



PERFLUORCARBONS (PFC) CASE STUDY

SUBSTITUTION OF PFC'S

13/12/2016
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Esprit Europe Services GmbH

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1 INTRODUCTION AND BACKGROUND INFORMATION

Perfluorinated carbons (PFCs) are mostly used in high performance outerwear to achieve a breathable fabric surface for garments that is also water, dirt and oil repellent. In the manufacturing process, PFCs are applied to the surface of a fabric, usually before cutting and sewing. They can be found in a wide range of products, such as outerwear, sleeping bags, umbrellas, tents, backpacks, and shoes, and also in electronic devices like tablets and smart phones.

The term PFC is used for a large group of chemical formulas. In the textile industry, perfluorooctane sulfonates (PFOS) and perfluorooctanoic acids (PFOA) are the most commonly used PFCs. The difference between these two chemical formulas is the number of carbon atoms within the perfluorinated carbon chain, which has either four, six, or eight carbon atoms in its chemical structure. As a consequence of the widespread use of PFC chemistry, long-chain PFOAs and PFOS, have been detected globally in the environment, wildlife and humans. Due to their complex structure, they decay very slowly in the environment, and can affect the health of both people and animals. As they decompose, their chemical structure breaks down into bio-accumulative substances that can get into the ground water and therefore also into the food chain. Studies of PFCs and their effect on the environment have found damage to the immune systems of children, an increased incidence of cancer, and impairment of fertility¹. In December 2012, Esprit joined the Greenpeace Detox Campaign² and signed a commitment³ to eliminate eleven groups of hazardous chemicals that are commonly used in the apparel and footwear industries. In 2013, we developed a plan to eliminate the identified chemicals and communicated the plan to our employees and suppliers. We first focused on the elimination of PFCs and began work to find alternative chemicals for hydrophobic and oleophobic (water and oil repellent) textile finishes for our products.

Design and function are generally the top priorities in the choice of chemicals to be used in textile manufacturing. PFC-free alternatives must therefore meet a full range of performance requirements, as well as being better for the environment. Using impermeable materials to avoid PFC chemistry is possible, but it is not a viable solution for the textile industry because impermeable fabrics do not provide the breathability needed for them to be comfortable to wear for extended periods.

Since the actual chemical structures of C4, C6 and C8 PFCs are harmful, alternative chemicals are the solution to avoid negative impacts on the environment and human health. Besides PFC-free chemical alternatives, water repellent paraffin wax emulsions or silicones can be used for water repellent styles. Although these alternatives are water repellent and may address water-based stains, they do not repel oil or grease stains. For any alternative to PFC chemicals, an assessment is needed that includes an evaluation of performance and composition, including raw materials, by- and transformation products and additives, as well as hazards and exposure risks in order to assess the chemicals' potential impact on the environment and human health.

¹ For further information please visit: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3206400/>

² For further information please visit: <http://www.greenpeace.org/international/en/campaigns/detox/fashion/detox-catwalk>

³ For further information please visit: http://www.esprit.com/press/ESPRIT_Greenpeace_Detox_Solution_Commitment.pdf

2 TESTING AND TECHNICAL RESEARCH

Beginning in 2014, Esprit's Fabric Management Department undertook extensive technical research on alternative chemistry to PFCs. Esprit identified eleven alternative chemicals from various international suppliers engaged with their customers' Detox Commitments and who could offer chemicals that meet the requirements of the Manufacturing Restricted Substances List (MRSL)⁴ of the ZDHC Group⁵. We chose chemical suppliers able to offer their products world-wide, so that our ultimate choice(s) would be easily accessible to all our suppliers.

Six chemical suppliers from Germany, three from Switzerland, one from Spain, and one from Italy sent chemicals to be tested in the Esprit laboratory, located at our Headquarters in Ratingen, Germany. Those tests started in November 2014 and ended in March 2015. In these tests we focused on water-repellency because this feature is Esprit's key performance requirement for our product range, and already includes a clear set of quality parameters for our suppliers.

In February 2015, Greenpeace staff visited the Esprit Headquarters in Ratingen to check our testing methods and procedures. The aim of the testing was to identify the correct handling and quality of the PFC-free chemicals for a water-repellent finish and to achieve the best possible performance by using the lowest possible amount of chemicals, time, and energy consumption. All eleven alternative chemicals were tested on four different fabric qualities, which are the most common in the Esprit product range:

- 1: 100% Polyester
- 2: 100% Polyamide
- 3: 94% Polyester, 6% Polyamide
- 4: 57% Cotton, 34% Polyester, 9% Polyamide

Many global chemical suppliers offer PFC-free chemicals in their portfolios of products to achieve a water, dirt, soil and oil repellent surfaces on textiles.

In general, five different types of PFC-free chemicals are available:

OVERVIEW OF PFC-FREE CHEMICAL ALTERNATIVES

Chemical	Environmental breakdown (%)	Hazard classification	Human Health	Properties
Paraffin*1	90%	not hazardous	not dangerous	Harsh surface
Multi Compound*2	70 - 90%	not hazardous	not dangerous	Effect depends on amount used
Modified Fat Acid	> 80%	not hazardous	not dangerous	Slippery surface
Modified resin	> 80%	not hazardous	not dangerous	Effect depends on amount used
Silicon	80%	not hazardous	not dangerous	Slippery surface

Not all of these alternative chemicals are suitable for all fabric types and finishing effects. The following table shows a brief explanation of the properties and finishing effects of the various classes of chemicals.

⁴ For further information please visit: http://www.roadmaptozero.com/fileadmin/pdf/MRSL_v1_1.pdf

⁵ For further information please visit: <http://www.roadmaptozero.com/>

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Chemicals	Water repellency	Oil repellency	Soil repellency	Abrasion	Wash resistance
PFC	++	++	++	-	++
Modified Resin	++	-	-	++	++
Paraffin	++	-	-	+	+
Modified Fatacid	++	-	-	+	+
Compound	++	-	-	++	++
Silicone	+	-	-	+	+
PERFORMANCE OVERVIEW					

++ excellent results + good results - not fulfilling results

To achieve a specific performance level, it is important to collaborate with the mill in order to agree on the exact properties desired.

2.1 Methodology

As a first step in the testing procedure, the four fabric samples were weighed in order to determine the correct amount of chemical on the surface for the treatment. In this way, use of too much or too little of the chemicals could be avoided.

Our Fabric Management Department then prepared three different tests for all eleven PFC-free chemicals:

1. The chemicals were prepared according to the formulation and recommendation in the technical application sheet from the chemical supplier.
2. They were prepared using double the amount recommended in the technical application sheet.
3. They were prepared using half of the recommended amount.

All three chemical preparations were applied by a dye-pad machine onto the four different fabrics by controlling the temperature and time also variably to achieve the best possible washing results, explained in step three, for each of the four test fabrics. After the padding process the chemicals were dried and fixed. In total, 45 fabric samples were prepared according the above procedure.

In a third step, the Fabric Management Department conducted washing tests on the prepared samples. Each sample was washed five times according to standard ISO 6630 6A. After the first, third, and fifth washes, a spray test according to standard AATCC 22-2009 was conducted to evaluate the water repellency performance of each chemical. In total, 225 standard washes and 180 spray tests were performed during the testing.

SPRAY TEST ACCORDING TO AATCC 22-2009



Untreated fabric



PFC-free Treated
fabric

Finally, the test fabrics were tested for PFCs according to standard DIN EN/TS 15968:2010-11 to ensure that the test formulations were completely free of them.

All chemicals used in the experiment were found to comply with Esprit's RSL & MRSL requirements and were therefore viable alternatives to PFC chemistry.

2.2 Conclusion

All eleven PFC-free chemicals that were tested passed the PFC test in the last step of the testing procedure. The spray tests according to AATCC 22-2009 showed that different amounts of chemicals were needed to reach the Esprit quality requirements, but that the requirements could, indeed, be met. The following chart presents the best results achieved in each fabric, with each chemical taking into account the three recipes checked:

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RESULTS ON WATER REPELLENCY (WR) TESTING

Chemical supplier	Chemical name/ nature of chemical	Amount of chemical (padding)	Amount of chemical (fabric)	WR (before washing)	WR (after 1 wash)	Composition
Bozzetto Group	Reaprett FF	100g/l	60	100 ISO 5	100 ISO 5	100% PA
DyStar	EVO Protect DWA	80g/l	68	100 ISO 5	90 ISO 4	57% CO, 34% PES, 9%PA
DyStar	EVO Protect DWA	80g/l	55	100 ISO 5	90 ISO 4	100% PES
DyStar	EVO Protect DWA	50g/l	60	100 ISO 5	100 ISO 5	100% PA
Huntsman	Phobotex RHP	80g/l	60	100 ISO 5	100 ISO 5	57% CO, 34% PES, 9%PA
Huntsman	Phobotex RHP	60g/l	70	100 ISO 5	100 ISO 5	100% PES
Huntsman	Phobotex RHP	40g/l	53	100 ISO 5	100 ISO 5	100% PA
Rudolf	Ruco Dry Eco Plus	60g/l	68	100 ISO 5	90 ISO 4	57% CO, 34% PES, 9%PA
Rudolf	Ruco Dry Eco Plus	30g/l	60	100 ISO 5	100 ISO 5	100% PA
Schoeller	Protect FF (ecorepel)	200g/l	60	100 ISO 5	100 ISO 5	57% CO, 34% PES, 9%PA
Schoeller	Protect FF (ecorepel)	150g/l	60	100 ISO 5	100 ISO 5	100% PES
Schoeller	Protect FF (ecorepel)	100g/l	60	100 ISO 5	100 ISO 5	94% PES, 6% PA
Schoeller	Protect FF (ecorepel)	150g/l	50	100 ISO 5	100 ISO 5	100% PA
Thor	Contraqua PZ	90g/l	66	100 ISO 5	90 ISO 4	57% CO, 34% PES, 9%PA

Research conclusion:

- The experiment proved that, for any of the four fabrics, at least two different recipes with different chemicals could achieve Esprit's water repellency standards.
- Many more recipes are possible, and laboratory conclusions must be translated properly to industrial scale by the mills. Nevertheless, that the tests confirmed that PFC alternatives work. Further recipes must be developed by mills in cooperation with chemical suppliers.

As a result of our extensive testing program, Esprit has produced all water-repellent products PFC-free since November 2014.

3 INSPECTION PLAN

Since switching to PFC-free chemistry, Esprit has conducted water-repellency tests and PFC test controls on all styles with water repellent treatment during and after production to assure that our suppliers comply with our requirements for all Esprit garments.

ESPRIT GARMENTS WITH WATER REPELLENT TREATMENT



All styles are manufactured with PFC-free chemicals. In addition, we have collected information from fabric mills on the chemicals that they are currently using to provide water repellent finishing for Esprit garments. We have also checked that the alternative chemicals designated by Esprit are not exchanged for harmful chemistry during the various stages of production. For these ongoing tests, we work with certified external laboratories. We also conduct random PFC inspections on incoming goods at our Distribution Center for Europe in Mönchengladbach, Germany. To date, results from third party laboratories have matched the findings of our in-house laboratory.

Although already very good results have been achieved, we are still not at the limit of what is possible. Critical material qualities, for example very light weight fabrics, still represent a challenge to mills and chemical suppliers to achieve Esprit's water repellency requirements. We are working intensively on solutions together with the suppliers of materials and chemical manufacturers.

3.1 Methodology

In total three tests are prepared for each style:

- Before production: with a proto-sample checked by our lab and the supplier
- During production: our supplier internally and third party laboratories conduct spray tests and third party laboratories conduct PFC tests (DIN CEN/TS 15968) to ensure PFC-free chemistry in our garments.
- After production: both spray tests and PFC test (DIN CEN/TS 15968) are conducted as part of incoming goods inspections.

The results of the tests are analyzed by our Risk Management Department. In 2014 and 2015 more than 660 test reports were created.

3.2 Conclusion:

Quality tests during production allow us to achieve the best possible results on water repellency, and to take any corrective actions needed early in the production process. With the additional in-house test on PFC-chemicals using DIN CEN/TS 15968, we ensure that no PFC-chemistry is used in our products.

4 CONTROL PLAN

In addition to testing, in the next phase, we intend to ensure that our Tier 1 suppliers and their subcontractors, Esprit's Tier 2 suppliers, do not use PFC chemistry in our products. To achieve this aim, Esprit's Fabric Management Department provides extensive training on industry best practice to deal with chemicals to achieve the Esprit's quality requirements, especially on water repellency.

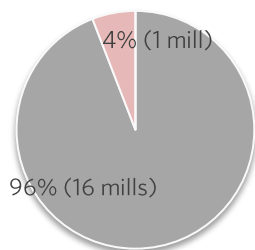
The Fabric Management Department has met with chemical companies that provide PFC-free alternatives to understand best practice using those chemicals in order to achieve better performance. We also developed an audit and training program for all 17 identified mills that produce water-repellent styles for Esprit. With this comprehensive program, which started in June 2015, we strive to understand what our suppliers are doing in production and how to improve our quality standards on water repellency. First, we started to conduct audits in the production facilities. Then we provided a comprehensive training on PFCs, Esprit's quality standards on water repellency, and best practice.

4.1 PFC audits

In June 2016, a first round of audits was conducted by the Esprit Fabric Management Team. During this audit, several areas were assessed: water (fresh and waste) treatment, product processing, quality control, machinery controls and processes, chemical management, and internal testing- all focused on water repellency finishing applications.

We identified 37 master suppliers providing water repellency treatment in 17 different mills. By the end of February 2016 all mills were audited by the Esprit Fabric Management Team. The results are presented in the following graphs:

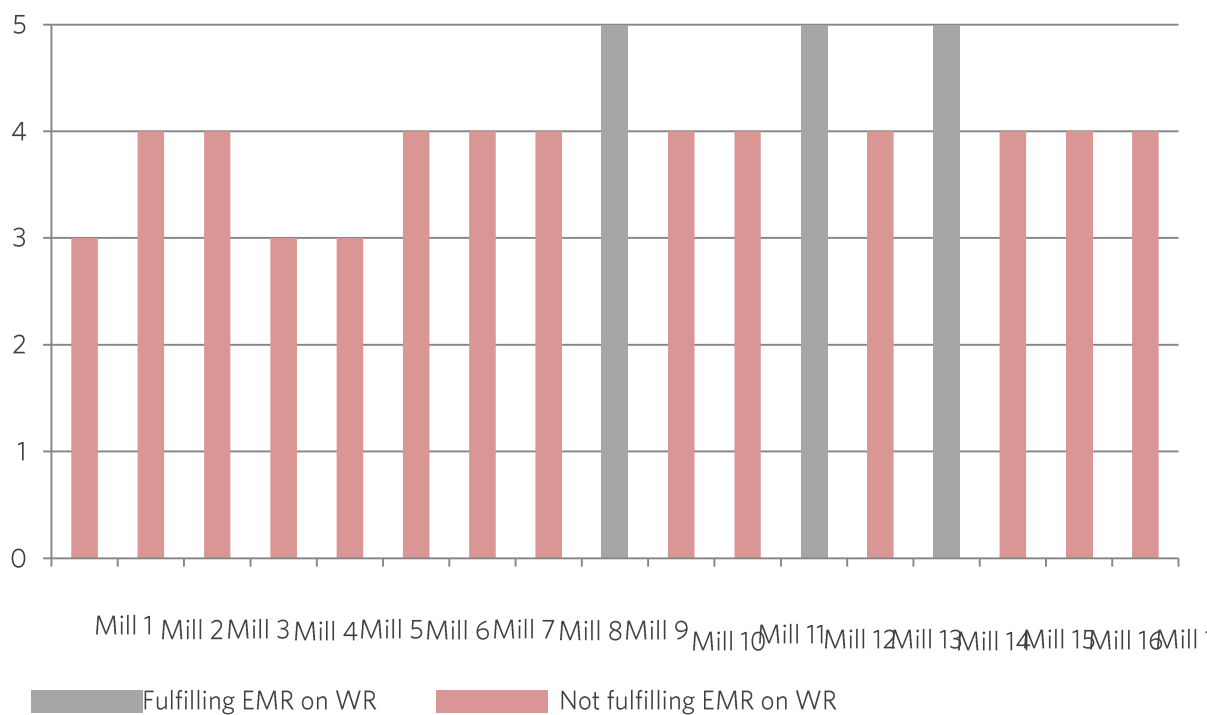
AUDIT RESULTS



Score	Description	Amount of mills
90.01 – 100.00	Passed if no critical issue found	0
70.01 – 90.00	Passed if no critical issue found. Follow-up is needed.	16
60.01 – 70.00	Passed if no critical issue found. Close follow-up is needed.	1
60.00 or below	Factory quality level is below average and not recommended for Esprit.	0

In the audits, we found that 14 of the 17 mills are able to achieve our minimum for water repellency by using PFC-free chemicals.

WATER REPELLENCY (WR) TEST RESULTS



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For the three mills that were not able to achieve our quality standards, our Fabric Management staff developed a corrective action plan to be checked in a later audit.

Audit findings:

- Cross-contamination is a problem due to the use of the same padding machinery to produce garments that contain PFCs as well as those that do not.
- There is often no SOP for proper cleaning of machines after using PFCs
- Storage and handling of PFC and PFC-free chemicals are often not separated

4.2 PFC trainings

The audits and trainings are conducted by the Esprit Fabric Management Department. Technical staff from both Tier 1 suppliers and fabric mills (Tier 2) attend the trainings. In the training sessions, Esprit staff explains the chemical properties of PFCs, their harmfulness and Esprit's requirements on water repellency.

Additionally, alternatives to PFCs, how to read and understand technical data and safety data sheets from chemical suppliers, and factors that affect the water repellency performance in the production process are discussed in detail. We share the results of our internal testing of different chemicals with the suppliers, as explained in point 2 above.

Enlisting the support of chemical companies is a further part of this discussion. Proactive and open communication between chemical companies and suppliers is important to achieve Esprit's quality standards on water repellency with PFC-free chemicals in production. A Tier 1 supplier relies on their fabric supplier (Tier 2) for technical support. Besides quality parameters, contamination with PFCs is another important part of the training. Since the same machines are used to make garments both with and without PFCs, PFC-free fabrics can still be contaminated with PFCs unless the machines are cleaned properly after using PFCs. To avoid cross-contamination, the suppliers need to be aware of this risk and have an SOP in place for proper cleaning.

Different testing methods for alternative chemistry are also part of the training. Wash testing according to ISO 6630 6A, spray testing according to AATCC 22-2009, and the test method DIN DEN/TS 15968:2010-11 to identify PFCs in fabrics are also explained in detail, with a series of examples and pictures.

We also present plasma treatment, a new technology, to our suppliers. This eco-friendly technology helps to apply chemicals to different fabrics with different compositions without affecting the water repellency performance. In a last step of the training, the Fabric Management Team explains the results of the PFC-audit to the suppliers and discusses corrective actions.

TRAINING SCHEDULE

Date	Location
27/06/2016	Shanghai
28/06/2016	Shanghai
28/06/2016	Hong Kong
29/06/2016	Shanghai
29/06/2016	Shanghai
30/06/2016	Shanghai
08/07/2016	Hong Kong
08/07/2016	Online VC
11/11/2016	Hong Kong
18/07/2016	Hong Kong
19/07/2016	Hong Kong
21/07/2016	Hong Kong

5 FURTHER ACTIONS

In September 2016, a second round of audits was conducted to check the level of achievement on the part of the mills on the corrective action plans developed by auditors from the first audit. The testing plan as described in this document will continue until we can ensure that all our suppliers consistently fulfill Esprit's requirements on PFC-free chemistry and water repellency performance.

In the middle of 2016, a new audit template was created with more than 200 Questions to evaluate wastewater, energy, environmental, chemical management and technical quality controls.

6 ATTACHMENT

ECO-CERTIFICATE

11.10.2016



PRODUCT NAME: **Reapret FF**

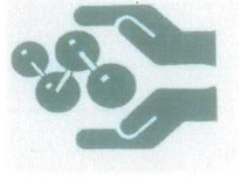
We confirm that this product complies with the European Legislation.

If applied according to our recommendations textiles treated with above mentioned product, qualify for the ÖKO-TEX-Standard 100 Edition 01/2016.

Marion Thomas

Marion Thomas
Quality management

Bozzetto GmbH
Bäckerpfad 25
47805 Krefeld



DyStar Colours Distribution GmbH, Cologne Office, Julius-Bau-Straße 2, D-51063 Köln

To whom it may concern

December 2015

Ref.: ZDHC MRSL 1.1 2015.docx

ZDHC MRSL Compliant Product List: Towards Zero Discharge of Hazardous Chemicals **DyStar Products complying with the ZDHC MRSL 1.1 2015 published in December 2015**

DyStar® has always been committed to the highest standards of product safety and through its econfidence® program is actively supporting the objective of removing hazardous chemicals from the textile and clothing supply chain.

Chapter 1 of the ZDHC Manufacturing Restricted Substance List (MRSL) addresses hazardous substances potentially used and discharged into the environment during manufacturing of textiles and clothing and related processes. It is not limited to those substances that could be present in the finished products.

Based on its econfidence program DyStar has compiled a list of globally marketed textile dyes and auxiliaries that are qualified to support the objective of the Joint Roadmap: Towards Zero Discharge of Hazardous Chemicals.

None of the listed DyStar products use as intentional ingredients any of the chemical substances or substance groups subject to a usage ban as per chapter 1 of the ZDHC MRSL 1.1 2015:

- Alkylphenols (AP) and Alkylphenol Ethoxylates (APEO)
- Chlorobenzenes & Chlorotoluenes
- Chlorophenols
- Dyes – (Azo (Forming Restricted Amines)*)
- Dyes – (Navy Blue Colorant)
- Dyes – (Carcinogenic or Equivalent Concern)
- Dyes – (Disperse (Sensitizing))
- Brominated and chlorinated flame retardants (incl. SCCPs)
- Glycols
- Chlorinated solvents
- Organotin compounds
- Polycyclic aromatic hydrocarbons (PAHs)
- Perfluorinated and Polyfluorinated Chemicals (PFCs)
- Phthalates (including all other esters of ortho-phthalic acid)
- Total Heavy Metals (arsenic, cadmium, mercury, lead, chromium (VI))
- Volatile organic compounds (VOC)

* azo dyes that can undergo reductive cleavage of the azo bond(s) to release carcinogenic amines as defined in Annex XVII of REACH or 2,4- and 2,6-xyldine

- 2 -

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www.dystar.com



ISO 9001
Certified Worldwide

In accordance to our econfidence program all products as listed hereunder are assessed for a possible risk of contamination (induced by e.g. by-products in synthesis or by raw materials) and –where appropriate- monitoring routines are in place to guarantee that thresholds as given for Group B: Chemical Supplier Formulation Limit in the MRSL will not be exceeded.

We trust that this information will be of assistance to all our partners in the textile and clothing supply chain.

With best regards
DyStar Colours Distribution GmbH

Dr. Anette Weber
Technology
Global Product Safety & Ecology

Dr. Christine Lorkowski
Technology
Global Product Safety & Ecology

This declaration is based on our general experience and tests on samples of typical manufacture. It does not absolve the user from making own tests and controls to ensure that his finished textile article conforms to the requirements he has to meet.





PRODUCT STEWARDSHIP IN ACTION

Ref : SDS information on pollution risks

20th May 2016

Dear Sir or Madam,

The H statements that are reported in our SDS are regulated by European laws. The same EU laws stipulate how substances have to be classified to reflect human and ecology hazards.

When limits for aquatic toxicity of substances are exceeded we have to assign them with appropriate H phrases (H400, H410, H411, H412, H413). and this appears in chapter 3 of the SDS. Depending on the concentration of the substance in the mixture or preparation (sales product, a dye formulation or textile auxiliary) we may also assign some of the phrases to the sales product itself (Chapter 2)

For finishing products applied by padding, in order to minimise surplus finishing bath liquor being discharged, good housekeeping practices are advised.

- Prepare only as much treatment liquor as necessary for each production run.
- Use a displacer for short production runs to avoid the preparation of high volumes of treatment liquor to fill the pad trough.

NB. In the cases of both PHOBOTEX® RHP and PHOBOTEX® RSH, the products are 'not classified' as hazardous (please see Section 2 of the SDS)

During the water purification process in effluent plants, the chemicals used, which will have been diluted to much lower concentrations than the values quoted in the SDS in Chapter 12, will be eliminated by degradation and/or adsorption onto the sewage sludge, so the RISK of pollution is significantly reduced.

NB. For both PHOBOTEX® RHP and RSH, in Chapter 12 of the SDS / 'Persistence and Degradability' they are described as 'inherently biodegradable' as a result of the OECD 302B modified test, which aims to replicate realistic conditions in effluent treatment plants.

There are very many mills operating in Austria, Italy, Germany and Switzerland (to name just a few countries with extremely high environmental standards) that use Huntsman dyes and chemicals which conform to the very demanding legislation and local ordinances and do NOT pollute the local rivers. There are no particular treatment methods used, generally activated sludge plants, which may be treating purely industrial waste or mixed domestic and industrial

Please do not hesitate to contact your Huntsman representative, if you have any further questions.

Safer products.
Better business.
Everyone's responsibility.



ESPRIT



Archroma Management GmbH
Global Product Stewardship
CH-4153 Reinach

Reinach, 27th October 2016

Archroma Management GmbH herewith declares, that searching the CAS numbers and chemical names of all substances affected by one or more of the fore mentioned criteria :

Esprit - Material Quality Requirements for Apparel and Footwear Part I – Restricted Substance List – Version 03/2016

on the chemical composition of our products result in the following hits:

Number	Product name	ZDHC	Esprit RSL 03/2016
275909	Arkophob DAN new liq	None	None
245252	Smartrepel Hydro CMD liq	None	1)
280819	Smartrepel Hydro PM liq	None	None

- 1) The compliance with the finished textile with the above named RSL depends on the individual textile processing parameters (applied concentration, fiber type, process type e.g.).
The user is requested to calculate and/or order appropriate analytical testing for verification of formaldehyde.

This list does not consider all technically unavoidable trace impurities in concentrations, which are not expected to cause health risks on finished textiles, which are produced as recommended.

Due to technical reasons, this information binds **ONLY** given list of restricted substances as in RSL applied worldwide, excluding local, regional or country specific regulation and other technical requirements. These should be checked in addition depending to which region/country the products will be sold.

We strongly recommend our customers to carefully read Safety Data Sheet of each product as a complement to this information.

This document is valid without signature.

Disclaimer:

This information corresponds to the present state of our knowledge and is intended as a general description of our products and their possible applications. Archroma makes no warranties, express or implied, as to the information's accuracy, adequacy, sufficiency or freedom from defect and assumes no liability in connection with any use of this information. Any user of this product is responsible for determining the suitability of Archroma's products for its particular application.* Nothing included in this information waives any of Archroma's General Terms and Conditions of Sale, which control any purchase unless it agrees otherwise in writing. Any existing intellectual/industrial property rights must be observed. Due to possible changes in our products and applicable national and international regulations and laws, the status of our products could change. Material Safety Data Sheets providing safety precautions, that should be observed when handling or storing Archroma products, are available upon request and are provided in compliance with applicable law. You should obtain and review the applicable Material Safety Data Sheet information before handling any of these products. For additional information, please contact Archroma.

* For sales to customers located within the United States and Canada the following applies in addition:

NO EXPRESS OR IMPLIED WARRANTY IS MADE OF THE MERCHANTABILITY, SUITABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OTHERWISE OF ANY PRODUCT OR SERVICE.

9/2013

ESPRIT



Archroma Management GmbH
Global Product Stewardship
CH-4153 Reinach

Reinach, 27th October 2016

Archroma Management GmbH herewith declares, that searching the CAS numbers and chemical names of all substances affected by one or more of the fore mentioned criteria

ZDHC – Zero Discharge of Hazardous Chemicals Program – MRSL – V1 - 2015

on the chemical composition of our products

Smartrepel Hydro CMD liq
Arkophob DAN new liq
Smartrepel Hydro PM liq

resulted in the following hits: None

This list does not consider all technically unavoidable trace impurities in concentrations, which are not expected to cause health risks on finished textiles, which are produced as recommended.

Concerning this, analytical testing is not performed for all the groups as per our routine inspection plan.

We strongly recommend our customers to read carefully Safety Data Sheet of each product as a complement to this information.

This document is valid without signature.

Disclaimer:

This information corresponds to the present state of our knowledge and is intended as a general description of our products and their possible applications. Archroma makes no warranties, express or implied, as to the information's accuracy, adequacy, sufficiency or freedom from defect and assumes no liability in connection with any use of this information. Any user of this product is responsible for determining the suitability of Archroma's products for its particular application.* Nothing included in this information waives any of Archroma's General Terms and Conditions of Sale, which control any purchase unless it agrees otherwise in writing. Any existing intellectual/industrial property rights must be observed. Due to possible changes in our products and applicable national and international regulations and laws, the status of our products could change. Material Safety Data Sheets providing safety precautions, that should be observed when handling or storing Archroma products, are available upon request and are provided in compliance with applicable law. You should obtain and review the applicable Material Safety Data Sheet information before handling any of these products. For additional information, please contact Archroma.

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9/201

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www.schoeller-tech.com



Sevelen, 2016-10-27

Schoeller Protec FF / Impregnoil 6900

To whom it may concern,

In support of the Joint Roadmap Version 2: Towards Zero Discharge of Hazardous Chemicals (October 2014), we confirm that Schoeller Protec FF and Impregnoil 6900 do not intentionally contain any of the substances in the priority chemical groups above the limits listed in the ZDHC MRL and therefore can be used to supply textiles to Brands that have signed up to the version 2 of the Joint Road Map.

In addition, we do not intentionally introduce the listed substances that would be subsequently found on the textile above the limit values as stated in the AFIRM Group RSL guidance, when the products are applied as recommended.

Schoeller Technologies AG

A blue ink signature of Hans U. Kohn, written in a cursive style.

Hans U. Kohn
Chief Operating Officer

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