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10 Steps Toward RoHS Directive Compliance

Manufacturers will likely need documented, auditable systems to prevent noncompliant products from entering the EU.

The EU's RoHS Directive imposes unprecedented regulatory restrictions on substances used in electronics. The targeted substances are cadmium, mercury, lead and hexavalent chromium, along with polybrominated biphenyl (PBB) and polybrominated diphenyl ether (PBDE) flame retardants.

Manufacturers must adhere to significant, and potentially costly, compliance requirements in order to meet the RoHS deadline of July 1, 2006. What is not provided, however, are clear requirements for implementation, specifically what

actions will constitute "compliance." Concerns, then, center on the actions necessary to prove RoHS compliance to regulatory bodies – and customers.

To determine certain implementation details, the European Commission formed the Technical Adaptation Committee, comprised of representatives from EU member states. TAC's role: establishing a process for ensuring that the RoHS substance ban provisions are met. One area this group will address is a method for RoHS compliance and enforcement. Options being discussed include producer self-declaration, supply-chain declarations and market surveillance/testing.

The U.K. has proposed a "due diligence" approach, which will likely be copied by other EU members. Rather than expecting manufacturers to prove that every part they buy is free of RoHS-defined substances, members will likely expect manufacturers to establish documented and auditable systems to prevent noncompliant products from entering the EU market. Assuming this approach will be taken, development, implementation and proof of a corporate RoHS compliance strategy is essential.

Many RoHS implementation issues remain to be settled. The TAC has not given clear direction, but deadlines are nearing and industry must move ahead. In the absence of well-defined statutory or regulatory guidance, implementation of a best management practice approach that incorporates the common compliance

activities of industry leaders may prove a valuable corporate strategy. Here are 10 steps toward developing and implementing a strategy for compliance.

1. Determine the company's legal exposure. This is the first step. Senior management must support this initial exposure assessment and someone within the company must take responsibility for directing the effort. This person should initiate internal dialogue to determine whether the company is subject to the directive or whether its products are covered by an exemption. An in-house attorney or outside legal counsel should make a quick assessment of whether – and to what extent – the company must comply with requirements.

2. Form a corporate-wide compliance team. The next step is to assign ownership of the task to a corporate-wide compliance team. The RoHS Directive's requirements are complex and their impacts are far-reaching, affecting product design, manufacture, distribution, procurement and sale. Virtually all corporate departments must be aware of the directive and its potential impacts. Various departments should be involved in the compliance team and they should meet regularly to assess the impact on current and future operations.

A recent Strategic Counsel LLC survey of electronics manufacturers identified engineering, procurement, legal and marketing as key corporate departments involved in RoHS compliance. Other departments mentioned were quality assurance, logistics/manufacturing, environmental health and safety, operations and new product development. In a separate question, 41% of respondents indicated that they had two to five full-time employees working on compliance, 37% reported having zero or one employee (Figure 1).

3. Develop a corporate RoHS Directive compliance statement. The team's first task: develop a corporate compliance statement articulating the company's commitment to, and goals for achieving, timely RoHS compliance. The statement can be a simple one-page document stating that the company intends to "comply with all regulations worldwide," or a more detailed, substance-by-substance discussion of its compliance status. It should



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include a date (or dates) for compliance and might also outline supplier requirements, such as methods for verification of compliance (i.e., testing, documentation). The objective is to have a formal document to respond to customer inquiries about RoHS compliance. Without this document, customers may perceive the company as an ineligible supplier, which could lead to lost sales.

4. Develop an internal RoHS compliance “roadmap.” An internal document will help guide plans for compliance. This roadmap should define concrete actions the company will take with an implementation schedule. It should identify which products will be offered as lead-free with timelines and deadlines for sample availability and production availability. It might also set deadlines for the discontinuation of “leaded” products; identify plans for part renumbering (e.g., separate part numbers for lead vs. lead-free products); and discuss substitute materials (e.g., preferred alloys to replace tin-lead solder). The roadmap is a living document that will adapt and change as the company’s RoHS preparedness evolves.

5. Assess the company’s supply-chain exposure. The company needs to look very closely at components and parts that it purchases to determine where RoHS-restricted substances may exist within its covered prod-

uct lines. There are the obvious places, such as lead in solders and surface finishes, but there are also less apparent high-risk components, such as lead and cadmium in cables and banned flame retardants in plastics, housings, cables, connectors, fans and components. A company’s restricted substance specification, updated to include the RoHS substance MCVs (maximum concentration values), is an appropriate compliance metric for suppliers.

Product-specific assessments are necessary to identify 1) components at greatest risk for compliance and 2) key suppliers of those components. A risk-based supply chain compliance program should combine documentation of components’ RoHS compliance status with limited testing requirements.

6. Qualify suppliers. Companies should qualify suppliers to determine their level of RoHS preparedness. A questionnaire may help begin this process. Questions may include: Are you aware of/familiar with the RoHS Directive? Does your company have a person responsible for environmental compliance? Is your company ISO 14001 certified? This information, combined with the product risk assessment described above, will help companies identify suppliers that will require the greatest attention because they provide high-risk components and require more education and supervision to ensure that they can deliver RoHS-compliant components. It may be useful to develop a compliance checklist for high-risk components to both inform procurement personnel and provide documentation that RoHS requirements were addressed in procurement decisions.

7. Establish a supply-chain material declaration process. Although RoHS requires manufacturers to know what substances are *prohibited* in their products, it’s also important to know what substances and materials are *used* in their products. A material declaration questionnaire is typically used to obtain this information. A good starting point is the Joint Industry Guide for Material Composition Declaration, developed by EIA, EICTA and JGPSSI (eia.org/resources/2003-09-19.10.pdf). This guide sets an industry standard for materials and substances that, when present in products and subparts above certain thresholds, must be disclosed (i.e., “declared”).

Companies must establish a database for information received from suppliers so they can use it to determine compliance. This database may be as simple as a corporate spreadsheet; however, software vendors, seeing the market potential generated by the RoHS Directive, are busy developing proprietary solutions to help companies manage and use supply-chain disclosure data.

8. Perform limited testing and validate results. Although

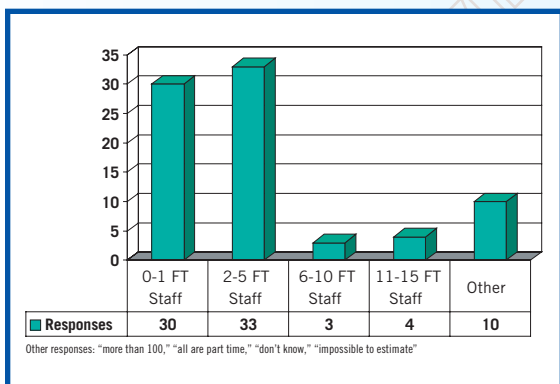


FIGURE 1: Number of full-time employees assigned to RoHS compliance (source: Strategic Counsel LLC).

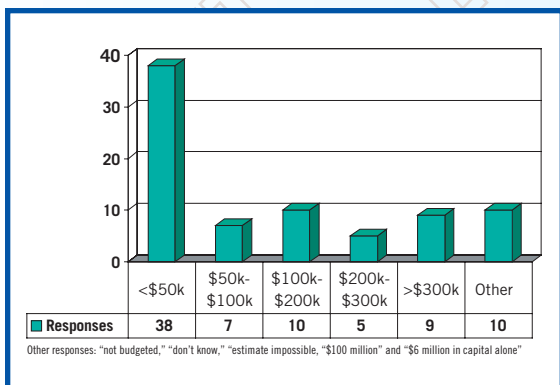


FIGURE 2: RoHS compliance budgets (source: Strategic Counsel LLC).

educating suppliers and procurement managers is the first line of defense in a compliance strategy, a testing plan should also be developed based on the presence of high-risk components. It may not be necessary to test every component, but companies must have a legitimate risk-based testing process using approved methods. Table 1 lists RoHS substance MCVs and several commonly used test methods.

Due to the inherent difficulties in digestion and analysis of product materials using wet chemical methods, x-ray fluorescence is receiving attention as an analytical technique for RoHS compliance analysis. XRF is nondestructive, gives real-time analysis information, and can be used to analyze a wide variety of product materials. Because XRF can detect only elemental substances, in most cases it must be used in conjunction with other analytical methods to achieve a full compliance determination. Portable XRF equipment is easy to use and, although limited by uncertainties in numerical results and low sensitivity for cadmium, can be an excellent screening tool for detecting elemental RoHS substances in a range of product materials.

The evolution of RoHS substance limits for products has created the need for a reference standard to objectively define analytical testing procedures for use in compliance determinations. An IEC (International Electrotechnical Commission) ad-hoc committee has been formed to address this need, and an IEC RoHS testing standard is expected to be issued prior to the July 2006 compliance date.

The final steps are to document, incorporate and periodically evaluate the quality of information received. Testing and compliance documentation should be auditable to ensure credibility and effectiveness.

9. Exchange RoHS compliance data with customers.

Once companies compile material content data, they need to be able to manage and exchange them with customers. A standard approach to materials composition declarations, including data collection and exchange,

could reduce the cost and complexity of compliance and make a more efficient and effective process for the overall supply chain. The International Electronics Manufacturing Initiative's (iNEMI's) Material Composition Data Exchange team is working with international standards bodies to help define and validate standards for the exchange of material composition data between all elements of the supply chain and across the entire product lifecycle in order to support requirements of RoHS. For additional information, visit inemi.org/projects/fis/Material_composition.html.

10. Incorporate RoHS Directive compliance strategy into company-wide operations. A RoHS compliance strategy is complex and requires commitments from several departments. Once in place it must be implemented company-wide. Engineers must update design specifications, procurement officers must understand which suppliers are "high-risk" and the corporate team must be aware of changing requirements and legal determinations (such as new restrictions or changes in concentration levels or exemptions). Specifications must reflect the appropriate RoHS substance limits and be cited in manufacturing and procurement contracts. Procurement needs to monitor the supply chain closely and communicate to suppliers the importance of compliance. Inventory managers must be aware of deadlines (noncompliant products must satisfy the RoHS "placed on the market" condition in the EU prior to July 1, 2006). The sales team must be aware of the company's program so that they can respond to customer requests.

Although the TAC continues to meet on a regular basis, the industry does not expect clear guidance in the near term as to what actions will be accepted as proof of RoHS compliance. In the absence of guidance, the industry must take immediate steps to adopt corporate and industry-wide best management practices to demonstrate RoHS compliance. Companies must put strategies in place now in order to meet the impending RoHS deadlines. The actions outlined in this article are consistent with what's being done by others and are solid steps toward accomplishing a compliance strategy based on due diligence. ■

Bibliography

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| RoHS Substance | Likely RoHS MCV Limits | Typical Testing Approaches |
|---------------------|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lead | 1000 ppm* | <ul style="list-style-type: none"> • Wet chemical digestion followed by ICP (Inductively coupled plasma) or AAS (atomic absorption) spectroscopy • XRF (X-ray fluorescence) spectroscopy |
| Cadmium | 100 ppm | <ul style="list-style-type: none"> • Wet chemical digestion followed by ICP or AAS • XRF |
| Hexavalent Chromium | 1000 ppm | <ul style="list-style-type: none"> • Wet chemical digestion followed by UV-VIS (ultraviolet and visible absorption) spectroscopy • XRF (for elemental Cr only) |
| Mercury | 1000 ppm | <ul style="list-style-type: none"> • Wet chemical digestion followed by AAS • XRF |
| PBB/PBDE | 1000 ppm | <ul style="list-style-type: none"> • Solvent extraction followed by GC/MS (gas chromatography/mass spectroscopy) • XRF (for elemental Br only) |

*Note: A California Prop 65 ruling limits lead to 300 ppm in external cables to avoid product warning labels.

TABLE 1: RoHS substances, MCV limits and typical testing approaches.