Logistics

- Talk will be 30-45 minutes with 30 minutes for questions and discussion afterwards
- In-person audience members
  - Please hold questions until the end
- Webinar audience members
  - Please type questions into the chat function of the webinar interface as they occur
    » we will address questions after the talk
  - Please put your phone on mute unless clarifying a question during the question / answer period
Agenda

- Today’s Talk
- Introductions
- Why are sustainable products important?
- What are sustainable products?
- Defining chemical footprinting
- Methodology: Are chemical risks knowable?
- Case Studies
- Trends in Product Chemicals Management
Intro – Rebecca Sternberg, EORM

- **EORM**
  - Founded in 1990 by Environmental, Health and Safety (EHS) managers focused on the high tech space
  - Diversified to other industries such as life sciences, food and beverage, manufacturing and expanded offerings into sustainability

- **Rebecca Sternberg, Sustainability Practice Lead**
  - 14 years experience in corporate management consulting with firms such as Accenture, Cap Gemini Ernst & Young
  - Expertise ranging from technology implementation to strategy development
  - Past five years focused on helping Fortune 2000 corporations such as Microsoft, Williams Sonoma, Waste Management, Suncor and others define and implement sustainability strategies
Intro – Julie Panko, ChemRisk

- **ChemRisk, LLC**
  - A scientific consulting firm committed to helping clients develop sustainable solutions to a growing number of environmental, health and safety concerns
  - Pioneer of risk assessment methods to characterize and understand complex exposures involving chemicals, pharmaceuticals, or radionuclides

- **Julie Panko, Principal Health Scientist**
  - 20+ years experience in human and environmental risk assessment
  - Expert in industrial hygiene, exposures assessment and risk assessment of various chemicals
  - More than 10 years or product sustainability and risk assessment experience
EORM and ChemRisk Partnership

- In 2010, EORM and ChemRisk signed an agreement to align their complementary skills in order to more comprehensively serve their clients
  - ChemRisk’s expert toxicology consulting services
  - EORM’s leading EHS and sustainability consulting services
- Recent collaborations include joint assessment of potential human health risks throughout the life cycle of a gallium arsenide thin film photovoltaic cell.
Why are Sustainable Products Important?
## TOP SUSTAINABLE BUSINESS TRENDS OF 2011

<table>
<thead>
<tr>
<th>Trend</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumer Giants Awaken to Green</td>
<td>3</td>
</tr>
<tr>
<td>Companies Aim for ‘Zero’</td>
<td>5</td>
</tr>
<tr>
<td>The Developing World Yanks the Supply Chain</td>
<td>6</td>
</tr>
<tr>
<td>Greener Transport Makes Its Move</td>
<td>8</td>
</tr>
<tr>
<td>Sustainable Food Becomes a Main Course</td>
<td>10</td>
</tr>
<tr>
<td>Metrics and Standards Become the Rule</td>
<td>12</td>
</tr>
<tr>
<td>Toxics Concerns Spur Greener Alternatives</td>
<td>14</td>
</tr>
<tr>
<td>Water Footprinting Makes a Splash</td>
<td>16</td>
</tr>
<tr>
<td>Companies Learn to Close the Loop</td>
<td>18</td>
</tr>
<tr>
<td>Bioplastics Become Material</td>
<td>20</td>
</tr>
</tbody>
</table>
While there is no rise in ‘pure green’ consumers, there is a rise in “conflicted” or “conscious” consumers who want it all: green at the same or lower price.

“What is and has been driving the greening of business is not consumer pressure but a mix macro-level forces and operational sustainability success stories, the countless examples of reduced packaging, lowered toxicity, and condensed versions of products (in detergents for example) that save shelf space and tons of energy in shipping and storage” (Andrew Winston, HBR)
Focus on Win-Win Product Changes and Direct Impact

- Consumers will not pay a premium simply for green – but they will pay extra for other co-benefits
- Green products are used by some customers to ‘identity signal’
- Natural resources saving products provide benefits as cost of resources rises
- “Marketing green products, then, may not be all that different from marketing any other product: ‘It comes down to: How does this affect me and my family?’”
What are Sustainable Products?
Our Definition

Reducing consumption, health impact and employing labor equitably

- Reduce consumption of natural resources
  - Manufacture
  - Use
  - End of life

- Utilize fair labor principles

- Reduce adverse short or long term health impacts on humans and other living beings (plants and animals) through their lifecycle
Questionable Claims

7 Earth Day Pitches That Made Us Cringe
By Grendel21st Staff
Published April 22, 2011
More Stories On: Earth Day 2011

"Chair massage is the perfect renewable energy source."

7 Earth Day Pitches That Made Us Cringe
By Grendel21st Staff
Published April 22, 2011
More Stories On: Earth Day 2011

What’s black, green, and eco-ridiculous all over?
By Michelle Malkin • March 31, 2008 07:58 PM

I know you all heard about the gestu-politics stunt known as “Earth Hour” over the weekend, in which countless eco-activists around the globe turned off their lights and recreated the Dark Ages to help “raise awareness” of the environment. Because, you know, there’s not enough Awareness Raising about it—what with radical environmentalism being crammed down your kids’ throats and Al Gore everywhere and John McCain crusading against global warming, etc., etc., etc. Anyway, as many of you noticed, Google jumped on the bandwagon by turning its search page black.

The thing is, as tech bloggers have noted, it takes more energy to power black pages than white ones.

Yes, to raise awareness of the need to conserve energy, Google caused its users to use more energy than they normally would.
Green Guides

- Companies should not make general unsubstantiated claims such as “green” or “eco-friendly” without specific substantiation
- They should limit claims to specific benefits
- Marketers should disclose any material connections to any certifier, should clarify the basis for certification, and again, limit and unsubstantiated certification to specific benefits, and third party certification does not limit marketers’ liability
- Specific definitions for terms such as “degradable”, “ozone safe/ozone friendly”, “recyclable”, “free of/non-toxic”, “made with renewable materials”, “made with renewable energy”, “carbon offset”
Standards and Certifications

Many product claims can be substantiated / clarified through use of standards. This also provides basic, common baselines for industries and their suppliers. Examples include:

- **Industry Driven:**
  - Electronics Industry Citizenship Coalition
  - EPEAT
  - EcoIndex
  - LEED

- **Third-Party Driven:**
  - Scientific Certification Systems
  - Green-e

- **Government Driven:**
  - USDA Organic
  - Energy Star
  - Design for Environment
Defacto standards set by customers

<table>
<thead>
<tr>
<th>SKU-level questions:</th>
<th>Desired Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>NICU Product?</td>
<td></td>
</tr>
<tr>
<td>PICU Product?</td>
<td></td>
</tr>
<tr>
<td>Latex-free?</td>
<td>Yes</td>
</tr>
<tr>
<td>Lead, Mercury, Hexavalent chromium,</td>
<td></td>
</tr>
<tr>
<td>Polybrominated biphenyls, Polybrominated</td>
<td></td>
</tr>
<tr>
<td>diphenyl ether, &lt;1,000ppm or Cadmium &lt;100ppm</td>
<td></td>
</tr>
<tr>
<td>Polyvinyl Chloride (PVC)-free?</td>
<td>Yes</td>
</tr>
<tr>
<td>Diethylhexyl phthalate (DEHP) - free?</td>
<td>Yes</td>
</tr>
<tr>
<td>California Prop 65 Chemical &lt;threshold or</td>
<td></td>
</tr>
<tr>
<td>warning level</td>
<td>Yes</td>
</tr>
<tr>
<td>If yes to (A), List Chemical Abstracts</td>
<td>(fewest listed)</td>
</tr>
<tr>
<td>Service (CAS) #’s (separated by “,”)</td>
<td></td>
</tr>
<tr>
<td><strong>Product</strong> - Contain more than 10% post-</td>
<td>Yes</td>
</tr>
<tr>
<td>consumer recycled content?</td>
<td></td>
</tr>
<tr>
<td><strong>Primary Packaging</strong> - Contain more than</td>
<td>Yes</td>
</tr>
<tr>
<td>5% post-consumer recycled content?</td>
<td></td>
</tr>
<tr>
<td><strong>Secondary Packaging</strong> - Contain more than</td>
<td>Yes</td>
</tr>
<tr>
<td>30% post-consumer recycled content?</td>
<td></td>
</tr>
<tr>
<td><strong>Product</strong> - Designed for multi-use (i.e.</td>
<td>Yes</td>
</tr>
<tr>
<td>not a single-use device)</td>
<td></td>
</tr>
<tr>
<td>Manufacturer's product code for environmentally preferable alt.</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Source: Fast Company, May 2010
Defacto standards set by customers

Supplier Sustainability Assessment: 15 Questions for Suppliers

**Energy and Climate: Reducing Energy Costs and Greenhouse Gas Emissions**
1. Have you measured your corporate greenhouse gas emissions?
2. Have you opted to report your greenhouse gas emissions to the Carbon Disclosure Project (CDP)?
3. What is your total annual greenhouse gas emissions reported in the most recent year measured?
4. Have you set publicly available greenhouse gas reduction targets? If yes, what are those targets?

**Material Efficiency: Reducing Waste and Enhancing Quality**
1. If measured, please report the total amount of solid waste generated from the facilities that produce your product(s) for Walmart for the most recent year measured.
2. Have you set publicly available solid waste reduction targets? If yes, what are those targets?
3. If measured, please report total water use from facilities that produce your product(s) for Walmart for the most recent year measured.
4. Have you set publicly available water use reduction targets? If yes, what are those targets?

**Natural Resources: Producing High Quality, Responsibly Sourced Raw Materials**
1. Have you established publicly available sustainability purchasing guidelines for your direct suppliers that address issues such as environmental compliance, employment practices and product/ingredient safety?
2. Have you obtained 3rd party certifications for any of the products that you sell to Walmart?

**People and Community: Ensuring Responsible and Ethical Production**
1. Do you know the location of 100 percent of the facilities that produce your product(s)?
2. Before beginning a business relationship with a manufacturing facility, do you evaluate the quality of, and capacity for, production?
3. Do you have a process for managing social compliance at the manufacturing level?
4. Do you work with your supply base to resolve issues found during social compliance evaluations and also document specific corrections and improvements?
5. Do you invest in community development activities in the markets you source from and/or operate within?
Defining Chemical Footprinting
The Relevance of Chemical Risks

- Potential to harm employees, customer and environment
- Brand protection
- Avoidance of recalls
- Disruption of the supply chain

Risk to the Enterprise

- Chemicals
- Water Footprint
- Carbon Footprint
- Recycled Content
What do we mean by “Chemical Footprinting”?

Product Focus

- Greenhouse gas footprinting refers typically to an entity’s operational energy use
- Water footprinting typically refers to operational water use
- Here we are referring to the embedded chemical risks associated with a product
History and Terminology

- Chemical footprint has been a term of art since at least 2000.
- Not to be confused with chemical 'fingerprint'.
- Several groups using it but mostly referring to the quantity of chemicals used.
To whom or what are chemicals a concern?

Reasonably controlled environment

Acceptable exposure levels have often been established for workers and environment
Service Life

- Industrial, commercial or consumer users? ...
  - Purposeful release?
  - Unintentional release?
  - Mis-Use?
End of Life

- Consumer disposal often not controllable
- Re-purposing often considered a green action – but is it safe?
- Recycling can ‘return’ different chemicals than went out
- Raw material recovery
Methodology: Are Chemical Risks Knowable?
A Three-Tiered Approach

- Review existing information
- Screening Models
- Data Collection or Higher Tiered Models
Existing Information

- All those lists !!!
  - Mostly based on HAZARD properties of a chemical; some on environmental fate properties

- Chemical specific risk assessments
  - EU Risk Assessment reports
  - USEPA VCCEP reports
  - California Proposition 65 risk assessment
  - EU REACH Dossiers…coming soon
Screening Models

- Mathematical models have been developed to estimate exposure to chemicals from manufacture, use and end-of-life of products.
- Based on physical-chemical properties of individual chemical constituents.

Groundhog Day, Punxsutawney PA
Data Collection or Higher Tier Models

- Conduct a study and collect exposure data

- Similar to screening models, except that they incorporate more information on use conditions; provide more realistic picture of the product use.

- Requires significantly more knowledge of product than the screening model
  - Trade-off in terms of gains to be obtained from refinement of the exposure estimate
Case Studies
Manufacturing of a Fluoropolymer

Question...did this present a health risk? (Paustenbach et al. 2007)
Process to Understand

- Calculated the amount released to air, soil, and water over a 50+ year period
- Used environmental models to understand the chemical’s transport in the environment and estimate exposures

Diagram:
- Emission from factory
- Disposition in the environment
- Human exposure potential
Service Life of a Tire

Tires wear out and the rubber is released to the environment… …is that a health risk?
Process to Understand

- Compile state of knowledge from literature and determine data gaps/needs
- Develop methods
  - measure tire wear particles in the environment
  - Collect particles for testing
- Evaluate toxicity

(Kreider et al., 2010 and www.wbcsd.org)
Service Life of a Spray Paint

Lots of chemicals are in there….is this safe for my kids?
Some important things to consider…

- Who are the possible users?
- Under what conditions?
- How much will they use?
- How often?
- What would constitute misuse?
End-of-Life: Tires
Response to Public Concern

- Evaluated the literature
- Summarized all existing risk assessments and identified data gaps
- Risk-safety benefit analysis was important
Trends in Product Chemicals Management
Emerging Trends in Measurement and Expectations

- Information is WIDELY accessible
  - Blogs
    » [http://myplasticfreelife.com/](http://myplasticfreelife.com/)
  - Tweets
    » [http://twitter.com/#!/whygreenchem](http://twitter.com/#!/whygreenchem)
    » [http://twitter.com/#!/GreenChemistry](http://twitter.com/#!/GreenChemistry)
    » [http://twitter.com/#!/beyondbenign](http://twitter.com/#!/beyondbenign)
  - News
    » Environmental News Network [http://www.enn.com/](http://www.enn.com/)
Emerging Trends in Measurements and Expectations (continued)

- Product testing by consumers or advocacy groups
- Biomonitoring data of whole populations...has a chemical used in your products been detected?
Emerging Trends in Measurements and Expectations (continued)

- Improved understanding of WHERE people interact with chemicals...
- People expect to NOT be exposed to chemicals
Thoughts for the future...

- Lots of opportunities for leadership
- Incorporation of chemical footprint concept into LCA
- Refine the definition or establish a quantitative unit in order to compare choices made with respect to chemicals