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Harmonization of Environmental Data Management

An iNEMI White Paper

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The overall objectives of this white paper

The objective of this white paper is to outline the electronic supply chain's past, present and future challenges in collecting and reporting product composition information. This paper will supply a nonpartisan view of available options and a high-level description of how these various options are executed. In conclusion, this paper will strive to deliver one set of recommendations to help simplify and align environmental materials data reporting.

Background and business problem

It is a necessity for electronics companies to be able to manage materials data to meet customer and regionally specific compliance mandates. These companies must also track quantitatively reportable substances in order to register their use or support a plan for substance reductions. Additionally, analysis of a product's compliance with such laws as REACH (Registration, Evaluation, Authorization and Restriction of Chemical substances) and RoHS (Restriction of Hazardous Substances Directive) throughout the product lifecycle is a required capability.

The number of inquiries throughout the supply chain and among industry stakeholders — both to and from contract manufacturers (CMs), electronics manufacturing service providers (EMS), original equipment manufacturers (OEMs), component manufacturers, customers, raw material suppliers, nongovernmental organizations (NGO), and governmental agencies — has exploded, and with each request there are different types and formats for the data. Harmonization is vital to ensure that all of the resources within these groups are used efficiently for accurate, up-to-date data reporting. This harmonization includes initiation of supplier material declaration requests, monitoring of supplier execution, validation that the incoming data are appropriate/accurate, and acceptance/rejection of declaration submissions. The long-term goal is for all players in the supply chain to move toward a standardized "push" system where necessary and nonproprietary material composition information is provided as part of the materials quote and specification.

Historically, many companies, from raw material suppliers to original equipment manufacturers, were not collecting actual material content data. Rather, they collected or housed documents of conformance. Many companies have been reactive to environmental regulations by conducting surveys and sending out letters of notification. However, follow-through on the notifications and surveys has often been lacking and, thus, supply chain members at times did not report data. With the growing awareness of such regulations as EU REACH in 2007 and the EU RoHS

Recast (adopted in 2011), the attitude in the electronics supply chain has changed: materials content data must be collected and records must be retained. What is not consistent is the format by which data are collected, the type of data, and the amount of data. For instance, should companies just collect data for RoHS substances, use Chemical Abstracts Service (CAS) numbers, and/or collect EU REACH substances? What about battery types and Joint Industry Guide 101 (JIG) substances?

Significant expertise and resources are required to know the types of regulations, and the amount and type of data needed, and to validate such data. Once this is accomplished it is important to integrate the data and make it accessible and usable in the day-to-day functions of the overall product lifecycle. This must be done to avoid problems such as general availability of products to markets, fines, poor customer satisfaction, or customs holds. It is also needed to ensure safe handling of the part and material during its entire life, including disposal of the end products.

There was no globally developed "one size fits all" solution for material data collection and transfer between companies in the supply chain. To ease the burden on the electronics industry, the industry and its stakeholders developed an international standard to aid data collection.

Demand for a growing set of diverse data

The need for a materials data management system took off with preparation for the EU ROHS 2006 effective date. The initial six substances restricted in EU RoHS, plus their exemptions, along with other similar regulated substances have been tracked, reported and housed. The EU REACH regulation deals with the registration, evaluation, authorization and restriction of chemical substances, further broadening data declaration challenges. This law greatly expanded the list of Substances of Very High Concern (SVHCs) requiring reporting in electronic products. What was a handful of substances in 2006 has now expanded to hundreds of various substances that require tracking, reporting and data retention.

As directives change and/or new regulations are implemented, compliance definitions will need to be changed and the mechanisms for collecting the data will need to be updated with an auditable tracking mechanism. REACH chemical lists are updated biannually, usually in June and December, and specific country lists and requirements, such as for China and Canada, must also be understood and supported.

Value proposition of globally recognized material declaration standard

One key mechanism for achieving alignment and simplification is the generation and widespread adoption of industry standards. Examples of this exist across all industries and around the globe. Such standards as those associated with product safety or product sizes and capacities, such as AAA batteries, make all of our jobs much easier and more cost-effective.

The electronics industry needs to gather information about the composition of products/product parts for global regulatory compliance and environmentally conscious design requirements. Currently, material declarations are driven either by individual product manufacturer's specifications or regional industry standards such as the IPC-1752, released in the US in 2006. Though it is being used globally, it is not recognized as an international standard.

IEC 62474 (*Material Declaration for Products of and for the Electro technical Industr*y) was recently approved by 96% of the national committees within the International Electro technical Commission's (IEC's) TC111 (Technical Committee for Environmental Standardization for Electrical and Electronic Products and Systems). This international standard was developed with representatives from various existing standardization efforts like the Global Automotive Declarable Substance List (GASDL) for the automotive industry, Joint Industry Guide (JIG) 101 for electronic products declarable substance lists, and IPC-1752 (*Materials Declaration Management*)[1] for data exchange schema to leverage the best known methods (BKM) for materials declaration for the electronics industry.

The main intended uses of this international standard are to provide data to downstream manufacturers that:

- Allow assessment of products against global substance restriction compliance requirements.
- Can be used in the environmentally conscious design process and across all product lifecycle phases.

The new IEC 62474, an international material declaration standard, benefits the electro technical industry by establishing requirements for reporting of substances and materials, standardizing protocols, and facilitating transfer and processing of data. A key benefit of material declaration standardization is in creating economic efficiencies and data quality improvements across the global supply chain.

With the release of IEC 62474, there will be an adoption and transition period from options utilized at companies today.

Industry database options and analysis

Product material content reporting has become an increasingly important issue with the escalating trend toward regulating chemicals in products. Although the chemical industry has been reporting chemical content for many years, this is a relatively new area for electronic products.

There are several options available for industry to collect, store, and report on part/product material content. Some of the advantages and considerations with each type of method are discussed below.

Industry databases

The key advantage of an industry database is the ability to store and share information in a cost effective manner among various users.

Several different types of industry databases are in existence within the marketplace today and the most commonly known types are discussed briefly below.

[1] IPC-1752 builds on formats and data collection processes developed by iNEMI projects. This standard establishes electronic data formats and provides standardized forms to simplify the exchange of materials declaration information. For additional information: http://www.inemi.org/node/2276

Industry sector-wide database**.** An industry sector-wide database is good for manufacturers that all make a very similar finished product and may share many common piece parts. An example of this is the automotive industry's International Material Data System (IMDS) (https://www.mdsystem.com/magnoliaPublic/en/public.html). With the IMDS, the car manufacturers agreed upfront to create a standardized approach. The benefit of this system is that they created a single industry-standard solution instead of multiple individual solutions, and that solution included an industry sector reporting list, the Global Automotive Declarable Substance List (GASDL). The IMDS system enabled automotive industry suppliers to provide data to multiple customers with one system and created identical reporting processes within the whole supply chain. The IMDS is scalable regarding data volume and supports introduction of new legislation without impacting the existing data.

Industry product-specific reporting database. Companies that would like a database to manage their supplier data collection as well as outbound reporting can consider an industry database that allows for a company-specific bill of material (BOM) data collection. An example of this type of database is BOM Check (https://www.bomcheck.net). A benefit of this type of database is the ability to leverage third-party solutions to calculate compliance for a company's specific assembled products and to leverage the technical expertise of the other users of the system to provide guidance and training to the supply chain for better data quality.

Multi-sector database of commonly used industry parts. An example of this type of database is the IHS Parts Universe (http://www.ihs.com/products/product-design-sourcing/componentsupplier-data/4donline.aspx). A benefit of this type of database is that parts used by many different industry sectors are managed in a single location. This can assist designers and commodity managers in finding and managing compliant parts in an efficient and cost effective manner.

Some considerations for selection of industry databases are secure access to data, scalability of the database for existing/future regulations and part data, and language or training support for global supply chain access.

Company-specific databases

A key advantage of a company-owned database is the ability to control access within a company firewall for protection of intellectual property (IP). In addition, this type of database may be suitable for a component manufacturer that needs to account for processing conditions where supplier chemical material safety data sheet (MSDS) information needs to be adjusted to post manufacturing conditions to accurately reflect finished product content.

Some considerations for this type of database are that a single company is responsible for all software development and update costs and all costs associated with data collection, storage and reporting. It can be challenging to gain acceptance of company-specific data control and formatting by various regulatory groups around the globe. Note that — in many cases of industry-specific database usage — material and component manufacturers may not include full materials disclosure in the interest of IP protection.

A positive case study: the automotive industry

The most broad and accepted example of a standardized database schema is the automotive industry's IMDS with GADSL. It has a proven track record with widespread industry acceptance. Its key characteristics are:

- Developed and accepted by all stakeholders from raw material supplier to processors to OEMs.
- Combination of "rough compositional information" and "detailed indication of declarable substance."
- 10% "Joker" substances (not being declarable substances) gives freedom to operate for raw material suppliers without being forced to disclose confidential IP. However, even in cases such as these exceptions, a declaration process must be supported and updated each time a new reportable or restricted substance is published in a law or client requirements document.
- Regular update of GADSL (addition as well as removal of substances) via well defined rules/commission of acceptance.

Issues Faced by Industry Databases

- Who pays for such a database? This must be defined and agreed upon up front and must be equitable for all entities.
- Often limited to a set of substances related to one Industry segment, which narrows the "list of declarable substances" for that segment. As an example, the automotive list of controlled substances includes all chemicals; however, only a subset of this list is pertinent to electronics. The scope of these industry databases can, thus, be an issue.
- In cases where various systems/databases continue to co-exist, there is the danger of use of different electronic data exchange formats.
- Adequate protection of IP can be a concern.

Whatever database may be used, whether it is internally developed, internationally developed or developed by a software provider and purchased for use, what is most important is how data is transferred between companies or even between databases. Through the use of a common data transfer standard, companies can more easily share and automate the sharing capability between the requesting company's database and the supplying company's database. Time and human error can be greatly reduced with proper tools using an internationally defined standard process.

The "do's and don'ts" of IP protection

IP (intellectual property) protection is an important aspect of material content reporting. IP rights protect the interests of inventers by giving them property rights over their creations. IP protection is key to a system that encourages and rewards innovation.

The IP of items such as base materials and leading generation semiconductors is composed primarily of detailed material ingredients and recipes for composition. Material declarations of

such items, therefore, could be in direct conflict with a company's drive to protect its valuable IP. On the other side, players in the value chain have the business need to know regulated substances that their products contain. To balance between both sides in cases such as this, a declaration of "rough compositional" content can be selected, leaving the manufacturer some leeway to protect IP critical parts of its substance list. An example would be to declare approximately 90% of the content and not divulge a few IP critical substances, including them instead in a generic category. The automotive industry's IMDS is a prime example of such a system.

Individual one-to-one company relations could also be covered by specific non-disclosure agreements (NDAs) that enable strictly confidential material content declarations in a well protected environment. Such models work ideally in bilateral company relations. This is particularly possible near the front of the supply chain where concerns are often the greatest. Companies put in place agreements where the "recipe" is put in escrow and is administered by a trusted third party.

One risk associated with material data collection is the potential for inappropriate data sharing. Thus, there must be freedom and flexibility in a standard and system such that manufacturers can not divulge core IP while still supporting the critical substance reporting requirements.

Summary and iNEMI recommendations

The potential benefits of well-designed and implemented harmonized environmental data reporting are large and include**:**

- Ease of transition to new legal requirements from a living system.
- Reduction in testing costs for compliance control.
- Increased accuracy and transparency: A standard, with a minimum set of requirements, allows less "green washing" for players in the supply chain; it will drive provision of environmental data from being a "differentiator" to being one of a "qualifier."
- The system must be global and, therefore, accepted in all geographic markets and by all government regulators.

The iNEMI membership strongly supports the adoption of the global electrical and electronics industry standard IEC 62474, which is now published and available for use

http://webstore.iec.ch/webstore/webstore.nsf/artnum/046233!opendocument

This standard is a critical piece of the overall solution set adopted by the electronics industry. It was developed by an international working group consisting of players representing various sectors of the electronics industry such as lighting, medical, mobile phones, personal computers, digital imaging, automation, etc.

IEC 62474 greatly simplifies what specific data is to be reported. It includes a declarable substance/developer table/schema database (std.iec.ch/iec62474) and covers the key elements of harmonized environmental data reporting:

- Standardized declarable substance/reference substance list
- Standardized material classes for “full material declarations.”
- Standardized XML electronic data exchange schema.

Furthermore, its requirements will interface with other infrastructure pieces that are required to manage and share data effectively, including software and systems for managing, publishing, and using the data.

It should be noted that iNEMI was actively involved in the development of the MDC then sent to IPC for the IPC-1752 development. INEMI was a strong advocate of the IPC 1752 standard when it was published in 2006. It will be expected that a viable needed update to both data exchange schemas standards will occur in a timely manner to create better alignment; increase data exchange integrity, decrease the need for individual company collection reporting and minimize impact within the electronics supply chain.

The iNEMI members that support this white paper are aligned with the usage of IEC 62474 as a key piece of needed global standards for electronics material data management.

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