International Challenges in Environmental Compliance and Supply Chain Sustainability

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Five years ago, if you asked someone in the electronics industry to explain the meaning of "environmental compliance," the answer would have been fairly straightforward. Environmental compliance meant meeting the European Union's (EU) recycling requirements identified in the Waste Electrical and Electronic Equipment (WEEE) directive and meeting the EU's substance/threshold limit requirements of the Restriction of Hazardous Substances (RoHS) directive which took effect on July 1, 2006. The environmental management standard of record was the relatively well-known International Organization for Standardization (ISO)14000:1996.

Fast forward to 2010 and ask the same question, and the answer is entirely more complex and difficult. Today, environmental compliance is not solved by crossing a well-defined finish line. Over the past few years, there has been an explosion of new environmental requirements across the globe, with a myriad of new restrictions and reporting requirements being imposed on the entire electronic supply chain. Many of these regulations are still evolving, most are widening in scope, and some are interpreted or enforced differently in various global regions. In addition to regulations, there are additional requirements being imposed by large original equipment manufacturers (OEMs) that are often more rigid and extensive than those being pushed by governmental agencies. All of this is forcing electronics companies and their suppliers to deal with an overwhelming set of environmental compliance variables that vary from customer to customer, product line to product line and region to region.

An Explosive Growth of New Regulations

It has been said that the massive number of new environmental regulations that are coming into force can be best described as a tsunami—many are coming in from distant shores, often with little warning. To understand the magnitude of dealing with environmental compliance today, consider what has happened in the last few years:

- China introduces their version of RoHS adding new labeling requirements and environmentally friendly use period (EFUP) rules, which specify the period of time before any of the RoHS substances are likely to leak out and cause possible harm to health and the environment.
- California introduces their own RoHS laws prohibiting an electronic device from being sold or offered for sale in California if that device is prohibited from being sold or offered for sale in the EU due to the presence of lead, mercury, cadmium or hexavalent chromium above certain maximum concentration values (MCVs).
- ISO releases an amended version of its environmental management standard ISO14001:2004.
- The EU introduces Registration, Evaluation, Authorization and Restriction of Chemical Substances (REACH), ultimately regulating an estimated 30,000 chemicals and banning or restricting any substances of very high concern (SVHC). Several revisions have already been made to the SVHC list of chemicals/compounds. There are currently a few dozen SVHCs for semiconductor "articles," but the list is expected to grow to 300 or more.
- Joint Industry Guide (JIG)-101 significantly grows the number of reportable substances in the Material Composition Declaration for Electronic Products.
- Japan introduces the Japan Green Procurement Survey Standardization Initiative (JGPSSI) standardizing the list of substances identified by the JIG and establishing new and comprehensive chemical management systems requirements. Although the requirements were considered voluntary, many Japanese customers now require their upstream suppliers to adapt and push the Japanese chemical management systems requirements throughout their supply chain.
- Carbon, Greenhouse Gas (GHG) Protocol and energy content reporting requirements begin expanding.
- The EU begins drafting RoHS 2, which will restrict additional hazardous substances and will expand the scope of the directive to include previously exempted categories 8 and 9 (medical devices and monitoring and control instruments) with coverage effective January 1, 2014.

If the numerous known and pending environmental regulations weren't enough for companies to deal with, new social responsibility issues are now becoming regulatory targets. The sweatshop conditions that started in the apparel business in emerging countries are now being seen in the electronics industry, as evidenced by the recent and much publicized news of suicides amongst electronics assembly workers in China. Attempts to rectify these conditions include:

- Establishment of the Electronic Industry Citizenship Coalition (EICC) to promote a common code of conduct for the electronics and information and communications technology industries. Members such as Apple, Cisco, Dell, Intel, HP and others are members of this coalition who are working to improve environmental and worker conditions. EICC member companies promote and sometimes require their suppliers to adopt corporate social responsibility (CSR) programs.

- Introduction of the Conflict Minerals Trade Act, which is legislation designed to help stop the deadly conflict over minerals in eastern Congo by regulating the importation and trade of tin, tungsten and tantalum—minerals commonly used in cell phones, laptop computers and other popular electronic devices. Under the bill, U.S.-sanctioned auditors would audit mineral mines declaring them conflict-free or not. Importers of these goods would have to certify on their customs declaration whether their goods were conflict mineral-free based upon this audit system.

Treating Compliance as an Ongoing Process

After exerting tremendous effort to comply with RoHS and WEEE, electronics companies are now finding that developing sustainable, environmentally friendly products is an ongoing process and not a one-time effort. The challenges in ensuring product compliance seem overwhelming (Figure 1), especially for small to mid-sized companies, and it appears it is only going to get worse. After RoHS 2 is enacted into legislation in the next couple of years, it appears that RoHS may become a "Conformité Européene (CE) Mark" directive. The CE marking certifies that a product has met EU consumer health, safety and environmental requirements. Manufacturers and anyone selling the product under their brand will have to audit their manufacturing processes or subcontractor's processes and have the documentation to prove that their products do not have any hazardous substances. Furthermore, this documentation will need to be retained for 10 years. Needless to say, it appears that environmental compliance will be a much more complex and resource-intensive activity in the future.

Figure 1. Challenges in Ensuring Environmental Compliance

How do companies with limited resources, especially after shedding resources to survive the recent economic downturn, meet all of these compliance demands in a cost-effective way? Certainly, reacting to each new regulation or iteration and treating them as separate events will be costly, time consuming and will never allow a company to get ahead of the curve. Staying in reactive mode also increases potential market risks, such as costly and time-consuming redesigns, product recalls, lost sales and brand damage. What is needed is a systematic approach, which provides a way to be compliant, reduce market risk and do it at a lower cost than competitors.

From a high-level view, there are four key areas that most companies need to focus on to build an effective and sustainable environmental compliance program (Figure 2).

Figure 2. Focus Areas for Environmental Compliance

Understanding Compliance Requirements

While few companies can devote the amount of resources to compliance management that large OEMs can, smaller companies can always establish cross-functional teams comprised of members from the engineering, manufacturing, legal, procurement and sales departments. Each team member can represent their functional group and work together to collectively understand requirements, address short-term goals and establish systems and processes to meet long-term goals.

Staying on top of changing and emerging environmental initiatives, directives and regulations is challenging even for experienced compliance managers. One way of accomplishing this is by monitoring information available to the public on various Web sites. There are also industry-specific professional societies, trade associations and consortiums that provide reports, workshops, conferences and guidance. Another tool is to use subscription-based Web services that deliver information on product-oriented environmental compliance for the electronics industries through online tools, webinars, electronic newsletters, etc. Some downstream customers will also inform their supply chain of pending changes, and some even offer workshops for their suppliers to help them understand changes and ways to become compliant.

Design for Environment

One of the best ways to develop sustainable product is to design compliance into the products right from the beginning, commonly called design for environment (DfE) (Figure 3). The first step is to specify all the requirements necessary to produce an Environmentally Preferred Product (EPP) in the marketing specification. The marketing specification should detail the use of non-hazardous materials and the maximum power consumption to meet energy efficiency requirements, and address any end-of-life reuse or recycling requirements. Making compliance data available to designers throughout the design process will also help ensure that the materials and components selected are compliant. Addressing compliance early while design flexibility is still high allows engineers to use materials that provide good performance, are environmentally friendly, and avoid costly re-engineering and late product launches. Good DfE practices also involve selection of environmentally friendly shipping

materials and distribution strategies to minimize waste, energy use and emissions from transportation.

Figure 3. DfE Concepts
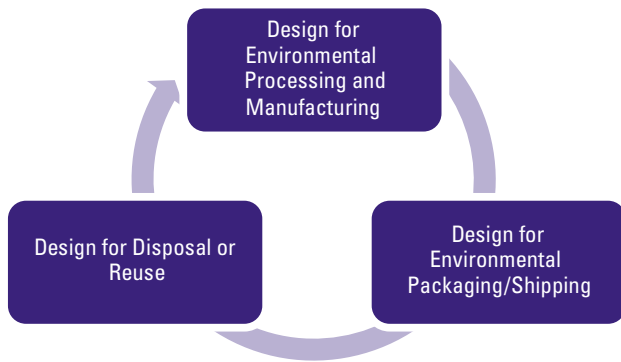
Green Supply Chain Management

The idea of green supply chain management (GSCM) is to eliminate hazardous materials and minimize waste (energy, emissions, landfill material, etc.) during procurement, manufacturing, distribution and reverse logistics. It is important to identify and qualify suppliers who follow RoHS directives, are ISO14000 and OHSAS18000 certified, and have a CSR program or adhere to commonly accepted codes of conduct such as those from EICC. Generating and maintaining an approved suppliers list will help ensure that only suppliers capable of providing compliant materials or components will be used. The suppliers' environmental performance should be assessed periodically through audits to ensure ongoing compliance. It is also useful to establish partnerships with strategic suppliers to share roadmaps and generate action plans that will lead to continuous improvement in environmental compliance for both parties.

Collecting, Managing and Disseminating Compliance Data

Most electronic products are too complex, and the supply chain is too dynamic today to rely on manual documentation methods. Documenting product compliance electronically in a database system is essential. Some companies have customized their product lifecycle management or enterprise planning systems to address product compliance, while others have chosen to use third-party software tools. When customizing or looking for new software tools, it is important to address data importing, error checking and ability to produce customer- or regulation-specific reports to avoid resource-intensive manual generation.

Obtaining compliance data from component suppliers and subcontractors is becoming less challenging than it used to be since mainstream suppliers are now starting to post the data on their Web sites. In many cases, however, the data must still be requested through a sales or technical support portal which may take significant time and effort. This issue should be taken into consideration when selecting suppliers.

The most widely accepted standard reporting format for electronic data exchange of environmental data is the IPC-1752x Material Declaration family. Unfortunately, use of the IPC standard is not universal, so data may come in a variety of formats. Standardize reporting formats for electronic data exchange with suppliers whenever possible, so importing data can be done quickly and at the lowest cost. When standardization is not possible, special software

utilities can sometimes be used that can handle uploading of different data formats into an environmental compliance database to avoid tedious and error-prone manual entry. Gathering compliance data from a variety of sources and building a technical compliance file can significantly reduce the risk of making incorrect representations about a product (Figure 4). Components of a typical product technical compliance file:

- Homogenous material composition data.
- Material safety data sheet (MSDS) for homogeneous materials.
- Third-party analytical test data for materials.
- Supplier declarations of conformity.
- Supplier audits.
- Relevant technical publications available on the Internet.

Figure 4. Risk vs. Resources
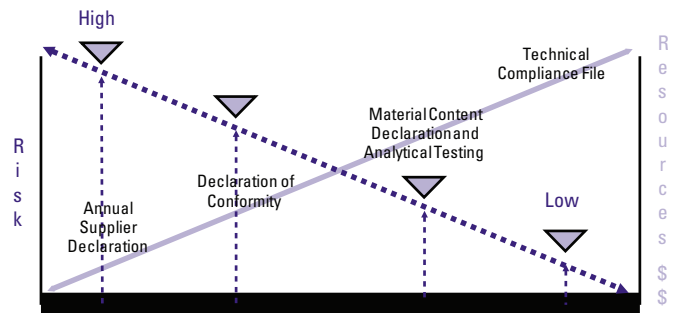
Conclusion

Companies that take a systematic approach to environmental compliance can develop a sustainable system that provides maximum product compliance at the lowest cost. Develop a proactive approach to stay on top of new and changing regulations, and make sure compliance is consciously built into the product during the early specification and design stages. Partner with suppliers who are serious about reducing their environmental impact since they will most likely have continuous improvement programs which will lower the risk of getting non-compliant materials. Standardize and automate as much of the technical compliance data management process as possible to reduce resources, costs and errors. Strive for higher levels of disclosure now, which will minimize additional work needed later as more stringent regulations come into force. Companies that embrace ongoing environmental compliance practices now will be more competitive in the global market moving forward. ∎

About the Authors

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