



8th Annual GC3 Innovators Roundtable

New Brunswick, New Jersey | May 8–10, 2013

Selected Presentation Highlights

This report highlights key messages, lessons, and discussions at the Eighth Annual Innovators Roundtable, hosted by the Green Chemistry and Commerce Council and the Lowell Center for Sustainable Production on May 8-10, 2013. More than 100 representatives from brands, manufacturers, suppliers, retailers, chemical companies, academia, government, and nonprofit sectors attended the meeting designed to stimulate a conversation about challenges and opportunities for advancing safer chemistry along supply chains.

Introductions and Overview

Carl Van Horn, Director of the John J. Heldrich Center for Workforce Development at Rutgers University

The John L. Heldrich Center is one of the largest university centers in the country that focuses on workforce trends. Its focus is applied research to affect public policy. It was started with a contribution from Mr. Heldrich, a former Johnson & Johnson executive. [The Roundtable was held in the Heldrich Hotel which is part of the Center].

Al Ianuzzi, Director of Product Stewardship and Green Marketing, Johnson & Johnson

Johnson & Johnson has over 275 operating companies, 127,000 global employees, and sells in more than 175 countries. Sales were \$67.2 billion in 2012. It has three major segments: Pharmaceuticals, Medical Devices and Diagnostics (largest division), and Consumer Products (smallest division). The company has received many forms of recognition. Among them: The Innothink Center for Research in Biomedical Innovation named J&J the most productive drug firm of the last 10 years. It is #2 in Interbrand's list of the Best Global Green Brands. In 2011, it was given the 2011 Humanitarian of the Year Award by the United Nations.

Social and environmental responsibilities have been core business elements since John & Johnson was founded. Robert Wood Johnson, the company founder, wrote "Our Credo" that has four pillars: Customers, Employees, Communities, and Stockholders. The Credo also states that "we must maintain in good order the property we are privileged to use, protecting the environment and natural resources." It is assumed that when the Credo is followed, there will be a healthy profit. Sustainability was and will continue to be central to the company. Johnson & Johnson has set sustainability goals for three areas: Healthy People, Healthy Planet, and Healthy Business.

EARTHWARDS® is Johnson & Johnson's proprietary plan for reducing a product's environmental footprint and strengthening product stewardship. EARTHWARDS® supports development of more

sustainable products, provides tools and resources to enable innovation, and enables meaningful and credible claims about products. It covers waste, social impacts, innovation, water, energy, materials, and packaging. A panel of sustainability experts from government, academia, business, and NGOs has reviewed the process. UL Environment audits the process each year and certifies the products.

The EARTHWARDS® process. To be considered for recognition, J & J teams use a proprietary scorecard for a four-step evaluation. The steps include: 1.) Understand what materials are in the product, where they come from, and what happens after the product is used; 2.) Undergo a life cycle screening to understand impacts and quantify improvements; 3.) Identify improvements (there must be at least three improvements of more than 10% across the seven categories.) 4.) Submit for review by sustainability experts, who determine if EARTHWARDS® recognition is warranted and suggest improvements.

GC3 Year in Perspective

JOEL WILL WORK ON THIS SECTION

Joel Tickner, University of Massachusetts Lowell

The GC3 has accomplished much this year. We held the Second National Summit for Retailers. The four project groups made significant progress. Members and funding increased. Articles about the GC3 were published in trade newsletters and magazines, such as Green Biz, and GC3 activities were presented at a number of conferences and on Webinars. Some of these are listed on the GC3 website..

Much has changed since the GC3 started. More scientific information is available on chemicals of concern and possible alternatives. Public and advocacy attention have increased. Demands for safer chemicals in supply chains have increased and not just in “green” companies. The chemical industry is changing with a greater focus on bio-based chemistry and an increasing number of small green chemistry start-ups.¹ Sector-focused collaborations are increasing. New tools are being developed to assess chemicals and products.

There are six recurring themes in GC3 activities over the past seven years:

- 1.) Increased transparency within supply chains and with the public
- 2.) More collaboration and partnership across sectors and within firms,
- 3.) Demonstrated power of purchasing to shift markets
- 4.) Increased need for a solid business case for selling green chemistry
- 5.) Metrics and tools to measure progress in operations and supply chains are needed
- 6.) Education- consumers, within firms, etc. is critical

Challenges for advancing green chemistry

¹ Not clear what is being referred to.

- Supply chains are global and complex and need to be better understood to advance green chemistry.
- Smaller companies may not have enough leverage to change their supply chains.
- There is a need for:
 - Transparency of ingredients
 - Better understanding of supply chain beyond Tiers I and II
 - Traceability
 - Better regulation
- There are some barriers to business to business collaboration that stem from competition, limited resources, and barriers to information flow in supply chains
- There is limited funding/resources for green chemistry research and application in government and many firms. Suppliers, particularly in Asia, do not have resources to innovate, given cost-margins.

The GC3 occupies a unique niche.

- It includes members from many sectors and multiple points in the value chain. It includes chemical producers, brands, and retailers.
- It develops pragmatic solutions. It conducts collaborative projects to advance green chemistry and design for environment in industry.
- The focus is on chemicals, not on broader sustainability issues.
- Fostering business to business relationships is a high priority.
- Education through practical projects and training about challenges and opportunities for application of green chemistry is a hallmark of GC3 activities.
- It is based at a university research center – but could involve other academics, such as business schools

The primary goal of the GC3 is to mainstream green chemistry.

- Charge to the GC3: **Create a roadmap for mainstreaming green chemistry.** The roadmap will help the GC3 determine where to focus its efforts. It will bring recognition to what must be changed to mainstream green chemistry.
- To achieve this, GC3 will need to:
 - Develop a road map for industry.
 - Develop a road map for policy.

How the GC3 can take advantage of changing conditions

Change market demand.

- Address barriers to green chemistry in the marketplace
- Help concentrate demand through linking those needed green chemistry solutions and those developing them.

Support innovation.

- Promote university/business partnerships
- Respond to green chemistry challenges

Support green chemistry policy.

- Promote policies for R & D and education.

Increase communications and branding.

- Promote case examples and best practices.

- Make the business case.

Suggestions for mainstreaming green chemistry from the GC3 Needs Survey

- Case examples that make the business case.
- Integrating into academic education
- Green chemistry evaluation tools
- Public policy changes that address chemicals of concern and provide incentives for safer alternatives
- Education at the senior management level
- Retailer engagement – particularly linking retailers and chemical/material manufacturers
- Convening/Networking people across sectors and levels of supply chains
- White papers addressing key challenges
- Case examples and best practices to build the business case

Barbara Hanley of HP is this year's winner of the GC3 Pioneers Award. The award is given to recognize exceptional champions of advancing green chemistry. She richly deserves the award for outstanding work in her company and industry, and with the GC3.

Overview of Project Group Accomplishments in 2012

The project groups work on a variety of projects that advance the GC3 mission. The number and focus of projects undertaken each year are decided at the annual GC3 Roundtable. Following are reports from the four project groups that GC3 members participated in over the past year as well as a proposal for a new project group. Full project group reports are available on the GC3 website here: <http://www.greenchemistryandcommerce.org/projects.php>

Advancing Green Chemistry in Education *Presented by Barbara Hanley, HP*

The primary focus of this group is embedding green chemistry in universities and professional education as well as in research, education, and development funding programs.

The Green Chemistry Education Position Statement is being circulated for signatures. This sign-on statement broadly supports sustainability in higher education, with a focus on green chemistry and green engineering. It includes recommendations and commitments from signing companies to academia. To date, 20 companies and 11 other entities have signed on. Next steps include outreach to companies, universities, green chemistry initiatives, and the media.

Training in green chemistry/safer alternatives is being planned. The goal is to develop and deliver training for companies that takes account of the needs of specific job functions and fosters communication inside the company, in the supply chain, and among industry sectors. The group has identified audiences and needs. It is currently gathering curricula and identifying gaps.

Business/University Partnerships for Safer Chemicals *Presented by Monica Becker, GC3*

This project group formed in 2010 to develop and pilot a new model of business and academia collaboration for identifying and assessing safer alternatives to chemicals of concern. The group decided to focus this past year on safer alternatives to DEHP plasticizer in wire and cable applications. The group involved OEMs, retailers, suppliers, academia, government, an NGO, and a toxicology consultant. The project has now been completed.

Why the group decided to focus on alternatives to DEHP. DEHP is the most commonly used plasticizer in wire and cable. There are concerns about its toxicity and exposure. It is being increasingly regulated and many companies are seeking to eliminate it. Focusing on a plastic additive leverages the unique capability of UMass Lowell in plastics engineering.

Accomplishment: Identifying nine chemical alternatives and conducting detailed assessments of them. The group investigated 100 alternative plasticizers. Based on industry knowledge, availability, performance, and toxicity, the group pared the list down to nine chemical alternatives. The original idea was to conduct performance testing and cost analysis and then identify the final candidates. But the group did not do that because it was satisfied with the list of nine. The group now has several detailed chemical assessments, including results using the GreenScreen tool that will be made public.

Benefit: Value of independent assessments. Plasticizer manufacturers found value in independent assessments that they could use in internal communication and marketing. Compounders and brands appreciated independent assessments and having a single score to support decision-making.

Benefit: Value of a collaborative process. Combining knowledge, funds, and data lowers the cost for individual companies and creates more robust results. It can also create alignment on safer chemical alternatives within a sector. This can increase demand and lower costs for safer alternatives.

Challenge: Lack of transparency in some formulations. Some companies required non-disclosure agreements (NDAs) for their formulations. While the results were made available to members of the project group, the identities of these chemicals were not disclosed.

Engaging Retailers in the Adoption of Safer Products *Presented by Roger McFadden, Staples*

In 2009, this workgroup published a report on best practices in product chemicals management in the retail sector. It held the First National Summit for Retailers in 2011. Over the years, it also created the Retailer Portal which is a database of tools to evaluate chemicals in products, and compiled a summary of retailer chemical policies and initiatives on safer products. This past year, the group put together a webinar series and organized the Second National Summit for Retailers.

Accomplishment: The Retailer Webinar Series. The work group held three webinars: 1) FTC Green Guides: What Retailers Need to Know. 2) How Companies Can Meet Increasing Demands for Greater Transparency on Chemicals While Still Protecting Critical IP. 3) The Guide to Safer Chemicals: How Retailers Can Improve Chemicals Management.

Accomplishment: The Second National Summit for Retailers. The Summit was held the day before this year's GC3 Roundtable. It can be challenging for businesses to share information, but everyone at the Summit opened up to explore common problems as well as successes. Participants understood that the GC3 can support innovation and suggested the following ideas for 2013-14.

Create a Retailer Leadership Council. It could tackle issues, develop collective strategies, and advance retailer efforts.

Work on standardization and common frameworks. Common language and approaches are needed to approach complex issues in a strategic way –issues such as hazard criteria, chemical use disclosure, and prioritization.

Engage more actively with retailer associations. Associations have access to a broad audience of retailers.

Help retailers evaluate and assess tools. Retailers need help with how to choose the right tools and how to implement them in their organizations.

Identify and map common supply chain opportunities. Each company has its own supply chains, but common supply chains that companies share use the same chemicals. Identifying common chemicals of concern and supply chain issues could be useful

Identify how to evaluate and reward merchants for purchasing safer products. Walmart will be rewarding its merchants for purchasing more sustainable products. What metrics can retailers use?

Determine ways to increase transparency of chemical information. How the CBI barrier can be broken to create a more open environment.

Facilitating Chemical Data Flow Along Supply Chains ***Presented by Homer Swei, Johnson & Johnson***

The project group has been focusing on facilitating confidential business information (CBI) along supply chains. It has been estimated that 70% of the market value of some firms lies in CBI. However, CBI is seen as a common hurdle to information flow through the supply chain. It is often the reason given for not providing information requested by other nodes in the supply chain.

Accomplishment: Four webinars this past year on supply chain interfaces: 1.) The Wercs (Supply Chain Information) and Walmart (Retail) 2.) Durst (Construction) and Healthy Building Network 3.) Herman Miller (Furniture) and MBDC/Cradle to Cradle 4.) Segetis (Chemical Supplier) and Seventh Generation (Cleaning & Personal Care Products)

Accomplishment: A matrix of how different types of CBI are handled, by whom, and why. Everyone uses confidential disclosure agreements (CDAs). The differences lie in who is exchanging the information and how it is being managed.

What the group learned: Access to hazard information is what matters the most to companies. CBI is defined by how that information is protected. The group examined these examples:

- The Wercs provides non-confidential hazard information to Walmart based on confidential information about composition.
- Cradle to Cradle communicates hazard assessment results generically to protect composition detail.
- A Health Product Disclosure (HPD- used for building products) allows hazard disclosure without disclosing intellectual property.

What the group learned: Information must be treated as CBI to be CBI. It is critical to maintaining the confidentiality of CBI. Business-to-business disclosure without a CDA is not CBI. If the information has been disclosed publicly such as in a patent, publication, or a label, it is not CBI. Disclosure without a

CDA prior to obtaining a patent can destroy patentability. CBI that is subject to a patent has an effective expiration date.

Ideas for New GC3 Project Groups on Mainstreaming Green Chemistry

Presented by Monica Becker, GC3

Green chemistry has yet to be integrated in the core business of the chemical enterprise, education, or government. The proposed project group would focus on what is needed to mainstream green chemistry and how the GC3 could most effectively leverage its activities and resources to support these changes. Two major activities were suggested:

1. Create a Roadmap for Mainstreaming Green Chemistry

- Determine key leverage points to integrate green chemistry into the fabric of the chemical enterprise/global products systems, education, and government
- Identify the primary barriers and challenges inhibiting the growth and adoption of green chemistry
- Identify goals, strategies, and programs for the GC3 to pursue in the next 3-5 years to help make these changes happen.

Possible deliverables: GC3 white paper, action plan, published article, cross-sector dialogue on key leverage points

2. Research Green Chemistry Innovation in the Chemical Industry

- Identify examples and models of green chemistry innovation in the chemical industry
 - Large and small companies/start-ups
 - Mechanisms such as venturing, open innovation, competitions
- Identify key leverage points to drive innovation
- Identify the primary barriers and challenges
- Identify strategies for the GC3 to pursue in the next 3-5 years to encourage innovation

Possible deliverables: webinar series, chemical industry/value chain dialogue, GC3 report, case studies, published article/series of articles

Keynote Panel Discussion: Advancing Green Chemistry in the Chemical Industry

Leading thinkers from three major chemical manufacturers exchanged perspectives on the challenges, opportunities, and drivers for green chemistry.

Panelists:

Frank Sherman, Akso Nobel
Kathy Shelton, DuPont
Curtis Zimmerman, BASF

Green chemistry is part of the sustainability solution.

We use more environmental services than our planet can support. Green chemistry will help provide greater living conditions for all. It is a way to serve customers while making products that don't overtax the planet and that provide shareholder value. Chemical companies aspire to apply green chemistry principles in all applications every day.

It doesn't have to be a new molecule to be innovative or sustainable. Chemical processes are important, too. Molecules can be created by using enzymes or microbes rather than through traditional pathways. This saves costs and energy and has other societal benefits.

Customers ultimately drive strategy but what they want is not always clear. There is a role for government regulations in driving change, but it is customers who make the business case and create demand. It is important to listen to what the market wants but customers may not be able to easily define what they need. It is therefore important to understand drivers and work with stakeholders.

Multi-stakeholder involvement is increasingly key for developing strategies. Demand is ultimately driven by consumers and society. Yet given the complexity of supply chains and lack of customer clarity about what is needed, the entire supply chain, government, NGOs, and investors are all needed to help guide strategy.

A safer chemical with the same cost and performance characteristics may not be enough to drive change. Few consumers will pay premium prices for greener chemicals. Customers may not buy even a significantly better product if it costs more.

Scaling up is a significant challenge. Some products will have to be niche products at first. Companies may invest in scaling up production when they can work collaboratively with the customer. To understand the potential market for increasing scale, they may need to look across sectors. Yet it is challenging to develop the market for multiple uses of a chemical such as a surfactant. It involves educating consumers and customers and working with diverse stakeholders in several sectors. More than niche products are needed to change an industry; competitors need to be developing new products and markets as well.

Challenges of restricted substances lists (RSLs). Some chemicals on RSLs have a sound scientific basis for being on a list but others do not. Many toxic chemicals serve important purposes and are safe when used as intended but there is a need for safer chemicals in certain applications. There is concern that once a chemical appears on any list, it can get blackballed. DuPont has developed a tool that identifies why a chemical is on certain lists. It can then be determined if the reasons apply to a product under development.

Progress is being made. Companies are already following a green chemistry roadmap. Ten years ago, Seventh Generation would not have bought a chemical from any of the three companies represented on the panel. Today it buys from all three. As retailers became more outspoken about what they want and don't want, companies are working to keep their products from being deselected.

More enlightened companies will make a broader business case that includes environmental P&L. "Business case" is a relative term. Many environmental resources and services are being used for free. However, as climate change and water shortages become more apparent, companies are going to have to factor in these costs. Companies need to be making the sustainability case for business.

Alternatively, sustainability should be the main case, not economics. Market dynamics are changing. Life cycle assessment and sustainability are now being taken into account before new products are developed.

Solutions are being created both by in-house R & D and by outside partnerships. There are many new models of research. Company R & D budgets have decreased. Using in-house R & D and forming outside partnerships are both important strategies. It can be cheaper to buy another company than invest in R & D. Academia needs to step up to the plate with practical research.

REACH is a significant burden but is driving change. REACH has increased transparency and provided more data on chemicals, but overall it puts a high burden on chemical companies. It is particularly difficult for specialty chemical companies with small volumes and limited markets. Companies may drop some small-volume chemicals and this may slow innovation. The Substances of Very High Concern (SVHC) list developed by REACH will drive the search for alternative chemicals. Companies are also looking at business opportunities provided by REACH.

Discussion: Mainstreaming Green Chemistry

The GC3 Advisory Committee recently underwent a strategic planning process, and decided that the clearest statement of the GC3 mission is to mainstream green chemistry. The following session focused on identifying the most important changes that must occur in the next five to ten years to mainstream green chemistry.

Introductory Remarks by Bob Israel, Valspar

When green chemistry is mainstreamed: green chemistry = chemistry. There have been several successes in green chemistry but it is not yet at the point where it can be called mainstream. It is now more than a novelty, but is still limited in practice.

Some Current Issues

- Alternatives do not exist
- Green costs more (specialty vs. commodity)
- Lack of government incentives (taxes, legislation)
- Limited out-of-the-box thinking
- Limited collaboration between industry, academia, government, and NGOs

Highlights from Group Brainstorming on Mainstreaming Green Chemistry

- Create powerful communication. Link green chemistry to quality of life.
- Educate children to adults, working professionals, consumers, supply chain, etc.
- Provide incentives such as rebates to businesses and consumers.
- Develop milestones to measure success.
- Create standards to level the playing field.

Green Chemistry at Genentech: Inspiration and Innovation

Tse-sung Wu, Genentech

With 15,000 employees, Genentech is the US Headquarters of Roche. Its focus is to turn biologics (large molecules) into target-specific anti-cancer agents. It is a leader in reducing the ecological footprint of its core competencies and is currently in the top 3 of the Dow Jones Sustainability Index.

Green chemistry provides opportunities for innovation. Genentech practices Green BioPharma. Green BioPharma is the design, development, and implementation of biological and chemical products and processes that reduce or eliminate the use and generation of substances hazardous to human health and the environment. For Genentech, this means that employees continuously innovate, evaluate, and implement ways to reduce the environmental impact of their decisions and operations. Wherever possible, it quantifies the results of green innovations.

Genentech's organizational change model. All efforts are rational, scientific, and scalable. They are presented as opportunities for innovation. Behavioral changes lead to influencing decision making.

Build teams, build expectations, build a culture. Key assumptions for organizational change:

- **Cross-functional collaboration leads to scalability.** It helps create a unified perspective for Genentech.
- **Leadership endorsement leads to institution building.** It legitimizes new efforts. Leaders tend to be connectors who can find mavens.
- **Employee engagement leads to leadership development.** The Green Genes Sub-Team tests products, shares best practices, pilots programs, and shares lessons.
- **Industry benchmarking leads to industry leadership.** Knowledge about peers motivates improvements and validates efforts.

Advancing Safer Chemistry in the Medical Device Sector

This panel explored the evolution of safer chemistry in the medical device sector, with a particular focus on the role of large-scale purchasing in moving the marketplace for safer products.

- What is the role of the health care industry in promoting green chemistry and what have been the key drivers?
- What innovations in safer chemistry has the medical device sector made in the products it manufactures?
- How can large-scale purchasers use their purchasing power to advance the marketplace for safer chemistry?

Lara Sutherland, Practice Greenhealth

Key drivers for green chemistry in healthcare. Healthcare is a mission-driven industry. Yet in 1996, medical waste incinerators were one of the largest sources of mercury and dioxin in the environment. A movement grew to change health care practices so that they would no longer be a source of hazardous contaminants. Environmental chemicals not only contribute to diseases suffered by patients. Healthcare workers themselves suffer unusually high rates of diseases such as asthma.

Healthcare procurement presents significant opportunities for changing markets. With an estimated \$200 billion in annual purchasing and 4.1 million employees, the healthcare marketplace is projected to

account for 20% of GDP by 2015. An estimated 71% of healthcare institutions have changed their practices to purchase more sustainable products. 90-95% of hospitals use a small number of group purchasing organizations (GPOs) which manage 80-85% of all healthcare procurement.

Tools for greening the healthcare supply chain. Practice Greenhealth has created an Environmentally Preferable Purchasing (EPP) Leadership Coalition. It has developed an EPP Specifications and Resources Guide that provides standardized questions for suppliers to streamline the process and improve access to EPP products and services. It currently has standardized questions about contents containing PVC, phthalates, BPA, flame retardants, mercury, latex, and hazardous waste. Standardized questions about electronics are being developed. The Healthier Hospitals Initiative is a network of hospitals working to improve their environmental health and sustainability practices. Safer chemicals and smarter purchasing are among its highest priorities.

Mike Chung, Ethicon Surgical Products

Ethicon is a medical device company that is part of the Johnson & Johnson family. It has over 15,000 product codes and a global supply chain. It practices Johnson & Johnson's EARTHWARDS® continuous improvement process to develop more sustainable products.

Ethicon focuses on the process of moving from product development to production. A "Design Transfer List" uses a number of best practices for internal technology transfer to ensure that manufacturing, launch, and marketing will go smoothly. Information about materials selection, regulatory reviews, packaging issues, the EARTHWARDS® scorecard, and supporting documentation are among the many requirements of the list.

Change the small things while talking about the visions. Mind shifts are needed. Changing the way things are done in manufacturing facilities – recycling, energy efficiency, water use - helps drive the needed cultural changes.

Kyle Tafuri, The Deirdre Imus Environmental Health Center at Hackensack University Medical Center

The Hackensack UMC is unique in that its sustainability program started with chemicals. In 2001, it started the Greening the Cleaning® Program that created cleaning products specifically for hospitals. In 2005 it started the Deirdre Imus Environmental Health Center®. The hospital was the first in the country of its size to commit to being a green hospital. In 2012, it signed an MOU with the US EPA committing to phase out PVC, DEHP, and other chemicals. The Environmental Health Center has helped pass green cleaning legislation and executive orders in 10 states.

Communications have been key for greening the hospital. Hackensack UMC has developed an environmental purchasing policy (EPP) that depends on clear communication within the hospital as well as with vendors. It educates staff about why the policy has been implemented and asks suppliers about what is in their products. An internal Product and Value Analysis Committee determines which products are preferable to purchase. The CEO told the hospital to eliminate styrofoam from its food service operations in 30 days. It did so by working with staff and patients to switch to biodegradable food service ware, with the longer term goal of re-usable food service ware.

Challenges in greening the hospital. For some people, especially in healthcare, calling a product "green" may be negative. It may be more useful to say it is beneficial or healthy. Group purchasing

organizations (GPOs) may also present problems. When the hospital buys greener products that are not in the current GPO contract, it is penalized.

Ellen Kondracki, Becton Dickinson

Becton Dickinson, founded in 1897, has three main divisions: BD Medical, BD Diagnostics, and BD Biosciences. Its sustainability strategy has two basic components: 1.) operations and 2.) product stewardship. It is a member of the Healthier Hospitals Initiative, which has about 3,000 hospital and network members.

Coalitions offer important support for changing products and supply chains. BD is a member of Practice Greenhealth's EPP Business Leadership Coalition. Purchasing coalitions can help bring together the right expertise to address the most important questions. The Coalition has fostered collegial and effective communications among businesses, GPOs, and hospitals. BD is also part of Practice Greenhealth's Greening the Supply Chain™ Initiative that is working with suppliers to develop greener products for healthcare. BD benefits by taking a leadership position that also increases its exposure to developments in the healthcare sector.

Safer Chemicals and Materials: Closing the Gap Between What Brands Need and What the Chemical Industry Is Offering

Part 1: Cleaning and Other Formulated Household Products

This is the first panel of a two-part discussion that considered the following questions. Brands as well as large and small chemical companies participated.

- How can brands engage with the chemical industry or government to accelerate the development of safer substitutes for the chemicals of concerns?
- What strategies are effective when suitable substitutes do not yet exist?
- What strategies are effective when alternatives are available but brands and retailers are unsure of their safety and performance?
- Can better communication of needs/development capabilities up and down the value chain accelerate innovation and commercialization?
- What strategies are effective when chemical companies (small or large) or others with the capacity to innovate do not see sufficient market demand or may not have funding for R & D or scaling up?

Greg Howard, US Environmental Protection Agency

The EPA's Design for the Environment (DfE) program helps consumers, businesses, and institutional buyers identify cleaning and other products that perform well, are cost effective, and are safer for the environment.

The DfE label can be used on products that meet highly protective standards. About 2,600 products, mostly cleaning products, currently have a DfE label.

DfE publishes environmental profiles of alternatives to hazardous chemicals used in specific applications. The DfE program is currently conducting assessments of alternatives to phthalates, flame retardants, and BPA in paper. It is a hazard-based program. It identifies all alternatives available and

then translates scientific data into accessible hazard information for the broader public. Hazards are classified as low, medium, or high.

Chemicals in the DfE's Safer Chemical Ingredients List help manufacturers identify safer chemicals that meet hazard criteria for a specific function. The chemicals listed are high performance, cost effective chemicals that meet DfE criteria. They are arranged by functional use class (colorant, fragrance, surfactant, etc.). Hazard criteria for a chemical may vary, depending on the function of the chemical in a particular use. GreenBlue has developed CleanGredients, a bigger version of the same kind of list.

Ed Bissinger, Azko Nobel

With roots in the 1600s, Azko Nobel is headquartered in the Netherlands. It focuses in three major areas: decorative paints, performance coatings, and specialty chemicals. It serves four major sectors: buildings and infrastructure, transportation, consumer goods, and industrial. It was ranked #1 in the chemicals sector by the 2012 Dow Jones Sustainability Index.

Azko Nobel undertook a Priority Substance Project. It reviewed and scored every substance in its global inventory. After initial review, hazardous substances were put through a state-of-the-art risk assessment process. It then developed a list of restricted substances, prohibited substances, and substances under review. 150 substances scored high. It is now evaluating each one. So far, the company has decided to eliminate most of them.

Collaboration with customers and regulators is crucial. For example, the company created a new chemical with an excellent safety profile but it has a structure similar to a substance that causes kidney cancer in animals. The chemical had not been tested for carcinogenicity in animals. The company worked with the US EPA to develop a new testing approach that would avoid a long, costly, and animal intensive process. The new approach focused on proteins that animals produce and excrete in larger amounts if the kidneys are damaged. This requires less time and fewer animals. Testing showed that the new chemical has no impact in kidneys. This is a new approach for testing carcinogenicity.

Neil Burns, P2 Science

P2 Science is a two-year-old start-up company that produces high-value specialty materials from vegetable oils. Target markets include flavors and fragrances, cosmetics, surfactants, polymers, and lubricants. Many of the chemicals made by the P2 Science process are available today only from petrochemical sources. Major users and formulators of specialty chemicals have a strong interest in substituting vegetable for petrochemical ingredients. This is a \$40 billion market opportunity.

P2 Science can make its specialty chemicals for the same cost as petroleum-based chemicals. But the company is about more than costs; it also sees value in doing good, as Seventh Generation does.

Barriers to growing a start-up chemicals company. The major barrier is money. For a startup, communication is everything after money. It is important to engage with customers, talk to people, develop partnerships, and collaborate.

Martin Wolf, Seventh Generation

Seventh Generation makes household cleaners, recycled paper products, personal care products, and baby care products. It has four aspirations: nurture nature ("care today for the next seven generations

of tomorrows”), enhance health (“through education, activism, and innovation”), build communities (“advance social justice and equality to unleash human potential”), and transform commerce (“champion honesty, responsibility, and radical transparency in commerce”).

Many Seventh Generation products are sold to retailers at a cost comparable to traditional products, but retailers increase the prices because they think consumers will pay more.

Obstacles to advancing safer consumer products. 1.) The science is inadequate to assess chemical risks to health. We are in the early stages of developing tools to understand the impacts. 2.) The legislation is inadequate to manage chemical risks to health. The federal chemical regulatory system has not changed substantially since TSCA (the Toxic Substances Control Act) was enacted in 1976. 3) Companies, legislators, and regulators are unwilling to put the needs of society ahead of risks to commerce.

Opportunities for advancing safer products. 1.) Advance science in areas such as rapid screening for metabolic activity, improved risk modeling, and green chemistry. 2.) Reform legislation through grassroots organizing and education. A regulatory framework will need to be updated to address the problems of the last 60 years of synthetic chemistry. The proposed Safer Consumer Products Act is a thorn in the side of commerce but it is also step in the right direction. REACH is also imperfect but it will become better. 3) Transform commerce by changing the way companies look at costs and by increasing the numbers of for-benefit corporations.

Companies can eliminate hazardous materials if they commit themselves and are clear with suppliers about their needs. Companies can do better. Suppliers have created new product lines to meet Seventh Generation requirements. In the process, they have transformed their own companies.

Keynote Address: Judith Enck, EPA Region 2

Judith Enck is the Administrator of the US EPA Region 2. This region has the most Superfund sites of any region and New Jersey has the most sites of any state (147). This is its industrial legacy. When people bought chemicals in the past, no one asked about environmental justice or impacts on health. Now, 65 million Americans live within four miles of a Superfund site.

Green chemistry is affordable. The costs of not using green chemistry can be high. The EPA website shows how expensive it is to clean up Superfund sites. GE is now paying \$2 billion to clean up 40 miles of the Hudson River that is a declared Superfund site due to PCBs.

There is a disconnect between what is happening now and where change needs to happen. The damage is immense from dry cleaners that improperly disposed of perchloroethylene. It could cost \$15-\$20 million to clean up one site, yet there has not been a transition to wet cleaning. Why aren't wet cleaners on every street corner?

Green chemistry is important because EPA can't regulate everything. Companies are using many chemicals with unknown hazards. More information is needed about what goes into products but there are legal and resource barriers to obtaining that information. Yet since TSCA was started, EPA has required testing on only 200 chemicals.

Green chemistry has evolved from theory to a term of art, to established practice. GC3 Conferences used to be about asking if we can make safer chemicals with useful applications. Now it is clear that we can and that green chemistry will expand dramatically in the years ahead. The earlier conferences relied on the better angels of human nature to make green chemistry a priority. Now it is more driven by consumer demand. Since 2000, sales of organic food have grown 16.5%. On the purchasing side, businesses and governments are beginning to include green chemistry in their procurement practices.

The cost of pollution is more than dollars. It also includes major health impacts on people and communities. According to the American Cancer Society, one in two men and one in three women will have cancer. Any accurate accounting of the true cost of environmental protection has to include long-term benefits to health. Not protecting the environment is expensive.

We need to significantly accelerate green chemistry innovation. The field is not going to change unless everyone takes this on in a big way. Ecological protection should be at top of decisions we make about commerce.

Project Group Reports from Breakout Sessions

Each of the project groups met for two hours to plan for the coming year. A new project group on Innovation in the Chemicals Industry also met. Reports from these breakout sessions follow (note: more updated descriptions of workgroup activities are on the GC3 website).

Next Steps: Advancing Green Chemistry Education Work Group

Green Chemistry Position Statement

- Write a one-page description of the statement
- Develop a checklist for signers
- Move from the checklist to key performance indicators (KPI's) or plan for continuous improvement (reflecting incremental nature of green chemistry implementation)
- Create an outreach strategy with goals

Green Chemistry and Safer Alternatives Bootcamp

- Create financial models including revenue for the trainings
- Create a matrix of training modules for specific job functions and sectors
- Gather existing curriculum and develop new curriculum where there are gaps
- Organize 3-4 one hour tier I green chemistry education webinars and identify host for 1-2 day in person tier II training.

Next Steps: Retailer Work Group

Establish a Retailer Leadership Council

- Look for common supply chain opportunities
- Work with retailer associations
- Best practice sharing – identifying case examples
- Incentives for merchants

Potential Project - Create a Retailer Toolkit

- Training materials to purchase safer products

- Communication – e.g., co-branding, customer education
- Chemicals of concern by product category - Focus on personal care/electronics to start

Next Steps: Facilitating Chemical Data Flow Along Supply Chains

Finalize draft report that lays out principles and guidance for facilitating confidential business information flow through supply chains

- Fill in remaining gaps in understanding from the webinars and research
- Draft outline for paper and hold discussions
- Finalize and publish paper as a GC3 guidance document and possibly later as a journal article in a business journal or both.
- Goal is to finalize research by end of calendar year with GC3 report finished by spring

Next Steps: Mainstreaming Green Chemistry

- Conduct research and develop report on drivers, collaborations, and policies needed to advance green chemistry adoption – the mainstreaming report
- Convene multi-stakeholder advisory group
- Develop draft mainstreaming green chemistry report

Next Steps: Promoting Green Chemistry Innovation

- Conduct research on innovation models in the chemicals and other sectors
- Organize a series of webinars on innovation models
- Develop framework for a GC3 innovation portal

Safer Chemicals and Materials: Closing the Gap Between What Brands Need and What the Chemical Industry Is Offering

Part 2: Engineering Plastics and Articles

This session considered the same questions listed with the earlier session “Cleaning and Other Formulated Household Products.” (see page 12)

Ray Lizotte, Schneider Electric

Schneider Electric is a large European multinational company that specializes in energy management, from large substations to outlet plates. The brand stands for energy that is safe, reliable, efficient, productive, and green. FY 2011 sales were \$31.4 billion.

Solutions cannot be delegated to the supply chain. The company asked its supply chain to make power cords that are RoHS compliant but the new cords caused product failures that cost the company over \$5 million in recalls. This made the company realize that it needs to be more involved in the design process.

Develop partnerships with multiple stakeholders to identify safer alternatives. The company spends \$25 million each year to purchase PVC wires that contain phthalates. The wires are involved in 30% of net revenue. That revenue is at risk because phthalates are likely to be prohibited eventually under REACH. Schneider Electric joined the GC3 project group to find safer alternatives to phthalates in wire and cable. The GC3 phthalate project not only found substitutes, but demonstrated a good process that includes toxicological evaluations of the substitutes.

Recommendations for replacing hazardous chemicals with safer alternatives. 1.) Utilize the company's expert community to conduct evaluations, find replacements, and communicate with the supply chain. 2.) Involve experts outside the company. This includes the supply chain, start-ups, and academia. 3.) Leverage existing sustainability initiatives to test and promote substitutes. 4.) Leverage marketing advantages as an early adopter of safer chemicals.

Design and build model products with maximum environmental characteristics. Imagine what the most environmentally sound products would look like and build them. There may be a market for some of them. Schneider Electric sold quite a few model products even though they cost substantially more.

Leverage new product designs to improve the standard portfolio. Learn from and evaluate characteristics of the model products that could be incorporated into the standard portfolio.

Mark Labelle, FRX Polymers

FRX Polymers develops polyphosphonate homopolymers and copolymers that are inherently flame retardant. The key competitive advantage of their product, Nofia, is that it will not migrate out of the product as BFRs (brominated flame retardants) do and will not sustain a flame unless there is a high level of oxygen. FRX has demonstrated market potential in textiles/carpeting, in hard goods, and as a copolymer with biopolymers.

Barriers to bringing a greener material to the market. 1.) Customer skepticism. Customers need to put it through significant testing. 2.) Fit with selected applications. The material must have the required mechanical properties. 3.) It must be cost competitive.

Opportunities to overcome barriers. Develop complete data packages that demonstrate fit with product requirements. Provide customers with starting formulations for their evaluation. Make cost competitiveness an R & D requirement. Support appropriate legislation.

The Phosphorous, Inorganic, and Nitrogen Flame Retardants Association (PINFA) seeks to continuously improve the sustainability of flame retardants. An ideal flame retardant would be nontoxic, non-migrating, not toxic or corrosive in a fire, recyclable, and biodegradable (or remain neutral as a naturally occurring substance).

Steve O'Rourke, HallStar

HallStar is a 100-year-old Chicago company that manufactures esters. Its core competencies are esterification, polymer material modification and optimization, photo stabilization sciences, nature derived solutions, and anti-aging sciences. Many products are used in personal care products. It has developed several USDA certified biobased esters including potential phthalate replacements.

Barriers to bringing green biobased materials to market. 1.) Available raw materials have significant costs. 2.) Regulatory compliance costs can be high, especially for a smaller company. 3.) The infrastructure capacity is minimal for renewable esters. HallStar is willing to step in, but it can't develop all the new infrastructure needed. 4.) It is more challenging than anticipated to obtain biobased raw materials that can yield polymer grade esters. 5.) Outside of the EU, there are no other legislative bans or restrictions on phthalate esters. Companies are thus not as motivated to replace phthalates.

Opportunities to overcome barriers. The LEED Green Building Standard is increasing incentives for producers of wire and cable, adhesives, and wall coverings to use renewable materials. There is an EU directive to discontinue certain phthalates. There is increasing interest in compostable and biodegradable plastics.

Emile Homsy, DSM

DSM (Dutch State Mines) is a \$15 billion company with over 200 locations across all continents. It is focused on food and nutritional products, pharmaceuticals, polymer intermediates, and performance materials. It is a global player in polyamides and polyesters. These materials are used in components for the electrical and electronics, automotive, flexible food packaging, and consumer goods industries.

The quest for sustainable development will be the main trend in the coming decades. Companies that differentiate themselves today will become qualifiers in all major environmental performance markets. For DSM this means low or neutral carbon footprint, recycling and cradle-to-cradle solutions, and biobased polymers in critical technical components. DSM is also actively replacing hazardous materials, particularly by introducing halogen-free alternatives.

Biobased performance materials will grow by at least 15% per year until 2020. Raw materials from biomass will become more available in the coming years. New biobased raw materials are leading to new polymers with new properties.

Green solutions sell more for their performance than for their green characteristics. DSM "ECO+" solutions are products and services that create more core value with less environmental impact than conventional solutions. For example, EcoPaXX™ is a high-performance polyamide made with 70% castor oil that can be used in engine covers and more. Arnitel®Eco is a tough biobased copolyester elastomer for automotive tubes and hoses.

Discussion

Biodegradable plastics in the current plastic recycling stream are a significant concern. Until there is sufficient composting infrastructure, recyclers may have difficulties sorting them and they can contaminate other plastic recycling streams. If they end up in a landfill, they may biodegrade, releasing methane, a powerful greenhouse gas. ASTM is rethinking the recycling coding system and may give biodegradable plastics their own number.

There is a disconnect between companies that want their products to undergo hazard assessments and trade associations that do not support hazard assessments. Companies know that they need these assessments to sell their materials and products. Since customers want them, this disconnect will eventually disappear.

Measuring Progress Toward Safer Chemical Use in Processes and Products

This session explored the landscape of new tools that are available for companies to use in benchmarking their progress toward safer chemical use in manufacturing processes and products.

- What do companies need to do to implement a comprehensive approach to chemicals management within their supply chains?
- What information is needed to benchmark progress on safer chemical use?
- Currently progress is measured by reduction in the use of toxic chemicals. Is this the right metric? How should we measure progress? How can this improvement best be communicated?
- Is it possible for companies to differentiate themselves based on their chemicals management strategies? If so, what are effective approaches for accomplishing this goal?

Bob Buck, DuPont

The Apparel Industry Association has created a Chemicals Management Framework (CMF) that tells each actor what they need to do to reduce the impact of chemicals. The goal is to identify and drive improvements within an organization and throughout the supply chain.

The CMF offers a strategic planning framework for each player in the supply chain. It is a comprehensive, tiered roadmap helps integrate a system for managing chemicals in business operations. It helps identify opportunities for improvement (such as Higg Index indicators) and provides a shared path toward sustainable chemistry. It promotes harmonized communications and offers guidance on external resources, tools, and services.

The CMF enables a company to start where it is. It asks a company to learn about the CMF, assess where it is in the performance continuum, create an action plan, and share results for benchmarking and feedback. It can be used in sectors beyond footwear and apparel.

Anne Bonhoff, UL

UL Environment is part of Underwriters Laboratories. It recently acquired GoodGuide, one of the largest online sources of information on the health, environmental, and social impacts of consumer products. UL Environment has developed the GoodGuide Supply Chain Transparency Platform to help track use, define benchmarks, and ensure data quality of chemicals. It provides a scorecard for the public to help understand if a specific product meets consumer preferences. In addition, it can create a private scorecard to indicate if a specific product meets a company's specific criteria.

The GoodGuide Supply Chain Transparency Platform can be used to understand and manage supply chain materials and risks. The platform gathers, analyzes, and presents chemical-related attributes of products such as: Does a product contain chemicals that trigger regulatory or consumer notification requirements? Does the composition of a product comply with a manufacturer's or retailer's Restricted Substances list?

Clients can customize screening and rating systems to compare chemical and materials performance of products and vendors. A supply chain hub enables suppliers to provide data on material composition. The end user can then check a product's ingredients against applicable chemical

standards. The Platform enables purchasers to convey materials management policies through the supply chain. It can also be modified to include additional product attributes.

Libby Bernick, Trucost

Trucost helps organizations understand the economic value of their environmental impacts. It measures environmental performance, including externalities that companies do not pay for. It then monetizes environmental impacts to have a common metric for comparisons. Trucost tracks over 100 environmental impacts and has developed environmental profiling models for 464 industrial sectors. It can apply the sector-based profiles to a specific company, using public information and company data. Companies can use this information to measure their own and suppliers' performance, track and compare progress, and manage risks in operations, supply chains, and products.

The Trucost Environmental Register contains environmental performance information on 4,500 of the world's largest companies. It includes 10 years of data on over 750 key performance indicators (KPIs), in physical and dollar terms. The data undergo an extensive validation process and modeling is used to fill data gaps. The information is used by raters, investors, researchers, and corporations.

A Trucost study estimated the environmental externalities of global primary production and processing industries in over 1,000 regional sectors to be \$7.3 trillion. This equals 13% of global GDP. The analysis measured 100 environmental impacts and grouped them into six key performance indicators: land use, water consumption, air pollution, land and water pollution, greenhouse gas emissions, and waste. The study demonstrates that all of these resources are at risk and that the costs of using them need to be accounted for by companies.

The Trucost database does not currently address safer chemicals and practices. The GC3 is encouraged to consider appropriate metrics for safer chemicals and practices. Trucost uses metrics that are science based, quantitative, able to indicate net benefits, include both environmental and business contexts, and can measure rates of change.

Mainstreaming Green Chemistry, Part 2

As a follow up to Bob Israel's presentation on Mainstreaming Green Chemistry, Barbara Hanley gave an overview of HP's Green Chemistry efforts and reflected on steps that she felt would help bring Green Chemistry into the mainstream. This was followed by a discussion among participants about other steps that are needed.

Barbara Hanley, HP: Reflections on Mainstreaming Green Chemistry

HP operates in 170 countries, has 330,000 employees, and made \$120 billion in revenue in 2012. It has one of largest and most complex supply chains in the world. Its strategic focus areas are in education, environment, and global health. It wants to use scale to drive environmental programs and be a positive force for change. It is building green chemistry into existing operations by filtering burdensome chemicals from new products, being transparent about what they know and where they want to go, and assessing the risk of existing chemicals in use.

The GC3 is a powerful force for change. Registrants at this year's Roundtable represent close to \$890 billion in revenue, 31 companies, and 14 business sectors, and 3 million employees.²

What needs to change to make a better business case for green chemistry?

- Safer chemicals = innovation. Choosing between innovation and safer chemicals is a false choice.
- Include compliance costs in the price of the chemical. End the push of environmental burden down the supply chain. Consider the regulatory burden of the next actor in the supply chain. A less burdensome chemical has higher value for downstream users.

Voluntary programs work best when tied to preferential procurement.

Regulation levels the playing field. There is a role for it. Harmonization of regulations is preferred because it lowers costs of compliance and reduces complexity. Early adopters pay a cost penalty without regulatory drivers.

NGOs are essential participants. They educate consumers, keep industry honest, and make government enforce the law.

Discussion: What Goals Should the GC3 Be Pursuing in Next 3-5 Years?

Members and other participants shared ideas for how the GC3, over the next 3-5 years, can help to mainstream Green Chemistry:

Create a Roadmap.

- Look at how to build demand throughout the supply chain.
- Identify places to stop and reflect on next steps.
- Go beyond green chemistry to look at materials, including life cycle, resources, and end of life.
- Identify best points to influence change and create a model for change.

Support Incentives for Green Chemistry.

- Advocate against fossil fuel subsidies, and for production tax credits.
- Survey firms on barriers to implementing green chemistry.
- Develop funding proposal to move the needle on green chemistry.

Strengthen Visibility and Marketing of Green Chemistry.

- Create awards/recognition for different parts of the product development chain.
- Create a product differentiation system/label.
- Inform the public about manufacturers who are leading the way.
- Move societal trust.
- Use the media.
- Create a positive, general message about green chemistry that the average person can relate to.
- Start a Call to Action – from GC3 or others.

² Revenue and employees exclude chemical companies.

- Create an X Prize for green chemistry aimed at solving a problem and raising awareness. The Cradle-to-Cradle Product Innovation Challenge might fill this role.

Design an interactive green chemistry innovation portal to help speed the scale of transition.

- Use the portal to share problems and ask for solutions – leading to a “trade show” like Greenbuild or Clean Med.
- Learn from what’s been done.
- Encourage cross-fertilization.
- Include simple how-to’s for implementing green chemistry.
- Post substitution case studies and FAQs.
- Identify ways to lower costs and increase scale.
- Include matchmaking/ratings - the “Angie’s list” of green chemistry.

Create Metrics.

- Develop green chemistry metrics to include in existing sustainability ratings – such as Dow Jones.
- Develop a scorecard to measure incremental improvement toward integration of green chemistry in a company.
- Identify ways to work with Trucost on creating and implementing green chemistry metrics.

Expand Purchasing of Safer Products.

- Help create consistent specifications and expectations.
- Provide information to purchasers about safer products.

Promote the GC3 and increase its impact.

- Expand internationally.
- Intensify exchange with other green chemistry networks (EU, Asia).
- Hold next GC3 in EU or Asia.

Expand beyond current types of members.

- Work on roadmap with other societies.
- Bring product designers to GC3.
- Raise understanding beyond chemists.
- Get more chemical companies in the room.
- Raise the value proposition.
- Hold GC clinics at others’ meetings.
- Engage insurance companies in education.
- Help designers and engineers understand implications of decisions.
- Engage biotech sector

Strengthen outreach.

- Create an Opportunity Statement that encourages companies to join the GC3.
- Build reputation for supporting innovative solutions, problem solving.