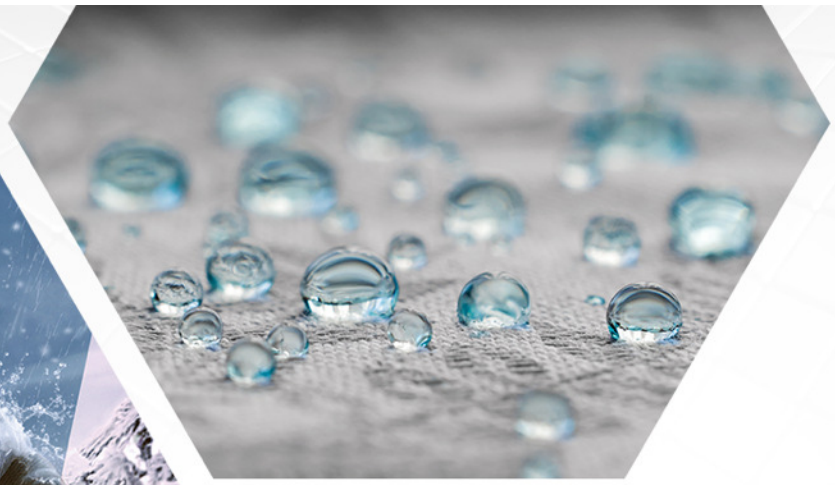

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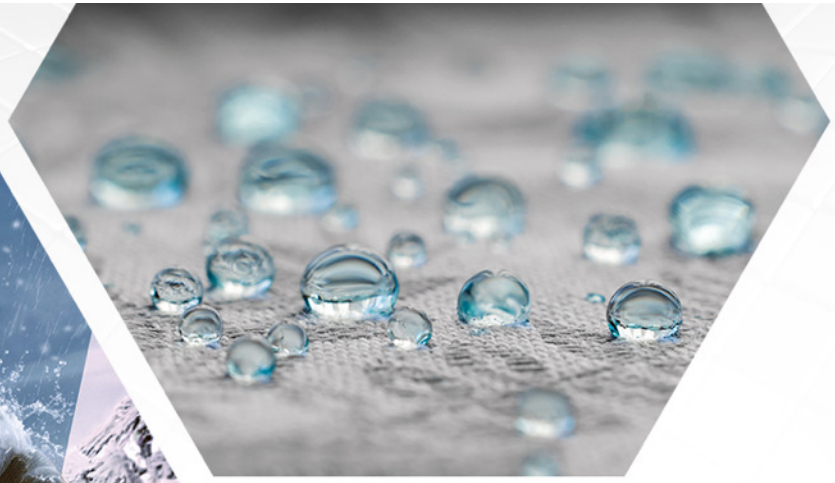
Navigating through the PFC dilemma

12 April 2018 | ITECH-LYON
79ème CONGRÈS DE l'ACIT

Bruno Terrier - Global Project Manager
Huntsman Textile Effects

Agenda

- Industry macro trends and the PFC debate
  - Paradigms framing our thinking re: sustainability, transparency and collaboration
- Navigating through the DWR challenge
  - Framing Durable Water Repellency (DWR)
  - Spectrum of technologies / Alternatives
  - Performance challenges
- New solutions
  - PHOBOTEX® RSY
  - ZELAN™ R3
- Summary and questions



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Macro trends and the PFC debate

Macro Trends

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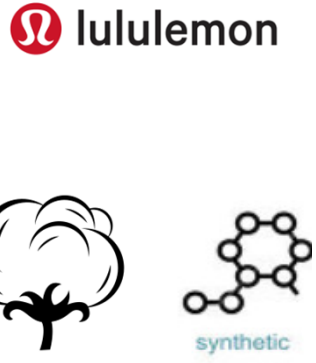
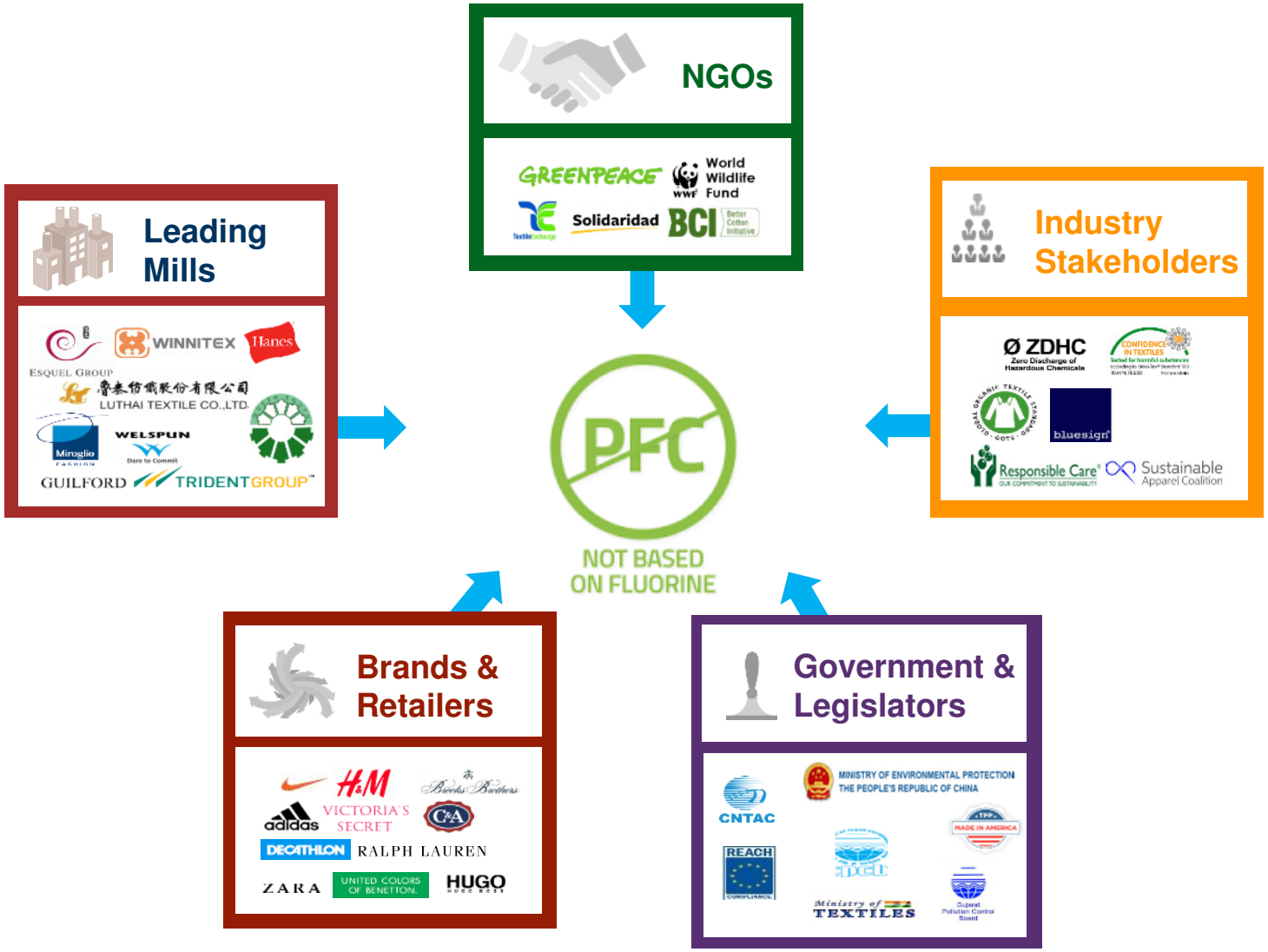
Fiber Shift	Environmental Protection	Supply Chain Changes	Legislation Changes	Manufacturing Excellence
				
				

The industry is facing a paradigm shift and challenging times ahead

PFC-free drive across all stakeholders



On-going pressure for PFC-Free

Source: Greenpeace_International.org

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Regulatory vs. Voluntary

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Mandatory Regulation
(National & Regional)

- EU Reach
- US EPA
- Calif. Prop. 65
- China GB Std.

Voluntary Regulation
(Industry , Association or Brand Driven)

- Chemical Assessments
- ZDHC
- Bluesign
- Higg INDEX

Registration
Evaluation
Authorization
and restriction of
Chemicals

Applies to substances (alone ar
formulations) manufactured or i
EU.
Applies to EU imported articles
substances, irrespective of whe
articles
are made

CHEM-IQ^{SM}

Ø ZDHC
Chemical Registry

Sustainability
Innovation
Collaboration

Market drivers and trends in DWR

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Performance Driven

Local & regional Regulations

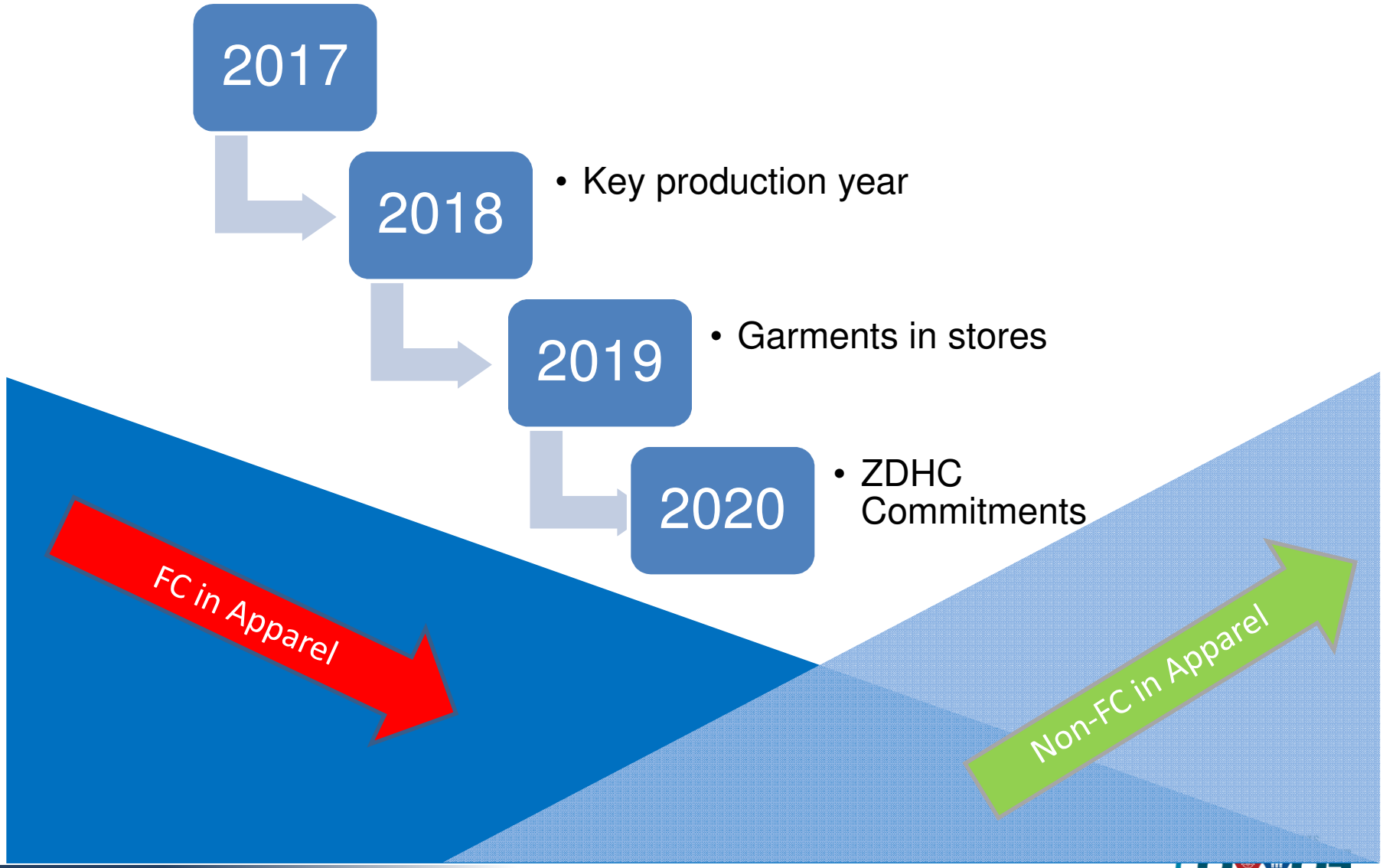
NGO & public pressure

- DWR is Complex, challenging and highly-competitive business landscape
- Technology shift from PFC (incl. C6) to PFC-free / non-fluorinated alternatives in apparel and outdoor textiles
- Industry pressures for stricter environmental compliance
- Brands demand quality, safety, functionality, reliability and Durability of their products remain top priority

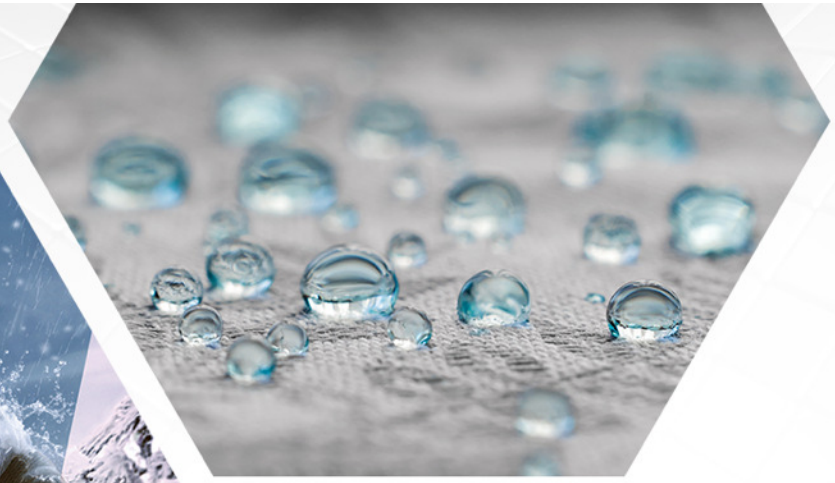
FC – C6

Non FC

Market shift to non-FC by 2020




How will the industry solve these challenges?



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Navigating through the DWR Challenge

Scope of applications

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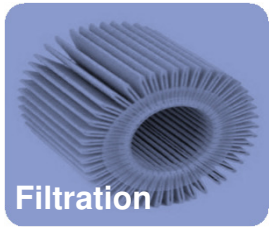
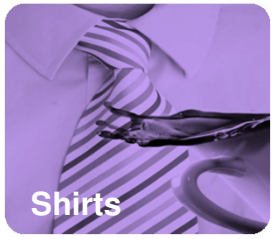
Functional fabrics



Rain Protection

Stain Protection



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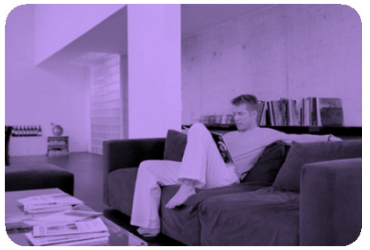
Collaboration

Going beyond just Durable Water Repellency

- Water repellency
- Reduction of water absorption
- Water pressure resistance
- Oil repellency
- Chemical resistance
- Stain repellency
  - *– allows spot cleaning of stains*
- Stain release
  - *– removal of stains during laundering*
- Dry soil resistance



Achieving the desired effects depends on the type of chemistry used, while product selection depends on requirements and end-use!

PFC alternatives

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- Global manufacturers are rapidly moving to new technologies.
- The marketplace is awash with “alternatives.”
  - With fluorinated carbons and without fluorinated carbons
  - Hazards, exposure, risk and life-cycle environmental impacts need to be understood.
- A product that has “no fluorine” is not necessarily safer or better.

*What is needed to know that an “**alternative**” is suitable and avoid “**regrettable substitution**?”*

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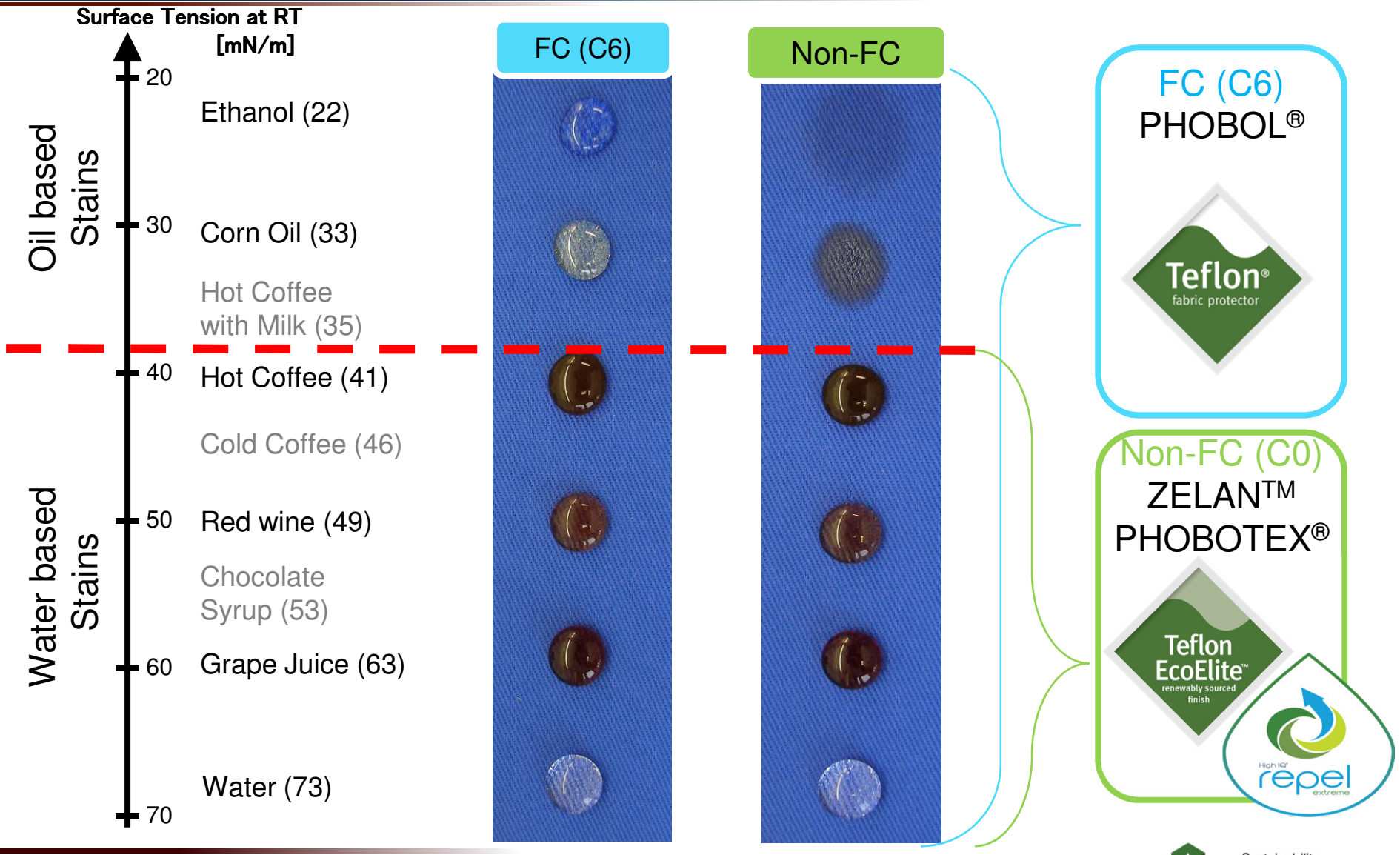
Alternatives – Desired attributes

- Have a more favorable environmental, health and safety (EHS) profile.

- First and foremost, the alternative technologies must deliver the performance required for the end-use application.

We must start to take into account a FIT FOR PURPOSE approach!

Stain Repellency



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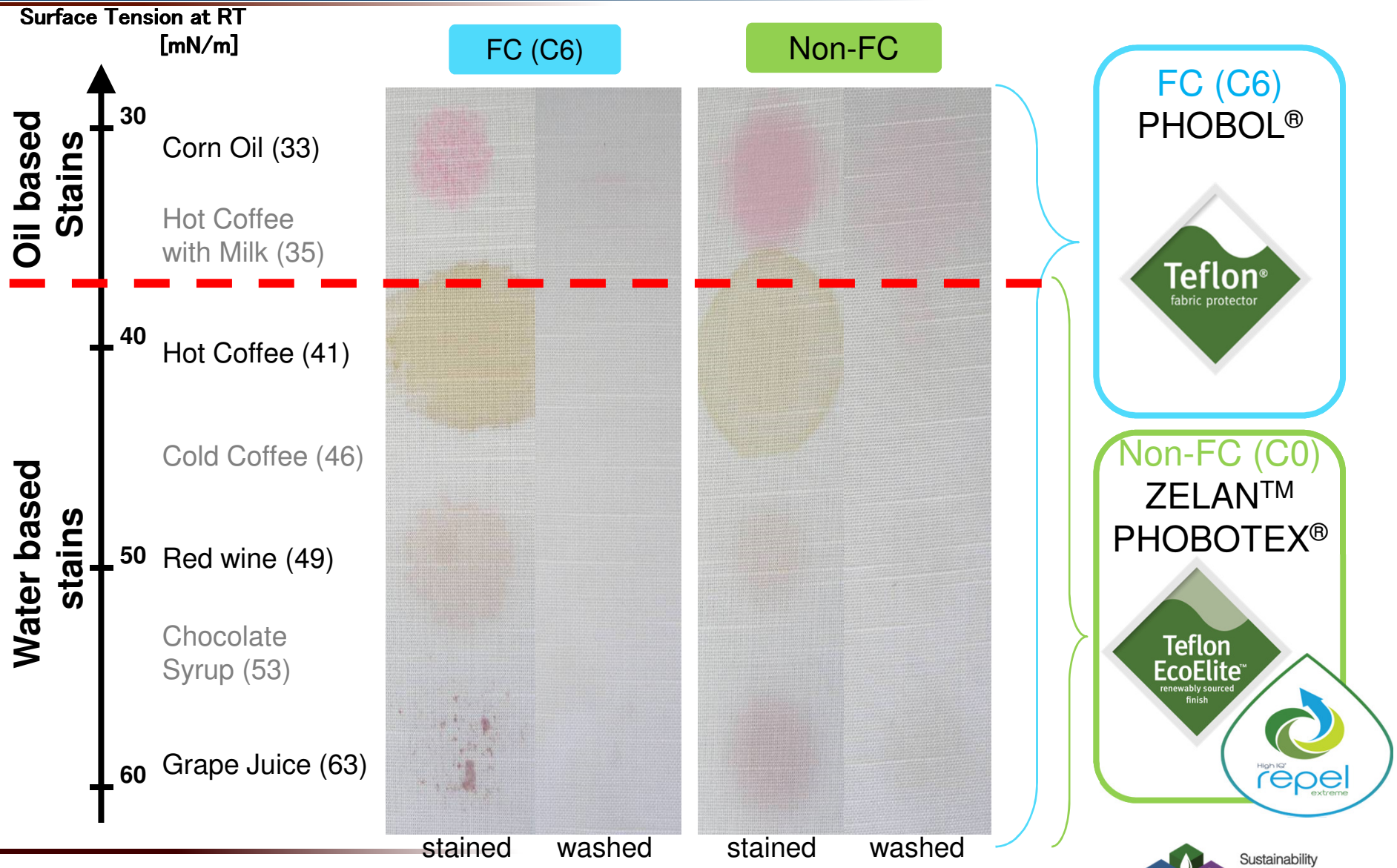
Stain Release



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Durable Water Repellency
Many different options

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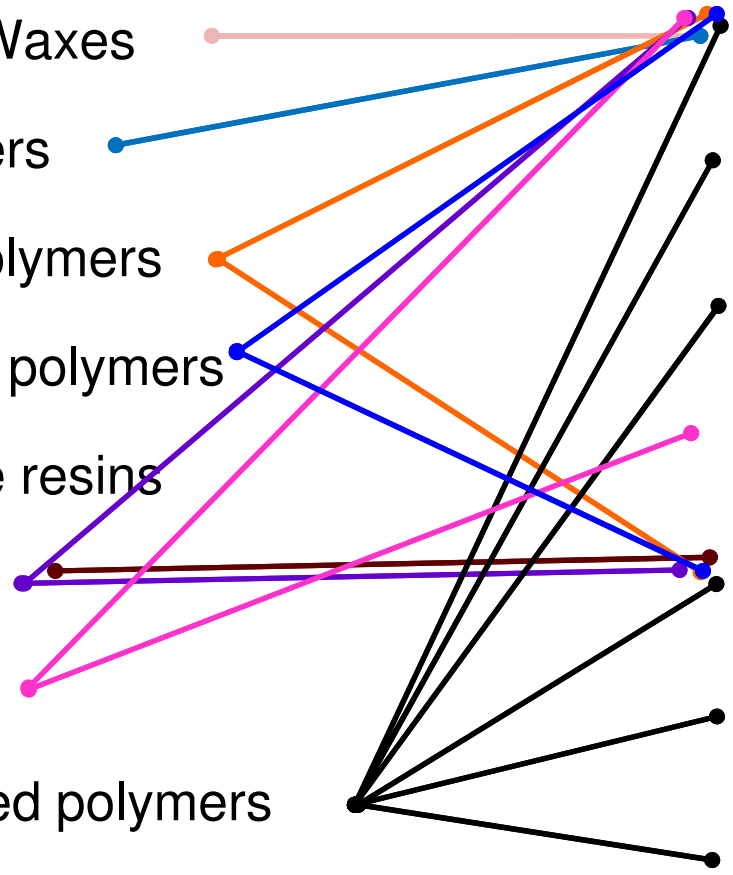
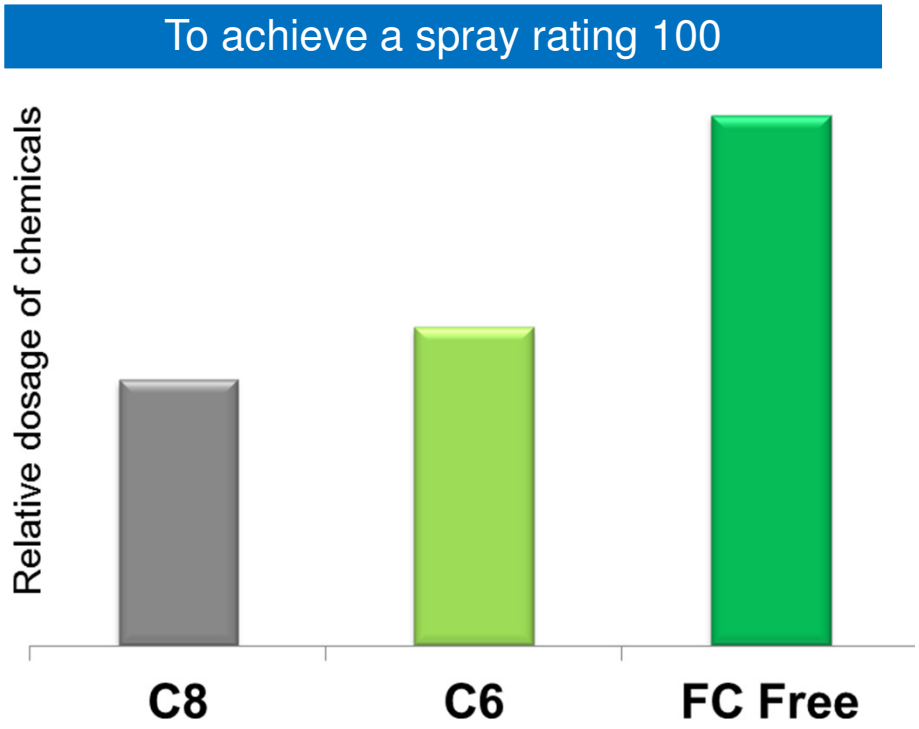
DWR Technologies	Performance
• Paraffin Waxes	• Water repellency
• Dendrimers	• Oil repellency
• Acrylic polymers	• Stain release
• Urethane polymers	• Soft handle
• Melamine resins	• Abrasion resistance
• Particles	• Air-dry performance
• Silicones	• Laundry durability
• Fluorinated polymers	



Challenges of the transition



- FC has much higher efficiency at lower amount.
- FC free generally needs higher dosage which may impact:-
  - Coating adhesion
  - Lamination bonding strength
  - Seam slippage
  - Chalk marks
  - Color fastness & shade
  - Handle
  - Cost, etc.

Product and application process needs to be selected carefully subject to fabrication, end-use and requirement

DWR Capability Pre-transition

	Run	Wind	Rain	Storm
End-use				
Processes	FC-treatment → pad / dry / cure			
	Opt. Calendering	Calendering or by fabric construction	Back coating (solvent) → coat / dry / cure	Lamination → laminate / dry / cure
Performance	Spray: Initial: 4-5 5 -20 x hl: 3-4 Shiny effect:	Spray: Initial: 4-5 5 - 20 x hl: 3-4 Water column: > 400 mm Wind repellent: 10 – 50 mm/s Breathability (MVP): > 3000 g/m²/24h	Spray: Initial: 4-5 5 - 20 x hl: 3-4 Water column: > 1500 mm Wind repellent: 0 – 10 mm/s Breathability (MVP): > 3000 g/m²/24h	Spray: Initial: 4-5 5 - 20 x hl: 3-4 Water column: > 5000 mm Wind repellent: 0 – 10 mm/s Breathability (MVP): > 5000 g/m²/24h

DWR Today

End-use

Run

1 : 1 replacement of the FC finishing by Non FC without issues is possible

Wind

1 : 1 replacement of the FC finishing by Non FC without issues is possible

Rain

1 : 1 replacement of the FC finishing by Non FC not always possible, because a coating step is involved

Storm

1 : 1 replacement of the FC finishing by Non FC not always possible, because a coating / lamination step is involved

A certain performance compromise and / or process change has to be considered.

Challenges of the Transition

Surface Tension of the Finishing

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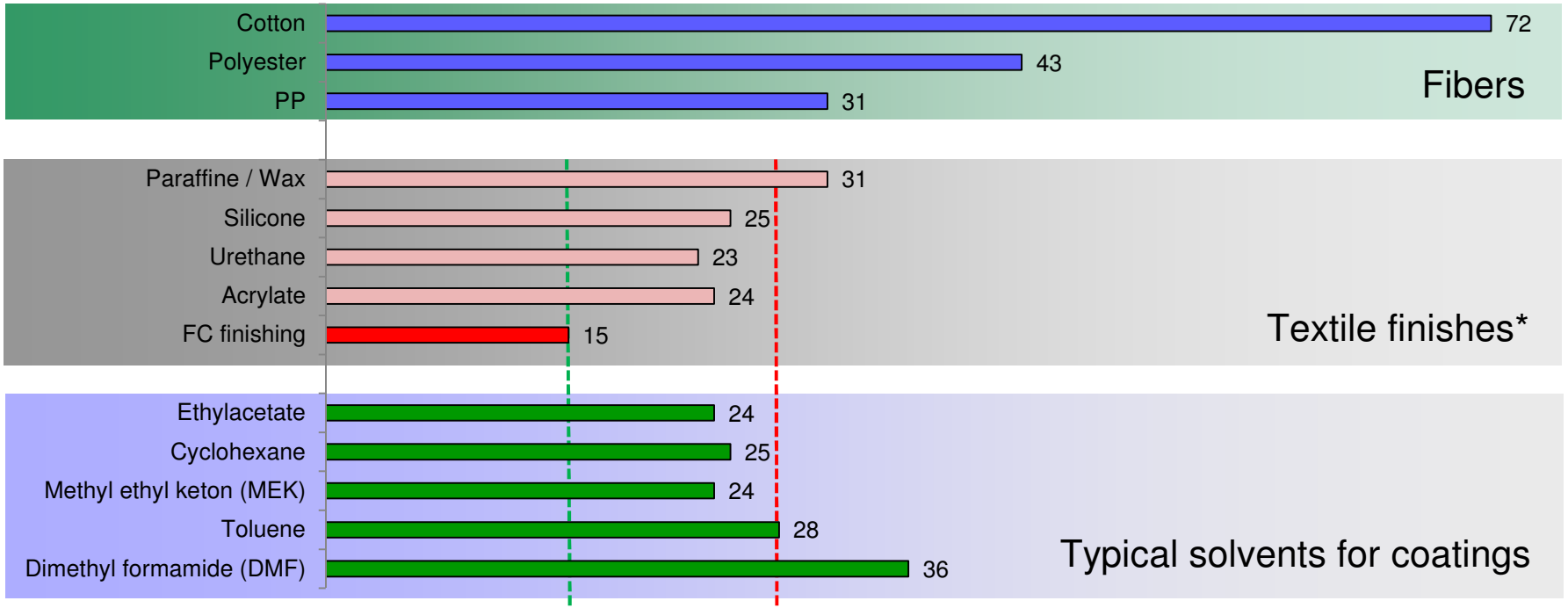
Surface tension mN/m at 20 °C



* The final achievable surface tension of the finishing may vary by additional other components which are used in the product formulation.

FC finishing repels all of the commonly used solvents

Non-FC finishing do not repel most of the commonly used solvents

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Non-FC alternatives

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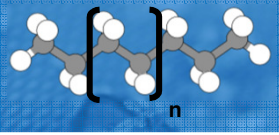
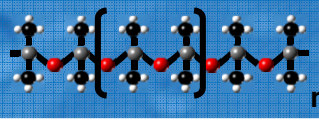
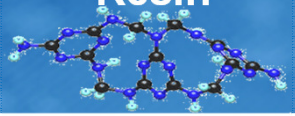
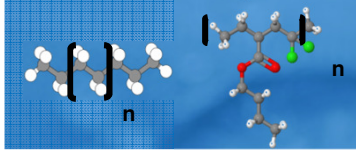
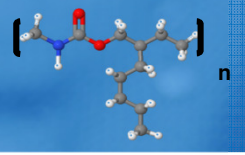
Paraffin	Silicone	Fat-modified Resin	Wax / Acrylate	Urethane
				
▪ Good water repellency ▪ Water proof ▪ No wash durability ▪ Impact on breathability ▪ No oil repellency	▪ Good water repellency ▪ Good stain repellency ▪ Good durability ▪ Outstanding LAD performance ▪ Soft handle ▪ Breathable ▪ No oil repellency ▪ Not possible to coat/laminate	▪ Good water repellency ▪ Good stain repellency against water based stains ▪ Very good durability ▪ Used as extender in combination with FC ▪ No oil repellency	▪ Good water repellency ▪ Good stain repellency against water based stains ▪ Excellent durability on all fibers ▪ Formaldehyde free ▪ No oil repellency	▪ Good water repellency ▪ Good stain repellency against water based stains ▪ Excellent durability on all fibers ▪ Formaldehyde free ▪ No oil repellency
PHOBOTEX® APK, ZAN	**PHOBOTEX® WS/BC**	**PHOBOTEX® JVA, RSH, RHP, RHW**	**PHOBOTEX® RCO, RSY**	**ZELAN™ R3**

Switching from PFC to PFC-Free

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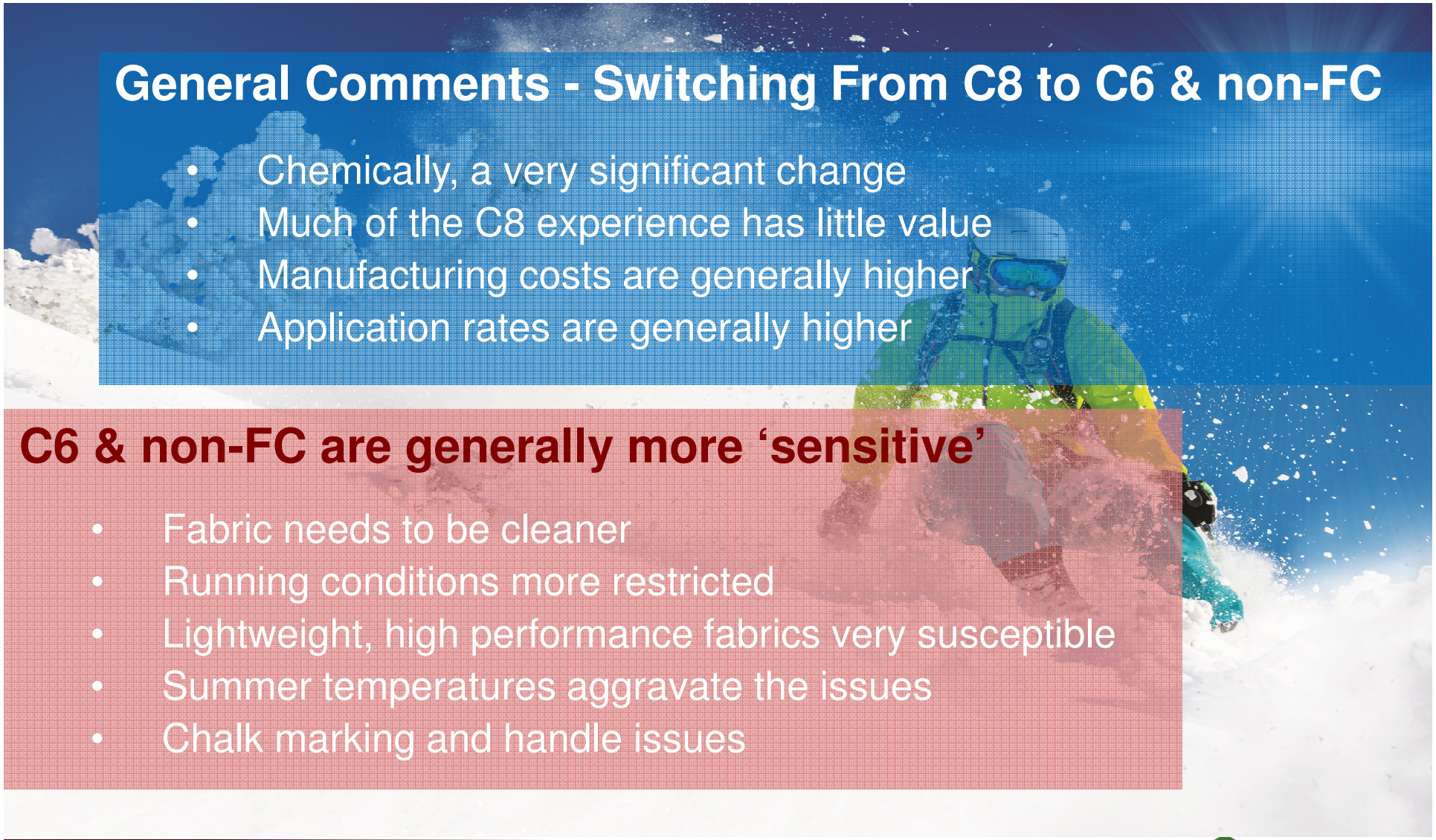
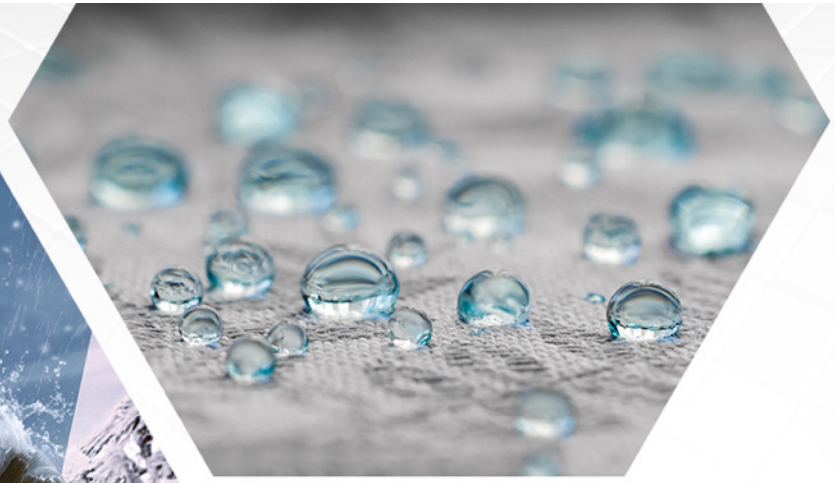


General Comments - Switching From C8 to C6 & non-FC

- Chemically, a very significant change
- Much of the C8 experience has little value
- Manufacturing costs are generally higher
- Application rates are generally higher

C6 & non-FC are generally more 'sensitive'

- Fabric needs to be cleaner
- Running conditions more restricted
- Lightweight, high performance fabrics very susceptible
- Summer temperatures aggravate the issues
- Chalk marking and handle issues



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New solutions to meet market expectations

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PHOBOTEX® RSY

Raising the bar in Durable Water Repellency

Benefits:

- Excellent water repellency on synthetic fabrics and their blends
- Excellent wash durability up to 20 Home Launderings and beyond
- Excellent abrasion resistance
- Superior coating, bonding and post embellishment compatibility
- Additionally suitable for cellulosic based materials
- Low impact against phenolic yellowing
- Qualifies for High IQ® Repel Performance Assurance scheme
- Formaldehyde-free
- Compliant with bluesign®, ZDHC and suitable for OEKO-TEX® Standard 100

bluesign® APPROVED

CONFIDENCE IN TEXTILES Tested for harmful substances according to Oeko-Tex® Standard 100 00000000 Institute

Ø ZDHC Zero Discharge of Hazardous Chemicals

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Brand assurance scheme

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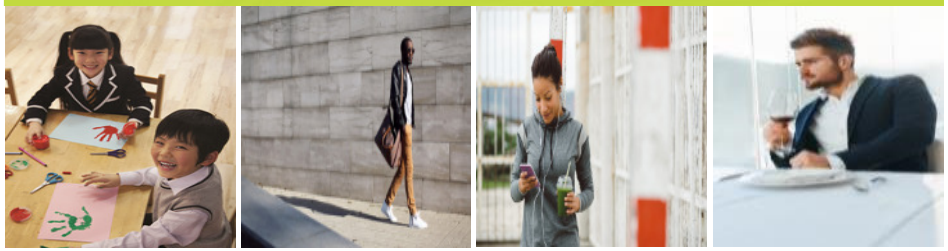
High IQ® Repel **Everyday**

- Repels water
- Repels stains
- Durable

School Wear | Casual Wear | Atheisure Wear | Business Wear

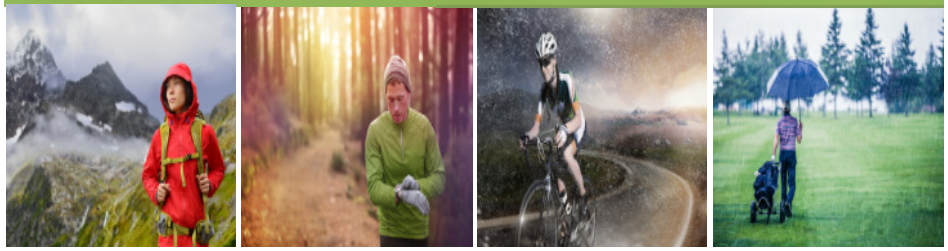


High IQ® repel everyday

High IQ® Repel **Outdoor**

- Rain protection
- Stain & splash proof
- Cleaner for longer

Hiking and Trekking | Running | Cycling | Golf



High IQ® repel outdoor

High IQ® Repel **Extreme**

- Highest protection against the elements
- Extremely durable

Snow Boarding | Skiing | Mountaineering | Climbing

High IQ® repel extreme


Teflon
EcoElite™
renewably sourced
finish
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ZELAN™ R3
Made from nature
to stand up to
the elements
USDA
CERTIFIED
BIOBASED
PRODUCT
PRODUCT 60%
Chemours™

The technology in Teflon EcoElite™ renewably sourced finish

- Zelan™ R3 contains 60% renewably sourced content per ASTM method D6866, and is USDA Certified Biobased Product
- Zelan™ R3 is bluesign® approved
- Renewable refers to material from plant origin that can be replenished naturally over time
- Repels water and common water-based liquids
- Delivers high-performance repellency to at least 10 washes and up to 30 washes
- Performs well on cotton, synthetics, and blends
- Is applied in pad bath applications at loading levels comparable to other repellent finishes

Renewably sourced

Repels water and water-based stains

USDA CERTIFIED BIOBASED PRODUCT
PRODUCT 60%

bluesign® APPROVED


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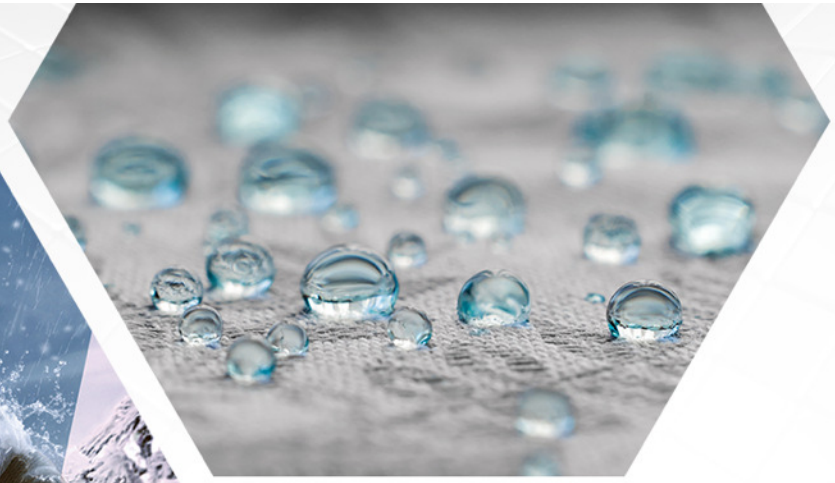
The Future
of DWR



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Thank You

Questions & Answers

Bruno Terrier - Global Project Manager
Huntsman Textile Effects