd party validated;
- Availability of environmental and human health toxicity test data, whether 3rd party safety/risk assessment has been done; and
- Availability of chemical product 'quality' test data (i.e. high quality may offset amount required in processing, reliability and consistency from a textile production perspective etc.).

This work should build on information contained in the research report in Appendix A, as well as additional information that will be provided by the sponsoring organizations, from their efforts to gather information from suppliers of these technologies.

The list of chemical constituents of each alternative identified should be compared against the ZDHC list of critical chemicals to identify any ingredients that are on this list.

Gate: The sponsoring organizations will review the deliverable from Task 4a-1 and determine which technologies are relevant and should be the focus for Task 4a-2.

Task 4a-2. Collect test data and other information related to performance and the practical application (including quality and efficiency) of the technologies from Task 4a-1, to include information on:

- The ability of the technology to provide water repellency, oil repellency, soil and stain-release;
- Compatibility of the technology with different coating types (i.e. PU);
- Usability and durability in the use phase including repellency performance, bonding strength, fabric breathability, or abrasion resistance, before and after several wash cycles (see also Appendix B);
- Impacts on product characteristics, such as resin marks, fabric hand, and colour modification.
- Durability in the manufacturing phase for contamination resistance;
- Suitability of finished fabrics for further manufacturing, e.g. taping, printing, welding;
- Changes required to the manufacturing process when making a switch from a long-chain or short-chain fluorinated to a non-fluorinated repellency technology;
- Production processes used to make the product, including practical application methods and processing logistics;
- Distinct advantages and disadvantages of the technology in finished products as well as at textile processing stage;
- Feasibility of scale-up; and
- Cost (or some relative measure of current cost relative to long-chain PFCs and other alternatives, e.g., +, ++, o, -).

This work should build on information contained in the research report in Appendix A, as well as additional information that will be provided by the sponsoring organizations, from their efforts to gather information from suppliers of these technologies and also by third-party testing.

Deliverable: Database containing information collected in Tasks 4a-1 & 4a-2.

Project 4b. Identification and collection of performance data for short-chain fluorinated repellency technologies

This project has two tasks:

Task 4b-1. Identify and characterize commercial and pre-commercial short-chain repellency technologies.

Characterization should include:

- Description of the technology;
- The class of chemical constituents;
- Type of textile finishing application method (foulard, spray, etc.);
- Commercial availability in brands' sourcing markets to date and as indicated by supplier;
- Availability of performance test data, test methods used, whether performance testing was 3rd party validated;

- Availability of environmental and human health toxicity test data, whether 3rd party assessment has been done on toxicity; and
- Availability of chemical product 'quality' test data (i.e. high quality may offset amount required in processing, reliability and consistency from a textile production perspective etc.).

This work should build on information contained in the research report in Appendix A, as well as additional information that will be provided by the sponsoring organizations from their work to gather information from suppliers of these technologies.

The list of chemical constituents of each alternative identified should be compared against the ZDHC list of critical chemicals to identify any ingredients that are on this list.

Gate: The sponsoring organizations will review the deliverable from Task 4b-1 and determine which technologies to focus on in Task 4b-2.

Task 4b-2. Collect test data and other information related to performance and the practical application of the technologies from Task 4b-1, to include information on:

- The ability of the technology to provide water repellency, oil repellency, soil and stain-release;
- Compatibility of the technology with different coating types (i.e. PU);
- Usability and durability in the use phase including repellency performance, bonding strength, fabric breathability, or abrasion resistance, before and after several wash cycles (see also Appendix B);
- Impacts on product characteristics, such as resin marks, fabric hand, and colour modification;
- Durability in the manufacturing phase for contamination resistance;
- Suitability of finished fabrics for further manufacturing, e.g. taping, printing, welding;
- Changes required to the manufacturing process when making a switch from a long-chain to short-chain fluorinated repellency technology;
- Production processes used to make the product, including practical application methods and processing logistics;
- Distinct advantages and disadvantages of the technology in finished products as well as at textile processing stage;
- Feasibility of scale-up; and
- Cost (or some relative measure of current cost relative to long-chain PFCs and other alternatives, e.g., +, ++, o, -).

This work should build on information contained in the research report in Appendix A as well as additional information that will be provided by the sponsoring organizations, from their efforts to gather information from suppliers for these technologies and also by third-party testing.

Deliverable: Database containing information collected in Tasks 4b-1 & 4b-2.

Project 5a. Data gathering and assessment of the potential environmental and human health impacts of the non-fluorinated repellency technologies

The work in this project should be informed by the assessment and recommendations from Project 3. This project includes three tasks:

Task 5a-1. Develop or select an existing system for conducting an assessment of the environmental and human health impacts of non-fluorinated repellency technologies and identify the dataset needed to conduct assessments using this system.

The system should consider:

- The environmental and health (human-toxicological) characteristics of the chemicals contained in the repellency product (intentionally added and known or expected impurities), including their emissions into air and water (e.g. applying the German air emission factor method);
- The raw materials used to make the product;
- The manufacturing processes employed;
- The management of chemicals within the supply chain;
- The existence and best approach to accessing necessary data from the chemical industry and from government agencies that are required to assess the items above, and the recommended steps to access the data, such as entering into non-disclosure agreements (NDAs);
- The potential breakdown of products in application and use;
- Release of chemicals during normal usage and washing; and
- End of life considerations are likely out of scope for this project, but could be considered for future research efforts.

The system should be informed by, and made consistent with, the guidance contained in the OIA/ZDHC document "Using Chemical Hazard Assessment for Alternative Chemical Assessment and Prioritization" (in Appendix C), and other assessment tools developed by the sponsoring organizations.

The system should be structured in such a way that the output will enable the brands to make comparisons between technologies.

Deliverable: A recommended system for conducting an assessment of the environmental and human health impacts of non-fluorinated repellency technologies and specification for a dataset needed to conduct assessments using this system.

Gate: The sponsoring organizations will review the deliverable from Task 5a-1 and provide approval, feedback and guidance for the work in Task 5a-2.

Task 5a-2. Collect the data necessary to perform the assessments for the non-fluorinated technologies that were identified in Project 4a, and deemed to be technically relevant by the sponsoring organizations. Note data gaps.

This work will have to be done with the involvement of the chemical companies that are supplying these repellency products, since they hold much of the relevant data.

Deliverable: Database containing information collected in Task 5a-2, with identification of data gaps.

Task 5a-3. Using the system from Task 5a-1 and the data collected in Task 5a-2, conduct an assessment of the potential environmental and human health impacts of non-fluorinated repellency technologies that were deemed technically relevant by the sponsoring organizations.

Project 5b. Data gathering and assessment of the potential environmental and human health impacts of short-chain fluorinated repellency technologies

The work in this project should be informed by the assessment and recommendations from Project 3. This project includes three tasks:

Task 5b-1. Develop or select an existing system for conducting an assessment of the environmental and human health impacts of short chain repellency technologies and identify the dataset needed to conduct assessments using this system.

The system should consider:

- The environmental and health (human-toxicological) characteristics of the chemicals contained in the repellency product (intentionally added and known or expected impurities), including their emissions into air and water (e.g. applying the German air emission factor method);
- The raw materials used to make the product;
- The manufacturing processes employed;
- The management of chemicals within the supply chain;
- The existence and best approach to accessing necessary data from the chemical industry and from government agencies that are required to assess the items above, and the recommended steps to access the data, such as entering into non-disclosure agreements (NDAs);
- The potential breakdown of products in application and use;
- Release of chemicals during normal usage and washing; and
- End of life considerations are likely out of scope for this project, but could be considered for future research efforts.

The system should be informed by, and made consistent with, the guidance contained in the OIA/ZDHC document "Using Chemical Hazard Assessment for Alternative Chemical Assessment and Prioritization" (in Appendix C), and other assessment tools developed by the sponsoring organizations.

The system should be structured in such a way that the output will enable the brands to make comparisons between technologies.

Deliverable: A recommended system for conducting an assessment of the environmental and human health impacts of short chain repellency technologies and specification for a dataset needed to conduct assessments using this system.

Gate: The sponsoring organizations will review the deliverable from Task 5b-1 and provide approval, feedback and guidance for the work in Task 5b-2.

Task 5b-2. Collect the data necessary to perform the assessments for the short chain technologies that were identified in Project 4b, and deemed to be technically relevant by the sponsoring organizations. Note data gaps.

This work will have to be done with the involvement of the chemical companies that are supplying these repellency products, since they hold much of the relevant data.

Deliverable: Database containing information collected in Task 5b-2, with identification of data gaps.

Task 5b-3. Using the system from Task 5b-1 and the data collected in Task 5b-2; conduct an assessment of the potential environmental and human health impacts of short chain repellency technologies that were deemed technically relevant by the sponsoring organizations.

Project 6. Launch new research and development on non-fluorinated technologies

The aim of the work in this project is to launch research to develop new non-fluorinated repellency technologies and will build on the work carried out in Project 4a.

This project has two tasks:

Task 6-1. Where there are gaps in non-fluorinated repellency technologies for specific performance requirements that are needed by brands, develop recommendations for how the brands can instigate new research by chemical companies and other organizations that have the capacity to develop these new technologies. Recommendations may include activities such as:

- Communicating needs directly to firms capable of developing new technologies, through, for example:
  - A technical brief detailing the need for new technologies to fill specific performance gaps; or
  - An open-innovation forum[1].
- Creating incentives and providing funding for R&D in this area, through
  - An innovation/idea competition; and
  - Venturing.

Gate: The sponsoring organizations will evaluate the recommendations in Task 6-1 and determine whether and how to initiate work under Task 6-2.

Task 6-2. Based on the results of Task 6-1, instigate new research and development on non-fluorinated technologies.

[1] Example of an open innovation forum http://www.ifm.eng.cam.ac.uk/events/oipitching/, with their prioritized list of innovation needs http://www.ifm.eng.cam.ac.uk/uploads/Events/OI_forum_innovation_areas.pdf

Project 7. Development of recommendations for whether and how brands can effectively pool and share their repellency technology performance test data

Some brands have already conducted performance testing of repellency technologies and may be willing and able to share the data with other brands.

This project has four tasks:

Task 7-1. Determine whether brands within the sponsoring organizations are willing to share performance test data, and whether sharing data would violate anti-trust requirements.

Task 7-2. If firms are willing to share performance test data, review examples of performance test data from several brands and assess whether these data can be pooled in a way that the data will be useable and comparable for a broad group of firms.

Task 7-3. If it is legally and technically feasible to pool data, develop recommendations for how this can be done effectively.

Gate: The sponsoring organizations will evaluate the recommendations from Task 7-3 and determine whether and how to initiate work under Task 7-4.

Task 7-4. Develop the specifications for an information system to house pooled performance test data from brands.

Project 8. Create a streamlined data collection and dissemination system for data collected in and beyond this project

Create a streamlined data collection and dissemination system for data gathered in the project, to include but not be limited to:

- Standardized data input formats and forms
- A protocol for ongoing data input and validation, beyond this project
- A system to house data that can be easily accessed by all industry stakeholders

Project 9. Document the work of this project to create a model for future projects

Document the work done in this project, including the successes, challenges, and lessons learned, so that it can become a model framework/process for the industry to collectively and proactively address other classes of chemicals in the future.

Appendix A: Durable Water and Soil Repellent Chemistry in the Textile Industry

Appendix B: Table of Use Cases

Appendix C: Using Chemical Hazard Assessment for Alternative Chemical Assessment and Prioritization