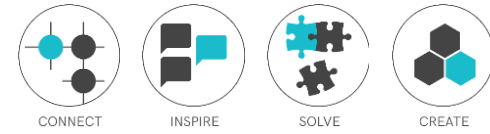


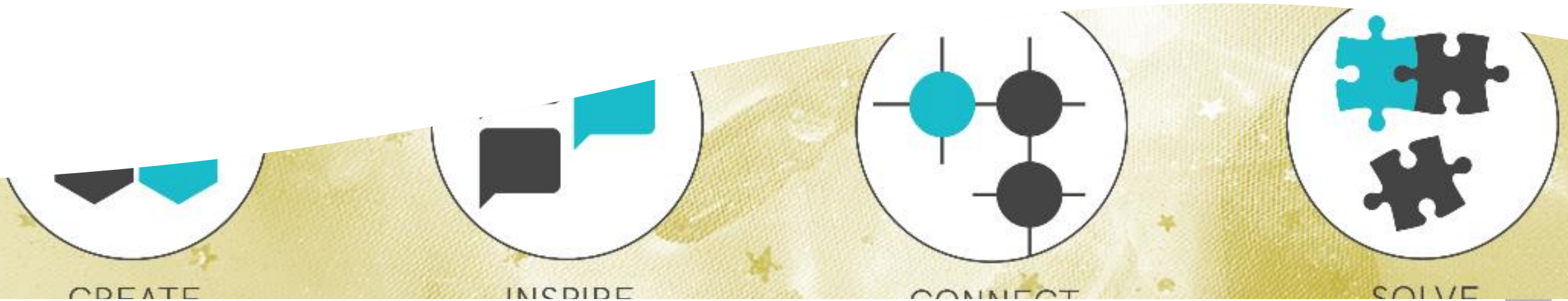
PFAS in the textile industry: a curse or a blessing

BE PFAS-event | Day 2 | Session 1 Breaking the cycle: addressing PFAS concentration in recyclable products

Stijn Steuperaert – Consultant environment & toxicology



Introduction Centexbel



Collective Research Centre



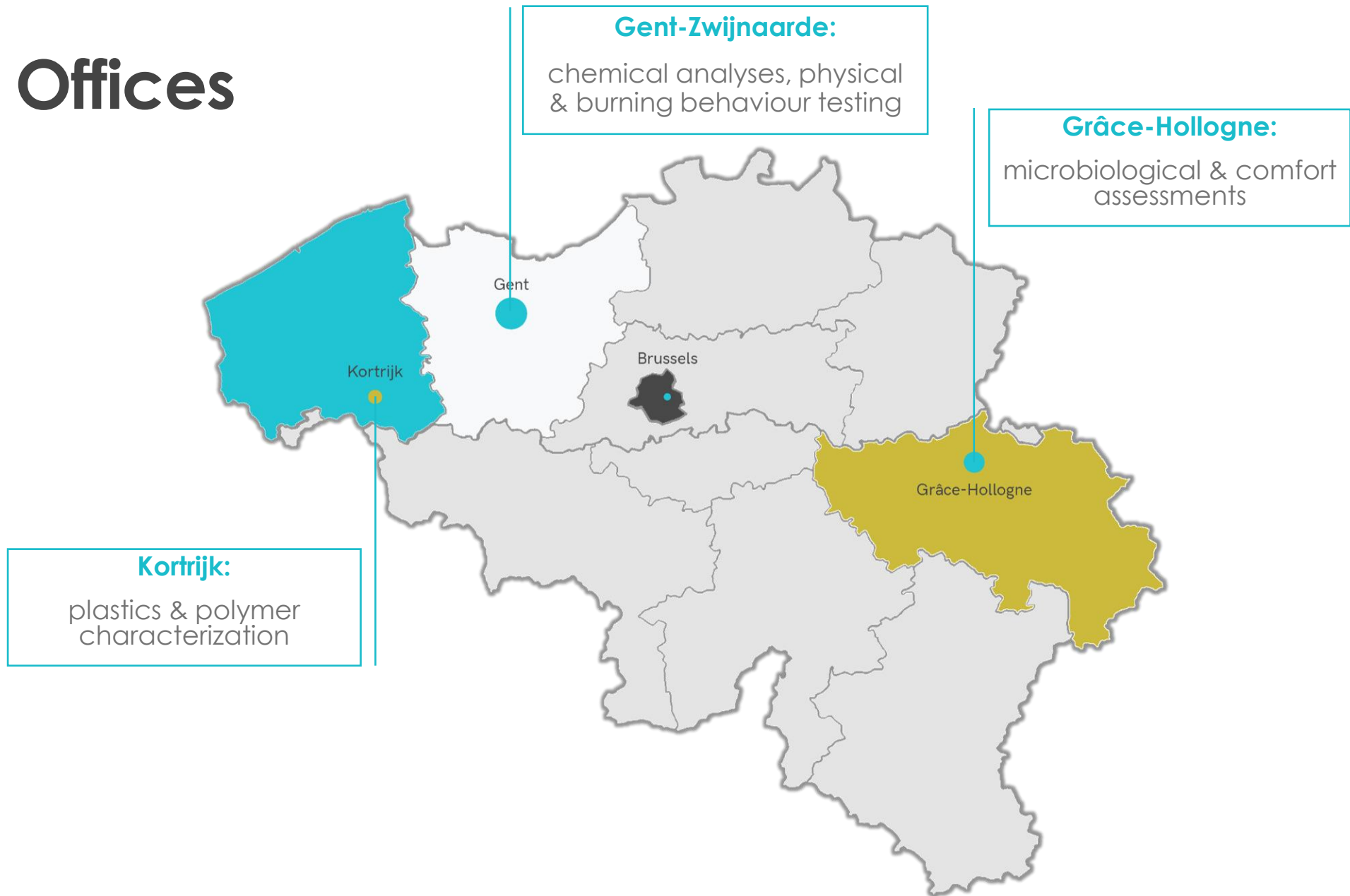
Membership organisation

- uniting all Belgian textile producing companies and European companies from associated industrial sectors

Governed by the industry

In service of the industry

Labs & Offices



People



This is who we are

180 enthusiastic and highly educated men and women, committed to an innovating and sustainable industry, and with a keen eye on the future!

Activities

This is what we're doing

Research & Development

Testing

Platforms for open innovation

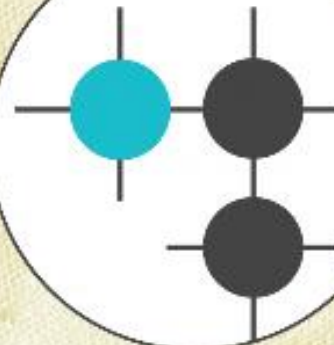
Consultancy & Services

Patent-Cell

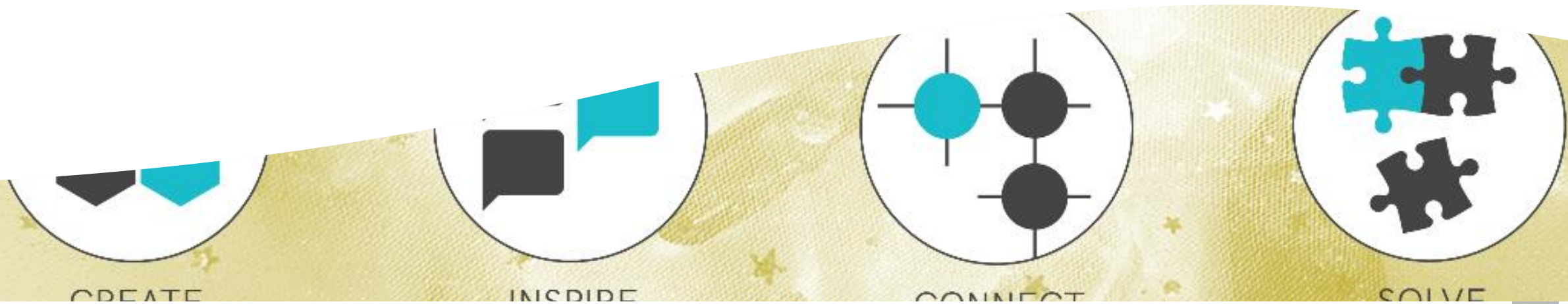
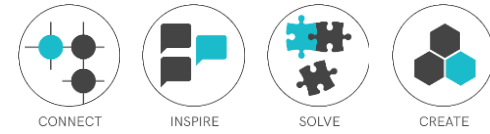
Standards Cells

Product certification

Knowledge dissemination



PFAS in REACH/POP



REACH

- EU-regulation came into force on 01/06/2007
- Applicable on
 - manufacture
 - import
 - bringing on the market
 - the use
- No data no market
- ECHA manages the system
- Purpose
 - Protection of human health and environment
 - Simplification of existing EU legislation



Of chemical substances

Authorisation process

Registry of intentions

- No obligations
- Substances that are relevant for own production?
- Alternatives?
- R&D necessary?

Candidate list

- Obligation of communication
- Alternatives?
- R&D necessary?
- Budget necessary?

Authorisation list

- Shared authorisation? Alternatives?
- R&D necessary?
- Budget?
- Communication?

Annex XVII: PFOA & related substances (shifted to POP)

- PFOA & salts: 25 ppb (0,025 mg/kg)
- PFOA related substances: 1 mg/kg
- Exemption for:
 - Medical devices: PFOA & salts 2 mg/kg
 - Textiles for the protection of workers from risks to their health & safety:

4/07/2023

Annex XVII: C9-C14 PFCA related substances

- Regulation 2021/1297

'68. Linear and branched perfluorocarboxylic acids of the formula $C_nF_{2n+1}-C(=O)OH$ where $n = 8, 9, 10, 11, 12, \text{ or } 13$ (C9-C14 PFCAs), including their salts, and any combinations thereof;

Any C9-C14 PFCA-related substance having a perfluoro group with the formula $C_nF_{2n+1}-$ directly attached to another carbon atom, where $n = 8, 9, 10, 11, 12, \text{ or } 13$, including their salts and any combinations thereof;

Any C9-C14 PFCA-related substance having a perfluoro group with the formula $C_nF_{2n+1}-$ that it is not directly attached to another carbon atom, where $n = 9, 10, 11, 12, 13 \text{ or } 14$ as one of the structural elements, including their salts and any combinations thereof.

The following substances are excluded from this designation

- $C_nF_{2n+1}-X$, where $X = F, Cl, \text{ or } Br$ where $n = 9, 10, 11, 12, 13 \text{ or } 14$, including any combinations thereof,
- $C_nF_{2n+1}-C(=O)OX'$ where $n > 13$ and $X' = \text{any group}$, including salts.

1. Shall not be manufactured, or placed on the market as substances on their own from 25 February 2023.

2. Shall not, from 25 February 2023, be used in, or placed on the market in:

- (a) another substance, as a constituent;
- (b) a mixture;
- (c) an article,

except if the concentration in the substance, the mixture, or the article is below 25 ppb for the sum of C9-C14 PFCAs and their salts or 260 ppb for the sum of C9-C14 PFCA-related substances.

3. By way of derogation to paragraph 2, the concentration limit shall be 10 ppm for the sum of C9-C14 PFCAs, their salts and C9-C14 PFCA related substances, where they are present in a substance to be used as a transported isolated intermediate, provided that the conditions in points (a) to (f) of Article 18(4) of this Regulation are met for the manufacturing of fluorochemicals with a perfluoro carbon chain length equal to or shorter than 6 atoms. The Commission shall review this limit no later than 25 August 2023.

4. Paragraph 2 shall apply from 4 July 2023 to:

- (i) textiles for oil- and water-repellency for the protection of workers from dangerous liquids that comprise risks to their health and safety;
- (ii) the manufacture of polytetrafluoroethylene (PTFE) and polyvinylidene fluoride (PVDF) for the production of:
 - high performance, corrosion resistant gas filter membranes, water filter membranes and membranes for medical textiles;
 - industrial waste heat exchanger equipment;
 - industrial sealants capable of preventing leakage of volatile organic compounds and PM_{2.5} particulates

5. By way of derogation to paragraph 2, the use of C9-C14 PFCAs, their salts and C9-C14 PFCA-related substances shall be allowed until 4 July 2025 for:

- (i) photolithography or etch processes in semiconductor manufacturing;
- (ii) photographic coatings applied to films;
- (iii) invasive and implantable medical devices;
- (iv) fire-fighting foam for liquid fuel vapour suppression and liquid fuel fire (Class B fires) already installed in systems, including both mobile and fixed systems, subject to the following

Annex XVII proposals: PFHxA (C6) + PFAS

- **Restriction proposal PFHxA (C6)** (Germany)

In case of a restriction of all C6-C4 chemistry, the EU textile industry would experience serious challenges in meeting safety standard requirement with alternatives that are not suitable for certain applications. That might imply a possible modification in the standards for protective clothing—unless an exception will be granted. It should be highlighted that a change in the safety standards might imply lower levels of protection.



- **Restriction proposal PFAS** (Germany, The Netherlands, Norway, Sweden & Denmark)

Annex XVII proposal: PFHxA (C6)

- **Restriction proposal PFHxA (C6) (Germany):**
 - Q4 2021: Final RAC & SEAC opinion
 - 06/2023: Restriction proposal from European Commission
 - 22/06/23: discussion proposal in REACH Committee (member states EU), which has to approve the proposal.
 - Q3/Q4 2023: 3rd adapted proposal by European Commission: focus on use of the general public

Annex XVII proposal: PFHxA (C6)

- 27/11/23: 3rd proposal European Commission

1. Shall not, from [PO: please insert the date = 24 months from the date of entry into force of this Regulation] be placed on the market, or used, in a concentration equal to or greater than 25 ppb for the sum of PFHxA and its salts, or 1000 ppb for the sum of PFHxA-related substances, measured in homogeneous material, in the following:
 - textiles, leather, furs and hides in clothing and related accessories for the general public;
2. Shall not, from [PO: please insert the date = 36 months from the date of entry into force of this Regulation] be placed on the market, or used, in a concentration equal to or greater than 25 ppb for the sum of PFHxA and its salts, or 1000 ppb for the sum of PFHxA-related substances, measured in homogeneous material, in textiles, leather, furs and hides, other than in clothing and related accessories referred to in paragraph 1, for the general public.

Paragraphs 1 and 2 shall not apply to the following:

- personal protective equipment intended to protect users against risks within the scope of Risk Category III (a), (c), (d), (e), (f), (h), (l) of Annex I of Regulation (EU) 2016/425 of the European Parliament and of the Council ;
- medical devices as specified in Regulation (EU) 2017/745 of the European Parliament and of the Council and woven, knitted and nonwoven medical textiles within the scope of Regulation (EU) 2017/745 of the European Parliament and of the Council with a minimum performance requirement of >20 cm hydrostatic head according to EN 13795;
- in vitro diagnostic medical devices and integrated components within the scope of Regulation (EU) 2017/746 of the European Parliament and of the Council ;
- textiles used as construction textiles.



Annex XVII proposal: PFHxA (C6)

- General public: refers to consumer textiles. Further clarification is necessary (cfr. PPE for consumers).
- Unclear what the link is with the general PFAS restriction (next slides)
- This could be a temporary restriction, which will be replaced by the general PFAS restriction.

Annex XVII proposal: PFAS

- **Restriction proposal PFAS** (Germany, The Netherlands, Norway, Sweden & Denmark)



Annex XVII proposal: PFAS

- **Restriction proposal PFAS** (Germany, The Netherlands, Norway, Sweden & Denmark)

Scope

Per- and polyfluoroalkyl substances (PFASs) defined as:

Any substance that contains at least one fully fluorinated methyl (CF₃-) or methylene (-CF₂-) carbon atom (without any H/Cl/Br/I attached to it).

A substance that only contains the following structural elements is excluded from the scope of the restriction:

CF₃-X or X-CF₂-X', where X = -OR or -NRR' and X' = methyl (-CH₃), methylene (-CH₂-), an aromatic group, a carbonyl group (-C(O)-), -OR'', -SR'' or -NR''R'''; and where R/R'/R''/R''' is a hydrogen (-H), methyl (-CH₃), methylene (-CH₂-), an aromatic group or a carbonyl group (-C(O)-).

Annex XVII proposal: PFAS

• Restriction proposal PFAS (Germany, The Netherlands, Norway, Sweden & Denmark)

1. Shall not be manufactured, used or placed on the market as substances on their own;
2. Shall not be placed on the market in:
 - a. another substance, as a constituent;
 - b. a mixture,
 - c. an articlein a concentration of or above:
 - i. 25 ppb for any PFAS as measured with targeted PFAS analysis (polymeric PFASs excluded from quantification)
 - ii. 250 ppb for the sum of PFASs measured as sum of targeted PFAS analysis, optionally with prior degradation of precursors (polymeric PFASs excluded from quantification)
 - iii. 50 ppm for PFASs (polymeric PFASs included). If total fluorine exceeds 50 mg F/kg the manufacturer, importer or downstream user shall upon request provide to the enforcement authorities a proof for the fluorine measured as content of either PFASs or non-PFASs.
3. Paragraphs 1 and 2 shall apply 18 months from entry into force of the restriction.

5. By way of derogation, paragraphs 1 and 2 shall not apply to:
 - a. polymerisation aids in the production of polymeric PFASs until 6.5 years after EIF. This derogation does not apply to the production of PTFE, PVDF and FKM.
 - b. textiles used in personal protective equipment (PPE) intended to protect users against risks as specified in Regulation (EU) 2016/425, Annex I, Risk Category III (a) and (c), until 13.5 years after EiF;
 - c. textiles used in personal protective equipment (PPE) in professional firefighting activities intended to protect users against risks as specified in Regulation (EU) 2016/425, Annex I, Risk Category III (a) - (m), until 13.5 years after EiF;

PFAS in USA

Minnesota

The following bills were introduced into the Minnesota House regulating PFAS in a variety of categories with varying enforcement dates:

- Ski wax (HF2952), July 1, 2024
- Carpets and fabric treatments (HF3180), Jan. 1, 2024
- Juvenile products (HF3571), Jan. 1, 2024
- Cookware (HF2907), Jan. 1, 2025
- Cosmetics (HF2906), Jan. 1, 2025
- Apparel or outerwear (HF3076), Jan. 1, 2025

Vermont

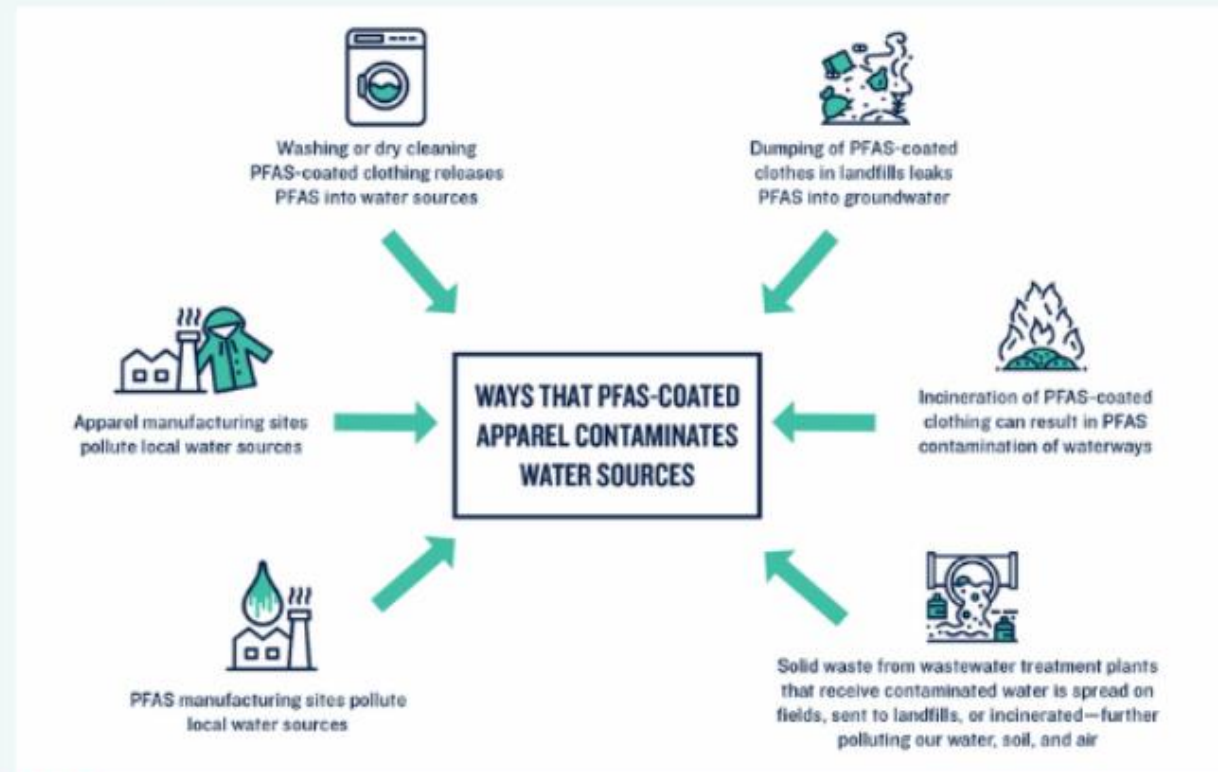
Aside from regulating class B firefighting foam and food packaging, Act No. 36 (S.20) also prohibits the manufacture, offer for sale, distribution and use of residential rugs or carpets, aftermarket stain or water-resistant treatment for rugs or carpets, and ski wax to which PFAS have been intentionally added in any amount.

U.S. State	PFAS Chemicals in Children's Products	
	Effective Date	Reference
California	July 1, 2023	Assembly Bill 652
Colorado	Jan. 1, 2024	House Bill 22-1345
Maine	July 28, 2020	06-096 Chapter 890
New York	March 1, 2020	Senate Bill S501B
Oregon	March 1, 2021	ORS 431A.253-258
Vermont	July 1, 2022	Act 36 (S.20)
Washington	Oct. 30, 2017	Chapter 173-334-130

PFAS in USA

- California AB1817

Let's get PFAS out of textiles!



PFAS in USA

- California AB1817
- 30/09/2022: California Law AB1817 (safer clothes & textile act)
 - Ban in the state on new textile articles that contain PFAS: manufacture, distribute and sell.
 - Obligation on the producer to use the less toxic alternative for PFAS in textiles
- First state to ban PFAS on apparel & textile products (01/01/25)



PFAS in USA

Scope

Household textiles, inclusive, but not limited to, clothing, accessories, handbags, backpacks, curtains, shower curtains, upholstery, bedding, towels, napkins and table cloths.

Exemptions

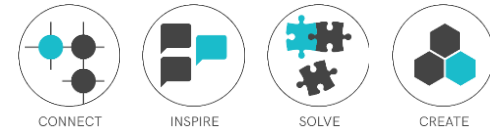
- **Carpets, rugs**, treatment with PFAS for the use on textiles or leather that is used in critical functions as fire extinguishing of industrial applications of textiles.
- **Outdoor clothing** that is made for very wet circumstances, till 2028, but from 01/01/25 producers have to mention the use of PFAS on their products with the following message "made with PFAS-chemicals".

PFAS in USA

Limit values

- 01/01/2025: **100ppm** PFAS, measured via **total fluorine**
 - 01/01/2027: **50ppm** PFAS, measured via **total fluorine**
-
- Centexbel has made an investment in a device to measure total fluorine content

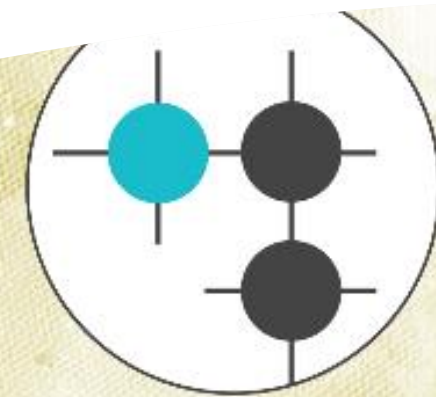
PFAS in the textile industry



CREATE



INSPIRE

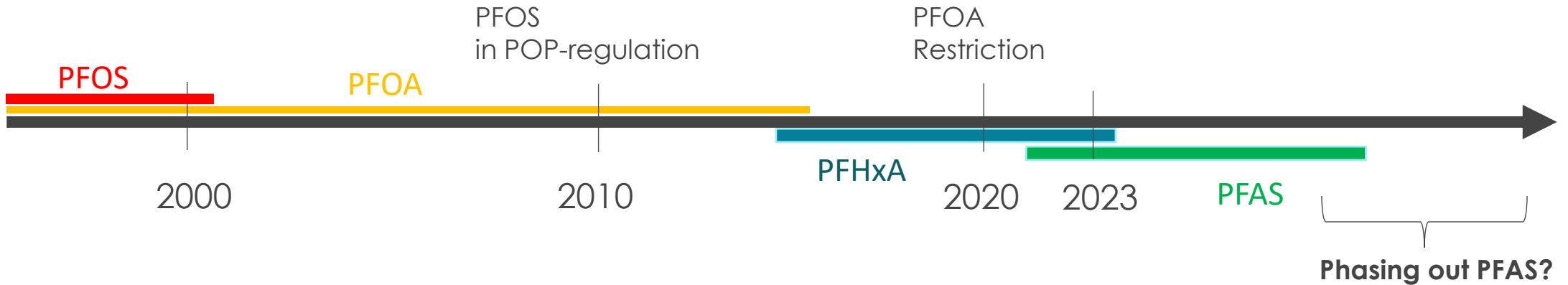


CONNECT

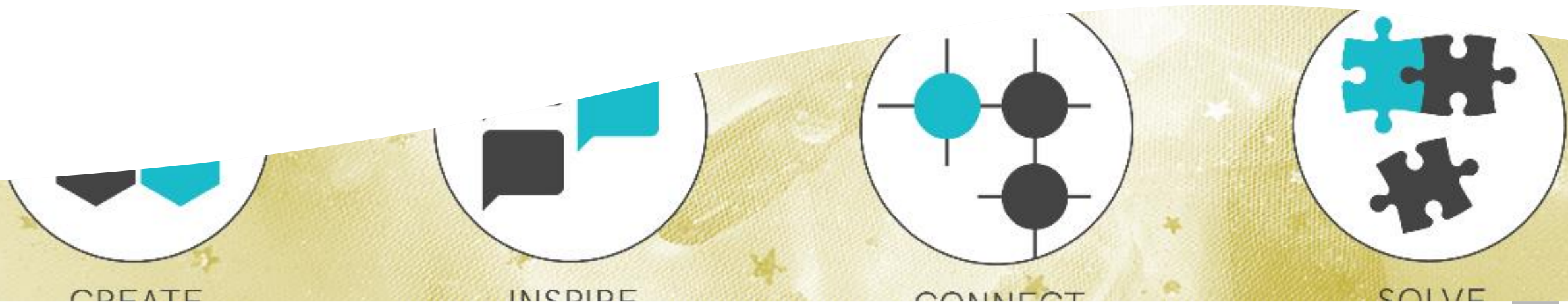
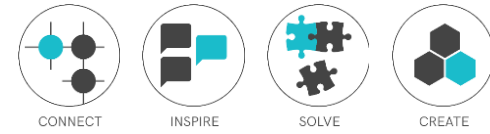


SOLVE

Evolution PFAS use in textiles



Testing PFAS in textiles



Testmethods en standards

- OEKO-TEX®
 - Regulation PFAS
 - Own OEKO-TEX®-method
- STANDARDS
 - EN 17681-1:2022
 - Textiles and textile products - Organic fluorine - Part 1: Determination of non-volatile compounds by extraction method using liquid chromatography
 - EN 17681-2:2022
 - Textiles and textile products - Organic fluorine - Part 2: Determination of volatile compounds by extraction method using gas chromatography
 - ISO 23702-1:2023
 - Leather — Per- and polyfluoroalkyl substances — Part 1: Determination of non-volatile compounds by extraction method using liquid chromatography

PFAS substances

- PFAS, Per- & polyfluoralkyl compounds
 - PFOS
 - PFOSA
 - PFOSF/POSF
 - N-Me-FOSA
 - N-Et-FOSA
 - N-Me-FOSE
 - N-Et-FOSE
 - PFHpA
 - PFOA
 - PFNA
 - PFDA
 - PFUdA
 - PFDoA
 - PFTTrDA
 - PFTeDA

PFAS substances

- PFAS, Per- & polyfluoralkyl compounds
 - PFBA
 - PFPeA
 - PFHxA
 - PF-3,7-DMOA
 - 2,3,3,3-tetrafluor-2-(heptafluoropropoxy)propanoic acid, salt & acylhalides
 - PFBS
 - PFHxS
 - PFHpS
 - PFDS
 - 7HPFHpA
 - 4HPFUna
 - 6:2-FTS

PFAS substances

- PFAS, Per- & polyfluoralkyl compounds

• 1H,1H,2H,2H-Perfluoro-1-hexanol	4:2 FTOH	GC/MS/MS
• 1H,1H,2H,2H-Perfluoro-1-octanol	6:2 FTOH	GC/MS/MS
• 1H,1H,2H,2H-Perfluoro-1-decanol	8:2 FTOH	GC/MS/MS
• 1H,1H,2H,2H-Perfluoro-1-dodecanol	10:2 FTOH	GC/MS/MS
• 1H,1H,2H,2H-Perfluorooctylacrylate	6:2 FTA	GC/MS/MS
• 1H,1H,2H,2H-Perfluorodecylacrylate	8:2 FTA	GC/MS/MS
• 1H,1H,2H,2H-Perfluordodecylacrylate	10:2 FTA	GC/MS/MS

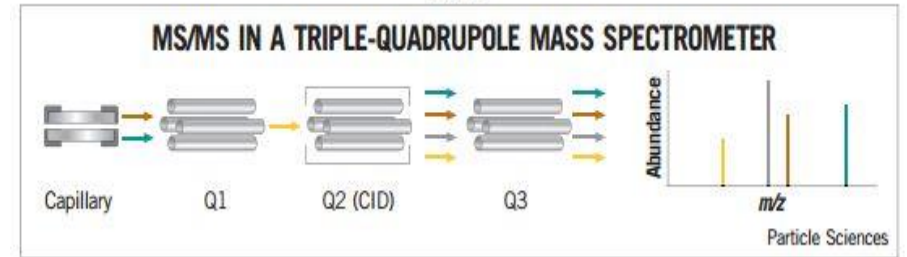
- PFOA related Substances

- 8:2 FTA
- 8:2 FTOH
- 6:2-FTS

Testmethod PFAS

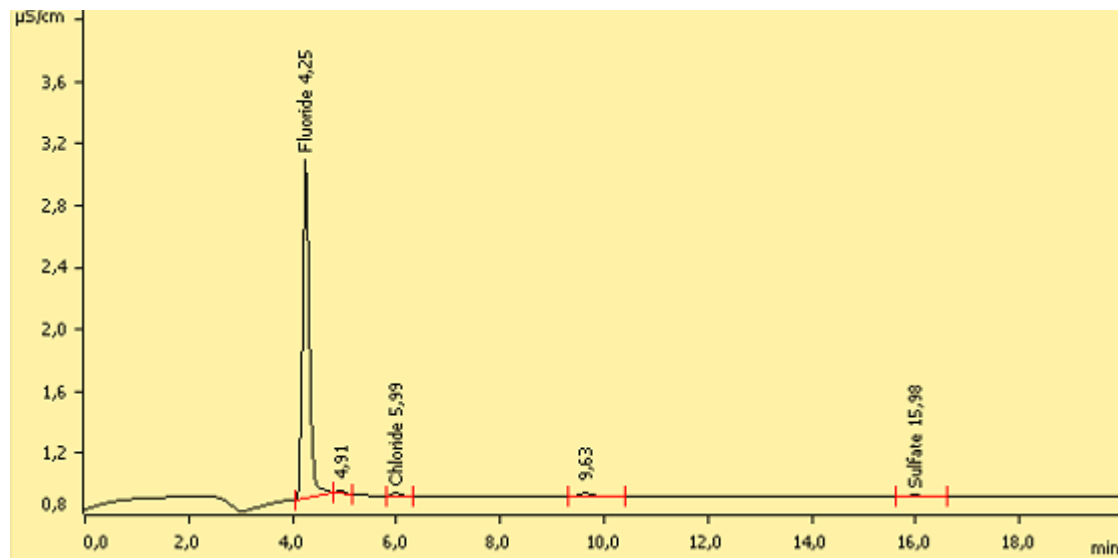
- Analysis techniques
 - ESI-LC/MS/MS
 - Agilent 1290 UPLC
 - SCIEX QTRAP 4500
 - GC/MS/MS
 - Determination of components via SRM
 - Choose the right transitions (precursor ion/production)
 - Most of the components determined via LC/MS/MS
 - Telomeric alcohols & telomeric acrylates via GC/MS/MS
 - Reporting limit: 10 µg/kg, 100 µg/kg (telomeric alcohols & acrylates)

Figure 1



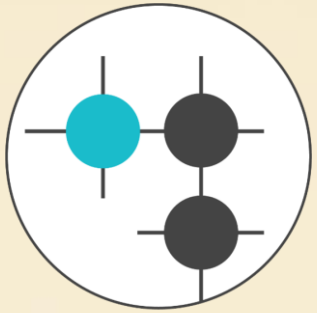
Testmethod PFAS total fluorine (TF)

- New parameter OEKO-TEX® STANDARD 100 & LEATHER STANDARD
 - Method applicable on textiles (fibres, yarns, fabric ...), feathers, down & leather, with an oil and water repellent finish or coating (PUR, PVC ...), also for PUR foils, membranes, laminates and foams
- 01/2024 – total fluorine (TF) – limit 100 mg/kg
- Measurement of solid samples & determination via Combustion Ion Chromatography (CIC)
- Device Metrohm



Questions





CONNECT



INSPIRE



SOLVE



CREATE

Thank you!

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