Alternatives Assessment 112 Webinar:
Prioritizing Chemicals of Concern in Alternatives Assessment

MAY 15, 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

• 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

• Many private and public sector alternatives assessment initiatives often begin with prioritization processes.

• A wide range of chemical prioritization, ranking, and scoring processes have been developed over the past twenty years. These have served to identify priority chemicals, uses, processes and sectors for alternatives assessment as well as risk management.

• While all include chemical hazard evaluation, with a range of endpoints and criteria, chemical exposure and use have been addressed to a varying degree across these schemes.

• This webinar will present three different prioritization approaches, how different agencies have addressed chemical prioritization, potential harmonization across these approaches, and how these approaches can be used to support informed substitution.
Speakers

- Maria Doa, US Environmental Protection Agency
- Danie Dube, Environment Canada
- Jack Geibig, Ecoform
Discussion Questions

- What processes have been developed to prioritize chemicals of concern and what are there similarities/differences?

- How have exposure and use data been integrated into chemical prioritization schemes?

- How have these schemes been used in chemical alternatives assessment processes? How could they be more effectively linked to alternatives assessment processes in the future?

- How can hazard categories and criteria be more effectively harmonized?
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.
Prioritization of Canada’s Domestic Substances List

Danie Dubé
Environment Canada
Objective

• Provide an overview of the 2006 prioritization process used for chemicals in Canada
  – Methodology used
  – Tools for prioritization
  – Guidance and technical approaches developed
Existing Substances under *Canadian Environmental Protection Act (CEPA)*

- Approximately 23,000 substances (e.g., industrial chemicals) on Canada’s Domestic Substances List (DSL)
- The DSL was created for the purpose of defining a “new substance” under CEPA
- Includes substances “grandfathered” under the legislation
- For categorization, focus on substances nominated as being, between 1984-1986 (when DSL was created):
  - In Canadian commerce or used for commercial manufacturing in Canada, or;
  - Manufactured or imported in Canada at >100 kg/year
  - Does not include: contaminants, by-products and wastes
Types of Substances on the DSL (total 23,000 substances)

- Polymers: 20%
- Inorganics: 10%
- UVCBs: 20%
- Discrete Organics: 50%

The pie chart illustrates the distribution of these substances.
CATEGORIZATION of the Domestic Substances List (DSL) 2006 (n=23,000)

- Greatest Potential for Human Exposure
- Substances that are Persistent or Bioaccumulative
  - “Inherently Toxic” to Humans
  - “Inherently Toxic” to non-Human Organisms

SCREENING ASSESSMENT (Second Phase) 2007-2020

- No further action under this program
- Add to Schedule 1

Risk Management
### Categorization Criteria for P, B, and non-human iT

<table>
<thead>
<tr>
<th>*Bioaccumulation</th>
<th><strong>iT – non-humans</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>BAF $\geq 5000$</td>
<td>Acute aquatic toxicity of LC(EC)$_{50}$ $\leq 1$mg/L, or a chronic aquatic toxicity of NOEC $&lt; 0.1$ mg/L</td>
</tr>
<tr>
<td>or BCF $\geq 5000$</td>
<td>or $\log K_{ow} &gt; 5a$</td>
</tr>
<tr>
<td>or log Kow $\geq 5a$</td>
<td></td>
</tr>
</tbody>
</table>

### *Persistence*
A substance is considered persistent if its transformation half-life satisfies the criterion in any one environmental medium or if it is subject to long-range transport.

<table>
<thead>
<tr>
<th>Medium</th>
<th>Half-life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air</td>
<td>$&gt; 2$ days (or LRT)</td>
</tr>
<tr>
<td>Water</td>
<td>$&gt; 6$ months</td>
</tr>
<tr>
<td>Sediment</td>
<td>$&gt; 1$ year</td>
</tr>
<tr>
<td>Soil</td>
<td>$&gt; 6$ months</td>
</tr>
</tbody>
</table>

*Criteria as outlined in the Persistence and Bioaccumulation Regulations*
<table>
<thead>
<tr>
<th>Preference</th>
<th>P</th>
<th>B</th>
<th>iT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Higher</td>
<td></td>
<td>Experimental</td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td></td>
<td>Analogue / Groupings / Scientific rationale</td>
<td></td>
</tr>
<tr>
<td>Lower</td>
<td></td>
<td></td>
<td>Modelled (QSAR)</td>
</tr>
</tbody>
</table>
Tools for DSL Categorization – Human Health

• Simple Tools:
  – Simple Exposure Tool (SimET)
    Relative ranking of all DSL substances based on submitters (S), quantity (Q) and expert ranked use (ERU)
  – Simple Hazard Tool (SimHaz)
    Identification of high or low hazard compounds by various International agencies based on weight of evidence for multiple endpoints

• Complex Tools
  – Complex Hazard Tool (ComHaz)
    Hierarchy of multiple toxicological endpoints and data sources including QSAR
Results of Categorization brought a challenge: how to distinguish “Priorities among Priorities”

• 4300 substances on Canada’s Domestic Substances List have been identified as requiring further work/action
  – 4000 met the categorization criteria
  – 300 warrant further attention from a human health perspective
Highest Potential Concern for Human Health:

• Substances that were Greatest Potential for Exposure or Intermediate Potential for Exposure and High Hazard
  – Formed the basis for the substances in the Challenge and Petroleum Sector Stream Approach
Highest Potential Concern for the Environment

- P and B substances that are also inherently toxic are the ecological highest priority for action.
- For substances that are P, exposure can not easily be reduced by discontinuing production. Problems caused by persistent chemicals are, therefore, long-lasting.
- Persistent substances that are bioaccumulative concentrate up to several orders of magnitude. They can reach concentrations where adverse effects occur even at low levels of exposure in the environment.
Lower Concern: Low volume < 1 tonne

• As context:
  – For new substances, volume trigger for notification and assessment is 100 kg.
  – Under the REACH proposed legislation, substances being addressed are those above 1 tonne.

• Some substances with inherent properties of concern can be identified as needing further assessment

• Some low volume substances will be included in a group where other members of a group will have different concern profiles

• A ‘Rapid Screening’ approach has been developed to assess these substances
In Summary ……

From 23,000 to 4300 Substances

- 500 High Priorities
- 2600 Med Priorities
- 1200 Low Priorities
- 4300 Priorities from Categorization
Ecological Technical Approaches/Strategic Guidance

- **Organics**
  - October 2002 Technical Workshop

- **Inorganics**
  - Findings and Recommendations from the IWG Report (2001)

- **UVCBs**
  - Category Approaches Documents (2005)

- **Polymers**
  - Category Approaches Documents (2005)

- **Organometallics**
More Information On Human Health Approach

Substances Management Coordinator
Chemicals Management Plan
200 Sacré-Cœur Boulevard
Gatineau, QC K1A 0H3
Tel: 1-800-567-1999 or 819-953-7156
Fax: 819-953-7155
Email: Substances@ec.gc.ca

the Chemical Substances website:
http://www.chemicalsubstanceschimiques.gc.ca/
Purpose

- Identify chemicals that EPA would focus on in the near term
  - Not an exclusive list but would indicate where EPA planned to focus its resources in the existing chemicals program
  - Could also be modifications to the list based on changes in production
  - EPA would conduct risk assessments for these chemicals
- Consideration of both hazard and exposure
Public Input

- Stakeholder Meeting
  - 28 attendees from industry, NGOs, states, tribes
- Webinar
  - More than 400 participants
- Discussion Forum
  - 23 groups/individuals submitted comments online
Methods Document

- Describes the methodology EPA used to identify work plan chemicals
- Step 1 Factors and Data Sources
  - Step 1 Factors
  - Step 1 Factors and Data Sources
  - Step 1 Excluded Chemicals
- Step 2 Criteria
  - Hazard
  - Exposure
  - Persistence and Bioaccumulation
- Step 2 Categorizing Chemicals
- Work Plan Chemicals
- Potential Data Gathering Chemicals
Step 1 Factors

- Chemicals identified as potentially of concern for children’s health (e.g., chemicals with reproductive or developmental effects)
- Chemicals identified as neurotoxic
- Chemicals identified as persistent, bioaccumulative, and toxic
- Chemicals identified as probable or known carcinogens
- Chemicals used in children’s products
- Chemicals used in consumer products
- Chemicals detected in biomonitoring programs
Step 1 Factors and Data Sources

- Known or probable carcinogen
  - IRIS Classification
    - 1986 A, B1; 1996 Known or probable, 1995/2005 Carcinogenic
  - IARC Group 1 or 2A
  - NTP Classification as Known Carcinogens

- Persistent, Bioaccumulative, Toxic Chemicals
  - TRI PBT Rule
  - Great Lakes Binational PBT
  - Canadian P, B and T (all three criteria met)
  - UNECE LRTAP POPs
  - UNEP Stockholm Convention POPs
Step 1 Factors and Data Sources

- **Children’s Health**
  - IRIS: RfD or RfC for reproductive or developmental effects
  - NTP CERHR: Infants Any Effect, Pregnant Women Any Effect
  - California Proposition 65: Reproductive

- **Neurotoxicity**
  - IRIS: RfD or RfC based on neurotoxic effects

- **Children’s Product Use**
  - 2006 TSCA Inventory Update Report: Reported in products intended for use by children
  - Washington State Children’s List
Step 1 Factors and Data Sources

• Biomonitoring
  • Addressed both human biomonitoring and environmental monitoring indicative of human exposure
    • NHANES
    • Drinking Water Contaminants
    • Fish Tissue Studies

• Step 1 identified 1,235 chemicals
Step 1 Excluded Chemicals

- Pesticides, drugs, certain radioactives
  - Statutorily excluded under TSCA
- Already the subject of an Action Plan
- Subject to regulation under development
- Complex process streams, other highly variable batches
- Polymers
- Common oils, fats, plant extracts
- Gases, naturally-occurring (only) chemicals, combustion products
- Explosive, pyrophoric, extremely reactive or corrosive
- Metals principally toxic to the environment
- Remaining 345 chemicals entered Step 2
Step 2 Criteria

- Chemicals scored using numerical algorithm based on combination of 3 characteristics
  - Hazard
  - Exposure
  - Persistence and Bioaccumulation
- Data available for all three factors
  - Chemical was binned as High, Moderate or Low
- Chemical could not be scored for hazard, or not for exposure (but high or moderate for hazard or persistence and bioaccumulation)
  - Chemical was binned for potential data gathering
Step 2 Process to Create the TSCA Workplan Chemicals List
Candidate Chemicals from List 1

- **Hazard Score**
  3 – 1
  Based on highest scoring human health OR environmental toxicity endpoint

- **Exposure Score**
  3 – 1
  Normalized from rankings based on use type, general population and environmental exposure, and TRI or surrogate release information

- **Persistence/Bioaccumulation Score**
  3 – 1
  Normalized from separate scores for persistence and bioaccumulation

**Chemical Score Calculation** = Hazard Score + Exposure Score + Persistence/Bioaccumulation Score

If Scores for All Three Components:
Normalized and Priority-Binned, 7-9 = High
5-6 = Moderate, 3-4 = Low

If No Score for Hazard OR No Score for Exposure but a 2 or 3 for Hazard OR for Persistence/Bioaccumulation: Potential Candidate for Information Gathering

Further Analysis Through TSCA Workplan for High Rankings
Step 2 Hazard

- Highest hazard score for any single human health or environmental toxicity endpoint became chemical hazard score
- Hazard classification criteria based on *DfE Alternatives Assessment Criteria for Hazard Evaluation, August 2011*
- Score based on readily available data
  - Screening-level review
  - If high score for any endpoint, identified as high
Step 2 Hazard

- Endpoints scored as High (3) Moderate (2) or Low (1)
  - Acute Mammalian Toxicity
  - Carcinogenicity (High includes presumed, suspected, likely)
  - Mutagenicity/Genotoxicity
  - Reproductive Toxicity
  - Developmental Toxicity
  - Neurotoxicity
  - Chronic Toxicity
  - Respiratory Sensitization
  - Acute Aquatic Toxicity
  - Chronic Aquatic Toxicity
Step 2 Exposure

- Exposure Score based on combination of:
  - Use Type
    - Likelihood of potential exposures based on use
      - Consumer products: consider form, how widespread use
      - Industrial/commercial uses: consider dispersives
  - General Population and Environmental Exposure
    - Measured data in biota, environmental media
  - Release to Environment
    - Toxics Release Inventory data
    - Where no TRI, calculation using IUR/CDR production volume, number of sites, release potential from type of use
Step 2
Persistence/Bioaccumulation

- Persistence and bioaccumulation
  - Chemicals that are persistent and bioaccumulative are of particular concern because they can build up in the environment and organisms
- Used TRI and TSCA New Chemicals Program PBT criteria for ranking each factor separately
- Where no data, used EPI Suite 4.10 estimate
- Individual P and B scores were summed, then normalized to generate a P + B score (3, 2, 1)
Step 2 Categorizing Chemicals

- Normalized Hazard, Exposure and P/B scores were summed
  - High: 7 to 9
  - Moderate: 4 to 6
  - Low: 1 to 3
- Work Plan Chemicals are chemicals that scored high
  - 83 chemicals
- Chemicals that could not be scored were classified as Potential Data Gathering Candidate
  - 45 chemicals
Work Plan Chemicals

- All 83 Work Plan chemicals are candidates for risk assessment over next several years
- EPA will explore options on assessing, addressing data gaps on Potential Data Gathering chemicals
Workplan Chemicals -2012

- EPA identified 7 Work Plan chemicals to begin risk assessment in 2012:
  - Antimony and Antimony Compounds
  - HHCB (1,3,4,6,7,8-Hexahydro-4,6,6,7,8,8,-hexamethylcyclopenta[g]-2-benzopyran)
  - Long-Chain Chlorinated Paraffins
  - Medium-Chain Chlorinated Paraffins
  - Methylene Chloride
  - N-Methylpyrrolidone
  - Trichloroethylene
Factors in selecting initial 7

- Whether chemical reflects multiple Step 1 factors (e.g., both PBT and children’s health, or carcinogenicity and presence in biomonitoring)
- Variety: the 7 covered the Step 1 factors
- Whether chemicals would benefit from preliminary work to scope and target risk assessment appropriately, suggesting assessment be approached in a later year
- Agency work load considerations, including existing commitments for assessments
- These factors will also be used to identify other chemicals from the group of 83 for assessment in future years
Work Plan Chemicals -2013

- 2-Ethylhexyl-2,3,4,5- tetrabromobenzoate (TBB)
- 1,2- Ethylhexyl 3,4,5,6-tetrabromo-benzenedicarboxylate, or (2-ethylhexyl)-3,4,5,6 tetrabromophthalate (TBPH)
- Tris(2-chloroethyl) phosphate (TCEP)
- Octamethylcyclotetrasiloxane (D4)
- 1-Bromopropane
- 1,4-Dioxane
Flame Retardant Chemicals

- **Brominated Phthalates Group**
  - 2-Ethylhexyl 2,3,4,5-tetrabromobenzoate (TBB)
  - 1,2- Ethylhexyl 3,4,5,6-tetrabromo-benzenedicarboxylate or (2-ethylhexyl)-3,4,5,6 tetrabromophthalate (TBPH)
  - 2-(2-Hydroxyethoxy)ethyl 2-hydroxypropyl 3,4,5,6-tetrabromobenzenedicarboxylate
  - 3,4,5,6-Tetrabromo-1,2-benzenedicarboxylic acid, mixed esters with diethylene glycol and propylene glycol
  - '1,2- (2,3-dibromopropyl) benzenedicarboxylate
  - Chemical A – Chemical Identity claimed confidential by manufacturer
  - Chemical B – Chemical Identity claimed confidential by manufacturer
Flame Retardant Chemicals

- Chlorinated Phosphate Esters Group
  - Tris(2-chloroethyl) phosphate (TCEP),
  - 2-Propanol, 1,3-dichloro-, phosphate (TDCPP),
  - 2-Propanol, 1-chloro-, phosphate (TCPP)
Flame Retardant Chemicals

- **Cyclic Aliphatic Bromides Group**
  - Hexabromocyclododecane (HBCD) and related congeners, 25637-99-4 and 3194-55-6
  - 1,2,5,6-Tetrabromocyclooctane, 3194-57-8
More Information

- Main EPA web link to Work Plan Process:
  http://www.epa.gov/oppt/existingchemicals/pubs/workplan.html
- Methods Document:
  http://www.epa.gov/oppt/existingchemicals/pubs/wpmethods.pdf
Thank you

- Questions?
Use Cluster Approach to Chemical Prioritization
What is a Use Cluster?

A set of chemicals, products, processes, and technologies that may substitute for one another to perform a specific function.
Why Focus on Function?

• Focus is on what is achieved, not on how
• Opens evaluation to an array of alternatives
  – Technology
  – Chemical
  – Systems
• Provides a unit of equivalency to inform evaluation that forms good policy
  – Risk/exposure
  – Lifecycle Analysis
History of Approach

• Grew out of the EPA RM2 process in early 1990’s under TSCA
  – Single chemical focused
  – Modular approach to minimize risk
• Formally adopted by EPA DfE in Cleaner Tech Substitutes Assessments (1995)
  – Voluntary decision-making
  – Risk approach less rigorous than RM2
  – Expanded analysis to include other key drivers
• Implemented with key industry sectors
Use Cluster Approach

1. Identify targets
   – Specific chemicals of concern
   – Specific industry sectors of interest

2. Characterize and prioritize end uses
   – Define key parameters of function
   – Score use clusters and prioritize

1. Identify potential alternatives
   – Technologies, chemicals, systems, design

(Note: When evaluating industry Sectors, Steps 2 and 3 sometimes done concurrently.)
Use Cluster Approach (cont.)

5. Evaluate and compare alternatives
   – Alternatives assessment frameworks
   – Life-cycle analysis

6. Set policy to drive change (if appropriate)
   – Regulatory
   – Incentive based policy
Characterize/Prioritize End Uses

How To Make A Printed Wiring Board

To produce a multi-layer wiring board—from incoming materials to shipping the completed product—requires over 50 process steps. These steps include electrical, chemical, mechanical and optical processes, plus testing at key points to make sure that quality is built into the product. Here is an overview of the production flow.

1. Prepare photo tools for manufacturing. Prepare Numeric Control programs to control the drilling, routing, and testing equipment during production.

2. Manufacture inner-layers and cores with circuit design. Press cores together to form panels from which individual circuit boards will be cut.

3. Drill holes through board to establish a continuous electrical path between layers and to provide holes for customers to mount their components.

4. Dip panel in a stripping solution to promote copper deposition in the bottom of the drilled holes.

5. Coat the panel with a photoresist material, then place circuitboard image on the panel using photo tool artwork. Develop the photo image.

6. Electroplate panel in a copper solution to form electrical conductors on circuits and holes.

7. Terminate panel to provide power and data connectors, then plate pattern to complete circuit pattern.

8. Electrically test the panel for opens and shorts, using a custom-designed bed of pins to test connectivity.

9. Expose the panel and then cut it apart on the panel's design pattern.

10. Cut the panel in a pattern solder, then blast with hot air to even out solder coating on which customers will solder-mount their parts.

11. Cut a cross-section of a sample board from each lot and examine the plated holes with a photo microscope.

12. Cut the individual circuit boards out of the panel.

13. Electrical test, dimensional and visual inspection, and quality assurance to ensure compliance with customer requirements.

14. Package, label and ship the finished circuit boards according to the customer’s specification.

Priority Use Clusters in PWB Manufacturing?

<table>
<thead>
<tr>
<th>Use Cluster</th>
<th>Concern</th>
<th>Score*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lamination</td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>Brown Oxide treatment</td>
<td>Persulfate, peroxide</td>
<td>42</td>
</tr>
<tr>
<td>Making Holes Conductive</td>
<td>Formaldehyde, Chelating agents</td>
<td>87</td>
</tr>
<tr>
<td>Surface finishing</td>
<td>Lead, Nickel, reducing agents</td>
<td>84</td>
</tr>
<tr>
<td>Strip and Etching</td>
<td>Hydrogen peroxide, various acids</td>
<td>38</td>
</tr>
</tbody>
</table>

* Use cluster scoring performed by EPA using hazard based methods.
Prioritization for analysis

- Prioritization for further based on potential for risk reduction:
  - Hazards of chemicals
  - Availability of alternatives
  - Viability of alternatives
  - Marketplace factors
- Making holes conductive was deemed as top priority
  - Several viable and preferable alternatives
  - Potential improvements in exposure and hazard
  - Priority chemical targets (e.g. formaldehyde)
Making Holes Conductive Use Cluster

Function – To conduct an electrical signal between layers of the printed wiring board.

Alternatives:
• Hot air solder levelling (mechanical)
• Organic Solder Preservative
• Carbon
• Graphite
• Tin- Palladium/ Palladium-based
<table>
<thead>
<tr>
<th>Alternative</th>
<th>Worker Health Risks</th>
<th>Environmental Concerns</th>
<th>Performance</th>
<th>Production Costs</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>see Question 3</td>
<td>see Questions 3 and 6</td>
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<tr>
<td></td>
<td>Inhalation Risk</td>
<td>Water Use</td>
<td></td>
<td></td>
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<td></td>
<td># chemicals of</td>
<td>(gal/ssf)</td>
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<td></td>
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<td></td>
<td>concern</td>
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<td></td>
<td>Dermal Risk</td>
<td>Energy Use</td>
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<td># chemicals of</td>
<td>(# Chemicals with</td>
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<tr>
<td></td>
<td>concern</td>
<td>High Aquatic Toxicity</td>
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<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Electroless Copper</td>
<td>10</td>
<td>12</td>
<td></td>
<td>0.51</td>
</tr>
<tr>
<td>Non-conveyorized (BASELINE)</td>
<td></td>
<td></td>
<td>Performance for all technologies varied among test sites</td>
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<tr>
<td>Electroless Copper</td>
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<td></td>
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<tr>
<td>Conveyorized</td>
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<td></td>
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<td></td>
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<tr>
<td>Carbon</td>
<td>★★★</td>
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<td></td>
<td>★★★</td>
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<td>Conductive Polymer</td>
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<td></td>
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<td>Graphite</td>
<td>★★★</td>
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<tr>
<td>Non-Formaldehyde Electroless Copper</td>
<td>★</td>
<td>★</td>
<td></td>
<td>★★★</td>
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<tr>
<td>Organic Palladium-Non-Conveyorized</td>
<td>★</td>
<td>★</td>
<td></td>
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<tr>
<td>Organic Palladium-Conveyorized</td>
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<td>★★</td>
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<td>★★★</td>
<td>★★</td>
<td></td>
<td>★★★</td>
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</tbody>
</table>
Notable outcomes

• Several alternatives have better overall human health and environmental profiles
• Many of the alternatives are able to be effectively conveyorized
  – Greatly limits worker exposures to heated chemical processes
  – Improved cost and performance profiles
• Within 5 years, market share of boards made with alternative processes increased 42%
Use Cluster Advantages

• Focus is on solutions, not problems
  – Hazard based policy eliminates problems
  – Use cluster seeks alternatives

• Fosters innovation at point of use
  – Technology
  – Prevention/Elimination

• Multi-risk reduction through systems approach
Other Use Clusters Analyzed

DfE applied this methodology successfully to a number of use clusters:

– PWB Surface finishing (lead/nickel)
– Furniture adhesives (TCA, MeCl, nPB)
– Screen printing cleaners
– Lithographic cleaners
– Dry cleaning solvents (PCE)

CTSAs and other documents available on the DfE website. (www.epa.gov/Dfe)
For more Information or Questions, contact:

Jack Geibig (865) 850-1883
jgeibig@ecoform.com
Discussion Questions

- What processes have been developed to prioritize chemicals of concern and what are there similarities/differences?

- How have exposure and use data been integrated into chemical prioritization schemes?

- How have these schemes been used in chemical alternatives assessment processes? How could they be more effectively linked to alternatives assessment processes in the future?

- How can hazard categories and criteria be more effectively harmonized?
Next Webinars

- Alternatives Assessment 113: Addressing Trade-offs in Alternatives Assessment Processes-
  - June 11, 2013, 12pm EST
  - Speakers:
    - Adam Finkel, UMDNJ School of Public Health
    - Kathy Hart, US EPA
    - Ann Blake, Environmental and Public Health Consulting

- Alternatives Assessment 114: Alternatives Assessment for Flame Retardants: A Cross Cutting Issue
  - July/August 2013
Webinar Audio & Slides

The audio recording and slides shown during this presentation will be available at:
http://www.chemicalspolicy.org/alternativesassessment.webinarseries.php