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RoHS VS. REACH WHAT DOES THIS MEAN TO I/T HARDWARE COMPANIES AND DATA MANAGEMENT?

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ABSTRACT
RoHS (Restriction of Hazardous Substances) regulations (1) vary by geography, e.g., EU RoHS, China RoHS Hazardous substance table, individual U.S. states, cities, etc. The information needed to be gathered for material declarations vary as the regulatory requirements change. However, most RoHS requirements focus on a common theme, e.g., removal and/or reduction of hazardous substances

With respect to the European Union (EU) RoHS requirements, various exemptions have been granted, albeit some have an expiration date. On the other hand, EU REACH legislation (2) has no such provision. In either case the ability to readily assess the concentration of substances in articles (SIA) for REACH or in homogeneous materials for ROHS is needed.

When preparing to meet EU REACH requirements for I/T electronic hardware, the focus is on tracking, communication, and notification of certain substances in articles, while RoHS focuses on eliminating or restricting the use of heavy metals and other substances in homogeneous materials. Because of the larger number of potential chemicals involved (Substances of Very High Concern, SVHC, candidates), and the fact that there are no exemptions applicable to hardware products, the REACH requirements can be a challenging task for companies. With EU REACH, if you exceed the stated concentration level of SVHC candidates in articles (e.g., hardware products), producers and importers in the EU are subject to communication and possibly notification requirements. This drives extensive information requests throughout the supply chain. These regulations drive requirements for quantitative and qualitative chemical data and an increased need for the surveillance of emerging regulations as they are being formulated so that one can design compliance processes that are ahead of what will become firm requirements.

This paper will attempt to outline data collection options that the electronics industry can deploy in connection with their supply chain and with their clients to develop material composition information systems necessary to comply with both RoHS and REACH requirements.

This paper is not meant to be the silver bullet, but rather the start of a brainstorming session to develop options and possibilities that will produce a new and common approach that can enable the electronics industry to collect material composition data for hardware products in a more effective and efficient manner.

Key words: data collection, material compliance, IPC1752, IPC1756

INTRODUCTION

Since the implementation of the European Union's (EU) Restriction of Hazardous Substances directive, many countries have begun developing similar laws and regulations. China, Korea, Japan, and various other governmental entities including some U.S. states have created their own RoHS-like legislation. Similarly the electronics industry now faces the enactment of other instruments the EU Battery Directive, which can be transposed differently by each member state and EU REACH Regulation which is not. Either way, In order to implement these new EU requirements, some countries are expanding on existing laws and regulations, while others are using the new EU requirements as starting points for their own requirements, resulting in a challenging regulatory environment for the Electronics Industry.

The need to acquire accurate and timely data in a concise, qualitative, as well as, quantitative report has become increasingly important but has been compounded by the variance in laws from country to country.

The ever increasing need for diverse product content data has resulted in supply chain requests for substance and material content data, most notably analytical materials test reports. Specifics related to various commodities such as batteries and desiccants, also affect importation and data collection processes. Data we need to acquire is not simply heavy metal content but also specific chemical substance/compound data.

Compliance with restriction of hazardous substances requirements can be accomplished in a number of ways, and has driven dissimilar initiatives among companies as they strive to do the best for the environment while complying with various country/jurisdiction laws and regulations

Harmonization of data collection processes amongst the different country laws and regulations, as well as the differing company approaches to compliance is a challenging, though necessary step in facilitating the compliance of all companies with these laws and regulations.

A global approach to data collection that minimizes adverse effects on product development, manufacturing, service, logistical planning, import compliance and associated tasks, and which consolidates critical technology specification data (Thermal, Humidity, etc.) , product content data (heavy metals, DMF , etc) as well as standard substance information (TBBPA, Phthalates, etc) is necessary.. If data was imbedded in a common global electronics database which could be easily accessed by both importers as well as Data gatherers such as subassembly suppliers, contract manufacturers, and OEMs, (manufacturer or importer), the economics of doing business would be greatly streamlined and decreased for the Electronics Information Technology Industry

The approach taken must maximize the benefit to the data collection methods for substance identification across all geographies and current data providers and collectors. If this can be facilitated by the advantages gained by harmonized, common regulations and defined by common data models this process could reduce costs and supply chain reaction time,

A globally integrated enterprise model is being adopted by many companies that ship products worldwide. This model supports the goal of environmental protection by encouraging the rapid integration of environmental data, and its improvements in Information technology processes, products in countries that have enacted legal requirements, as well as, in countries where the manufacturer does business but no such environmental requirements may exist at this time.

There is unique country reporting, labeling, and other compliance requirements which can be challenging in implementing this modeling worldwide. To this end, the realization of the benefits of a globally integrated supply chain can best be experienced by a common set of data collection methods to meet world wide requirements and business processes within companies. In this case of global environmental requirements., the globally integrated supply chain must rely on the individual companies processes and diverse itself to the company it is working with in order to collect data for their customer or supplier.

The globally integrated supply chain was born out of necessity as companies needed to compete seamlessly across continents. Companies have been able to produce and ship locally and world wide - quickly, efficiently and at reasonable cost. Information sharing, weather common goals for reliability, environmentally efficient products and parts, is a world wide benefit as responsible electronics producers and service providers. If this can be established in a single repository available to all companies with regard to catalogue technologies both companies and the countries where they do business can benefit from a common data exchange method or repository.

APPROACH

Identification of Methods

Various format options such as IPC-1752, IPC-1756, material content declarations, and product content declarations can cause a supplier to spend significant resources on data loading to accommodate the various OEM, or CM formats required.

Taking a philosophical approach to the problem of environmental stewardship and data collection - our goal should be to describe the best practices to achieve data collection for all products worldwide without adversely impacting the logistics of manufacturing and importing while meeting all product regulatory and import requirements world wide.

Investigation of service providers for data collection vs. developing a universal I/T electronics repository was studied for 10 months.

Linking with the EICC (Electronic Industry Citizenship Coalition) (5), EICC A work group was established to investigate as a sub team in the environmental work group to:

- Identify existing initiatives to support a data interchange between Electronic and Electrical Equipment (EEE) companies for EU REACH (Registration, Evaluation, Authorization, and Restriction of Chemicals);
- Focus on Substances In Articles not intended for release;
- For existing initiatives define their adequacy and availability;
- If existing initiatives are not deemed satisfactory, define the characteristics that EEE companies in the supply chain require; and
- Define input format/parameters and output format/parameters.

The work group had 11 participants over 10 corporations to analyze and deliver the above information.

Team activities included but not limited to:

- With respect to the revised IPC 1752 form being reviewed, to assess if all bases are covered;
- Determined if a common format would benefit the industry in data collection; and
- Attain a list of potential software providers currently being assessed with regard to standards alignment.

IBM used the results of the work group above to evaluate nine service and software providers with the common criteria. The criteria evaluated included:

- Capability of handling industry standard formats –e.g., IPC XML format;
- Determine if the supplier has full service capability
- Data collection, storage and analysis;

- Are the tools broken into modules so a customer can select between full service or reduced service—e.g., REACH only; and
- Access the suppliers' software maturity level.

In assessing the various providers, one conclusion was drawn; there is no one company, software or service provider, common to all aspects of the Electronics I/T industry, capable of executing a common material content repository. The breadth needed to combine raw material suppliers, Contract Manufacturers, and OEMs, in order to gather, deposit or extract data or reports on parts and subassemblies was not available.

The next step was then to identify how IBM as a company can find, utilize and demonstrate an easier way to automate data collection and analysis in a timely manner through a service provider.

INVESTIGATION

Implementation Options

Given the lack of a single, electronics industry-wide repository for material content, attention was directed toward getting as close as possible toward realizing the sought-after benefit of improving productivity of the material content collection process.

Two approaches were explored in the attempt to realize the sought-after benefit:

- Implement commercial software packages that enable suppliers to assume a higher-level of responsibility in providing material content information and to do so in a pro-active, self-managing manner, thereby lessening the effort required to request, monitor, and enter data in product data management systems; and

- Contract with firms that specialize in collection and management of electronic component technical data thereby benefiting from economies-of-scale of existing repositories of commercial component data and utilizing the specialty of such firms to collect data for proprietary components.

Two types of commercial software were examined:

- Supplier Survey software; and
- Product Lifecycle Management software.

Supplier Survey software uses a relatively simple paradigm in which surveys are routed to suppliers who respond to the surveys by providing the requested information. The information requested in the survey is readily definable and the software is easy to use. This type of software is suitable for administrative data such as surveying suppliers for compliance with labor laws, but does not adequately support real-time validation of material content data at the moment of entry by suppliers. Additionally it does not support assessment of material content in Bills of Materials.

Product Lifecycle Management (PLM) software provides a more holistic solution to collecting and assessing material content information. The intrinsic capabilities of PLM software, such as Bill of Material management and workflow, are often complemented by dedicated functions that enable suppliers to automatically receive requests for material content information and directly enter that information into the PLM database. In this manner PLM software comes closer to realizing the sought-after productivity benefits.

Although commercial software can help address the productivity objective, it does not optimize the electronics industry supply chain as a whole. Optimizing the supply chain as a whole could be realized if suppliers provided material content information once and only once and that information was accessible to all authorized customers of the supplier.

Firms that specialize in collection and management of electronic component technical data are positioned for a "collect once, use many times" model. In this model commercial component information is collected and stored in a central database. Information in that database can be reused by each company that requests the data.

Proprietary components are naturally not suitable for sharing and therefore would not be stored in the central database. However, the data collection specialty of these information suppliers can help off-load non-core mission work thereby freeing engineering to develop innovative products.

Information Consolidation

Contracting data collection to an information supplier can help optimize the supply chain, but it does not eliminate the need to retrieve material from information suppliers for local storage and analysis.

Information suppliers typically operate on individual part numbers. Although material content of individual parts is important and must be managed, analysis of content in the context of Bills of Materials and end products is how products are qualified for market and how thresholds are computed. This implies that material content information must be retrieved and stored in a manner that makes it accessible to the software that is analyzing the full material content of Bills of Materials. Such functions for part and BOM information storage and analysis are typically provided by PLM software.

SUMMARY OF INVESTIGATION RESULTS

The studies of implementation options highlight that the material content I/T systems rely on three elements:

- Information suppliers that are contracted to collect and supply material content information for individual parts;
- Suppliers that provide the material information for the parts they manufacture; and

- Internal PLM system that manages individual parts and Bills of Material and provides functions for analyzing material content on individual parts and Bills of Materials.

Efficiencies can be realized by individually enhancing any one of the elements. But macro level enhancements such as implementation of the services of an information supplier will certainly necessitate changes to all three elements.

CHALLENGE TO IMPLEMENT

Adopting the services of an information supplier is, on the surface, a seemingly simple matter of outsourcing data collection services. When studying the matter for a period of time, however, it becomes apparent that several dimensions must be addressed for successful implementation:

- Business processes;
- Information Technology;
- Data format and content standards;
- Roles and Responsibilities; and
- Adaptability to new Environmental Legislation.

In-house business processes and I/T systems must now be integrated with the information suppliers' business processes and I/T systems. Failure to do so will lead to confusion and inefficiencies in daily operations.

Roles and responsibilities must be sorted out. It's not a simple matter of just off-loading work. New roles and expectations must be established to perform and manage daily operations.

Figure 1 illustrates integration of in-house and information supplier operations.

Once implemented, the challenges going forward will be coordinating changes across the I/T system, especially changes driven by new data content and new legislation requirements.

It is critical to understand that whatever solution is chosen and implemented, all dimensions stated above must be able to easily adapt to the ever changing legislations. It's not just a simple matter of adding a new substance here and updating established business logic. New legislation has the ability to tax your solution by adding a new twist not previously envisioned. Therefore the ability to allow and foresee change is an important aspect to any solution.

A LOOK FORWARD

Initial roll-out of an information supplier within the I/T system will be based on a process flow such as illustrated in *Figure 1*. In time, enhancements to PLM functional capabilities will further automate workflow and data loading. Perhaps as I/T systems become more sophisticated and can aggregate data between all I/T systems, companies will easily be able to view where their products are being shipped to, and know whether or not the products comply with all the various laws within that GEO region, at a glance. Ultimately this would be the Utopia of Environmental Data Management. *Figure 2* shows a draft of the EU Battery Directive addendum to the current Product Content Declaration (PCD). *Figure 3* illustrates the REACH and RoHS substances currently tracked through the IBM PCD.

FINAL SUMMARY

It is evident with growing legislation, varied data collection methods, and the amount of accurate and accessible data needed, a simple means of data repository would be an advantage to the electronics Industry.

For now a service provider as a partner can ease the data collection burden as the industry drives to a suitable solution to this problem.

It is, of course, not easy to take such a complex industry and make it simplistic in nature. To ask an industry with substantive knowledge encompassed with a mix of proprietary and commercial IP, to now entrust an industry council, or an industry team, to design, police and maintain a universal EE data base, may prove challenging.

It is suggested in this paper to not look at the immediate answer but let's work to develop a longer term solution for the OEMs, supply chain and business partners.

REFERENCE

[1] EU RoHS EU RoHS: "Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment", Official Journal of the European Union L 37/19

[2] EU REACH: "Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 Concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), Establishing a European Chemicals Agency, Amending Directive 1999/45/EC and Repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC"; Official Journal of the European Union L 396/1

[3] EU DMF Ban : "EU 2006/50/EC 2006 May 29 Commission Directive Amending Annexes IVA and IVB to Directive 98/8/EC of the European Parliament and of the Council Concerning the Placing of Biocidal Products on the Market"

[4] EU Battery Directive: "Directive 2008/103/EC of the European Parliament and of the Council of 19 November 2008 Amending Directive 2006/66/EC on Batteries and Accumulators and Waste Batteries and Accumulators as Regards Placing Batteries and Accumulators on the Market", Official Journal of the European Union L 327/7

[5] EICChttp://www.eicc.info/

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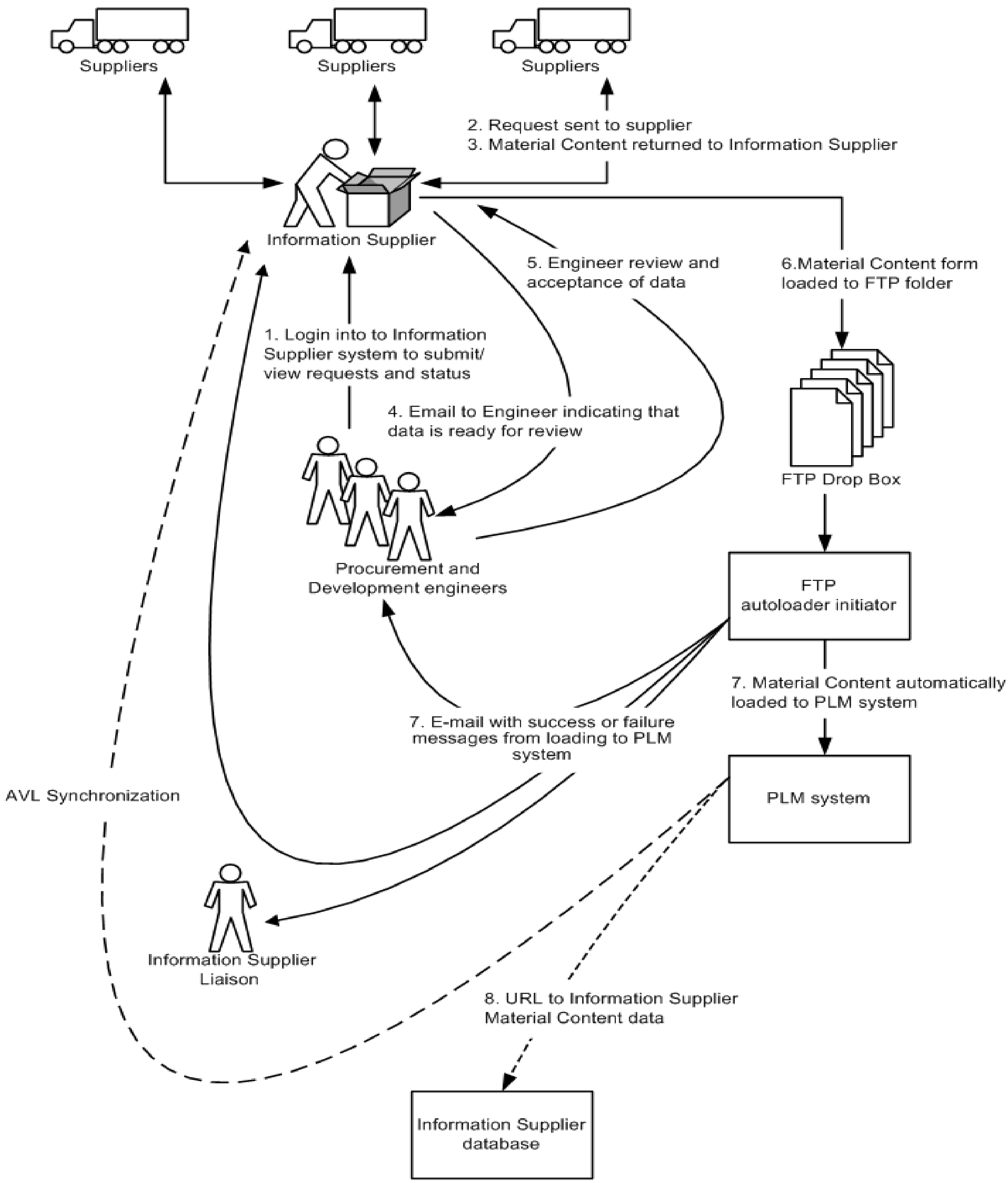

FIGURE 1 – Illustration of Information Supplier Process Flow (initial deployment)

Battery Questionnaire	Substances
Does this part contain a non-IBM part number battery? Yes / No	Alkaline (Zn/alkaline electrolyte/MnO2)
If Yes, please complete the questions below for each battery type.	Carbon-Zinc (Leclanche) (Zn/MnO2)
	Lithium-Carbon Monofluoride (Li/(CF)n)
General	Lithium-Ion (LiCoMO2)
	Lithium-Manganese Dioxide (Li/MnO2)
Name of Battery / Pack Supplier	Lithium-Sulphur Dioxide (Li/SO2)
Supplier Assembly Part Number	Lithium-Thionyl Chloride (Li/SOCl2)
(For Battery Pack)	Lithium/Solid Electrolyte (Li/P2VP)
Cell Supplier (Ex. Panasonic, Sanyo, etc)	Magnesium (Mg/MnO2)
Cell Part Number (Ex. CR2032, BR1225, CGA103450, UR18650E, etc)	Mercad (Cd/HgO)
Nominal Battery Voltage (Volts)	Mercury (Zn/HgO)
Chemistry (See Chemistries Below)	Nickel Metal Hydride (MHMetal/NiOOH)
Standard Cell Type (A, AA, AAA, C, D, Button, Cylinder, Pack, Flat Pack, L	Nickel-Cadmium (Cd/NiOOH)
Dimensions Cylinder DxH (mm) or Rectangular LxWxH (mm)	Nickel-Iron(NI-MH)
Rechargable (Yes / No)	Rechargeable Alkaline
Sealed Package (Yes / No)	Rechargeable Lithium Polymer Batteries (Li/PEO)
Rated Capacity (Ah)	Rechargeable Zinc/Air
Weight (g)	Sealed Lead Acid (Pb/PbO2) gel
Does the battery contain a date of manufacture? Yes / No	Sealed Lead Acid (Pb/PbO2) liquid
Transportation Requirements	Silver-Zinc (Zn/Ag2O)
	Zinc/Air (Zn/O2)
If Lithium, does it meet UN 38.3 (test report available) Yes / No	
If Lithium , cell or battery (Cell / Battery)	
If Lithium Metal, Lithium Content (g)	
If Lithium Ion, Rated Capacity (Calculated Wh)	
If Lithium Ion, battery, is Wh rating marked on case (Yes / No)	
If sealed lead acid gel, is "Nonspillable" marked on battery case (Yes / No)	
Qty of this cell or battery per assembly part number (EA)	

FIGURE 2 – Illustration of Battery - Specific Product Content Declaration Questionnaire

REACH SVHC Substances and CAS #	RoHS Substances
4,4'- Diaminodiphenylmethane (or methylene dianiline) | 101-77-9	Cadmium/Cadmium compounds
Anthracene | 120-12-7	Hexavalent Chromium/Hexavalent Chromium Compounds
Benzyl butyl phthalate (BBP) | 85-68-7	Lead/Lead Compounds
Bis (2-ethyl(hexyl)phthalate) (DEHP) | 117-81-7	Mercury/Mercury Compounds
Bis(tributyltin)oxide (TBTO) | 56-35-9	Polybrominated Biphenyls (PBBs)
Cobalt dichloride | 7546-79-9	Polybrominated Diphenylethers (PBDEs)
Diarsenic pentaoxide | 1303-28-2	
Diarsenic trioxide | 1327-53	
Dibutyl phthalate (DBP) | 84-74-2	
Hexabromocyclododecane (HBCDD) | 25637-99-4	
Lead hydrogen arsenate | 7784-40-9	
Sodium dichromate, dihydrate | 7789-12-0	
Triethyl arsenate | 15606-95-8	

FIGURE 3 – Illustration of REACH vs. RoHS Substances as Tracked in the Product Content Declaration (PCD) Form