Green Chemistry and Pollution Prevention

Dave Foulkes
Ohio EPA – Division of Environmental and Financial Assistance
Webinar – February 15, 2017
Webinar Outline

• What is Green Chemistry?
• How does it relate to P2 and Sustainability?
• Supply chain examples
• Ohio success stories
• Available tools and resources
What is Green Chemistry?

• Design of chemical products and processes that reduce or eliminate the use or generation of hazardous substances.
• Across the life cycle of product
• Applies to all areas of chemistry
• Solutions to real-world problems

Source: U.S. EPA’s Basics of Green Chemistry
12 Principles

1. Prevent Waste
2. Atom Economy
3. Less Hazardous Synthesis
4. Design Benign Chemicals
5. Benign Solvents & Auxiliaries
6. Design for Energy Efficiency

*Anastas, P. T.; Warner, J. C. Green Chemistry: Theory and Practice
12 Principles

7. Use of Renewable Feedstocks
8. Reduce Derivatives
9. Catalysis (vs. Stoichiometric)
10. Design for Degradation
11. Real-Time Analysis for Pollution Prevention
12. Inherently Benign Chemistry for Accident Prevention

*Anastas, P. T.; Warner, J. C. Green Chemistry: Theory and Practice
Green Chemistry vs. P2/Sustainability

• 1st Principle is the PREVENT WASTE
• Applies across life cycle of product(s)
• Also known as sustainable chemistry
• P2 at the molecular level

“In a few decades, it won’t be special anymore...Everyone will be doing green chemistry.”
Professor Robert H. Crabtree
Yale University
Chemistry Department

“If you build a better product, with superior performance and superior cost that, oh by the way, is more environmentally benign, it’s a no-brainer.”
Dr. John Warner
Green Chemistry in the Supply Chain

- Walmart’s Sustainable Chemistry Policy
  - Transparency
  - Advance safer formulations
  - Safer Choice in brands
  - Monitor & Report
Green Chemistry in the Supply Chain

**TARGET'S CHEMICAL POLICY**

**TRANSPARENCY**
We will strive for full visibility to chemicals contained in or used to make the products we sell and use in our operations.

**CHEMICAL MANAGEMENT**
We will work with business partners to implement policies, practices and tools that facilitate the management of chemicals throughout our supply chain and across our operations.

**INNOVATION**
We recognize that safer alternatives may not exist today for some chemicals, therefore we will actively pursue and promote new approaches to chemicals development and the commercialization of safer alternatives.
Ohio Success Stories

• The Sherwin-Williams Company
  – 2011 Designing Greener Chemicals Award
  – Water-based Acrylic Alkyd Technology
  – Made from PET, acrylics and soybean oil
  – 800,000 lbs. of VOC reduced
Ohio Success Stories

• BASF Corporation
  – 2005 Greener Reaction Conditions Award
  – UV-curable, low-VOC refinish primer
  – Third as much primer needed vs. conventional
  – 1.7 lbs. vs. 4.8 lbs. of VOC/gallon
Ohio Success Stories

• Battelle
  – **2008 Greener Synthetic Pathways Award**
  – 400 million pounds toner used per year
  – Biobased Toner
  – Easier to remove toner from paper fiber
  – Save energy & more paper fiber recycled
Ohio Success Stories

• Faraday Technology, Inc.
  – 2013 Small Business Award
  – Tri-Chrome plating process
  – Nearly drop-in replacement
  – Could eliminate 13 million lbs. of Hex-Chrome
What labels are available?

- **Safer Choice Program**
  - Increase awareness & recognition of label
  - Encourage innovation & development of safer chemicals
  - Evaluation & review process
  - 2,000 plus products carry label
What labels are available?

• **Green Seal**
  – Standards for cleaning products, paints, paper & packaging

• **ECOLOGO Certification**
  – Multi-attribute, lifecycle-based environmental certification
  – Building materials, cleaning products, office products, electronics, etc.
Green Chemistry Tools

• Typical tools
  – ID & screen out hazards
  – Compare alternatives
  – ID preferred chemicals/products
  – Life-cycle analysis

• Tools vary
  – Some are free & some are not
  – Be aware of data gaps
  – Chemicals ranked differently

Safe Products, Made Safely: Green Chemistry Tools for Business Resources Guide
Use in the supply chain

• Reasons for using tools in Supply Chain
  – Raw material/component supplier
    • Information to downstream user
  – Manufacturer/Assembler/OEM
    • Safer alternative materials
  – Retailer
    • Screen products
  – Corporate sustainability goals

Safe Products, Made Safely: Green Chemistry Tools for Business Resources Guide
Green Chemistry Tools

• What do you want to tool to do for you?
  – ID chemicals
  – Assess chemicals in use
  – Analyze lifecycles
  – Track materials, use and outputs
  – Look for alternatives/substitutions
  – Evaluate alternatives

Green Chemistry Resources

• **Green Chemistry Guide**
  – Collaborative document
  – Tools, life-cycle thinking & how-to checklist

• **Safe Products, Made Safely:**
  *Green Chemistry Tools for Business Resources Guide*
  – How to choose the right tool
  – List of organizations that can help
Green Chemistry Resources

• **BizNGO Chemical Alternatives Assessment Protocol**
  – ID alternatives

• **OECD Substitution and Alternatives Assessment Toolbox**
  – Compilation of resources
  – 4 resource areas
Green Chemistry Resources

• **Interstate Chemicals Clearinghouse**
  – Collaborate & manage/analyze data
  – Offer training

• **GreenScreen® for Safer Chemicals**
  – Chemical hazard assessment
  – **GreenScreen® List Translator**
**Green Chemistry Resources**

- **Quick Chemical Assessment Tool**
  - Simple, less expensive
  - Small business friendly

- **The Green Chemistry & Commerce Council**
  - Cross sectoral network
  - Promotes tools, polices and business practices
Thank You!

- Dave Foulkes, Environmental Specialist
- Ohio EPA – Division of Environmental and Financial Assistance
- dave.foulkes@epa.ohio.gov
- (614) 644-3118