# Strategies for Compliance and DfE: Managing Data throughout the Supply Chain

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## Abstract

As the number of countries with product stewardship laws grows, companies are finding it necessary to manage compliance on a global basis. A consistent methodology can be used to manage similarly regulated EPR issues, e.g. electronics, batteries, and packaging. In our experience, implementation of requirements within a company is best served by a three-tiered approach: 1) to achieve compliance at the corporate level, the company must determine how compliance responsibilities will be distributed among departments; 2) design procedures must be revised to incorporate EPR requirements into the product development and approval protocol, which drives global compliance at the product level; and 3) with the prevalence of outsourced manufacturing, compliance at the component level also entails developing a supply chain management system with sufficient due diligence procedures. A detailed product and packaging database that enables compliance with complex reporting and documentation requirements is crucial. Implementing a database and a centralized compliance program presents a variety of challenges and opportunities.

## 1 Background

As the regulatory landscape for product stewardship expands, many global companies are reexamining their approach to compliance with extended producer responsibility (EPR) laws such as the WEEE and RoHS Directives. EPR regulations now apply to many product streams, e.g. vehicles, electronics, waste oils, and govern material selection, design, labeling and information, and end-of-life management. This paper focuses not only on compliance with electronics requirements such as the WEEE and RoHS Directives, but also on the regulations for batteries and packaging, since these are also constituents of many of the industry's finished goods.

| Basis for Requirements | Materials Restrictions | Design / Construction Requirements | Labeling / Information Requirements | Recovery / Fee Requirements |
|---|---|---|---|---|
| **Product** | X | X | X | X |
| **Battery** | X | X | X | X |
| **Packaging** | X | X | X | X |

**Table 1: EPR Requirements for a Typical Consumer Electronic Product**

Historically, with EPR requirements in a handful of countries, many companies have addressed these regulatory issues at the "end-of-pipe," relying on their local sales offices in each country to keep them abreast of regulatory changes and pay recovery fees, while engineers tracked design requirements separately. This has led to significant duplication of efforts within the global company. A classic example is the destructive capture of packaging materials and weights for fee reporting by employees in the warehouse, who record the data according to the definitions requirements of a local recovery scheme, while other employees repeat the process in another country, capturing the same data along slightly different parameters. At the same time, in many multinational companies, corporate headquarters struggle to keep track of the EPR compliance status of its products around the world.

However, as the number of countries with product stewardship laws grows, companies are realizing the need to manage the issue on a global basis. A consistent methodology can be used to manage similarly regulated EPR issues, e.g. electronics, batteries, and packaging, as the goals and structure of the requirements are similar in each of these cases.

## 2 Preparing for the Unknown

### 2.1 Lack of Data Standards

Under current take-back requirements, data demands for recovery fee reporting have grown in complexity as each new law and recovery scheme has introduced a different set of rules or materials or even a different

definition of the regulated product. To enable reporting to the take-back schemes currently in operation, EPI has advised its clients to capture approximately 18-25 different data points at the product and component levels specifically for compliance with packaging requirements, about 6 to address battery requirements, and another 6 for compliance with existing national electronics take-back regulations, in addition to many basic product-level data points used for multiple reporting purposes. Though data collection can sometimes be simplified based on product line, degree of standardization, data format, etc., the cost and effort that data collection entails are immense for companies with complex products or large product ranges. The data demands under the WEEE and RoHS Directives will be much greater.

### 2.1.1 WEEE

The practical implications of the WEEE Directive for many companies hinge on the details of the implementation of the WEEE Directive at the EU level and in each Member State.

The WEEE Directive requires collection of data on the quantity and categories of products placed on the market, the mass of products, components, and substances entering and leaving treatment [1]. This data will be collected by producers and recovery organizations and aggregated in each Member State to assess market share, recovery and recycling rates, and other characteristics of the waste stream. It will also require the collection of data on the presence of substances listed in Annex II of the WEEE Directive which must be removed for treatment. Precise data points and formats are pending as of June 2004.

The WEEE Directive, in contrast to the RoHS Directive, allows Member States to define a wider scope or set more stringent requirements than those contained in the Directive itself. At the national level, the scope and requirements of the law and the rules of the recovery organizations will greatly impact the compliance burden on manufacturers. There are currently many open questions, particularly with regard to military, commercial, and industrial products. Ideally, product categories and component types would be defined uniformly, and Member States would decide individually to include or exclude certain product categories or component types. This approach has been applied to a certain extent with the Battery Directive. However, it is more likely that the categories and definitions used in the scope of the requirements will vary at a national level, creating a chaos of definitions similar to the one that has arisen under the Packaging Directive and its national implementations.

If implementing laws are not specific enough in defining their scope, it will fall to the recovery organizations to decide which products will be included in a category, how to assign fees to products, etc. For example: many systems will presumably require reporting by product weight. But should the product weight include cables and plug adapters? Auxiliary products that do not contain electronic components, such as plastic cases? Other products included with the device, such as CDs or instruction manuals? Can the weight of batteries which are soldered into the device be excluded, since the batteries are assessed fees based on weight by battery compliance schemes? While rules may differ from country to country, a common vocabulary should be developed.

### 2.1.2 RoHS & Materials Data

With the RoHS Directive, the task of data collection and reporting gains an order of magnitude. Although it is a harmonized directive, many companies are requiring their suppliers to report on a multitude of other substances (for example, the substances subject to removal under the WEEE Directive) in addition to the six substances banned by the RoHS Directive. In response to this trend, electronics industry associations in the US, Europe, and Japan (EIA, EICTA, and JGPSSI, respectively) drafted the Joint Material Composition Declaration Guide (referred to as Joint Industry Guide or JIG) to serve as an unofficial standard for materials data reporting [2]. The JIG incorporates a longer list of materials. However, numerous corporations require their suppliers to report on additional substances. Furthermore, many of these brandowners have developed their own customized reporting documents. As a result, suppliers find themselves inundated with forms as hundreds of customers ask for data on the presence of substances in the parts they supply, each customer with a different list and a custom report format. An employee of a supplier to a major U.S. computer brandowner estimated that completing the declarations required by that one customer alone would take approximately 40 hours. For the many small and medium-sized enterprises (SMEs) that supply parts to the electronics industry, the personnel burden can be staggering. Furthermore, fielding supplier inquiries by phone and e-mail can be daunting for large brandowners, as many of the approximately 48,000 electronics manufacturers (suppliers) in the US are unaware of RoHS.

## 2.2 RoHS and WEEE: Moving Targets

As electronics manufacturers prepare to comply with the WEEE and RoHS Directives, they continue to be faced with a variety of regulatory uncertainties in addition to the data questions already raised. For example, much of the effort towards eliminating lead from

solder and other applications has taken place in the absence of final threshold limits for lead and other substances restricted under RoHS. Even after implementation, the threshold values may be revised to reflect new technological or risk data. The exemptions from the RoHS Directive are also subject to review at least every four years and may be eliminated.

Medical devices and monitoring and control instruments are not subject to the RoHS Directive initially, but the Directive calls for the preparation by 13 February 2005 of a Commission proposal to include them [3]. Given the nature of the legislative process, however, it is impossible for affected manufacturers to predict when their products would be subject. In the interim, they are likely to be confronted with substitution as their suppliers discontinue parts containing banned substances and replace them with RoHS-compliant components. This will mean additional testing, re-specification, and requalification of devices.

Similarly, the WEEE Directive contains recovery and recycling targets that will be revised by 31 December 2008. Annex II also identifies printed circuit boards for mobile phones and liquid crystal displays for evaluation and possible amendment. As targets increase and technologies change, the scope of national regulations and/or compliance scheme rules may be changed in order to meet the new targets.

# 3 Strategies for Preparedness

In our experience, implementation of requirements within a company is best served by a three-tiered approach: 1) to achieve compliance at the corporate level, the company must determine how compliance responsibilities will be distributed among departments; 2) design procedures must be revised to incorporate EPR requirements into the product development and approval protocol, which drives global compliance at the product level; and 3) with the prevalence of outsourced manufacturing, compliance at the component level also entails developing a supply chain management system with sufficient due diligence procedures.

## 3.1 Compliance at the Corporate Level

### 3.1.1 Organization

One of the initial challenges in managing EPR compliance is determining "ownership" of the issue, i.e. who will take primary responsibility for managing the issue, coordinating compliance efforts throughout the corporation, tracking regulatory developments and disseminating this information to others involved in compliance. In some cases the task of assessing, achieving, and/or maintaining compliance is managed by the product development teams, in other cases by the Environment, Health and Safety (EHS) department or even by Regulatory Affairs. Finding an "owner" who understands the environmental regulatory issues is particularly difficult for some relatively new high-tech companies with outsourced manufacturing, as they may lack an EHS department altogether.

EPR compliance may best be managed centrally, but it is fundamentally a decentralized process. Regardless of who "owns" the issue, compliance with EPR directives, more than any other environmental regulations, requires the coordination and communication of many parts of a company, including EHS managers, legal affairs, product and packaging engineers, artwork designers, marketing, sales/financial departments, and procurement teams. The roles of each of these groups must be clearly defined and each group must be trained on their responsibilities with respect to EPR compliance.

### 3.1.2 Detailed Data Collection

Companies who have data systems in place for complying with existing design and take-back requirements are well positioned to meet the demands of the RoHS and WEEE Directives. However, they will need to respond to new scheme rules and customer demands, which may entail the addition of many new data fields. Collecting data with a high level of component granularity will better serve companies as they prepare reports for each system.

Compliance databases must also include technical drawings and/or instructions to dismantlers to locate substances which must be removed during pre-treatment.

As explained in previous sections, detailed materials data must be collected to facilitate documentation of compliance with RoHS and in order to identify parts subject to pre-treatment removal requirements.

An issue that many producers must address is traceability. The modern supply chain is more complex than merely a linear chain; producers often purchase a given part from several different vendors. This makes it necessary to differentiate the different variants by supplier within the database, even if the specifications for the part are identical. For example, if a product in a certain market is found to have a cable that exceeds heavy metals limits, the producer must be able to determine which vendor supplied the non-compliant part.

### 3.1.3 Data Flow

Capturing the information outputs of the product design process and the supply chain management system in a detailed product and packaging database is

crucial in order to comply with complex reporting and documentation requirements. However, data capture is only a small piece of the puzzle. Large quantities of information must flow between the various parties. Engineers, designers, and procurement teams rely on current information on the regulations so that they can create products that will conform to them. Data from product design and production will be used by managers or sales offices to calculate fees and document compliance with design requirements. Current and historic data must be made available to the next link in the supply chain and to end users and recyclers.

## 3.2 Compliance at the Product Level

The complexity of EPR compliance in the electronics industry is exacerbated by the fact that many electronics goods are manufactured for worldwide distribution. In order to ensure that each product will comply with applicable regulations worldwide, it is imperative that the latest product-based regulations are tracked and reflected in the corporate protocol for product development and specification. First, product engineers and/or product managers should review a list of regulatory criteria for the product in each market country and certify that the product will comply with these requirements. Second, product teams should obtain the relevant certification for any third-party components from the parts suppliers. Third, product and component data should also be captured during this phase to document compliance with the design requirements and enable later compliance with recovery and other requirements. Final approval of the product designs should be made contingent on fulfillment of these three criteria.

In our experience, given the number of EPR requirements that must be met by a new product, it is useful to employ a formalized questionnaire as part of the protocol for assessment and approval of new product designs. This questionnaire should address regulatory mandates such as material bans, disassembly requirements, part coding, etc. Incorporating EPR issues into the corporate protocol is helpful for developers, as it encourages them to consider environmental attributes of the product early on in the design process. This minimizes the investments of time and resources that will be made in a design that is incompatible with EPR regulations; at the same time, it fosters a higher weighting of environmental attributes with respect to other product characteristics.

## 3.3 Compliance at the Component Level

### 3.3.1 Supply Chain Communications

Despite the increasing trend towards third-party manufacturing, brandowners remain legally responsible for compliance with EPR legislation. As a result, supply chain management has become a central part of environmental compliance. Coordination between environmental managers, procurement personnel, and suppliers is crucial.

Suppliers must be informed of their obligations and the requirements that affect their products, they must certify that their products will meet these requirements, and they must provide key data on their products.

The procurement teams of the outsourcing company must provide explanations of the requirements to the suppliers and respond to their inquiries. They must ensure that the requirements are reflected in the appropriate contracts, specifications, and certifications. They must review and approve data provided by suppliers, and finally, they must perform due diligence to ensure that the requirements are actually being met by their suppliers.

### 3.3.2 Due Diligence

Due diligence starts with the design protocol and the requirement that certification of compliance with applicable standards be available for each supplier before the product design can receive final approval.

Supplier contracts should stipulate that the supplier provide independent lab test results at the request of the producer. These tests may be ordered to satisfy regulatory inquiries or to verify that the components meet company specifications.

In light of several incidents in which routine checks by customs authorities revealed illegal levels of heavy metals in product and packaging components that had been certified as compliant by the supplier, it is advisable to make random checks, either with a handheld device or using lab testing, a part of standard operating procedure.

Additionally, producers should conduct audits of their distributors to ensure that they are paying the appropriate WEEE, battery, and packaging fees in countries where they are obligated.

## 3.4 Know Your Costs

Since the WEEE Directive allows for both individual and collective compliance, producers should carefully weigh the two options. Factors such as limited product lines, a high degree of control over distribution channels, components common to multiple products, product designs that facilitate easy disassembly, leasing programs, service and maintenance programs, etc., may make individual compliance a viable and economical option to membership in a collective scheme. Producers who opt to join a collective recovery organization should track the recovery costs asso-

ciated with each product so that they can identify cost savings opportunities and determine when individual compliance may be preferable.

# 4 Tools for Compliance

## 4.1 RoHS-WEEE.NET: Database as Communication Channel

To address these issues effectively, a product and packaging database must be as much a communication tool as a data storage tool. The database should provide a link between different functions in the company (e.g. product designers, procurement, and sales) as well as between different parts of the global supply chain. It should offer a standard data collection format to meet a wide variety of custom reporting and certification requirements. With the right database tools, many data management and reporting processes can be automated.

Developed by Foresite Systems Ltd. in response to the complexities of EPR compliance, RoHS-WEEE.NET is a browser-based data management and reporting package to facilitate compliance with the RoHS and WEEE Directives, with optional modules for packaging and battery compliance. Rules for each recovery organization are stored within the software, allowing the user to print out the reporting forms for each organization based on a single dataset in minutes. The software is updated regularly to reflect any rule changes or new recovery organizations.

RoHS-WEEE.NET has many integrated communications functions which streamline the tasks involved in gathering data and documenting compliance, thereby saving personnel resources. For example, RoHS-WEEE.NET allows a company to set up limited access profiles so that its suppliers can enter data (e.g. parts and bills of materials) directly into the database. It can query part data to find data gaps and then automatically send e-mails to the relevant suppliers, prompting them to log in and enter the missing data. After the data are approved, they are used for reporting to WEEE, battery, and packaging recovery schemes.

RoHS-WEEE.NET incorporates the GoodBye Chain Group's Material Declaration Wizard, providing a user-friendly interface for suppliers to declare and certify material declaration forms. The system conforms to the Joint Industry Guide data collection and reporting formats. Materials to be declared include the six RoHS substances, the JIG "A" list of restricted substances, the JIG "B" list of substances of interest, and customer-specific lists. This means that suppliers only need to fill in data once and certify it. They can then use this data to fulfill a variety of customer reporting requirements. Parts-per-million are calculated automatically and the compliance status is instantly displayed as a green light (for compliant items) or a red light (for non-compliant items). This information can be "rolled up" to the product level and displayed in red light/green light format. There is a separate column to display conformance status with respect to each materials list.

In addition, the Advisor, an extensive library of online contextual help, answers many supplier questions about RoHS, substance limits and exemptions, and related issues, minimizing redundant phone calls and e-mails asking for help in understanding the regulations.

RoHS-WEEE.NET's "What-If?" functionality allows product developers to model quantify the impact of design modifications to EPR fees, and to weigh design options against one another with respect to fees worldwide.

# 5 Reaping the Benefits

While creating corporate management protocols and databases is no doubt a substantial undertaking requiring a high level of corporate commitment, it can bring about several beneficial changes in addition to regulatory compliance: new lines of communication are opened between various parts of the business, economies of scale arise in data management, and the systems put in place to manage compliance with regulatory mandates also serve to facilitate voluntary environmental initiatives.

The same management practices, communication channels, and data systems that allow corporations to comply with EPR regulations also enable them to respond quickly, accurately, and competently to information requests by regulatory authorities, shareholder groups, or NGOs. This preparedness is critical both in terms of compliance and public relations.

Making the cost of end-of-life recovery and recycling known to product developers and educating them about the cost drivers can encourage the application of DfE principles such as substitution and design for disassembly. These projects can be supported by RoHS-WEEE.NET, and resultant cost savings opportunities can be evaluated. Furthermore, implementing an EPR-based design protocol and capturing the design information in a detailed EPR database generates a wealth of data that can be used to track the impact of the product range and support company sustainability reporting.

# 6 Conclusion

Companies who establish a centralized EPR compli-

ance system with clearly defined roles and responsibilities, good supply chain communications, and protocols for thorough data collection can comply with existing EPR requirements most efficiently and will be well positioned to comply when the requirements of the WEEE and RoHS Directives take effect. The complexities of data requirements and the changing nature of the regulations require a sophisticated EPR database to reduce personnel costs resulting from data entry, data transfer, and communications, with the flexibility to facilitate worldwide reporting and compliance documentation. The management and database systems put in place to address environmental mandates can be leveraged for fee reduction, DfE projects, sustainability reporting, and other voluntary initiatives.

# 7 References


[1] Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003 on waste electrical and electronic equipment. OJ L 37, 13.2.2003, p. 24-38

[2] Joint Industry Guide: Material Composition Declaration Guide. Electronic Industries Alliance, European Information & Communications Technology Industry Association, and Japanese Green Procurement Survey Standardization Initiative. Draft of 19 September 2003.

[3] 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. OJ L 37, 13.2.2003, p. 19-23.