ASSOCIATION FOR THE ADVANCEMENT OF ALTERNATIVES ASSESSMENT

International Symposium on Alternatives Assessment Virtual 2020

Current Practices and Future Prospects

October 27-29, 2020

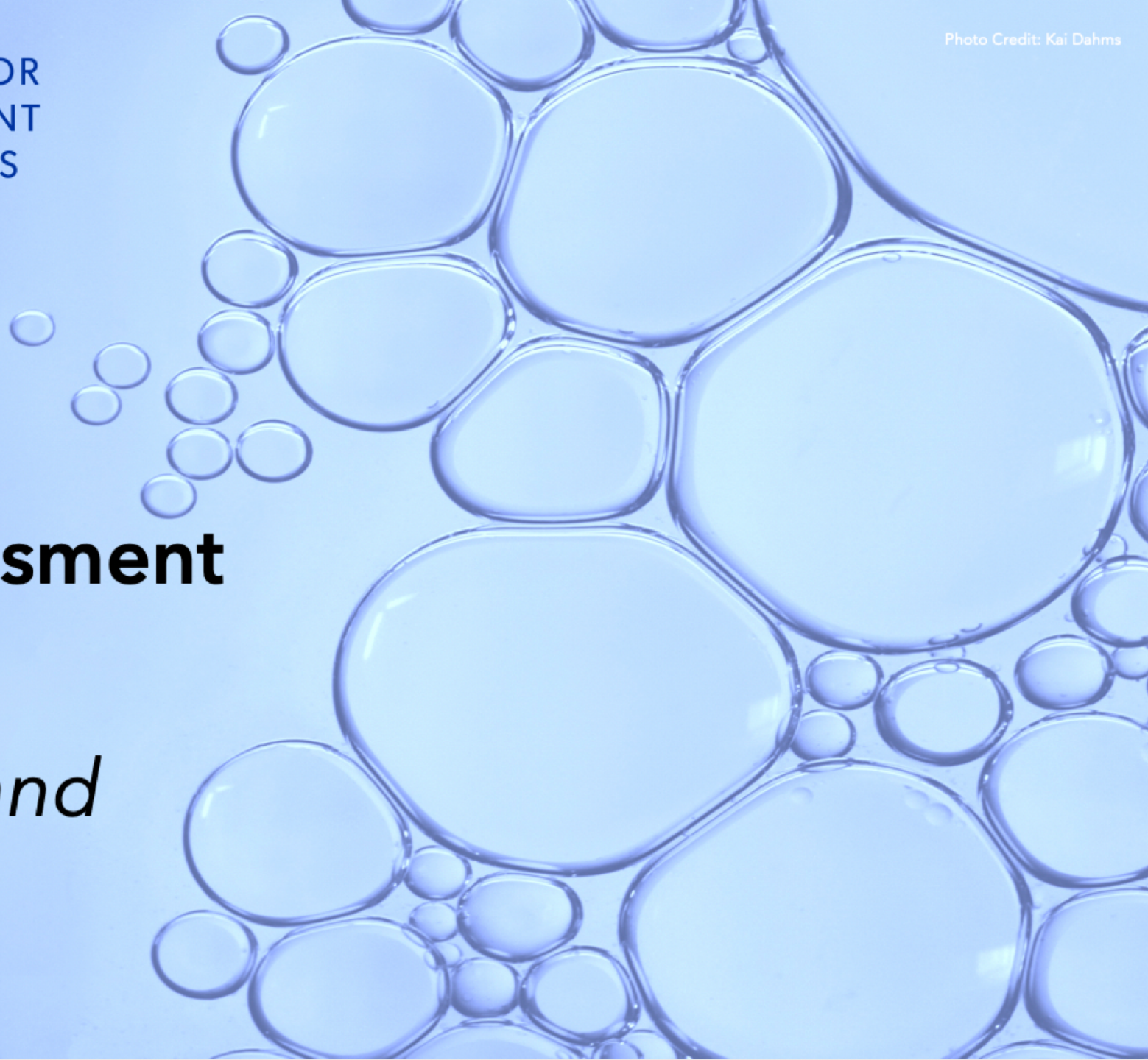


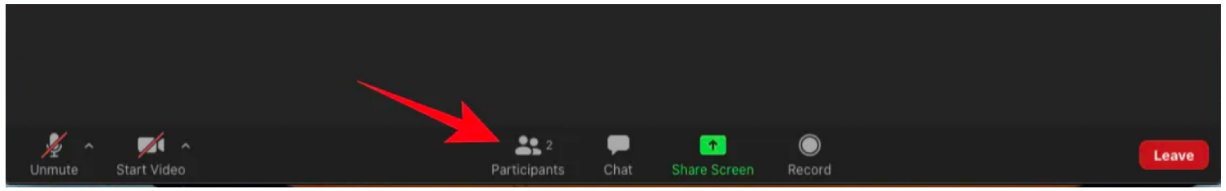
Photo Credit: Kai Dahms

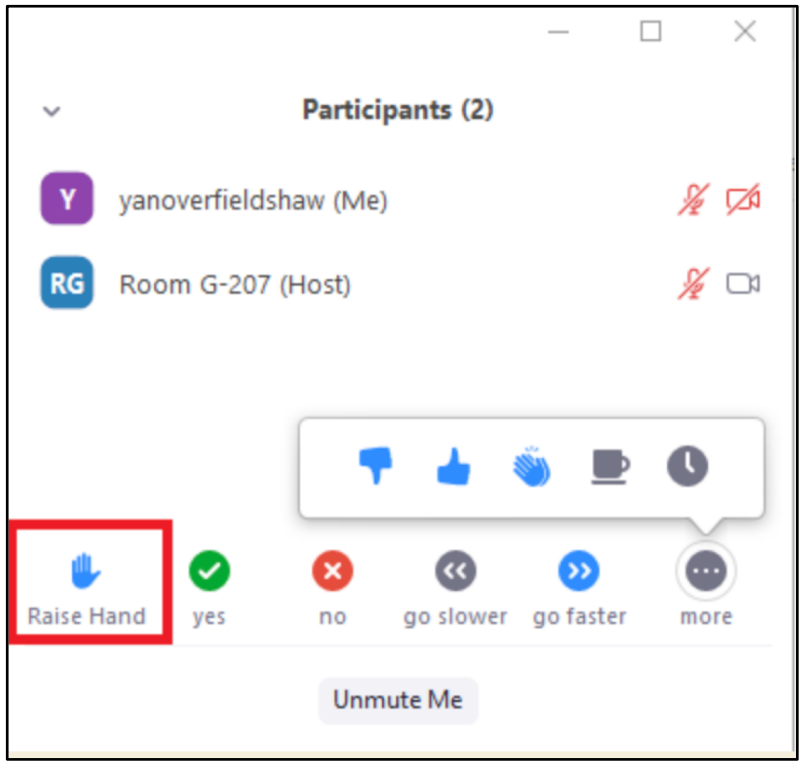
Welcome Back - Thank You Sponsors

Session Etiquette

- Please keep your **lines muted and your videos off.**
- Please make sure your **full name and organization** are noted. You can change your name by clicking on the … next to your name/image.
- Use "**speaker view**" in Zoom – it will offer the best viewing experience.
- During the Q&A portion of the session, if you wish to ask a question or offer a comment, please raise your hand
  - Feel free to unmute your line and turn on your video so engage more voices/faces in the conversation.
  - Also feel free to use the chat.
- This session is being recorded and will be posted with the slide deck on the A4 website: www.saferalternatives.org

Raising your hand in Zoom





- To “raise you hand”
  - first open the participants icon on the bottom of your computer screen
  - When the participants view opens, you’ll find the “raise hand” icon in the icon list at the bottom.
  - Help us by lowering your hand (toggle the icon) when you finished with your question/comment
- The chat will work too

Symposium Session 2 – Industry Experience Implementing Alternatives Assessment and Substitution

Part I: Lessons learned from large multi-nationals

Lessons learned from incorporating AA into business operations

How does AA manifest in the real-world?

- Regulations, RoHS, REACH, CA Safer Consumer Products-market access requirements
- Strategic substitutions, phthalates
- Voluntary initiatives, low-halogen, Zero Discharge of Hazardous Chemicals (ZDHC)
- Eco-label requirements-customer driven force

Moderator & Panelists

CORY ROBERTSON
Hewlett Packard

DHRUV RAINA
Tarkett

JOEL TENNEY
Israeli Chemicals

KAJ JOHNSON
Method

SAFR®

A SYSTEMATIC ASSESSMENT FOR FLAME RETARDANTS

Joel Tenney

October 27, 2020

About ICL Group

- **$5.3bn sales in 2019**
- **Manufacturing sites spread around the world**
- **~13,000 Employees**
- **20 R&D centers with 500 researchers**
- **Newly included in the FTSE4Good index for sustainability efforts**

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Flame Retardants

Providing safety to modern comfort

What are they?

Responsible choices start with product design

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Flame retardants key functionality

NO IGNITION – NO FIRE

- Broad range of substances with differing characteristics and intended uses
- Used ONLY in products presenting fire risk
- Inhibit ignition – essential for safe use of many products
- Key in Fire Prevention – first and most important layer of fire protection
- Flame retardants save lives

Performance, Safety and Circular Economy

- Product safety is a public heatlh issue, fire and chemical.
  - In 2019 CPSC issued 84 product recalls related to fire or burn hazards.
- Chemical SAFETY across whole life cycle
- BFRs vs PFRs vs Inorganic - How do we choose for Safety?
  - They are not alike with regards to functionality
  - They all have their own unique risk characteristics in product designs
  - They all have different circularity benefits and challenges
  - *OFRs do not have a common chemical structure or predicted biologic activity and therefore cannot be treated as a single class**

*National Academies of Sciences review of organohalogen FRs grouping
http://www8.nationalacademies.org/onpinews/newsitem.aspx?RecordID=25412

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Building on accepted hazard criteria, SAFR assesses the extent to which hazards translate into potential risks due to possible exposure to humans and/or the environment during a product's service life.

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HAZARD + EXPOSURE ⇒ RECOMMENDATION

HAZARD / EXPOSURE	LOW	MEDIUM	HIGH	UNACCEPTABLE
LOW POTENTIAL	RECOMMENDED	RECOMMENDED	ACCEPTABLE	TO BE PHASED OUT
MEDIUM POTENTIAL	RECOMMENDED	ACCEPTABLE	NOT RECOMMENDED	
HIGH POTENTIAL	ACCEPTABLE	NOT RECOMMENDED	NOT RECOMMENDED	

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ASSESSING HAZARD

OUR STARTING POINT

Defined 13 endpoints which include human health and environment

CRITERIA

Based mainly on the Global Harmonized System (GHS) for classification and labelling

ASSESSMENT

Asses the hazard for the FR and its relevant degradation products

FINAL HAZARD SCORE

Given according to SAFR® hazard categories

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HAZARD SCORING

Hazard Category	Hazard Criteria
Unacceptable Hazard	Very High Human Toxicity **OR** Very High P* + Very High B**
High Hazard	High P + High B **OR** Very High P + High Ecotoxicity **OR** Very High B + High Ecotoxicity **OR** High Human Toxicity
Medium Hazard	Moderate P + Moderate B **OR** High P + Moderate Ecotoxicity **OR** High B + Moderate Ecotoxicity **OR** High Ecotoxicity **OR** Moderate Human Toxicity
Low Hazard	When none of the above apply

P : Persistency*
*B **: Bioaccumulation*

THE ENDPOINTS

Environment

- Acute ecotoxicity
- Chronic ecotoxicity
- Persistency
- Bioaccumulation

Human Health

- Acute mammalian toxicity
- Systemic toxicity/organ effects
- Carcinogenic, Mutagenic, Reprotox (CMR)
- Skin sensitization
- Skin corrosion/irritation
- Serious eye damage/eye irritation
- Endocrine Disruption (ED)

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HOW DO WE ASSESS EXPOSURE?

1

FREQUENCY OF CONTACT
during the intended use

2

POTENTIAL EMISSIONS
of the flame retardant used; due to either migration to surface, volatilization or leaching.

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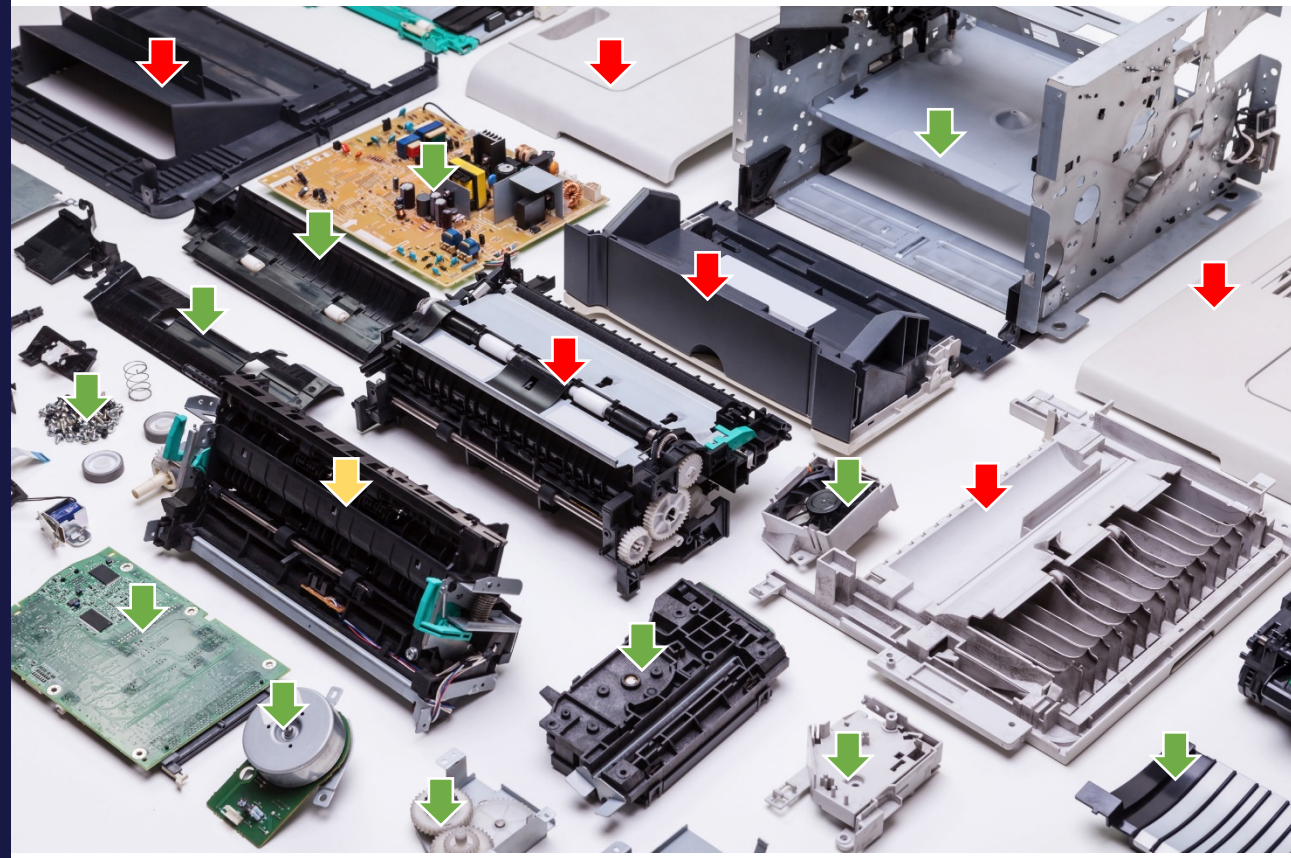
1

Frequency of contact



➡ **RARE CONTACT :** mechanical and structural internal parts

➡ **OCCASIONAL CONTACT :** ink cartridge

➡ **FREQUENT CONTACT :** external case, paper tray

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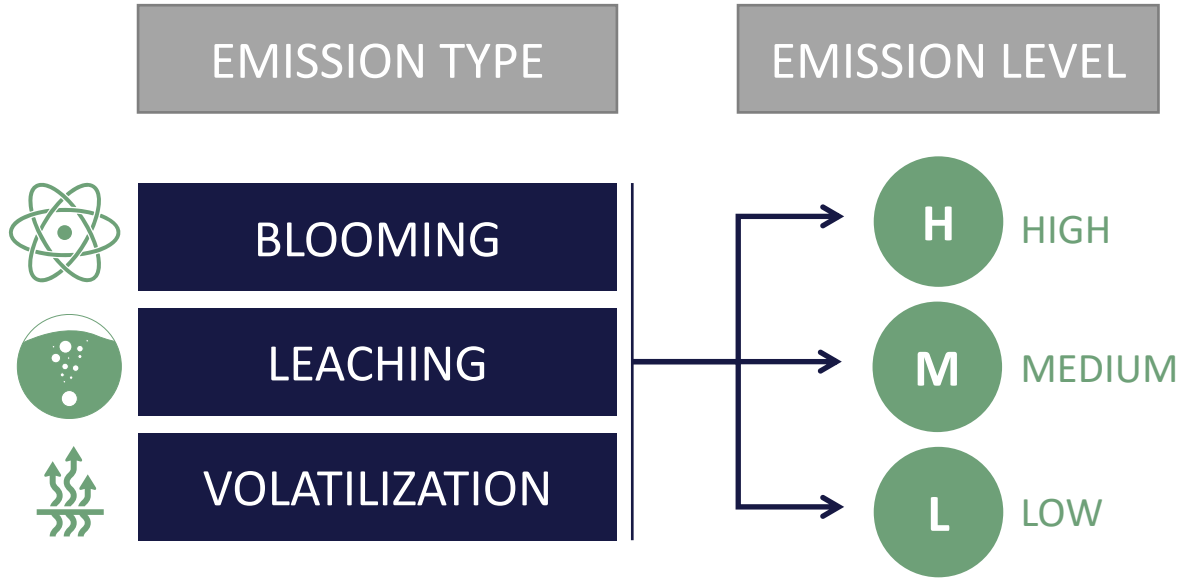
2

Potential emissions



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ASTM INTERNATIONAL
Helping our world work better

BLOOMING

- Ageing of samples at 70°C
- Sweeping of samples
- Analysis of filters for bromine

Levels µgBr⁻/cm²
Low/No: Br⁻ ≤ 1
Medium: 1< Br⁻ ≤10
High: Br⁻ > 10

ASTM D8280 (2020)

LEACHING

- Soxhlet extraction of the fabric
- Water evaporation
- Analysis of solid extracts

Levels mgBr⁻/m²
Low/No: Br⁻ < 5
High: ≥ 5

VOLATILIZATION

- VOC and FOG analyses based on VDA 278
- Current of inert gas
  VOC: 30 min at 90°C
  FOG: 60 min at 120°C
- Analysis by GC-MS

Level mg/Kg:
Low: VOC < 50 OR FOG <125
High: VOC ≥ 50 OR FOG ≥ 125

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BLOOMING

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ASTM INTERNATIONAL
Helping our world work better

Blooming method approved by ASTM

Standard Test Method for Determination of the Blooming of Brominated Flame Retardants onto the Surface of Plastic Materials by Ion Chromatography", ASTM D8280

"The new standard has tremendous importance for product designers, regulators, and supply chains to compare and chose safe, effective, and sustainable brominated flame retardants"

Marcelo Hirschler (2020), a member of ASTM International's plastics committee (D20)

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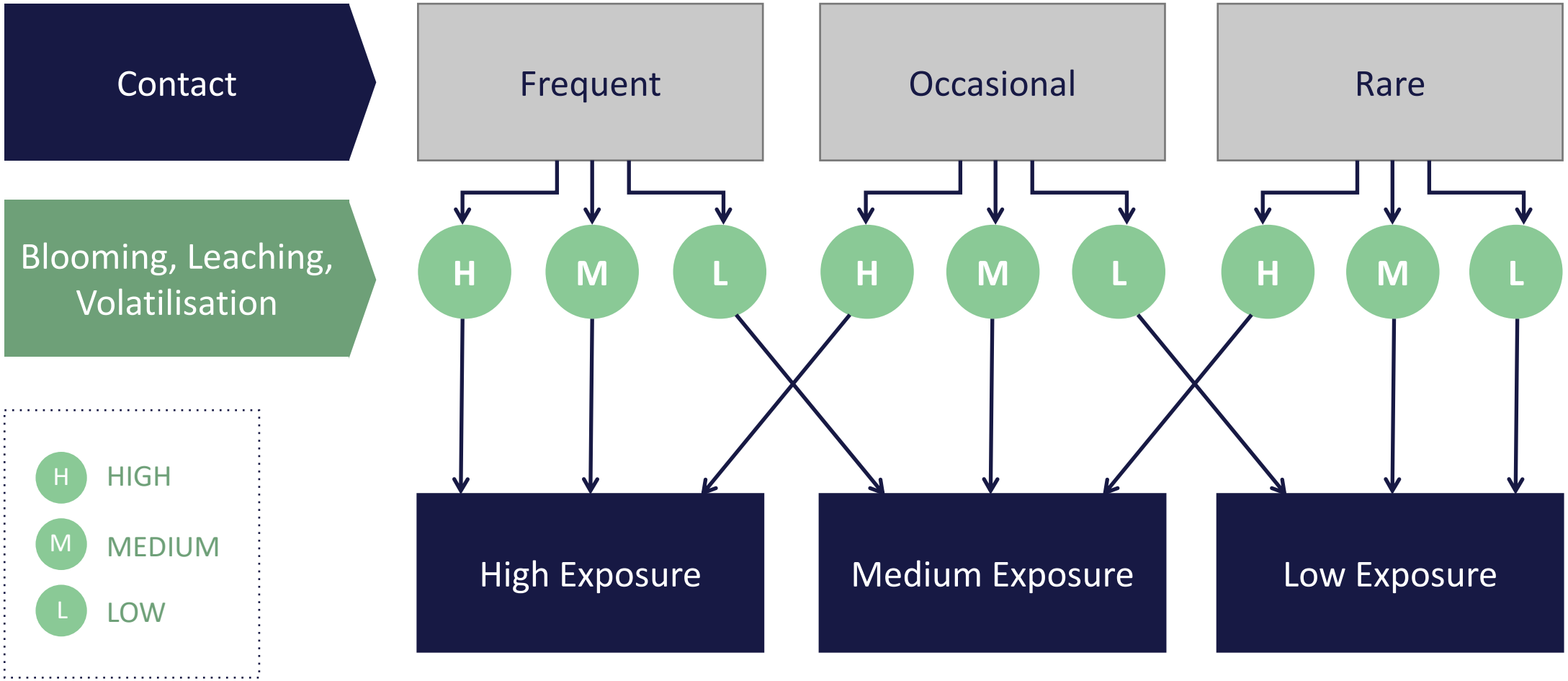
EXPOSURE



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RESULTS – TEXTILES CASE

Flame Retardant	Hazard	Exposure	Uses		
			RECOMMENDED	ACCEPTABLE	NOT RECOMMENDED
TexFRon® 4002 PL	**L**	**L/M**	**Textile:** Upholstery, drapes, carpets (wall to wall), tents **Transportation:** Seats' covers, carpets, covered parts (filters)		
TexFRon® P PL	**L**	**M**	**Textile:** Professional protective clothing		
FR-1410	**L**	**M/H**	**Transportation:** carpets (wall to wall)	**Textile:** Upholstery, drapes, tents **Transportation:** seats' covers	
TexFRon® 9001	**L**	**M**	**Textile:** Upholstery, drapes, carpets, tents		
Fyrol® FR-2 (TDCP)	**H**	**H^+**			**Textile:** Tents
TexFRon® 5001	**L**	**M^+/H^+**	**Transportation:** under seats' covers **Textile:** carpets (wall to wall)	**Textile:** Upholstery, drapes, tents, professional protective clothing	
FR-1210 (Deca)	**UNACCEPTABLE**	**NR**	**PHASED OUT**		

ICL-IP advances the circularity of plastics with BFRs

Focus: chemical/physical recycling methods that allow separation of brominated flame retardants from plastics and recycle them in dedicated streams including bromine recovery

Process: dissolution processes like the CreaSolv® Technology and bromine recovery in the bromine recovery unit of ICL Terneuzen

Applications: E&E, automotive, construction & building, Textiles

Current projects: NONTOX, PLAST2bCLEANED, PolyStyreneLoop

PolyStyreneLoop

- ✔ EPS/XPS waste containing HBCD
- ✔ Co-initiated and led by ICL-IP with 70 companies from the EPS/ XPS value chain
- ✔ Technically and economically viable

3300 mtons of EPS/XPS waste /y

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WANT TO KNOW MORE?

www.safrworks.com

safr@icl-group.com

www.icl-group.com

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Thank You!

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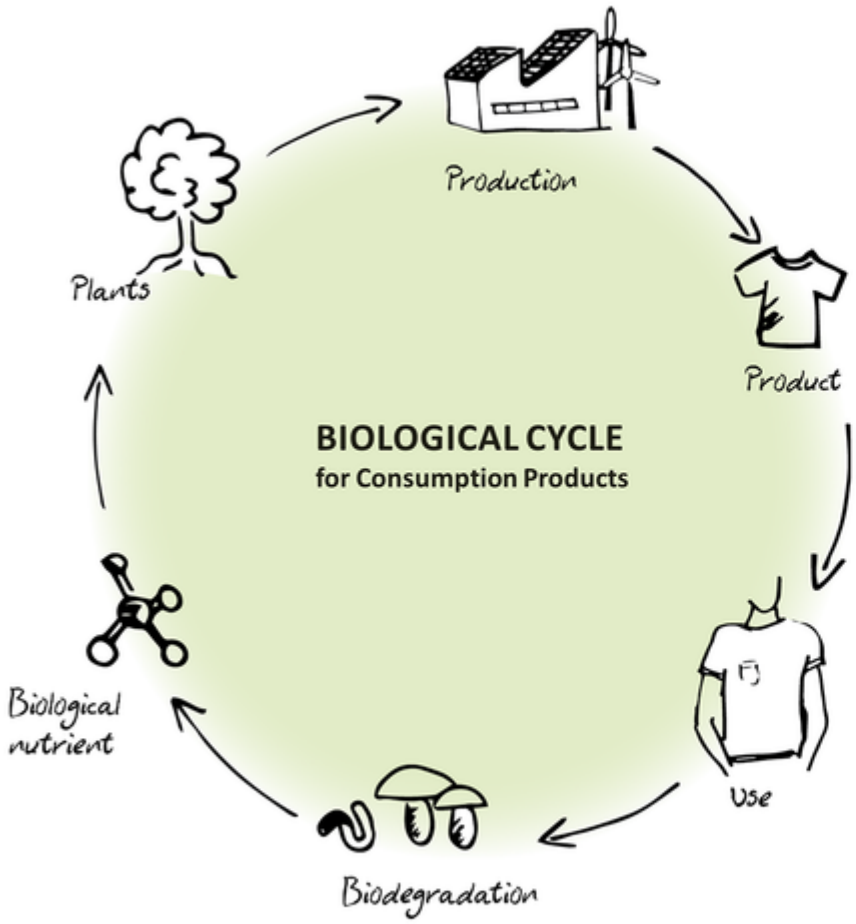
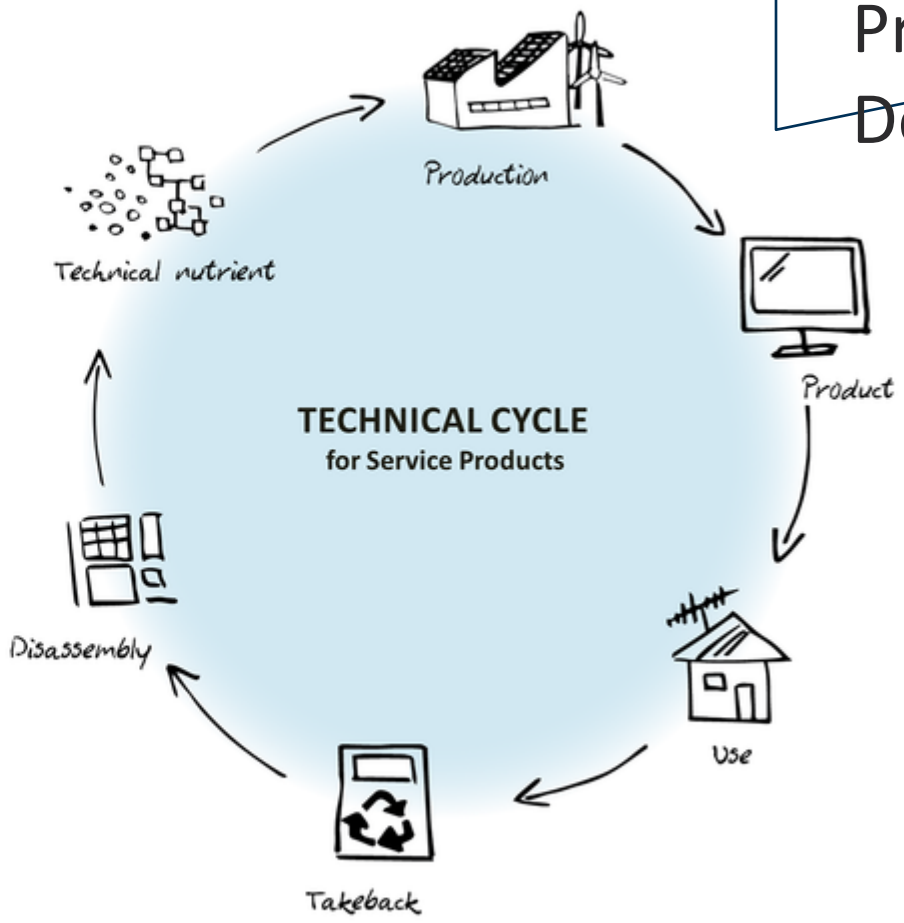
A Timeline of Innovation

As the world's population grows, shifting to a regenerative circular economy is vital to protecting Earth's climate and conserving finite natural resources.

Rethinking Product Design





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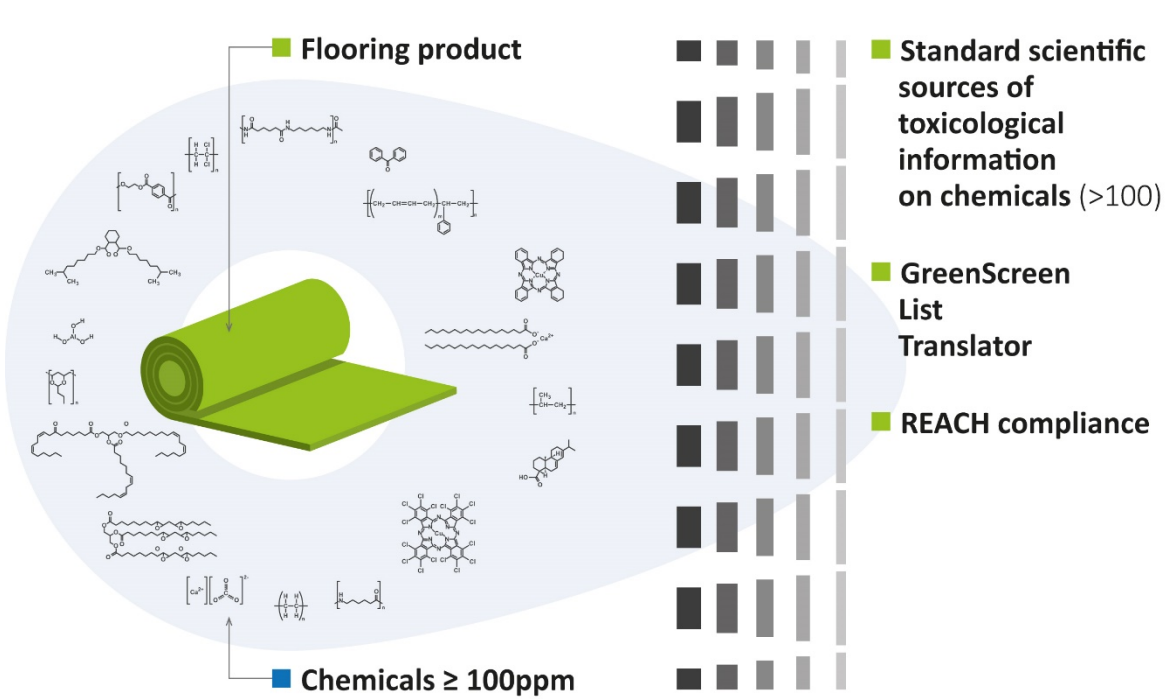
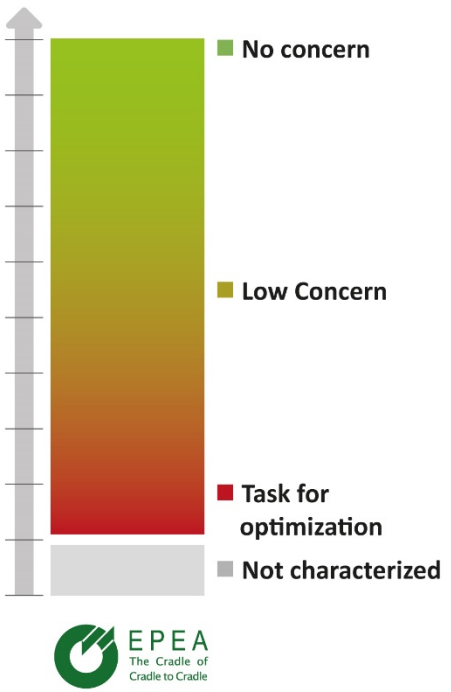
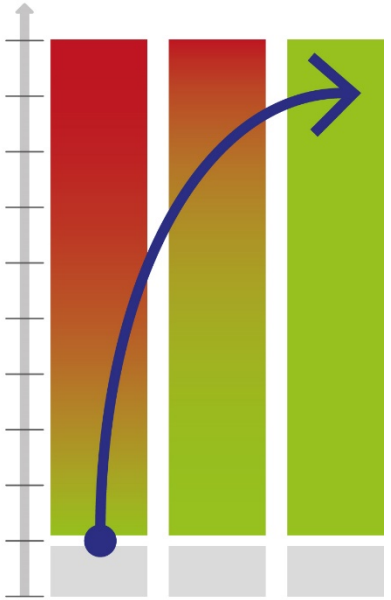
Raw Materials Assessment Pathway

INVENTORY | SCREEN | ASSESS | OPTIMIZE



- Standard scientific sources of toxicological information on chemicals (>100)
- GreenScreen List Translator
- REACH compliance





cradletocradle®

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98% (3000+)
Raw Materials
Assessed to date

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Customer Communication

Formula of the product

Unique numerical identifier assigned by the Chemical Abstracts Service (CAS) to every chemical substance described in the open scientific literature

Rate of the component in the formula

Colour-coded rating given by the EPEA
- No concern
- Moderate concern
- High concern – Task for material optimization
- Unknown concern - Task for knowledge development

Comment of the EPEA on the use or the exposure to this component

GreenScreen List Translator Score and GreenScreen Benchmark Score according to Toxnot classification, an American classification of chemicals (https://toxnot.com/)

REACH is the European Community Regulation on chemicals and their safe use.
✔ Non hazardous substance or <0,1%

Function	Component	CAS	Content	Rating	Comment	GS-LT GS-BM	REACH
Filler	Calcium carbonate	1317-65-3	< 50%			LT-UNK	✔
Polymers	Polyvinyl butyral	27360-07-2	< 40%		Polymers contributing to the build-up of the different layers, partially with a prehistory of use in former applications	LT-UNK	✔
	Polylactic acid	9051-89-2				N.I.	✔
	Additional polymers with minor contributions	Proprietary 2				N.I.	✔
						LT-UNK	✔
Plasticizers	2-Ethylhexanoic acid diester with triethylene glycol	94-28-0	< 10%		Plasticizers and additives with an annex role as plasticizers have for a part an agricultural origin and for another part a prehistory of use in former applications	LT-UNK	✔
	Glycerides, castor-oil mono-, hydrogenated, acetates	736150-63-3				N.I.	✔
	Soybean oil, epoxidized	8013-07-8				LT-UNK	✔

Abstract of the MHS of iD Revolution

Tarkett

Doing Good. Together.

dhruv.raina@tarkett.com

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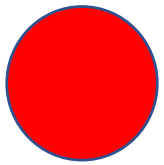
Alternatives Assessment

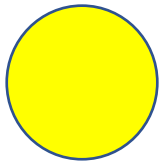
10.24.2020

Alternatives Assessment 10/27/2020

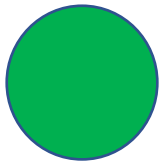
Alternatives Assessment Approach



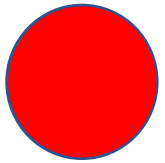
No Fly Zone- Hard Stop. Avoid.



Assessment tools.



Fly to- Aspirational Targets.



No Fly Zone- Some Obvious Examples.

Formaldehyde Preservatives

Halogenated Polymers

TCE, Benzene

Excessive Packaging etc…

Assessment Tools & Examples

New Solutions- Chelates, Preservatives & Boosters, Polymers, Surfactants

BENEFIT BLUEPRINT

PEOPLE

Improve the health + livlihood of people.

ENVIRONMENTS

Have the lowest environmental impact possible.

VALUE

Use business as a force for good.

compass of clean

human health
for people

- EYE SAFETY
- SKIN SAFETY
- SKIN SENSITIZATION

environmental health
for the planet

- BIODEGRADATION
- ALGAE SAFETY
- DAPHNIA SAFETY

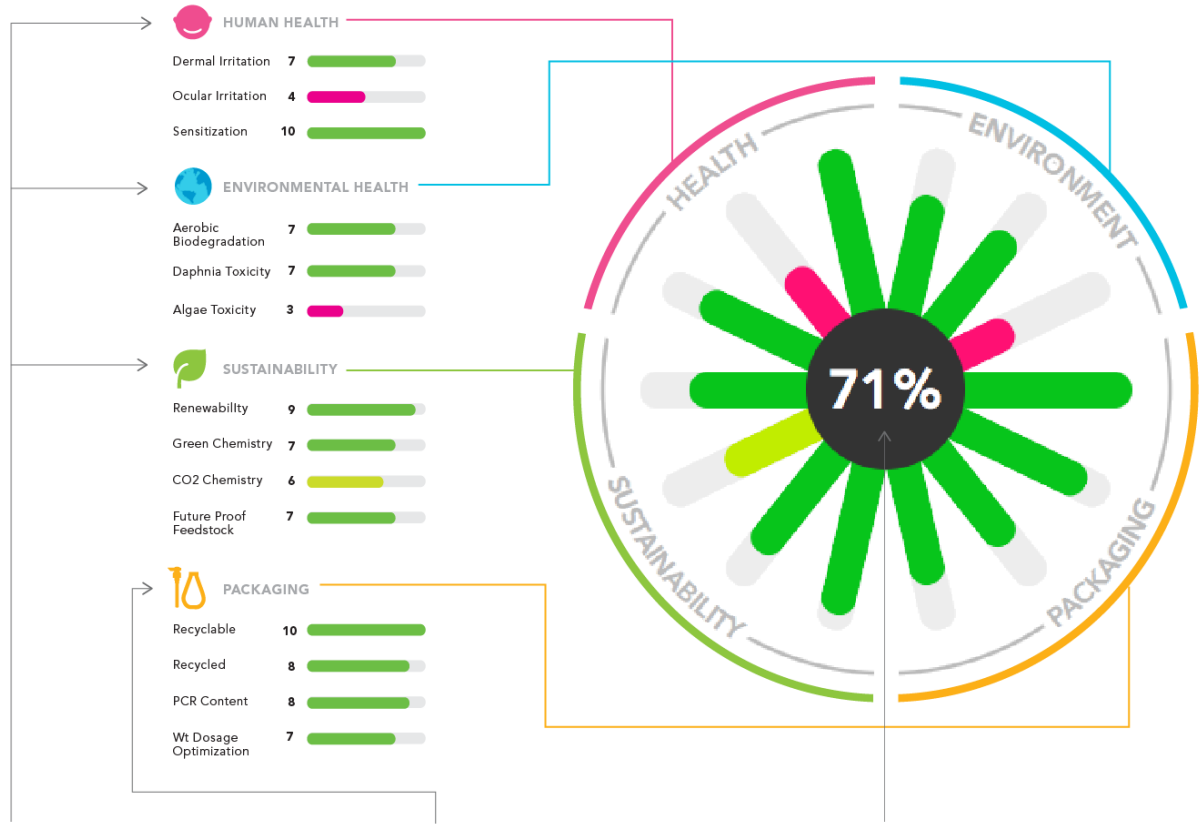
sustainability
for the future

- RENEWABILITY
- CO2 FOOTPRINT
- GREEN CHEMISTRY
- FUTURE PROOF

packaging health
for responsible resource use

- RECYCLABLE
- RECYCLED
- SOURCING
- OPTIMIZATION

product evaluation process



ingredient ratings + packaging endpoints = product rating

evaluate all ingredients in product on 10 different compass metrics and assign cumluative score

evaluate the product's package on 10 different compass metrics and assign a score

create cumulative chart assign a percentage score

Collaboration Tools (Business and Developing Great Scientists)

Collaborations to proactively advance great solutions?

- GC3 Safer Preservatives
- UCB Deplastify the Planet and Greener Solutions Courses
- USDA Partnership on Sustainable Solutions
- Persistent polymers & Chelates (Acrylates, EDTA, PFOA's)
- Eliminate Packaging Waste
- Problematic Solvents
- Improved Surfactants.

GC3 GREEN CHEMISTRY & COMMERCE COUNCIL Business Mainstreaming Green Chemistry

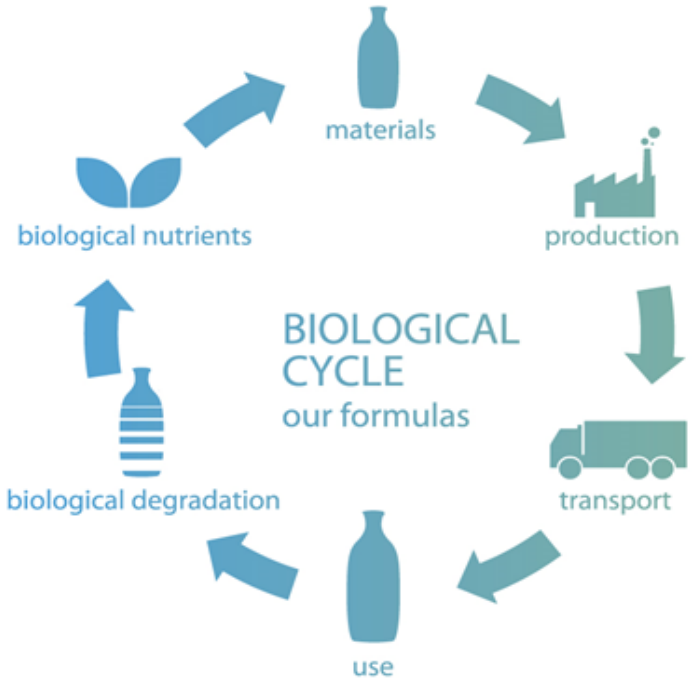
USDA

UNIVERSITY OF CALIFORNIA BERKELEY

GREEN CHEMISTRY CHALLENGE A U.S. EPA Program

Let’s Aspire to Avoid Alternatives?

Design for Safety & Biodegradability



Biopolymers, chelates and surfactants that can degrade

Design for End of Life

Some Things that can get in the way?

- Risks, Resources, Costs and Scaling new paths
- Regulatory Hurdles and Fees
- Missing Data or expertise
- Status Quo


thank you!

Panel Discussion

Register at: www.saferalternatives.org

Join Us Tomorrow

Symposium Session 3 – Updates from Europe

Part II: Safe-By-Design

Moderator:
Peter Fantke, Technical University of Denmark

Panelists:

- Horizon Europe 2020 and Beyond – Soren Bowen, European Commission, DG for Research and Innovation
- Safe Chemicals Innovation Agenda – Ronald Flipphi, Dutch Ministry of Infrastructure and Water Management
- SusChem – Vivi Filippousi, CEFIC

Symposium Session 4 – Industry Experience Implementing Alternatives Assessment and Substitution

Part II: Lessons from Small Business Users of Chemicals

Moderator:
Pamela Eliason, Mass. Toxics Use Reduction Institute

Panelists:

- Jamie delos Santos, Burien Auto Rebuild
- Adam Pearson, Merrimack Ales
- Scott Song, Family Dry Cleaners

Thank You Sponsors


Thank you for
joining us!