



U.S. EPA Design for the Environment Program

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Design for the Environment Program at EPA



- Science expertise of EPA
- Value as a convener
- Synergy with Regulatory Programs

Existing Chemicals Action Plans

- Factors used to select priority chemicals:
 - PBT
 - High production volume
 - In consumer products
 - Concern for children's health (based on reproductive or developmental effects)
 - International
 - Human bio-monitoring
 - New Chemicals Program categories of potential concern
- Updating prioritization process

Action Plan Chemicals

- Benzidine Dyes
 - Bisphenol A*
 - Hexabromocyclododecane (HBCD)*
 - Methylene Diphenyl Diisocyanate (MDI)
 - Nonylphenol and Nonylphenol Ethoxylates*
 - Pefluorinated chemicals (PFCs)
 - Penta, octa, decabromodiphenyl ethers (PBDEs)*
 - Phthalates*
 - Short-chain chlorinated paraffins
 - Toluene Diisocyanate (TDI)
- * DfE Alternatives Assessment in progress

Functional Use

- The role of the ingredient in the product
 - Surfactant in a cleaner
 - Surfactant in a drilling fluid
 - Flame retardant in polyurethane foam
 - Flame retardant in polystyrene foam
- An Alternatives Assessment for a given functional use can simplify the risk equation ($\text{risk} = f\{\text{hazard, exposure}\}$)
- Applications
 - CleanGredients
 - Alternatives Assessments
 - Green Chemistry Challenge

Steps to Conducting a Chemical Hazard Alternatives Assessment



- 1) Determine needs
- 2) Gather information
- 3) Involve stakeholders
- 4) Assess hazard
- 5) Report information
- 6) Apply information

Step 3: Stakeholders – HBCD in Building Insulation, Textiles, and Electronics



- Academics
- Consultants
- NGOs
- Flame Retardant Manufacturers
- Flame Retardant Importers
- Compounders and Resin Manufacturers
- Building and Construction Industry
- Textile Industry
- Automotive Industry
- Electronics Industry
- Recyclers
- U.S. Federal Government
- State and Local Governments
- International

Steps to Conducting a Chemical Hazard Alternatives Assessment



- 1) Determine needs
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Step 6: Apply the Information

- DfE AAs do not rank chemicals
- Alternatives assessments complement regulatory action
 - PentaBDE SNUR – Showed availability of safer, highly functioning alternatives
 - NP AWQC* – Promoted compliance by reducing use of NP through SDSI
- Tools that can aid decision-making (e.g., GreenScreen)
 - Harmonizes with existing systems (GHS, DfE)
 - Provides an overall score (Benchmarks 1-4)
 - Hewlett Packard uses GS to assess alternative materials
- Safer alternatives not available?
 - Challenge for innovative chemical design
 - Alternatives Assessment can set the criteria



*NP AWQC = Nonylphenol Ambient Water Quality Criteria,

SDSI = Safer Detergents Stewardship Initiative

Transparency for Alternatives Assessments

1. Methodology on DfE website; published in ES&T
2. Toxicological criteria; published for public comment

Human Health Toxicity

- Acute mammalian toxicity
- Carcinogenicity
- Mutagenicity/
Genotoxicity
- Reproductive and Developmental Toxicity
- Neurotoxicity
- Repeated Dose Toxicity
- Respiratory and Skin Sensitization
- Eye and Skin Irritation/Corrosivity

Environmental Fate & Effects

- Aquatic toxicity
- Environmental persistence
- Bioaccumulation
-
- *Endocrine Activity*

www.epa.gov/dfe/alternative_assessments.html

Thank you!

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DfE Alternatives Assessments

	Issue	Actions
Flame Retardants in Furniture Foam	<ul style="list-style-type: none"> • PentaBDE has been found in birds, fish, Arctic mammals, and human breast milk. • Alternatives were not well understood, raising the potential for unintended consequences from the substitution 	<ul style="list-style-type: none"> • Complement to voluntary phase-out. • Industry switched to safer alternatives using the alternatives assessment information. • Completed in 2005.
Flame Retardants in Printed Circuit Boards	<ul style="list-style-type: none"> • TBBPA in the environment and people. • Computer manufacturers have committed to using safer alternatives if they are identified. 	<ul style="list-style-type: none"> • Hazard assessment completed. • Combustion testing underway.
<i>Action Plan Chemicals</i>		
BPA in Thermal Paper	<ul style="list-style-type: none"> • Contributes to environmental release; elevated levels found in pregnant cashiers. 	<ul style="list-style-type: none"> • More than 100 stakeholders. • Hazard evaluation of BPA and 19 alternatives – September 2011 • Draft report – January 2012
DecaBDE flame retardant in electronics and textiles	<ul style="list-style-type: none"> • DfE action will complement voluntary phase-out. 	<ul style="list-style-type: none"> • More than 100 stakeholders. • Draft report with hazard evaluation of DecaBDE and 30 alternatives – Winter 2011

DfE Alternatives Assessments

	Issue	Actions
Phthalates	<ul style="list-style-type: none"> •Eight Action Plan Phthalates were chosen due to potential impacts on development and reproduction and presence in people and the environment. 	<ul style="list-style-type: none"> •Stakeholder interest is high •Will evaluate the eight phthalates and potential alternatives •Kick-off Meeting – August 2011 •Scope – October 2011 •List of Alternatives – January 2012 •Draft Report – October 2012
HBCD flame retardant in polystyrene foam	<ul style="list-style-type: none"> •HBCD has been the only effective flame retardant for polystyrene foam for building insulation and other uses. HBCD is persistent in the environment, bioaccumulates in living organisms, and is highly toxic to aquatic organisms. 	<ul style="list-style-type: none"> •Similar stakeholders to DecaBDE with addition of the polyurethane foam and building industries •Draft Report – June 2012
NP / NPE surfactants	<ul style="list-style-type: none"> •Builds on Safer Products Labeling and Safer Detergents Stewardship Initiative •Partnerships with retailers and manufacturers resulted in near phase-out from consumer products •Partnership with laundry industry to phase-out use 	<ul style="list-style-type: none"> •Draft report – September 2011 •Final report: - January 2012

Step 1: Determine Needs

Step 2: Gather Information

- Are alternatives in use and by whom?
- Are there limitations to use?
 - Technical
 - Cost
- How do practical considerations of commerce impact the analysis?
 - Flammability Standards
 - Chemical & polymer manufacturing & compounding
 - Product manufacturing (e.g., electronics housing and textile backing)
 - Retailing
 - Advocacy Groups
 - Products' end of life considerations
- Project Description

Step 3: Involve Stakeholders

- Build a web of stakeholder contacts
 - Up and down the supply chain (manufacturers to retailers)
 - Across the spectrum of interested parties (NGOs, trades)
 - To build buy-in and a sense of ownership
- Stakeholders are key to technical understanding
 - Inform project methodology
 - Identify alternatives
 - Monitor implementation
- Enhances transparency and understanding
- Leads to adoption of safer alternatives & promotes technology transfer

Step 4: Assess Hazard

- Similar to NCP Standard Review; combines information from five sources:
 - Test data from literature
 - CBI test data
 - Structure-Activity-Relationship- (SAR) based estimations
 - Professional judgment of EPA staff
 - Company-confidential data
- Assign a value of high, moderate or low for each human health and environmental endpoint
- Characterize evidence for endocrine activity
- EPA review
- Broad stakeholder review for all hazard calls

Step 5: Report Information

- Hazard Portion
 - Tables summarizing EPA assessment for environmental and human health endpoints
 - Detailed hazard reviews
- Information for context and decision-making
 - Manufacturing process
 - Use patterns & life-cycle thinking
 - Unconventional solutions
 - Decision-making tools