Lowell Center for Sustainable Production
UNIVERSITY OF MASSACHUSETTS LOWELL

Alternatives Assessment 110 Webinar:

Collaborations to Advance Safer Alternatives- Examples and Models

MARCH 4, 2013

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** If you would like to ask a question or comment during this webinar please type your question in the Q&A box located in the control panel.*

Goals

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- Continuing education and dialog
- To advance the practice of alternatives assessment for informed substitution across federal, state, and local agencies through networking, sharing of experiences, development of common approaches, tools, datasets and frameworks, and creation of a community of practice.

Purpose of this call

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- Increasing acknowledgement of the challenges of identifying, evaluating, and adopting safer chemicals and materials.

- Growing understanding of the need for supply chain, government, academic and non-profit collaboration to advance application of alternatives assessment for informed substitution.

- Many examples of successful supply chain collaborations to advance evaluation and application of safer materials.

- Such collaborations may not be encouraged or supported by government agencies or face challenges in their implementation due to budgets, limitations in working with the private sector, etc.

- Two case examples of collaborations between academic institutions and other stakeholders to prioritize and evaluate safer chemistries. Examples provide lessons for the role of government in supporting alternatives assessment and adoption of safer chemistries.

Speakers

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- Kate Winnebeck, New York Pollution Prevention Institute
- Monica Becker, Monica Becker and Associates

Discussion Questions

- What lessons have you learned about how collaborative efforts can advance policy goals for safer alternatives?
- Are collaborative efforts more effective at some points in the evaluation and adoption process than others (prioritization and evaluation of alternatives versus adoption).
- What are some of the main barriers to collaborative efforts such as these and how can these be overcome?
- Is there a "right" policy mix of collaborative (voluntary) and regulatory initiatives that can advance adoption of safer alternatives?

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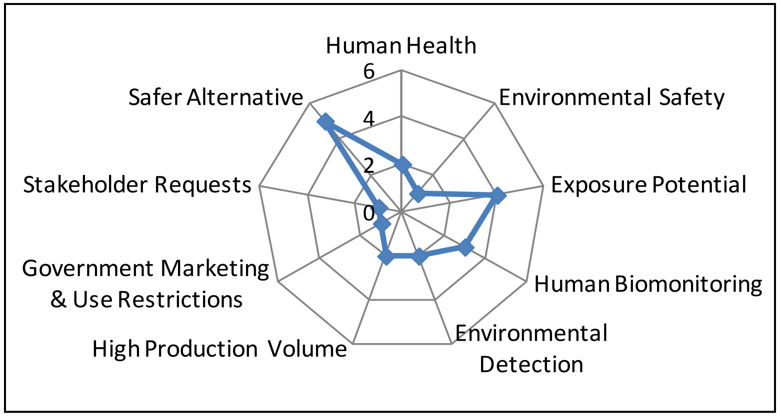
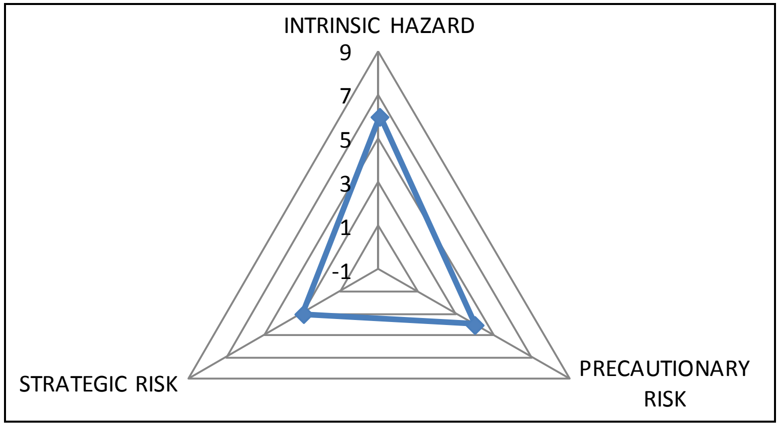
Webinar Discussion Instructions

- Due to the number of participants on the Webinar, all lines will be muted.
- If you wish to ask a question, please type your question in the Q&A box located in the drop down control panel at the top of the screen.
- All questions will be answered at the end of the presentations.





A Framework to Assess the Risk of a Chemical Product Portfolio

New York State Pollution Prevention Institute (NYSP2I)
Rochester Institute of Technology (RIT)

Kate Winnebeck
Life Cycle Assessment Certified Professional (LCACP) &
Sr. Environmental Health & Safety Specialist

March 4, 2013

New York State Pollution Prevention Institute

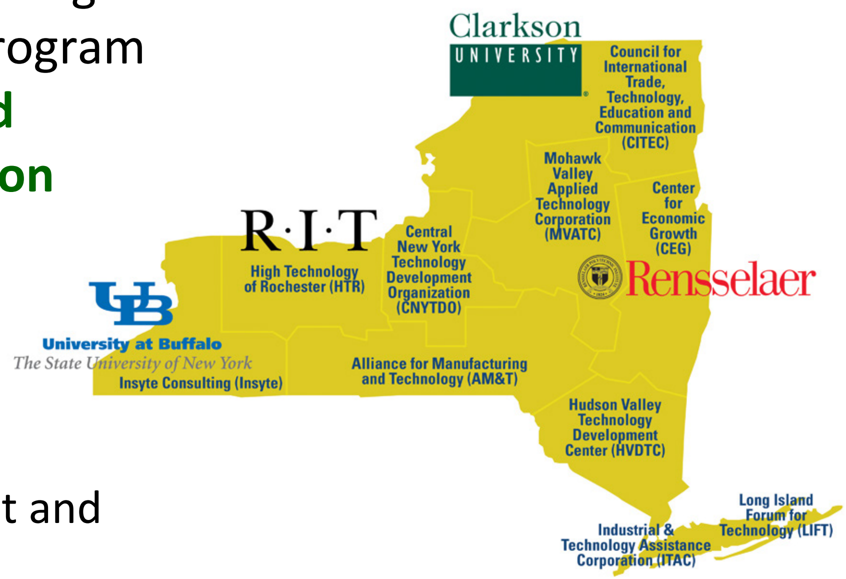
Rochester Institute of Technology
Funding Provided by NYS Department of Environmental Conservation

New York State Pollution Prevention Institute

The vision of the NYSP2I is to **foster the transformation and development of sustainable businesses and organizations in NYS** in a collaborative program committed to making the State a leader in environmental stewardship.

The mission of the Institute is to provide a high-impact, comprehensive and integrated program of **technology research development and diffusion, outreach, training and education aimed at making New York State more sustainable for workers, the public, the environment and the economy** through:

- reductions in toxic chemical use
- reductions in emissions to the environment and waste generation
- efficient use of raw materials, energy and water



Funding Provided by NYS Department of Environmental Conservation

SI Group, Inc.

- SI Group is a privately held, global manufacturer of chemical intermediates, and phenolic resins headquartered in Schenectady, NY
- 16 manufacturing facilities on six continents & customers in 90 countries
- SI Group has created a global network to deliver exceptional quality, consistency, and efficiency
- Operations in the USA, European Union and Asia make global regulatory compliance and product stewardship issues of paramount importance
- Operational safety, product safety and corporate responsibility are at the foundation of our organization
- **As a member of the American Chemistry Council and a Responsible Care® company, SI Group is interested in evaluating their existing chemical products for potential environmental, health, and safety risks as a part of the Responsible Care® code**.

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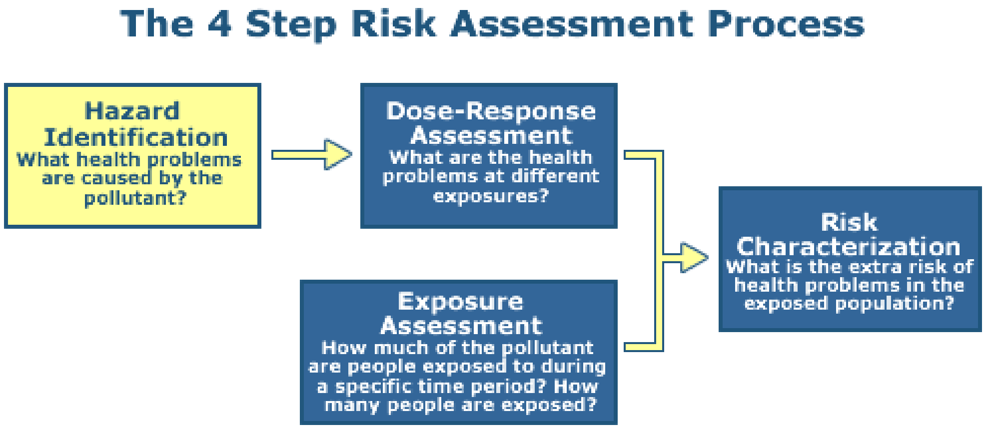
Assessing the Risk of Chemical Products

- SI Group asked NYSP2I to assist with evaluating the environmental footprint of their industrial chemical and polymeric products through the development of a risk assessment tool specific to SI Group operations
- The assessment tool will **characterize hazardous properties and prioritize** SI Group products to inform the business of the current state of the product line to aid in strategic decision making
- The goal is to **understand current and future potential for the substance to be regulated or voluntarily deselected**
  - Identify to what degree EHS attributes will be a factor in future use of the substance

Need for the Tool

- Traditionally, chemical substances are evaluated on their intrinsic hazard/risk



- Companies make decisions based on a substance's intrinsic hazard and business risk
  - Factors which may impact a business' perception of the **long term viability** and **growth potential** of a chemical product or product portfolio

Graphic: http://www.epa.gov/ncea/risk/hazardous-identification.htm

New York State Pollution Prevention Institute
Rochester Institute of Technology
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Tool Development

1. SI Group developed a draft tool based on ACC's Prioritization Screening Approach, incorporating
   - Exposure ranking: use, PBT, & tonnage
   - Hazard ranking: environmental hazard & human health hazard
2. NYSP2I & SI Group worked to develop attributes for business risk
3. Framework developed
4. Tool piloted by SI Group

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Guiding Principles

- Method to **assess and rank products internally**.
- **Evaluating chemical intermediates** is the goal.
- The **structure is adaptable** such that users may integrate other factors which may be critical to evaluating the risk of a substance.
- Results are **replicable internally**.
- Results speak to the **sustainability of a product line**.
- Results are **predictive**.
- Results are **actionable**.
- Results **represent a snapshot in time**.
- The structure **focuses on trends**. The intrinsic EHS risk of a substance changes over time as additional testing and exposure information becomes available and regulations change.
- **Market driven greening of the portfolio**. R&D activities are guided to reduce high risk substances and high risk aspects of substances.

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Framework Structure

Intrinsic Hazard	identify substances with high intrinsic hazard & exposure potentials due to **high production volume or dispersive end use** [based on ACC's Prioritization Screening Approach]
Precautionary Risk	understand the **potential for future regulatory action** or **voluntary deselection** of chemistries and considers detection & production volume
Strategic Risk	understand the potential risk of industry moving **away from use of the substance**

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Framework Structure

- Qualitative or quantitative criteria established for each risk attribute
- Substance receives a score from 0 to 5
- Mathematical models roll individual attributes up to category level

Intrinsic Hazard	Precautionary Risk	Strategic Risk

• Hazard Potential
  • Environmental Safety
  • Human Health
• Exposure Potential
  • Use Patterns
  • Production Volume
  • Persistence and Bioaccumulation
	• Detection
	  • Human Biomonitoring
	  • Environmental Detection
	• High Production Volume
		• Alternatives Assessment
		• Government Marketing & Use Restrictions
		• Stakeholder Requests
		• Safer Alternative

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Framework Structure

Precautionary Risk

- Detection
  - Human Biomonitoring: trends in US CDC National Biomonitoring program data
  - Environmental Detection: detection in environmental media based on the appropriate region for the analysis
- High Production Volume: US EPA & OECD HPV chemicals

Framework Structure

Strategic Risk

- Alternatives Assessment: status of government AA and to degree recommendations are implemented
- Government Marketing & Use Restrictions: applications of the substance with restricted use
- Stakeholder Requests: requests for the reduction of substances in specific applications
- Safer Alternative: degree to which safer alternatives have been identified and the price/performance of the alternatives

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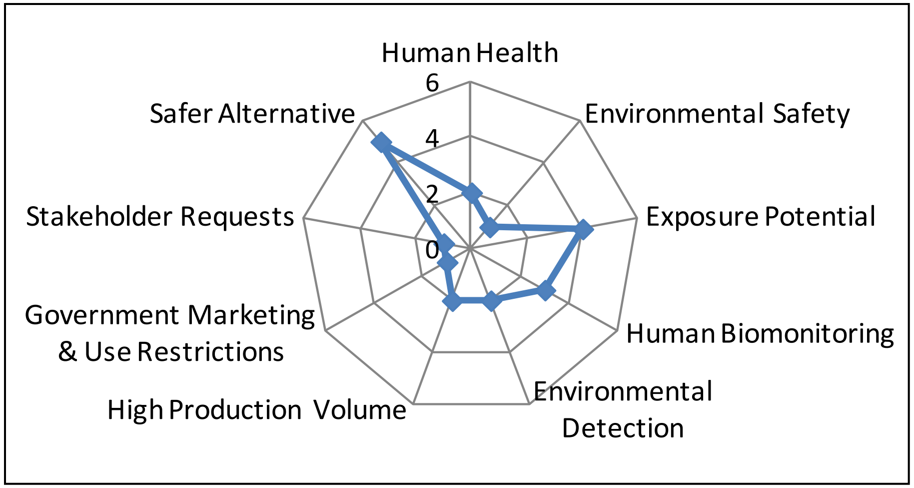
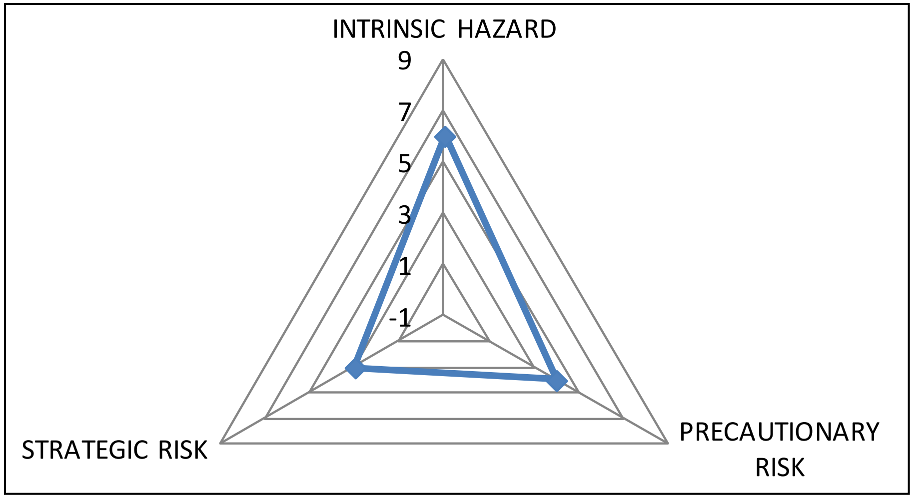
Framework Results

- Resulting risk profile allows the user to
  - Review results at the individual risk attribute level and the higher risk category level
  - Understand the attributes which contribute the most and least risk to be easily identified
  - Compare substances at the individual component level of risk & at risk category level





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Prioritizing Substances for Action

Risk profile results provide information, but they aren't actionable

1. **Identify high risk substances** by adding or multiplying the risk profile scores and ranking the results
   a. Intrinsic hazard, precautionary risk, and strategic risk are equally important
   b. One risk type is prioritized

   Result: high risk substances – may be actionable, but does not account for importance to the business
2. **Prioritize high risk substances for action** by multiplying by a business factor and ranking the results
   a. Prioritize substances with the highest sales margin
   b. Prioritize substances with the highest profit margin

   Result: high risk and high business importance substances

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Use at SI Group Today

- Slightly modified version of the Framework for one of their product lines
- Trial the Framework and roll it out to other product lines as appropriate
- Results used to inform the business development group
- Results are an element of decision making used in business planning
- Results are not necessarily used to deselect materials from the product portfolio at this time, though other users may use the Framework for this

Rochester Institute of Technology
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New York State
Pollution Prevention Institute

Rochester Institute of Technology
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The GC3 Plasticizer Project:
A Collaborative Alternatives Assessment to Identify Safer Alternatives to DEHP in Electronics Wire & Cable

March 4, 2013

Monica Becker, Principal

Monica Becker and Associates Sustainability Consultants

Green Chemistry and Commerce Council (GC3)

Monica Becker & Associates Sustainability Consultants

GC3 Green Chemistry & Commerce Council

Moving Business Toward Safer Alternatives

Overview of Presentation

1. Brief overview of the Green Chemistry & Commerce Council (GC3)

2. Collaborative Plasticizer AA
   - objectives
   - process
   - results
   - lessons learned
   - role of government

GC3 Green Chemistry & Commerce Council

Moving Business Toward Safer Alternatives

A cross sectoral, B-2-B network of more than 80 companies and other organizations formed in 2005 with a mission to promote green chemistry and design for environment (DfE), nationally and internationally

- Share best practices and push the frontier of business practices that promote green chemistry

- Work collaboratively on projects to develop new business strategies, technologies, tools and information

GC3 Green Chemistry & Commerce Council

Moving Business Toward Safer Alternatives

- Based at the Lowell Center for Sustainable Production (LCSP) at the University of Mass. Lowell
- Project groups meet by teleconference to work on projects that further the mission of the GC3
- Annual meeting –

2013 GC3 Roundtable

Johnson & Johnson

May 8-10

New Brunswick, NJ

GC3 Members, include:

Chemical/Specialty Chemicals
Alpha Chemical Service, Inc.
BASF Corporation
Bayer MaterialScience LLC
The Dow Chemical Company
Kluber Lubrication
The HallStar Company
Hubbard Hall
ACS Green Chemistry Institute
Diversey
DuPont
ecoSolv Technologies, Inc.
Rivertop Renewables

Apparel & Footwear
Anvil Knitwear
Nike, Inc.
VF Corporation
New Balance

Outdoor Industry
REI

Consumer Products
Avon Products, Inc.
Johnson & Johnson
Henkel/Dial
Method Products, Inc.
Seventh Generation, Inc
Colgate-Palmolive Company

Office Furniture
Steelcase
Herman Miller
Designtex

Building Products
Construction Specialties

Retail
Walmart
Staples
Target
Green Depot

Aerospace
Lockheed Martin

Electronics
Bose Corporation
HP
Intel
Dell
EMC Corporation

Pharmaceutical
BWC Pharma Consulting

GC3 Members, include:

Software

Actio Software
The Wercs

Product Standards & Certification

Bureau Veritas
Green Seal
EPEAT, Inc.
NSF International

Consulting

Inside Matters
Pure Strategies
ToxServices, LLC
Environmental and Public Health Consulting
Daley International
Sustainable Research Group

Government

Minnesota Pollution Control Agency
Environmental Protection Agency
German Federal Environment Agency
Mass. Toxics Use Reduction Institute
Washington State Department of Ecology

Non Governmental Organizations

Investor Environmental Health Network
Center for Environmental Health
Clean Production Action
Cradle to Cradle Products Innovation Institute
GreenBlue
Environmental Health Fund
Pacific Northwest Pollution Prevention Resource Center

GC3 Green Chemistry & Commerce Council
Moving Business Toward Safer Alternatives

The GC3 Plasticizer Project: A Collaborative AA

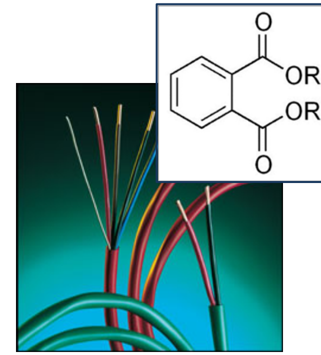
Project Objectives:

- To develop a model for collaborative AAs, involving industry and academia
- To create the model through the development of an actual collaborative AA, with useable results

The GC3 Plasticizer Project

A Collaborative AA to Identify Safer Alternatives to DEHP
di (2-ethylhexyl) phthalate plasticzer in Electronics Wire & Cable

Why did the GC3 focus its project on wire and cable & DEHP?



- Phthalates are of interest to many GC3 members
  - Many are toxic
  - High exposure potential from plastics
  - Used in many different plastic products
  - Focus of numerous regulations
  - Many companies need to eliminate them and find safer substitutes
- Wire & cable is of interest to many GC3 members
- Most wire and cable is made from PVC
- DEHP is the most commonly used plasticizer for PVC wire and cable
- Leverages Univ. of Mass. Lowell’s expertise in plastics engineering

GC3 Green Chemistry & Commerce Council
Moving Business Toward Safer Alternatives

Project Audience:

- Organizations that are interested in collaborating on AAs, rather than going it alone

- Organizations that need to make decisions on plasticizers
  - ✓ Electronics brands (e.g., HP, Dell) original equipment manufacturers (OEMs)
  - ✓ Plastic compounders
  - ✓ Plasticizer manufacturers
  - ✓ Retailers
  - ✓ Others: purchasing organizations, governments, advocates, green certification programs

Plasticizer Evaluation Project Partners

OEMs/Retail

Dell

EMC

HP

Staples

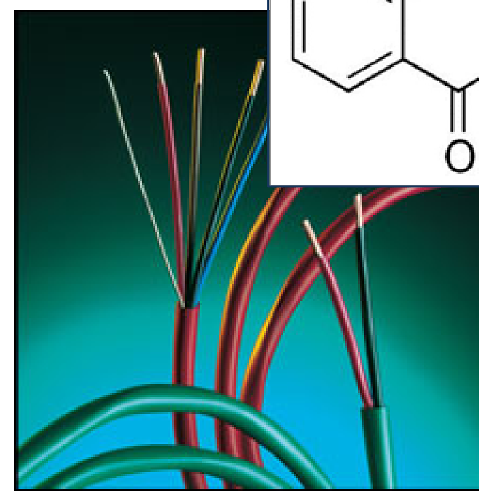
Suppliers

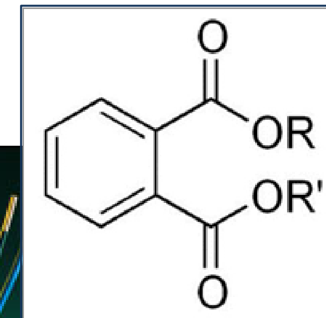
BASF

Dow Chemical

Hallstar

Teknor Apex





University Partners

Lowell Center for Sustainable Production

Faculty of Univ. of Mass Lowell

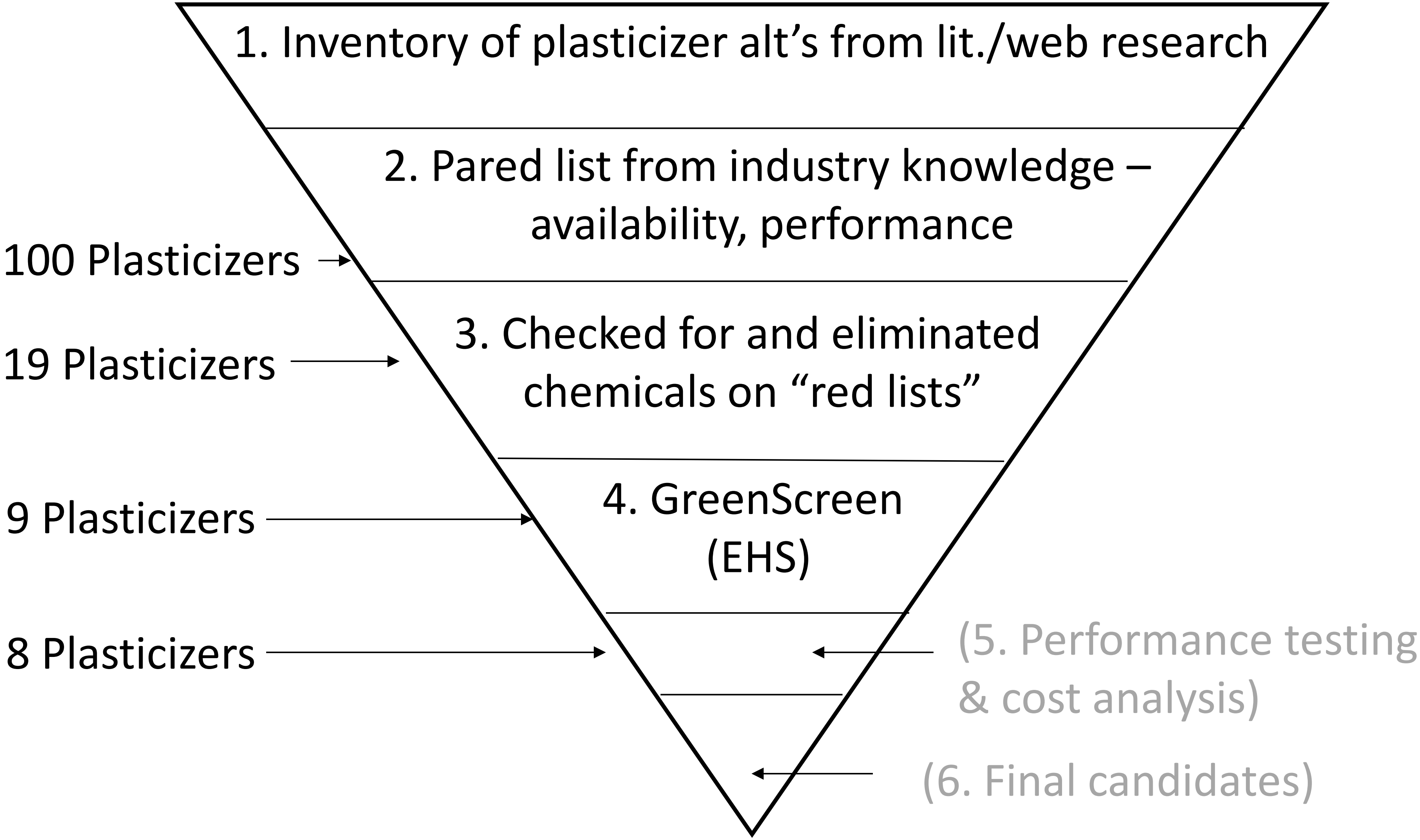
Government & NGOs

Washington State

Clean Production Action

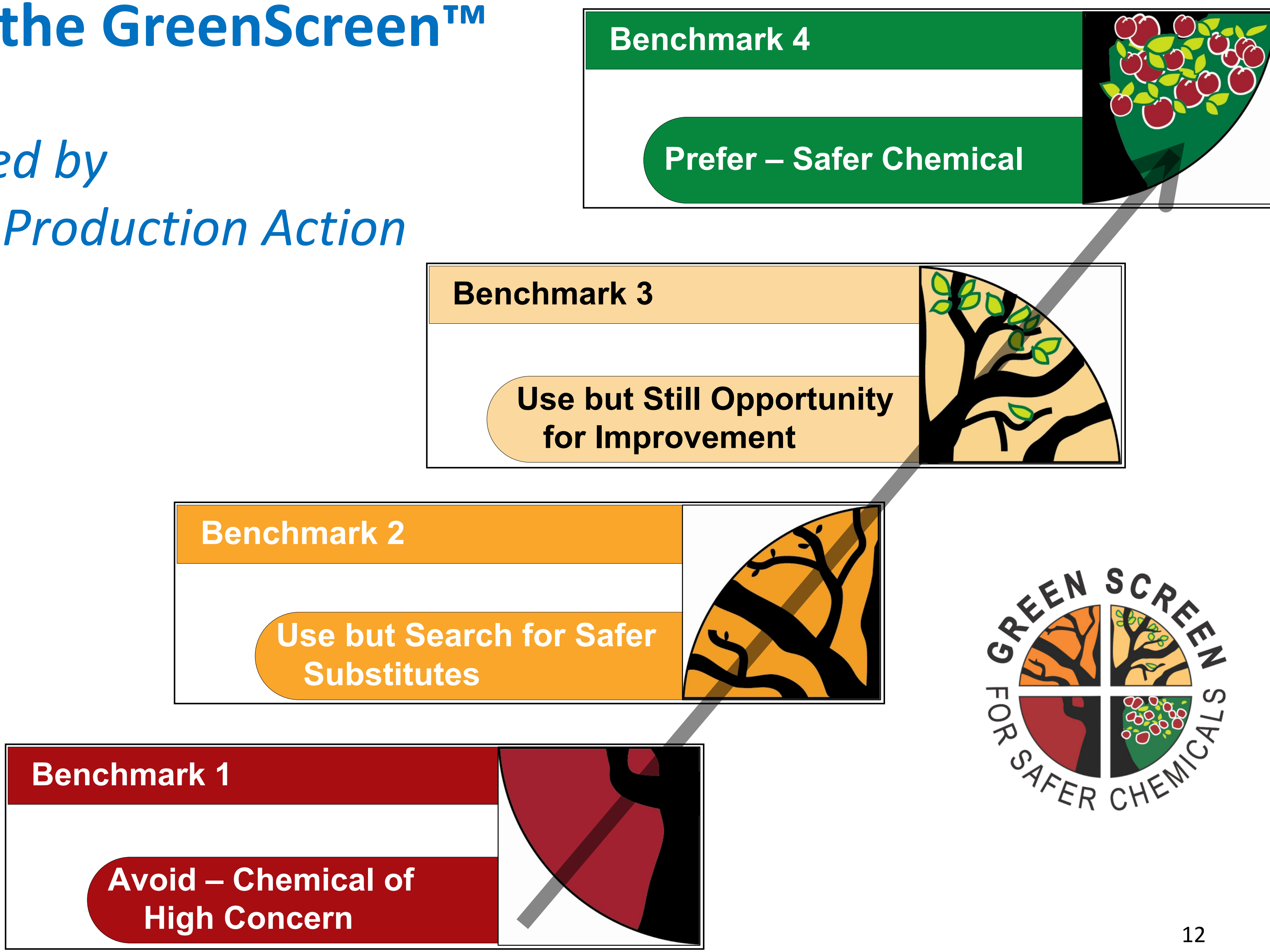
Pacific Northwest Pollution Prevention Resource Center

Plasticizer Candidate Screening Process



Chemical Hazard Assessment with the GreenScreen™

Created by
Clean Production Action



GREEN SCREEN FOR SAFER CHEMICALS

What is the GreenScreen?

- Comparative Chemical Hazard Assessment approach (CHA) developed by Clean Production Action
- Builds on the U.S. EPA's DfE Alternatives Assessment approach and Safer Product Criteria and other precedents such as the Globally Harmonized System (GHS) of Classification & Labeling of Chemicals
- Considers 18 environmental and human health endpoints
- Addresses chemical constituents and any chemical transformation products
- Evaluates chemical hazards for an overall chemical score, or "Benchmark"
  - Benchmark 1 – 4, or
  - U if there is insufficient data to establish a benchmark

How to do a GreenScreen Assessment

Three Steps:

1. Assess and classify hazards
2. Apply the Benchmarks
3. Make informed decisions

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GreenScreen ™ v1.2
Hazard Endpoints

Human Health Group I	Human Health Group 2	Environmental Toxicity & Fate	Physical Hazards
Carcinogenicity	Acute Toxicity	Acute Aquatic Toxicity	Reactivity
Mutagenicity & Genotoxicity	Systemic Toxicity & Organ Effects	Chronic Aquatic Toxicity	Flammability
Reproductive Toxicity	Neurotoxicity	Other Ecotoxicity Studies when available	
Developmental Toxicity	Skin Sensitization	Persistence	
	Respiratory Sensitization		
Endocrine Activity	Skin Irritation	Bioaccumulation	
	Eye Irritation		

GreenScreen™ Criteria for Each Endpoint
Example - Carcinogenicity (C)

Information type	Information Source	High (H)	Moderate (M)	Low (L)
Data	GHS Category	1A (Known) or 1B (Presumed) for any route of exposure	2 (Suspected) for any route of exposure or limited or marginal evidence of carcinogenicity in animals	Adequate data available, and negative studies, no structural alerts, and GHS not classified.
A sample of A Lists*	EPA-C (1986)	Group A, B1 or B2	Group C	Group E
	EPA-C (1996, 1999, 2005)	Known or Likely		Not Likely
	IARC	Group 1 or 2A	Group 2B	Group 4
	Prop 65	Known to the state to cause cancer		

*See the GreenScreen ™ V 1.2 for the complete set of A & B lists

Hazard Summary Table with Hazard Classification and Confidence Levels

Green Screen Hazard Ratings																			
Group I Human					Group II and II* Human									Ecotox		Fate		Physical	
Carcinogenicity	Mutagenicity	Reproductive Toxicity	Developmental Toxicity	Endocrine Activity	Acute Toxicity	Systemic Toxicity		Neurotoxicity		Skin Sensitization*	Respiratory Sensitization*	Skin Irritation	Eye Irritation	Acute Aquatic Toxicity	Chronic Aquatic Toxicity	Persistence	Bioaccumulation	Reactivity	Flammability
						single	repeated *	single	repeated *	*	*								
L	**L**	**L**	**M**	*M*	**L**	**L**	**L**	**vH**	*H*	**L**	**L**	**L**	**L**	**H**	**H**	**vL**	**L**	M	*L*

Level of Concern:

- vH = very High
- H = High
- M = Moderate
- L = Low
- vL = very Low
- DG = Data Gap

Level of Confidence:

- **Bold = High confidence**
- *Italics = Low confidence*

the New button.

Apply the Benchmarks

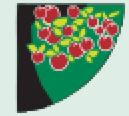
ABBREVIATIONS

- **P** Persistence
- **B** Bioaccumulation
- **T** Human Toxicity and Ecotoxicity

This chemical passes all of the criteria.

BENCHMARK 4

Low P* + Low B + Low T (Ecotoxicity, Group I, II and II* Human) + Low Physical Hazards (Flammability and Reactivity) + Low (additional ecotoxicity end points when available)



Prefer—Safer Chemical

BENCHMARK 3

a. Moderate P or Moderate B
b. Moderate Ecotoxicity
c. Moderate T (Group II or II* Human)
d. Moderate Flammability or Moderate Reactivity

Use but Still Opportunity for Improvement

If this chemical and its break-down products pass all of these criteria, then move on to Benchmark 4.

BENCHMARK 2

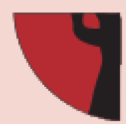
a. Moderate P + Moderate B + Moderate T (Ecotoxicity or Group I, II, or II* Human)
b. High P + High B
c. High P + Moderate T (Ecotoxicity or Group I, II, or II* Human)
d. High B + Moderate T (Ecotoxicity or Group I, II, or II* Human)
e. Moderate T (Group I Human)
f. Very High T (Ecotoxicity or Group II Human) or High T (Group II* Human)
g. High Flammability or High Reactivity

Use but Search for Safer Substitutes

If this chemical and its breakdown products pass all of these criteria, then move on to Benchmark 3.

BENCHMARK 1

a. PBT = High P + High B + [very High T (Ecotoxicity or Group II Human) or High T (Group I or II* Human)]
b. vPvB = very High P + very High B
c. vPT = very High P + [very High T (Ecotoxicity or Group II Human) or High T (Group I or II* Human)]
d. vBT = very High B + [very High T (Ecotoxicity or Group II Human) or High T (Group I or II* Human)]
e. High T (Group I Human)



Avoid—Chemical of High Concern

If this chemical and its breakdown products pass all of these criteria, then move on to Benchmark 2.

BENCHMARK U

- Unspecified Due to Insufficient Data

GreenScreen Benchmark 1 Criteria

BENCHMARK 1

a. PBT = High P + High B + [very High T (Ecotoxicity or Group II Human) or High T (Group I or II* Human)]

b. vPvB = very High P + very High B

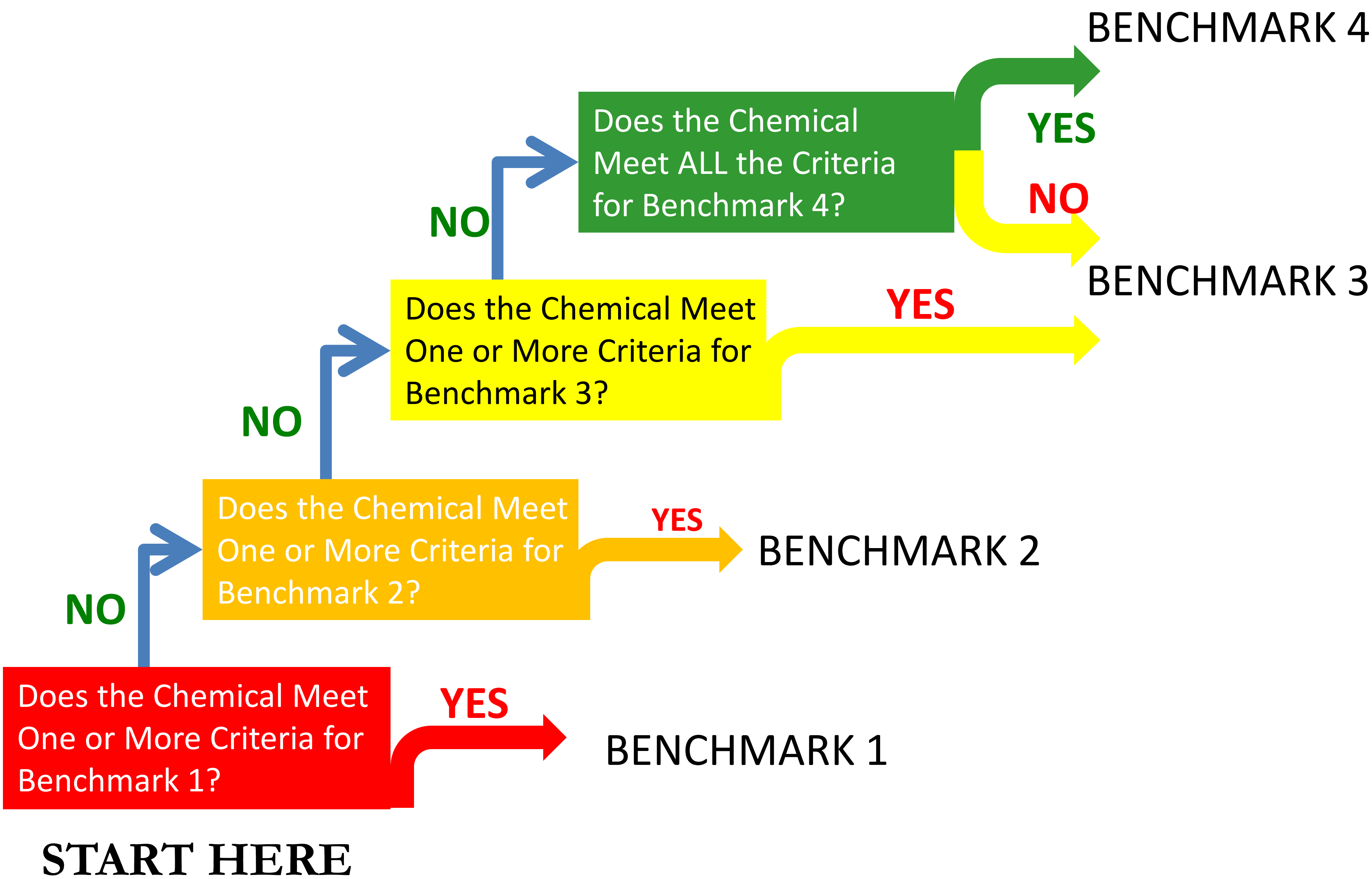
c. vPT = very High P + [very High T (Ecotoxicity or Group II Human) or High T (Group I or II* Human)]

d. vBT = very High B + [very High T (Ecotoxicity or Group II Human) or High T (Group I or II* Human)]

e. High T (Group I Human)

Avoid—Chemical of High Concern

How to Apply the Benchmarks



GreenScreen Assessment Process

- Hired ToxServices, a licensed GreenScreen Profiler, to conduct GreenScreens
- Draft GreenScreens and all project protocol documents were posted on a webpage, results were discussed on calls, and all call notes and comments from the workgroup were posted on-line

- Profiler reviewed assessments and comments from the workgroup, and revised assessments where scientifically valid and consistent with GreenScreen guidelines.

GreenScreen Results

Plasticizer	GreenScreen ™ Benchmark	Notes:
Hexamoll® DINCH® (BASF)	BM 2	Moderate endocrine activity
DOZ	U	Data gaps for cancer and endocrine activity
DPHP	U	Data gaps for cancer and endocrine activity
TEHTM	U	Data gaps for cancer and endocrine activity
DEHT (Eastman 168)	BM 3_{DG}	Data gaps for neurotoxicity and respiratory sensitization
DINP	BM 1	High endocrine activity, developmental and reproductive toxicity
Dow Ecolibrium™ **(Redacted)**	4 Formulations BM 3 for 3 BM 2 for 1	The BM for the formulation is for the monomer with the lowest GS BM score
HallStar Dioplex™ and Paraplex™ **(Redacted)**	5 chemical ingreds BM 3 for 4 BM 2 for 1	The BM 2 chemical is a fatty alcohol monomer with moderate developmental toxicity

Funding for the Project

Sources:

- Companies in the GC3 Project Group provided cash
    - Plasticizer manufacturers
    - Electronics companies (i.e., users of wire & cable)

- The GC3, Lowell Center, and the Toxics Use Reduction Institute contributed significantly from its operating budget and through in-kind contributions

Lessons Learned

1. Benefits of the project

- Plasticizer manufacturers found value in an independent assessment for internal communication and marketing
- Compounders found value in an independent assessment, to avoid "regrettable substitutions"
- Brands found value in an independent assessment to avoid "regrettable substitutions" and in getting a single score to support decision-making
  - Though they find the U's confounding
- GreenScreen offered a robust system/program for comparative hazard assessment for all parties

Lessons Learned (cont'd)

2. **Value of collaborative process**
   - Pooling knowledge, funds and data to evaluate alternatives is valuable

     - lowers the cost to individual companies to get assessments done

     - creates more robust results

     - can create alignment on safer chemical alternatives within a sector, which can lead to greater demand and lower costs for alternatives

     - organizations learn from each other

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Moving Business Toward Safer Alternatives

Lessons Learned (cont'd)

3. Challenges

- Lack of transparency in some formulations
  - Some GreenScreens done under NDA with the Profiler
  - GreenScreen results reported but not the identity of chemicals used
  - Some brands/retailer find this frustrating/not entirely helpful

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Lessons Learned (cont'd)

3. Challenges (cont.)

- Obtaining complete tox data sets for chemicals
  - Data availability for certain endpoints particularly challenging
    - Cancer
    - Endocrine activity
  - Even though the GreenScreen allows for chemical surrogates to be used, in some cases suitable surrogates could not be found
- Data gaps are particularly problematic when evaluating newer chemical products and products from smaller manufacturers

Green Chemistry & Commerce Council
Moving Business Toward Safer Alternatives

Current Status of Project

- Finishing "verification" (i.e., peer review) of the GreenScreens
- Once verification is done, GreenScreens will be made public
  - Requests from several organizations to include the assessments in their chemical/material databases
- Publishing articles on our model for collaborative AAs

RSC | Advancing the Chemical Sciences

Chemical Alternatives Assessments

Editors: R M Harrison and R E Hester

How collaboration can lead to better decisions on safer chemical alternatives

By Monica Becker
Published October 26, 2012
Tags: Chemicals, Green Chemistry & Toxics, More...
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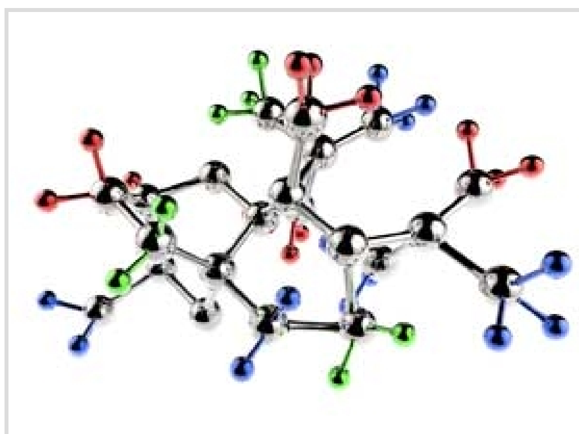

The pressure is mounting on brands to eliminate known chemicals of concern from their products. The European Union's REACH regulations Wa t, an ne w exa o identify and eliminate chemicals of concern. Add to this list growing interest and pressure from individual consumers, NGOs and retailers for greater safety and transparency.

The path to elimination can be riddled with challenges. Finding a truly safer substitute that

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Discussion Questions

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- What lessons have you learned about how collaborative efforts can advance policy goals for safer alternatives?
- Are collaborative efforts more effective at some points in the evaluation and adoption process than others (prioritization and evaluation of alternatives versus adoption).
- What are some of the main barriers to collaborative efforts such as these and how can these be overcome?
- Is there a "right" policy mix of collaborative (voluntary) and regulatory initiatives that can advance adoption of safer alternatives?

Next Webinars

Lowell Center for Sustainable Production
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- The Interstate Clearinghouse on Chemicals Alternatives Assessment Guidance Document Process
  - April 4,2013 at 12pm Eastern/ 9am Pacific
- Identifying priority chemicals, uses, and sectors for alternatives assessment and informed substitution –
  - May/June 2013
- Evaluating and addressing tradeoffs in alternatives assessment practice
  - May/June 2013

Webinar Audio & Slides

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The audio recording and slides shown during this presentation will be available at:

http://www.chemicalspolicy.org/alternativesassessment.webinarseries.php