

7th Annual GC3 Innovators Roundtable

NSF International | May 9–11, 2012 | Ann Arbor, Michigan

Meeting Summary

Introduction

The seventh annual Green Chemistry and Commerce Council (GC3) Innovators Roundtable was hosted by NSF International in Ann Arbor, MI, from May 9-11, 2012. There were over 100 participants representing industry, government, non-government organizations, and academia. Presentations and discussions included supply chain perspectives on the adoption of safer substitutes, sustainability in the auto industry, greening the textile industry, tools for designing and selecting safer chemicals, materials and products, implementing a corporate-wide chemicals management program, and opportunities and challenges associated with bio-based chemicals and materials. The overall objectives for the meeting were to:

- Develop projects and strategies to advance the application of green chemistry and Design for Environment across supply chains.
- Share information, experience and understanding among a diverse group of companies and other stakeholders on developing, adopting and implementing safer chemicals, materials and products.

The following is a summary of Roundtable presentations and discussions.

Wednesday, May 9th

Welcome and Introductions

Kevan Lawlor, CEO, NSF International, welcomed participants to the meeting on behalf of NSF International. In its 67 year history NSF International's services have reflected a commitment to the protection of public health. Green chemistry has been embraced as a new area of activity at NSF as it supports the health of communities and the environment. NSF partners with a variety of organizations in developing standards that support green chemistry and supply chain transparency. Those present at the Roundtable include: US EPA Design for Environment Program, the American Chemical Society Green Chemistry Institute, GreenBlue, Clean Production Action, the Association for Contract Textiles and the Business and Institutional Furniture Manufacturer's Association (BIFMA).

Joel Tickner, Lowell Center for Sustainable Production, presented a year in perspective for the GC3, highlighting 2012 accomplishments that included:

- Redesigning the GC3 website providing detailed project information to members.
- Quarterly newsletters to more than 600 people and quarterly webinars.
- Launching a retailer portal of tools to manage chemicals in products.
- Developing an inventory of initiatives and organizations advancing safer products in the retail sector.
- Developing a GC3 position statement on Green Chemistry in Higher Education.

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- Evaluating training programs for green chemistry and safer alternatives education.
- Developing a collaborative model for a comparative chemicals hazard assessment of alternatives to phthalate plasticizers in wire and cable.
- Documenting needs and efforts in the electronics sector to standardize chemical data collection systems including development of a chemical data “superset”.

Joel then presented a number of future directions for GC3 including: collaboration to solve common challenges; products and their impacts along supply chains; information and transparency in supply chains; the role of market forces in moving towards safer chemistry; and a greater use of bio-materials. He noted two key themes that have emerged in the past year: the need for collaboration; and transparency in achieving safer chemistry throughout supply chains. He noted the critical niche for the GC3 in the future as moving from big ideas to addressing challenges of pragmatic implementation.

Overview of Working Group Activities

There were four GC3 working groups for 2011-2012. Each group provided a brief summary of its accomplishments, lessons learned, and future plans.

Advancing Green Chemistry Education: Rich Helling, Associate Director of Sustainability / Life Cycle Assessment, The Dow Chemical Company, explained that the focus of this project group is to find ways to embed green chemistry in university and professional education as well as in research, education, and development funding programs. The group has worked on two main projects this year:

- The development of a “policy statement” in support of green chemistry education at the university level that can be widely supported by chemical companies, product manufacturers, and retailers. This statement supports the need for the establishment of green chemistry programs at the university level and for graduates of institutions with green chemistry education programs to be preferentially treated in the market place, all other aspects being equal. The policy statement has been a collaborative process with input from many GC3 companies and stakeholders. It supports the adoption of green chemistry and green engineering principles in science and engineering disciplines, non-science disciplines, and continuing education and training within companies. The statement puts forth a series of recommendations and commitments.
- The design of a 3-4 day Green Chemistry and Safer Alternatives Boot Camp for a broad technically savvy audience from materials designers and chemists to regulatory affairs experts. The objectives and goals include fostering communication between job functions, sectors, and levels of supply chains on issues regarding safer alternatives, and green chemistry, and adult learning through “real-world” case studies. To date, the audience for the boot camp has been identified and the needs for the training have been accessed.

Next steps for the green chemistry policy statement include developing an outreach and press strategy. Next steps for the boot camp include gathering existing curriculum and modules, and identifying gaps in curriculum for further development. The boot camp is expected to be ready for launch in spring 2013.

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Business and Academic Partnerships for Safer Chemicals: Shari Franjevic, Principal, Transform to Green LLC, explained the primary motivation for this project was for GC3 companies to collaborate around evaluating chemicals of concern and alternatives to those chemicals, and work with universities who have the technical expertise to conduct evaluations. The objectives of this project were 3-fold:

- To develop a repeatable model for a collaborative process with university and business partners to evaluate safer alternatives to toxic chemicals.
- To pilot test the model.
- To share results with the public to promote the adoption of safer chemicals and materials in supply chains.

The pilot that was chosen for this work was alternatives to phthalate plasticizers in PVC & non-PVC wire & cable applications. Achievements to date have included identifying and prioritizing potential alternatives and conducting chemical hazard assessments on 9 alternative plasticizers using the GreenScreen™. This process has successfully demonstrated the value of a collaborative chemical alternatives assessment approach including: dialogue within supply chains that yields more robust/usable results; a process that yields more data; and cost-effective: pooling of resources instead of companies conducting assessments themselves.

Potential next steps for the project group include conducting collaborative technical performance and economic evaluations on top performing alternatives and choosing another chemical class or application to repeat the work already done with phthalate plasticizers in PVC and non-PVC wire and cable applications.

Engaging Retailers in the Adoption of Safer Products: Roger McFadden, Vice President and Senior Scientist, Staples, explained the 3 year history of the project group to engage retailers and share best practices in managing chemicals in products in the retail industry. The work products of the group this year have included:

- Completing the *Retailer Portal: Tools to Evaluate Chemical Ingredients in Products* and its companion document. The portal classifies retail operations into 20 product sectors and 4 tool categories.
- Drafting a *Business Case for Retailers: Using Green Chemistry to Sell Safer Products* to help decision makers within retail operations understand green chemistry, the relationship between green chemistry and safer products, and the benefits of selling products made using green chemistry.
- Compiling an online resource of retailers' chemicals policy efforts that address chemical hazards in products.
- Compiling an inventory of initiatives and organizations advancing safer chemicals and products to understand the landscape of activities relevant to retailers that are advancing sustainability with a focus on safer chemicals and products.
- Developing a webinar series for retailers, both to educate retailers new to the discussion about safer and greener products and to advance the dialogue with retailers already engaged.

Next steps for the project group include: continuing the retailer webinar series; completing the *Business Case for Retailers: Using Green Chemistry to Sell Safer Products*; and planning for a national summit of retailers to understand drivers for safer products, provide information on tools

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and approaches, determine effective supply chain management strategies, and build long term collaborations in the retail sector and with suppliers to advance safer chemicals and products.

Facilitating Chemical Data Flow Along Supply Chains: *Monica Becker, Principal, Monica Becker and Associates* explained the history of the project group with the focus during the last 3 years being to facilitate the flow of chemical data along supply chains. The project focus for 2011-2012 was to evaluate the feasibility and benefits of standardizing chemical data types and formats in supply chains. Currently data requests from customers are very diverse in nature. Data standardization would provide many benefits including: increased data availability; reduced cost of data gathering; and improved data quality.

The group chose to evaluate the electronics sector where there is significant experience with chemical data reporting in supply chains (RoHS, WEEE, REACH), there is an existing data exchange protocol in the US (IPC 1752) and an improved international data exchange protocol (IEC 62474). For 6 months a small group of 4 companies in the electronics sector engaged in dialog about the types of data they collect, the way in which that data is collected from their suppliers and passed along to their customers, the opportunities and barriers for standardization, and their involvement with existing data standard programs. The larger project group then looked at whether the experience and approaches to data collection were relevant to other sectors as well.

Next steps for the project group include taking lessons learned in the electronics sector and applying it to the apparel and footwear sector. Evaluating tools for data exchange in this sector would support the Joint Roadmap Initiative. Another potential project is addressing the issue of confidential business information (CBI) as an obstacle to business-to-business chemical data communication.

Discussion on Potential New Projects: *Monica Becker, Principal, Monica Becker and Associates*, facilitated a discussion on potential GC3 projects for 2012-2013. In addition to the projects suggested for the coming year in the project group summaries the following project ideas were proposed:

1. Begin a discussion on biochemicals and biomaterials with potential topics of differentiating biobased products, and harmonizing regulations and data reporting systems.
2. Repeat the chemical hazard assessments from the pilot developed in the Business and Academic Partnerships for Safer Chemicals project group and apply it to other classes of chemicals and applications e.g. anywhere vinyl is used.
3. Build stronger collaborations with other organizations and determine how to compliment rather than overlap efforts with groups like AAFA, GAFTI, Outdoor Industry Association, Sustainability Consortium, and the Sustainable Apparel Coalition. An example is the Outdoor Industry Association and the need for chemicals education, “why chemicals matter,” to elevate knowledge amongst suppliers, brands and retailers. GC3 could play this role very well and develop a green chemistry boot camp for this industry sector as a pilot.
4. Develop a collaboration of organizations conducting alternatives assessments by mapping all the efforts, overlaps and synergies.
5. Develop best practices for business to consumer communication.

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6. Build on the chemical data flow work and establish a global base set of data across industries with a common core of information.
7. Organize a Chemical Data Summit bringing together all stakeholders from suppliers through users with a goal to develop a common set of data in support of alternatives assessment.
8. Use information gathered on alternative chemicals, alternatives assessment and best practices in GC3 work products to develop a database of tools and information on safer chemicals to inform investors.

Supply Chain Perspectives on the Opportunities and Challenges to Commercial Adoption of Safer Substitutes

This session aimed at addressing the following key questions:

- How are companies in supply chains working together to develop and adopt safer chemical or material alternatives?
- What are the drivers, opportunities, and challenges for these types of collaborations?
- How do strategies for engaging suppliers differ when the supplier is a large chemical company versus a smaller or start-up firm?
- What kinds of challenges lie ahead (5-10 years) and how can these supply chain collaborations help to meet them?

Case 1: Durable Water Repellants (DWRs) for High Performance Fabrics:

Bob Buck, Technical Fellow, DuPont Company, discussed how DWR finishes add value and life cycle benefits to products (reduce drying time of garments, use cold water to wash). Long chain (8 carbon) DWR technology is being replaced with more environmentally favorable short-chain (6 carbon) technology. The carbon-fluorine bond is very strong and gives great performance for water and stain repellency. Short chain products don't build up in living systems, but may persist in the environment. Currently the supply chain is highly fragmented. Brands and chemical suppliers need to reach out to their supply chains.

Kevin Myette, Director of Product Integrity, REI, discussed the function of durable water repellents (DWR) in outdoor wear - water repellency, waterproofness, moisture vapor transmission. He noted that not all products need the same level of DWR, but marketing and sales may drive design. The most effective treatments are the most persistent, bioaccumulative and toxic. Kevin noted the need for a universal method for hazard analysis and supply chain collaboration.

Case 2: Bio-Based Solvents for Cleaning Products

Tess Fennelly, Director of Marketing and Communications, Segetis, discussed developing safer bio-based cleaning products from cellulosic biomass. Segetis is a green chemistry company that develops novel biobased materials. Segetis has developed a new monomer – levulinic acid made from cellulosic biomass and sugar – that is a building block that can be used to make polyols, plasticizers, solvents, surfactants, and polymers. Segetis' current focus is on making plasticizers and solvents from levulinic ketals. Segetis faces supply chain challenges with this new material as it is not a synthetic equivalent. It has an improved health and environment footprint as indicated by LD 50, Ames test, and biodegradability testing. To succeed

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commercially, Segetis needs to collaborate with its customers (e.g., 7th Generation) to bring new products to market using its chemistries.

Discussion:

1. Supply chains working together in true collaboration: Segetis finds interested customers and signs Confidential Disclosure Agreements (CDAs). Dupont shares what it can and then asks for Non-Disclosure Agreements (NDAs). REI finds that true collaboration happens when there is trust so there is a need to establish trust and then agree about what you are going to collaborate on. REI does not sign NDAs. He believes that sustainability is a team sport and transparency is important. It was noted that having an anti-trust agreement in place in supply chain collaborations is important.
2. Integration of green chemistry in the chemical industry: Dupont recognizes the opportunity in biomaterials and has made large investments. Durable Water Repellents pose a unique challenge as what does sustainable fluorine mean?
3. Impact of news on sources of gas and petroleum based feedstocks: Segetis noted stabilization of pricing is important. In 2014, Segetis will be at scale and will be competitive but currently low costs of petroleum impact the company. Dupont will focus on renewably based materials going forward but will still have petroleum based products for quite a while.
4. Using biomimicry to catapult out of fluorine technology: Dupont is thinking about this but technology is early and difficult to bring to market. Technologies need to address both water repellency and oil stain resistance. Dupont is also thinking about these design challenges separately.
5. Stepping out into new innovation: Dupont said it is difficult to step out of entrenched technology but disruptive ideas are being raised. A question is whether Dupont can close the loop with fluorine as a technical nutrient in its function as a DWR.

Keynote Address: Sustainability in the Auto Industry

John Viera, Global Director, Sustainability and Vehicle Environmental Matters, Ford Motor Company

John Viera outlined Ford's activities in two areas of sustainability: CO₂ emission reduction and sustainable materials. He prefaced his remarks by saying that the 'message from the top' is that sustainability efforts need a business case as his organization is not the charitable arm of the company. They are committed to offering environmentally-friendly technologies in vehicles, but are at the beginning of the journey, and are being pushed by NGOs to improve. Quality, safety, smart design, and sustainability comprise Ford's four pillars of innovation.

The biggest part of their carbon footprint is CO₂ emissions from tailpipes, and they consider science to be the main driver for their reduction strategy. An example of the strategy in action is the Ford Focus, which has several different plug-and-play power trains available. If the goal is to use less energy than using more sustainable materials makes sense as they generally weigh less. There is therefore a direct connection to their sustainable materials strategy.

In their sustainable materials strategy, there are many emerging lightweight material opportunities. They aim for equal performance, with no compromise on cost and respect for virgin material. They are "filling shelves" with potential materials that may become economical

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enough to use as petroleum prices go up. Ford is collaborating with other auto makers on biomaterials and is pushing soy foams in seats and headliners. They are looking at regionally-appropriate sources of biomaterials, such as soy in the US. John presented many examples of sustainable materials they are using like reusing denim in carpet backing.

Discussion:

1. Batteries and materials: Ford is working with a consortium on end-of-life solutions for lithium-ion batteries.
2. New car smell: Ford is working on interior air quality with respect to VOCs and they have a VOC reduction plan.
3. Human health: Ford is looking at VOC-free, allergen-free, etc. alternatives to address human health issues.

Thursday, May 10th

Keynote Address: Advancing Green Chemistry Innovations – From Lab to Commercial Application

Rui Resendes, Executive Director, GreenCentre Canada

Rui Resendes of Green Centre Canada presented the work of the Centre, now in its third year of operation. The Centre was established with federal, provincial and industry funding (cost match) and earns a percentage from the commercialization of products. The Centre employs 31 people and is focused on moving game changing green chemistry discoveries from academic labs to commercialization in the entrepreneurial community. The Centre works to advance “smart chemistry” that combines environment, economy and quality of life. The philosophy of the center is that new discoveries are made all the time in academia but they have risks and academics are not the best marketers.

Green Centre Canada provides technology assessment, product application, new company creation, intellectual property and scale up services to move clever ideas to the “show me” phase where benefits can be quantified and investors can see a reason to invest. If economic or environmental benefits cannot be measured, a project is not continued. Industry collaboration is critical to this model. Resendes presented two case examples of innovative technologies that have been commercialized: switchable water technology for desalinization; and an oil sands processing method that significantly reduces water use.

Green Centre Canada has developed a Canada wide network of academics and receives problem statements from industry partners who are clear about their needs which then become challenges for academics to solve. In the end, the goal is to make change from the inside of firms by scaling up the viability of green chemistry technologies. In the future, Green Centre Canada would like to become a hands on investor for startups, expand its technical team, and expand nationally and internationally.

The Auto Sector’s Journey Towards Safer and Greener Chemical Design

This session aimed at addressing the following key questions:

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- How might the experience with collecting material / chemical information on articles / parts be useful to other sectors?
- How has working together within the auto sector as a group (OEMs, suppliers through the supply chain) been helpful?
- What are the challenges to implementing DfE and alternatives assessment strategies, adding value to the chemical data that have been collected?
- What are the lessons learned and challenges you have experienced?

Bing Xu, Enterprise Materials Management Program Manager, and Marcia Castellani, Environmental Control Engineer, Ford Motor Company, discussed the International Material Data System (IMDS) and Global Automotive Declarable Substance List (GADSL), industry solutions that have been developed on a worldwide basis with the entire automotive supply chain. IMDS was started in October 1997 to address the incoming EU End of Life Vehicle Directive. Currently over 30 OEMs have joined the IMDS, which is now a web-based system used to track all the materials in vehicles. The development of this database for materials and substances is a key enabler to meet current and future environmental regulations.

Developed by the Global Auto Stakeholders, GADSL is a single common list for reporting substances in IMDS within the auto industry. It currently specifies 2900 chemicals that suppliers must report. This voluntary, criteria driven list, assures environmental and health regulation compliance.

Brad Strohm, Manager, Environmental Technical Services, Delphi Corporation, discussed Delphi's Design for the Environment Program which is focused around 4 key ingredients: integration into the product development process; divisional alignment of resources; continuous improvement; and leveraged technical expertise. He noted the environmental health and safety benefits of the program include the ability to be proactive versus reactive, reduce risk, reduce cost and gain a competitive advantage. The challenges of the program include supplier disclosure, surveillance of regulatory and scientific findings, engineering engagement and scientific data availability.

Jake Welland, Manager of the Materials Development Group, Hyundai-Kia, stated that producing cars with materials that have no deleterious effects is personal to Hyundai. They understand that to have long term viability, big changes are needed as the methods used to extract, process, manufacture, assemble, use, and discard raw materials are not sustainable. They also understand that sustainable manufacturing makes long-term business sense, as it can produce competitive advantage. In 2011 Hyundai-Kia started attending EPA's Design for the Environment Partnership Program events, finding DFE to be a good early warning signal for chemicals to focus their attention on.

Discussion:

1. IMDS access for alternatives assessments: Data does not include LCA data, and one company cannot view data from other OEMs, just their own supply chain, so they can only do alternatives assessments with their own information.
2. IMDS costs and data quality: Costs are borne by the OEMs, not suppliers. Data quality is improving. The Production Part Approval Process (PPAP) requires IMDS submission for each part number before PPAP approval can be granted to the supplier.

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3. Application to other sectors: Having common data requests is important as well as having good relationships and communications with suppliers. Being clear and honest with suppliers about data needed and having realistic requirements is critical to building strong relationships. Advance notice of changes in requirements and engagement with suppliers about those changes is important.
4. Positive lists: These are a relatively new thing and they are just beginning to be created.
5. Nanomaterials: GADSL is looking at nano, but IMDS has a problem with nano as the database incorporates reporting based on CAS numbers.

Tools for the Design and Selection of Safer Chemicals, Materials and Products

This session was aimed at addressing the following key questions:

- What is driving the development of new tools for identifying safer chemicals, materials and products?
- What are the types of tools available?
- What are the strengths and limitations of these tools?
- How are businesses and other organizations using these tools in practice?

Sally Edwards, Lowell Center for Sustainable Production discussed alternatives assessment tools for screening, comparison, design, decision making and ranking. She also discussed similarities and differences between life cycle assessment (LCA), risk assessment and comparative chemical hazard assessment. Key elements in selecting a tool are purpose, expertise in toxicology and chemistry, budget and timeframe, and the importance of transparency in approach and data.

Ann Blake, Environmental and Public Health Consulting spoke about the drivers and tools for safer alternatives. Drivers include: regulations; advocacy; supply chain demand; increased consumer awareness and demand for safer products; and increased access to information on hazards; and investors. Tools include: decision support tools such as GreenScreen for Safer Chemicals; decision-making frameworks such as multi-criteria decision analysis and the Biz-NGO working group alternatives assessment protocol; and eco-labels.

Emma Lavioe, US EPA, Design for Environment spoke about the US EPA Design for the Environment chemical alternatives assessment framework as a tool that: evaluates chemicals of concern and potentially safer alternatives via comparative hazard assessment that complement regulatory actions; involves stakeholders from across the spectrum of interested parties; provides the information on hazard from literature and models; offers an alternate approach to risk assessment or life cycle analysis; and considers “functional use” and “life cycle thinking.” The intended outcome of these assessments is informed substitution.

Discussion:

1. Assessment use: Companies use LCA, risk assessment, and comparative hazard assessment but each has a different purpose. Some companies don't like to use RSLs, because designers and others may assume that any chemical not on a list is safe.
2. Tool limitations: Few tools evaluate the impact of the entire chemical/material product life cycle, they are only as good as the data available and one needs to know where science ends and judgment begins.

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3. DfE identifying functional alternatives: DfE researches what alternatives are available, asks stakeholders for ideas, and screens the initial list of alternatives through stakeholders.
4. Tools used by companies: Herman Miller uses internal databases, Cradle to Cradle (C2C), BIFMA's e3 Furniture Sustainability Standard, and LEED as tools for safer chemicals/materials/products; and Steelcase uses C2C, LCA, and has strong relationships with chemical suppliers (often including co-development).
5. Other available tools: the P2OASys tool from TURI considers worker exposure; Blue Green Alliance is working on developing a chemical hazard assessment tool for workers called CHEMhat; PHAROS is a tool to evaluate building materials; SciVera tool works with clients on decision-making methodology and prioritization and conducts hazard and risk assessment of chemicals and products.
6. CBI solutions: Third party data collection can offer solutions that protect confidential data such as C2C, SciVera, and GreenWERCs, among others.

Implementing a Corporate-wide Chemicals Management Program: The BizNGO Guide to Safer Chemicals

This session was aimed at addressing the following key questions:

- How has your organization benchmarked and reported on progress to safer chemicals and what have been some of the unexpected successes and hurdles?
- How should we better align current initiatives and needs for benchmarking and reporting on progress to safer chemicals?
- What are the similarities and differences in benchmarking and reporting across sectors and types of companies (retailers, manufacturers, specifiers, etc.?)

Mark Rossi, Co-Director, Clean Production Action presented the BizNGO Guide to Safer Chemicals which is in draft form. The draft lays out a set of 4 guiding principles: know and disclose; access and avoid hazards; commit to continuous improvement; and support policies and standards. For each principle, a trajectory of business activities from compliance to visionary is defined, best practices among downstream users in managing chemicals across lifecycle are presented, and a set of benchmarks based on progress towards vision are created. The principles are used internally to benchmark current performance, identify areas of improvement, and track progress, are integrated into environmental management systems, and are used externally to explain and report on corporate performance and progress.

Helen Holder, Corporate Material Selection, Hewlett-Packard said in implementing a corporate wide chemicals management program HP endorsed and adopted the BizNGO Principles for Safer Chemicals in 2009 which has allowed them to shift to a more forward looking chemicals policy stance officially. They have translated the principles into "HP speak," defining actions HP will take in adhering to each principle. HP has run into hurdles along the way including changing a large and complex organization and gaining mid-level management support for progressive policies. They have also had successes including a high level of enthusiasm internally for their corporate chemicals management program.

Roger McFadden, Vice President and Senior Scientist, Staples, said in implementing a corporate wide chemicals management program Staples has: endorsed the BizNGO Principles for Safer Chemicals, announced their "Race to the Top" sustainability initiative; developed a

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“bad actors” RSL; and drafted a company “Chemicals Policy.” Staples has run into hurdles in this process including a lack of awareness or urgency inside Staples; as well as more common hurdles like limitations to MSDS and SDS; supplier skepticism and reluctance to share chemical information beyond regulatory requirements; and the large number of data gaps especially related to human health and environmental impacts. They have however also run into successes like widespread supplier support for the “Race to the Top” sustainability strategy and finding safer alternatives to some chemicals of concern already exist.

Tracey Easthope, Environmental Health Director, Ecology Center, spoke about chemicals management programs in health care. The health care sector spends over \$106 billion on chemicals and chemical products every year and spends more than the agricultural sector on direct chemical purchases. The health care industry began by targeting chemicals of concern, preferring products that avoided mercury, lead, phthalates, formaldehyde, PBDEs and DEHP, among others. This has now expanded to a much broader list of chemicals to be avoided, the adoption of the BizNGO principles in leading healthcare institutions and the implementation of these through their own chemicals policies. These healthcare institutions are also engaged in supporting public policy initiatives that align with the principles for safer chemicals.

Discussion:

1. Accelerating the measuring and reporting on progress towards safer chemicals: Link a safer chemicals agenda to dollars so companies can get buy in from within the organization e.g. link it to sales, the cost of substitution etc.
2. Learning from other sectors: Create a chemical footprint equivalent to a carbon / water footprint. Take a look at leadership initiatives in other sectors specifically auto, office and furniture and apparel. It was noted that there is no common RSL across sectors as there are different types of chemicals of concern in each sector. There is an opportunity for agreement on defining the criteria for identifying chemicals of concern and safer alternatives like those in the GreenScreen.
3. Safer chemical demand within firms: This is usually from the top down or bottom up and it is difficult to get middle management support. Middle management is being asked to do additional work but is not seeing benefit.
4. Reporting mechanisms: Collecting information from suppliers is difficult. Suppliers can demonstrate compliance with RSLs which is a minimum. Through Nike’s green chemistry program suppliers can send information in, disclose chemicals, run GreenScreen assessments of the chemicals, compare to green chemistry goals, and integrate into Nike’s Material Sustainability Index.

Project Groups Report Back

Advancing Green Chemistry Education

This session began with a brief introduction of the GC3 Position Statement on Green Chemistry in Higher Education. It was noted that the position statement has been reworded to include non-science majors at academic institutions. The group said businesses have a significant role to play in the promotion of green chemistry as they can advocate for green chemistry in various universities. More companies are needed to sign onto the GC3 position statement and specific avenues of outreach include:

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- Outreach to states with existing relationships with green chemistry organizations.
- Outreach to Green Chemistry Institute (GCI) roundtables.
- Submitting publications to GCI and the Chemical & Engineering (C&E) newsletters.
- Using social media outlets such as Linked-In to connect with companies.
- Identifying and approaching different industry sectors such as the American Cleaning Institute and the Personal Care Products Council.
- Outreach to universities to change curriculum to include green chemistry.
- Linking industries that have signed onto the position statement to their respective universities.

The group then discussed development of a green chemistry curriculum for a 3-4 day Green Chemistry and Safer Alternatives Boot Camp. The boot camp should begin with a very general introduction to green chemistry and the group agreed that toxicology 101 and hazard assessment should be included in the core modules. Currently, 16 course modules have been developed and the group agreed that 16 modules may be too many. By October 2012, modules will be prioritized and a pilot of 10 core modules of 20 to 30 minutes each will be developed. Some of these pilot modules may be used in the “Green Chemistry 101” training being held on October 25, 2012, in Detroit, MI, to precede Michigan’s Annual Green Chemistry and Engineering Conference on October 26, 2012.

Funding sources for the boot camp were also discussed. Potential funding ideas included the Department of Energy (DOE) and the National Science Foundation (NSF). Since funding from these sources are primarily for industries and used as job training resources, the group suggested the GC3 develop the contract and identify a GC3 member company to be the principal investigator.

Business and Academic Partnerships for Safer Chemicals

Discussion in this group was organized by the following topics:

Releasing the GreenScreens publicly:

- The consensus of the group was not to release the 9 completed GreenScreens publicly until they are validated under the to-be-developed GreenScreen validation program and to support CPA’s efforts to develop, pilot and finalize the validation program. It was noted that EPEAT will be revising its standard in November and that it would be good to have the validation process finalized at that point to support efforts to include GreenScreen in that standard.

Cost evaluation of alternative plasticizers:

- This is not a priority for now. Cost is a moving target and it may not be value-added for the group to look at this.

Performance evaluation of alternative plasticizers:

- The group agreed that to do actual performance testing would be a significant effort. They discussed the possibility of gathering and reviewing existing test/performance data as a first step and then determining later if the group want sto undertake actual testing.

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Selecting and assessing another chemical class/application:

- This is worth considering only if there is a real driver, i.e., an existing or expected regulation that will require companies to find alternatives.

Funding model for future efforts:

- To ease the administrative challenges encountered in gathering cash support for the project, the participants agreed that a change to a traditional consortium model would be sensible.

Engaging Retailers in the Adoption of Safer Products

Discussion in this group began with ideas for the retailer webinar series. The first webinar was held in April 2012. The group thought this was an excellent way to engage retailers, educate them about green chemistry and safer products, introduce them to tools available for safer product selection, and highlight retailers that are leaders in this field. Webinar ideas included:

- Educating employees about green chemistry / sustainability issues from buyers to floor associates. Speakers may include Patagonia, Marks and Spencer, Staples, New Balance.
- Explaining the FTC Green Guides. Speakers may include an attorney with legal context of the marketing guidelines.
- Discussing bio-based materials, the science behind them and their life cycle implications. Speakers may include the FDA Bio Preferred Program, Sustainable Biomaterials Collaborative, and USDA.
- Raising the level of understanding around good chemistry versus bad chemistry targeted at product development personnel.
- Developing a corporate wide program by taking a deeper look at the BizNGO implementation guide.
- Building the business case for green chemistry supported by academic thought leaders.
- Messaging green chemistry, both business to business and business to consumer.

The draft *Business Case for Retailers: Using Green Chemistry to Sell Safer Products* was then discussed. As the goal, messaging and end use of the business case was still not agreed upon, it was tabled for a later discussion.

The last discussion item for the group was organizing a Retailer Summit, following the successful GC3 Retailer meeting in 2011. Staples has offered to host this summit. Goals would include: engaging a broader group of retailers; hearing from leaders able to inform retailers new to the discussion of green chemistry and safer products, and creating a space for discussion. Other items of discussion about a summit included:

- Participants: Engage sustainability specialists within companies.
- Time / date / location: Attach the summit to the 2012 GC3 (the day before).
- Key actors / champions: To be determined.
- Preliminary agenda: Webinar topics could form a basis for the agenda. Another

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suggestion was commonalities for testing and validation.

- Outreach strategy: Collaborate with RILA.
- Advisory committee: WERCS, Intertek, Staples, Target, and IEHN.

Facilitating Chemical Data Flow Along Supply Chains

The group agreed that two topics items would be pursued in the coming year. The following are discussion points from each topic:

Data standardization discussion points:

- Need to better understand and leverage what the electronics sector is doing as a model for the textile sector.
- Need to look at IMDS, particularly for textiles and how the model might be applicable to footwear and apparel.
- Look at the UNEP Products Information Systems report done by UMASS Lowell for models
- Nike is not used to sending data up and down the supply chain. There is no built-in pipeline for data exchange; it often gets lost between the formulator and Nike. We can build off the electronics work but there are some shortcomings for apparel due to many more organic materials.
- Could start with existing tools in textiles such as the Voluntary Product Environmental Profile (VPEP), a web based format for reporting information on chemicals. .
- Need to be able to ask the same questions the same way especially when there are multiple brands involved. There is a difference between information flow and chain of custody of materials.
- Need to know what questions are important to ask
- HAZCOM reform might be a help, but has to be global and aligned with GHS and have lower thresholds.
- B-Lab assessments, ULE 880, and the new NSF/GCI Greener Chemical Information Standard and third-party certifications were brought up as other models for data flow.
- May want to publish the report on electronics supply chain data flow, but it is not clear that this work has run to its conclusion.
- Is there commonality in data for products supplied to different sectors so that this project of developing a model for the footwear and apparel could be generalized? In this case the Joint Roadmap is an important impetus.
- Requirements put on products (from ecolabels, REACH, LEED, sectors, and locations) can influence the data set. Is it practical to start with the data elements of the most rigorous (high data) case?
- Cannot ignore certifications that are in the marketplace.
- Cannot be all things to all people.
- Need to agree on format and transmission method; they need to be scalable, starting with the minimum, and using a modular approach to add in additional data points like a plug and play system.
- System must allow for data flow through third parties.
- Two models for the system is a data exchange system, like IPC (that sets minimum level of reporting/interface standards) and a single user interface, like IMDS (where you have a single RSL list and single format). The problem isn't the technology it's more what and how information is transmitted.

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- There is value in GC3 identifying the 80% of common data. What is common across sectors and where are these differences?
- A dream situation would be barcoding of data starting at the raw material supplier which could follow the chemical from manufacture to final product.
- The goal should be to focus on common data for “what’s in it” and thresholds for reporting that can then get translated to other systems like Sci Vera to evaluate toxicity. Need a single/common format for data through supply chains.

Data standardization next steps: Develop a case example based on the textile industry and the Joint Roadmap requirements. Volunteers included Bob Buck, Scott Echols, Mary Ellen Mika, Tommy Thompson, and Sam Moore. A smaller group call is needed to map out the project further and how it can be broadly applicable to other sectors. It may be important to identify what toxicity endpoints are common across schemes.

Protecting confidential business information discussion points:

- Address delivery, transparency and protection of confidential business information (CBI) while facilitating chemical data transfer. Volunteers included Robert Giraud, Libby Sommers, Roger McFadden, Sean Burek and Pat Beatty.
- ULE and NSF may have lessons to pass along regarding CBI. ULE has worked through this in the product safety arena for 100 years.
- There are different levels or categories of CBI that may need different protections. Types of CBI that need protection depend on situation. There is a granularity so that it is hard to make generic statements.
- Industry needs to decide what CBI is really.
- What models are there out there for allowing information flows while protecting confidential information – business to business, third party, etc.? Open source versus closed source; new chemical versus existing chemical; IMDS wild cards.
- Goal is to develop an analysis of best practices and lessons in sharing confidential information and the strengths and weaknesses of each. One option is to take a particular product and do a pilot on that product.
- How can confidential information sharing provisions be made simple enough so that non-native English speakers can do it. How can suppliers be educated on this?
- Big need for training of suppliers.

Protecting confidential business information next steps: A call to map out an analysis of best practices and possible pilot project..

Friday, May 11th

Keynote Address: Green Chemistry in the Great Lakes Region – From Problems to Solutions

Frank Ruswick, Deputy Director of the Office of Great Lakes, Michigan Department of Environmental Quality

Frank Ruswick spoke about the relationship between green chemistry and Great Lakes protection and how green chemistry is the foundation of their economic and environmental future. Green chemistry can be successful for a number of reasons: emerging and historical

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chemicals of concern can be eliminated at the design phase; economics are a driver as much as ecological foresight; green chemistry collaboration is voluntary and is not government mandated which can create limitations; and green chemistry in Michigan is driven by the private and not the public sector.

Lana Pollack, Chair of the U.S. Section, International Joint Commission (IJC)

Lana Pollock spoke about an incident in Michigan in 1973 where about 4,000 Michigan residents ingested fire retardant chemicals, polybrominated biphenyls known as PBBs, accidentally introduced into the food supply. Although there has been some evidence linking long-term health problems in people who ate meat or drank milk contaminated by PBBs, the most significant health problems have been discovered in their children. Daughters for example are more likely to have a miscarriage.

Through this example, Lana made the point that the results of the misuse of harmful chemicals can be immediate but the cleanup can take a very long time. With growing awareness of the results of harmful chemicals there is rapid innovation. However, innovation lifecycles are getting shorter and Lana advised that correction and caution be built into any innovation process. With chemicals designed using green chemistry this precautionary work is done up front.

Lana then spoke about the mission of the International Joint Commission to prevent and resolve disputes between the US and Canada under the 1909 Boundary Waters Treaty. As an independent and objective advisor to the two governments, the Commission rules upon applications for approval of projects affecting boundary or transboundary waters including the implementation of the Great Lakes Water Quality Agreement and alerts the governments to emerging issues. One of the key roles of the Commission is to conduct scientific assessments of the health of the Great Lakes ecosystem. For example, pollution in the Great Lakes was reduced significantly when PCBs were banned 1979. However for assessments to be successful, the importance of monitoring and tracking has to be understood as it is costly and continues over a long period of time. Although one of the barriers to this understanding is natural healthy ignorance, there are also misinformation campaigns. She gave an example of the recent Chicago Tribune articles about misinformation regarding the need for fire retardants. Her message was to know the enemy as it sometimes has big money behind it.

Lana ended by asking companies, as they begin to design innovative solutions to harmful chemicals, to think not just of substitution of the chemicals themselves but to look at the processes by which innovative chemicals are being made. She specifically asked them to remember that water is a limited resource, and said that if the Great Lakes were being used at the rate of world water use, they would be dry in 80 years.

Discussion:

1. Instruments to getting widespread public interest: Look to successful cultural shifts e.g. smoking. It requires more of an investment in marketing and changing people's sensibility which these days includes social marketing and youtube etc.
2. Impact of agricultural non-point sources of pollution: Because of agricultural practices including the use of phosphates and antibiotics, one of the IJC priorities for the next 3 years is reducing Lake Erie's algae bloom. A lot is being done in terms of looking at

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sources of contaminants (nutrients) but after understanding their sources, political will is needed which means people have to make it known that addressing these issues are essential. There is an important role for green chemistry in agriculture.

Greening the Textile Industry

This session was aimed at addressing the following key questions:

- How is your company collaborating with your supply chain / other brands to make textile products more sustainable?
- What are the most important factors that have prompted these industry collaborations?
- What are the key ingredients needed for effective collaboration to occur?
- How can the lessons learned from these collaborative efforts be applied in other industry sectors?

Sam Moore, Managing Director, Hohenstein Institute America, gave an historical perspective of the progression of green chemistry in sustainable textiles. The textile industry was a leader in the globalization of the industrial revolution but is grossly inefficient: 10% of global carbon output and 20% of global water pollution is textile related. The textile industry has moved over the last 40 years from end of pipe treatments to pollution prevention, and is now entering the realm of greener products. Hohenstein Institute is one of the founding members of the Oeko-Tex Association which for 20 years has certified compliance textile products based on a Restricted Substance List. However, producers of global textile products are now being held accountable for the performance of their supply chains, even if they do not own the factories and cannot control compliance with local regulations. Oeko-Tex Standard 1000 has been developed to address many of the life cycle and environmental performance concerns including social responsibility and offers a third party assessment of performance.

Tommy Thompson, Senior Manager of International Environmental Affairs, Hanesbrands, spoke about the approach and advantage of Hanesbrands mostly owned supply chain in greening products and the production process. Hanesbrands was one of the first firms in the textile industry to track chemicals entering their facilities and in their products. With 90% of their owned manufacturing now outside the US, this information is even more important. Hanesbrands has developed a web-based corporate chemical database; screens all chemicals for consumer safety and environmental protection prior to use or integration into product design and/or manufacturing; has standardized chemical management systems in all manufacturing plants; and conducts chemical audits which include notification to management of chemicals of concern and recommendation of alternative chemicals. Hanesbrands has found the critical aspects of their success to be patience, education and support, cooperation, visibility, consistency and diligence, with particular emphasis on education.

Bob Buck, Technical Fellow, DuPont Company spoke about chemical management as a key focus area in the global textile industry as supply chain facing tools are developed to understand and assess the life-cycle environmental impacts for the industry. Through efforts of the Sustainable Apparel Coalition (SAC) and Outdoor Industry Association (OIA), among others, firms in the textile supply chain are discovering that success requires collaboration along the entire supply chain and the adoption of a life-cycle approach. The Chemicals Management Working Group of the SAC/OIA is currently working to: increase awareness around chemicals management and understanding; provide indicators (and in the future, metrics) that will be

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included in future versions of the apparel, footwear and equipment index tools; and collaborate with like-minded efforts like the Joint Roadmap: Toward Zero Discharge of Hazardous Chemicals.

John Frazier, Director of Sustainable Chemistry, Nike, spoke about the challenges facing the textile industry: 10-100% of chemical use by weight of fabric; 100-150 liters of water use by kg of textile for dyeing and finishing; over 1000 Tier 1 suppliers and over 2000 Tier 2 suppliers; and contracted and shared manufacturing with limited technical resources and capacity. The part of the solution John focused on was collaboration and sharing in a precompetitive space with particular emphasis on Nike's Material Sustainability Index (MSI) which is being used in some of the collaborative initiatives. The MSI measures and rewards performance based on life cycle thinking, closed loop, water, chemistry and energy variables. Each material has a ranking so the materials combined in a footwear or apparel item produce a product score. Green chemistry is embedded in every part of the MSI which increases a material's ranking and ultimately, product score. John said part of the solution for the industry is to prescribe the chemistry and solutions they want, and for Nike that wish list consists of: reversible adhesives; devulcanized rubber; closed loop/renewable materials; greener materials and processes; and zero discharge.

Discussion:

1. Biggest hurdles to green chemistry and internal sustainability goals: Lack of basic information about chemistry being used and disconnect between purchasing incentives at major retail brands and objectives of green chemistry, e.g. bonuses need to be tied to sustainability; reliable accurate information and knowledge base / technical expertise in a global economy; sustainability isn't currently included as a fundamental element of business; education of the supply chain so that Tier 2 and 3 suppliers know what they are buying; and accounting for true costs – water, energy, chemicals, etc. – has to be understood.
2. Role toxics use reduction and pollution prevention training can play: There is a great opportunity for training as the global supply chain is very fragmented, knowledge transfer doesn't work, and there are cultural communication issues across the world.
3. Leverage points / access points for educating a global supply chain: The difficulties involved in educating a global supply chain may point to a different model, that of companies owning the factories and taking direct responsibility.
4. Transferability of models to other industries: The apparel, footwear and equipment industries see transferability to other industries and from other industries e.g. tools from the automotive industry. All indexes are freely available to other industries.
5. Working in a precompetitive space: Need to understand the challenges and problems common to all, where collaboration is needed to make a difference, and where individual companies have solutions that will benefit others.

Emerging Issues: Bio-Based Chemicals, Materials and Products

This session was aimed at addressing the following key questions:

- How can companies support the development and use of biobased products that are sustainable from feedstock sourcing through production to recovery at end of life?
- What differentiates one biobased product from another?
- What are the opportunities and challenges facing emerging biobased chemical/material

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suppliers?

- What are the opportunities and challenges facing companies that are pursuing a biobased chemical/material strategy for their products?

Ramani Narayan, Michigan State University began his presentation by looking at the 4th principle of green chemistry: use of renewable (biobased) feedstocks. Renewable (biobased) feedstocks use raw materials that are often made from agricultural products or are the wastes of other processes. He emphasized that biobased feedstocks have a fundamental, intrinsic value proposition. The rate and time scales of carbon utilization is in balance using bio/renewable feedstocks (1-10 years) as opposed to using fossil feedstocks. The regeneration and use rates of old carbon from fossil fuels such as oil, coal and natural gas are not sustainable. So the value proposition of biobased feedstocks comes not from the process footprint, but from the origin of the carbon.

Steve Davies, Director of Communications and Public Affairs, NatureWorks LLC noted that his company is the world's largest bioplastics producer making Ingeo, a biopolymer made from lactic acid. Ingeo is in a continuous improvement process based on reductions in greenhouse gas emissions. He gave numerous examples of its broad use from rigid plastics through apparel applications. The company is entering into a new paradigm for cradle-to-cradle materials recycling called feedstock recovery. An example given was cups used and collected for feedstock recovery at a Brussels music festival in June 2011.

Brenda Platt, Co-Director, Institute for Local Self-Reliance, explained the differences between biobased and biodegradable materials and products. Biobased content is the amount of biobased carbon in the material or product expressed as a percentage of weight (mass) of the total organic carbon in the material / product. Biodegradable means the material / product is completely assimilated into food and energy sources by microbial populations in a short time period. Although there are now a variety of resins and materials available for biobased products, and performance, price competitiveness and demand is improving, there are still numerous challenges: concern over genetically modified organisms; desire for sustainably grown biomass; need to develop adequate composting programs; concern with nanomaterials and fossil-fuel plastic blends; inconsistencies in and lack of adequate labeling; concern over contamination of recycling systems; and confusion in terminology.

Discussion:

1. Compost markets: These are growing for agriculture, landscaping, and erosion control (high quality compost only). Composters want the stuff that comes with the food scraps, not just anything.
2. Investigation into anaerobically degradable polymers for food serviceware: Some companies are designing polymers (like PHA) to be anaerobically digestible. Some collection/preprocessing systems screen out plastics.
3. Recycling PLA: Recycling systems are based on fossil fuel plastics. Plastics' recycling is only about 7% in North America. NatureWorks stays out of bottles so as not to contaminate the recycling stream. There is very limited infrastructure to recycle PLA so it ends up being a contaminant in most recycling systems.

Wrap Up Session

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Ken Geiser, Lowell Center for Sustainable Production spoke about the GC3 Roundtable and other discussions being a great opportunity for companies across sectors to share tools, experience, and strategies for advancing safer chemicals across supply chains. He noted this was among the best GC3 Roundtables in terms of the level of dialog and detail that has evolved over the past seven years. It was also the biggest GC3 to date and while there is still a lot of outreach to do to bring in new partners, the network is quickly establishing itself as an important support structure for leaders in firms trying to advance safer chemicals and products.

The GC3 adds substantial value to firms working to advance safer products. It offers:

- Fresh, cutting edge information.
- Information sharing within sectors and across sectors.
- Practical tools and initiatives.
- Substantive, detailed engagements on critical issues – a safe environment to talk about sensitive issues.
- Intra and cross-sector collaboration on valuable projects, including collaboration with other networks and stakeholders.

A major theme for this year's GC3 was collaboration. There are new sets of drivers for safer chemistry and it is clear that information sharing and collaboration focused around solutions are critical elements of advancing safer chemistry.

The panels allowed participants to explore various themes in advancing safer chemicals and products:

- The role of supply chain collaborations/initiatives in advancing safer chemicals such as efforts to address concerns over durable water repellants, the development of biobased solvents, and advancing safer chemistry and materials in the textile sector.
- The need to involve new sectors in the discussions around green chemistry and safer chemicals, such as the auto sector that has highly advanced sustainability programs focused on climate reduction and a history of supply chain information sharing.
- The challenges of globalization on advancing safer chemicals and how green chemistry principles can be integrated throughout complex, global supply chains. Given the need to integrate safer chemistry throughout these complex supply chains, "You have to be bold, and then you have to collaborate." One question that was raised was whether the collaborative model of the textile industry could be extended to other industries. Given that much of manufacturing is moving off-shore, is there a role for pollution prevention providers in education and technical support in these types of collaborations.
- The GC3 keynotes provided important perspectives from government, academia, and industry on the opportunities that exist for safer chemistry. Some key points from the keynotes included:
 - The need for pre-competitive collaboration to advance sustainability.
 - Green chemistry must be smart chemistry linking economic, social and environmental considerations. It is ripe with innovations and high in potential for commercialization.

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- Green Chemistry is Lovable Chemistry. It is critical to address product based chemical emissions and is doing the precautionary work up-front.

The four project groups reflected on next steps and identified a number of practical next steps, including:

- Facilitating Chemical Data Flow Along the Supply Chain
 - Continue work on standardizing and streamlining data transfer on chemical information including developing a model case example using the Joint Roadmap: Toward Zero Discharge of Hazardous Chemicals of the textile industry.
 - Develop models for advancing business-to-business chemical data flow while protecting CBI.

Engaging Retailers in the Adoption of Safer Products

- Conduct more quarterly educational webinars for retailers on a range of topics.
- Plan and host a second Retailer Meeting in conjunction with the next GC3 Roundtable.

Business and Academic Partnerships for Safer Chemicals

- Seek to validate current Green Screen assessments of alternative plasticizers and encourage formalization of Green Screen validation protocol.
- Consider new chemicals for assessment, exploring a funding consortium.

Advancing Green Chemistry Education

- Promote policy statement on green chemistry in higher education.
- Develop and pilot green chemistry and safer alternatives training resources.

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Appendix A: 2011-2012 Project Group Updates

Advancing Green Chemistry Education

The GC3 education group was tasked with two particular activities during the past year: developing a position statement on green chemistry in higher education, and also creating a green chemistry and safer alternatives training for business professionals.

Position Statement on Green Chemistry in Higher Education:

The goals of the position statement were to create a statement that can be supported by product manufacturers, and retailers supporting the need for:

- The establishment of green chemistry education programs at the university and continuing education levels
- Graduates of institutions with green chemistry education programs being preferentially treated in the market place, all other aspects of education being consistent and equal
- Suppliers working with manufacturers to advance education on green chemistry

The position statement is a result of a collaborative process with the GC3 education group, with input from many of the GC3 companies and stakeholders. The position statement broadly supports sustainability in higher education, with a focus on green chemistry and green engineering principles. The statement specifically mentions the need for these principles, and other important knowledge and skills, to be incorporated in to science and engineering disciplines. It also supports the incorporation of many of the concepts and principles in green chemistry and sustainability to be woven in to non-science disciplines. The statement supports continuing education and training within companies, to foster the adoption of current knowledge and skills for existing workers and professionals. Finally, the position statement sets forth a series of recommendations and commitments from the signing companies.

First signers include: Seventh Generation, Construction Specialties, Staples, Johnson and Johnson, The WERCS, Anvil Knitwear, Sustainable Research Group, Steelcase, EPEAT, Green Depot

Green Chemistry and Safer Alternatives Training:

The GC3 education group began work on creating training on green chemistry and safer alternatives for business professionals. The group began with identifying the audience and assessing the need for such a training. The group undertook research on both companies and organizations undertaking green chemistry and safer alternatives trainings and developed matrix to categorize these. Through some background research and brainstorming sessions, the group identified a number of stakeholders and course module topics that were of interest. The training is envisioned to be aimed at multiple job functions within chemical and consumer companies, with the goal of training professionals to be able to better communicate within a company and across levels of a supply chain on the topics of green chemistry, alternatives assessment and other sustainability-related topics. By better understanding how each of the job functions plays a role towards creating sustainable products and processes, companies can be better prepared to solve the many challenges they are faced with today. The group is continuing work on identifying curriculum gaps, pulling together existing curriculum, and identifying areas that need further development for this training. It is envisioned that this training will be launched between the time frame of late fall/early winter 2012 – May 2013.

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Appendix B: 2011-2012 Project Group Updates

Business and Academic Partnerships for Safer Chemicals *A Pilot Project on Plasticizers in Wire and Cable*

Following the 2010 GC3 Innovators Roundtable, a project group was formed to initiate a project designed to develop and pilot a model for companies and universities to collaboratively evaluate safer alternatives to toxic chemicals. The aim was to develop a collaborative model that will support decision-making for GC3 companies and their supply chain partners. To be successful, the model must yield better and more cost-effective results than those that companies can achieve on their own, through pooling of knowledge and costs for evaluations, as well as facilitating conversations within supply chains that can lead to better overall outcomes.

This model is being developed through a pilot project, focused on identifying and evaluating alternatives to known toxic phthalate plasticizers in PVC & non-PVC wire & cable applications. The original workplan called for an assessment of the relative hazard/safety of the alternatives, as well as evaluations of technical performance and cost. If none of the alternatives identified in the pilot are considered sufficiently low-hazard, the intention is to engage in development of new alternatives in partnership with researchers from the University of Mass. Lowell and the Warner Babcock Green Chemistry Institute.

The following companies, government agencies and NGOs have been meeting on monthly calls to provide direction and input on the project: BASF, Dow Chemical, Hallstar, Teknor Apex, Dell, EMC, HP, Staples, Washington State Dept. of Ecology, Clean Production Action, and Pacific Northwest Pollution Prevention Resource Center.

The first phase of the project -- the selection and hazard assessment of alternative plasticizers - has been completed. Nine plasticizers, which were selected by the workgroup, were evaluated by ToxServices using Clean Production Action's GreenScreen™ Method. Project group members reviewed the Draft GreenScreen™ assessments and provided comments. ToxServices addressed the comments received. The draft assessments and all comments received were posted on a password-protected webpage. The group's intention is to make the results of these assessments public shortly after the GC3 Roundtable.

Though we have not yet conducted the technical and cost assessments, by all accounts, the project group has succeeded in demonstrating that collaborative assessments can be done. The group faced and overcame numerous challenges and learned many valuable lessons. Several protocols were developed, such as a process to document and discuss dissenting views on the chemical hazard assessments. The dialogue within our supply chain group created robust, usable results and appears to have yielded more data than might have otherwise been available to an individual company.

While the cost paid by each company to participate in the project was low, the project required significantly more time on the part of GC3 and ToxServices consultants and staff than was anticipated. In effect, the GC3 and ToxServices provided a heavy subsidy for the work. A different funding model will be needed if the GC3 decides to continue this effort. A different funding model will certainly be recommended in the proposed collaborative model. Finally, the project has resulted in robust, third party chemical hazard assessments for nine

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alternative plasticizers for wire and cable, which are of significant interest to suppliers, chemical users and other stakeholders.

The immediate next steps for this project are to write up the results in a report that will include a description of work accomplished and lessons learned, as well as the proposed model for collaborative efforts for alternatives assessment, based on the pilot conducted. In addition, we will summarize the results of the chemical hazard assessments of alternative plasticizers and develop a dissemination strategy for those results.

At the 2012 GC3 Roundtable, we will discuss ideas for going forward with this work. Possible options include continuing along with the technical and cost evaluations of a subset of the plasticizers that have undergone GreenScreen assessments, and/or choosing another chemical class/application to repeat the type of work already done.

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Appendix C: 2011-2012 Project Group Updates

Engaging Retailers in the Adoption of Safer Products

Building on the work of the project group in previous years and the outcomes of the first GC3 meeting designed specifically for retailers (Product Chemicals Management for Retailers: Moving Beyond Compliance Toward Safer, Less-Toxic Product Lines held on May 3, 2011) project group members identified the following projects and deliverables:

The Retailer Portal: Tools to Evaluate Chemical Ingredients in Products and Companion Document

Completed in September 2011, the online database known as the retailer portal is a database of tools that enables retailers to evaluate chemicals or chemical-containing products for their potential human health and environmental impacts and identify chemicals or materials that are regulated or are of concern and not yet regulated. The portal, accessible on the GC3 web site, provides a convenient summary of tools that are relevant to all product sectors and those that are designed for a specific industry sector.

As many retailers lack the resources or expertise to fully educate themselves about the wide range of tools available, the portal and its companion document were developed to help retailers determine which chemical product management systems are the best fit for their operations.

A Business Case for Retailers: Using Green Chemistry to Sell Safer Products

Currently in draft form, the “business case” has been developed as a brief document to help decision makers within retail operations understand green chemistry, its relationship to safer products and the benefits of selling products made using green chemistry. Final comments for the draft business case will be gathered at the project group breakout session at the GC3 Roundtable.

Retailer Chemicals Policy Efforts

Available on the GC3 web site, this online resource was developed to provide information on chemicals policies some retailers have developed to address chemical hazards in products as part of their company’s broader sustainability initiatives. The policies include restricted substances lists, general chemicals/materials policies, product sustainability indices, corporate sustainability reports, and general sustainability program and policy information. Companies are listed alphabetically and links are live for easy access to the policies and lists.

Inventory of Initiatives and Organizations Advancing Safer Chemicals and Products

In December 2011, an inventory of twelve initiatives and organizations relevant to retailers that are advancing sustainability with a focus on safer chemicals and products was developed. The goal of the project was to understand the landscape by gathering data on each group’s purpose, membership, industry sector focus, and past and current projects. Group members requested this exercise to help determine the appropriate activities of the GC3 retail project group.

Retail Webinar Series

A webinar series for retailers was initiated in early 2012. The goals of the webinar series are to educate retailers new to this discussion and to help advance the dialogue with retailers already engaged in pursuing safer and greener products by highlighting activities of forward thinking retailers in products chemical management. The first webinar, *The Boots UK Story: How a*

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British Retailer is Moving Beyond Compliance and Leading the Way in Removing Toxic Chemicals in its Products was held on April 5, 2012. Webinars for retailers will be hosted quarterly. Ideas for webinar topics will be solicited at the GC3 retail project group breakout session.

Project Ideas for 2012-2013

- Continue the webinar series that began in April 2012.
- Complete the *Business Case for Retailers: Using Green Chemistry to Sell Safer Products* and develop a plan for dissemination.
- Plan for a national summit for retailers as a follow up to the retailer meeting organized by the Lowell Center in May 2011. Roger McFadden has indicated that Staples may be interested in hosting this meeting. Draft goals for the meeting include:
 - Understand the drivers for safer, greener products and the retailers' role in promoting this transition;
 - Share experiences of retailers that have been successful in implementing systems to improve chemicals management that help to identify safer products;
 - Provide information on tools and approaches that are available to advance safer products in the retail sector;
 - Determine how to work more effectively throughout the supply chain to improve chemicals management, such as developing common approaches to data collection from suppliers;
 - Provide opportunities for networking and collaboration in a non-competitive space;
 - Build long term collaborations in the retail sector and with suppliers to advance safer chemicals and products.

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Appendix D: 2011-2012 Project Group Updates

Facilitating Chemical Data Flow Along Supply Chains

At the 2011 GC3 Innovators Roundtable, a major topic of discussion was the potential importance of standardizing chemical data systems within supply chains to increase data availability, reduce the cost of data gathering/communication, and to improve the quality of data collected. Standardizing chemical data systems was identified as an important strategy to overcome the obstacles to data communication related to the wide range of datasets, data formats, and data collection tools being used within supply chains, which hampers data sharing and automation of data sharing, storage, and analysis. To summarize the problem, Mark Frimann from Texas Instruments said, "There are almost as many types of forms as there are companies requesting data."

Following the 2011 GC3 Roundtable, and the publishing of the "Supplier's Guide to Chemical Data" AKA, "Meeting Customers' Needs for Chemical Data: A Guidance Document for Suppliers," the Chemical Data Project Group initiated a new project for 2011/2012 with the objective of evaluating the feasibility and benefits of standardizing chemical data types and formats in supply chains.

The approach chosen was to engage in dialogue with companies in an actual supply chain. The electronics sector was chosen because this sector has: (1) had significant need for, and experience with, collecting and reporting chemical data to respond to RoHS, WEEE, REACH, and other regulatory program requirements; an existing standard for data collection and exchange (IPC 1752); and a new, international standard/data exchange protocol – IEC 62474 Material Declaration for Products of and for the Electrotechnical Industry – which has recently been finalized. We realized that a great deal could be learned from companies in this sector.

We engaged four companies in an actual supply chain -- Texas Instruments, Seagate, Hewlett Packard and Staples --in bi-weekly calls to discuss, identify and document the types of data that they collect; the way in which data is collected from their suppliers and passed along to their customers; the opportunities and barriers for standardization; and their involvement with existing data standard programs. The results of these calls were presented to and discussed with our larger GC3 Chemical Data Project Group and will be written up in a report to be released in late 2012.



At the 2012 GC3 Roundtable, the GC3 membership will discuss whether to continue working on chemical data-related projects. Two ideas that have been floated are: (1) to take the learning from our data standardization project in the electronics sector and apply it to the apparel and footwear sector, which is in need of tools for chemical data exchange systems to support its Joint Roadmap Initiative in the Apparel & Footwear Industry; or (2) to address the issue of confidential business information (CBI) as an obstacle to B-2-B Chemical Data Communication. In April, members of the project group organized a GC3 webinar on the topic, which over 60 individuals attended. The participant questions and discussion demonstrated a keen interest in this topic.