Meeting Customers' Needs for Chemical Data

A guidance document for suppliers

MOVING BUSINESS TOWARD SAFER ALTERNATIVES

GC3 Green Chemistry & Commerce Council

February 2011 • Version 1

Acknowledgements

The document was developed with input and guidance from members of the GC3 Chemical Data Working Group and from reviewers external to the project. We are grateful to the individuals listed below for their invaluable contributions.

Cal Baier Anderson, Environmental Protection Agency
Pat Beattie, SciVera
Michael S. Brown, Brown & Wilmanns Environmental Consulting
Topher Buck, Green Blue Institute
Sharon Cooperstein, Green Seal
Mindy Costello, NSF International
Scott Echols, Nike
Eric Harrington
Kathleen Hurley, Actio Corporation
Teresa McGrath, NSF International
Brian Miller, Seagate
Homer Swei, Johnson & Johnson
Gabe Wing, Herman Miller

This Guidance Document includes examples of approaches that suppliers, formulators, fabricators and/or retailers are using to gather chemical data from their supply chains. This document is not intended as an endorsement of these approaches on the part of its authors or contributors, the Green Chemistry and Commerce Council, the Lowell Center for Sustainable Production, or the University of Massachusetts Lowell.

Primary Authors

- Monica Becker, Monica Becker & Associates Sustainability Consultants
- Melissa Coffin, Research Associate, Lowell Center for Sustainable Production, University of Massachusetts Lowell
- Joel Tickner, Project Director, Lowell Center for Sustainable Production, University of Massachusetts Lowell

The Green Chemistry and Commerce Council (GC3) was formed in 2005 and provides a forum for participants to discuss and share information and experiences related to advancing green chemistry and design for the environment as it pertains to sustainable supply chain management. The GC3 is a project of the Lowell Center for Sustainable Production at the University of Massachusetts Lowell.

The Lowell Center for Sustainable Production uses rigorous science, collaborative research, and innovative strategies to promote communities, workplaces, and products that are healthy, humane, and respectful of natural systems. The Center is composed of faculty, staff, and graduate students at the University of Massachusetts Lowell who work with citizen groups, workers, businesses, institutions, and government agencies to build healthy work environments, thriving communities, and viable businesses that support a more sustainable world.

Green Chemistry & Commerce Council
c/o Melissa Coffin
Lowell Center for Sustainable Production
University of Massachusetts Lowell
One University Avenue
Lowell, MA 01854
(978) 934-2997
Melissa_Coffin@uml.edu
www.greenchemistryandcommerce.org

Lowell Center for Sustainable Production
UNIVERSITY OF MASSACHUSETTS LOWELL

This document is available at *www.greenchemistryandcommerce.org/publications.php.*

Preface

BUSINESS-TO-BUSINESS (B2B) COMMUNICATION OF CHEMICAL DATA, SUCH AS CHEMICAL IDEN-tity and health and safety impacts along supply chains, is critically important to product manufacturers' efforts to make informed decisions on the health and environmental impacts of the products that they put on the market. When chemical information is available in the design phase, a manufacturer can evaluate the full costs associated with using specific chemicals in product lines and strategically manage those costs, consider existing and future global chemical restrictions, as well as issues of liability and risk. This information is also vital for the design of safer products and advancing the application of green chemistry along supply chains.* With this information in hand, fabricators and formulators can provide retailers and consumers with the information that they need for their purchasing decisions.

This document is intended primarily for suppliers to product fabricators and formulators. Forward-looking companies working to bring safer products to market need the active engagement of suppliers to provide relevant chemical information. When they cannot obtain this information, many leading-edge firms look to alternative suppliers.

Obtaining chemical ingredient, health, and safety information from large, complex supply chains is a challenging task. Often data are not available or suppliers beyond Tier II are difficult to identify. The aim of this document is, 1) to advance the efforts of companies trying to obtain the chemical data needed for regulatory and corporate sustainability programs and in response to market demands, and 2) to advance the efforts of suppliers to provide chemical data needed by their customers.

This document outlines the reasons companies are seeking chemical information and the ways in which they are using the chemical data, with examples from well-known companies; the types of chemical ingredient and toxicity information that companies need from their suppliers to make informed decisions about safer materials; how that data is most effectively provided; and resources that can assist suppliers in collecting and providing chemical information to their customers. The document focuses primarily on information on individual chemicals used in chemical mixtures or articles though, in some cases, fabricators or formulators may want information on particular materials (such as specific plastics) that are used in a component or a product.

This Guidance Document was developed by the Green Chemistry in Commerce Council (GC3), a business-to-business network which provides an open forum for participants to discuss and share information and experiences related to advancing green chemistry, design for environment, and sustainable supply chain management. The GC3 provides the opportunity for cross-sectoral collaboration on enhancing chemical data sharing along supply chains. For more information about the GC3 or to become a member, visit *www.greenchemistryandcommerce.org*. The GC3 is a project of the Lowell Center for Sustainable Production at the University of Massachusetts Lowell.

Information contained in company examples and in Appendix B of this document was drawn from an email and phone survey conducted by the GC3 in 2010, and from case studies of Nike, Hewlett Packard and SC Johnson published by the GC3 in 2009. The case studies can be downloaded from the GC3 website at: *www.greenchemistryandcommerce.org/publications.php*.

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* Many companies have developed their own criteria for determining whether a chemical or product is "safe," and some laws and government programs, such as the EPA's Design for Environment Program, define attributes of "safer chemicals" or "safer products" which may prohibit use of specific chemicals of concern or chemicals that exceed specific toxicological standards for a particular functional use. This document does not seek to define "safer" or evaluate the definitions of safety developed by companies or government agencies.

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Introduction

FOR MOST FABRICATORS AND FORMULATORS, SUPPLY CHAIN SECURITY AND TRANSPARENCY IS a primary concern. When a manufacturer has confidence in a particular supply chain, it can grow its business around it.

Increasingly, an important element of good supply chain management is to know the identity and health and safety impacts of the chemicals within the materials companies purchase to manufacture their products, beyond what is typically disclosed on a Material Safety Data Sheet (MSDS). Product manufacturers need chemical information for a variety of reasons including compliance with regulations, meeting the demands of sustainability and safer chemistry programs developed by retailers, green product design and certification programs, and other chemical disclosure initiatives.

Obtaining chemical ingredient, health and safety information from complex supply chains is a challenging task. The aim of this document is two-fold:

1) to advance the efforts of companies trying to obtain the chemical data needed for regulatory and corporate sustainability programs as well as in response to market demands, and

2) to advance the efforts of suppliers to provide chemical data needed by their customers.

This document is intended primarily for suppliers to product fabricators and formulators and was developed with the input of product fabricators, formulators, retailers, suppliers, and other stakeholders.

Figure 1 illustrates an example supply chain for a fabricated product (article). See Appendix A for a full list of definitions and acronyms used throughout this document.

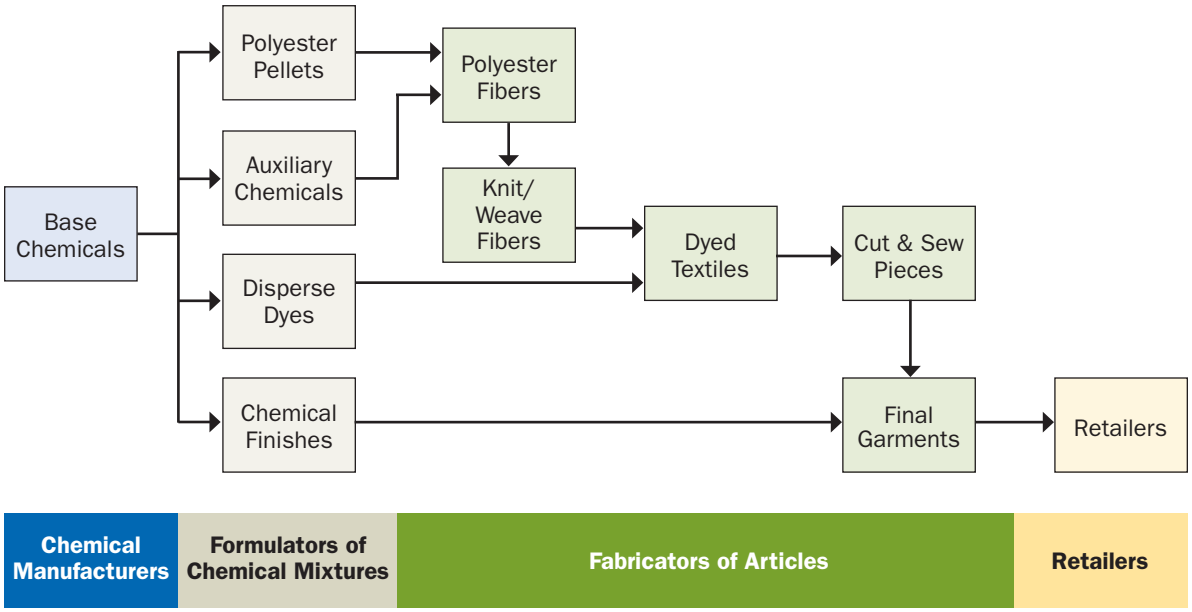
Box 1: Scope of This Document

This Guidance Document focuses on educating suppliers to fabricators and formulators about the importance of chemical data. The term *fabricator* is used in this document to describe a manufacturer (or a company that directs suppliers to fabricate) of an *article.* An *article* is an object (tangible good) that is given a special shape, surface or design during production that determines its function to a greater degree than does its chemical composition (e.g., a car, a battery, or a telephone).

An article can be a finished product, component of a product (such as a circuit board), or source material (such as a textile or leather) sold to other organizations or directly to consumers. A *formulator* is a manufacturer of a chemical preparation or a mixture of substances, such as paint, liquid cleaning products, adhesives or a surfactant package (i.e., a blend of different surfactants and possibly other chemical agents sold to cleaning product manufacturers).

While the provision of chemical data to formulators and fabricators is the focus of this document, in some cases a particular brand may have a third party manufacturer or OEM arrangement (without or in addition to its own manufacturing operations), but still need such data for regulatory or market purposes. Such companies can also exert significant influence over their supply chains. Recently, many retailers, some of which have their own product lines, are requiring chemical content, toxicity, and alternatives data from product suppliers for similar legal or market reasons.

Figure 1: Example Supply Chain for a Fabricated Product (Article)



In the case of a formulated product, such as a cleaning product, the relationship would be slightly different. Chemical manufacturers would supply base chemicals—solvents, surfactants, chelating agents, alkalinity boosters, polymers, builders—to either the formulator of the cleaning product or an intermediate formulator that makes "ingredient packages" such as fragrances or surfactant packages. The intermediate formulator would then provide the chemical mixture to the final formulator (the final product manufacturer) that would then sell the product to a retail operation or directly to the consumer or service provider.

How to use this Guidance Document

- **Q.** Are you a supplier just getting started collecting chemical data for your customers?
- **Q.** Are you a supplier that has been responding to customers' requests for chemical information and are looking for some new insights that can help you fulfill your customers' needs more effectively?
- **Q.** Are you a user of chemicals that needs to communicate with *your* suppliers about gathering chemical information?

Some topics covered in this guidance document will be of particular interest to suppliers that are just getting started, while others will be of interest to companies that have already begun to gather chemical information and are interested in learning how to streamline the data collection process, or in learning how chemical data is being used by fabricators and formulators. Suppliers can share this document with *their* suppliers to help communicate why chemical information is needed and how to streamline their data gathering processes. Retailers can share this document with their vendors.

While this document is focused on educating suppliers, particularly Tier I suppliers to finished product manufacturers, there is a need for communication to be a two-way street to enhance the ability of suppliers and fabricators, formulators, and retailers to work more effectively together in advancing transparency, product safety, and sustainability.

Whether just getting started or already moving forward, suppliers can use the appendices of this document to learn about what several companies across sectors are doing in this area. While there is no "one size fits all" approach to gathering chemical information, the examples provided represent some best practices collected from a range of industries.

SECTION 1

Why do Fabricators and Formulators Need Chemical Data?

FORMULATORS AND FABRICATORS NEED CHEMICAL DATA FOR A VARIETY OF REASONS, including:

- Compliance with retailer requirements to disclose chemical ingredients in products (see Box 2).
- Compliance with regulations that restrict the use of certain chemicals or require disclosure of chemical content in formulations or articles. Appendix D-1 contains brief descriptions of some of regulations that require fabricators and formulators to collect chemical data.
- Compliance with a voluntary corporate program restricting certain chemicals in their products.
- Evaluation and scoring of chemical environmental, health, and safety attributes prior to selection for use in formulations or the production of articles.
- Elimination or substitution of toxic materials in components with safer alternatives.
- Participation in third party green certification programs.
- Execution of voluntary efforts to disclose chemical ingredients to customers.

Box 2: Walmart Requires Chemical Ingredient Disclosure

Walmart requires all vendors of chemical products,* over the counter products, and batteries to disclose all intentionally added chemicals and their percentages for every product supplied. This information is submitted confidentially to a third party organization called the Wercs through an electronic data portal. In turn, the Wercs provides Walmart with information that it needs to transport and handle these products safely. To protect confidential business information, formulation information is never disclosed to Walmart.

Chemical ingredient information must be provided *before* a vendor's product is approved in Walmart's supplier portal. Walmart put this "hard stop" in place to ensure that regulatory information needed to handle the product is provided before it enters the supply chain.

* Walmart defines a *chemical product* as a product that contains a flammable solid, powder, gel, paste or liquid that is not intended for human consumption.

SECTION 2

What are "Chemical Data"?

IN THIS DOCUMENT, THE TERM CHEMICAL DATA INCLUDES, BUT IS NOT LIMITED TO, THE FOLLOWING types of information:

1. Chemical name, trade name, and CAS number of all chemical ingredients in an article or chemical mixture, including known impurities.
2. Function of a chemical ingredient in an article or chemical mixture (e.g. catalyst, plasticizer, monomer, etc.).
3. Human health and ecotoxicological characteristics of chemical ingredients and chemicals used in making that ingredient, as well as their physical safety properties such as flammability.
4. Potential for human or environmental exposure to chemical ingredients in an article or chemical mixture.

Currently fabricators and formulators are asking their suppliers for different types of chemical information based on their unique data needs. The level of detail of these types of information provided may vary depending on supplier, knowledge about a chemical or complexity of a supply chain. Given increasing regulatory requirements, the growing number and widening scope of efforts by companies to design safer products, and increasing market demands, many fabricators and formulators are expecting to expand their data requirements over time. More detail on these categories of chemical data is provided below.

1. Chemical name, trade name and CAS number of chemical ingredients in an article or chemical mixture

Fabricators and formulators may request information on the identity of all known chemical ingredients in an article or chemical mixture; all intentionally added chemicals; or all chemical ingredients above a certain threshold (for example above 0.1% by weight or 1,000 ppm).

Example: Johnson & Johnson asks for chemical identity information for all chemicals present in a supplied material at concentrations of 1 ppm or higher.

Example: For its TerraCheck products, True Textiles requests chemical ingredient information for all intentionally added ingredients and specific impurities.

Alternatively, fabricators and formulators may request the identity of chemical ingredients for a specific set of chemicals (as opposed to all ingredients), such as:

- Chemicals on a company's restricted substances list (RSL), which may include chemicals that are restricted by law and chemicals of concern that are not currently legally restricted.
- Specific categories of chemicals, such as those that are targeted by government regulatory programs aimed at reducing environmental or health impacts (carcinogens, or persistent, bioaccumulative and toxic substances, etc.).

Example: In addition to requesting the identity and quantity of chemicals that are considered Substances of Very High Concern (SVHCs) under REACH, Hewlett Packard requests information from its suppliers on approximately 240 additional chemicals that could be in electronic components that are carcinogens, mutagens and/or reproductive toxins (CMRs); persistent, bioaccumulative and toxic chemicals (PBTs); or endocrine disruptors.

A supplier may need to conduct analytical testing to determine the concentration of intentionally added chemicals (main ingredients, additives, preservatives, or fragrances) or impurities (contaminants, chemical reaction by-products, chemical breakdown products, unreacted raw materials, or residual catalysts).

While this document focuses primarily on individual chemical ingredients, in some cases a fabricator, formulator, or retailer may want information about material content (made up of individual ingredients) in a product, such as a particular plastic used in a bottle or electronics housing.

Appendix B contains more detail on the information that several fabricators and formulators are seeking on the identification of chemical ingredients.

2. Function of the chemical in an article or chemical mixture

Information on the function of each chemical in an article or chemical mixture provides a fabricator or formulator with a better understanding of why the chemical ingredient is being added, and can inform discussions about the need for that particular functionality, possible alternative chemicals or design options to achieve that function.

Examples of chemical function include: preservative, fragrance, colorant, biocide, stabilizer, anti-oxidant, and UV filter.

> **Example:** When evaluating materials for purchase, Method asks suppliers to identify the chemical ingredients that are used as preservatives and to offer alternatives that could be used in the same product formulation. Further, if Method finds the standard preservative to be undesirable, the company will ask the supplier to replace it with an alternative.

Some chemical suppliers use risk assessment to determine the safe concentration of their chemicals in specific applications or recommend against certain unsafe uses of their chemicals. While this document focuses on fabricator's and formulator's needs for chemical information, many suppliers would also like to know more about how their chemicals or materials are being used by the companies that are purchasing them to ensure their safe use.

3. Human, environmental and physical hazards of chemical ingredients

There are many ways that chemicals can adversely affect humans and the environment; therefore, characterizing the hazards of a chemical requires examination of an array of attributes or effects that a chemical ingredient (or chemicals involved in the production of that ingredient) can have. Table 1 provides a listing of some of the hazard characteristics for which fabricators and formulators often request data.

Appendix D-4 provides a list of resources that suppliers can use to find hazard and toxicity data for individual substances, and systems for evaluating the hazard of chemicals, materials and processes. Appendix D-5 provides resources for the identification of greener/safer chemicals.

Appendix B contains more detail on the types of hazard and toxicity data that fabricators and formulators are seeking.

Increasingly, fabricators, formulators and other purchasers may want to know more about the human health or ecosystem impacts of chemicals used or created in the lifecycle of a particular ingredient, including processing chemicals or byproducts (such as dioxins or polycyclic aromatic hydrocarbons) that may not form part of the final ingredient. Such data can be hard to obtain, particularly when production of the ingredient involves many complex steps with suppliers from across the globe. Fabricators, formulators and other purchasers may also want data on other lifecycle impacts of ingredients, including raw material extraction (for example the source of a bio-based materials), water use, and energy implications. In many cases Tier I suppliers may not have access to these types of data, which may reside several steps up a supply chain. Resources such as the SRI Consulting's Chemical Eco-

1 www.sriconsulting.com/CEH/Public/index.html

2 http://onlinelibrary.wiley.com/book/10.1002/0471238961

Table 1: Potential Endpoints for Human and Environmental Health Data

Human Health Effects	Ecological Effects
Physical hazards, e.g., Flammability Corrosivity Reactivity Other physical chemical properties indicative of hazard **Toxicity, e.g.,** Acute toxicity, including: • Acute—oral/dermal/inhalation toxicity • Irritation • Sensitization Chronic toxicity, including: • Repeated dose toxicity—oral/dermal/inhalation • Carcinogenicity • Reproductive and developmental toxicity • Genotoxicity • Neurotoxicity • Immunotoxicity • Respiratory effects (including asthma) • Cardiovascular effects • Effects on other organs (e.g., liver) • Endocrine disruption	Persistence/biodegradation Partitioning factors Bioconcentration or bioaccumulation Acute aquatic toxicity Chronic aquatic toxicity Toxicity to terrestrial plants

nomics Handbook[1] and the Kirk Othmer Encyclopedia of Chemical Technology[2] may provide general information about the production process for a particular chemical ingredient that can be used to estimate human and ecological health impacts across the lifecycle of an ingredient. Further, a number of lifecycle assessment software packages exist that can assist in estimating resource and energy implications of a particular chemical.

4. Potential for human or environmental exposure to chemicals of concern

Exposure to chemicals of concern can occur during the manufacturing, handling, transport and use of chemicals to make articles and chemical mixtures, or when products are used, disposed of, or recycled. Suppliers often have important information on the potential for exposure to chemicals of concern, information that is valuable to fabricators and formulators.

The potential for exposure to a chemical of concern is dependent on many factors including: the form of the chemical substance (liquid, solid, powder) when it is used in the production of an article or chemical mixture; properties of the chemical (potential for bioaccumulation, persistence and mobility in the environment, etc.); concentration; the ability of the chemical to migrate or leach out of an article; how the material or product will be used by consumers; and how it will be managed at the end of its life. To assess the potential for exposure, fabricators and formulators may want the following information from their suppliers:

- The physical form (i.e., as a solid material, a liquid or gas) in which a chemical mixture (such as a dye, coating or adhesive) is shipped to a fabricator or formulator.
- The physical form in which a chemical mixture is used by the manufacturer (liquid emulsion, etc.).
- Whether chemical ingredients are fixed within the makeup of the product in such a way that they do not migrate out of the product over the course of its use (leaching, off-gassing, etc.).
- Whether workers or neighboring communities can be exposed to a chemical of concern when the product is manufactured or used.
- Whether there is a need for special wastewater treatment methods when using the material.
- Whether there are available recycling or take back programs for unused or scrap materials.

SECTION 3

How Can Suppliers Benefit by Collecting and Providing Chemical Data to Their Customers?

IN THE CURRENT BUSINESS ENVIRONMENT, WHERE INFORMATION ON CHEMICALS IN FORMULATIONS and articles is either required by government regulation or demanded by consumers, suppliers that can provide this information to downstream users are at a significant business advantage:

- Companies such as Nike and Method have stated that they prefer suppliers with a chemical data collection and reporting process in place.
- Some retailers, such as Walmart, are requiring suppliers to provide chemical ingredient data as a prerequisite for selling their products.
- Suppliers that have not been forthcoming about the presence of chemicals of concern in the materials that they supply have been dropped by fabricators/formulators who previously purchased their products.

Other benefits to suppliers include:

- The ability to deliver a safer and more attractive product to customers. When a supplier has a better understanding of the chemical content and hazard characteristics of the materials that they procure, they are better able to make informed decisions about which materials to buy and which to avoid.
- Suppliers with knowledge of the chemical content of their materials are able to be proactive and reformulate if and when legislation or corporate policies restrict the use of these chemicals.
- Suppliers can market themselves as providing safer chemicals and products and work with customers to become preferred suppliers.

Example: In 2001 when SC Johnson first began using its chemical ingredient evaluation system called Greenlist™ the company approached its suppliers to request the environmental, health and safety (EH&S) data that was needed for the evaluations. Some suppliers got on board immediately; others pushed back saying that the EH&S data that SC Johnson was requesting was proprietary. SC Johnson informed its suppliers that if they did not provide the data their products would receive a score of 1, which would put them at a competitive disadvantage with suppliers that provided data and had products that were eligible for higher scores (the scoring in Greenlist™ is: 3 = Best, 2 = Better, 1 = Acceptable, 0 = Restricted Use Material (RUM)). SC Johnson began meeting with suppliers to train them on the Greenlist™ evaluation process and the specific criteria used to score ingredients. SC Johnson developed mechanisms to address suppliers' CBI requirements such as the use of non-disclosure agreements and restricting data access only to SC Johnson toxicologists. Still some suppliers would not provide the data and those suppliers have lost sales.

SC Johnson
A FAMILY COMPANY

SECTION 4

Why Isn't the Material Safety Data Sheet (MSDS) or Safety Data Sheet (SDS) Enough?

THERE IS A PERCEPTION AMONG MANY SUPPLIERS THAT PROVIDING A MATERIAL SAFETY DATA Sheet (MSDS) or Safety Data Sheet (SDS) should be sufficient to meet their customer's demands for chemical data. In this section, we explain why this is not necessarily true.

Box 3: What is an MSDS?

In the US, the Occupational Safety and Health Administration's (OSHA) Hazard Communication Standard (HCS) requires that a manufacturer or importer of a hazardous chemical substance or mixture prepare a Material Safety Data Sheet (MSDS). The primary function of an MSDS is to communicate information about a chemical substance or mixture of chemicals that can be used to protect workers during storage, handling, and use. A hazardous chemical is defined as a chemical that poses a physical or health threat to workers, such as cancer, reproductive health effects, or flammability.

What are the legal requirements for an MSDS that are relevant to chemical data sharing?
While there are many requirements for MSDSs, the following are most relevant to chemical data sharing:

Listing of chemical ingredients:

- Generally, all hazardous ingredients must be listed by their common name and chemical name if the ingredient makes up 1% (10,000 ppm) or more of the product.
- Cancer causing chemicals (carcinogens) must be listed if they make up 0.1% (1,000 ppm) or more of the product.
- If an ingredient of a product poses a health risk to workers it must be listed on an MSDS regardless of the percentage amount. Appendix A of the HCS lists health effects of chemicals that are considered to pose a health risk to workers.
- Information that could jeopardize trade secrets may be omitted from MSDSs by claiming confidential business information (CBI). See Section 5 for more about CBI.

Hazard and toxicity information

Hazard and toxicity information required on an MSDS is limited to chemical ingredients that could be harmful. For each such ingredient an MSDS must describe:

- A recommended exposure limit.
- Likely routes of exposure and suggested protective equipment to prevent it.
- Properties of that chemical which make it likely to be dangerous (explosive, vapors at ground level, etc.).
- Health impacts that can be expected following exposure, both immediate (acute) and delayed (chronic).

For many chemicals these health impacts have not yet been determined. In these instances the MSDS author is not required to generate the missing data, instead MSDSs may note that data was unavailable or could not be determined.

Box 4: What is an SDS?

In order to standardize safety data sheets internationally, the United Nations has developed the Globally Harmonized System for Classification and Labeling Chemicals (GHS), a globally standardized approach to communicating hazard and safety information for chemicals. Manufacturers in countries that choose to adopt the GHS are required to create an SDS containing an identical set of chemical hazard information, displayed in the same way, for chemicals, mixtures, and products.

The European Union Member States, New Zealand and countries in South America, and Asia have already begun implementing the GHS and manufacturers in these countries are beginning to generate SDSs. The US has committed to adopting the GHS and OSHA estimates that it will issue necessary changes to its rules by mid 2011. It is unclear to what degree new classifications developed by other agencies will be included. Once these changes are in place, US companies will have three years in which to rewrite their MSDSs, issue new labels, and provide necessary staff training.

What are the legal requirements for an SDS that are relevant to chemical data sharing?
SDSs must contain 16 sections, similar to an MSDS, but rearranged slightly. Beyond workplace protections, SDSs are meant to communicate with other audiences, including those transporting the material, emergency responders, and consumers. Required information relevant to chemical data sharing is included below.

Listing of chemical ingredients, including:

- Chemical name, CAS number or other identifying number, and synonyms or other names by which the chemical is known.
- A listing of any additives or impurities contained in the chemical which add to its hazard classification level.
- When describing a mixture, any hazardous ingredient and its concentration must be listed.

Hazard and toxicity information, including:

- Chemical properties.
- Stability and reactivity.
- Toxicological hazards and supporting data
  - Probable routes of exposure.
  - Symptoms from exposure (both fast acting and long term).
  - Numerical toxicity data.
  - Ecological toxicity information:
    Aquatic toxicity.
    Terrestrial toxicity.
    Ability to degrade.
    Bioaccumulation potential.
    Mobility in the soil.
    Any other environmental impacts.

Do SDSs provide more information for chemical data sharing than MSDSs?

While much more detailed than the US MSDS in its data requirements overall, the SDS requires that companies disclose only the identity of chemical ingredients known to be hazardous. Non-hazardous ingredients and chemicals not yet known to be hazardous will not necessarily be listed.

More importantly, information claimed as Confidential Business Information (CBI) will not appear on SDSs since CBI claims supersede requirements for ingredient identification.

SDSs may contain more hazard and toxicological information than MSDSs, but SDSs are unlikely to contain more information on chemical ingredient identity than their US counterparts.

SDS and MSDS shortcomings

MSDSs are often a company's only resource for chemical ingredient, hazard, and toxicity information. While they could be more useful, they are better than having no information at all. Unfortunately, MSDSs fall short of providing enough information to satisfy the chemical data needs of many fabricators and formulators. There are several reasons why:

- For chemical mixtures or materials, MSDSs rarely contain a complete list of chemical ingredients. This is a problem when a fabricator or formulator needs full formulation data, and a bigger problem when a list of both intentionally added chemicals and impurities are required.
- MSDSs and SDSs do not require full disclosure, and when companies claim confidential business information (CBI), ingredient lists can be significantly incomplete.
- Often, an MSDS or SDS lists an ingredient according to its chemical category (e.g., glycol ether) rather than a specific chemical name, indicating that the actual chemical name and CAS number are proprietary.
- The concentration of a chemical may be reported as a range rather than an exact number. Companies needing detailed ingredient information need exact names and percentage data rather categories and concentration ranges.
- Often the chemical hazard and toxicity information are insufficient. This could be because the MSDS/SDS preparer did not provide complete information, or because the chemicals have not been adequately tested for hazard or toxicity. Additionally, the hazard data that is reported is often not cited or untraceable.
- MSDSs often provide incorrect or incomplete information. MSDSs are not written or reviewed by a government agency and may have inaccuracies.
- Information may be inconsistent from one manufacturer to another. When more than one manufacturer or exporter makes a chemical (and therefore creates an MSDS), the information provided in each of the sheets may be inconsistent.
- MSDSs/SDSs are typically not provided for articles such as materials, components, sub-assemblies or fully fabricated products. A circuit board, for example, would not have an MSDS/SDS disclosing that lead solder was used in its fabrication.

SECTION 5

How do Companies Address Confidential Business Information?

CONFIDENTIAL BUSINESS INFORMATION (CBI, ALSO CALLED TRADE SECRET INFORMATION) refers to information that companies wish to keep confidential. It can include trade secrets or commercial and financial information. Typically, companies declare certain information CBI if they believe that it is disclosed, it may harm their business.

When a supplier determines that the chemical data sharing requested by customers is not necessary or may harm their business, relationships between suppliers and customers can be harmed. In some cases, fabricators or formulators may drop suppliers that are unwilling to provide information due to confidentiality claims because they need to ensure regulatory compliance or to advance sustainability or disclosure objectives.

Why do suppliers and vendors claim that certain chemical data are CBI?

For chemical ingredient information:

To ensure that the information is not shared with a competitor to prevent copying of a product and loss of market share.

For chemical hazard or toxicity information:

To prevent a competitor from using the data to determine the identity of an ingredient or manufacturing process.

Taking a critical look at whether chemical data really needs to be kept confidential

In order to gain new business and to protect existing business, it is worthwhile for suppliers to closely examine which information is critical to maintain as CBI, and which information can be safely shared.

How can the dual goals of chemical data sharing and protection of CBI be achieved?

For legitimate CBI, there are a variety of mechanisms that can be used to satisfy a customer's need for chemical data. These include:

- Disclosure of sensitive chemical data with a customer under a non-disclosure agreement (NDA).
- Disclosure of sensitive chemical data to a third party under an NDA. The third party can evaluate the data and provide sanitized information to the customer to verify that the chemical or product meets regulatory or other requirements specified by the customer. The third party may be an organization that provides certification under a green or other product standard.

Example: Some of SC Johnson's suppliers are guarded when it comes to sharing the chemical data that the company needs to evaluate a material under its Greenlist™ system for rating raw materials based on their impact to the environment and human health. Over time, SC Johnson has developed protocols to deal with these confidentiality issues.

There are essentially three levels of confidentiality. Some chemicals purchased by SC Johnson are in common use in industry and are not considered proprietary by their suppliers. For these chemicals, sup-pliers freely provide SC Johnson with Environmental Health and Safety (EH&S) data. Other chemicals or formulations are considered proprietary by their suppliers, but these suppliers are willing to provide SC Johnson with EH&S data under a nondisclosure agreement. Under these agreements, only SC Johnson toxicologists get access to the data for the purpose of scoring the material in Greenlist™. Polymers and dyes typically fall under this category.

Finally, some suppliers regard their products as highly proprietary. This is typically the case with fragrances. In these cases, the supplier determines the Greenlist™ score and provides only the score to SC Johnson. The company audits these submittals.

Example: Method uses a third party reviewer to evaluate all chemical ingredients for safety prior to their selection for a product formulation. The evaluation includes potential for undesirable contaminants from the manufacturing process. Chemical data is gathered from suppliers through detailed questionnaires. In most cases the questionnaire is sent by the supplier to Method and Method sends it to the third party reviewer. In cases where there is an issue of confidentiality, the supplier sends the questionnaire directly to the third party reviewer under an NDA.

Box 5: Trends in Chemical Transparency

The US EPA is changing its rules allowing companies to keep chemical information confidential. The Environmental Protection Agency announced in early 2010 that it is taking steps to increase the public's access to chemical information and these steps are expected to have an effect, over time, on the ability of chemical manufactures to keep chemical information confidential. In a May 27, 2010 announcement, the EPA said it plans to "generally deny confidentiality claims for the identity of chemicals in health and safety studies filed under the Toxic Substances Control Act (TSCA), except in specified circumstances."*

TSCA is the US law that governs toxic substances. Draft legislation aimed at reforming the law contains even stricter conditions on CBI claims and more demanding requirements for chemical information disclosure by companies.

* *www.epa.gov/oppt/existingchemicals/pubs/transparency.html*

SECTION 6

How are Fabricators and Formulators Gathering Chemical Data from Their Supply Chains?

INCREASINGLY, FABRICATORS AND FORMULATORS ARE ASKING THEIR SUPPLIERS TO PROVIDE DATA on the chemical content of the raw materials that they supply and components and products that are produced for them in contract factories. Clarity in terms of the types of information needed, how that information should be provided, how the information will be used, and consequences of not providing that information is important for ensuring consistent and quality data from suppliers as well as maintaining good supply chain relationships. Some companies have developed systems to help their suppliers provide this information. These systems are outlined below.

- Written guidance detailing chemical information needed, which may include:
  - The level of detail required in chemical ingredient lists.
    All ingredients contained in the mixture, component, or product above a certain threshold concentration.
    All intentionally added ingredients.
    All ingredients present on a particular list of chemicals.
  - Required format of the data.
- Supplier questionnaires with specific questions addressing chemical ingredients, concentrations, toxicity information on chemical ingredients, etc.
- Web portals for chemical data entry.
- Training suppliers on chemical data reporting requirements.

Example: Hewlett Packard developed a web portal that suppliers use to enter chemical data. This system uses the company's SAP/Environmental Health and Safety module to process the information.

Example: International Material Data System (IMDS) is used by the automotive industry to gather information on the chemicals used by their suppliers.

Example: SC Johnson provides training to suppliers on its Greenlist™ system—the system that the company uses to score raw materials according to environmental and human health impacts—with particular focus on the toxicity data needed from its suppliers for scoring chemicals and materials.

Example: Hewlett Packard provides training to Tier I and some Tier II suppliers to clarify data requirements.

In some cases a supplier may not have access to or may not be willing to provide specific information, or in sufficient detail, to respond to a fabricator or formulator's request. In these cases, a fabricator or formulator may need to determine what data are most important to assessing chemical or product hazards and exposures and whether those data are obtainable through other means. Some fabricators or formulators may count missing data as an indication of concern for a chemical or deselect a chemical for which adequate data for chemical assessment are not available.

SECTION 7

Where and How do Suppliers Get Chemical Data to Provide to Their Customers?

GETTING CHEMICAL DATA IS NOT NECESSARILY EASY. IT CAN BE TIME CONSUMING AND THAT means that it can be costly to a supplier to obtain, manage and report. Just how difficult and costly depends on where the supplier is in the supply chain, how large and complex the supply chain is, and how willing the parties upstream of the supplier are to provide data. Further, the initial establishment of databases and structures for chemicals information management can be resource intensive. Once these systems are established and learning begins, costs generally come down and it becomes easier to provide data in various formats for different purchasers and purposes.

In addition to developing data collection systems, developing good supply chain relationships is critical for obtaining thorough and accurate data. Some fabricators and formulators have found that by developing strong relationships with a smaller number of suppliers, they can not only reduce costs (through bulk buying arrangements), but also increase their access to data, and leverage over their supply chain. This then allows for win-win situations where suppliers are more effectively able to respond to both their immediate customer and also the ultimate product purchaser's needs.

When the supplier is a chemical manufacturer

If the supplier is a chemical manufacturer (e.g., a manufacturer of individual chemical substances), the supplier presumably knows the identity of the chemical being supplied, or of any added preservatives or other additives, and may be knowledgeable about unreacted materials or other unintended chemical components. A chemical manufacturer is most likely in possession of hazard and toxicity data, which may vary depending on the chemical and size of the supplier. For example, many smaller specialty chemical manufacturers may not have toxicological testing resources or capabilities of a larger chemical manufacturer. Further, chemical manufacturers may not have easy access to data on health, safety, and ecological impacts of upstream building block and processing chemicals. If the supplier is a chemical distributor that does not actually manufacturer the substances, the level of knowledge may be less.

NSF International and the American Chemical Society's Green Chemistry Institute are developing an American National Standard to standardize the chemical hazard and process impact data that are provided down the supply chain, as well as a certification process by which this information is verified as accurate and complete by a qualified third party. The NSF/GCI 355 Greener Chemicals and Processes Information Standard is expected to be completed in June 2011 (see Box 6).

When the supplier is downstream from a chemical manufacturer (perhaps many tiers removed)

If a supplier is downstream from a chemical manufacturer (perhaps many tiers removed) or is a manufacturer of articles from chemicals, it may be necessary to gather information from numerous sources in their supply chain. The supplier may not have a direct relationship with the companies that manufacture, select, and have knowledge about individual chemical ingredients: this information may reside multiple levels back in the supply chain. Further, some of those suppliers may not want to disclose the information. Without a clear relationship with such Tier II and beyond suppliers, data collection may be challenging.

Box 6: NSF/GCI 355 Greener Chemicals and Processes Information Standard

The purpose of the Greener Chemicals and Processes Information Standard is to provide chemical companies with a voluntary and standardized way to define and report a chemical product's hazard profile and manufacturing process' impacts. This information will be provided by suppliers to communicate clearly, with transparency and consistency, to help customers evaluate the relative greenness of a chemical product and process over its life cycle, and to provide the data needed to make informed choices between suppliers.

This standard was developed using a consensus-based process with the input of over 100 stakeholders from industry, government, public health and NGOs. The standard includes guidance on how to report data on the chemical's:

- Hazard profile including human health hazards, ecological hazards and physical chemical properties.
- Process impact including process efficiency, waste production, water use, energy use, bio-based content, process safety, and innovative manufacturing processes.
- Corporate social responsibility.

Certification to NSF/GCI 355 will allow a qualified third-party to verify that the data presented in the report is complete, accurate and verified on an ongoing basis.

When beginning a chemical data gathering initiative, suppliers have two options: 1) they can work directly with their lower tier suppliers, or 2) they can leverage their relationship with their Tier I supplier to contact *their* Tier I suppliers who then contact *their* Tier I suppliers, and so on. The latter is a very common approach generally, and in particular among electronics fabricators needing to gather chemical data for compliance with the EU's RoHS Directive (see Appendix D-1 for a description of the RoHS Directive). The second option often takes longer and requires the Tier I supplier to coordinate the efforts of these lower tiers, but could save staff and financial resources for the supplier and its customer.

Guidance for suppliers getting started with data sharing

Companies new to data sharing initiatives will need to work closely with their customers. Specific actions and points to keep in mind are outlined below.

- Ask your customer (the fabricator or formulator that you are supplying) for clear guidelines, preferably in writing, on the type and format of information that they are looking for and why it is needed.
- Ask your customer for a data collection spreadsheet or other type of template that can ensure that they are getting the data that they need.
- Develop systems to both respond to data requests as well as to collect and collate data so that they can be used for multiple customers and purposes.
- Be prepared to explain clearly to your suppliers what information you need and why you need it.
- Be prepared to offer an option for dealing with data that your suppliers want to keep proprietary, such as a non-disclosure agreement. Also, if it is necessary for the release of your chemical information, be prepared to ask your customer for a similar option for the information you provide them.

Gathering chemical ingredient information

Guidance specific to gathering chemical ingredient information is offered below.

- For chemical products that you are purchasing from your suppliers, use the MSDS or SDS as a starting point to get an initial view of chemical ingredient information.
- If the ingredients listed on the MSDS do not total 100%, ask your supplier to provide complete ingredient information.

- If the product is a single chemical or chemical mixture, ask your supplier if they have a Certificate of Analysis (CoA), which is a document that a supplier may generate for each run or batch of a product shipped. A COA provides business customers with information related to product quality, purity, and conformance to product requirements. They may contain a list and percent composition of active ingredients, and results of analytical tests that were performed on the product, such as tests for contaminants (e.g., lead, cadmium).

Gathering chemical hazard or toxicity information

In addition to chemical ingredient information, techniques for gathering chemical hazard and toxicity information are listed below.

- For chemical products that you are purchasing, use the MSDS or SDS as a starting point to get a first cut view of the hazard and toxicity information provided by your supplier.
- Ask your supplier if they have additional information that is not on the MSDS or SDS.
- If your supplier does not have adequate hazard or toxicity data but does have comprehensive ingredient information, consider consulting lists of chemicals of concern with associated hazard data or databases containing data for individual chemicals (see Appendices D-4 to D-6 or consult with a professional toxicologist).

Guidance for suppliers currently collecting and providing chemical data

Companies already working with their customers to share data can build knowledge and improve upon existing systems to streamline future data collection efforts. Some such improvements are listed here.

- Consider creating a chemical data web portal for your suppliers to enter their chemical information if the information is to be sent by you.
- Ask your customer to provide training to appropriate staff in your company on issues such as:
  - Types of data needed, format of data, and alternative forms of data (e.g., alternative toxicity test results).
  - Why the customer needs the information and how they are using it.
  - How your CBI is being protected.
  - How to use the customer's chemical data web portal.
- If you are a supplier of multi-material components or subassemblies, consider purchasing a software system such as those listed in Appendix D-3 for collecting and reporting chemical data to customers. There are systems available that can provide chemical substance volume tracking of multilevel Bill of Materials (BOMs) and can tie into your ERP/ERM and PLM systems.

Consider enhancing your value to your customers by proactively screening the chemical ingredients of your products to ensure that they are safer to human health and the environment. This may include identifying chemicals that are not currently subject to chemical restrictions such as those restricted by specific states or RoHS, but that have been identified by the scientific community or others as potential chemicals of concern (see Appendix D-1 for guidance).

The importance of good quality data

For some product fabricators and formulators, particularly those in industries such as cosmetics, personal care products, and electronics where suppliers are accustomed to providing chemical data, the challenge is not necessarily getting the data, but getting consistent, accurate, complete, detailed, and current data. Suppliers with robust data gathering and communication systems are more likely to be considered high-value supply chain partners, particularly in these product markets.

Some fabricators and formulators have found that the data provided by their suppliers on chemical content or toxicity is not consistently accurate. To address this issue, some companies combine data gathering with additional validation techniques such as physical testing of materials, components, or products.

The fabricators and formulators profiled in this document have reported that they place a premium on accurate data and value suppliers with systems in place to correctly report chemical data. Under laws such as California Proposition 65 or the EU's RoHS Directive, some manufacturers use third party verifiers to test products for the presence of substances that must be reported or are restricted. Suppliers may want to develop systems to ensure that data provided are consistently accurate.

To be successful in providing this information, companies need to employ a big-picture strategy. Rather than respond to data requests individually, the use of a data management system may allow for a more robust chemical data reporting process.

A robust chemical data system could have the following elements:

- A central database repository for chemical data.
- A system for generating data reports to customers.
- A system for generating data requests to suppliers.
- A system for checking the accuracy of data (e.g., totaling of chemical constituents to check for 100% reporting for chemical mixtures, components or products).
- A system for updating data when changes occur upstream in the supply chain.

Appendix D-3 contains descriptions of software systems for chemical data management.

SECTION 8

How Fabricators and Formulators Use Chemical Data to Make Cleaner and Safer Products

CHEMICAL DATA IS CRITICAL TO THE EFFORTS OF FABRICATORS AND FORMULATORS SEEKING to design and manufacture products that are safer for human health and the environment. The data are used by these companies in a variety of ways, as described here.

Evaluation and scoring of chemical, environmental, health and safety prior to selection for use

Example: In 2001, SC Johnson launched Greenlist™, an innovative chemical classification process that rates raw materials based on their impact on the environment and human health. Greenlist™ scores are reported alongside performance and cost information in the company's chemical formulary so chemists can consider environmental and health properties in choosing materials. Using these scores, materials can be easily compared. Toxicological and other hazard data are needed for SC Johnson toxicologists to develop Greenlist™ scores. The data comes from suppliers and from publicly available databases.

Example: Herman Miller has developed a database of pre-screened materials that represent 80% of the company's common materials. It provides guidance for both new product development and re-design of existing products. This database allows the company to quickly ensure that materials selections are made using the safest materials possible. Any new material must be screened prior to use.

Evaluation and scoring chemicals in existing products to eliminate or substitute toxic components

Example: Nike is engaged in an ongoing effort to develop environmentally preferred material platforms. Chemical ingredients are evaluated for environmental, health, and safety hazards, and high-hazard chemicals are prioritized either for elimination, if possible, or substitution with a safer chemical. This process requires full disclosure of chemical ingredients, and is complex, costly, and slow, particularly when hazard data is difficult to find. A significant portion of the cost comes from the use of toxicology consultants to evaluate the hazards of chemicals in the original material and of potential substitutes.

Using this approach, Nike evaluated the ingredients used to make a rubber outer sole for footwear. The effort resulted in the creation of a new, environmentally preferred material that uses more benign accelerators, vegetable oils, and modified processing chemicals and methods. Chemical substitutes were selected based on low toxicity, performance, processability and cost.

In FY04 Nike launched the first environmentally preferred rubber formulation for use in footwear products. By FY07 Nike had expanded to three environmentally preferred compounds with different properties to meet a range of sport performance requirements for other products. In FY09, 76% of Nike shoes contained environmentally preferred rubber, up from 3% five years earlier.

The company is currently evaluating alternatives to solvents used to produce synthetic leather for footwear products with the goal of identifing more benign, water-based chemical alternatives.

Promoting the use of specific chemicals that are highly rated for environmental safety and health

Example: SC Johnson is promoting the use of greener chemicals in a number of ways. Once the company determines, through its Greenlist™ system that a chemical scores highly and performs well, it promoted through its global formulary and publicized within the company's formulator community. SC Johnson allows suppliers of green chemicals to publicize their products during technical briefing sessions at corporate headquarters in Racine, Wisconsin.

Tracking chemicals of concern in products in preparation for future regulatory requirements

Example: As described on page 30, Hewlett Packard requests information from its suppliers on approximately 240 chemicals of concern that are possibly in electronic components, but are not currently regulated. This voluntary reporting initiative provides HP with information on where and how these chemicals are used in their supply chain, should they become restricted in the future.

Undertaking programs to voluntarily disclose chemical ingredients to customers

Example: SC Johnson is working toward disclosing all ingredients in its air care and home cleaning products, both on product labels and on the company's website. *www.whatsinsidescjohnson.com*

Example: Method discloses all ingredients in its products on the company's website. *http://methodhome.com/*

Example: Seventh Generation discloses all ingredients of all its products on the company's website.
www.seventhgeneration.com/ingredients#ingredients-for-nid-163

Example: The Consumer Specialty Products Association has initiated a voluntary disclosure program whereby formulators and retailers can make product ingredients public within four product categories: air care, automotive care, cleaning products, and polishes and floor care products.
www.cspa.org/public/media/info/cpici.html

Other ways chemical data are used by fabricators/formulators include:

- Reporting of SVHC chemicals under Article 33 of the EU's REACH Regulation.
- Reporting of chemical content under state chemicals regulations, such as those in Maine, Washington, and California.
- Restricting the use of certain chemicals in products (either banning the chemical or limiting its concentration).
- Undertaking research on and application of green chemistry solutions. Green Chemistry is the design of chemicals that reduces or eliminates the need for and generation of hazardous materials during the manufacture, design, and application of chemical products.

SECTION 9

Conclusions and Future Directions

THE REGULATORY AND MARKETPLACE DRIVERS FOR CHEMICAL DATA SHARING BETWEEN FABricators, formulators and their suppliers are likely to increase in the coming years. Retailers will have an increasingly important role in seeking data from their supply chains. Fabricators, formulators, and their suppliers will need to find innovative solutions to efficiently meet the growing demands for chemical information.

Demands for chemical data are likely to increase as government agencies, customers and consumers ask for detailed information on lifecycle impacts of chemicals, materials, and products (for example under California's proposed safer consumer product regulations or in the green building sector). Given these increasing demands, starting to build both data collection systems and relationships through supply chains is of utmost importance. Software systems (such as those described in Appendix D-3) for capturing and reporting chemical data in dynamic manufacturing environments are certainly one important strategy.

Another strategy for facilitating data flow within supply chains and reducing the financial burden on both suppliers and customers is the standardization of customers' requests, and suppliers' data reporting across industry sectors. Lessons can be learned from the automotive industry's International Material Data System and other systems described in Appendix D-2.

A final strategy for facilitating data flow is to increase communication up and down supply chains, particularly from tier to tier, so that expectations and needs are clear, and opportunities exist to improve chemical data flow, and subsequently the health, safety and environmental attributes of products.

The focus of this guidance document has been on access to chemical information for regulatory and voluntary data-driven activities. However, another important factor is that recipients of chemical data be assured that the information they are getting is accurate, and is updated by the supplier when changes are made to the material formulation or source of supply. Some fabricators and formulators have stated that this challenge is equally important to gaining access to data. Suppliers can differentiate themselves by demonstrating that they can consistently provide accurate data and have systems for generating updates when necessary. Furthermore, customers should reward those suppliers that have invested in the infrastructure to provide this level of assurance.

Beyond tracking chemicals and materials of concern, fabricators, formulators, and their suppliers will need to continue to innovate in ways to utilize chemical information to design and manufacture safer products. The approaches and tools developed within the fields of green chemistry, design for environment, and alternatives assessment can provide guidance.

Suppliers may want to get out ahead of coming trends and work with their customers to identify data gaps and work collaboratively to fill them.

APPENDIX A

Terms and Acronyms Used in this Document

Article—An object that is given a special shape, surface or design during production, which determines its function to a greater degree than does its chemical composition. Examples: a car, a battery, or a telephone. Finished products, sub-assemblies, components and materials such as textiles or plastic parts are types of articles.

Assembly—A collection of components and materials that are not intended to be disassembled, or cannot reasonably be disassembled without the use of a specialized tool, by the end user. Finished products are considered to be assemblies.

BIFMA—Business and Institutional Furniture Manufacturer's Association.

CAS (Chemical Abstract Service) registry number—an internationally recognized system of numbers used to uniquely identify substances such as chemical elements, chemical compounds, etc.

CBI—Confidential Business Information, or trade secret.

CMR—Carcinogen, Mutagen or Reproductive toxicant.

Component—A piece of a larger assembly/article. Example: a computer circuit board (composed of many components such as the power supply, memory chips, etc.).

Consumer—A member of the general public purchasing finished products.

CSPA—Consumer Specialty Products Association.

Customer—The fabricator or formulator that purchases articles, components, or assemblies.

Fabricator—A manufacturer of articles.

Formulator—A manufacturer of a preparation or a mixture of chemical substances. These can be gaseous, liquid, or solid preparations (paints, liquid cleaning products, adhesives, etc.). The products that formulators make can be intermediate or finished products sold to another formulator, a fabricator, a distributor, retailer, or consumer.

HAP—Hazardous Air Pollutant.

Homogeneous material—A material that cannot be mechanically separated into different materials; the materials are of uniform composition throughout. Examples: ceramics, glass, metals, alloys, paper, board, resins, and coatings. Mechanically separation includes processes such as unscrewing, cutting, crushing, grinding, and abrasion.

INCI (International Nomenclature of Cosmetic Ingredients) system—The official dictionary for cosmetic ingredients which was established in the early 1970's by the Personal Care Products Council (former CTFA, Cosmetic, Toiletry, and Fragrance Association).

Intentionally added—Any ingredient deliberately used in a material or part where its use in or continued presence in the finished article is desired to provide a specific characteristic, appearance, or quality, or where the ingredient is added in manufacturing and where some or all remains in the final product (e.g., a catalyst or solvent carrier). Intentionally added substances and materials can be introduced at any point in the supply chain.

Material—Items used to construct parts. Examples: polyethylene, aluminum, etc.

Part—Any item or assembly that a supplier sells to a customer to be incorporated into a finished product.

Parts per million (ppm)—Used to express the concentration of substances.

PBT—Persistent, Bioaccumulative, and Toxic.

Preparation—A mixture or solution made of two or more chemical substances. Examples: inks, paints, adhesives. Examples of dry or solid preparations would include materials such as powdered detergents, printer toners, and cement.

Product—A complete assembly, chemical mixture, or other item intended to be used as-is by a consumer.

REACH—Registration, Evaluation, and Authorization of Chemicals.

RoHS—Restriction of Hazardous Substances.

SVHC—Substances of Very High Concern.

Tier I Supplier—The immediate supplier to a fabricator or a formulator.

Tier II Supplier—The immediate supplier to a Tier I supplier. Each additional tier in the supply chain is a step further removed from the fabricator/formulator.

Substance—Chemical elements, their inorganic and organic compounds, and polymers. Examples: iron, sodium chloride (common table salt), ethylene, and polyethylene. As defined by REACH, a chemical element and its compounds in the natural state or obtained by any manufacturing process, including any additive necessary to preserve its stability and any impurity deriving from the process used, but excluding any solvent which may be separated without affecting the stability of the substance or changing its composition.

VOC—Volatile Organic Compound.

APPENDIX B

Examples of Company Data Collection Practices

Company	Program	Supporting Chemical Data Needed
method™	Cradle-to-Cradle Certification (MBDC/EPEA) Risk Mitigation—third party EPEA GmbH conducts a safety review of all raw materials prior to use in a formulation	Identification of all ingredients including: • Additives • Dyes, pigments • Residual monomers • Preservatives • Identification of all unreacted raw materials, reaction byproducts, residual catalysts, diluents Chemical hazard information requested for each material supplied, if available: • Toxicity—oral and dermal LD50 data • Biodegradation testing (OECD 301D preferred) • Aquatic toxicity • Mutagenicity • Carcinogenicity • Sensitization potential • Bioaccumulation potential (if calculated).
	Carbon footprinting	Location of manufacture
		Feedstock identity
	Restricted Substances List (RSL) compliance program	Analytical test results for supplied materials, components and products to verify compliance. See: *http://greenchemistryandcommerce.org/downloads/Nike_final.pdf*
	Considered Chemistry Program to develop environmentally preferred material (EPM)	Chemical formulation and hazard information for materials
	Safety assessments at contract factories	Chemical formulation and hazard information for materials that are used at contract facilities to manufacture products, including materials such as adhesives and solvents used in manufacturing operations.
Johnson & Johnson	FDA requirements REACH compliance EU Cosmetics Directive 76/768/EEC Determine whether to source materials for own factories and contract factories Write specs for materials purchased	Chemical composition data, including all components in the finished product with concentrations > 1 ppm Fragrance information (not fragrance composition, which is proprietary) Human toxicity, including : • Acute toxicity • Skin irritation • Mucous membrane irritation • Sensitization • Mutagencity Summary of Eco-Toxicological impact from raw material, including persistence, bioaccumulation, and toxicity

CONTINUED

Company	Program	Supporting Chemical Data Needed
SC Johnson A Family Company	Greenlist™ evaluation of preferred ingredients and ingredients to avoid EPA DfE Certification	Full disclosure of all ingredients for a commercial raw material, including: • All intentionally added chemicals • Reaction by-products • Additives • Preservatives • Unreacted materials Toxicological and other hazard data for individual chemicals or more complex materials to develop Greenlist™ scores. Some suppliers regard their products as highly proprietary. In these cases, the supplier determines the Greenlist™ score and provides only the score.
true.	In house Product Approval Submittal System (PASS)—used in facilities to identify regulated hazardous materials and screen out products containing hazardous ingredients of concern. PASS supports efforts to reduce usage of chemicals that are SARA 313, HAPs, and VOCs, to control & communicate to associates the raw materials that are approved or rejected for production usage.	All chemicals, particularly SARA 313, HAPs, VOCs Chemical quantity is requested to the nearest tenth of a percent. MSDS % VOC SARA reportable % concentration HAPs % concentration For some products, ATMI (American Textile Manufacturers Institute) questionnaire with % metal content in ppm and biocide ppm.
hp	REACH Compliance	Information on Substances of Very High Concern (SVHC) under Article 33 of the EU's REACH Directive. HP's suppliers are required to provide information on the weight of substances listed on the current Annex XIV candidate list of chemicals under REACH. Suppliers are given the option to indicate where the substances are used in the product.
	Voluntary chemical reporting initiative, which provides HP with information on chemicals of concern in their supply chain. Includes chemicals that HP considers to be possible targets for future chemical regulation under REACH and/or other regulatory programs.	Information from HP's suppliers on approximately 240 chemicals (weight of substances and location of substances optional), possibly in electronic components that are: • Carcinogens, mutagens and reproductive toxins (CMRs) • Persistent, bioaccumulative and toxic chemicals (PBTs) • Endocrine disruptors
	HP's General Specification for the Environment (GSE) Development of MSDSs and green certification programs such as EPEAT and Blue Angel	Additional chemical identity, toxicity, physical hazard, and other data required for these programs.

CONTINUED

Company	Program	Supporting Chemical Data Needed
Walmart	Chemical Assessment Review Process (CARP)	Identification of all ingredients in the product Characteristics of the product that could pose a hazard (flashpoint, pH, applicable LD50s, etc.) MSDS
	GreenWERCS Program	Chemical hazard information on the product as a whole is scored based on regulatory lists of the categories below: • Carcinogens, mutagens and reproductive toxins (CMRs) • Persistent, bioaccumulative and toxic chemicals (PBTs) • Endocrine disruptors

APPENDIX C

Sample letters and forms

C-1: Sample customizable letter to suppliers requesting chemical information

C-2: Sample customizable material information form

APPENDIX C-1

Sample Customizable Letter to Suppliers Requesting Chemical Information

Date

Name
Company
Address

Dear :

I am writing to request information on the following chemicals/materials/components/products that you are supplying to us/we are interested in purchasing from you:

Product 1
Product 2

This information is needed by Company (choose one or more of the following)

to help us comply with regulations that restrict the use of certain chemicals in our products

to help us comply with regulations that require disclosure of chemical content in our products

to support our company's program that restricts the use of certain chemicals in our products

to evaluate environmental, health and safety characteristics of chemicals prior to selection for use in our products

to ensure that all the chemical ingredients in our products meet our standards for safety

to support our participation in a green certification program, called name of program

to help us comply with a retailer customer's requirements to disclose chemical ingredients in our products

to support our company's voluntary program to disclose chemical ingredients to our customers

Please fill out the form attached, sign and return to us.

If you have questions, need additional guidance, or would like to set up a non-disclosure agreement (NDA) or other mechanism to protect trade secret information, please contact _____ at _____

Sincerely,

_____

APPENDIX C-2

Sample Customizable Material Information Form

Material Information Form

Material Name (INCI format, if possible):
CAS No:
Trade Name:
Producing Company:
Location of Manufacture:

For each product supplied, we request the information indicated below. Please check each item that is being provided, attach documents requested and sign at the bottom.

___ **Material Safety Data Sheet (MSDS)/Safety Data Sheet (SDS)—attach**

___ **Technical data sheet—attach**

___ **Certificate of analysis (COA) (if available)—attach**

___ **Chemical composition information—fill in information below**

Please copy and complete the table for each product that we are requesting information on.

Target weights plus impurities should total to 100%

List all intentionally-added[1] constituents in part 1 of the table below and impurities in part 2

Part 1. Intentionally-added constituents—if supplied material is the product of chemical synthesis, list feedstock materials and solvents			
Constituent name (INCI or equivalent)	**CAS number[2]/ EINECS or ELINCS[3]/ EC No[4]/C.I.[5]**	**Weight % (minimum/ maximum/ target)**	**Constituent function in product***

* Constituent function can be: raw material/feedstock, preservative/anti-oxidant, solvent, catalyst, coating, finishing chemical, fragrance, UV filter, or other categories.

Part 2. Impurities—list impurities regardless of amount, including residues, catalysts, reaction by-products, residual solvent carriers, unreacted raw materials (e.g., monomers).			
Constituent name	**CAS number/ *EINECS or ELINCS*/ EC No/C.I.**	**Maximum level in weight %, ppm or ppb**	**Comments (including explanation of why impurity is in the product)**

If composition is not completely listed, please indicate reason below

1 *Intentionally added* means anything deliberately utilized in the formulation of a material, part or product where its use in the formulation or continued presence in the finished article is desired to provide a specific characteristic, appearance or quality or where it is added in manufacturing and where some or all remains in the final product (e.g., a catalyst or solvent carrier). Intentionally added substances and materials can be introduced at any point in the supply chain—a sub-tier supplier may add a material or substance to a material or part that a tier 1 supplier sells to a customer.

If supplied material is the product of chemical synthesis, feedstock materials and solvents should be listed.

2 *CAS* (Chemical Abstract Service) registry numbers are unique numerical identifiers for chemical compounds, polymers, biological sequences, mixtures and alloys.

3 The EINECS number is a registry number given to each chemical substance commercially available in the EU between January 1, 1971 and September 18, 1981. The inventory was created by Directive 67/548/EEC. As of September 19, 1981, the inventory has been replaced by the ELINCS. All new substances brought in to the European market are allocated an ELINCS number after their notification to the European Commission.

4 EC-No, or European Commission number, is the seven-digit code that is assigned to chemical substances that are commercially available within the European Union.

5 Colorants (dyes and pigments) are listed according to Colour Index Generic Names and Colour Index Constitution Numbers

___ Human Safety information

If your company has conducted toxicological testing of chemicals/materials/components/products that you are supplying/that we are evaluating, **please attach robust summaries of the tests performed.**

Please provide test summary information for chemical/material/component/product as supplied in the table below.

Test	Test protocol	Date	Result	No information available*
Carcinogenicity				
Mutagenicity				
Reproductive toxicity				
Developmental toxicity				
Endocrine disruption potential				
Acute toxicity				
Chronic toxicity				
Irritation potential				
Sensitization potential				
Other				
Other				
Other				
General comments/notes:				

* List reason for lack of information.

___ **Ecotoxicological information**

If your company has conducted ecotoxicological testing of chemicals/materials/components/products that you are supplying/that we are evaluating, **please attach robust summaries of the tests performed.**

Please provide test summary information for chemicals/materials/components/products as supplied in the table below.

Test	Test protocol	Date	Result	No information available*
Fish toxicity				
Algae toxicity				
Daphnia toxicity				
Biodegradability				
Bioaccumulation potential				
Organohalogen content	**Yes, as follows:**		__ **No organohalogen content**	
Metal content	**Yes, as follows:**		__ **No metal content**	
Other				
Other				
Other				
General comments/notes:				

* List reason for lack of information.

___ **Potential for human or environmental exposure to chemicals of concern**

Please provide the following information related to potential for human or environmental exposure.

In what form is the product shipped? (e.g., powder, liquid, gas, etc.)

In what form is the product used by the factory. (e.g., dust form, liquid emulsion form, etc.)

How should excess product be disposed of?

Are there any special wastewater treatment requirements for this material?

"As an authorized representative of the company, I verify that all responses provided above are correct, based upon our currently available data."

NAME _____ TITLE _____

LOCATION _____

DATE _____ SIGNATURE _____

APPENDIX D

Additional Information and Resources

D-1: Key regulations that require fabricators and formulators to report chemical data

D-2: Industry sector initiatives to streamline chemical data collection

D-3: Software for collecting and reporting chemical data to customers

D-4: Sources for chemical hazard and toxicity data

D-5: Sources for information on safer chemicals

D-6: Systems for evaluating the safety and design of chemicals, chemical products, and processes

APPENDIX D-1

Key Regulations that Require Fabricators and Formulators to Report Chemical Data

1. REACH

The European Union's REACH Regulation (Registration, Evaluation, Authorisation and Restriction of Chemicals) requires companies involved in manufacturing or importing chemicals (or products containing chemicals) into the EU to collect or generate data on these substances. It is designed to control risks to human health and the environment and promote innovation in safer products.

For substances produced or imported in quantities of 1 tonne or more per year per company, manufacturers and importers need to submit a registration dossier to the European Chemicals Agency (ECHA). Testing and data requirements increase depending on production volume.

REACH contains a provision for the "authorization" of chemicals to ensure that substances of very high concern (SVHCs) are controlled and substituted by safer substances or technologies or only used where there is an overall benefit for society. These substances will be prioritized over time and included in Annex XIV of REACH. Once included, ECHA may impose restrictions on the manufacture, use or placing on the market of these SVHC. If an end-use consumer requests information on SVHCs in a product, and the product contains more than 0.1% by weight (w/w) of an SVHC chemical, the manufacturer must respond within 45 days with information that will enable the safer use of the product, at a minimum the name of the substance (from Article 33 of REACH). See: *http://ec.europa.eu/environment/chemicals/reach/reach_intro.htm*

2. RoHS

The European Union's Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment 2002/95/EC (commonly referred to as the Restriction of Hazardous Substances Directive or RoHS) was adopted in February 2003 by the European Union. The RoHS directive took effect on 1 July 2006, and is required to be enforced and become law in each member state. This directive restricts the use of six hazardous materials—Lead (0.1%); Cadmium (0.01%); Mercury (0.1%); Hexavalent Chromium (0.1%); polybrominated biphenyl (PBBs—flame retardant) (0.1%); polybrominated diphenyl ethers (PBDEs—flame retardant) (0.1%)—in the manufacture of various types of electronic and electrical equipment. It is closely linked with the Waste Electrical and Electronic Equipment Directive (WEEE) 2002/96/EC which sets collection, recycling and recovery targets for electrical goods and is part of a legislative initiative to solve the problem of huge amounts of toxic e-waste. The directive is currently being reviewed and it is expected that additional substances will be added, exemptions retired, and the scope expanded. See: *http://ec.europa.eu/environment/waste/weee/legis_en.htm*

3. Prop 65

California's Safe Drinking Water and Toxic Enforcement Act of 1986, commonly known as "Prop 65" prohibits the discharge or release of any chemical known to the state to cause cancer or reproductive toxicity into water or onto or into land where such chemical passes or probably will pass into any source of drinking water. Knowing and intentional exposure of any individual to a chemical known to the state to cause cancer or reproductive toxicity without first giving clear and reasonable warning to such individual (e.g. labeling) is also prohibited. The Act requires the Governor to annually publish a list of those chemicals known to the state to cause cancer or reproductive toxicity and establishes the Safe Drinking Water and Toxic Enforcement Fund to implement and administer the regulation. See: *http://oehha.ca.gov/prop65/background/p65plain.html*

4. EU Cosmetics Directive

The European Union Cosmetics Directive requires that cosmetics sold in the EU be free of ingredients that are harmful to human health. (The directive provides a list of chemical ingredients that may not be used in cosmetics (Annex II), and a list of chemical ingredients that may only be present at restricted levels (Annex III). The Directive also requires that cosmetics be labeled with their ingredients listed, provides an ingredient nomenclature common across the Member States, and bans the testing of cosmetics on animals or the sale of any product itself tested on animals or which contains ingredients tested on animals. See: *http://ec.europa.eu/consumers/sectors/cosmetics/documents/directive/index_en.htm*

5. EU Toy Safety Directive

The European Union Toy Safety Directive came into force in January 2011 and requires that toy manufacturers test for potential hazards to children, including hazards posed by chemicals, prior to sale in the EU marketplace. The Toy Safety Directive also requires that toys be in compliance with all other chemicals regulations, including REACH. Toys may not contain chemicals that are carcinogenic, mutagenic, or reproductive toxicants (CMRs) or any of 55 specific fragrances. Eleven other fragrances must be listed on the toy's packaging if added in concentrations of .01% of the product's weight. New limits on certain metals are also included, and are restricted based on percentage of the final product by weight depending on the form of the substance (powder, liquid, etc.). See: *http://ec.europa.eu/enterprise/sectors/toys/documents/directives*

6. Washington: Children's Safe Products Act

The state of Washington passed the Children's Safe Products Act of 2008 which calls for the virtual elimination of phthalates, lead, and cadmium in children's products. Children's products includes cosmetics, jewelry, toys, and other products intended for or marketed to children under the age of 12. The Act also calls for the state to identify high priority chemicals that are of high concern to children found through biomonitoring to be within the human body, present in household dust, drinking water, or otherwise in the home environment by 2009. The Act requires manufacturers of products containing high priority chemicals to provide notice to the state. Children's products or product categories that may contain these chemicals will be identified. A report will be issued accordingly with policy options for addressing the presence of these chemicals in children's products. See: *www.chemicalspolicy.org/chemicalspolicy.us.state.php*

7. Maine: Act to Protect Children's Health and the Environment from Toxic Chemicals In Toys and Children's Products

Maine enacted the "Act to Protect Children's Health and the Environment from Toxic Chemicals in Toys and Children's Products" in April of 2008. The Act calls for the publication of a list of chemicals of high concern. The Act permits the Commissioner of Environmental Protection to designate a chemical of high concern as a priority chemical if the chemical meets certain criteria, at which time a manufacturer or distributor of a children's product that contains the priority chemical must provide certain information to the state. See: *www.chemicalspolicy.org/chemicalspolicy.us.state.php*

More information on federal, state, and international laws that require chemical data or restrict particular chemicals can be found at *www.chemicalspolicy.org*.

APPENDIX D-2

Industry Sector Initiatives to Streamline Chemical Data Collection

The following sector-based initiatives are profiled here:

1. Electronics Industry—JIG, IPC-1752
2. Automotive Industry—GADSL, IMDS
3. Personal Care Products Council Supplier Questionnaire
4. American Textile Manufacturers Institute (ATMI) Voluntary Product Environmental Profile (Supplier Questionnaire)
5. Apparel and Footwear—AAFA Restricted Substances List
6. ANSI/BIFMA e3-2010 Furniture Sustainability Standard
7. Global Data Synchronization Network (GDSN)

1. Electronics Industry—JIG, IPC-1752

Joint Industry Guide for Material Composition Declaration for Electronics Products (JIG)

A workgroup composed of electronics industry representatives developed the JIG to promote consistent and standardized material declaration requests across the global supply chain. The JIG contains lists of materials and substances for disclosure; threshold levels for reporting; regulatory requirements establishing reporting thresholds; and recommended data fields. Three criteria determine whether substances need to be declared: Criteria 1—R (Regulated)—substances that are prohibited or restricted by regulation or require labeling; Criteria 2—A (Assessment)—substances that are likely to be subject to enacted legislation; and Criteria 3—I (Information) unregulated substances where there is a recognized market requirement for reporting their content. Thresholds for substance/material reporting are governed either by regulations for regulated substances. When a substance is restricted by law but no threshold is specified, "intentionally added" acts as threshold. For Criteria 3—I substances, the default threshold is 0.1% (1000 pmm) by weight of product. See: *http://www.ce.org/PDF/JIG_101_Ed_3_1_final_100913.pdf*

IPC-1752

Materials Declaration Management Standard (IPC—Institute for Printed Circuits) established standardized material declaration forms and electronic data exchange formats to facilitate electronic reporting for suppliers and customers along the electronics supply chain. See: *http://members.ipc.org/committee/drafts/2-18_d_MaterialsDeclarationRequest.asp*

2. Automotive Industry—GADSL, IMDS

Global Automotive Declarable Substances List (GADSL)

GADSL was created by the Global Automotive Stakeholders Group (GASC), comprising automakers, parts suppliers and chemical/plastics industries. The list currently includes 139 "declarable" or "prohibited" substances or families of substances (e.g. lead and its compounds) that are expected to be present in a vehicle at the point of sale. It does not cover substances used during manufacturing processes. There are two categories of substances: prohibited substances ("P") are prohibited from use in automotive products, absolutely or only when they exceed certain threshold limits; and declarable substances ("D") are not prohibited but must be declared (for recycling purposes) when they exceed certain thresholds. "D/P" substances are prohibited in some applications and declarable in all other cases. Like the JIG (described above), GADSL classifies substances as Legally Regulated, For Assessment, or for Information. Where substances are not regulated or projected to be regulated, the 2010 GADSL Version 1.0 document states that a substance may be listed if:

> "It is demonstrated, by testing under OECD (Organization for Economic Cooperation & Development) guidelines for testing chemicals, conducted under Good Laboratory Practice (according to the OECD Principles on Good Laboratory Practice as revised in 1997), that the substance may be associated with a significant hazard to human health and/or the environment, and its presence in a material or part in a vehicle may create a significant risk to human health and/or the environment. Other scientifically valid methodology, based on the weight of evidence, may also be considered."

Declaration thresholds are 0.1 g/100g (weight %, or 0.1% or 1000 ppm) non-separable, homogeneous materials, unless a regulation sets a lower threshold. See: *www.americanchemistry.com/s_plastics/blank.asp?CID=1106&DID=9290*

International Material Data System (IMDS)

A consortium of auto manufacturers developed the IMDS, an online database that suppliers can use to provide standardized information on chemical substances in the parts they sell to auto manufacturers. As of 2006, the IMDS contained a list of over 8,000 substances. Users can choose to report on a GADSL subset list. See: *www.mdsystem.com/html/en/home_en.htm*

3. Personal Care Products Council Supplier Questionnaire

The Personal Care Products Council developed a standardized supplier questionnaire for it's members that addresses data requirements for a variety of regulatory programs affecting the industry. See: *www.personalcarecouncil.org/member-industry-resources/standardized-raw-material-information-form-rmif*

4. American Textile Manufacturers Institute (ATMI) Voluntary Product Environmental Profile (Supplier Questionnaire)

This questionnaire addresses data requirements for a variety of regulatory programs affecting the textile industry. See: *http://reference.milliken.com/supplier/documents/atmivpep.pdf*

5. Apparel and Footwear—AAFA Restricted Substances List

The American Apparel & Footwear Association (AAFA) created, and regularly updates, a global restricted substances list (RSL) covering home textiles, apparel and footwear. First released in 2007, the list covers chemicals and other substances whose presence in a product is regulated through a government standard or law. It identifies the most restrictive version of that regulation internationally, and is reviewed and updated every six months. The 2010 release reflects changes made by the Consumer Product Safety Improvement Act (CPSIA) and now includes US state chemical regulations. See: *www.apparelandfootwear.org/Resources/RestrictedSubstances.asp*

6. ANSI/BIFMA e3-2010 Furniture Sustainability Standard

Developed by the Joint Committee on Business and Institutional Furniture Sustainability, the e3-2010 Furniture Sustainability Standard was created through a partnership between BIFMA (the Business and Institutional Furniture Manufacturers Association) and NSF International. The goal of the standard was to create a single furniture standard for the office furniture sector industry which would allow customers to identify environmentally preferred furniture in the marketplace. The standard is designed to offer a pathway for improvement, and applies to components and materials used by suppliers, as well as finished furniture. Criteria upon which the standard is based include energy usage, human and ecosystem health, and more general concerns of social responsibility. Companies adhering to the standard can choose first, second, or third-party certification, and can show improved environmental performance by reaching higher levels of achievement within the standard. See: *http://bifma.org/public/SusFurnStdArchive/Draft/2009-02-20%20e3.pdf*

7. Global Data Synchronization Network (GDSN)

The Global Data Synchronization Network is an international framework for facilitating data sharing between retailers and suppliers. It is a platform that allows companies to manage product information on a wide variety of parameters. The system is designed so that suppliers can provide detailed information on chemical contents to a third party who will keep the information confidential. Retailers can then access selected information from the third party, if the supplier grants permission. The information released may be the results of screening based on company-specific restrictions, regulatory requirements, or other specifications. The system allows retailers to select products that meet their specifications, while allowing suppliers to maintain confidentiality about their formulations. It also allows those participating to be notified when changes are made to any of the partners' databases, including product formulation and/or design. The GDSN is particularly relevant for regulatory compliance and developing procurement initiatives. See: *www.gs1.org/gdsn*

APPENDIX D-3

Software for Collecting and Reporting Chemical Data to Customers

A chemical data management system can be a valuable tool for handling data collection and reporting requirements. Listed below are examples of commercial software systems.

1. WercsHELP

WercsHELP is a software tool that allows companies to track and assess ingredients in products, as well as regulatory implications of those ingredients. Several retailers, such as Sears and Walmart, now require chemical product suppliers to provide information on intentionally added ingredients to WercsHELP. WercsHELP keeps the formulation data confidential, but lets retailers know whether the products are regulated under federal or state environmental laws, and how they should be handled and disposed of. See *www.wercsmart.com/wercs.html*

2. Material Disclosure Software from Actio Corporation

Actio Chemical Management software is designed to allow suppliers and manufacturers to automate communications and their chemical-substance data management. Actio software automates supplier efforts and funnels related data into a unique, secure, central database. Both suppliers and manufacturers quickly become compliant with regulations, directives and standards relevant to their needs—such as REACH, RoHS, WEEE, IPC 175x, GADSL, Tier 2, safer chemistry regulations, and HAP/VOC-related emission reductions. See: *www.actio.net/default/index.cfm/products/material-disclosure*

3. InSight Environmental Compliance Software from PTC

Software company PTC offers a suite of programs aimed at Product Lifecycle Management in the Industrial, High Tech, Aerospace & Defense, Automotive, Consumer, and Medical Device industries. InSight allows users to track the environmental performance of its products, materials, and parts from its suppliers along multiple dimensions. See: *www.ptc.com/products/insight/environmental-compliance*

4. Comply Plus Software from IHS

Comply Plus from IHS assists firms with data management by automating data collection from MSDSs, regulatory sources, and chemical inventories into a system customized to each firm's needs. This system allows companies to begin where they are and develop more complex data management systems as their needs and experiences change over time. The system allows companies to develop detailed chemicals management systems to identify and reduce chemicals subject to regulatory requirements and others of concern through supply chains. See: *www.dolphinmsds.com/default.asp?id=17*

5. The SciVera Lens

SciVera Lens is a web-based assessment system able to analyze both final products and their chemical ingredients. The system is designed as a tool for decision-makers of varying levels of familiarity with chemicals management by collecting product ingredient data along supply chains. The program enables data sharing between customers and suppliers while protecting CBI and other supplier information. The Lens is currently available to a limited number of industrial sectors. See: *www.scivera.com/products.php*

APPENDIX D-4

Sources for Chemical Hazard and Toxicity Data

Databases

A number of databases for chemical hazard and toxicity data have been created. A selection of such databases are listed below.

ATDSR Minimal Risk Levels for Hazardous Substances	*www.atsdr.cdc.gov/mrls/index.html*
EDF Chemical Scorecard Database and related information	*www.scorecard.org*
EPA ACToR Toxicology Database	*http://actor.epa.gov/actor*
EPA Analog Identification Tool	*http://aim.epa.gov/default.cfm?CFID=9738310&CFTOKEN=29241229 &jsessionid=4a30aedaf5dfe06e15c1273c273874725230*
EPA EPI Suite	*www.epa.gov/opptintr/exposure/pubs/episuite.htm*
EPA HPVIS (High Production Volume Information System)	*www.epa.gov/HPV/hpvis/index.html*
IUCLID (International Uniform ChemicaL Information Database) 5	*http://iuclid.eu/index.php?fuseaction=home.project*
Human and Environmental Risk Assessments on Ingredients in Household Cleaning Products	*www.heraproject.com/RiskAssessment.cfm*
National Toxicology Program Searchable Database	*http://ntp-apps.niehs.nih.gov/ntp_tox/index.cfm*
TOXNET	*http://toxnet.nlm.nih.gov*
UNEP–SIDS for High Volume Chemicals	*www.chem.unep.ch/irptc/sids/oecdsids/indexcasnumb.htm*

Lists of chemicals of concern

The following compilation of lists was created by Clean Production Action (www.cleanproduction.org) and the Healthy Building Network (www.healthybuilding.net/index.html) and published as the "Chemicals of High Concern—List of Lists" in January of 2009 (see www.cleanproduction.org/Greenscreen.php or www.bizngo.org/pdf/CPA-HBN_Red_List_26jan09.pdf) is reproduced in this document with permission. CPA and HBN also created a spreadsheet of chemicals on those lists that can viewed at www.bizngo.org/resources.php, under "Safer Chemicals", "Red List of Chemicals."

To generate this compilation of lists, Clean Production Action (CPA) and Healthy Building Network (HBN) started from authoritative chemical lists developed by a body established by one or more government entities. No authoritative government lists currently exist for neurotoxicants, chemicals that are very persistent and toxic (vPT) and

very bioaccumulative and toxic (vBT) and endocrine disruptors. For endocrine disruptors, the government lists are preliminary screening lists that identify chemicals that are prime candidates for the high concern label, but are in need of further assessment before they can be assigned with certainty. Since neurotoxicity and endocrine disruption are endpoints of high concern, they provide "watch" lists to flag chemicals that may meet these criteria. While these chemicals are under assessment, precautionary avoidance is warranted.

It is important to note that the authoritative lists are based on evaluation of only a limited set of the approximately 80,000 chemicals in commerce. Many chemicals have simply not been tested. Therefore it is important to assess the available toxicological literature on chemicals which are not listed and to use modeling tools and analogs to determine whether the weight of evidence indicates that a chemical is a chemical of high concern. The authoritative and watch lists that follow provide a starting point for identifying chemicals of high concern.

Persistent, Bioaccumulative and Toxic (PBT) Substances

1. United Nations Environment Programme (UNEP), Stockholm Convention Secretariat Stockholm Convention on Persistent Organic Pollutants (POPs)
   Source: For the list of 12 POPs under the convention, see: *http://chm.pops.int/Convention/12POPs/tabid/296/language/en-US/Default.aspx* (accessed 10/23/2008); and for chemicals in review process, see: *http://chm.pops.int/Convention/POPsReviewCommittee/RecommendationsofthePOPRC/tabid/440/language/en-US/Default.aspx* (accessed 01/29/2009).

2. US Environmental Protection Agency (EPA), Toxics Release Inventory (TRI) Program, "TRI PBT Chemical List"
   Source: *www.epa.gov/triinter/trichemicals/pbt%20chemicals/pbt_chem_list.htm* (accessed 1/26/09).

3. US Environmental Protection Agency (EPA), Persistent Bioaccumulative and Toxic (PBT) Chemical Program, Priority PBT Profiles
   Source: *www.epa.gov/opptintr/pbt/pubs/cheminfo.htm* (accessed 10/23/2008).

4. US Environmental Protection Agency (EPA), National Waste Minimization Program, Priority Chemicals
   Source: *www.epa.gov/epawaste/hazard/wastemin/priority.htm* (accessed 10/23/2008).

5. European Union, European Chemicals Bureau, European Chemical Substances Information System (ESIS) PBT list
   Source: *http://ecb.jrc.it/esis/index.php?PGM=pbt* (accessed 10/23/2008).

6. State of Washington, Department of Ecology, Chapter 173-333 WAC Persistent Bioaccumulative Toxins
   Source: *http://apps.leg.wa.gov/WAC/default.aspx?cite=173-333-310* (accessed 1/26/09).

very Persistent and very Bioaccumulative (vPvB) Substances

1. European Union vPvB list (vPvB's are included in the PBT list). See European Union, European Chemicals Bureau, European Chemical Substances Information System (ESIS)
   Source: *http://ecb.jrc.it/esis/index.php?PGM=pbt* (accessed 10/23/2008).

Carcinogenicity

1. US National Institutes of Health, National Institute of Environmental Health Sciences, National Toxicology Program (NTP), Report on Carcinogens (ROC)
   a. Known to be Human Carcinogens
   b. Reasonably Anticipated to be Human Carcinogens
   Source: http://ehis.niehs.nih.gov/roc (accessed 10/23/2008).

2. US Environmental Protection Agency (EPA), National Center for Environmental Assessment, Integrated Risk Information System (IRIS) Database
   a. 1999 and 2005 Guidelines:
      i. "Carcinogenic to humans"
      ii. "Likely to be carcinogenic to humans"
   b. 1996 Guidelines: "Known/likely human carcinogen"
   c. 1986 Guidelines:
      i. "Group A - Human Carcinogen"
      ii. "Group B1 - Probable human carcinogen"
      iii. "Group B2 - Probable human carcinogen"

Source: *www.epa.gov/ncea/iris/search_human.htm* (accessed 10/23/2008).

3. International Agency for Research on Cancer (IARC), Agents Reviewed by the IARC Monographs
   a. Group 1: Agent is carcinogenic to humans
   b. Group 2A: Agent is probably carcinogenic to humans

Source: *http://monographs.iarc.fr/ENG/Classification/index.php* (accessed 10/23/2008).

4. State of California Environmental Protection Agency, Office of Environmental Health Hazard Assessment (OEHHA) California Proposition 65 (Safe Drinking Water and Toxic Enforcement Act Of 1986) Chemicals Known to the State to Cause Cancer or Reproductive Toxicity
   Source: *www.oehha.ca.gov/prop65/prop65_list/Newlist.html* (accessed 10/23/2008).

5. European Commission, Enterprise and Industry DG, Carcinogens List—See consolidated version of Annex I of Directive 76/769 EEC, which includes Annex I of Directive 65/548/EEC (which is to be replaced by Annex XVII of REACH on 1 June 2009).
   a. Carcinogen Category 1: "known"
   b. Carcinogen Category 2: "should be considered carcinogenic to humans"
   Source: *http://ec.europa.eu/enterprise/chemicals/legislation/markrestr/index_en.htm* (accessed 10/23/2008).

6. European Commission, Joint Research Centre (DG JRC), Institute for Health and Consumer Protection (IHCP), Consumer Products Safety & Quality (CPS&Q) Unit, Substances with EU Risk & Safety Phrases (Commission Directive 67-548-EEC)
   a. R45 "May cause cancer"
   b. R49 "May cause cancer by inhalation"
   Source: *http://ecb.jrc.it/documentation/* (click on: "DOCUMENTS", "CLASSIFICATION-LABELLING", "DIRECTIVE 67-548-EEC", "ANNEX I OF DIRECTIVE 67-548-EEC", and then either of the files listed as: "Annex I of Directive 67548EEC") (accessed 10/23/2008).

7. National Institute for Occupational Safety and Health (NIOSH) Carcinogen List
   Source: *www.cdc.gov/niosh/topics/cancer/npotocca.html* (accessed 1/26/09).

Mutagenicity

1. European Commission, Enterprise and Industry DG, Mutagens List—See consolidated version of Annex I of Directive 76/769 EEC, which includes Annex I of Directive 65/548/EEC (which is to be replaced by Annex XVII of REACH on 1 June 2009).
   a. Mutagen Category 1: "Substances known to be mutagenic to man"
   b. Mutagen Category 2: "Substances which should be regarded as if they are mutagenic to man"
   Source: *http://ec.europa.eu/enterprise/chemicals/legislation/markrestr/index_en.htm* (accessed 10/23/2008).
2. European Commission, Joint Research Centre (DG JRC), Institute for Health and Consumer Protection (IHCP), Consumer Products Safety & Quality (CPS&Q) Unit, Substances with EU Risk & Safety Phrases (Commission Directive 67-548-EEC)
   a. R46 "May cause heritable genetic damage"
   Source: *http://ecb.jrc.it/documentation/* (click on: "DOCUMENTS", "CLASSIFICATION-LABELLING", "DIRECTIVE 67-548-EEC", "ANNEX I OF DIRECTIVE 67-548-EEC", and then either of the files listed as: "Annex I of Directive 67548EEC") (accessed 10/23/2008).

Reproductive/Development Toxicity

1. European Commission, Enterprise and Industry DG, Reproductive Toxicants List—See consolidated version of Annex I of Directive 76/769 EEC, which includes Annex I of Directive 65/548/EEC (which is to be replaced by Annex XVII of REACH on 1 June 2009).
   a. Reproduction Category 1: "known" to impair fertility in humans or cause developmental toxicity in humans"
   b. Reproduction Category 2: "should be regarded as if" they impair fertility to humans or cause developmental toxicity to humans"
   Source: *http://ec.europa.eu/enterprise/chemicals/legislation/markrestr/index_en.htm* (accessed 10/23/2008).
2. European Commission, Joint Research Centre (DG JRC), Institute for Health and Consumer Protection (IHCP), Consumer Products Safety & Quality (CPS&Q) Unit, Substances with EU Risk & Safety Phrases (Commission Directive 67-548-EEC)
   b. R60 "May impair fertility"
   c. R61 "May cause harm to the unborn child"
   Source: http://ecb.jrc.it/documentation/ (click on: "DOCUMENTS", "CLASSIFICATION-LABELLING", "DIRECTIVE 67-548-EEC", "ANNEX I OF DIRECTIVE 67-548-EEC", and then either of the files listed as: "Annex I of Directive 67548EEC") (accessed 10/23/2008).
3. State of California Environmental Protection Agency, Office of Environmental Health Hazard Assessment (OEHHA) California Proposition 65 (Safe Drinking Water and Toxic Enforcement Act Of 1986), Chemicals Known to the State to Cause Cancer or Reproductive Toxicity
   Source: *www.oehha.ca.gov/prop65/prop65_list/Newlist.html* (accessed 10/23/2008).
4. US National Institutes of Health, National Institute of Environmental Health Sciences, National Toxicology Program (NTP), Center for the Evaluation of Risks to Human Reproduction. Expert Panel Reports & Monographs on Reproductive and Developmental Toxicity. Review monographs to identify chemicals of high concern.
   Source: *http://cerhr.niehs.nih.gov/chemicals/index.html* (accessed 10/23/2008).

Neurotoxicants

Neurotoxicant Screening List. Chemicals listed in the article below are potential chemicals of concern. Grandijean, P & PJ Landrigan. 2006. "Developmental neurotoxicity of industrial chemicals." *The Lancet*, v.368: 2167-2178. List of 201 Chemicals known to be neurotoxic in humans.

Endocrine Disruptors

Endocrine Disruptors Screening List. Chemicals listed in the European Union documents below are potential chemicals of concern.

1. European Union, Category 1 ("at least one in-vivo study providing clear evidence for endocrine disruption in at least one species using intact animals"), Endocrine Disruptor chemicals. SCREENING LISTS—potential Red List chemicals, still undergoing assessment.

Sources:

a. DHI. 2007. Study on Enhancing the Endocrine Disrupter Priority List with a Focus on Low Production Volume Chemicals. *http://ec.europa.eu/environment/endocrine/documents/final_report_2007.pdf*

b. Commission Staff Working Document on the implementation of the "Community Strategy for Endocrine Disrupters" - a range of substances suspected of interfering with the hormone systems of humans and wildlife (COM (1999) 706), (COM (2001) 262) and (SEC (2004) 1372) (Brussels, 5 December 2007). *http://register.consilium.europa.eu/pdf/en/07/st16/st16123.en07.pdf* – (accessed 6/9/08).

APPENDIX D-5

Sources for Information on Safer Chemicals

1. CleanGredients

CleanGredients is a partnership initiative between the EPA's Design for Environment (DfE) program, industry, and GreenBlue, a non-government organization. Together, these organizations have created a database of ingredients used in cleaning products which have been determined as the safest available ingredients in their chemical class. Makers of new, safer chemical ingredients can submit their products to the database in search of customers, while formulators can search the database for safer ingredients. In this way, CleanGredients creates markets for safer chemistry and provides for makers of environmentally preferred cleaning products to be recognized by the DfE program. See: *www.cleangredients.org*

2. EPA Design for Environment Alternatives Assessments

The EPA's Design for Environment Program (DfE) alternatives assessment program helps industries choose safer chemicals by providing an in-depth comparison of potential human health and environmental impacts of the chemicals they currently use or plan to use. The program has conducted alternatives assessments on chemicals used in several product types and has published a methodology for conducting alternatives assessments. See: *www.epa.gov/dfe*

3. The Green Screen for Safer Chemicals

Clean Production Action developed the Green Screen for Safer Chemicals as a free and publicly available tool for chemical screening. The Green Screen can be used to design, manufacture and use safer chemicals through the use of a series of four benchmarks. Preferred and "greener" chemicals will pass through the screen to the final benchmark, while more hazardous chemicals, or those with limited alternatives available will score as red, orange, or yellow at one of the first three benchmarks. The Green Screen uses the work of EPA's DfE program as the foundation of its evaluations for each benchmark. See: *www.cleanproduction.org/Green.php*

4. PRIO

Prio, a web-based tool designed by the Swedish Chemicals Inspectorate (KEMI), is intended to be used to preventively reduce risks to human health and the environment from chemicals. The aim of PRIO is to facilitate in the assessment of health and environmental risks of chemicals so that people who work as environmental managers, purchasers and product developers can identify the need for risk reduction. To achieve this PRIO provides a guide for decision-making that can be used in setting risk reduction priorities. See: *www.kemi.se/templates/PRIOEngframes____4144.aspx*

5. Massachusetts Toxics Use Reduction Institute Alternatives Assessments

The Massachusetts Toxics Use Reduction Institute (TURI), at the University of Massachusetts Lowell provides research and educational support to companies under the 1989 Massachusetts Toxics Use Reduction Act. TURI has undertaken numerous alternatives assessments of chemicals of concern and maintains a library and online data base of safer chemicals and manufacturing processes. See: *www.turi.org*

6. SUBSPORT Portal

The goal of the SUBSPORT project is to develop an internet portal that constitutes a state-of-the-art resource on safer alternatives to the use of hazardous chemicals. It should be a source of not just information on alternative substances and technologies, but also of tools and guidance for substance evaluation and substitution management. The portal is intended to support companies in fulfilling substitution requirements of EU legislation, such as those specified under the REACH authorization procedure, the Water Framework Directive or the Chemical Agents Directive. See: *www.subsport.eu*

APPENDIX D-6

Systems for Evaluating the Safety and Design of Chemicals, Chemical Products, and Processes

1. IHS eco Platform

The eco Platform by IHS is a suite of software tools designed to assist companies with managing their chemical inventories and supply chains. Using ecoAnalysis, firms can compare the health and environmental attributes to rank chemicals within their in-ventories, and rate these chemicals against a set of safety criteria. This analysis allows companies to choose their preferred chemical ingredients within a particular category, and assess which alternatives might be available based on a master list of ingredients, and price. Using ecoScorecarding, companies can rate chemicals against a customized scorecard of regulatory requirements, internally specified criteria, or other information as desired. Finally, ecoFormulator allows companies to anticipate future outcomes of chemical decisions through the use of "what if" scenarios. Alternate versions of a product can be designed, scored, and compared to assist a company in choosing the appropriate ingredients based on the product's intended use and which sustainability endpoints the company wishes to prioritize.

2. GreenWERCS

The GreenWERCS Chemical Screening Tool takes data generated through the Wercs software, evaluates chemical ingredients for human and environmental health risks, and scores products on this basis. Retailers can use this information to compare competing products and encourage suppliers to substitute safer ingredients for harmful ones. The GreenWERCS tool is now available for chemical manufacturers to assess their formulations. See: *www.greenwercs.com*

3. SciVera Lens

Refer to Appendix D-3 for a description.

4. Green Screen for Safer Chemicals

Refer to Appendix D-5 for a description.

5. iSUSTAIN Green Chemistry Index

The iSUSTAIN™ Green Chemistry Index is a tool that allows users to score chemical products and processes based on the 12 Principles of Green Chemistry. The generation of waste, energy use, health and environmental hazards posed by materials and ingredients, the safety of manufacturing the product, and other endpoints are all considered when awarding a score, based on data proposed by the user. Using information from a Bill of Materials (BOM) needed to make the product, and a corresponding BOM of any wastes generated, the iSUSTAIN Index proposes various changes to the manufacturing process which could result in a more sustainable end product. See: *https://www.isustain.com*

6. Green Chemistry Expert System (GCES)

The Green Chemistry Expert System (GCES) is a free software program that helps reduce or eliminate the use or production of hazardous substances. It identifies opportunities for greener chemicals through design and process modifications, suggests alternatives, and provides a searchable database of green chemistry references. See: *www.epa.gov/greenchemistry/pubs/gces.html*

7. Cradle to Cradle Certification Process

McDonough Braungart Design Chemistry (MBDC) has developed the Cradle to Cradle Certification Process, a multi-

attribute eco-label that assesses a product's safety for humans and the environment and design for future life cycles. The Cradle to Cradle framework focuses on using safer materials that can be disassembled and recycled as technical nutrients or composted as biological nutrients. Sustainability of a product and the practices employed in manufacturing the product are evaluated in five categories: material health, material reutilization, renewable energy use, water stewardship, and social responsibility. One part of the assessment, the Materials Assessment Protocol, screens chemicals into categories of green, yellow, red, and orange depending upon the hazards associated with the chemicals. See: *www.mbdc.com*.

8. Sustainable Minds Lifecycle Software

Sustainable Minds is a comprehensive and standardized system that allows designers to estimate, evaluate, compare and track the life cycle environmental and human health performance of products in the earliest stages of design. Assessments are created in a three-stage process that incorporates in-context learning, and knowledge creation and sharing. Sustainable Minds includes more than 600 impact factors from across all product life cycle stages: materials, processes, use stage consumables, transportation and end of life. These impact factors include human and ecological health categories and resource impacts. See: *www.sustainableminds.com/product/methodology*

9. Pharos

Pharos is a tool developed by the Healthy Building Network that is intended to help commercial buyers evaluate product content, certifications and other relevant data about building materials against key health, environmental and social impact benchmarks. Pharos evaluates product impacts during use, but also manufacturing and downstream disposal impacts. Impact categories include: toxic user exposure, manufacturing and community toxics, renewable materials and renewable energy. Pharos provides users with a comparative, multi-attribute analysis of these impacts in the form of numerical and color-coded scores (a spider diagram from which products can be compared across categories). See: *www.pharosproject.net/about/faq*

10. 3E Green Product Analyzer

The 3E Green Product Analyzer (GPA) enables companies to assess the sustainability footprint of their raw materials or finished goods, compares products to evaluate preferred alternatives for purchasing decisions, and provides a simple baseline methodology to measure improvement. Users can access 3E Company's chemical profiles and substance data to analyze and compare products by toxicity, environmental impact, use type, and cost. Each product receives a 3E score based on the product' impact on people (employees and customers), property, and the environment. See: *http://3ecompany.com/solutions/csr-and-sustainability/ 3e-green-product-analyzer-trade-gpa*

Meeting Customers' Needs for Chemical Data

A guidance document for suppliers

Business-to-business communication of chemical data, such as chemical identity and health and safety impacts, along supply chains is critically important to product manufacturers' efforts to make informed decisions on the health and environmental impacts of the products that they put on the market. When chemical information is available in the design phase, a manufacturer can evaluate the full costs associated with using specific chemicals in product lines, strategically manage those costs, and consider existing and future global chemical restrictions and issues of liability and risk. This information is also vital for the design of safer products and advancing the application of green chemistry along supply chains. Forward looking companies working to bring safer products to market need the active engagement of suppliers to provide relevant chemical information. This Guidance Document provides tools and examples in support of improved supply chain communication between suppliers and their customers, and in the development of more sustainable products.

GC3 Green Chemistry & Commerce Council

Green Chemistry & Commerce Council

Lowell Center for Sustainable Production · University of Massachusetts Lowell
One University Avenue, Lowell, MA 01854 · 978-934-2997

Chemicals, alone or in combination, are the platform upon which key elements of the global economy have been built, and have been incorporated into millions of products used every day. Many chemicals may have inherently harmful characteristics that can impact ecological and human systems as they are used throughout supply chains. A growing number of companies are discovering that the approaches of green chemistry and Design for Environment (DfE) allow for a transition to safer alternatives. The Green Chemistry and Commerce Council provides open conversation about the challenges to and opportunities for this successful transition. It is a project of the Lowell Center for Sustainable Production at the University of Massachusetts Lowell.

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