Sustainable Chemicals & Materials Roundtable

Sleuthing the Supply Chain: Capturing Chemical & Material Content

October 22, 2014

A roundtable discussion meeting was held on October 22, 2014 at the offices of The Horinko Group, 1001 Pennsylvania Avenue, NW, Washington, DC 20004. The roundtable meeting was the second in a series to gather information and exchange ideas of sustainable use of chemicals and materials in both public and private sectors. The Horinko Group in cooperation with Noblis hosted the meeting.

These proceedings capture the purpose of the meeting and the information exchanged. The information presented in this report is not an official representation of the agencies or companies present. The opinions expressed by the speakers and participants are of their own.

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EXECUTIVE SUMMARY

Supply Chain Transparency. Industries and companies are at various stages of developing reporting systems to better understand the chemical and material content of items present in their supply chains. Regulations have made these systems necessary for some, while others are developing systems to stay ahead of future regulation or market pressures that may drive chemicals out of commerce. It is clear that more complete information on product composition, or at least a means by which to efficiently collect that information, is needed across many industries to better manage risk.

Participants debated the ideal characteristics of such a reporting system, whether full enumeration of product ingredients was preferable to targeted information collection, or whether a risk or classification-based system was preferred to a hazard-based list for reporting requirements; and if so, how might implementation challenges be overcome. Practical questions about the design of reporting systems and processes were also discussed, such as whether to include process chemicals, how to manage confidential business information, how to specify chemical identity, and how to maintain the currency of chemical reporting lists.

- **Key Takeaway – Market forces as well as regulatory and legal drivers will force implementation of supply chain management systems that account for chemical and material content of items across all industries and sectors of the economy.**

Communication & Education. Whether the approach is comprehensive or targeted information gathering, whether risk-based or hazard-based, there are a number of common challenges related to communication and leverage. Communication and data collection through complex and multi-tiered supply chains is cumbersome, and further hindered by language barriers, time zones, and large wholesalers and distributors. It requires working through higher-tier suppliers to access lower-tier supplier information and involves tracking down many small businesses, which may not be represented in umbrella organizations such as trade associations. Large organizations may have significant leverage to impose reporting requirements on their suppliers, but each may risk both burdening businesses without the capacity or resources to comply, as well as driving away lower-tier suppliers with diverse markets.

- **Key Takeaway – There is a common need for education, involvement, and support throughout the supply chain to ensure that all participants understand the need for product content data and can develop the capability to provide such data to remain competitive.**

Overcoming Obstacles. The public and private sectors share many challenges and motivations around supply chain reporting, but are differently situated with respect to what drives decision-making and change. The budget process and political nature of spending decisions in government do not lend themselves to spending practices on the front-end that mitigate risks in the future. In particular, the U.S. Department of Defense faces unique challenges given their need to meet strict performance requirements and modernize their legacy military specifications. Top-down directives and policies are essential, particularly within a government agency, if change is to occur, but bottom-up acceptance and initiatives are needed as well.

Participants reiterated throughout the discussion that a public-private forum around these topics would be beneficial, not only for experience sharing but also to coordinate and harmonize initiatives and data collection systems across sectors. An alliance between companies and government agencies to exchange information and push forward on establishing and advancing these systems would provide significant mutual value.

- **Key Takeaway – There is a need for cross-industry, public-private collaboration to ensure that supply chain management systems are harmonized to avoid duplication of efforts and waste of resources.**

INTRODUCTION

The Sustainable Chemicals & Materials Roundtable comprised a group of stakeholders from government, private industry, non-governmental organizations, and other interested parties and provided a forum for discussion on the opportunities, challenges, and existing efforts underway for reporting the chemical and material contents of products through working with suppliers. The roundtable provided a unique opportunity for mutual learning, information gathering, and sharing of views among a diverse group of seasoned stakeholders.

The meeting format consisted of an introduction by the Department of Defense (DoD) outlining the department's interest and drive to increased sustainability of its systems through the use of informed chemical and material contend data. It also included three case study presentations by commercial speakers representing a wide cross-section of industrial sectors of the economy, as well as a presentation by the Environmental Protection Agency. Following the presentations, moderated discussion sessions were held to further explore the ideas presented.

Refer to Appendices I, II, III for Participant List, Agenda, and Issue Overview Paper.

OPENING REMARKS

Marianne Horinko, President of The Horinko Group, and Drew Rak, Senior Scientist, Noblis Inc., commenced the roundtable with introductory remarks and thanks to all participants. Ms. Horinko then introduced the morning's presenters.

ISSUE INTRODUCTION

Paul Yaroschak, Deputy for Chemical & Material Risk Management, Office of Deputy Under Secretary of Defense (Installations & Environment) gave an introductory background to the roundtable topic, an initiative that has evolved from DoD's Chemical and Material Risk Management Program. DoD's Program has three core strategic priorities:

1) Strategic process improvements at a national level;
2) Identifying, assessing, and managing DoD risks internally and with industry partners;
3) Engaging stakeholders across the public and private sector.

The Program started out as an emerging contaminants (ECs) program, which brought together EPA and the Environmental Council of the States (ECOS) to define[1] and study ECs. Risks from ECs include: adverse health effects to operating forces, DoD employees, and/or the public; reduced training and readiness; restricted availability of materials or chemicals due to changing science adversely impacting mission-critical applications and the industrial base community; and increased operations and maintenance and/or cleanup costs draining resources from mission needs.

To manage these risks, DoD developed the "Scan-Watch-Action" Process. Under this process, a workgroup looks at scientific literature, periodicals, regulatory communications, and other news sources to identify chemicals of concern on the horizon. If a chemical that might pose risks is identified, a one-page summary is produced and reviewed by a senior group. If there is

[1] DoD defines emerging contaminants as "chemicals & materials that have pathways to enter the environment and present real or potentially unacceptable human health or environmental risks and either do not have peer-reviewed human health standards or standards/regulations are evolving due to new science, detection capabilities, or pathways."

agreement that potential risks exist, it is moved to the Watch List for a qualitative Phase I Impact Assessment. The result of this assessment is a probability and severity risk matrix that is used to determine whether the chemical should be placed on the Action List. Chemicals on the Action List undergo a quantitative Phase II Assessment to identify where and how DoD is using the chemical and whether it is in mission critical operations. Risk management options are derived from that assessment and taken to the DoD's EC Governance Council, a group of senior leaders from across DoD's components. If endorsed by the Council, they become risk management actions. These actions are varied and could range from simply initiating research on substitute materials to major new policies.

Thus far DoD has screened over 500 chemicals and materials, completed 36 Phase I Impact Assessments, 10 Phase II Assessments, and is tracking 60 risk management actions, over 60% of which are completed.

Mr. Yaroschak then described a number of evolving risks and issues related to ECs:

- New hazard assessments or toxicity studies on the health effects of ECs underway or planned through programs like EPA's Integrated Risk Information System (IRIS) are a precursor to regulatory changes, restrictions, or bans for many chemicals and materials important to DoD.

- For a number of new explosive compounds used by DoD, the fate and effects and human toxicity are not fully understood, which presents risks to ranges due to residual contamination. The EC program is conducting a number of Phase I Assessments on these compounds.

- Because of regulatory or market pressure, or both, a number of chemicals have been prematurely phased out or are likely to be phased out, banned, or restricted before acceptable substitutes are developed. Chemical and material non-availability poses risks to readiness of mission critical systems, platforms, and equipment.

- There is a lack of visibility for chemicals and materials in complex supply chains, making it very difficult to assess risk and pinpoint risk management actions when chemicals pose a potential risk or go out of production (e.g., DecaBDE, a flame retardant, went out of production and DoD, along with many private companies, had a difficult time determining where it was used in the supply chain).

The EC Governance Council directed that DoD should study capturing the chemical and material content of items in the DoD supply chain to support risk management and material recovery. It was proposed that the Federal Logistics Information System database could accept such information and already has data fields for much of it.

There are three reasons to undertake the proposed data collection. Without knowing the chemical and material content of a product, it is 1) difficult to recover valuable, strategic chemicals and materials at the end of life, 2) difficult to determine risks to system performance for chemicals or materials being phased out, and 3) difficult to determine risks to personnel. For instance, dangerous levels of lead were discovered in a workplace and determined to be derived from a brake assembly, an item not required to report lead on a Material Safety Data Sheets (MSDS). In another example, investigations revealed that beryllium-containing parts were not being tracked properly and were being sent to a scrap facility, wasting valuable resources and presenting liability concerns.

While a number of industries are starting to collect this information, there are a number of holes in DoD's current policies and procedures. To implement a more strategic approach, the first step will be to conduct a gap analysis of procedures, policies, and regulations. From this

analysis, a feasibility study on collecting chemical and material content data through the supply chain will be conducted and presented to the DoD Governance Council.

The roundtable serves as one component of intelligence gathering leading to the feasibility study. He described a primary goal for the day: identifying and discussing how to overcome barriers to change, which might fall into three categories: 1) normal behavioral resistance, 2) legitimate problems that could be overcome through procedural or policy change, and 3) legitimate barriers that cannot be overcome, which would indicate the need to change the proposal.

CASE STUDY PRESENTATIONS

Tim Sheehan, Regulatory and Risk Manager, Global Substances Program, Raytheon Company presented on the aerospace and defense industry's efforts to manage materials declaration through their supply chain, both in the U.S. and internationally.

The current hazardous materials reporting in domestic military systems acquisition was described. Systems developed for military purposes (such as planes, radars, ships, etc.) tend to be large, contain commercial "off-the-shelf" products as components, and are developed under contract often with a multi-year development period. They are specification-driven in both commercial and military applications, and often, potentially hazardous chemicals are embedded into the specifications because they have been tested and proven to be effective. Since the 1990s, system development contracts have included requirements to report on hazardous materials, including those in the design of the product, as well as those needed for operations and maintenance of the systems, and the hazardous material management needed throughout the life cycle of the system.

Hazardous materials reporting is conducted under the National Aerospace Standard 411 (NAS411) reporting framework, an Aerospace Industries Association (AIA) product. When this standard was initially implemented, differing lists of chemical substances to be reported were imposed by each contract because there was no standardized list in use. Furthermore, information was provided in documents with limited consistency in format and content, providing limited opportunity for its reuse. The initial version of the standard also focused on *amounts* of hazardous materials, rather than risks those materials presented. With these shortcomings identified, a workgroup was convened in 2012 to reconfigure and improve the standard.

As a result of collaboration between DoD and the AIA, two standards were published in September 2013: 1) the NAS411 update, and 2) NAS411-1, "Hazardous Material Target List" (HMTL). The NAS411 update tweaked the original standard to focus on materials posing higher risk, not necessarily amounts of materials. The HMTL is a tiered, prioritized list of materials for restrictions/declaration analogous to the EU's REACH structure of risk management. The top tier is a prohibited group for which system developers have to seek approval from their military customer to use those materials. The next tier is a restricted tier, which is tailorable to the contract. Materials in this group can be prohibited under the requirements of a contract or restricted based on specific applications that the customer might see as high risk. Finally, the lowest tier is comprised of purely "declarable" materials, which are only reported and not restricted in any way. Current activities are focused on identifying the final list of "declarable" or "tracked" materials.

Mr. Sheehan then turned to the larger global issue of materials declaration that is primarily focused on controlling supply chain risks by reaching down and gathering information on chemical and material content of items from suppliers to then pass to customers. Ideally, manufacturers would report the substance composition (i.e. chemical and materials content) of

materials of interest in their products and there would be full transparency for those materials throughout the supply chain. This type of transparency would inform regulatory and contractual compliance for hazardous materials, product safety, predictive materials obsolescence (in other words, when regulatory or market-driven pressures lead to early chemical phase out), source concerns about material provenance (e.g. conflict minerals), end-of-life concerns for reclamation and disposal, and product marketability.

Engaging the complex supply chains of the aerospace and defense industry is an immense task. Standardizing the content and formatting of materials disclosure is thus essential. A reporting system standardized across the industry would reduce the burden on suppliers and contractors, enable risk management progress and additional needs to be identified across many contracts, and allow for the protection of proprietary information.

The automotive and electronics industries are leading the industry-wide establishment of supply chain declarations processes. The International Aerospace Environmental Group (IAEG)[2], a global collaboration of aerospace and defense companies, is currently developing a Declarable Materials Standard, which would include a list of declarable materials—the Aerospace and Defense Declarable Substances List (AD-DSL)— and specify the declaration formation and process, as well as the maintenance process for the standard and the list. After the list is compiled, the next step for IAEG will be outreach to suppliers. IAEG has begun this process through a pilot where an original declaration list was sent out to suppliers for their review and response. Feedback was collected and will be discussed within IAEG soon.

Aerospace and defense companies hope to correlate military and commercial declaration lists and to harmonize the NAS411 process with the IAEG declarable substances process. Challenges to such harmonization include resolving the scope differences between the two lists. The IAEG list is solely based on international regulations, whereas the AIA list focuses on operational risks not always covered by those regulations. Furthermore, the issue of chemical families speciation poses a challenge. For example, there is a restriction on hexavalent chromium in military products, but in terms of the raw materials going into those products, designers need to know the specific Chemical Abstracts Service (CAS) registration numbers for the chromium compounds, which is the chemical language of the reporting process.[3] Speciating the lists is therefore essential and requires significant effort.

Once established, a number of possibilities arise out of a global standard: 1) electronic data transfer for information reuse and secure data transmission, 2) materials risk identification and management across the supply chain and across industries leading to collaboration on critical materials sourcing and availability issues, and 3) harmonizing across supply chains in various industries, key for companies that supply to various industries.

Brenda Baney, Product Stewardship Manager, Delphi Automotive; and, Amy Lilly, Senior Environmental Regulatory Engineer, Hyundai-Kia gave an overview of the automotive industry's mature policies, procedures, and its tool to track its supply chain contents. The process, known as the International Material Data System (IMDS),[4] was developed in response to automotive industry-specific chemical regulations in Europe, the End of Life Vehicles (ELV) Directive for automobiles.[5] The directive includes specifications for heavy metals and improving recycling percentages, causing auto manufacturers to realize they needed to gather information from their supply chains. Numerous other regulatory activities around the world addressing chemicals also have an impact on the automotive industry,

[2] www.iaeg.org

[3] A CAS number is a unique numerical identifier assigned by Chemical Abstracts Service, a division of the American Chemical Society, to every chemical substance described in scientific literature.

[4] www.mdsystem.com

[5] http://ec.europa.eu/environment/waste/elv_index.htm

including RoHS and REACH (Europe), California Green Chemistry and TSCA (U.S.), the Canadian Gazette, and the global Stockholm Convention.

When the ELV Directive was initiated, original equipment manufacturers (OEMs) were using paper surveys to collect information from about 3,000+ vehicle components through 17+ tiers of the supply chain. This was burdensome for both the OEMs and the suppliers. In 1999, A group of 7 OEMs developed a standardized, web-based data collection tool in collaboration with EDS (now Hewlett Packard). This effort, funded by the OEMs, would eventually become the IMDS and include over 45 OEMs.

As part of the IMDS, the Global Automotive Declarable Substance List (GADSL) was developed. It is not risk-based but simply includes substances expected in an automobile part that are regulated, or are likely to be. Suppliers are required to report on all substances included in GADSL present at the specific threshold level, which is .1% as a default or is based on the lowest level required by regulation or scientific evaluation. They are able to report some as pseudo substances (e.g. polymers, ceramics) and can put up to 10% (by weight total) of the non-GADSL material content in "jokers" or "wildcards" to protect proprietary information. There are mechanisms at the bottom-level of the supply chain to flag if a substance reported in wildcard form gets added to GADSL, and messages are sent to consumers up the supply chain if this is the case.

The IMDS standardizes how this information is communicated through the seven or so tiers of the automotive supply chain. Each supplier enters the substance information for their component into IMDS once where it goes into the secure databases of all of their customers. The information passes in that manner from the raw material supplier, through the various tiers of the supply chain, to the OEM. As information is passed up, if the suppliers want the data in a usable format, they have to pay to get it out of the IMDS, but at each tier, suppliers have the ability to see and verify most of that information all the way down the supply chain. Chemicals used in production that are not in the final product do not need to be reported under the IMDS requirements.

In recent years, updates have focused on a modern look and platform as well as more advanced functionality for data quality, data ownership, and faster updates from material manufacturers through the supply chain to downstream end customers. The next round of updates will focus on unified requirements from OEM's and supply chain tiers, supply chain confidentiality, published data accuracy and accountability, as well as building in flexibility for new environmental regulations (e.g., biocides). A committee of OEMs and suppliers is working to look at upcoming regulations and revise the GADSL list once a year. Each time the GADSL list evolves, suppliers may have to re-report some of the data on materials. This is a time intensive process, starting from the raw material suppliers and rolling up the supply chain, but ultimately the system is effective.

China is committed to developing its own system, known as CAMDS, which would require testing in a Chinese-certified lab for every car component sold in China. CAMDS looks very much like IMDS and relies on GADSL, but its developers plan to add databases for recycled content, VOCs, and test data. Japan also has a tool under development known as METI, which would be a cross-sector reporting system. These two systems raise questions about the ownership of each industry's list. In a globalized supply chain, however, standardized information for chemicals in products is key and is being pursued within various standard-making bodies.

Some lessons and challenges have been identified through the IMDS and GADSL evolution. The well-established process now provides a consistent means of reporting across the industry and reduces costs by harmonizing rules for various chemical regulatory regimes. It was useful for the industry that the legislation in Europe was tied to type-approval of a car. For instance, lead

in solder is exempted until newly type approved cars starting in model year 2016. It did, however, take five years to reach a point where data quality was sufficiently reliable, and data quality and accuracy are still an issue. Data quality challenges often emerge from companies on the lower tiers who don't have the expertise in chemistry or toxicology to enter data properly. The wildcard system is important to protect confidential business information, but it will always be slightly problematic. Furthermore, the system only applies to existing regulations and is not forward-looking. Discussions on how to expand to include forecasted substances are ongoing. If a material is not regulated, or pending regulation, and thus not on the GADSL list, there is not an easy way to know if it is in the supply chain. Often, information gathering from individual suppliers is necessary. Even if the substance is reported in IMDS, an investigation via IMDS can take months. Finally, the reporting is based on CAS numbers, which aren't always provided in the regulations.

The auto industry suppliers are very interested in having a cross-industry system, where at the bottom level the data would all look the same, so that the reporting burden would be reduced for materials suppliers at the bottom tier of the supply chain who are selling to a number of different industries. Those suppliers would benefit immensely from knowing the various lists of interest to each industry and having a streamlined process and a single format to disclose the necessary information. Such an effort would be useful for creating sustainable product development processes, improving risk management, and exporting a global culture of responsibility.

Richard Leahy, Vice President, EH&S Compliance, Walmart discussed related efforts within the consumer products industry. In particular, he described Walmart's efforts to gather information on the chemical and material content of formulated consumer products from its supply chain.

Mr. Leahy began by describing the immense scale of Walmart's operations as the world's largest retailer. Operating 11,000 retail units in 27 countries with 2.2 million associates and 2-5 million products sold, the global supply chain that Walmart deals with is enormous and involves tens of thousands of suppliers. On such a scale, the lack of visibility of product ingredient information needed for compliance and sustainability programs presents a great challenge. Such information is needed for various regulatory compliance purposes (e.g., Resource Conservation and Recovery Act (RCRA), Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), Department of Transportation (DOT) hazmat shipping, etc.) and sustainability program purposes (e.g., chemical ingredients for green chemistry initiatives).

Being such a large retailer in an aggressive regulatory environment, Walmart undergoes 22,000 compliance inspections, 1,800 environmental inspections, and 25,000 facility audits per year. Until the last ten years, EPA's RCRA program had not focused much attention on retailers and caught many retailers by surprise with large hazardous waste enforcement fines. In California, for instance, Walmart was fined $27.6 million in 2010 for improper disposal of consumer products. Because of product disposal, mostly related to nicotine, which is listed as an acutely toxic substance, many Walmart stores and other retailers are considered large quantity generators under RCRA. This has doubled the number of large quantity generators on the RCRA registry in the last year.

Mr. Leahy outlined a number of challenges to complying with RCRA for consumer products: 1) the product make-up is normally a trade secret, 2) the material safety data sheet is not designed to indicate RCRA status if the product is disposed, 3) the products are regulated under other regimes as safe for consumer use, and 4) the retailer must train associates to manage products they use in their home as hazardous wastes.

To work towards a solution on these challenges, Walmart partnered with The WERCS,[6] a third party that collects and analyzes information submitted by Walmart's suppliers. To have a product sold at Walmart, suppliers are required to submit product composition information to The WERCS. If the product is a pesticide, aerosol, or chemical, The WERCS conducts an assessment to determine information on its regulated status. This information is then used to populate the item file in Walmart's database and is transferred via barcode scanning so that the item may be properly managed in the stores. Using scanners, store associates are asked questions and given disposal instructions based on the product's information and characteristics.

Walmart is also focusing a great deal of attention on sustainability initiatives going beyond compliance including a Sustainable Chemistry in Consumables Policy.[7] Under this policy, Walmart considers chemicals on regulatory lists around the world, such as REACH, EPA lists, State lists, etc. to be priority chemicals. The policy aims to reduce the aggregate amount of priority chemicals used in consumer products and provide the safest product without raising the cost. There are three pillars to this effort. The first, transparency, is focused on beginning ingredient disclosure online in 2015 and listing priority chemicals on the consumer package beginning in 2018. Safer formulation, the second pillar, aims to reduce, restrict, and eliminate use of priority chemicals using informed substitutions. Walmart has identified 10 high priority chemicals based on ubiquity, exposure issues, volumes in supply chain, potential for regulation, and feasibility of an informed substitution. Using The WERCS, Walmart is able to identify which products have chemicals of high priority and share this information with suppliers to alert them and encourage them to work on safer substitutions. Finally, the third pillar focuses on Walmart's private brand, encouraging all the private brand suppliers to obtain EPA Design for the Environment certification.

MODERATED DISCUSSION

Part 1 – Capturing chemical and material content from the supply chain: *What are participants' experiences and observations?*

Discussion & Analysis:

Participants discussed many aspects of managing supply chain reporting systems, the common challenges encountered, and ideas for improvement.

Practical questions were discussed such as how to maintain a list of materials for reporting. Participants recommended a governance process that is active and ongoing, with close attention to emerging chemicals. The discussion revealed that some industries exclude process chemicals from materials declarations while others have included them, or have plans to, as regulatory attention is emerging. Participants largely agreed that reporting on process chemicals would mitigate a number of risks, but would pose an even greater burden for those reporting and managing the data.

Other practical challenges included lack of reporting capacity for small suppliers, both in expertise and resources. Participants agreed that the key is to gather stakeholder input from such suppliers, and to design a reporting scheme where confidential business information is not compromised. Many solutions to the CBI issue, such as "wildcards," or third-party data management companies, were discussed.

Classification schemes and risk-based approaches were identified as potentially preferable

[6] http://www.thewercs.com
[7] http://www.walmartsustainabilityhub.com/app/answers/detail/a_id/310

alternatives to hazard-based listing and reporting. There are a number of challenges to implementing these generally preferred approaches, such as incompatibility with performance-based specifications and final product risk versus chemical risk characteristics at the manufacturer level. Lists requiring reporting on regulated chemicals are less controversial to implement, but participants agreed that risk-based and classification-based schemes would help to break out ahead of future issues. Finding other means to forecast for chemicals that might become listed in the future was identified as a critical need, especially in the context of products with long development cycles.

To make progress on a number of these challenges and advance reporting systems in an integrated fashion, participants noted that a cross-sector forum on chemical and materials data collection would be of great utility.

Perspectives Shared:

- *Maintaining Lists* – Managing the list of chemicals relied on for reporting is essential to the continued success of the reporting systems. Any list for reporting must have a governance process and can never be static. The HMTL, included in the aerospace NAS411 standard, is maintained and updated through a NAS411 workgroup. Maintaining the AD-DSL will be the responsibility of IAEG. A committee of OEM's update the auto industry's GADSL once a year. The electronics industry has a schema to do this as well incorporating several lists.

- *Process Chemicals* – The inclusion of process chemicals in a reporting inventory revealed important differences in existing reporting systems. It is common for materials declarations systems, such as the auto industry's IMDS, to exclude process chemicals. It was recognized, however, that cases where a process chemical accidentally ends up in a final product or cases where a process chemical is taken out of commerce pose a risk to downstream users. Regulatory attention to process chemicals is also emerging, making it necessary for the downstream user to know what process chemicals are used. For instance, the EPA has a regulation starting in January 2015 that will require labeling of components and products that use Class II ozone-depleting substances as a process chemical. Lately there has been more pressure on companies to report all chemicals and how they are used, especially given rising concerns about labor conditions and sourcing (e.g. conflict minerals, illegal logging, etc.). Reporting on all chemicals used throughout the process of product development would help to mitigate these concerns but would pose a greater data collection challenge. In developing its reporting systems IAEG does currently intend to include process chemicals. The footwear and apparel industries are also dealing with this issue given public attention to labor conditions around process chemicals in China, especially in response to regulatory pressure and advocacy.

- *Forecasting for future listing* – The issue of maintaining such lists brought to light a core issue, that is, forecasting what chemicals or materials will be on reporting lists in the future. For products with long development cycles or product maintenance lifespans, like those in the aerospace industry, engineers would benefit from knowing what may be listed for reporting requirements or restrictions five or ten years in the future. Oftentimes, replacement parts are phased out because they are found to contain a newly listed chemical, creating supply constraint risks for those parts. Ideally, a cross-sector structure could look at systems and lists and forecast out future issues to help inform legacy problems. Participants discussed the trend towards gathering ingredient information and looking at hazard and risk characteristics of those ingredients to determine if they might be on a list in the future. The question then becomes how much reporting the downstream purchaser can ask of their supply chain. For example, the REACH regulation is looking at the potential of adding 400-500 additional chemicals to

the authorization list by 2020, but giving suppliers 500 new substances to report on now is likely to be unsuccessful. The aerospace industry went through such a predictive reporting approach unsuccessfully in the late 2000s.

- *Classification versus listing* – Classification was presented as a more effective alternative to listing. For example, in the process of phasing out ozone-depleting substances (ODS), one organization had reviewed every technical order and identified all ODS, some $15 million worth of work, when the list changed, and it all had to be redone. A classification scheme was thus implemented and proved to be much more time and resource efficient. The Globally Harmonized System of Classification and Labeling of Chemicals (GHS) is the most advanced means of classification. It has been adopted by OSHA and the European Chemicals Agency (ECHA) and may be useful for more of a risk-based approach. It was noted that such a system might work better for identifying risks at the plant level than at the end-product level. The Classification Labeling Inventory[8], maintained by ECHA, was also identified as a useful resource for determining the hazards of a particular material. For instance, if DoD were to identify a hazardous material with many uses reported throughout the MSDS system, information on the hazard would be needed before the risk could be determined. The inventory provides that information, which, when combined with information on substance quantity and exposure, can be used to determine risk.

- *Risk-based versus hazard-based reporting* – Most participants were in agreement that the progress made in establishing supply chain reporting systems is impressive, but that ultimately, risk-based, not hazard-based, reporting is the goal. Though imperfect, lists have thus far been the implementable tool. For the most part, lists based on regulatory requirements are the less controversial approach. In order to see over the horizon, however, risk-based reporting is necessary. One participant noted an important challenge in getting to such an approach would be in designing a characteristic- or risk-based specification. Specifications would have to be based on toxicity profile or other hazard characteristics that were not previously part of how a product was specified. Adding characteristics to design specs would certainly take time and be complex, but might be a critical step. A related discussion occurred around linking the product end use to the product hazard characteristics for risk analysis. IMDS has application codes built into it that address this to an extent. The European toy safety directive also has an exposure risk component to it that allows chemicals with inherent hazards to be used in specific acceptable applications.[9]

- *Bottom of the supply chain reporting* – When dealing with products with long development and product service life cycles, multi-tiered supply chains, and immense numbers of suppliers, collecting information through the supply chain becomes a huge challenge. At a certain tier in the supply chain, there might be diminishing returns for the resources and time invested. At the very bottom of the supply chain, it could be very difficult for suppliers to report on the requested chemical information due to lack of expertise or capacity to do such reporting, or inadequate information. To better understand this challenge, IAEG mocked up a declaration process and sent it to supply chain stakeholders for review. In the electronics, toy, office furniture, and footwear and apparel industries, bottom-level supply chain reporting of this nature is being done. Small business at tiers six or seven in the supply chain are being asked for the chemical and material content of their products. In many cases, suppliers know this information, but the key is developing a reporting system whereby suppliers are not required to disclose proprietary information.

[8] http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
[9] http://ec.europa.eu/enterprise/sectors/toys/documents/directives/index_en.htm

- *Confidential business information (CBI)* – The top tier of the supply chain, or the purchaser requesting the chemical and material content information, must be able to learn the chemical and material characteristics of a product but not the "secret recipes." In some cases, requesting a list of chemicals, not formulations, may be enough to protect CBI. For specialty chemicals, however, the chemical itself may be considered CBI as molecules compete for functionality. In those instances, businesses often use generic descriptors, which would provide a chemist or toxicologist enough information to glean hazards. Some CBI submitted to EPA also uses generic descriptors. This type of approach might be more conducive for supplier willingness to report. The IMDS system, which allows for 10% of content to be reported as proprietary information, takes one potential approach to this issue. With this type of "wildcard" or "joker" system, however, the unreported information accumulates up the supply chain until it represents a significant unknown about a product. To ensure safety, one participant suggested that IMDS could require the supplier to do risk-based analysis or provide classification data on the chemicals contained in that 10% to ensure that the final product was ultimately safe. A third-party data management company, such as The WERCS, may represent another solution. An independent third-party could broker proprietary formulations and pass on relevant information to buyers without the exact composition of the material divulged. This third-party approach would enable full disclosure of information, including the last 10% the automotive industry is working to obtain, without compromising the suppliers CBI.

- *Cross-sector collaboration* – Participants identified the need to scale up and integrate reporting frameworks across sectors. At present, industries can attempt to keep apprised of other industries, but there is no recurring forum for it. A materials declaration dialogue or some sort of professional society bringing together industries and agencies with similar goals to share challenges and lessons learned was suggested. Such a group might contribute to tracking and forecasting chemicals of emerging concern.

- *Improving design* – Though the discussion focused around collecting chemical and material content as part of supply chain management, there is a related need for informing product design to make better chemical and material content decisions upfront, incorporating life cycle analysis thinking, and designing for many years down the road.

LUNCHEON REMARKS

Jim Jones, Assistant Administrator, Office of Chemical Safety & Pollution Prevention, U.S. EPA spoke about EPA's Chemical Management Program. He first discussed the TSCA inventory, published in 1979, which includes 22,000 chemicals that were reviewed through the new chemicals Pre-Manufacture Notice process and 62,000 chemicals that were already on the market when the inventory was introduced but have, for the most part, not been assessed for their safety. He noted that EPA does not have a statutory mandate to evaluate existing chemicals in commerce under TSCA.

Mr. Jones explained the Agency's creative and multi-pronged approach for its Existing Chemicals Program strategy, which includes improvements in three areas: 1) risk assessment and management; 2) increased access to chemical data; and, 3) promoting the design and use of safer chemicals.

With respect to the first approach, EPA identified a Work Plan of 83 chemicals for review and risk assessment. Four of the initial five draft assessments are now final, two indicating risks and two indicating no risk. If an assessment indicates potential concerns, EPA will evaluate and

pursue appropriate risk management efforts. These have largely been voluntary but could include regulatory actions under TSCA's Section 6, a tool that hasn't been used for many years. If risks are negligible, EPA will conclude its work on the chemical. Risk assessments will continue on the remaining Work Plan chemicals, and additional chemicals may be added to the Work Plan if warranted. Mr. Jones noted that in EPA's hazard and risk-assessment processes, European and Canadian data and/or assessments, to the extent they are accessible, are reviewed, evaluated, and incorporated as appropriate.

EPA has also focused on reducing risks through the Significant New Use Rule (SNUR) under TSCA. SNURs limit particular uses of chemicals, ensuring that chemicals taken off the market for certain uses cannot be reintroduced to the market for those uses.

Mr. Jones went on to describe the second prong of EPA's strategy, its efforts to improve the accessibility and usability of chemical data, such as reducing unchallenged CBI claims, conducting alternatives assessments, and making data publicly available through ChemView. The online tool ChemView, which was released in September 2013, provides enhanced access and use of EPA's chemical information. It contains detailed information on approximately 8,700 chemicals, which users can rely upon to make more informed chemical safety and usage decisions. Through their Design for the Environment (DfE) program, EPA has focused on conducting alternatives assessments to identify and evaluate functional, safer alternatives to problematic chemicals.

In its third approach to reducing risk, EPA is promoting the design and use of safer chemicals through programs and activities such as the Safer Chemical Ingredient List, the DfE Safer Product Labeling Program, and the Green Chemistry Initiative.

The DfE Safer Product Labeling Program has reached over 2,500 products, but the label has not gained traction with consumers and is currently undergoing a redesign. One challenge with this program is that, for the most part, the product manufacturer has to report all ingredients in a product for it to be labeled under DfE, which is not desirable where CBI is involved. The exception to this is when DfE reviews pre-manufacture notices, in which case the program follows the same CBI procedures as are followed under TSCA. DfE has been criticized by some because its criteria for labeling are mostly hazard-based rather than risk-based. Mr. Jones clarified, however, that the assessment is functional-use specific, taking it somewhat further than hazard-based.

The Safer Chemical Ingredient List being developed includes 650 chemicals that meet criteria under the Safer Product Labeling Program, most of which were identified through DfE screenings. EPA has also done outreach to encourage manufacturers, who may not have a consumer product but may have a chemical that meets the criteria, to get that chemical assessed and added to the list.

Other initiatives underway include the Presidential Green Chemistry Awards Challenge and Environmentally Preferable Purchasing (EPP) Program. The Green Chemistry Awards promote the development, manufacture, and use of greener chemistry and safer products and have recognized technologies using safer chemicals that often have other attributes such as reducing water, waste, or carbon emissions. EPA's EPP Program is providing guidance to federal agencies in identifying and procuring environmentally preferable products in support of Executive Orders. To that end, EPA proposed an evaluation of non-governmental environmental standards and ecolabels to ensure the robustness of those standards and assist federal purchasers in identifying greener and safer products. EPA will engage a third-party to evaluate product standards against a set of criteria identified by EPA for each category of goods (e.g. sustainable furniture). If a standard meets EPA's requirements, it will be placed on a registry so that those making purchases in government know that the standard is reliable. In 2015, EPA will pilot this approach in a few product sectors active with ecolabels that represent a

significant federal spend.

MODERATED DISCUSSION

PART 2 – Developing the process and communicating with suppliers: *What best practices can be shared?*

Discussion & Analysis:

An underlying question of the day's discussion was whether to collect as much information as possible or to prioritize and pursue specific concerns based on "hotspots." A targeted approach would require navigating the "rope of sand" of the complex supply chain, but could employ creative means such as engaging trade associations to do so. When investigating a particular issue, the time horizon for collecting the requisite information could be extensive if a system is not in place. Setting up such a system and collecting information on the front end would lead to a searchable database of chemicals and their uses within the supply chain. This is a very beneficial prospect but is also likely to require a much greater up-front investment of time and resources.

The bill of substances document, used in a number of industries, was referred to as a proxy for the comprehensive information collection approach. The discussion around the bill of substances exposed a number of potential barriers that could arise if DoD were to attempt to implement a similar approach. Discussion around DoD's product hazard data elements, which aim to harmonize and improve reporting across DoD components, revealed progress made towards collecting data for hazardous materials in the DoD supply chain.

All participants have found that communicating through the supply chain is difficult, especially given differing languages and time zones. Working through higher-tier suppliers to access lower-tier supplier information is often necessary, but can be cumbersome and further complicated by distributors and wholesalers. Participants agreed that training and educating through the supply chain is essential for the success of reporting systems. This might be conducted through trade associations or other umbrella organizations, however, for small suppliers without such representation, this poses a serious challenge.

Many facets of supply chain leverage and dynamics were discussed. For example, major purchasers, such as DoD, may have the leverage to make additional requirements of their suppliers, but at certain lower-tiers of the supply chain, their leverage may become weaker, especially for suppliers of products with a diverse range of purchasers. There are a variety of situations that must be considered so as to protect the interest of small businesses and to ensure that suppliers of strategic materials are not driven away by reporting requirements.

Perspectives Shared:

- *Communicating through the supply chain* – Participants shared experiences related to conflict minerals and collecting information from lower tiers of the supply chain.[10] In making requests of suppliers and using the universally recognizable Conflict Minerals Reporting Template, it was found that engaging and working through tier-one suppliers was necessary to access content data from tier-two suppliers. The same approach would then be taken with tier-two suppliers to access data from tier-three, and so on. The process is cumbersome, especially given the communication barriers of various languages and time zones, and not all components of the reporting template are

[10] http://www.sec.gov/News/Article/Detail/Article/1365171562058#.VG-WQ4e0ZAY

effective.

- *Bill of substances* – Though experiences have differed across product industries, there is a fairly common document called the bill of substances. This describes the engineered components for a product and how they roll up through the assembly process to the finished product. In the European toy market, this type of document is a contract requirement as part of the technical dossier, and other product markets are moving in this direction. General substance information and thresholds, or de minimis levels, are being applied to establish reporting requirements based on the product. The consumer of this information is requiring a report on substances of concern, which applies criteria of restrictive substance lists, but is not requiring the entire "recipe" for the product. The process becomes further complicated because suppliers to major recognizable brands want to conceal what suppliers they rely upon, creating an additional CBI hurdle. However, pressure is being applied to sub-suppliers through the use of the bill of substances, creating further supply chain transparency. The requirement to test is also important, especially recognized in the automotive industry, because data is not always reliable. Labs performing audits to test products against what has been reported are also being considered. Furthermore, participants weighed in on potential barriers for DoD if they were to request such a bill of substances with a de minimis threshold level from all suppliers and client contractors. These included:

    - The training gap to reach through several tiers of suppliers;
    - Many suppliers are small and sole source suppliers and such a requirement may discourage them from selling to that market if it is an insignificant percentage of their overall business (DoD's experience with titanium was offered as an example);
    - Distributors and wholesalers pose major challenges given their size and the number of products handled; it may be difficult to pass information through distributors or, conversely, may be difficult to work through them to contact the next tier in the supply chain;
    - Formulated additives will present a challenge, and manufacturers may not know the specific contents; and,
    - Differing *de minimis* threshold levels are likely necessary depending on product type, use, risk, and exposure.

- *Pressure from major purchasers* – Major purchasers are in a position to give preference to suppliers that provide the most complete information requested, and this can send signals to the marketplace. However, where suppliers have sufficiently large markets with fewer requirements, this pressure may push them to sell elsewhere. It was also noted that even for major spenders, their leverage becomes weaker each tier down the supply chain. Caution was also offered regarding small business suppliers and their lack of capacity or expertise to provide requested information, as well as the disadvantage they would face in cases where major purchasers comprise a large percentage of their market. As it pertains to conflict minerals, pressure has been targeted and applied to smelters. Once smelters are compliant with Conflict-Free Smelter Program requirements[11], the remaining supply chain can rest assured. This was not an attempt to engage every tier of the supply chain, a differentiating factor from the bill of substances approach of applying pressure through multiple tiers of sub-suppliers.

- *Supply chain education* – Participants agreed that for a number of the challenges presented, supply chain education, outreach, and support are key. Training and educating all levels of a company's workforce, from executives to practitioners, is also critical for purposes of buy-in, efficiency, and succession planning. Most OEMs have an

[11] http://www.conflictfreesourcing.org/conflict-free-smelter-program/

annual training for their suppliers on a number of issues, including market developments, reporting processes, etc.

- *Sub-supplier representation* – Wide engagement of sub-suppliers, including Tier 3, was recognized as a challenge because no readily identifiable trade association or umbrella organization represents this vast array of companies, creating difficulty for outreach and education. It was suggested that an alternative approach might target specific products (e.g. fasteners) and identify groups that represent multiple assembly product companies. Mapping trade associations might also provide insight into means for reaching particular suppliers.

- *DoD business process reengineering* – DoD identified the need to establish standard hazardous materials management processes, data requirements, and business rules. The first phase of DoD's hazardous materials business process reengineering focused on reengineering hazardous materials management in operation and sustainment activities across DoD, specifically directed at process authorization and collecting product hazard data.[12] The interest of engineers and emergency responders in chemical and material content was the impetus for the reengineering, which has evolved from a hazardous materials management approach into a broader chemical management and enterprise information collection opportunity. To achieve interoperability across DoD departments and systems, DoD aligned its data standard with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS), an internationally agreed-upon system, created by the United Nations, to replace the various classification and labeling standards. Its Product Hazard Data (PHD) Set has been the first step, establishing requirements for centralized, accurate, consistent, interoperable information for hazardous materials. Implementation of the PHD will harmonize searchable data and allow users the ability to pinpoint where a certain chemical or material is being used within DoD. This started with the MSDS and is now further expanding to including kits (e.g. wet chemicals, spare parts) and articles containing hazardous materials. The long-term goal is to have an enterprise system with a central data repository. It is also intended that this standardized data set interface with the Federal Acquisition Regulation registry.

PART 3 – Overcoming the obstacles: *What challenges and pitfalls should be recognized, as well as ideas for an improved process?*

Discussion & Analysis:

The final discussion segment focused largely on challenges unique to DoD given the federal acquisitions process they are subject to, their need to prioritize performance, and their engrained military specifications, among others. The budget process and political nature of spending decisions in government do not lend themselves to life cycle thinking that would suggest spending on the front end to mitigate risks down the line. In the private sector, top-down pressure in the form of regulation has led to change, but bottom-up change has also occurred in response to consumer and market pressure. The willingness to take a progressive approach, however, depends on where a company is situated within the supply chain and whether it has a brand name at stake. Considering these many factors, it was generally agreed that top-down directives and policies are essential, particularly within a government agency, if change is to occur, but bottom-up acceptance and initiatives are needed as well.

[12]This effort is described at: http://www.acq.osd.mil/ie/download/HMPC_IMR/hmpcimr_execsum.shtml

Approaches to implementing a chemical and material reporting scheme within DoD were then discussed. Some proposed a phased-in approach targeting priority chemicals at the outset. Others suggested that DoD might give preference in source selection to suppliers who could provide the requested information. For these approaches, costs to suppliers and costs to DoD, time delays on contracts, and the priority of performance above all else for strategic systems, were noted as key considerations.

Participants reiterated that a public-private forum around these topics would be beneficial. An alliance between companies and government agencies to exchange information and push forward on reporting systems would go a long way, and would be especially helpful for those companies that do not have the leverage to implement such requirements on their own.

Perspectives Shared:

- *Government acquisition* – In many cases where greener and/or better performing products have been tested and approved, getting these products purchased through the federal acquisition process poses a huge challenge. For instance, certain greener solvents that met specifications and performed well were not chosen by the contracting officer in acquisitions, despite the Executive Order on federal sustainability, until the end-item manager specified they would accept green products. Conversely, examples were shared where greener, and often better performing products, potentially with lower life cycle costs, were tested and proven and the end user specified their desire for them, but the contracting officers still would not make those purchases. Often, purchasing decisions are made based on the contracting officer's habits, relationships, unwillingness to change, or directive to reduce *up-front* costs to the greatest extent possible, even when the product may save costs over the long term.

- *Military specifications* – DoD faces a unique challenge with its acquisitions and with managing risks through its supply chain given the engrained military specifications that must be met. Often these specs require a certain chemical, and changing them is very difficult. Defining best value and incorporating sustainable, life cycle aspects into such a definition is a challenge to begin with and is even further complicated by military specs, which are in many cases seen as outdated.

- *Encouraging Environmentally Preferable Purchasing (EPP)* – For each of the challenges described above, behavioral and/or cultural changes are needed. In many cases, both a top-down directive and a developed bottom-up capacity are both needed because without a requirement to consider long-term savings over the product life cycle, short-term spending will remain the sole focus. DoD has developed methods to evaluate life cycle environmental impacts and life cycle costing, but there is no forcing function for these to be integrated into purchasing decisions. EPA has conducted research on EPP showing that existing individual relationships between suppliers and purchasers are a key barrier to change. This too might be aided by a top-down requirement. DOE has a program to encourage EPP that relies on competition between facilities and rewards for greener purchasing. Walmart has had success with the Sustainability Consortium, a multi-stakeholder effort bringing together its supply chain and peers to work on these issues. Convened, well-structured initiatives like this were recommended for DoD and other organizations with large supply chains to establish leverage on these issues. It was suggested that DoD might use existing forums such as the American Logistics Association conferences to tap into wholesalers, distributors, and small businesses to initiate such a coalition.

- *Private industry leadership* – It was noted that the private sector is further ahead as far as sustainable purchasing and supply chain information exchange. This has historically

been driven by regulations, but market incentive and consumer-pressure have also been key drivers. Though market pressure exists for the government as well, decisions are often based on politics and what the leadership wants to enforce, not necessarily on the "right" or most cost efficient decision in the long term. Budgets are specified through Congressional appropriations, so a profit-motive does not exist; there is no reward for future savings, nor are such savings well tracked. Notably, in the private industry, commitment and leadership on these issues also depends on where a company is situated in the supply chain. Those who have to protect brands tend to make longer-term decisions and view their investments entirely differently than others who make "building block products."

- *Priority chemical-based phase in* – Discussion took place around whether it would be more effective for DoD to proceed by exception or by complete enumeration. Some argued it would be far more cost effective and achievable for DoD to ask their supply chain to report on a specific set of priority chemicals rather than to require a complete bill of substances. This targeted, risk-based approach could be coupled by reasonable estimations of the product's "hotspots" for the priority areas of concern. Such a requirement could be phased in by priority, and collecting information on a product "as built" was seen as preferable to "as designed," given changes over time.

- *Preference in source selection* – It was suggested that as a start, DoD might provide preference in source selection for a bidder providing a "bill of substances." This would extend to other substances beyond the requirement in FAR 52-223-3 and FED-STD-313. However, one issue is the number of preferences already required in procurement regulations that are of high priority. Though a preference may be possible for products, it might be inconsequential since performance requirements are top priority. In addition, it may be costly to offer a procurement preference for weapons systems based on providing a bill of substance for thousands of parts. Providing a bill of substance could be weighed as a factor but wouldn't easily become the deciding factor. There is also a timing aspect to be considered, that is, how long such a request might delay a contract.

- *Additional cost* – There is a hesitancy to require additional information from suppliers because it may increase cost of supplies and products provided. DoD is aiming to address this by asking small businesses and other suppliers if additional cost would be added to bids if they were required to submit a bill of substances for a product.

- *Public-private forum* – Many agreed the timing is right to tackle the issue of improved supply chain reporting. Many companies, including those small businesses without the capacity to undertake this on their own, are also looking to improve their supply chain reporting systems and may be interested in an alliance amongst companies and government agencies.

CLOSING REMARKS

Marianne Horinko, President of The Horinko Group, concluded with a summary of observations. She highlighted the recommendation for a cross-industry, public-private forum to help sort through many aspects of the issues discussed. Such a group could share experiences and build off existing knowledge to sort through issues such as thresholds, wildcards, CBI, classification, CAS numbers and chemical identity, bill of substances vs. priority chemicals, and other solvable logistical issues. There is clearly an opportunity for future collaboration around these subjects. Ms. Horinko acknowledged that culture change is harder than the logistical aspects in any organization, but market forces may encourage such change. Organizations may have success by using carrots and not sticks, but it was also clear from the discussion that top-down directives would be of great help in certain situations. An educational effort must be directed both outwards to the supply chain and inwards to organizations. The aim to promote a "global culture of responsibility" is a great way to describe the importance and significance of this effort.

APPENDICES

- **APPENDIX I – PARTICIPANT LIST**
- **APPENDIX II – AGENDA**
- **APPENDIX III – SUMMARY TABLE: KEY CHALLENGES**
- **APPENDIX IV – ISSUE OVERVIEW PAPER**

APPENDIX I – PARTICIPANT LIST

Marianne Horinko (Moderator)
President
The Horinko Group

Andrew Rak (Moderator)
Sr. Principal Scientist
Noblis, Inc.

Brenda Baney
Product Stewardship Manager
Delphi Automotive

Jim Cooper
Senior Petrochemical Advisor
American Fuels and Petrochemical Manufactures

Maria Doa
Director, Chemical Control Division
Office of Pollution Prevention and Toxics
U.S. Environmental Protection Agency

Jim Jones (Keynote Speaker)
Assistant Administrator
Office of Chemical Safety & Pollution Prevention
U.S. Environmental Protection Agency

Richard Leahy
VP, EH&S Compliance
Walmart

Russ LaMotte
Principal
Beveridge & Diamond

Amy Lilly
Senior Environmental Regulatory Engineer
Hyundai Kia

Mary Ellen Mika
Manager, Global Sustainability Initiatives
Steelcase, Inc.

Jason Pearson
Executive Director
Sustainable Purchasing Leadership Council

Lee Plowden
Supply Chain Integration
Logistics & Materiel Readiness
Office of the Assistant Secretary of Defense
U.S. Department of Defense

James Reed
Program Manager
DLA Hazardous Minimization Program
Defense Logistics Agency
U.S. Department of Defense

Joe Rinkevich
Founder
SciVera LLC

Karyn Schmidt
Assistant General Counsel, Value Chain Outreach
American Chemistry Council

Tim Sheehan
Regulatory and Risk Manager
Global Substances Program
Raytheon Company

Sheryl Sizelove
Director of Network Centric Operations, Integrated Defense Advanced Systems
The Boeing Company

Ted Smith
Founder
Silicon Valley Toxics Coalition

Steve Spitzer
VP, Customer Relations
Haas Group International

Joel Tenney
Director of Advocacy
ICL Industrial Products

Randall Turner
Portfolio Management & Investment Strategy
Office of the Deputy Under Secretary of Defense (Installations & Environment)
U.S. Department of Defense

Ruben Vazquez
Program Management Officer
Supply Operations, Army Liaison
U.S. General Services Administration

Tabby Waqar
Assistant Chief Counsel, Environment
U.S. Small Business Administration, Office of Advocacy

Boma Brown-West
Manager, Consumer Health
Environmental Defense Fund

Paul Yaroschak
Deputy for Chemical & Material Risk Management
Office of the Deputy Under Secretary of Defense (Installations & Environment)
U.S. Department of Defense

Supporting Attendee List

David Asiello
Program Manager
Office of the Deputy Under Secretary of Defense
(Installations & Environment)
U.S. Department of Defense

Benedict Cohen
Chief Counsel, Government Operations
The Boeing Company

Mattie Coleman
Marine Corps Installations Command
U.S. Department of Defense

Cathryn Courtin
Program Manager
The Horinko Group

Shawn Dolan
President
Virtual Technology LLC

Pratima Gangopadhyay
Environment & Energy
Association of Global Automakers

Malcolm Garg
Army Environmental Division, OACSIM
U.S. Department of Defense

Mary Hammerer
Naval Air Systems Command
Environmental Logistics
U.S. Department of Defense

W. Michael McDevitt
U.S. Army Institute of Public Health, U.S. Army
Public Health Command
U.S. Department of Defense

Trish Mathena
Marine Corps Installation Command
U.S. Department of Defense

Sean McGinnis
Director of Finance & Business Development
The Horinko Group

Larry McLaury
Senior Procurement Analyst
Contract Policy and International Contracting
Defense Procurement & Acquisition Policy
Office of the Under Secretary of Defense
(Acquisition Technology & Logistics)
U.S. Department of Defense

John Mire
Special Military Assistant - Natural Resources
Program Manager-Environmental Information
Technology Management
Office of the Assistant Secretary of the Army
Installations, Energy & Environment
U.S. Department of Defense

Christopher Pollock
Supply Operations
U.S. General Services Administration

Leslie Riegle
Director, Environmental Policy
Aerospace Industries Association

David Rostker
Assistant Chief Counsel, Environment
U.S. Small Business Administration, Office of
Advocacy

Stacy Tatman
Environmental Affairs Manager
Alliance of Automobile Manufacturers

Amy Williams
Contract Policy and International Contracting
Defense Procurement & Acquisition Policy
Office of the Under Secretary of Defense
(Acquisition Technology & Logistics)
U.S. Department of Defense

APPENDIX II – AGENDA

Sustainable Chemicals & Materials Roundtable
Sleuthing the Supply Chain:
Capturing Chemical & Material Content

1001 Pennsylvania Ave, NW, 9th Floor
Washington, D.C. 20037

October 22, 2014

8:45 – 9:00am **Registration**

9:00 – 9:15am **Welcome and Introductions**

Marianne Horinko, President, The Horinko Group (Moderator)

Drew Rak, Senior Scientist, Noblis Inc. (Moderator)

9:15 – 9:30am **Issue Introduction**

Paul Yaroschak, Deputy for Chemical & Material Risk Management, Office of Deputy Under Secretary of Defense (Installations & Environment)

9:30 – 10:30am **Case Study Presentations (20 minutes)**

Tim Sheehan, Regulatory and Risk Manager, Global Substances Program, Raytheon Company

Brenda Baney, Product Stewardship Manager, Delphi Automotive; and, Amy Lilly, Senior Environmental Regulatory Engineer, Hyundai-Kia

Richard Leahy, Vice President, EH&S Compliance, Walmart

10:30 – 11:30am **Moderated Discussion**

- Part 1 – Capturing chemical and material content from the supply chain: *What are participants' experiences and observations?*

11:30 – 12:00pm **Networking Luncheon**

12:00 – 12:30pm **Luncheon Remarks**

Jim Jones, Assistant Administrator, Office of Chemical Safety & Pollution Prevention, U.S. EPA

12:30 – 2:00pm **Moderated Discussion**

- Part 2 – Developing the process and communicating with suppliers: *What best practices can be shared?* (45 minutes)

- Part 3 – Overcoming the obstacles: *What challenges and pitfalls should be recognized, as well as ideas for an improved process?* (45 minutes)

2:00 – 2:15pm **Take-Aways & Wrap Up**

Marianne Horinko, President, The Horinko Group

APPENDIX III – SUMMARY TABLE: KEY CHALLENGES

What are participants' experiences and observations?

Reporting Design and Implementation Challenges

- *Maintaining Chemical Lists*: Any list used in a reporting requirement must have a governance process to update and maintain it. List maintenance requires resources, as the process needs to be ongoing and never static. As a list evolves, the re-reporting up the supply chain can be a time-intensive process.

- *Forecasting for future listing:* Especially for products with long development cycles and maintenance lifespans, forecasting which chemical might be listed in the future is critical, but challenging.

- *Data quality and accuracy*: Data quality challenges often emerge from sub-suppliers, who don't have the expertise (e.g. background in chemistry or toxicology) to enter data properly, making the requirement to test important.

- *Process Chemicals:* Knowing all chemicals used throughout the entire product development process would be beneficial to address public and regulatory concerns related to safety, environmental risks, labor conditions, and sourcing, but would pose a significant challenge for data collection and management.

- *Risk-based versus hazard-based reporting*: Hazard-based lists reflecting regulated chemicals can be the most easily implemented reporting requirement, however, risk-based reporting using a classification scheme is a more forward looking alternative.

- *Reporting ability & burden*: Lower-tier suppliers may experience difficulty meeting reporting requirements because of lack of expertise, resources, capacity, or information (e.g. formulated additives with unknown contents). The more information requested of suppliers, from one or from various industries with distinct requirements, the greater this burden will be.

- *Priority chemical-based phase in*: Though a complete bill of substances requirement would be ideal, it may be more cost effective and achievable to prioritize reporting requirements for specific sets of chemicals.

- *Confidential Business Information (CBI)*: Protecting proprietary formulas while collecting sufficient chemical and material content information poses a persistent challenge. Potential solutions, such as a "wildcard" system or a third-party data management company, each involve unique challenges as well.

Reporting Management and Communication Challenges

- *Communicating through the supply chain*: It is often necessary to work through suppliers to reach sub-tier suppliers, a cumbersome process that can be further complicated by language and time zone barriers. Due to their size and the number of

products handled, large distributors or wholesalers may also be difficult barriers to information exchange between supply chain tiers. The process can become further complicated when suppliers to major recognizable brands want to conceal what suppliers they rely upon.

- *Cross-sector collaboration*: There is currently no recurring forum on chemical and material declaration initiatives for collaborating across sectors or integrating frameworks.

- *Supply chain engagement*: For new reporting requirements, training and educating each tier of the supply chain will be essential, however, doing so is complex and requires engaging sub-suppliers who are not represented by trade associations or umbrella organizations. Efficient, wide engagement of sub-suppliers presents an outreach and education challenge.

- *Reporting Pressures*: Small or sole-source suppliers may be discouraged from selling to markets where the reporting burden is too great. Reporting requirements may, on the other hand, disadvantage small-suppliers who don't have the expertise, capacity, or resources to compete and can't move into other markets.

- *Additional Cost*: Requiring additional information from suppliers may increase cost of supplies and products or may result in contract delays.

- *Private industry leadership*: Companies with brands to protect tend to make longer-term decisions and view investments differently than government agencies that operate on budgets from congressional appropriations, lack a profit-motive, and might base decisions on politics and pressure from leadership. This poses a cultural barrier to implementing systems that are based on the prevention of future risk.

Government/DoD Specific Challenges

- *Government acquisition*: Government purchasing decisions are often made based on contracting habits, relationships, or directives to reduce up-front cost, even when products are tested and proven to be more sustainable, better performing, and/or more economic over the long-term. Without a top-down requirement to consider long-term cost, short-term spending will remain the sole focus.

- *Military Specifications*: DoD must meet engrained, outdated military specifications that often specify particular chemicals and are very difficult to change.

- *Preference in source selection*: Giving preference in source selection to suppliers who provided a complete bill of substances would be difficult given the number of existing high-priority preferences and the performance requirement priorities.

APPENDIX IV - ISSUE OVERVIEW PAPER

Sustainable Chemicals & Materials Roundtable

Sleuthing the Supply Chain:
Capturing Chemical & Material Content

October 22, 2014

1001 Pennsylvania Ave, NW, 9th Floor
Washington, DC 20004

Background

On December 6, 2013, The Sustainable Chemicals & Materials Roundtable convened a group of public and private stakeholders to debate the current state of laws, policies, and procedures to integrate sustainable chemicals and materials into systems and products. Sustainable chemicals and materials (including products and processes) were defined as those that:

1) Have less impacts on human health and the environment;
2) Have an adequate supply into the future;
3) Often can be recovered and re-used; and,
4) Meet performance requirements and are cost-effective.

The discussion entitled, *Moving from High Risk to Low Risk Chemicals,* focused on how risk assessment is used, how organizations target chemicals for attention, and how alternatives are selected (See Attachment A). A topic of much discussion focused on the value of supply chain transparency and the opportunity for enhanced risk management through implementing a process for capturing the chemical and material content data for articles and supplies.

Roundtable Purpose

As an outgrowth of last year's discussion, a follow-up roundtable workshop among public and private sector leaders in the chemical management arena will provide a forum for discussion on the opportunities, challenges, and existing efforts underway for reporting the chemical and material contents through working with suppliers. The roundtable will provide a unique opportunity for mutual learning, information gathering, and sharing of views among a diverse group of seasoned stakeholders.

Issue Overview

In recent years, regulatory and market pressures have mounted to substitute more sustainable chemicals and materials in commerce. These regulatory drivers include the European Union's REACH program and similar statutes in other countries; efforts within the U.S. at the state level, such as those by California and Massachusetts; and, actions taken by the U.S. EPA to sign negotiated phase-out agreements with manufacturers and promote safer alternatives through collaboration. Market drivers include efforts by retailers such as Walmart to promote safer chemicals in the supply chain, as well as organizations like the U.S. Green Building Council to promote sustainable materials in construction and industries such as automobile manufacturing and aerospace's efforts to track chemical and material content.

Any large organization or industry faces a challenge in identifying the precise makeup of its supply chain. For example, an aircraft or recreational vehicle contains thousands of components, each with their own individual suppliers. Government and industry are seeking to manage risks around the uncertainty of the chemical and material contents of the articles and supplies that each heavily rely upon.

For a government entity such as Department of Defense (DoD), it is mission critical to begin the task of reporting and tracking chemical and material content for the following reasons:

- It is imperative to determine risks to system performance for chemicals or materials being regulated or phased-out (i.e. planned obsolescence), and assess availability of suitable substitutes;

- It is critical to assess risk to those potentially exposed to chemicals and materials that may be of concern, whether works or end-users; and,

- It is important to identify and recover/reuse valuable, strategic chemicals and materials at the end of their suitability for the intended purpose.

Cases demonstrate the chemical and material content issue, including a recent example of lead in C-130 brake assembly with potentially harmful exposures (See Attachment B). The manufacturer's Safety Data Sheet had not specified lead content, and workers were unaware of this hazard, as the contents was not listed in any Technical Order publications or hazardous material inventories. A separate case example centers on a life cycle study of beryllium that uncovered flaws in DoD's tracking of strategic, critical materials. Beryllium-containing materials of critical need and high value had been lost during end-of-life management, although it was technologically and economically possible to recover and reuse these materials.

To counter these risks and others, several efforts are underway ranging from pilot projects to new corporate policy, and both public and private sectors have placed emphasis on chemical data gathering (See Attachments C and D). Industry has invested heavily in new databases and procedures to capture each product's ingredients, while using reporting standards, processes, and systems designed to protect propriety information and address anti-competitive issues. DoD will be conducting a two-part study to analyze this issue. Part 1 will consist of a gap analysis to identify existing

policies, procedures, and regulations (e.g., Safety Data Sheets) that require reporting of chemical material content. The study will identify "gaps" or "loopholes" preventing full capture of chemical and material content. Part 2 of the study will conduct a feasibility study to examine the alternatives and costs of eliminating the gaps for items purchased and entered into the supply system.

By gathering a high-level group of public and private sector experts with experience in managing chemical risk in the supply chain, this roundtable will provide a unique opportunity to share state-of-the-art best practices and help inform the DoD study; explore opportunities for improvement; and leverage shared resources for mutual benefit.

Desired Outcomes

Desired outcomes for the roundtable include:

- Transferring information and knowledge among stakeholders that manage supply chains and/or are involved in the process of assessing risk and integrating more sustainable chemicals;

- Gauging lessons learned and best practices for reporting the chemical and material data of supply items and sharing insights into stakeholder engagement with implementation; and,

- Exchanging ideas on the desirability and feasibility of capturing chemical and material content for DoD or government-wide items in the supply chain.

Invitee List

Federal Departments and Agencies

Department of Defense

Environmental Protection Agency

Small Business Administration

General Services Administration

Industry (Association and Company Rep per Sector)

Aerospace

Automotive

Chemical Manufacturing

Chemical Management Services

Product Manufacturing

Consumer Products

NGO/Academia

Environmental/Community Groups

Academia

ATTACHMENT A

Sustainable Chemicals & Materials Roundtable

An Information Exchange:
Moving From High Risk to Low Risk Chemicals

December 6, 2013
Washington, DC

EXECUTIVE SUMMARY

Our society is fundamentally moving towards the use of more sustainable materials and chemicals. However, there is no orderly process for that transition. Instead, there is a panoply of efforts, both public and private, driven by both regulatory and market forces. As a result, current manufactures and developers of new products cannot easily predict what chemicals and materials will be available for use in the future.

The Sustainable Chemicals & Materials Roundtable convened a group of public and private stakeholders to debate the current state of laws, policies, and procedures to integrate sustainable chemicals and materials into systems and products. The discussions focused on how risk assessment is used, how organizations target chemicals for attention, and how alternatives are selected.

Risk Assessment. Risk assessment is generally the precursor for regulations and sometimes for market decisions to create safer alternatives. The participants discussed the suite of risk assessment tools used by EPA, from the comprehensive, most readily observed IRIS process (focused on a small selection of existing chemicals) to the screening risk assessments used by TSCA's New Chemicals Program. There is a spectrum of risk assessment methods available, and the degree depends upon the chemical's importance in commerce and level of toxicity and exposure. While there are not sufficient resources available to conduct extensive risk assessments for every chemical in commerce, enough is known about different categories or families of chemicals to make some informed decisions as to priority.

> **Key Takeaway – The nature of a risk assessment should be tailored to the chemical's importance and impact. Stakeholders need to provide input early in the process, especially information about relevant studies. There exists a need for a more clearly defined process for targeting and reviewing existing chemicals coupled with more effective coordination, outreach, and communication.**

Targeting Chemicals for Action. A number of agencies and organizations have begun to develop lists of prohibited or restricted chemicals or substances of concern. Some of these lists are developed without any coordination across government or private sector networks. The lists can sometimes be used as either market pressure points or in litigation to force chemicals out of commerce. The group debated mechanisms for better collaboration to help ensure that scientific principals and good public communications inform the creation and use of these lists. Creation of functional categories is another potential solution, as chemicals have different exposure profiles depending upon their intended use. Combining a chemical's risk profile with its functional use may also help to preserve critical uses.

- **Key Takeaway – The process for identifying priority chemicals (or categories) should involve the stakeholder community and consider the hazardous nature and functional use of the chemical.**

Safer Substitutes. Developing, testing, and integrating safer chemicals present a host of challenges. Supply chain transparency, data gathering, and communications require extensive effort, and most companies/agencies do not have sufficient resources. In some cases, industry groups with similar product lines have developed joint efforts to track chemicals in their supply chains and assess alternatives. Performance specifications could be tested across functional uses. The systems have to accommodate trade secrets as well as data collection and access to both the public and private sector.

- **Key Takeaway – Chemical substitutions require sufficient lead-time for performance testing. Safer substitutes should be identified early and tested throughout the supply chain, in a manner that ensures market stability for the replacement. There also needs to be regulatory flexibility for specialized applications (e.g., defense, transportation) requiring high performance and where exposure potential is low.**

Ideas for Action. Going forward, the group agreed that shared information about risk profiles linked to a chemical's (or its analog's) functional uses, supply chain transparency, and safety/efficacy of alternative substitutes would be helpful. The ability to build organizations and networks for sharing this information is highly dependent upon the collaborative resources that can be brought to the table, either by a group of single large entities (EPA, states, large private companies) or groups of smaller organizations. Small business in particular will need special assistance. Joint testing protocols for substitutes would be one step in the right direction. Assembling a public-private partnership to accomplish this collaboration will require changes in organizational culture, mutual understanding, and working across sectors to achieve a common goal. Continuing the exchange of ideas combined with powerful pilot projects would be useful next steps.

- **Key Takeaway – Public-private collaboration in a shared-solutions, cross-networked manner is needed to accelerate progress and prevent market crises.**

Complete roundtable proceedings can be accessed at:
http://www.thehorinkogroup.org/wp-content/uploads/2014/03/SCMR-Proceedings.pdf

ATTACHMENT B

Issue 1, February 2014

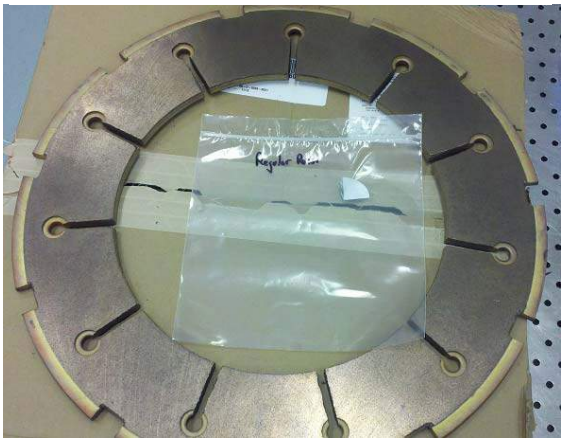
LEAD IN C-130 BRAKE ASSEMBLIES

DOD INDUSTRIAL HYGIENE WORKING GROUP FACT SHEET

LEAD ALERT

- Lead has been identified in C-130 aircraft brake assembly parts.
- Lead may not be identified by the manufacturer as part of the brake assembly composition in the safety data sheet (SDS).
- Workers may be potentially exposed to lead as a by-product of their occupation. If exposure assessments have not been performed, they may be indicated.
- It is unknown at this time if other airframes may be affected.

Dash-1 rotor from C-130 brake assembly
Part number 5012759; NSN 1630-01-464-8655



Regular Rotor from C-130 brake assembly
Part number 9543031; NSN 1630-00-937-6602

POTENTIAL WORKPLACE HEALTH HAZARD

During an occupational health special assessment at a C-130 hydraulics shop, results of a total metal analysis of swipe samples of two parts of the C-130 brake assembly identified lead contamination.

The airborne concentrations of lead measured during this brake assembly process were well below the OSHA permissible exposure limit of 50 $\mu g/m^3$ (8-hour time weighted average). However, the measured levels of lead dust on the workbench surface indicated a significant amount of contamination on the table that could pose a skin contact and ingestion hazard.

Follow-up swipe tests were conducted on new brake assembly parts removed directly from the packaging. Two rotor disks in the brake assembly were found to contain lead.

Because lead was not listed as part of the brake assembly composition, the manufacturer was contacted. The manufacturer stated in a February 2013 email that the "sintered mix used on the referenced rotor disks contains approximately 2.5% lead. The lead is used as a friction modifier and lubricant/anti-seize additive. Lead is an acceptable material for this engineering application."

Workers were not aware of this hazard because lead was not listed in any Technical Order publications or hazardous material inventories for the hydraulics shop.

PROTECTING WORKERS FROM LEAD HAZARDS

Workers conducting brake assembly activities may be potentially exposed to lead as a by-product of their occupation. Supervisors should request advice/guidance and monitoring from local safety and industrial hygiene resources, respectively. Good housekeeping practices to keep heavy metal contamination as free as practicable should be implemented.

To keep heavy metal exposure as free as practicable, workers should observe good personal hygiene and personal protective equipment (PPE) practices as recommended by the industrial hygienist.

- Thoroughly wash hands and forearms with warm water and soap immediately following the assembly operation or the housekeeping processes. This is especially important before taking breaks and at the end of the work shift, where accidental ingestion may occur from eating, drinking, smoking, applying cosmetics, or generally touching the face with dirty hands (something that unconsciously happens many times over the course of the day).

- When removing the wheels on the flight line, wear proper PPE as recommended by Technical Order publications and local safety and industrial hygiene professionals.
  - This is a must because of the amount of metal dust that can accumulate on the brakes after many touch-and-go maneuvers and short-field tactical landings where the brakes are used heavily.
  - Properly dispose of all contaminated PPE.

PURCHASING SPARE PARTS. When purchasing spare parts for a brake assembly, the contract should include a requirement for the manufacturer to provide the content of lead, beryllium, and cadmium in their products regardless of SDS requirements.

REFERENCE. Title 29, Code of Federal Regulations, Part 1910.1025
https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10030

For more information, contact your local safety officer, industrial hygienist, or Service Public Health Center.

The DoD Industrial Hygiene Working Group (IHWG):

- Serves as DoD's principal advisor for all aspects of industrial hygiene.
- Provides recommendations for implementation, staffing, and execution of the functional process improvements for business practices and information managing of DoD Industrial Hygiene Programs.
- Partners with other governmental agencies to develop recommendations for procedures and practices regarding program evaluation, preferred methods of industrial hygiene surveillance, hazard abatement, and information management.
- Integrates industrial hygiene into other environmental, safety, and occupational health programs to ensure conformance with current scientific knowledge, professional practices, and OSHA standards.

ATTACHMENT C

Management of Materials and Chemicals in the Supply Chain

List of organizations and tools for supply chain transparency, data gathering, and communication

The U.S. Department of Defense (DoD) is one of the world's largest purchasers of articles that contain chemicals and materials, many of which have unique high-performance requirements. The DoD has little insight into the chemicals and materials within its global supply chain. The need to collect and maintain information on an article's chemical and material content is driven largely by the following considerations:

- Creating efficiencies by reducing usage and cost through better management and exchange of information within the supply chain
- Complying with legal reporting requirements under existing national or international laws
- Enhancing recovery of precious metals and recycling of source materials
- Risk reduction through increased visibility of chemicals and materials in the supply chain and the ability to respond to market changes and warfighter demands

A. Legal Drivers

There are many existing and some proposed regulations that require suppliers to collect, maintain, and report chemical and material content data.[1] The following regulations are of specific interest at the international and Federal levels because of their potential impact on the DoD supply chain:

1. ***Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH).*** This European Union (EU) regulation replaces numerous EU Directives and regulations, and places responsibility on the chemical industry to demonstrate the safety of its products. The main aims of REACH are to ensure a high level of protection of human health and the environment from the risks that can be posed by chemicals, the promotion of alternative test methods, free circulation of substances on the internal market, and enhancing competitiveness and innovation. REACH makes industry responsible for assessing and managing the risks posed by chemicals and providing appropriate safety information to their users. In parallel, the EU can take additional measures on highly dangerous substances, where there is a need for complementing action at the EU level. Approximately 30,000 chemicals will have to be registered in an 11-year period following the legislation's enactment on 1 June 2007.

2. ***Restriction of Hazardous Substances (RoHS) Directive and Waste Electrical and Electronic Equipment (WEEE) Directive.*** The RoHS and WEEE Directives are two laws that set restrictions upon European manufacturers as to the material content of new electronic equipment placed on the market. The WEEE Directive sets collection, recycling, and recovery targets for all types of electrical goods. The RoHS Directive restricts the use of six hazardous materials in the manufacture of various types of electronic and electrical equipment (with more possibly to come). The RoHS 2 also requires the products to be labeled as compliant by using the "CE" mark.

3. ***Dodd–Frank Wall Street Reform and Consumer Protection Act.*** The U.S. Securities and Exchange Commission (SEC) adopted a rule mandated by the Dodd-Frank Wall Street Reform and Consumer Protection Act to require companies to publicly disclose their use of conflict minerals that originated in

[1] For an expanded list of regulations, see Appendix D-1 of *Meeting Customers' Needs for Chemical Data: a guidance document for suppliers*. February 2011, Green Chemistry and Commerce Council.

the Democratic Republic of the Congo (DRC) or an adjoining country. Independent, third-party traceability audits are required and then this information must be reported to the SEC. These audits must identify whether or not conflict materials originating from the DRC or adjoining countries are present in the supply chain. Under the Act, these minerals include tantalum, tin, gold, and tungsten.

4. ***Toxic Substance Control Act (TSCA).*** TSCA regulates the introduction of new or already existing chemicals, grandfathering in most existing chemicals in 1976 (not including polychlorinated biphenyls [PCBs]). Prior to manufacturing or importing a new chemical for commercial purposes, companies must provide notification to the U.S. Environmental Protection Agency (EPA), with some exceptions handled by other agencies (i.e., Food and Drug Administration [FDA] or the U.S. Department of Agriculture [USDA]). The EPA reviews these notifications and may choose to regulate the chemical, from limiting production or use to a complete ban. In response to the over 84,000 chemicals now regulated under TSCA, in February 2012 EPA issued a new approach in its Existing Chemical Program Strategy to focus its existing chemical materials program on three areas: (1) risk assessment and risk reduction, (2) data collection and screening, and (3) public access to chemical data and information. The EPA's use of significant new use rules (SNURs), test rules, and the issuance of chemical management plans is forcing manufactures and suppliers to become more aware of specific restrictions on the chemicals and materials in their supply chains.

B. Initiatives and Tools

The following is a selected list of initiatives and tools that are used or being implemented by industry, the Federal government, and internationally with respect to the management and identification of materials and chemicals across enterprise supply chains. These initiatives and tools are summarized in Table 1 and basic details on each are provide below.

Government

NASA Materials and Processes Technical Information System (MAPTIS). MAPTIS provides a single-point source for material properties for NASA and NASA-associated contractors and organizations. MAPTIS contains physical, mechanical, and environmental properties for metallic and non-metallic materials. MAPTIS is NASA'S authorized guide to materials that are safe to use in specific operating environments.

DoD Hazardous Material Information Resource System (HMIRS). The Defense Logistics Agency runs the HMIRS. This system is a database that contains Material Safety Data Sheets (MSDSs) for hazardous materials and other information required by logisticians in the field. It also contains government-unique value-added information input by the service/agency focal points. This value-added data includes HAZCOM warning labels and transportation information. This service is used across the DoD and by other civil agencies. HMIRS uses information submitted under the General Services Administration's (GSA's) FED-STD-313.

General Services Administration (GSA) FED-STD-313. This standard, also known as Material Safety Data, Transportation Data, And Disposal Data, For Hazardous Materials Furnished to Government Activities, establishes requirements for the preparation and submission of MSDSs by contractors who provide hazardous materials to government activities. The latest revision is FED-STD-313D, dated 3 April 1996, and Change Notice 1, dated 21 March 2000. Data obtained is used within the government in employee safety and health programs and to provide for safe handling, storage, use, transportation, and

environmentally acceptable disposal of hazardous materials by government activities. These data are input into the HMIRS. MSDSs for GSA products may be obtained online.

EPA ChemView. To improve chemical safety and provide more streamlined access to information on chemicals, the EPA has built and is populating a new database. This new database, named ChemView, provides access to health and safety data on chemicals regulated under the TSCA. It contains information EPA receives and develops about chemicals including those on EPA's Safer Chemical Ingredient List.[2] It does not contain any Confidential Business Information (CBI). EPA is populating the ChemView database in phases, and it currently contains information on more than 1,500 chemicals. Users can find information organized in templates for the following types of data:

- Data submitted to EPA
- EPA Assessments – includes hazard characterizations and Design for the Environment (DfE) alternative assessments
- EPA Actions – includes SNURs for "Existing Chemicals"

Classification and Labeling Inventory Database (C&L Database). The European Chemicals Agency (ECHA) maintains this database. The published information includes the chemical name in the International Union of Pure and Applied Chemistry **(**IUPAC) nomenclature for substances classified with certain hazard classes or categories set out in Article 119(1)(a), without prejudice to Article 119(2)(f) and (g) of REACH; the name of the substance as given in European Inventory of Existing Commercial Chemical Substances (EINECS), if applicable; other numerical identifiers as appropriate and available; and the classification and labelling of the substance. All notifications for any published substance are included in the Inventory. This includes notifications for non-classified substances.

Commercial Industry

Walmart. Walmart has begun several transparency initiatives related to materials and chemicals in its supply chain. These include disclosing full product formulations to The Wercs through WERCSmart, all product ingredients online by product beginning January 2015, and all priority chemicals listed on packaging beginning January 2018. In addition, they plan to increase use of safer formulation of products. Walmart will do this by completing the Sustainability Index to track performance on chemical disclosure, risk assessment, and hazard avoidance, and reduce, restrict, and eliminate use of priority chemicals using informed substitution principles. In addition, beginning in January 2014, Walmart began implementing the EPA's DfE in their private brand's cleaning products. Walmart plans on expanding this initiative. Walmart U.S. and Sam's Club U.S. monitor progress against this policy through the Sustainability Index and The Wercs, beginning January 2014, and plan to publicly communicate progress beginning January 2016.

IBM. The Baseline Environmental Requirements for Supplier Deliverables to IBM establishes requirements for supplier deliverables to IBM. These requirements contain restrictions on materials in products and on certain chemicals used in manufacturing. It also requires suppliers to disclose information about the content of certain materials in their products.

Steelcase. Steelcase works with suppliers to meet sustainability and lean goals and partners on critical sustainability initiatives like materials assessment, worker safety, chemicals of concern avoidance and

[2] http://www.epa.gov/dfe/saferingredients.htm#about

elimination, energy and material reduction, and technology and process improvements. Major waste, cost, and impact reductions are used to influence new processes and materials. Working with suppliers on long-term solutions requires supply chain partners to collect information on materials, recycled content, worker processing, and transportation. To support supplier partner relationships, Steelcase participates in the Green Suppliers Network, an EPA sponsored program. The program provides company suppliers with third-party auditing to identify sustainability improvement opportunities. Steelcase also participates in the Global Reporting Initiative (GRI) Index, a sustainability reporting framework that allows companies the opportunity to self-report on a variety of material subject areas.

Apple Inc. Apple publishes the list of banned and controlled substances in its supply chain. This list includes materials and chemicals that are not banned, but that Apple feels do not belong in its supply chain. Suppliers are required by Apple to identify and manage substances that may be a hazard and comply with labeling laws and regulations for disposal and recycling.

Motorola Mobility. Suppliers are to disclose banned, controlled, and reportable substances as well as recycled material content for each part supplied to Motorola Mobility. In addition to controlled and banned substances according to municipal, national, and international laws, Motorola Mobility has compiled a significant list of substances that must be reported on as part of an environmentally conscious design process or for end-of-life management. They use a standard collection format for material declarations that is consistent with IPC Standard 1752A.

Hewlett-Packard Company (HP). Suppliers are required to declare information on all substances regulated by REACH and RoHS. HP's General Specifications for the Environment (GSE) includes substance disclosure standards; additional content restrictions and guidelines including information to be disclosed about chemical identity and toxicity, product labeling, and marking requirements; and chemical registration requirements. HP uses the GRI reporting framework endorsed by the United Nations (UN) and participates in the Electronic Industry Citizen Coalition (EICC) to establish a supplier code of conduct. HP also publishes a list of almost 200 ore smelters that are identified with HP products.

Raytheon. Raytheon's supplier sustainability initiative starts with the source selection process. Raytheon requests and considers information on suppliers' sustainability efforts when conducting many of their supplier sourcing activities. Sustainability language is being incorporated into enterprise agreements and will continue to incorporate sustainability metrics and reporting in key supplier business reviews. Raytheon is also currently developing and deploying a Product Material Content system to identify and track substances in all Raytheon products.

General Motors (GM). GM's suppliers are required to participate in the Carbon Disclosure Project (CDP) Supply Chain Survey. GM has also adopted a common methodology to obtain chain of custody declarations from suppliers to increase the transparency of conflict minerals in their global supply chain. GM also participates in the International Material Data System (IMDS), requiring suppliers to upload content material information into this database.

Siemens. Siemens' suppliers are required to declare all substances in products that are on Siemens' List of Declarable Substances (LoDS). The list of declarable substances is based on legislation from several different countries including RoHS, REACH, TSCA, China RoHS, and legislation concerning Ozone Depleting Substances or Persistent Organic Pollutants. Suppliers are required to declare all substances on the LoDS regardless of location. Siemens AG and its affiliated companies use BOMcheck as an independent, third-party substance declaration database for its suppliers.

Canon. Canon's suppliers are required to provide Canon with comprehensive information on the presence of substances, including REACH Substances of Very High Concern (SVHCs), in the items that are supplied to Canon. In addition, Canon uses ECHA's Candidate List in the criteria for their supplier survey. Canon also maintains a public online library of MSDSs on all of its products.

Keurig Green Mountain. Suppliers are expected to provide to Keurig Green Mountain reports on the occurrence of substances in any materials supplied to Keurig Green Mountain that may be restricted by, or require disclosure to, governmental bodies, customers, and/or recyclers. Suppliers are required to undertake reasonable due diligence with their supply chains to assure that conflict minerals are being sourced only from mines and smelters with the following characteristics:

- Are outside the Conflict Region (the DRC or an adjoining country)
- Are mines and smelters that have been certified by an independent third-party as conflict free if sourced within the Conflict Region

In addition, suppliers must provide written evidence documenting that raw materials used to produce gold, tin, tantalum, and tungsten used in the materials to manufacture components and products supplied to Keurig Green Mountain originate from outside the Conflict Region, or if they originate from within the Conflict Region, that the mines or smelters be certified as conflict free by an independent third-party.

John Deere. Suppliers are required to verify to John Deere that the products sold to John Deere are compliant with threshold limits or prohibitions placed by laws such as REACH or RoHS. John Deere places the responsibility of verification on the supplier. John Deere provides suppliers with a restricted materials list that describes both limits of use of materials and descriptions of how these materials may be used.

International Aerospace Environmental Group (IAEG). The IAEG is a Trade association formed by major aerospace companies. The IAEG was formed to address the complexity and variability of requirements and associated impact on the Aerospace industry (Civil and Defense) and its supply chain. Currently, the IAEG is working on industry standards for reporting of chemical content and supply chain sustainability survey harmonization. The IAEG reporting of chemical content subgroup has:

- Developed a declarable substance list
- Established data elements requirements
- Conducted a pilot project
- Submitted results to a standardization body (SAE International)

Interestingly, the IAEG chose not to build a data repository like the automotive industry's IMDS. Instead, they have decided to agree on a standard format, and then a declarable substance list, and then allow each company to use their own vehicle to report. The IAEG is also currently developing an industry standard sustainability questionnaire.

Global Automotive Stakeholder Group (GASG). The GASG's purpose is to facilitate communication and exchange of information regarding the use of certain substances in automotive products throughout the supply chain. The Global Automotive Declarable Substance List (GADSL) only covers substances that are expected to be present in a material or part that remains in a vehicle at point of sale.

IPC - Association Connecting Electronics Industries. The electronic trade association's aim is to standardize production in the electronics manufacturing industry. IPC has several standards related to

material and information disclosure of participants across supply chains. These standards include IPC-1755 Conflict Minerals Data Exchange Standard and IPC-1752A Materials Declaration Management Standard. Standardization of data transfer across the supply chain allows for more efficient and effective communication of data.

Together for Sustainability (TfS). The TfS initiative was founded in 2011 by the Chief Procurement Officers of six multinational chemical companies. TfS provides independent sustainability assessments or audits to members that are specific to the chemical industry. These audits look across the supply chain of these multinational companies. The audits are either conducted by TfS or an independent auditor. The four assessment areas are: environment, social, ethics, and supply chain. The TfS audit criteria refer to five areas: management, environment, health and safety, labor and human rights, and governance.

American Chemistry Council (ACC) Responsible Care® Partnership Program. The ACC is working to extend the Responsible Care ethic and management practices throughout the entire chemical supply chain through its Responsible Care Partnership Program. The Program is open to companies that have direct and substantial involvement in the distribution, transportation, storage, use, treatment, disposal, or sales and marketing of chemicals. Responsible Care Partners adhere to the same Responsible Care requirements as ACC members including:

- Endorsing the Responsible Care Guiding Principles,
- Measuring and publicly reporting performance on an annual basis,
- Implementing the Responsible Care Security Code within a firm time frame,
- Implementing the Responsible Care Management System® to achieve and verify results, and
- Obtaining independent certification that a management system is in place and functions according to professional specifications.

Partner companies are separated into different sectors based on their primary business operation. The companies that participate in the Responsible Care Partnership Program strive to continually improve environmental, health, safety, and security performance for all of their operations and business activities involving products manufactured by ACC member companies. There were 104 companies participating as of June 2014.

Global Reporting Initiative (GRI). This nonprofit organization promotes standardized sustainability reporting and publishes reporting standards, framework, and guidelines. GRI connects its reporting framework to other initiatives including the UN's Environment Programme and the International Organization for Standardization's ISO 26000, amongst others. The core document in GRI's framework is the *G4 Sustainability Reporting Guidelines*.[3]

Supply Chain Data Management Tools

G4 Sustainability Reporting Guidelines. This core document in GRI's Sustainability Reporting Framework makes reports comparable by including internationally agreed upon metrics and disclosures. These guidelines are endorsed by the UN and Organization for Economic Co-operation and Development and are aimed at providing stakeholders with enhanced sustainability information to inform their decision-making process. In regards to materials and chemicals, the G4-EN1 and G4-EN2 Standards instruct on reporting the total weight or volume of materials that are non-recyclable and renewable, and also the

[3] https://www.globalreporting.org/reporting/g4/Pages/default.aspx

percentage of materials that are recycled input materials. G4-PR3 instructs on reporting content, "particularly with regard to substances that might produce an environmental or social impact."

Global Automotive Declarable Substance List (GADSL). The GADSL is the common standards list for declaration of parts composition within the automotive industry. It provides a definitive list of substances requiring declaration in specific uses with the objective to minimize company-specific requirements and ensure cost-effective management of declaration practices along the complex supply chain. The scope covers declarable substances relevant to parts and materials supplied throughout the automotive supply chain, from production to the end of life phase. The GADSL only covers substances that are expected to be present in an item or part that remains in the vehicle or part at point of sale. The GADSL does not cover process and operational materials associated with vehicle part or vehicle manufacture. In addition, REACH packaging is a B2B International issue and not within the scope of the GADSL. The information is applicable to the use of these parts or materials in the production of a vehicle up to its usage and relevant to the vehicle's re-use or waste disposal.

International Material Data System (IMDS). The IMDS, developed by HP, is designed to act as an easily accessible database to help manufacturers record and track material usage. The system supports recyclability and recoverability of materials in a vehicle and addresses the disposal of substances of concern. The HP system provides a venue for information exchange among car manufacturers and their suppliers—and their suppliers' suppliers—about the materials used in all vehicle components. HP released the first version of the system in 2000 to support the new EU legislative directive. Currently, the system is operated on behalf of the leading automobile manufacturers.

SAP Environment, Health, and Safety (EHS) Management. SAP EHS Management is a supply chain management tool used to ensure compliance with product and material regulations for all industries such as REACH compliance. SAP EHS Management helps with:

- Product safety and stewardship. SAP EHS Management helps to meet legal, safety, and sustainability obligations along the supply chain, and supports compliant product storage, packaging, shipping, and transportation.
- Environmental compliance. This functionality of SAP EHS Management helps ensure compliance with environmental laws and policies and reduces associated efforts and risks on plant and corporate levels.
- Product and REACH compliance. This functionality of SAP EHS Management helps to comply with product and material compliance regulations for all industries and helps to secure rights to market products.

BOMcheck. This web-based portal is a collaboration among manufacturers and is a database in which suppliers can submit information in standardized regulatory compliance declarations. In order to improve efficiency, stakeholders are pushing for Full Materials Declarations (FMDs) amongst suppliers in order to streamline response to upcoming regulations across the globe. FMDs are confidential, and BOMcheck continuously updates regulatory status, notifying suppliers of changes that may affect their compliance.

Compliance Data eXchange (CDX). CDX is a program made by HP that enables users to collect, maintain, and analyze material data across all levels of their supply chain. The CDX data is collected through the entire supply chain, enabling participating companies to comply with global legal requirements such as the Hong Kong Convention (HKC), REACH, SVHC, WEEE, Conflict Minerals Declaration, or similar

regulations. The system is available to all industries outside of automotive, and is currently focused on Shipbuilding, Electronics, and General Manufacturing.

Quaker Chemical Management Services (QCMS). This is a service provided by Quaker that optimizes chemical consumption and minimizes chemical waste streams. The QCMS collects data and metrics for each chemical category, process, and department. The service does not eliminate usage of chemicals, but rather increases efficiency of usage and lowers consumption.

The Wercs. The Wercs Inc., owned by Underwriter Laboratories Inc., provides several software solutions used in industry. These include safety data sheet (SDS) Authoring Software; WercSMART, which provides municipality-based products restrictions and state-specific hazardous waste regulations; and GREENWercs, which provides a chemistry and sustainability solution.

Material Disclosure. Material Disclosure is a software tool that collects, parses, and stores information about product ingredients, primarily for Corporate Sustainability Reporting (CSR) and compliance reporting to agencies such as the EPA. The software has capabilities for manufacturing companies who make or sell food and beverage products, consumer finished goods, and auto and aerospace parts and components. The software uses MSDSs, technical data sheets, certificates of analysis, information from suppliers, and a compliance database that is updated by Actio.

Design Tools

CES Selector. CES Selector is an engineering design tool that contains a database of common materials available for use. The materials database contains information such as RoHS (EU) compliance and allows for user to conduct an early stage eco-audit before materials are implemented.

Granta Material Intelligence. Granta's design assistance tools improve quality, innovation, and efficiency, while reducing risk and cost in industries including aerospace, energy, automotive, industrial and consumer equipment, medical devices, materials production, electronics, and oil and gas. Granta Design is a materials information technology (software tools, materials data, and materials database) solution that helps engineering enterprises to:

- Manage critical materials data
- Enable better materials decisions
- Design for environmental objectives and regulations
- Provide materials support for engineering design, analysis, and simulation

Table 1. Initiatives and Tools for the Management and Identification of Materials and Chemicals Across Enterprise Supply Chains.

	Selected Chemical and Materials Management Initiatives and Tools	Category			
		Govern-mental	Commer-cial	Trade Organization	Management Tool
1.	NASA Materials and Processes Technical Information System (MAPTIS)	X			
2.	DoD Hazardous Material Information Resource System (HMIRS)	X			
3.	General Services Administration (GSA) FED-STD-313	X			
4.	EPA ChemView	X			
5.	Classification and Labeling Inventory Database (C&L Database)	X			
6.	Walmart		X		
7.	IBM		X		
8.	Steelcase		X		
9.	Apple Inc.		X		
10.	Motorola Mobility		X		
11.	HP		X		
12.	Raytheon		X		
13.	General Motors		X		
14.	Siemens		X		
15.	Canon		X		
16.	Keurig Green Mountain		X		
17.	John Deere		X		
18.	International Aerospace Environmental Group (IAEG)			X	
19.	Global Automotive Stakeholder Group (GASG)			X	
20.	IPC - Association Connecting Electronics Industries			X	
21.	Together for Sustainability (TfS)			X	
22.	ACC Responsible Care® Partnership Program			X	
23.	Global Reporting Initiative (GRI)			X	
24.	Global Automotive Declarable Substance List (GADSL)				X
25.	G4 Sustainability Reporting Guidelines				X
26.	International Material Data System (IMDS)				X
27.	SAP EHS Management				X
28.	BOMcheck				X
29.	Compliance Data eXchange (CDX)				X
30.	Quaker Chemical Management Services				X
31.	The Wercs				X
32.	Material Disclosure				X
33.	CES Selector				X
34.	Granta Material Intelligence				X

Acronyms Listing

ACC	American Chemistry Council
CDX	HP's Compliance Data eXchange
DfE	EPA's Design for the Environment
DoD	U.S. Department of Defense
DRC	Democratic Republic of the Congo
ECHA	European Chemicals Agency
EPA	U.S. Environmental Protection Agency
EU	European Union
FMD	Full Materials Declaration
GADSL	Global Automotive Declarable Substance List
GASG	Global Automotive Stakeholder Group
GM	General Motors
GRI	Global Reporting Initiative
GSA	General Services Administration
HMIRS	DoD's Hazardous Material Information Resource System
HP	Hewlett-Packard Company
IAEG	International Aerospace Environmental Group
IMDS	International Material Data System
LoDS	Siemens' List of Declarable Substances
MAPTIS	NASA Materials and Processes Technical Information System
QCMS	Quaker Chemical Management Services
REACH	EU's Registration, Evaluation, Authorisation and Restriction of Chemicals
RoHS	EU's Restriction of Hazardous Substances
SEC	U.S. Securities and Exchange Commission
SNUR	EPA's Significant New Use Rule
SVHC	REACH Substance of Very High Concern
TfS	Together for Sustainability
TSCA	Toxic Substances Control Act
UN	United Nations
WEEE	Waste Electrical and Electronic Equipment

ATTACHMENT D - Report Excerpt

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

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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.

Table of Contents

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.

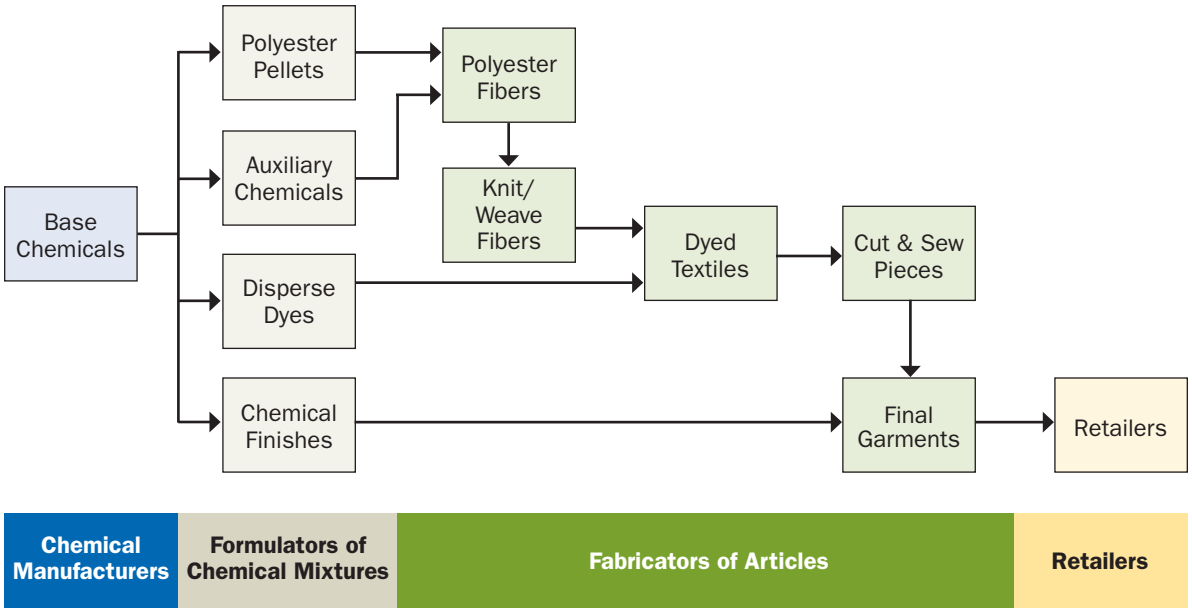
Box 1: Scope of This Document

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.