

GCC3



**INNOVATORS
ROUNDTABLE**

HOSTED BY P&G FABRIC CARE
MAY 7-9, 2019 • CINCINNATI, OH

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Introduction

The GC3 Roundtable is a critical gathering of companies and other stakeholders along the value chain focused on sharing experiences and best practices, developing new project ideas, and creating opportunities for networking and partnership. We are pleased to share the GC3 Innovators Roundtable proceedings with you. Through high level keynote presentations, panel discussions, networking and breakout sessions the GC3 was able to convene a diverse group of sustainability, business, and research experts, from throughout the supply chain, who are dedicated to the advancement of green chemistry innovation. We received positive feedback about this year's GC3 Roundtable from our participant survey and will use this feedback to improve our Roundtable in the future.

This report contains summaries and key takeaways from Roundtable sessions. Of course, the report cannot fully capture the depth and breadth of conversations held during the roundtable. PowerPoint slides from sessions are available on the GC3 Website.

Wednesday, May 8, 2019

Opening Remarks

GC3: Year in Review

Presentation: [Click here to download slides](#)

Presenter:

Joel Tickner, Executive Director, GC3

Summary:

Joel Tickner, GC3 Executive Director, provided an overview of the GC3's activities and its strategies for growth in the future. He noted that the GC3 has grown significantly over the past year, with more than twenty new members. The GC3's focus on supply chain collaboration to bridge the gap between technology needs, driven by market forces and regulation, and green chemistry solutions is unique and positions the organization for greater impact in the future. The GC3's platforms of Collaborative Innovation, Supply Chain Engagement, and Advocacy – combined with its various signature projects provide a strategic approach to addressing supply chain challenges to the development, commercialization, and adoption of green chemistry solutions.

Over the past year, GC3 has taken on a number of strategic projects including: Building support at the c-suite level for green chemistry innovation; building the foundations for a GC3 Europe, initiating a supplier working group, and forming a new professional society dedicated to the field of alternatives assessment – the Association for the Advancement of Alternatives Assessment (A4 – www.saferalternatives.org). GC3 has also had numerous discussions with other organizations about strategic partnerships to grow the green chemistry ecosystem and how it relates to emerging issues such as the circular economy.

Much has changed in the green chemistry world over the past decade – greater market demands and greater collaboration along the value chain. Joel noted that the GC3 is at a cross-roads, where it can significantly increase its impact. The key is to build on the organization's unique niche, recognition, foundations, and core strengths to position GC3 as a thought leader, influencer, and connector with deep

knowledge of the green chemistry innovation ecosystem. The GC3 was fortunate to be a recipient of a Target Green Chemistry grant to undertake strategic planning over the coming year that will allow the organization to capitalize on increasing demands for green chemistry innovation, GC3 has been successful as a highly respected convener of the full value chain and seeks to build on its experience to date. GC3 has partnered with Schaffer & Combs to develop and execute a 3-5 year organizational plan that extends the impact of existing work and strengthens the GC3 brand.

Joel noted that this is a good time to grow movement to commercialize green chemistry. GC3 looks forward to working with its members and other stakeholders as it defines its organizational directions.

Welcome Remarks

P&G: Steps Forward in Sustainable Innovation

Presentation: [Click here to download slides](#)

Presenter:

Sundar Raman, Vice President, North America Fabric Care, Procter & Gamble

Summary:

P&G is an old company and looks at the long-term. P&G pursues long term value creation by doing what is right for the consumer. Sustainability is part of that, and the company must tackle major challenges:

- Consumption is growing and outpacing natural sources. P&G seeks to address this challenge by shifting to renewable resources.
- Water is not distributed on earth everywhere that it is needed. P&G is searching for solutions to solve dependence on and scarcity of water, including reducing the water content of liquid products.
- Soon there will be more plastic in the ocean than fish. It is not easy to replace plastic in consumer products. This is a massive challenge for P&G.
- The trend toward fast fashion has led to textile waste becoming the second in quantity in landfills; plastic is first. It's necessary to prolong the life of clothing.
- P&G aims to make its factories zero waste to landfill and powered by renewable energy.

P&G has to work to resolve these problems but still satisfy what consumers need and delight them and meet shareholder expectations. Their supply chain is massively complex.

P&G seeks to operate at the intersection of: (1) Delight for the customer, (2) Environment, (3) Value for the shareholder. The more the company can find solutions at this intersection, the more success they will find.

Examples of where P&G has opportunities at the intersection and associated constraints:

1. **Cold water washing.** The vast majority of household impact is heating water for laundry. P&G seeks to eliminate the need to heat. Cold water washing is at the intersection (above) but the consumer perceives that heating is the best way to get clothes clean but also that hot water can damage clothes. Consumers want to cleanliness of hot and the protection of cold water. From a business standpoint, P&G needs to resolve this tradeoff in the minds of the consumer. Tide's cold-water product achieves success at the intersection. Its enzymes clean better in cold water than in warm water and it offers a payback for consumers.
2. **Packaging.** Focusing on the intersection, P&G created a new Tide product for shipping – the Tide Box. They reduced the amount of plastic, reduced space in the truck, increased the concentration and achieved a product with 30% less water to ship and 60% less plastic. The idea for the box existed for 10 years, but it only became possible today with the materials available and the right design.
3. **Renewable resources.** Historically P&G has tried to formulate with biobased ingredients, but they were not as efficacious. The solution came with the development of Tide Purclean, with plant-based ingredients; the same cleaning, no tradeoff; which justifies the tide bulls eye logo.

P&G is looking for more solutions at the intersection and to get them to the market fast. What makes them possible is talent of the companies in the room – suppliers and startups, able to solve these challenges.

Key Takeaways:

- The biggest barrier to sustainability is inertia and complacency. Inertia: with every step in the right direction, 100 voices are saying it's not good enough. Don't let perfection stand in the way of progress. The P&G Ecobox is not perfect - the plastic is not recyclable. Coldwater Tide is not perfect – P&G has to charge a premium for the enzyme. Tide Purclean is not perfect, P&G has to charge a premium for the biobased ingredients.
- P&G is changing its culture. Everyone at P&G cares about sustainability but in a big company there are different definitions of success. There is a need to align incentives around the intersection and if we do, it's harder for internal barriers to exist.
- P&G is studying and driving consumer behavior change. It's difficult. Best approach is “nudges” through advertising, messaging on packaging to suggest better behavior, e.g., Europe – “turn to 30” (i.e., 30 degrees. In Europe there are numerical temperature settings on washing machines); in Canada – “brave the cold,” why are you afraid of cold when it comes to washing? We have gotten to 50% consumer use of cold; we want to hit 80%.
- The next important step in sustainability is the next step. All of us need to take the next step.

KEYNOTE – THE LEGO GROUP

The Journey of Developing Sustainable Materials for LEGO Bricks

Presentation: [Click here to download slides](#)

Moderator:

Joel Tickner, Executive Director, GC3

Presenter:

Søren Kristiansen, Senior Director of Technology and Sustainable Materials, The LEGO Group

Summary:

In 2015, LEGO announced it would set Sustainable Materials Goal to meet by 2030, with the understanding that this would be an ‘adaptive challenge’ as there was no reliable way to forecast success 15 years in the future. The drivers for setting this goal include acknowledgement of the growth in the ‘belief-driven’ buyer who is highly concerned about the global plastic pollution crisis, as well as the global youth movement pushing for aggressive policy actions to address harm to future health of the planet.

LEGO is addressing energy consumption at the corporate and manufacturing level. LEGO has addressed adoption of more sustainable energy used by its facilities through installation of wind turbines and solar panels. However, approximately 75% of energy consumption occurs during manufacturing, so LEGO has committed to increasing use of more sustainable materials in its core products and packaging.

Søren highlighted important product attributes that need to be in place for all LEGO products. Most important is to determine what product characteristics optimize the play experience. The goal is to produce more sustainable products that do not trigger a perceptible product difference for the consumer. LEGO guidelines for sustainably sourced material development require that bio-based material for both product and packaging meet the following requirements:

- Feedstock must be ethically sourced and manufactured and cannot negatively impact food security.
- Material must be safe for the consumer -- cannot compromise on human safety.
- Material must be recyclable generate minimum waste along the value chain.
- Consumer-perceived quality or durability (lifespan) cannot be compromised.

The initial strategy for assessing product safety was to examine the safety assessments of existing monomers and polymers and filter based on safety and desirable performance attributes. Starting in 2014, LEGO began to add bio-based materials to their product line, specifically incorporating bio-based polyethylene generated using wind-turbine energy. However, feedback from the Ellen MacArthur Foundation to take product circularity into account encouraged LEGO to create new parameters for assessing carbon circularity for their plastic production. This initiative is ongoing, and LEGO is clear that it requires engagement across the value chain, and solution-building with other stakeholders, including universities and NGOs.

Unfortunately, biodegradable polylactic acid (PLA) thermoplastics are still not in an ideal state to fully replace the desirable material (functional) properties of ABS so they are not a viable material replacement

at this time. Also, continued degradation studies for new materials and colorants are critical since there are no long-term studies available for new/emerging materials. There is a need to understand normal exposure scenarios of these products for consumers, including in sunlight and with detergents to accurately assess the lifespan of a product under different stressors.

It is important to understand the different options and limitations of managing plastic at its ‘end-of-life’ stages. For example, the advantage of mechanical recycling is that it requires low energy consumption, but challenges include very tight restrictions on impurities. There are new depolymerization technologies emerging, that are more energy-intensive but increase the supply for virgin material (bringing materials back to base monomers that can then be used as feedstock for virgin material).

Key Takeaways:

- Understanding what leads to a good ‘play experience’ for children is a critical element of developing sustainable materials for toys.
- Setting expectations for sustainable product development is an ‘adaptive challenge’.
- Industry and academia are important partners for creating sustainable solutions.
- In the production of truly sustainable materials, one must consider the balance of resource integrity, availability, and renewability along with waste management and reduction to approach more realistic parameters around product circularity.

Panel

Advancing Bio-based Materials Through Supply Chain Partnerships

Presentation: [Click here to download slides](#)

Moderator:

Michele Jalbert, Chief Operating Officer, GC3

Presenters:

Jason Clark, Materials Lead – Open Innovation, Renewable Chemicals & Materials, Braskem

Jad Finck, Vice President of Innovation and Sustainability, Allbirds

Søren Kristiansen, Senior Director of Technology, The LEGO Group

Summary:

This session explored the supply chain partnerships between Braskem, a bio-based materials supplier, with two of its customers, Allbirds and The LEGO Group.

Braskem is a large petrochemical company and the world's leading biopolymer producer. It started its development of biopolymers with “green” polyethylene and now makes other biopolymers including EVA. To understand market needs, Braskem speaks with brands and retailers and develops solutions that meet these needs. This has required new ways of organizing and collaborating with different actors. Allbirds is a San Francisco-based sneakers startup that makes shoes from environmentally friendly materials such as merino wool and eucalyptus tree fiber. It is a “purpose driven brand” that tells its story directly to the consumer. Allbirds wanted to develop a springy midsole from an environmentally sustainable material. The company originally used EVA and approached Braskem about making “green”

EVA from sugarcane. Allbirds calls this new material SweetFoam™. It is carbon negative in production through the efficiency of carbon capture. Sweet Foam™ is used in Allbirds flip flops. Every part of the flip-flop is bio-based or recycled. The company is profitable and is one of the fastest growing shoe companies in history. It has worked with Braskem to open up the IP for its bio EVA to grow the market for the material.

The LEGO Group is a privately held, family owned company, founded in 1932, based in Denmark. The LEGO philosophy is “that ‘good quality play’ enriches a child’s life and lays the foundation for later adult life.” LEGO has long had an emphasis on creating high quality and durable toys. The LEGO Group has made a commitment to use sustainable materials in core products and packaging by 2030. LEGO worked with Braskem to develop a sugarcane-based polyethylene that is now being used in LEGO botanical elements such as leaves, bushes and trees. LEGO is continuing research to develop other sustainable materials for its products. This development has required engagement and partnership with suppliers, universities, NGOs, employees, and consumers, including children. It has been important to engage with the entire value chain in evaluating new materials. Collaboration with suppliers has required developing openness and trust and the sharing of costs and risk.

Following the presentations and panel discussion, participants, discussed at their tables what has worked to overcome barriers and then shared with the full group what they understood as enabling factors for green chemistry startups.

Key Takeaways:

- To understand market needs, suppliers of new materials must reach out to brands and retailers.
- To identify sustainable materials, partnerships must be explored and developed with entities that a company may not have partnered with before.
- The entire value chain must be engaged in the development of sustainable materials.
- Both startups and larger suppliers must mutually benefit from any partnership that is developed.
- It can be valuable to leverage government grants when startups are creating agreements with industry partners.
- It is important not to be so protective of IP that business opportunities are missed.

Trust and transparency are critical for partnerships to work effectively.

Panel

Taking Action on Paint Strippers: Retailers and Suppliers Report from the Field

Presentation: [Click here to download slides](#)

Moderator:

Sally Edwards, Director of Retailer Engagement, GC3

Presenters:

Chris Cassell, Director of Corporate Sustainability, Lowe's Companies, Inc.

Paul Ellis, Head of Sustainable Chemicals Management, Kingfisher

Tess Fennelly, CEO, remooble

Greg Morose, Research Manager, Toxics Use Reduction Institute (TURI)

Summary:

The goal of this session was to use the case study of replacing methylene chloride/NMP in paint strippers as an example to speak to the challenges of successfully developing/identifying safer alternatives and implementing them in products and to analyze how to overcome barriers and challenges.

Paul Ellis from Kingfisher outlined his company's experience with replacing products containing MC/NMP and identified the main challenges of replacing a hazardous chemical in a product and how to avoid a regrettable substitution. He also identified that the main drivers of change for replacing a hazardous chemical are regulations such as REACH and input from customers.

Chris Cassell from Lowes discussed Lowes' sustainability goals and the challenges of banning and replacing MC/NMP paint strippers, citing retail competition, performance of alternatives, and supplier dissonance as major hurdles. Lowe's has introduced alternative products that do not contain MC/NMP but some of these products contain hazardous chemicals. Lowe's is working with its suppliers to identify better options.

Greg Morose from TURI reviewed what is currently unfolding in the marketplace with some potential regrettable substitutions for paint strippers. To meet demands, some companies are replacing products containing MC/NMP with products that contain chemicals categorized as benchmark 1 (avoid) according to Green Screen®. Consumers and retailers need to be aware of which products are safer and which ones are hazardous.

Tess Fennelly, CEO of the startup remooble, talked about creating a company focused on creating safer products through green chemistry. Her company has created a paint stripper that does not have any GHS symbols. She talked about the difficulty of getting the product on shelves due to competition with legacy brands and not having a suite of products to compete with these brands. remooble has struggled to convince retailers to purchase their products and noted barriers such as greenwashing, misleading packaging, and skepticism about performance.

Key Takeaways:

- Retailers value sustainability and product stewardship and actively look for safe and effective products for their customers.
- Key drivers for change include regulations (EPA and REACH), consumer needs, and communication/pressure from NGOs.
- Retailers find value in conferences like the GC3 to communicate with startups and learn about innovative technology which is crucial for progress.
- In responding to market/policy demands, retailers need green products quickly that are scaled-up, high performing, and shelf ready.
- Ongoing challenges include competition with the incumbent brands, greenwashing, and skepticism of performance of new products.

- Long-term contracts with suppliers may constrain retailers from introducing new products.
- Startups like remooable have created safe and effective alternatives, but struggle to get shelf space at large retailers.
- Retailers and consumers need to be educated on which products contain regrettable substitutions and which are the safer options.

Panel

Models for Advancing Green Chemistry Innovation: Collaborative Innovation, Open Innovation, Incubators, and Accelerators

Presentation: [Click here to download slides](#)

Moderator:

Monica Becker, Director of Collaborative Innovation, GC3

Presenters:

Han Bevinkatti, Global R&D, Nouryon

Greg Stillman, Venture Investor, Plug and Play - Fashion for Good

Frank Tropper, Senior Director, NineSigma Inc.

Summary:

Three presenters each shared their respective models for advancing green chemistry innovation and commercialization.

Greg Stillman, Venture Investor with Plug and Play – Fashion for Good, presented collaborative innovation models to tackle fashion’s biggest challenges. The organization is focused on circular solutions where the end-of-use garment would be collected and reworked into fiber for use in another garment. He shared their three-step approach:

- **Accelerate** – Brand partners help to define a set of industry needs. Plug and Play then seeks entrepreneurs to identify solutions for those needs by driving one on one interaction to accelerate development.
- **Scale** – The pilot project identified in the accelerate phase is then scaled up from one to multiple partners. In this phase, the value proposition is better defined, and the investment is subsequently de-risked as a result of this demonstration of scalability.
- **Mainstream** – The Good Fashion Fund is a debt-financing fund designed to finance supply chain investments in circular apparel. Deal Flow, a structured approach to introducing financing between startups and brands/partners, is the heart of the Good Fashion Fund. GC3 members including Checkerspot, Nature Coatings, and Colorifix have benefitted from this program.

Frank Tropper, Senior Director, NineSigma Inc., provided an overview of NineSigma, focusing on the company’s leadership in managing complex prize-based challenges. Utilizing their role in the Ellen MacArthur Foundation’s Circular Materials Challenge as an example, Dr. Tropper explained the process as well as keys to success of prize-based competitions to drive sustainable innovations.

- **Process** – After defining the challenge problem statement, there is an open period with outreach efforts to the network of NineSigma scientists as well as open webinars. Following the submission deadline, 63 qualified responses were received from 23 countries. The top 30 were reviewed, thirteen of which were given a more thorough due diligence review with five ultimately selected as winners of the prize money as well as incubation expertise from the Ellen MacArthur Foundation and the sponsors.
- Keys to success for prize-based competitions:
 - Think big, be bold, do good.
 - Committed partners and stakeholders across the value chain aligned with a common goal.
 - Define a problem with a specific target with semi-bounded solution criteria.
 - Provide opportunity to an engaged solution-provider community. It is not enough to offer a prize; the solution-providers need to be engaged.
 - Look for more than ideas; Look for partners with expertise.

Han Bevinkatti, Global R&D, with Nouryon presented on their Imagine Chemistry Challenge which has generated ~500 ideas to date to solve real-life business challenges with an emphasis on green and sustainable chemistry. Now concluding the third edition of the Imagine Chemistry Challenge, some key learning includes:

- Challenge topics change every year to meet the company’s technology needs.
- Submissions can range from proof of principle through to full product.
- Intellectual property stays with the startup.
- Combining startups with the legal, business, R&D, and EHS capabilities of Nouryon is a good combination.
- The unique approach crunches years of work into three days during the final round with 700+ experts evaluating business impact in a collaborative approach.
- Feedback from the experts has proved to be helpful even if the startup is not selected as a winner.

Winners receive a variety of support ranging from joint development agreements, business support, research agreements, sourcing agreements, etc., depending on the opportunity.

Key Takeaways:

- Committed external partners with a shared goal are essential for success of collaborative innovation models.
- Clearly defined problem statements are beneficial for all parties including the solution-providers as well as the partners.
- Access and outreach to solution-providers across the globe from the earliest stage of innovation to advanced product development helps increase likelihood of success.

- Clear intellectual property strategy for the collaboration/competition helps solution-providers understand how their innovation will be protected.
- De-risking through demonstration of value proposition, scalability, expert analysis, etc. helps all players advance green chemistry innovation to market.

Panel

Investment Potential: The 2019 GC3 Technology Showcase Finalists

Presentation: [Click here to download slides](#)

Moderator:

Julie Manley, Startup Network Coordinator, GC3

Summary:

Three innovative startup companies, considered by judges and participants, to have had the strongest pitches at the 4th GC3 Technology Showcase, were selected to participate in a mock “Sharktank” pitch during this panel with tech scouts, large company experts, and investors.

Representatives from the three startup finalists included:

1. *Paul Petersen*, VP of Sales, Visolis Biotechnology
2. *David Nugent*, Co-Founder and Chief Commercial Officer, Colorifix Limited
3. *Kevin White*, COO, Akron Ascent Innovations

Panelists chosen to ask clarifying questions of the startup representatives included:

1. *Al Iannuzzi*, Vice President, Sustainability, Estée Lauder Companies
2. *Chris Killian*, Vice President, Technology, Eastman Chemical Company
3. *Martin Mulvihill*, Managing Partner, Safer Made
4. *Bryan Stubbert*, Associate Research Scientist, Dow

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Presenter:

Paul Petersen, Visolis Biotechnology

Visolis Biotechnology’s business model is centered on identifying key platform chemicals that have large downstream application potentials and targeting those downstream chemicals for production via a combination of synthetic biology/fermentation and traditional downstream chemical processes. Their approach is supported through high-throughput screening and machine learning which allows for targeting of bio-based chemicals for production and delivering a complete technology package for partners. Paul discussed the competitive advantages of their base platform molecules that convert bio-based raw materials into other bio-based molecules using traditional chemistries. Applications of their materials include green solvents, adhesives and elastomers, super absorbent polymers, terpenes, polyols and polyurethanes, and unsaturated polyester resins. One of the key performance advantages of their green solvent is that can also be used to ‘recycle’ high-performance polymers using ant-solvents. The key advantage of their bio-based diol is that it performs as a ‘drop-in’ replacement for high performance

polyurethanes, polyesters, and polycarbonate polyols and other applications at a low-cost position, providing a significant competitive advantage to petroleum. Visolis' 'big picture' strategy is to identify new platform molecules or permutations to change how chemicals are made globally in the next decade or two, either from fossil fuel sources or renewable resources.

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Presenter:

David Nugent, Colorifix Limited

Colorifix Limited is the only dyeing technology that exclusively uses renewable resources. Natural pigment-dependent dyeing techniques were transformed in the mid-1800s with the generation of Azo dyes that revolutionized the textile industry. Unfortunately, production and application of Azo textile dyes is very energy intensive and environmentally damaging.

Colorifix Limited is transforming the industry by 'growing' color through industrial fermentation. Molasses by-products of sugar industry are fed to microorganisms engineered to produce, transfer and fix pigment materials onto a substrate. These microorganisms are able to reproduce every 22 minutes. Pigments are NOT extracted from the microorganisms. The Colorifix technology relies on a sterilization process that kills microorganisms and lyses cells to release both the pigment and other natural molecules that acts as mordants to fix the color to the material. This color transfer process works on both natural and synthetic fibers, is less water and energy intensive than traditional dyeing methods and does not use any hazardous chemicals in the process. It is also important to note that this process works with existing dye machines.

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Presenter:

Kevin White, Akron Ascent Innovations

Akron Ascent Innovations focuses on a biomimicry-inspired approach to adhesion and their technology is centered on a fiber production method called electrospinning that creates a network of very small fibers that have been formulated to get the proper balance of mechanical properties to conform to a whole of range of surfaces. With an NSF/SBIR grant in 2015, Akron Ascent Innovations was able to scale up operations, but it quickly discovered that success at lab scale does not necessarily translate to success at commercial scale. As a startup, Akron Ascent Innovations set up a working relationship with larger strategic partners, but subsequent corporate acquisitions and merger situations led to dissolution of initial contracts with their strategic corporate partners. In 2018, Akron Ascent Innovations focused on ways to scale up existing projects along with a commercialization partner that already had all the equipment on hand. They also launched a "pinless" brand of dry-adhesion products and to direct-to-consumers to ask for feedback. Akron Ascent Innovations recently received their first distributor relationship and are looking for more B2B opportunities. Specifically, they are looking to expand their pipeline for existing products, develop partnerships to guide development, drive value-add through advanced material solutions that respect principles of green chemistry and further advance their intellectual property through processes and product architecture.

Thursday, May 9, 2019

KEYNOTE – DOW

Sustainability at Dow – Collaborating Across the Value Chain

Presentation: [Click here to download slides](#)

Moderator:

Joel Tickner, Executive Director, GC3

Presenter:

Eunice Heath, Global Director, Environment, Health, Safety, and Sustainability, Dow

Summary:

The new Dow tagline, “Seek Together,” embodies the desire to collaborate to solve the company’s and the planet’s most pressing challenges. In sustainability, this means collaborating with partners and customers to innovate; educating on material handling and safety; committing to transparency and global standards and enabling the increase in sustainability literacy and representation.

Key Takeaways:

- In developing their 2025 Sustainability Goals Dow has realized that if it is going to truly leverage science, expertise, and global reach to help shape a more sustainable world, it must stretch well beyond immediate business. Hence, through a focus on collaboration – by asking the right questions and seeking the right answers to the challenges of society, Dow can expand its impact.
- Collaboration areas include engaging communities, customers and employees, advancing a circular economy, valuing nature, and delivering breakthrough innovations.
- Dow has collaborated with the Nature Conservancy to figure out how to make valuing nature actionable and operational at the site level. They developed modeling tools (Ecosystem Services Identification and Inventory) to help make valuing nature practical and ultimately second “nature” for project managers and engineers. These are tools not just for Dow; they are available to other businesses and organizations to help in their decision processes.
- Dow has engaged both internal and external partners throughout value chain to eliminate plastic waste. Dow is a founding member of the Alliance to End Plastic Waste, a newly formed organization to develop and scale solutions that manage plastic waste and promote post-use solutions of plastic. Also, through Dow’s #PullingOurWeight campaign over 5,600 employees, customers and industry peers participated in fifty-five waterway cleanups and collected over 51,000 pounds of trash in 2018 in conjunction with the Ocean Conservancy and other local organizations.
- The company established Dow’s Product Stewardship Academy in emerging markets, such as the Middle East and Africa, which focuses on safe management of chemicals throughout the life-cycle, while improved quality of life and sustainable development.

- Dow signed a memorandum of understanding (MoU) in 2018 with China's State Key Laboratory of Environmental Criteria and Risk Assessment to collaborate in the fields of environmental criteria, standards, and ecological protection in terms of scientific research, policy counsel, technical service, and applications, in addition to training and coaching sessions.
- Dow is developing a transparency portal to help communicate the information needed for safer use of products across the value chain; this includes sharing information beyond safety on Data Sheets as well as how chemicals and products are evaluated from a health and environmental perspective.
- Dow has developed a series of free [online lectures](#) from sustainability academics.
- The Sustainability Academy is an employee development program that provides tools needed to bring sustainable business insights into their jobs.
- Dow established and Inclusion Office a year ago which includes all aspects of diversity. Inclusion enables innovation, sustainability, and global citizenship as mobilize employees to deliver on mission.
- Dow's commitment to Building the Workforce of Tomorrow is based on the belief that the economic and societal value of an employed, productive, and diverse workforce is fundamental to the health of each individual, community, and to the world.
- A trained workforce is essential for producing the talent necessary to solve major world challenges. Whether it's climate change, food shortages, or economic inequality, almost all the world's most pressing problems require STEM (Science, Technology, Engineering, and Math) based solutions. And there is an important role of increasing the ranks of women and minorities in STEM fields. All of tomorrow's problem-solvers need excellent STEM teachers today to guide them.

Panel

Green Chemistry: The View from the Middle of the Supply Chain

Presentation: [Click here to download slides](#)

Moderator:

Tess Fennelly, CEO remooble

Presenters:

Annie Bevan, Global Head of Sustainability, Superior Essex Communications

Mike Patel, Director of Marketing and Business Development, Teknor Apex Company

Emily Williams, Global Growth Platform Leader - Circular Economy, Michelman

Summary:

Three presenters each shared their perspectives on the challenges and opportunities for advancing green chemistry from the middle of the supply chain.

Mike Patel, Director of Marketing & Business Development at Teknor Apex, a large plastics compounder, gave an overview of the company, highlighting their business in supplying materials to the packaging, industrial consumer, electrical, transportation and other sectors. They supply materials for PVC products used in many daily applications. They are engaged in sustainability practices for example in their Hose Division where they recycle PVC.

From a plastic compounder's perspective:

- Teknor takes design specifications from their customers and they are dependent on their supply chain to provide them with raw materials. Their preference for green or other raw materials in essence is less important than the customer's demands. They need to utilize: (1) What's available, (2) What's economically acceptable, and (3) What can be handled by their customers. The value they bring is their compounding know-how, i.e., how do you put all the materials together to get the product that is desired.
- Teknor brought Biovinyl to the market in 2012 as a flexible PVC product with bio-sourced plasticizers. It required significant investment on their part to find viable applications and there were numerous challenges to bring the material to market. They encountered limited success due to economics – their customers didn't want it at the time and weren't willing to pay added cost.
- Teknor brought Terraloy, a bioplastic with bio-content and composability, to market. It also had limited market uptake because of cost.
- Is the market ready for green? Teknor Apex has not seen the evidence. They are willing to advance greener materials if they have partners that want to go down that path.

Annie Bevin, Global Head of Sustainability from Superior Essex Communications described her company's businesses in electrical and communication cables for buildings. Superior Essex is selling into many markets and to companies such as ATT and Verizon. Annie echoed Eunice Heath from Dow's refrain with regard to green chemistry, "If you don't ask for it you aren't going to get it." Annie and Superior Essex are very involved in initiatives such as LEED, ILFI, and the Declare Label program. Their cable is always behind the wall but there is significant chemistry in these products.

- The market is demanding green chemistry – LEED, Well, Living Building Challenge. In 2012 architects and designers sent Superior Essex letters saying for example, "If you don't know the chemical content of your products down to the 100-ppm level, we will not specify." Superior Essex didn't know which chemicals were in their products at that time and this motivated them to figure out how to communicate it to their customers. This led to development of Environmental Product Declarations (EPDs), to study the total life cycle impacts of their products, develop Health Product Declarations (HPDs) to report chemical content down to 1000 ppm and hazard and report that transparently to the world. This is a tremendous amount of work for the company but now with Google committing that all their buildings will comply with the Living Building Challenge, Superior Essex is further dedicated to this work.
- Superior Essex and other companies are now evaluating the impact of their work to meet these stringent healthy materials specifications and they are not seeing the payoff to their businesses. Superior Essex and fifty other companies wrote an open letter to the A&D community stating this. In response, sixty-one A&D firms have signed a pledge to buy these materials. The company believes this will help.

- The company is working with Toxnot to determine chemical composition of materials. They upload a Bill of Materials (BOM), it goes to supplier, the supplier fills in the BOM with chemical information and the system has hazard data. It can output HPDs and EPDs and helps determine compliance with REACH and RoHS.
- The company is trying to go beyond Toxnot to learn more about the human health of their materials and chemicals. They use ToxServices to determine if they are using the best material for an application.
- The company is working with other leading manufacturers to develop “green PVC”: Tarkett, Armstrong, Interface, and Saint Gobain.

Emily Williams, Global Growth Platform Leader Circular Economy for Michelman provided an overview of the company’s broad packaging business and talked about their focus to make packaging biobased, biodegradable, recyclable and compostable. Emily described the holy grail as being able to make a single use coffee cup that is fully recyclable or biodegradable. The major hurdle is the inner material composition of the inner coating. Michelman is participating in the NextGen Cup Challenge where companies are collaborating to develop and demonstrate a more sustainable cup design.

Key Takeaways:

- Major drivers for green chemistry are: market pull from consumers and brand owners; negative view on certain chemicals, e.g. phthalates.
- The challenges to getting green chemistry products to market are cost and performance and the lack of good safety and performance data for some new materials. Change is slow, typically 3 – 4 years. There is a need to get the spec writers to demand greener chemicals and materials. If they don’t, it won’t happen.
- Ways to overcome challenges are to demonstrate the performance of new products to show that they have equal or better performance. Also, it is important to pitch to customers differently by stating, “We align with your vision in sustainability,” instead of stating, “Let me tell you about our sustainable products.”
- Collaboration can happen with value chain partners, e.g., Superior Essex collaborates with building owners that have purchasing power and want to create the optimal office space to attract and retain talent. They partner to provide those products.
- It’s not build it and they will come, we need the pull. GC3 should work to create the demand pull. Also, companies need help getting new materials on line and help identifying where there are data gaps on safety of new chemicals and materials – they don’t want to spend the money on new chemicals and materials unless there is robust data.
- Startups in the room would like to know who the companies are in the middle of the supply chain with the capacity to test and convert their technologies. Can the GC3 help identify those companies?
- Raw material and brand owners should bring to the GC3 RT their most important middle of the supply chain suppliers to get the cross sectoral discussion going.

Panel

Circular Economy & Green Chemistry

Presentation: [Click here to download slides](#)

Moderator:

Amanda Cattermole, CEO, Cattermole Consulting

Presenters:

Tammy Ayers, Manager, Global Sustainable Design & Development, Steelcase

Serena Pozza, Manager, Healthy Materials, DSM-Niaga

Dhruv Raina, Director of Sustainability, Tarkett

Summary:

Use of safer chemicals is a critical enabler of circularity. Three leading companies are developing new materials, products and lifecycle product management systems based on green chemistry and circular economy principles. Flooring company, Tarkett, office products company, Steelcase, and product design startup and carpet producer, Niaga, shared emerging thinking on new materials development, supply chain collaborations, information systems for tracking chemicals and materials in products, and the underlying sustainable business models, and commitments that enable their work.

- Serena of DSM-Niaga noted that, "...there is no away when we throw away stuff." DSM-Niaga's product design philosophy is reverse design for products that are recyclable and used production waste. To achieve their objectives, they conduct tests in-house, track and trace content, as well as share knowledge with suppliers and consumers to obtain stakeholder input.
- Tammy noted Steelcase's shift to a subscription-based model, where consumers can switch out their products when they want to. For sustainability goals, Steelcase's approach is to identify what issues are important, the levels they can be considered at, and the means to measure progression. Tammy shared the details of Steelcase's in-house tool to evaluate where a project falls on the spectrum of: compete, lead, or innovate as well as their Division Frameless Screen exemplifying simple materials, easy disassembly, and working with supplier to ensure fabric takeback.
- Dhruv discussed that Tarkett USA takes a holistic approach to assess all raw materials, use 75% of recycled material, consider how can product be taken back (adhesives make it difficult). Product examples include Ethos Modular Carpet Tile, utilizing windshield waste as carpet backing and iD Revolution, which is recyclable, contains 85% recycled content, and made with 100% renewable energy.

In addition to sharing the details of their efforts, they discussed their challenged and provided example products that exemplify their success. The following emerged from the discussion:

- To improve circularity in products, each of the companies stressed the importance of starting early in the development phase, and working collaboratively, both within the company and with suppliers.
- Shared challenges include finding quality sustainable materials, meeting customer expectations, keeping ahead of the innovation/regulatory curve, and reverse logistics.

- While the efforts of all three companies extend beyond certifications, certifications help with verification and communication.
- GC3's role in transitioning to circular systems is facilitating collaborations to connect companies with potential solutions.

GC3 Project Breakout

Retailer Leadership Council (RLC)

Presentation: [Click here to download slides](#)

Moderator:

Sally Edwards, Director of Retailer Engagement, GC3

Presenters:

Francie Abramson, Senior Manager, Corporate Responsibility, Target Corporation

Chris Cassell, Director of Corporate Sustainability, Lowe's Companies, Inc.

Summary:

The mission of the GC3 Retailer Leadership Council (RLC) is to promote safer chemicals, materials and products across retail supply and value chains. Current members of the RLC include: Amazon, Best Buy, CVS Health, Home Depot, Kingfisher, Lowe's, Meijer, Staples, Target, and Walmart. These retail leaders are working proactively to: develop and implement chemicals policies/strategies; understand which chemicals of concern are in their products; adopt safer alternatives that perform and are cost-effective; engage suppliers in improving chemicals management and using safer alternatives; and, educate customers about safer products.

Members of the RLC provided an update on their work over the past year to identify priorities for chemical innovation and to develop a road map for increased transparency. The RLC focused this session on obtaining feedback from the entire supply chain in identifying next steps, particularly on the Transparency Road Map. Discussion questions included:

- Is your company working toward achieving transparency about chemical ingredients for formulated products? For articles?
- If yes, what challenges are you facing in doing so?
- If no, what are the main obstacles/barriers to doing so?
- What is needed to achieve these goals?
- What are your suggestions for immediate next steps?

Brands, formulators, chemical manufacturers, and representatives of government agencies provided thoughts on communication, prioritization, and stakeholder engagement. The following points emerged from the discussion:

- The supply chain participants noted that retailers receive the strongest demand signals for safer chemicals. The retailers noted consumer and business customers' demands are as strong a driver as is regulation and an interest in preserving their brand reputations.
- Flavor or fragrance houses were identified as a key stakeholder necessary for achieving transparency.
- Several companies expressed their concern about the difficulty of providing full disclosure given the complexity of their supply chains (e.g. mixture of mixtures).
- Participants noted that it is important when identifying classes of chemicals to be as clear, specific, and descriptive as possible. Increased specificity can help to drive change as these priorities can be communicated by retailers to their suppliers and to chemists that are designing new products.
- Participants discussed potential product categories to focus on as an initial next step for developing best practices in increasing transparency of chemical ingredients in articles. Some potential product categories include children's products and products that require water and oil repellency. The outdoor industry may be helpful here as it has done research on safer alternatives.

GC3 Project Breakout

Sustainable Chemistry Alliance (SCA)

Presentation: Slides not available

Moderator:

Michele Jalbert, Chief Operating Officer, GC3

Presenter:

Michael Parr, Co-Director, GC3 SCA

Summary:

The GC3 Sustainable Chemistry Alliance (SCA) was launched in 2018 and brings together GC3 member companies to advocate for US leadership in innovation, production and use of sustainable chemicals. This GC3 project and the diverse group of participants spans the entire value chain. The Alliance is focused on policies that can accelerate the development and scale of new sustainable chemistry processes and products.

The presenters reviewed the activities of the first 18 months for this GC3 project. These include two major areas of activity. The first is developing and advocating for public policies that support the development and scale up of more sustainable chemical alternatives. The second is educating and promoting sustainable chemistry awareness to side range of policymakers.

In January, the GC3 undertook a comprehensive Alliance member engagement process to develop a 2019 Advocacy Plan and identified the following overarching strategic objectives:

1. Build broad-based awareness among federal policymakers of the economic, environmental & health benefits of sustainable chemistry.

2. Educate federal policymakers about the barriers to accelerating development and production of sustainable chemistry alternatives.
3. Identify and pursue discrete federal policy opportunities that can accelerate adoption of sustainable chemistry across the value chain, including the development and production of sustainable alternatives.

The top Alliance policy priorities for 2019 are:

1. Incentives and support for accelerated R&D to create sustainable chemistry alternatives with requisite performance and economics.
2. Incentives and support for accelerated demonstration & scale-up of sustainable chemistry alternatives with requisite performance and economics.
3. Education of policymakers regarding benefits of more sustainable chemistry and the role of policy in supporting expansion of its use.

The Alliance is currently completing due diligence on concept for new sustainable chemistry matching grant program and shared the following proposed criteria for discussion:

- Encourage applications-oriented sustainable chemistry R&D.
- Focus on developing sustainable chemical alternatives where commercial need exists.
- Encourage and de-risk R&D with an emphasis on small to medium enterprises.
- Focus on sustainable alternatives to chemicals anticipated to experience regulatory or market pressure.
- Direct resources to R&D efforts with an appropriate nexus to the commercial market.

GC3 Project Breakout

Collaborative Innovation

Presentation: [Click here to download slides](#)

Moderator:

Monica Becker, Director of Collaborative Innovation, GC3

Presenter:

Christina Raab, Global Implementation Director, Zero Discharge of Hazardous Chemicals (ZDHC)

Summary:

To accelerate the development of green chemistry technologies, GC3 has been bringing members together to solve common green chemistry challenges. Over the years, the models for collaboration have adjusted to the project needs. To address the need to identify more sustainable alternatives for personal care and household products, the Preservatives Collaborative Innovation Project took several forms over time:

- Engage Consumer Packaged Goods Companies to define the scope.

- This group shared enough commonality and narrow enough focus to define a scope of work that could be impactful and achievable.
- Develop Criteria Document to define the set of new EHS and business criteria for sustainable preservatives.
 - This pre-competitive effort proved successful in creating a roadmap for suppliers and had the additional benefit of building effective group dynamics.
- Create open innovation competition designed and judged by formulators with suppliers choosing to engage as sponsors as a means of technology scouting.
 - After review of forty-eight submissions and third-party testing, seven technologies were selected in May 2018. Many of the technologies are in the process of development through partnerships between suppliers and consumer packaged goods companies.

GC3 is currently developing collaborative innovation projects to address siloxanes (likely a similar open innovation competition) and plasticizers (model yet to be determined).

Christina Raab with Zero Discharge of Hazardous Chemicals (ZDHC) briefly presented an opportunity under consideration to collaborate with the GC3 to advance innovation of new, green chemistry technologies in response to the identified needs of companies in the ZDHC, for the apparel, textile and footwear industries.

Discussion Outcomes:

- Other models for collaborative innovation or to scale the existing models to do more with existing resources, include:
 - Innovation speed dating may be another model for collaborative innovation.
What is the one thing you know and are willing to share to help others?
What is the one thing you know that your company needs?
 - Consider crowd sourcing whereby voting with money helps to move a project forward.
 - Work collaboratively to define the project scope with criteria for success, and then turn the implementation of the project over to a government or other organization.
- Additional topics to consider addressing through collaborative innovation:
 - Lead in electrical components
 - Solvents used for cleaning electrical components
 - Diisocyanates and polyurethanes in the textile industry
 - Chromium IV for tanning
 - DMAc in spandex/elastane production
- Engage with collaborators that bring new capabilities. GC3 has strong relationships with feedstock companies which could be beneficial to ZDHC.

- Benefits to collaborative innovation (i.e., with ZDHC):
 - Stimulate creativity to drive markets to meet brand needs.
 - Identify tangible market for sustainable innovations.
- Focus on functional substitution which opens the door for process and product design innovation instead of direct replacements.
- Consider GC3 member benefits especially when collaborating with non-members and/or other organizations.
- Build on the core competency of the GC3.

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