

A hiker with a red backpack is walking across a rocky path in a mountain valley. The hiker is wearing a blue plaid jacket, dark pants, and a black beanie. The landscape is rugged with brown and orange vegetation and snow-capped mountains in the distance under a cloudy sky. A red triangle is in the top right corner.

CHT

SMART CHEMISTRY
WITH CHARACTER.

**PFAS COME TO STAY –
TIME TO RETHINK WITH NON-FLUORINE FINISHES**

ATA OUTLOOK CONFERENCE

CONTENT

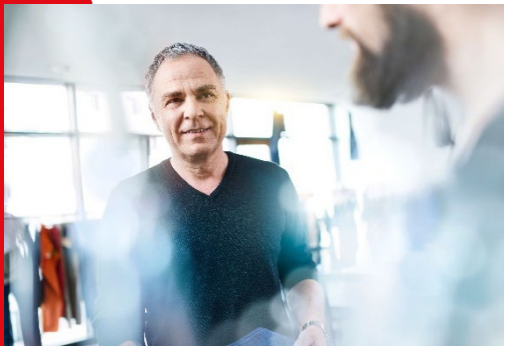
- ▶ The CHT Group
- ▶ PFAS – Properties and Impact
- ▶ Non flourine finishing
- ▶ Comparison PFAS vs. Non flourine
- ▶ Testings for water- and stain repellency
- ▶ Performance of ECOPERL
- ▶ Outlook



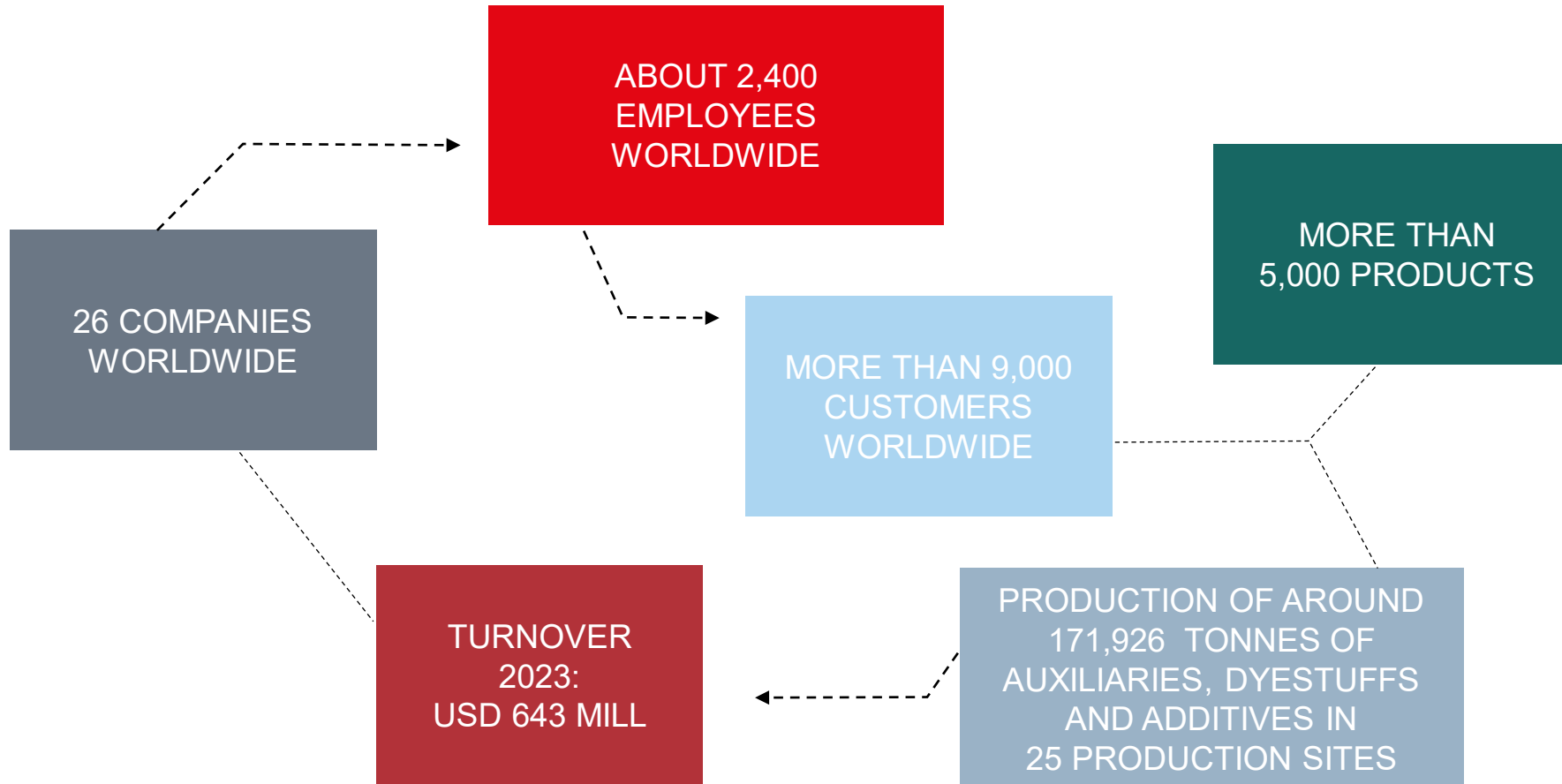
THE CHT GROUP

OUR MISSION

- ▶ THE leading reference for sustainable chemistry
- ▶ Individual service, innovative strength and outstanding product quality
- ▶ Sustainability is the foundation of our company corresponding to our culture / identity with global activity
- ▶ Our market position as an innovative company: sustainable products and process solutions for our customers



WE ARE OPTIMALLY POSITIONED



WE ARE AROUND THE WORLD



- ▶ Production sites
- ▶ Sales offices

PFAS – PROPERTIES AND IMPACT

PFAS

PER- AND POLYFLUORINATED ALKYL SUBSTANCES

- ▶ Group of substances with approx. 10.000 different compounds
- ▶ Unique properties: heat resistant, water repellent, oil- and dirt repellent, inert against chemicals
- ▶ A family of man-made chemicals that contain carbon, fluorine and other elements with a functional group at the end of the chain
- ▶ These structures are the basis for different chemical properties and different chemical names
- ▶ Impact: “PBMT substances” **P**ersistent, **B**ioaccumulative, **M**obile, **T**oxic
- ▶ The best-known PFAS substance groups are:



Perfluorooctanoic acid (PFOA)



Perfluorooctanesulfonic acid (PFOS)

WIDE RANGE OF APPLICATION FIELDS

Firefighting foam



Disposable foodstuff

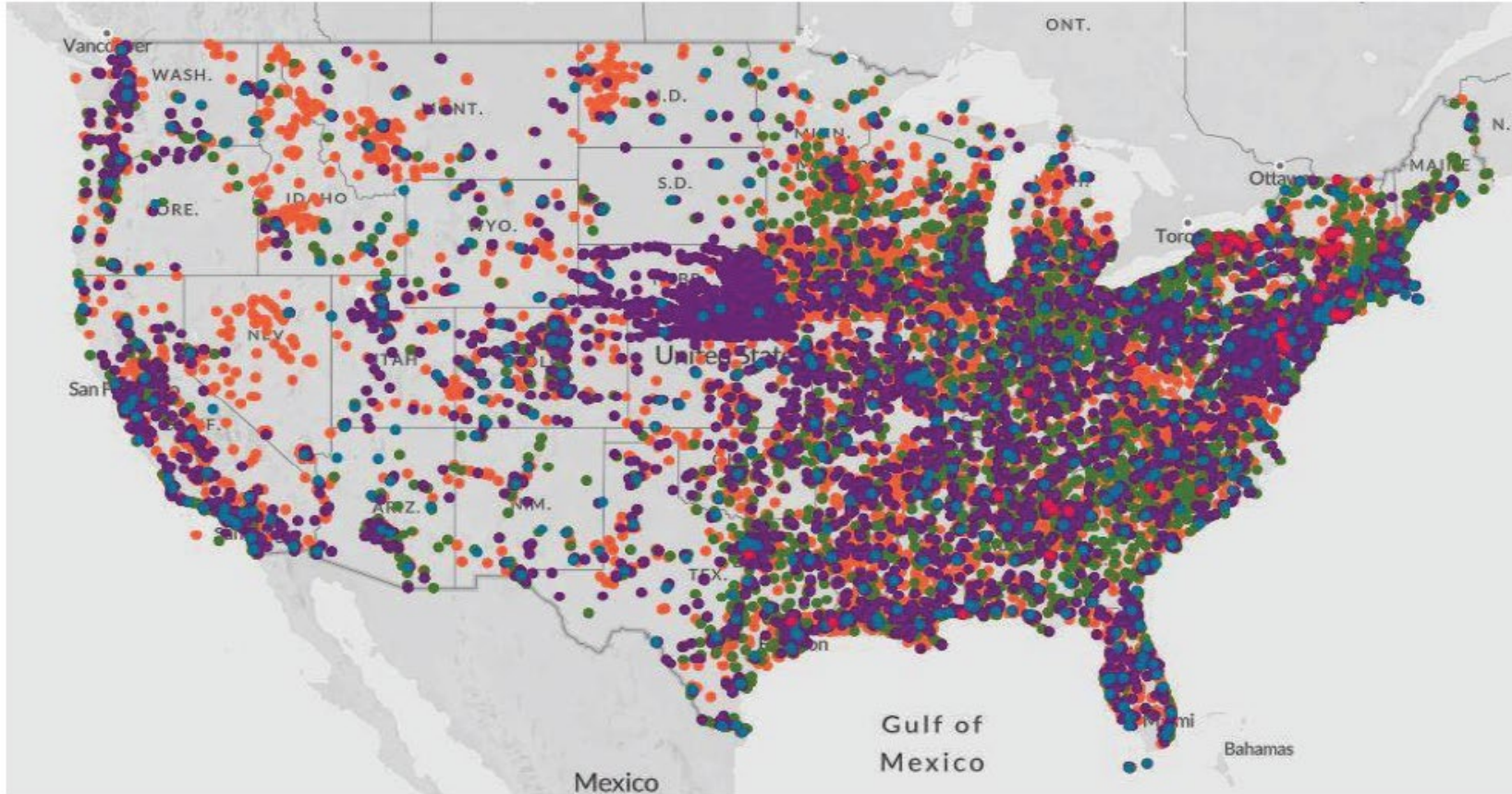


Non-stick frying pan

Membranes in outdoor clothing

Electronic components

PFAS CONTAMINATION IN THE U.S.



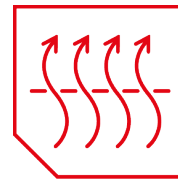
Source: Lanxess (2024)

NON FLOURINE FINISHING



ECOPERL PRODUCTS

- ▶ PFAS-free product range
- ▶ Highly water- and stain repellent (water-based)
- ▶ Excellent performance on cotton, synthetics and blend
- ▶ Breathable and wash fast
- ▶ Inherently biodegradable (acc to OECD 302B)
- ▶ USDA certified biobased products e.g. Ecoperl 4: 54% [BioPreferred](#)





01.05.2024

Annabel Pohlmeier, Technical Manager Finishing, BF Textile

ECOPERL®

ECOPERL 4

- **Excellent water and water-based stain repellency**
- Very good wash durability
- Neutral handle
- Perfect for outdoor textiles
- Biobased content 54% (USDA)
- U.S. TSCA

ECOPERL BOOST

- Cross-linking polymer
- Improves durability to washing
- **Best performance on PES**
- Biobased content 45%
- U.S. TSCA

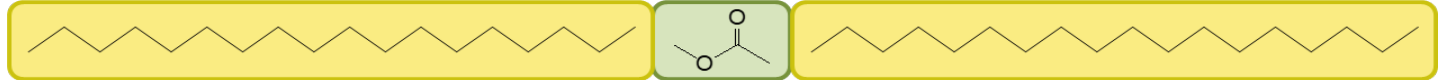
TUBICOAT FIX H26

- Crosslinking agent based on polyisocyanate, blocked, free from butanone oxime
- Improves durability to washing
- **Best performance on CO**
- U.S. TSCA

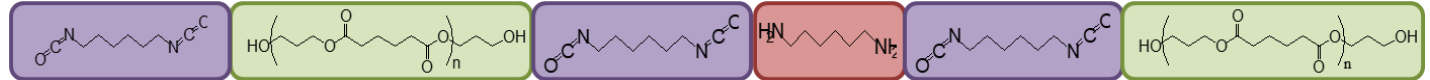
ECOPERL YWR

- **Very good anti-wick effect**
- Application via yarn dyeing machine, lick roller/ dosing system or drum washer
- Very good durability to washing
- Biobased content 49% (USDA)
- U.S. TSCA

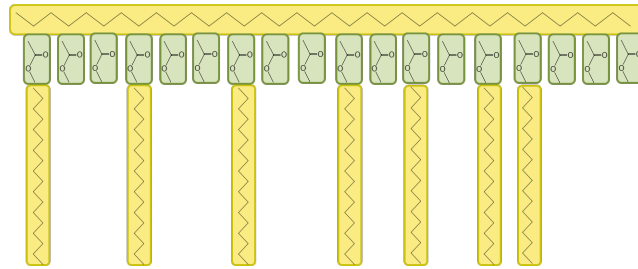
Waxes



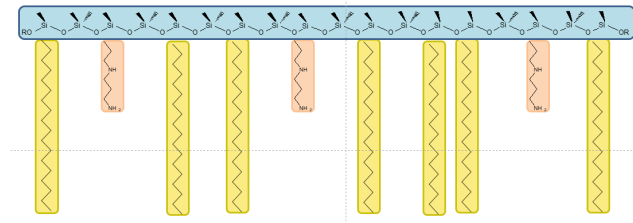
Polyurethane



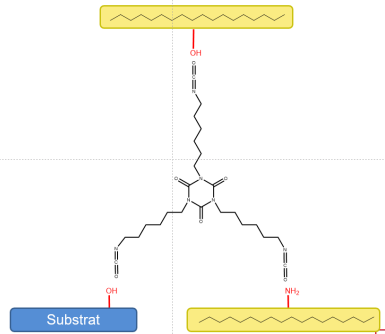
Acrylate



Silicone resin



Isocyanate



DIFFERENTIATION OF ECOPERL PRODUCTS

Components	ECOPERL BOOST	ECOPERL 4	TUBICOAT FIX H 26	ECOPERL BOOST
Waxes	-	X	-	X
Silicone wax	-	X	-	X
Alkyd resin	-	-	-	-
Cationic emulsifier	-	X	-	X
Blocked isocyanate	-	-	X	X
Polyurethane	-	-	-	-
Polyacrylat	X	X	-	X

COMPARISON PFAS VS. NON FLOURINE

DWR STRATEGY @ CHT GROUP

Customer needs water and / or oil repellent

Standard protection

AGROTECH / BUILDTECH / CLOTHTECH / GEOTECH /
HOMETECH / PACKTECH / SPORTTECH

Protection of people and environment

INDUTECH / MEDTECH / MOBILTECH /
OEKOTECH / PROTECH

PFAS free

ECOPERL

C6 Fluorocarbon

TUBIGUARD

Optimal CHT product and recipe formulation for customer application

FLUOROCARBONE VS NON FLOURINE REPELENCY

Categories	PFAS-free Water repellency	Fluorcarbon
CHT product name	ECOPERL	TUBIGUARD
Repellent effect	High, Water and liquid stains, Water-oil mixtures e.g. milk, Water-alcohol mixtures such as wine, Water-salt mixtures such as blood	Very high, Water, oil, alcohol, chemicals
Product amount	High, 50 – 150 g/l	Low, 30 – 100 g/l
Wash durability (depending on the type of laundry and temperature)	Very good	Very good
Ecological and toxicological effects	Free from all fluorinated bonds	C6-FC-based
Application fields	Without limitations	For medical and protective textiles only

WHAT IS IMPACTING THE DWR PERFORMANCE ?



Supporting impacts

- ▶ dense & smooth fabric structure
- ▶ pre-wash with an anionic surfactant & intensive rinsing
- ▶ thermal treatment



Opposing impacts

- ▶ open or uneven fabric structure
- ▶ disturbing residuals from previous working processes e.g. spin finishes, sizes, dyeing auxiliaries, detergents

TESTINGS

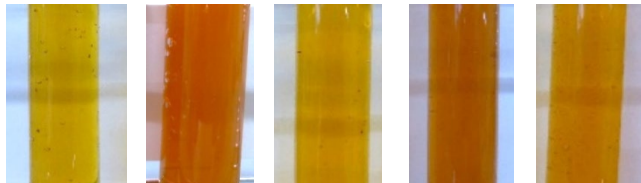
Development and customer needs

EVALUATION OF FABRIC QUALITIES IN RESPECT OF INTERFERING RESIDUAL SUBSTANCES

Dragendorff's reagent

Detection of non-ionic surfactants

Coloration depends on the residual surfactants present (light-low, dark-high)



blind

CO
black

PES
navy

PES
white

PES
orange

Residual content

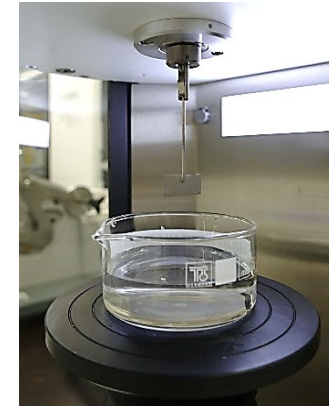
Extraction with petroleum ether
< 0.3 % (mostly) uncritical



Surface tension

Surface tension of the aqueous extract (Morapex) is measured using tensiometry

> 60 mN/m uncritical



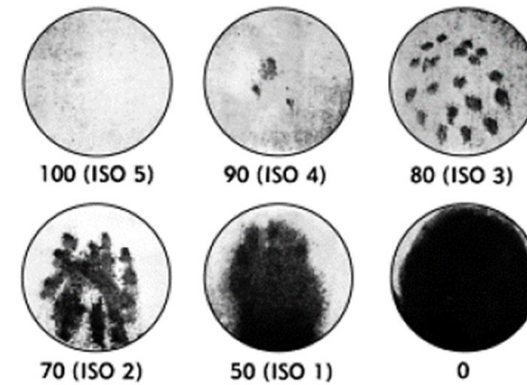


REPELLENCY TEST – SPRAY TEST AATCC 22

- ▶ This method measures **the resistance of fabrics to wetting by water**. Pouring 250 ml water into the funnel of the tester.
- ▶ Most common testing method



STANDARD SPRAY TEST RATINGS



FURTHER REPELLENCY TESTING METHODS:

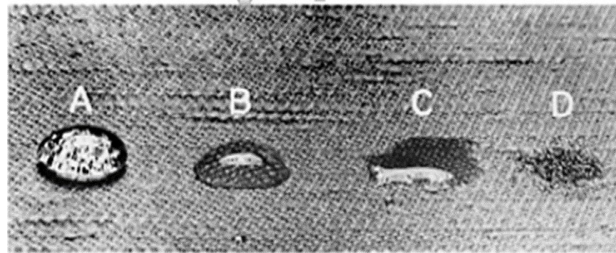
Bundesmann

ISO 9865 / EN 29865



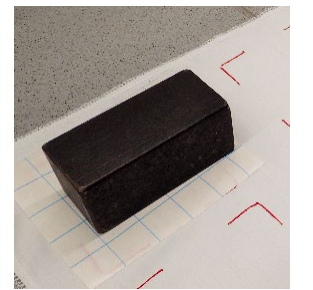
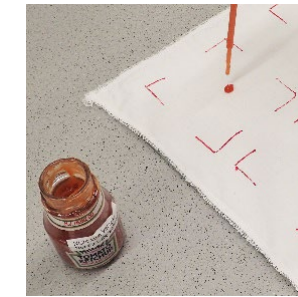
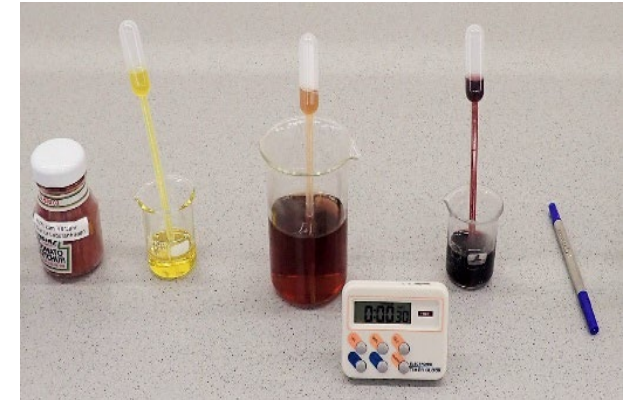
Water/ alcohol test

AATCC 193



Marks & Spencer

P33A



PERFORMANCE

ECOPERL

PERFORMANCE EXAMPLE : ECOPERL 4

Substrate : 100% Cotton woven printed fabric

► Purpose: Home textile

Recipe	g/l
ECOPERL 4	100
ECOPERL FIX H26	20
Kollasol CDO	0.5

Spray test (AATCC 22)	
Original	100
3x 40°C	85
5x 40°C	80



Pad application:
Liquor pick-up: 70%
Drying and Curing at 170 °C, 3 min

SH1209201901ATX

Substrate : Poplin (blue, 148 g/m²)

Recipe	g/l
ECOPERL 4	80
ECOPERL FIX H26	20
Kollasol CDO	1

Spray test (ISO 4920)	
Original	5
3x 40°C	4

Pad application:
Liquor pick-up: 65%
Drying at 110°C and Curing at 150 °C, 2 min

Wascator
Program ISO 6330 4N / 40 °C
20 g ECE washing powder including bleach component
Tumble dried

1376-AB-2017

PERFORMANCE EXAMPLE : ECOPERL 4 + ECOPERL BOOST

Substrate : PA/EL knitted fabric

► Purpose: Water repellent ski wear

Recipe	g/l
ECOPERL 4	60
ECOPERL BOOST	40
Kollasol CDO	0,5

Spray test (ISO 4920)	
Original	5
3x 40°C*	5
5x 40°C*	5
10x 40°C*	4

Pad application:

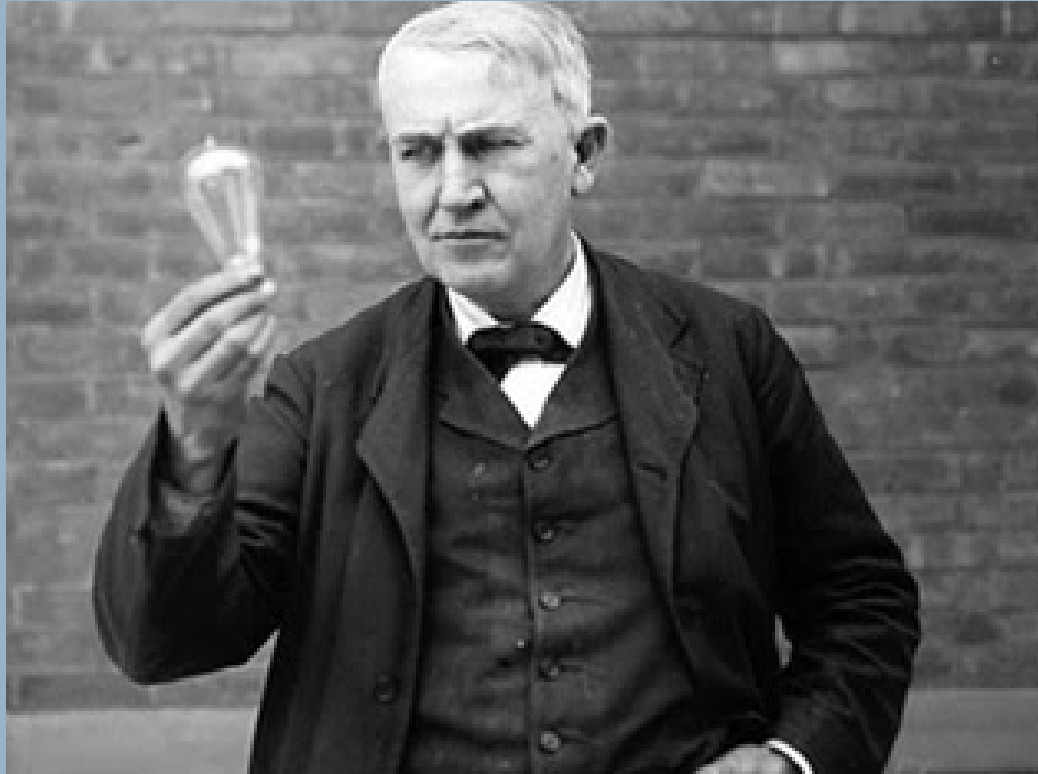
Liquor pick-up: 60%

Drying at 110 °C

Curing at 160 °C, 1 min

*Miele Household washing machine, 2h medium intense program at 40 °C, delicate washing powder, tumble dry

OUTLOOK



PFAS-free finishing is suitable and important for our planet, but is not (yet) always possible!

***„There is a way to do it better,
find it!“***

Thomas Alva Edison (1847-1931)



01.05.2024

ANY QUESTIONS?

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ANHANG

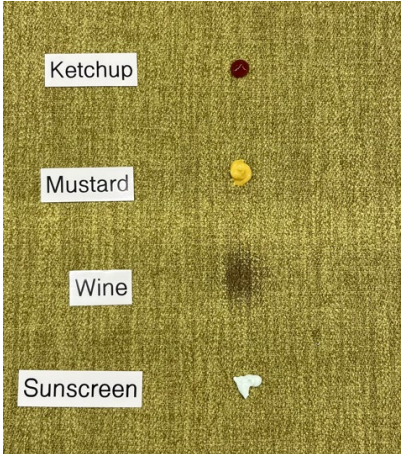
PERFORMANCE EXAMPLE : ECOPERL 4

Substrate : 100% PES

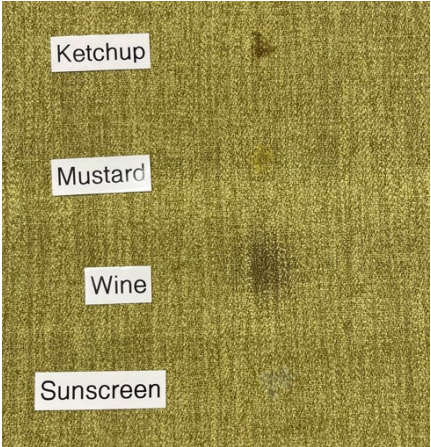
► Purpose: water-based stain repellency

Untreated base fabric:

Initial after staining

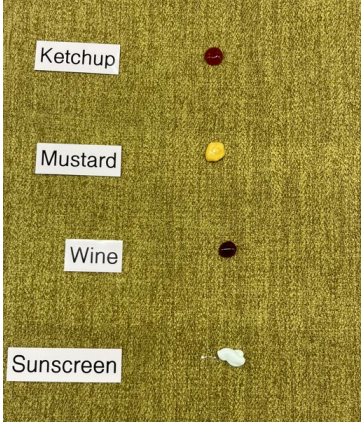


After wiping



Treated with ECOPERL 4

Initial after staining



After wiping

