Integrating Chemical Hazard Assessment into Procurement & Design
Webinar Format

1. Introduction to the GreenScreen
2. GreenScreen Practitioner Program
3. Authorized GreenScreen Practitioners
4. Questions and Answers
Speakers

Dr. Lauren Heine  
GreenScreen Program Director

Shari Franjevic  
GreenScreen Training Program Manager

Curtis Wray  
Authorized GreenScreen Practitioners

Pam Eliason  
Authorized GreenScreen Practitioners

Dr. Eric Rosenblum  
Toxicologist/Lead Instructor
PART I:
Introduction to the GreenScreen for Safer Chemicals
Everyone Selects Materials
Suppliers Select Materials

* e.g., Synthesis and processing chemicals

![Chemical synthesis diagram]
Manufacturers Select Materials

*e.g.*, Chemical ingredients in a product
Designers Select Materials

*e.g.*, Materials for a complex products and articles
Retailers Select Materials

e.g., Products to put on the shelf
End Users Select Materials

- Large-scale purchasers
- Specifiers
- NGOs and Governments
- Individual consumers
Material Selection Choice Points

1. Design
2. Substitution
Get it Right the First Time

Save money $$

GREENSCREEN®
FOR SAFER CHEMICALS
Get it Right the First Time

Avoid regrettable substitutions
Get it Right the First Time

Avoid unintended consequences
Get it Right the First Time

Create Lasting Solutions

BPA Free Thermal Paper Rolls

There is a growing awareness of the health effects of exposure to bisphenol A (BPA), widely used in a wide variety of products in the United States. For this reason, you decide if the purchase of BPA-free paper is important to you.

What is BPA?

- BPA is a chemical used in the production of plastics.
- In some countries, its use is prohibited due to its health effects.

For Safer Chemicals
Material Selection Parameters
Chemical Hazard

**Hazard**

- Human Health e.g. Carcinogen
- Environmental Health e.g. Aquatic Toxicity
- Physical e.g. Flammable

**Routes of Exposure**

- Dermal (skin)
- Inhalation (respiratory tract)
- Ingestion (stomach or digestive tract)
Chemical Hazard Metric?
Chemical hazard assessment (CHA) method developed by Clean Production Action

- Transparent
- Systematic
- Scientifically robust
- Freely and publicly accessible

http://www.greenscreenchemicals.org/method/method-documents
Simple: Integer Score (1-4)

Comprehensive: Transparent, detailed documentation
GreenScreen Assessment

1. Assess and classify hazards
2. Apply the Benchmarks
3. Make informed decisions
## GreenScreen Hazard Endpoints

<table>
<thead>
<tr>
<th>Human Health Group I</th>
<th>Human Health Group II and II*</th>
<th>Environmental Toxicity &amp; Fate</th>
<th>Physical Hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carcinogenicity</td>
<td>Acute Toxicity</td>
<td>Acute Aquatic Toxicity</td>
<td>Reactivity</td>
</tr>
<tr>
<td>Mutagenicity &amp; Genotoxicity</td>
<td>Systemic Toxicity &amp; Organ Effects</td>
<td>Chronic Aquatic Toxicity</td>
<td>Flammability</td>
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<tr>
<td>Reproductive Toxicity</td>
<td>Neurotoxicity</td>
<td>Other Ecotoxicity studies when available</td>
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<td>Developmental Toxicity</td>
<td>Skin Sensitization</td>
<td>Persistence</td>
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<td>Endocrine Activity</td>
<td>Skin Irritation</td>
<td>Bioaccumulation</td>
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<td>Eye Irritation</td>
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### GreenScreen Hazard Criteria Example - Carcinogenicity (C)

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<tr>
<th>Information type</th>
<th>Information Source</th>
<th>List Type</th>
<th>High (H)</th>
<th>Moderate (M)</th>
<th>Low (L)</th>
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<tbody>
<tr>
<td>Data</td>
<td>GHS Category &amp; Guidance</td>
<td>N/A</td>
<td>1A (Known) or 1B (Presumed) for any route of exposure</td>
<td>2 (Suspected) for any route of exposure or limited or marginal evidence of carcinogenicity in animals</td>
<td>Adequate data available, and negative studies, no structural alerts, and GHS not classified.</td>
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<tr>
<td>List (Sample included here)</td>
<td>EPA-C (1986)</td>
<td>Authoritative</td>
<td>Group A, B1 or B2</td>
<td>Group C</td>
<td>Group E</td>
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<td>Group 1 or 2A</td>
<td>Group 2B</td>
<td>Group 4</td>
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<td>Authoritative</td>
<td>Known to the state to cause cancer</td>
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</tbody>
</table>

See GreenScreen® Hazard Criteria for a complete set of hazard criteria for all hazard endpoints.

GreenScreen Hazard Summary Table

Summarizes and displays results of Step 1 - Assess & Classify Hazards.

<table>
<thead>
<tr>
<th>Carcinogenicity</th>
<th>Mutagenicity</th>
<th>Reproductive Toxicity</th>
<th>Developmental Toxicity</th>
<th>Endocrine Activity</th>
<th>Acute Toxicity</th>
<th>Systemic Toxicity</th>
<th>Neurotoxicity</th>
<th>Skin Sensitization*</th>
<th>Respiratory Sensitization*</th>
<th>Skin Irritation</th>
<th>Eye Irritation</th>
<th>Ecotox</th>
<th>Fate</th>
<th>Physical</th>
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* single repeated

** Summary Table

<table>
<thead>
<tr>
<th>Systemic Toxicity</th>
<th>Neurotoxicity</th>
<th>Skin Sensitization*</th>
<th>Respiratory Sensitization*</th>
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<thead>
<tr>
<th>Acute Aquatic Toxicity</th>
<th>Chronic Aquatic Toxicity</th>
<th>Persistence</th>
<th>Bioaccumulation</th>
<th>Reactivity</th>
<th>Flammability</th>
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GreenScreen Assessment

1. Assess and classify hazards
2. Apply the Benchmarks
3. Make informed decisions
GreenScreen Assessment
Step 2: Apply the Benchmarks

- **Benchmark 1**: Avoid – Chemical of High Concern
- **Benchmark 2**: Use but Search for Safer Substitutes
- **Benchmark 3**: Use but Still Opportunity for Improvement
- **Benchmark 4**: Prefer – Safer Chemical
GreenScreen Assessment
Step 2: Apply the Benchmarks

GS 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

ABBREVIATIONS
P  Persistence
B  Bioaccumulation
T  Human Toxicity and Ecotoxicity

See GreenScreen® Benchmark Criteria and GreenScreen® Guidance for a complete set of Benchmark Criteria and how to apply them. http://www.greenscreenc hemicals.org/method/method-documents
GreenScreen Assessment

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

Three levels of results:

1. Final GreenScreen Benchmark Score with explanation
2. Hazard Summary Table with hazard ratings for the 18 hazard endpoints
3. Detailed review of data for each hazard endpoint and references
GreenScreen Rating\textsuperscript{2}: Zinc borate was assigned a **Benchmark Score of 1** based on high concern level for reproductive and developmental toxicity. Zinc borate also has a very high concern level for environmental persistence\textsuperscript{2} and very high concern for chronic aquatic toxicity of zinc borate, and high or moderate concern level for respiratory sensitization of zinc oxide as a potential combustion or biodegradation product. A data gap exists for neurotoxicity.
2. Hazard Summary Table

<table>
<thead>
<tr>
<th></th>
<th>Group I Human</th>
<th>Group II and II* Human</th>
<th>Ecotox</th>
<th>Fate</th>
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Note: Hazard levels (Very High (vH), High (H), Moderate (M), Low (L), Very Low (vL)) in *italics* reflect estimated values and lower confidence. Hazard levels in *BOLD* font reflect values based on test data (See Guidance). For the purposes of this report, hazard levels derived from test data on boric acid or zinc salts were given a high level of confidence. Data on analogs or predicted data were given a low level of confidence.
3. Detailed Review of Data & References

Group I Human Health Effects (Group I Human)

Carcinogenicity (C) Score (H, M or L):
Zinc borate was assigned a score of Low for carcinogenicity based on: negative results in two chronic studies on boric acid.

Authoritative and Screening Lists:
• Zinc borate, zinc, zinc hydroxide, zinc chloride and zinc oxide were all classified as Group D - Not classifiable as to human carcinogenicity (EPA, 2004).

Zinc borate data:
• Carcinogenicity data were not identified for zinc borate (CAS #1332-07-6).

Zinc salts and Boric acid data:
• No adequate experimental evidence has been found to indicate that zinc salts administered orally or parenterally are tumorigenic (WHO/IPCS, 2001).
• Carcinogenic effects were not observed in 2-year and 38-week feeding studies on boric acid or sodium borate in rats and dogs treated with up to 1170 ppm B. This corresponds to approximately 213-333 mg B₂O₃/kg-day and 340-532 mg ZnO.2B₂O₃/kg-day based on boron equivalents. (Weir and Fisher, 1972).
• Carcinogenicity was not observed in a 2-year National Toxicology Program (NTP, 1987) dietary study in mice at boric acid doses up the highest dietary dose of 5,000 ppm boric acid (550 mg boric acid/kg-day or 96 mg B/kg-day as estimated by IRIS), which is on a boron equivalent basis approximately 837 mg ZnO.2B₂O₃/kg-day.
GreenScreen Assessment Process

Step 3: Make informed decisions
GreenScreen Uses

1. State Regulations
2. Alternatives Assessment
3. Materials Procurement
4. Product Development
5. Corporate Policies
6. Software Tools
7. Standards, Scorecards and Ecolabels
Types of GreenScreen Assessments

- Certified
- Authorized
- Unaccredited

Third-party review

Note: GreenScreen List Translator assessments are another type of assessment, are significantly less comprehensive than a full GreenScreen assessment, and are not depicted here.
GreenScreen Training

• Online Introductory Course coming fall 2015
• Custom training
• Advanced Topics Course
• Practitioner Program

For more information on Course Offerings, see the GreenScreen Education & Training website.

http://www.greenscreenchemicals.org/training/course-offerings
PART II: GreenScreen Practitioner Program
Practitioner Program

• Most advanced training offered
• Designed for individuals
• Leads to becoming Authorized GreenScreen Practitioner
Prerequisites

• Completion of a GreenScreen Standard Introductory Course or equivalent
• Ability to perform a literature search to find relevant data on a chemical of interest
• Familiarity with toxicological test methods
• Familiarity with reviewing toxicological studies
• Ability to assign hazard classifications to appropriate hazard endpoints
• Ability to perform Globally Harmonized System of Classification and Labeling of Chemicals (GHS)
Course Structure

1. Advanced Topics Course*
   – Four 3-hour live, web-based classes

2. Practicum
   – Two comprehensive GreenScreen assessments

* May be taken without the Practicum
# Advanced Topics Course

<table>
<thead>
<tr>
<th>Class</th>
<th>Class Name</th>
<th>Topics</th>
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<tbody>
<tr>
<td>1</td>
<td>Advanced Hazard Assessment I</td>
<td>• GreenScreen Online Resources</td>
</tr>
<tr>
<td></td>
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<td>• Assessing &amp; Classifying Hazard</td>
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<td></td>
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<td>• Hazard Assessment Tips – Group I Human Health</td>
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<td>• Hazard Assessment Resources</td>
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<td>2</td>
<td>Advanced Hazard Assessment II</td>
<td>• Hazard Assessment Tips – Group II Human Health</td>
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## Advanced Topics Course

<table>
<thead>
<tr>
<th>Class</th>
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</table>
| 3     | Advanced Hazard Assessment III  | • Hazard Assessment Tips – Environmental Toxicity, Fate and Physical Hazards  
                               | • Estimation                                                          |
| 4     | Advanced Benchmarking           | • Hazard Assessment Special Cases: Inorganic chemicals, polymers        |
                               | • Advanced Benchmarking: Data Gaps, Transformation Products, Inorganic Chemicals, Mixtures |
Practicum Process
Chemical #1

Hwk #1
Group I Human

Hwk #2
Group II Human

Hwk #3
ETF, Physical

Revised

Final

Class #1

Class #2

Class #3

Class #4

Q&A #1

GreenScreen Practitioner Program
Practicum Process
Chemical #2

Assessment

Revised Assessment

Final Assessment

Q&A #1

Feedback

Q&A #2

Feedback

Q&A #3

Feedback

GreenScreen®
Practitioner Program
Course Structure

• Total time commitment (class, practicum, and homework) = ~120 hours
  – Practicum: ~20-60 hours per chemical
  – Class: 17 hours (includes Q&A, orientation, closure)
  – Class homework: ~ 4 hours

• Time involved is highly dependent on participants' prior experience and expertise.
PART III:
Authorized GreenScreen Practitioners
Types of GreenScreen Assessments

- Certified
- Authorized
- Unaccredited

Third-party review

Note: GreenScreen List Translator assessments are another type of assessment, are significantly less comprehensive than a full GreenScreen assessment, and are not depicted here.
Authorized GreenScreen Practitioner

• License to author assessments for his/her registered organization, and
• License to submit authorized assessments for third party review resulting in certified assessments.

For Benefits to Individuals and Organizations, see:
http://www.greenscreenchemicals.org/training/certified-practitioner-program
## Authorized GreenScreen Practitioners

<table>
<thead>
<tr>
<th>Authorized GreenScreen Practitioner</th>
<th>Date of Completion (three-year renewal period)</th>
<th>Registered Entity</th>
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<tbody>
<tr>
<td>Jonathan Ostrowski</td>
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<td>Hewlett Packard</td>
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<tr>
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<td>Leah Boyd</td>
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<td>Pam Eliason</td>
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<td>University of Massachusetts Lowell</td>
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<tr>
<td>Mark Snyder</td>
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<td>Minnesota Pollution Control Agency</td>
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Authorized GreenScreen Practitioners

Curtis Wray
• Registered Organization: HP
• Date of completion: 4/14
Authorized GreenScreen Practitioners

Pam Eliason

• Registered Organization: Toxics Use Reduction Institute
• Date of completion: 11/14
PART IV:
Questions and Answers

Available to respond to questions:

• Lauren Heine: GreenScreen Program Director
• Shari Franjevic: GreenScreen Training Program Manager
• Curtis Wray: Authorized GreenScreen Practitioner, HP
• Pam Eliason: Authorized GreenScreen Practitioner, TURI
• Eric Rosenblum: Toxicologist/ Lead Instructor
REFERENCE SLIDES
# Types of GreenScreen Assessments

<table>
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<th>Assessor</th>
<th>Description</th>
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</thead>
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| **Certified**   | Licensed GreenScreen Profiler     | - Highest quality  
|                 | (Toxicology firm)                 | - Organization qualified and licensed by CPA  
|                 |                                   | - Meets standards and ecolabel requirements                                                           |
| **Authorized**  | Authorized GreenScreen Practitioner | - High quality  
| *May be upgraded to Certified with third party review* | - Individuals trained and credentialed by CPA                                                        |
| **Unaccredited**| Anyone                            | - No oversight by CPA  
|                 |                                   | - Method is freely available  
|                 |                                   | - Use for internal purposes                                                                         |
# How to Obtain Certified and Authorized Assessments

<table>
<thead>
<tr>
<th>Approach</th>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Purchase existing assessments</td>
<td>- Highest quality</td>
<td>- Limited of chemicals have been assessed to date</td>
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<tr>
<td></td>
<td>- Cost effective</td>
<td></td>
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<tr>
<td>2. Develop credentialed expertise</td>
<td>- Perform in-house</td>
<td>- Initial investment of time and money</td>
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<td>- Savvy consumer of assessments</td>
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<td></td>
<td>- Appropriate efficiencies</td>
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<tr>
<td>3. Hire a Licensed Profiler</td>
<td>- Highest quality</td>
<td>- Costly to hire for every chemical of interest</td>
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<tr>
<td></td>
<td>- Any chemical</td>
<td>- May pay to assess chemicals you will not use</td>
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<tr>
<td></td>
<td>- Third party</td>
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</table>
Benefits of becoming an Authorized GreenScreen Practitioner:

• Increased competitive advantage with professional credentialing

• Experience developing robust hazard assessments used in alternatives assessments, risk assessments, and Safety Data Sheets

• Recognition on the CPA website
Benefits for Organizations with Authorized GreenScreen Practitioners

• **Reduce costs:** Increase efficiencies by developing staff capacity to generate valuable authorized chemical hazard assessments

• **Increase sales:** Meet customer demands for chemical hazard assessments in support of:
  – Materials procurement requirements
  – Environmentally preferable product development
  – Compliance with alternatives assessment regulations
  – Compliance with sustainability standards and ecolabel requirements
Benefits for Organizations with Authorized GreenScreen Practitioners

• Reduce risk:
  • Better communicate and meet internal safer chemistry product development targets
  • Gain access to CPA third party review of authorized assessments through the GreenScreen Certification Process