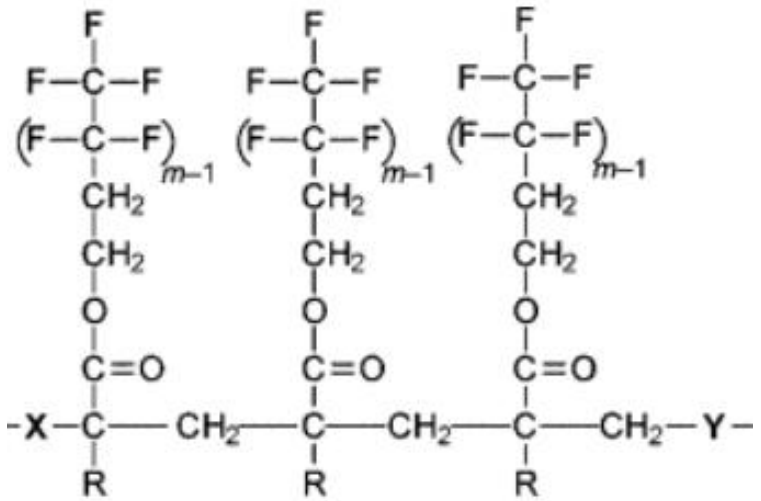
Functional additives

biobased solutions for FR, dyes and antimicrobials

AddBIO | Centexbel | Brecht Demedts | Myriam Vanneste

PFAS remains the absolute top in performance

- Large family of organic fluorinated chemicals
- Stable C-F bonds and very low surface tension
- Widely used in textiles for:
  - Excellent water, oil and stain repellency
  - Very good wash fastness
  - Chemical resistance
  - High performance even at low level



What are the major problems of PFAS

- Environmental
  - Persistent, bio-accumulative and toxic
  - ‘Forever chemicals’
- Health
  - Increasing evidence of adverse health effects
  - Difficult to assess individual PFAS -> class based concern
- Industry
  - Regulation

What does it means for textiles

- Impact
  - Increasing restriction of DWR chemistry worldwide, but most in EU
  - Mandatory PFAS testing & disclosure
  - Pressure on brands to ban PFAS
  - Non-compliance = market exclusion
- Risk
  - Low performance of alternatives

Commercial alternatives

- Silicone
- Solgel
- Hybrids
- Nanoparticles
- Fatty acid modified resins and wax
- Hyperbranched polymers
- Combination of above mentioned

The BIOBASED alternatives

Alternatives



Carnauba wax



Beeswax

Naturally occuring waxes

- Expensive
- Natural
- Allergens possible



Soybean wax

Waxes synthetized from natural oils

- From oleochemistry
- E.g. Naturewax (Cargill), agri-pure (Cargill)
- Also emulsified versions available (e.g. Govi, Solenis)

Provides some water-resistance, but no water repellency

Alternative – biobased silicone

- Up to 81% biobased
- Silicone based
- Uncertain whether silicones will come in the future as "regrettable substitute" (e.g. persistence, cyclic silicones)



Alternative – ultrahydrophobic PU systems

- Biobased polyols
- Several mechanisms to add additional hydrophobicity
  - Focus on long chain fatty acids
  - Not a simple task
  - Not for formulaters, but for PU synthesis companies
- Lots of expertise at Centexbel
  - Now available: proven washable water repellent (partially biobased) PU systems
  - Contact: David De Smet dds@centexbel.be

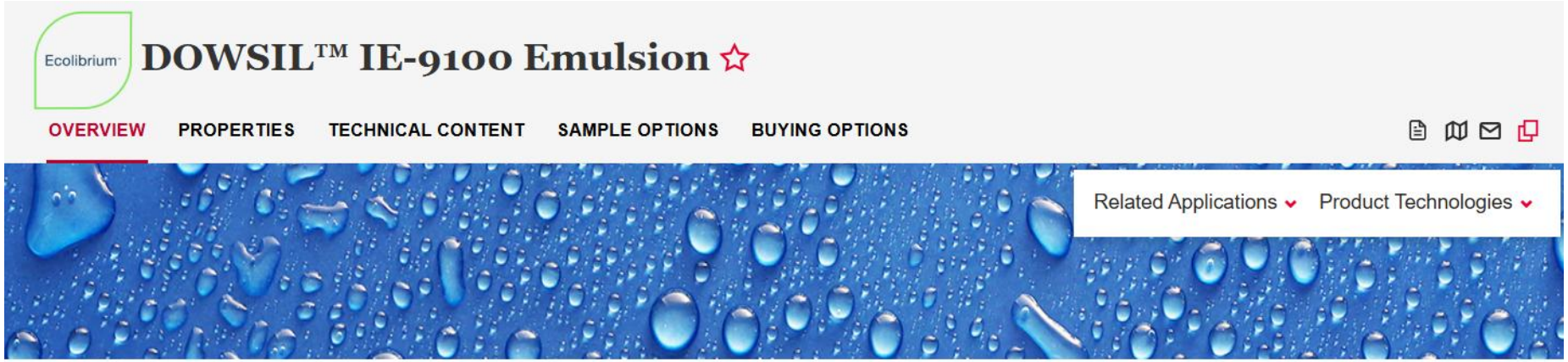
biobased alternatives for water repellency in textiles

- Importance of **substrate**
- **Alternatives exist** for water repellency
- **No alternatives available** for oil repellency
- Biobased alternatives score mediocre in our tests
- Tested products
  - Biobased wax emulsion
  - Partially biobased hydrophobised PU (pfasfree)
  - Partially biobased silicone (Dowsil)
- Test methods
  - Contact angle (good results)
  - Spray test (mediocre - bad results)

		contact angle			spray test		
		not washed	1x 30°C	5x 30°C	not washed	1x 30°C	5x 30°C
PES	no treatment	78	NA	NA	0	0	0
PES	wax treatment (high)	16	NA	NA	0	0	0
PES	wax treatment (low)	0	NA	NA	0	0	0
PES	pfasfree_48_B2 (high)	125	124	121	2	1	1
PES	pfasfree_48_B2 (low)	123	120	120	1	1	1
PES	biobased silicone	124	112	99	3	1	1

		contact angle			spray test		
		not washed	1x 30°C	5x 30°C	not washed	1x 30°C	5x 30°C
cotton	no treatment	0	NA	NA	0	0	0
cotton	wax treatment (high)	0	NA	NA	0	0	0
cotton	wax treatment (low)	0	NA	NA	0	0	0
cotton	pfasfree_48_B2 (high)	129	127	125	1,5	1	0
cotton	pfasfree_48_B2 (low)	119	NA	NA	0	0	0
cotton	biobased silicone	134	0	NA	2	0	0

Example of commercial products



What is DOWSIL™ IE-9100 Emulsion?

Sustainable, silicone-organic hybrid durable water repellent (DWR) for fashion and technical textiles. DOWSIL™ IE-9100 Emulsion concentrate is easy to dilute and combine with other ingredients to tailor performance to application requirements, including synthetic, natural, and blended fiber fabrics.

Uses

- Durable water repellent finishes on textiles
- Water repellent for synthetic and natural fabrics like polyester, nylon and cotton

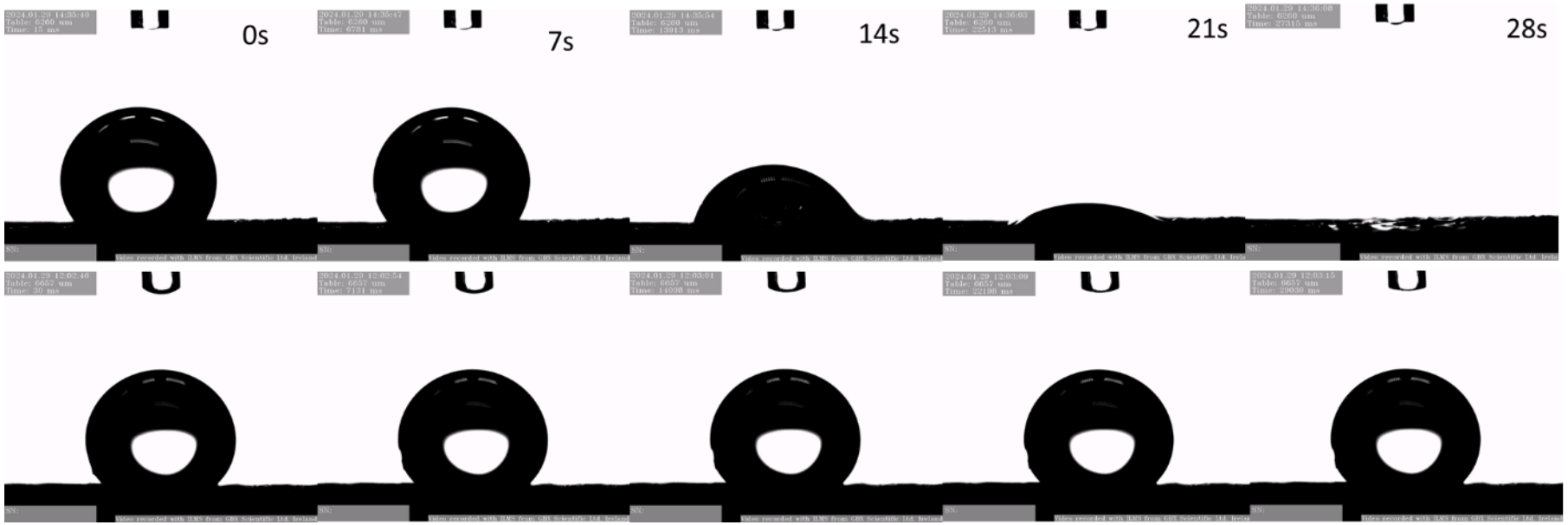
Benefits

- 81% certified biobased according to United States Department of Agriculture
- Common water-based stain protection while retaining color vibrancy
- Durable: excellent water repellency even after 20 home laundering washing cycles

Still inferior to the non-biobased alternative

Dowsil IE 8749 + Phobol XAN

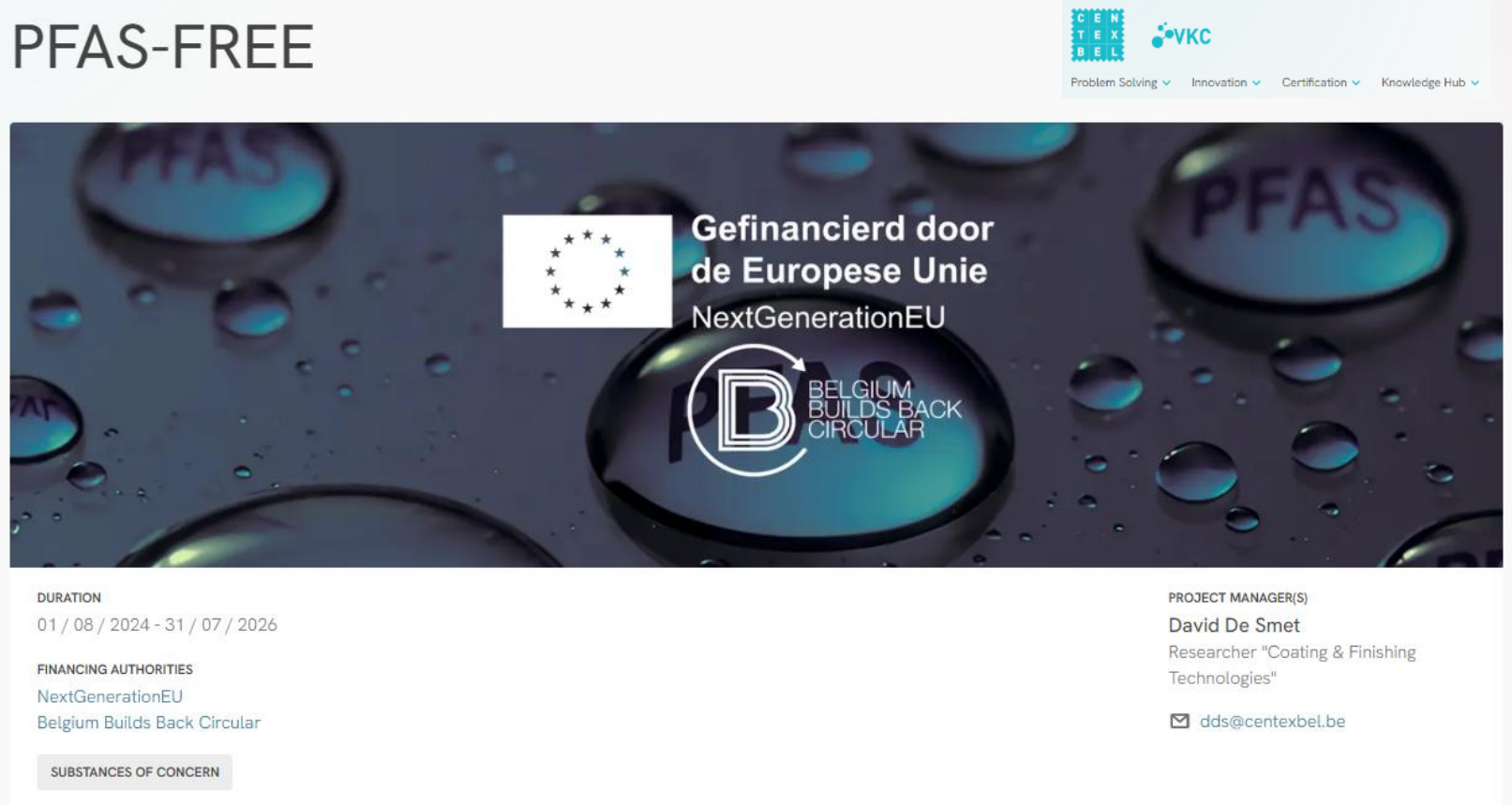
Dowsil IE 8749 + Imprafix 2794



Dowsil IE 8749 + imprafix 2794 also was the best in spray-test after 20x washing at 75°C

About PFAS-free

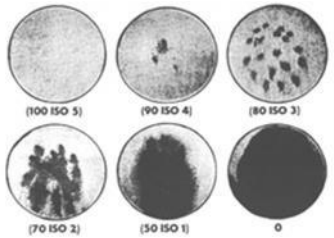
PFAS-free



https://www.centexbel.be/en/innovation/research/pfas-free

Interest? Contact David De Smet dds@centexbel.be

Spray test









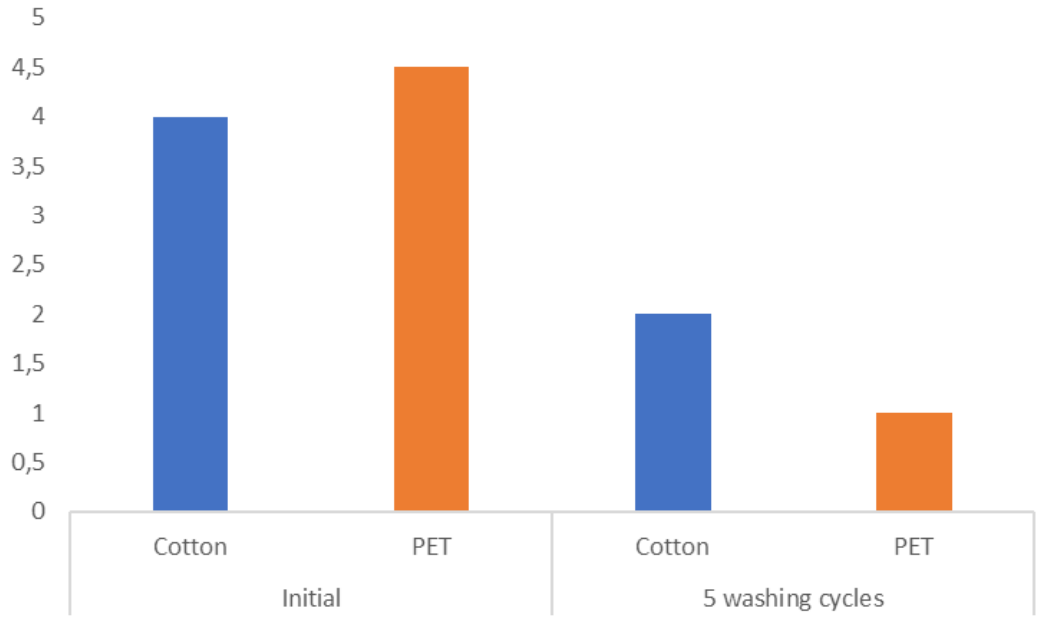
Untreated cotton
Score 0

PFAS-FREE biobased treatment cotton
Score 4

SSbD fluorfree water repellent 1

PFAS-free

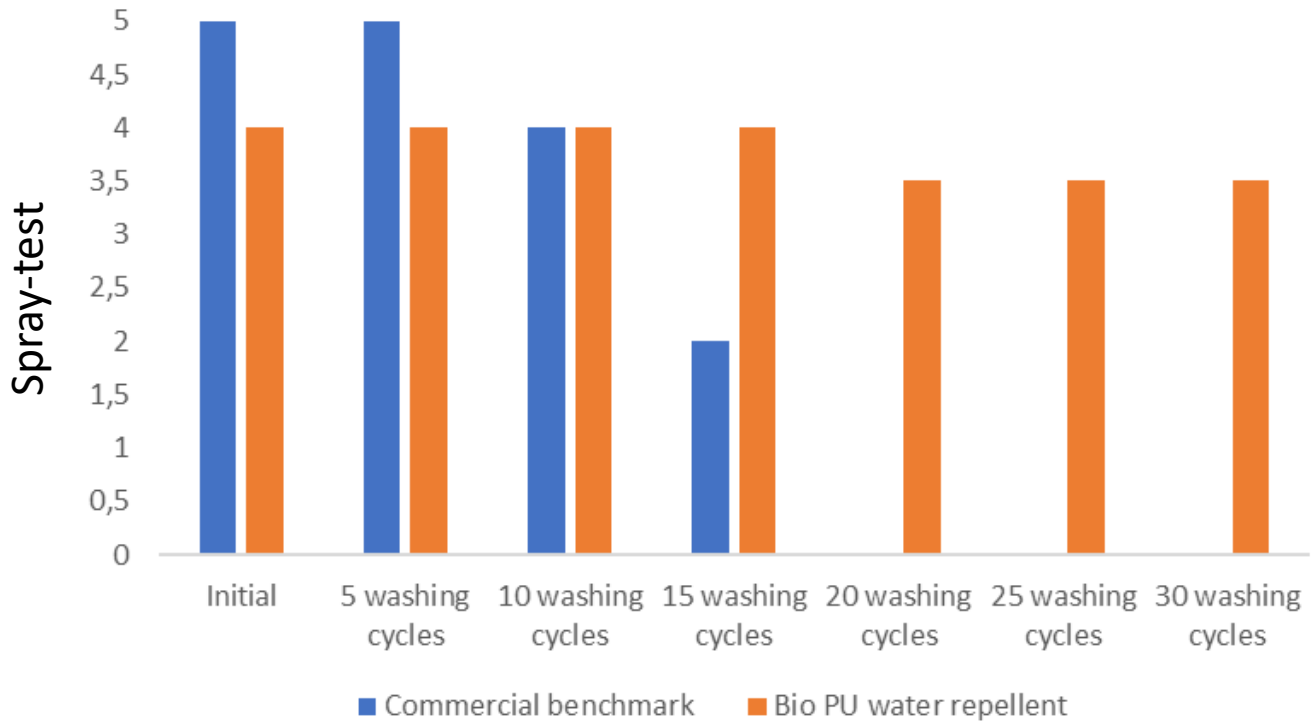
- High biobased content and excellent water repellency
- Wash fastness needs to be optimised



SSbD fluorfree water repellent 2

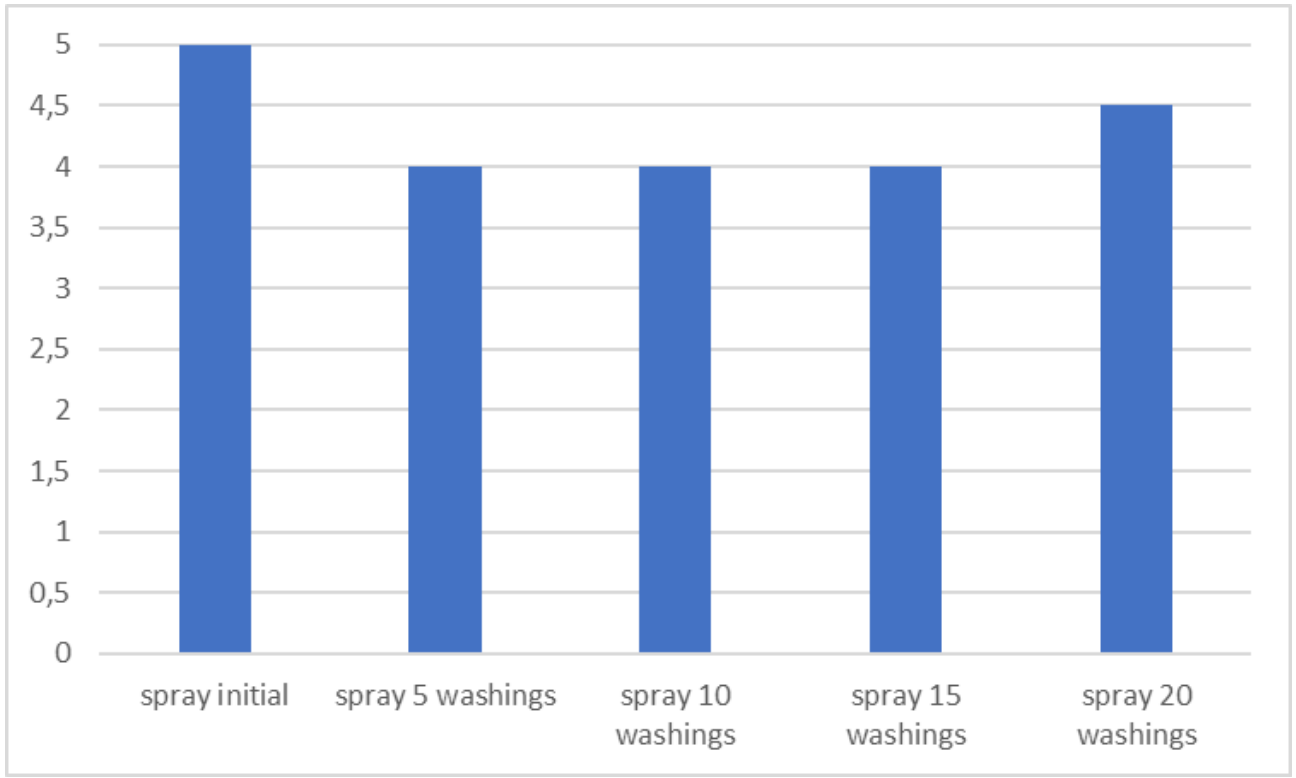
PFAS-free

- High biobased content (> 85%) and high wash durability



Research @ Centexbel

- Improving wash fastness further by modifying polymer



Thank you for your attention!







