10th Annual GC3 Innovators Roundtable Session Summaries

Wednesday, April 29th

Appendix: Green Chemistry Problem Solving

Session 1: Technical Solutions

This was a small breakout session designed specifically to brainstorm solutions to challenges facing two companies. The goals of the session were:

1. To provide potential technologies and connections for each challenge that may need further investigation.
2. To provide strategies to consumer-facing companies to help them find solutions to technical challenges they are currently facing.

Challenge 1: Community Playthings

Community Playthings is looking for a mattress that will meet flammability standards for children's bedding while being safe for consumers. They would like to keep using polyurethane foam due to its inherent comfort; polyester alternatives were found uncomfortable. They are currently using wool linings, but these are uncomfortable for babies.

Technical ideas included:

- SABIC may have flame retardants that meet the requirements
- Inman Mills has a wide cotton knit product treated with a non-toxic flame retardant that is fast to washing, but not chlorine bleach
- Coir is a coconut fiber used for mattresses in India

Challenge 2: Method

Method is looking for safer preservatives for its home cleaning products.

Technical ideas included:

- Boat paints need biocide—talk to Valspar about their acrylic boat paints
- Oxygen and UV light
- Surface modifications such as sharkskin texture
- Enzymatic approach

- Look at alternative manufacturing solutions, e.g. techniques used to reduce contamination during manufacturing in clean room environments

Overall Strategies

- Be very clear about your challenge. Create a needs statement.
- Work with other industry partners to find a solution; they often use the same suppliers. “Seatbelt approach” – good for everyone if safest possible solution exists.
- Align on standards to simplify and harmonize
- Change the regulation/policy (i.e. flammability standard)
- Join and work with good trade association
- Identify short-term solution, such as a drop-in substitute
- Identify long-term approach to meet desired functions by potentially different approach

Session 2: Overcoming Barriers

This session was intended to discuss barriers in the adoption of green chemistry in industry, and how best to overcome them using the resources of the GC3 and its members.

Supply Chain Hurdles

- Common language and metrics—often struggle with definitions
- Lack of transparency—especially with complex supply chains; communication gaps between initial supplier and final brand/retailer
- Customers don’t know what question to ask; retailers don’t know how to answer
- Cost of greener options
    - could be offset by alternative benefits, true cost
- Established local relationships—often cannot change suppliers easily
- Lack of consistent messaging to suppliers
    - could be solved with better intra-organization communication
- Supply chain bears cost of decisions made by brands/retailers
    - supplier should be involved in decision-making process
    - can be advocates if asked
- Adding new suppliers can conflict with corporate commitments to simplify supply chain

Collaborative Efforts

- New materials raise barriers—difficulty of integration, manufacturing changes
- Scale-up is expensive and requires collaboration
- Competitive vs. pre-competitive can cause problems
    - Tap into broad network of problem-solvers
- Cross-sectoral collaboration to move towards circular economy
    - One waste stream = other company’s feedstock
    - Need a safe space to discuss potential of waste streams without being vilified
- Apparel sector has effective chemicals management

- Brands could create lists of common needs to spark innovation
- Systems mapping (e.g. roadmap to ZDHC)
    - What groups should be engaged?
    - Bring together existing maps from multiple industries
- Integrating sustainability into business practices—major challenge
    - Education across departments, targeted at different specialties
- Peer motivation: genuine efforts from GC3 members excite other companies
- Increase visibility of tools/maps across industries
    - Solicit open feedback about these tools at conferences to make them more useful in the real world
- Education on data visualization and communication (Edward Tufte)

Compromise

- "Compromise" assumes knowledge of trade-offs, which is difficult in GC
    - stepwise is the only way forward
- Wegmans started out saying "no" to PLA, but changed to "yes" after visiting Natureworks and learning about technology
- Standards and certifications must compromise between simplicity for consumers/formulators vs. complexity of science

Role for GC3

- Bring suppliers to the table and help involve them in GC decision-making
- Connect problem-solvers with problem-havers
- Provide safe space to discuss potential of waste streams
- Bring brands together to create lists of common GC needs for each sector
- Collect existing systems maps from across industries
- Share successful GC efforts from member companies to inspire peers
- Increase visibility of GC tools across industries; compare capabilities
- Provide opportunities for education re: data visualization

Session 3. Bio-Based Feedstocks

This session was meant to explore how to grow the market for bio-based feedstocks and overcome factors limiting their uptake. BASF described their current challenges in developing a market for bio-based butanediol, and these as well as broader challenges were discussed.

Factors Limiting Uptake of Bio-Based Feedstocks

- Scaling is costly; senior management wants brand owner commitment first
- Customers expect chemical supplier to absorb costs; supplier's management wants to charge premium to cover costs and potential risks
- Larger chemical companies have gutted R&D departments; acquire small companies once their innovations are proven

Challenges for Business Case in Low Oil Price Market

- Volatile market. Low costs of non-renewables don't account for externalities

- Customers switch to bio-based if cheaper, or new properties, or marketing opportunity
- Chemical mindset is based on 120 chemicals from petroleum

Overcoming Barriers

- Provide bio-based materials at/below 10-yr average of petro-based commodity for fixed period of time
- Look for customers with strong sustainability propositions
- Use waste as feedstock to gain cost advantage (get paid to remove waste)
- Focus on specialty chemicals rather than drop-in commodity replacements
- Change mindsets of chemists/chemical engineers, rather than customers
- Differentiate by changing name of chemical (some disagreement on this)

Sharing Cost and Risk Throughout Supply Chain

- Difficult to control other companies' asking prices/premiums
- Chemical companies must talk to customers, customers' customers, and so on to explain value proposition and promote bio-based materials

Role for GC3

- Promote members that are providing sustainable materials through the GC3 Innovation Portal—list of companies with green materials, ability to post requests
- Create website with entire value chain and names of companies at each level
- Point to individual companies' portals
- Help develop business case
- Ask member companies to encourage supply chains to attend GC3 events

Session 4. Defining Green Chemistry

This group addressed the issue of a unified definition of green chemistry—how useful this is, how to arrive at one, and how to disseminate it.

Aligning on Single Definition

- Easy between partners in a collaboration, more difficult at large scale
    - Language depends on where you are in the value chain
- Is it helpful? Perhaps embracing heterogeneity and exploring different concepts is better
    - Clear definition is important in policy
    - Definitions are useful for metrics
    - Flexibility leads to creativity
- Map out components of green/sustainable chemistry to create linked set of concepts that strengthen each other
    - Map tools and definitions, compare performance

Guides vs. Definitions

- Could we work on using principles as a guide?
    - Evolution of principles over time?
    - No discussion of whether principles are inhibiting, how to implement
- State directionality of where we'd like to be rather than concrete principles/definitions
    - Chemicals that are less toxic, material intensive, energy intensive, etc.
- GC is innovation throughout lifecycle
    - Mulvihill et al paper can serve as model

What Makes Chemistry Green?

- Overall improvement without any one category worsening?
- Minimal criteria or baseline?
- Tool like LiDS wheel might be helpful to show where improvements are taking place
- Green chemistry alone cannot solve all problems

Next Steps

- Build relationship map of GC vs. sustainability/lifecycle concepts
    - Identify unique value and position of GC