Customer driven material selection through transparency and market access requirements.

2nd International Symposium on Alternatives Assessment

Cory Robertson, November 2018

Sustainable Impact

www.hp.com/sustainableimpact

How do we get to there?

- 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

Eco-labels

Beyond Regulatory Compliance

Eco-labels across our portfolio

% models, for products shipped in 2017*

Products	EPEAT® identifies high-performance, environmentally preferable products				ENERGY STAR® 7.0 or 6.1 certified recognizes products with superior energy efficiency	China SEPA recognizes energy-saving and environmentally preferable models	TCO recognizes various ergonomic and environmental features related to visual displays	Blue Angel recognizes criteria in product design, energy consumption, chemical emissions, noise, recyclable design, and take-back programs
	EPEAT (all categories)	EPEAT Gold registered	EPEAT Silver registered	EPEAT Bronze registered				
Personal systems	90%	57%	33%	0%	82%	72%	44%	NA
Printers	68%	3%	50%	15%	93%	96%	NA	53%

*EPEAT data for personal systems is for models registered worldwide and for printers is for models registered in the United States. ENERGY STAR data is worldwide. China SEPA data applies only to products registered in China. TCO data is for commercial desktops, notebooks, all-in-ones, and displays shipped in Europe. Blue Angel applies only to products registered in Germany. All data is for models shipped anytime during fiscal year 2017.

- Drives sustainability performance across the industry
- Drives transparency, extensive environmental information online
- Provides comprehensive (multi-attribute) information
- Enables customers to make more sustainable product choices

Source: www.hp.com/sustainableimpact

TCO Certified Accepted Substance List

Substance name	CAS	Flame retardant	Plasticiser	Benchmark	Assessment date	Sunset date	Report public	Comments
Aluminum diethylphosphinate	225789-38-8	Yes		2	Feb, 2016		Yes	
Aluminum Hydroxide	21645-51-2	Yes		2	Feb, 2016		Yes	
Ammonium Polyphosphate	68333-79-9	Yes		3	Feb, 2016		Yes	
Bisphenol A diphosphate	181028-79-5; 5945-33-5	Yes	Yes	2	Feb, 2016			Interchangeable CAS numbers
Magnesium Hydroxide	1309-42-8	Yes		3	Feb, 2016		Yes	
Melamine Polyphosphate	15541-60-3; 218768-84-4	Yes		2	Feb, 2016		Yes	Interchangeable CAS numbers
Phenoxyphosphazene	890525-36-7, 2791-22-2, 2791-23-3	Yes		3	Feb, 2017			
Poly[phosphonate-co-carbonate]	77226-90-5	Yes		2	Feb, 2016		Yes	
Polyphosphonate	68664-06-2	Yes		3	Feb, 2016		Yes	
Red Phosphorus	7723-14-0	Yes		2	Feb, 2016		Yes	
Resorcinol Bis-Diphenylphosphate	125997-21-9; 57583-54-7	Yes		2	Feb, 2016			
Siloxanes and silicones, di-Me, di-Ph, polymers with Ph silsesquioxanes	68648-59-9	Yes		2	Jan, 2016			
Substituted Amine Phosphate mixture	66034-17-1	Yes		2	Feb, 2016			
Tetrakis (2,6-dimethylphenyl)-m-phenylene biphosphate	139189-30-3	Yes		2	Jan, 2015			
Triphenyl Phosphate	115-86-6	Yes		2	Feb, 2016			
2-Ethyl-1-Hexanol	104-76-7		Yes	2	Aug, 2018			
Acetyl tri-butyl citrate (ATBC)	77-90-7		Yes	3	Aug, 2018			
Bis(2-ethylhexyl) Adipate (DEHA)	103-23-1		Yes	2	Aug, 2018			
Di(2-ethylhexyl) Terephthalate (DEHT)	6422-86-2		Yes	3	Aug, 2018			
Diisononyl Adipate (DINA)	33703-08-1		Yes	2	Aug, 2018			
Diisononyl Cyclohexanedicarboxylate (DINCH)	166412-78-8, 474919-59-0		Yes	2	Aug, 2018			
Dimethyl phthalate (DMP)	131-11-3		Yes	2	Aug, 2018			
Epoxidized soya bean oil (ESBO)	8013-07-8		Yes	3	Aug, 2018			
White mineral oil	8042-47-5		Yes	2	Aug, 2018			

Last updated: 4 Sep 2018

- All substances on this list have been reviewed and the benchmark set by approved Clean Production Action (CPA) licenced profilers.
- All substances of a mixture shall be accounted for. Non-accepted components shall not exceed concentration levels of 0.1% by weight of the flame retardant or plasticiser.

Plasticizers used in product housing and cable insulations must have been assigned a GreenScreen benchmark score of 2, 3 or 4 by a **licensed GreenScreen profiler** and appear on the public TCO Certified Accepted Substance List.

Source: https://tcocertified.com/accepted-substance-list/

EPEAT

Electronic Product Environmental Assessment Tool

- Most important multi-attribute eco-label for electronics
- Commercial focus, market access
- PC standard (2009) revision published this year
- Mobile phones, Imaging Equipment and Servers also have standards
- Many stakeholders, U.S. Government, NGOs, manufacturers, suppliers and chemical industry
- Opportunity to differentiate, push the industry

EPEAT

Electronic Product Environmental Assessment Tool

Product criterion: Manufacturer shall demonstrate that all substances used in the following materials and applications are assessed in accordance with the GreenScreen® for Safer Chemicals method and assigned a GreenScreen® Benchmark™ score.

- Flame retardants in plastic parts > 25 g. The assessment may exclude printed circuit boards, wires and cables, connectors, fans and power supplies.
- Plasticizers in plastic parts > 25 g

Performance	**Total Points**
All assessed substances are benchmark 2, 3 or 4	1
All assessed substances are benchmark 3 or 4	2

Excerpt

Alternatives Assessment

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Safer Chemical Use

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Chemical Assessment and Selection

- Initial approach rewarding number of assessments performed
- Wanted to drive actual use of safer alternatives
- Focused on flame retardants and plasticizers

Value Judgements

EPEAT Criteria Development

- GreenScreen® is based on GHS hazard classifications, why can't we use them instead of the GreenScreen®?

Which is better?

Substance 1
GHS Category 2 Carcinogen

Substance 2
GHS Category 1 Chronic Aquatic
GHS Category 2 Eye irritant

GreenScreen® vs Hazard Assessment

What about other tools?

EPEAT fine print: This information is given for the convenience of users of this standard and does not constitute an endorsement by the IEEE of these assessors. **Equivalent assessors may be used** if they can be shown to meet the qualifications outlined.

Used GreenScreen® by name

- Some stakeholders objected
- Considered other tools
- Transparency was critical
- Publically available assessments also important
- Last minute work to get agreement from Clean Production Action
- Is claiming this EPEAT point tantamount to a public claim of a GreenScreen® benchmark score?

BizNGO Project

A unique collaboration of business and environmental leaders working to advance healthy materials and a safer chemicals economy.

Facilitating alternatives assessment: A practical guide to incorporating hazard assessment in eco-label criteria

BizNGO recommended order of preference:

1. GreenScreen® certified
2. Require use of GreenScreen® profilers (TCO approach)
3. Have employees become authorized GreenScreen® Practitioners
4. Use the method internally but make no public statements

Takeaways

- **Introducing hazard assessment into eco-label standards is an important step forward** in advancing green chemistry because it creates customer driven demand for trailblazing products.
- **Incorporating hazard assessment into eco-label standards can be tricky** and involves many stakeholders. There will be disagreements about which tools to use and there are legal considerations regarding the use of tools like the GreenScreen® in a public database.
- **Sustainable impact**: important to consider what actions result in the most significant changes. For example, is it better to have manufacturers perform a certain number of hazard assessments or require the use of substances with a GreenScreen benchmark ≥2?

Thank you!

keep reinventing

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GreenScreen®

- Data and expert judgement are used to classify the hazard level for each of 18 human health and environmental endpoints
- Endpoints are scored as Low, Moderate, High, very Low and very High
- Hazard table created for the substance

GreenScreen for Safer Chemicals: Hazard Endpoints

Environmental Fate	Environmental Health*	Human Health Group I	Human Health Group II	Physical Hazards
Persistence (P)	Acute Aquatic Toxicity (AA)	Carcinogenicity (C)	Acute Mammalian Toxicity (AT)	Reactivity (Rx)
Bioaccumulation (B)	Chronic Aquatic Toxicity (CA)	Mutagenicity & Genotoxicity (M)	Systemic Toxicity & Organ Effects (incl. Immunotoxicity) (ST)	Flammability (F)
		Reproductive Toxicity (R)	Neurotoxicity (N)	
		Developmental Toxicity (incl. Developmental Neurotoxicity) (D)	Sensitization (SnS)	
		Endocrine Activity (E)	Respiratory Sensitization (SnR)	
			Skin Irritation (IrS)	
			Eye Irritation (IrE)	

*Other ecotoxicity studies when available.

Green Screen Hazard Ratings: [*Toluene*]

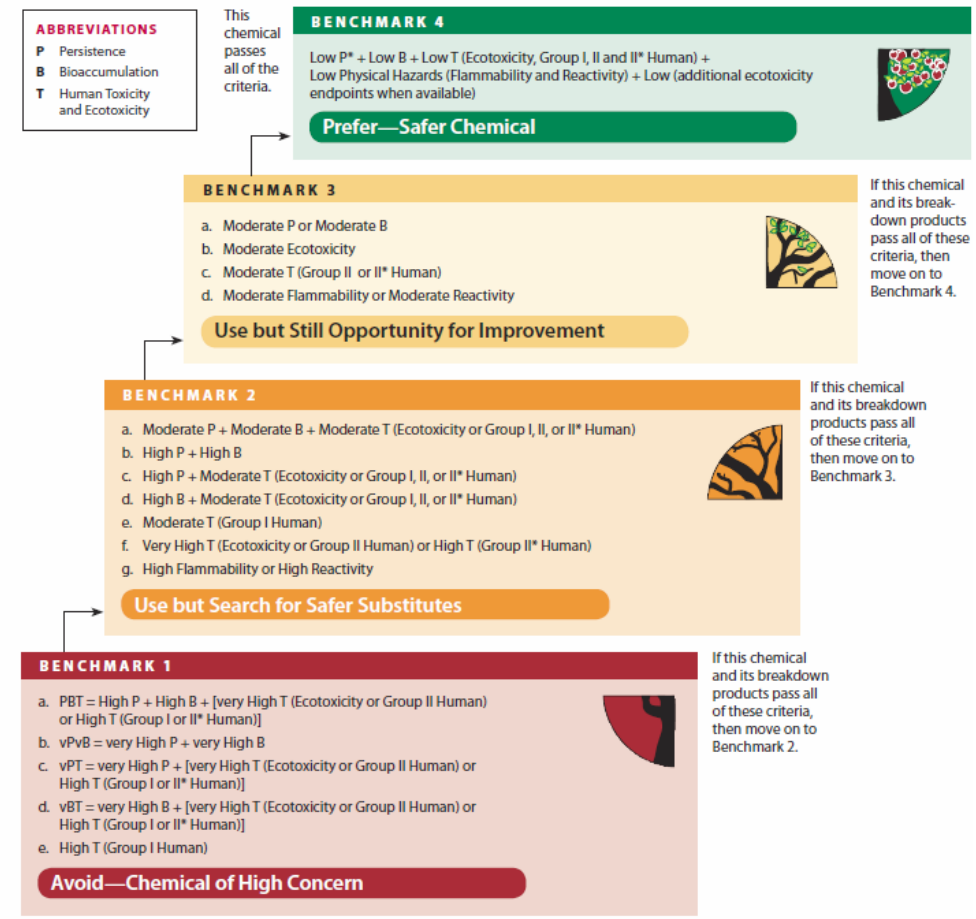
Group I Human					Group II and II* Human									Ecotox		Fate		Physical	
C	M	R	D	E	AT	ST		N		SnS*	SnR*	IrS	IrE	AA	CA	P	B	Rx	F
						single	repeated *	single	repeated *										
DG	L	H	H	M	L	M	M	M	H	L	DG	H	L	H	H	H	vL	L	H

Source: https://www.greenscreenchemicals.org/

GreenScreen®

Decision Logic

- L, M, H endpoint scores are used to determine the benchmark score based on this decision logic
- Benchmark 1= Avoid
- Benchmark 4 = Safer Chemical
- Human health endpoints such as carcinogenicity are more important to the score than ecotoxicity or flammability



Source: https://www.greenscreenchemicals.org/