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REGULATORY COMPLIANCE MEANS GOING THE EXTRA GREEN MILE

Photo: Motorola Inc.

As the weeks and months (and laws) pass, creating environmentally friendly products gets more difficult as designers try to hit the moving targets of local, federal, and international regulations.

Just when you thought you were beginning to understand Europe's environmental regulations, the European Union turns the tables and will change them again. In the process, these requirements will become much more complicated, more costly, and—for product designers—more challenging.

Adding to this growing complexity is the emergence of environmental restrictions that target the electronics industry from China, Korea, and India *(Fig. 1)*. Also, California's RoHS-like laws covering the chemical content of electronic products, electronic waste, and energy efficiency are expected to impact the industry inside and outside the state.

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The EU's Restrictions on Hazardous Substances (RoHS) originally limited the use of six hazardous substances in electronic products. Another EU directive, Waste from Electrical and Electronic Equipment (WEEE), focuses on recycling e-waste.

RoHS requires manufacturers to demonstrate that their products don't contain more than the maximum permitted levels of lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls, and polybrominated diphenyl ethers. RoHS has already come at a big cost to the industry, even to companies that have had formal environmental programs in place for years *(Fig. 2)*.

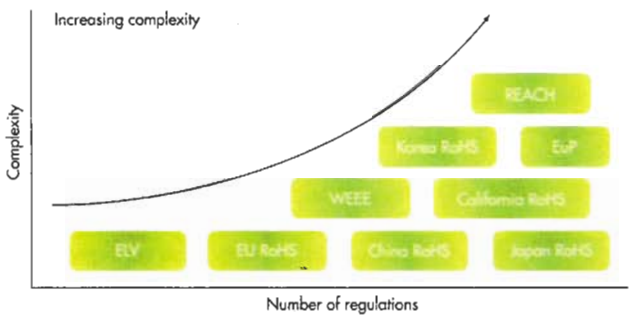
A study conducted for the Consumer Electronics Association by Technology Forecasters Inc. estimates that the RoHS directive cost the global electronics industry more than $32 billion for initial compliance and about $3 billion annually to maintain compliance. The study also found that companies spent on average about $2.6 million to achieve initial RoHS compliance and another $482,000 for annual maintenance.

But according to the European Commission (EC), which oversees RoHS and WEEE, more than four years after these directives went into effect, only about a third of electronic waste is reported to be treated in line with these laws. The other two-thirds is going to landfill and potentially to substandard treatment sites in or outside the EU.

THE PCB CONTROVERSY

Meanwhile, the EC was considering adding substances to the RoHS list. One of these was tetrabromobisphenol A (TBBPA), a reactive flame retardant used in most printed-circuit-board (PCB) laminates. TBBPA was one of the more controversial additions to the draft list of the European Commission's Environmental Directive-General.

The IPC, a global trade association that comprises 2700 members, has been anything but supportive of adding TBBPA to RoHS. The group says that many PCB manufacturers and end users of circuit boards would not be able to afford the more costly halogen-free laminates.



1. The list of environmental regulations aimed at reducing the use of hazardous substances in electronic products is growing in size, complexity, and scope. *(courtesy of Siemens PLM Software)*

The group also pointed out that some of the electrical and dielectric properties of halogen-free materials are different compared to those based on TBBPA, requiring the redesign of many PCBs. The IPC won its case when the EC recently announced that it does not intend to add TBBPA as an additional substance to be monitored or restricted under RoHS.

"TBBPA was found to be safe for humans and the environment by a comprehensive risk assessment conducted by the European Union and therefore is not expected to be restricted under the EU's Restriction, Evaluation, and Authorization of Chemicals (REACH) regulation," says Lee Wilmot, director of EHS at TTM Technologies Inc. and chair of the IPC EHS Steering Committee.

Several groups are involved in revising RoHS, now known as RoHS2. U.K.-based ERA Technology was contracted to look at the viability of adding categories, such as medical equipment and monitoring and control instruments, to the scope of RoHS, mainly because they represent different markets than consumer electronic products.

Also, the EC assigned the German-based Oko Institute to consider adding new restricted substances within the scope of the directive. Oko was further asked to conduct a separate study considering the validity of all current exemptions to RoHS.

At last count, a list of 46 potential restricted substances was reduced to eight under RoHS2. But in a letter to its member companies in May 2008, IPC called the institute's draft report on adding substance restrictions "biased" with "flawed methodologies."

MORE CHANGES

Other proposed changes by the EC's Directorate General Environment to both RoHS and WEEE directives showed up in a new round of proposals published in December, aimed at clarifying the scope and definitions in the directives. Details of the proposed changes can be found on the EC Web site at *http://ec.europa.eu/environment/waste/weee/index_en.htm*.

One change covers new procedures for exemptions, including introducing additional socio-economic criteria for granting exemptions and a requirement for applicants to evaluate substitutes before submitting requests. Another calls for adding medical devices and control and monitoring instruments to the scope of RoHS. There's also language for establishing a clear mechanism for identifying and, "if necessary," restricting the use of additional hazardous substances.

The EC says it recognizes that revisions to the RoHS directive covering medical devices and control and monitoring instruments may add manufacturing costs, particularly for products produced in smaller numbers. However, the commission also said that rolling out exemptions of these products over a period of time would allow the proposed exemptions to occur in normal product development cycles.

One of the big changes under consideration for WEEE is to harmonize the registration and reporting obligations for produc-

If you're a manufacturer or distributor and import substances (chemicals), or mixtures of solutions or substances, or an "article" that by the EU's definition forms a product, REACH will impact how you do business in the EU.

ers, along with harmonizing their financing across the EU. (Some member states already make producers fully financially responsible for WEEE.) The EC also wants to clarify what products are excluded from the scope of the directive.

Furthermore, the EU has been refining REACH, which focuses on regulating chemicals considered to be an endangerment to human health or the environment. The Helsinki-based European Chemicals Agency (ECHA) may require specific authorization for the use of these Substances of Very High Concern (SVHC).

ECHA recently announced the first batch of SVHC, the so-called candidate SVHC list, for authorization. The list includes 15 substances and will be updated regularly as more substances are identified as SVHC. REACH could potentially include as many as 1500 SVHCs.

Designed to replace more than 40 existing directives, REACH consists of 1000 pages of legal text and technical language. It's so complicated that the EC recently said it's trying to address problems related to "perceived inconsistency" with other EC environmental legislation, such as those that overlap with REACH.

Gary Nevison, the legislation and environmental affairs manager of Newark and Farnell, two business units of the U.K.-based distributor Premier Farnell plc, calls REACH "unbelievably complex" with "a different set of challenges" than RoHS. Another company's executive summary of REACH simply calls it "overarching" in its depth and complexity.

PROHIBITIVE AND OBSOLETE

Further complicating the lives of design engineers, some substances may become obsolete, mainly because of prohibitive costs reaching 0.5% to 7% in potential price increases, according to research estimates. Some products have already been phased out or replaced with "different" alternatives. The EC estimates that at least 2% of electronic products currently shipped into the EU will be obsolete.

It's not clear how many substances will be banned under REACH. But at this point if you're a manufacturer or distributor and you import substances (chemicals), or mixtures of solutions of substances, or an "article" that by the EU's definition forms a product (electronic components, a finished piece of equipment, and even packaging would apply), REACH will impact how you do business in the EU.

With REACH already becoming a moving target in terms of updates and other changes, Nevison says the demand for information on REACH has been huge. "I'm averaging about 20 calls a day from the U.S.," he says.

Unlike RoHS, which allows each EU member country to write its own regulations under a set of guidelines, REACH impacts all EU states equally and, by extension, the entire electronics and chemical industries globally as it is written.

If there's any good news here for designers, especially with smaller and medium-sized companies, it is that some of the new RoHS rules might not be implemented until 2012. This gives them plenty of time to think about China RoHS and Korea RoHS.

China's Management Methods for Controlling Pollution Caused by Electronic Information Products Regulation, published on March 1, 2006, declared March 1, 2007 as an enforcement date. Korea's Ministry of the Environment set January 1, 2008 as the compliance date for Korea's Act for Resource Recycling of Electrical and Electronic Equipment and Vehicles.

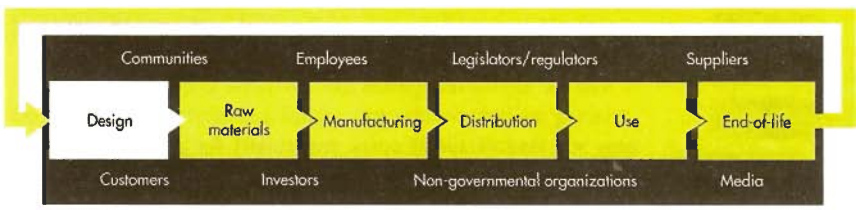
While the scope of EU RoHS currently focuses on eight broad categories of finished products and six substances, China RoHS covers all electronic information products. There's also an extensive list of products not covered by the EU directive, such as radar, medical equipment, and measurement instruments.

China's Ministry of Information Industry expects to phase in the rules and requirements of its version of RoHS. Labeling rules came into force in 2007, but a long-anticipated catalog of restricted substances is long overdue.

The bottom line is that responsibility for implementation of the China RoHS rules falls on manufacturers and importers of any products on the list. One big break for the industry is that products will only be listed in the catalog if they can be replaced by a mature technology and at a reasonable price, even if they contain hazardous substances.

While Korea RoHS is similar in some ways to the EU's RoHS and China's RoHS, there are differences. For example, unlike China RoHS, Korea does not require OEMs to label their product as compliant. According to Siemens, which offers product lifecycle management software to help customers work their way through the complex RoHS, REACH, and other regulations, all manufacturers have to do under Korea RoHS is register and say their product will comply with the legislation. But Siemens says in one of its reports that some of the critical details of Korea RoHS have still not been released.

Japan is well ahead of the rest of the world on many of these issues, and Japa-



2. Hewlett-Packard created a Design-for-Environment (DfE) program more than 15 years ago. It starts with design and moves through several cycles, right up to and including the end-of-life phase. *(courtesy of IDC)*

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nese companies have been working hard to comply with the EU's environmental directives *(Fig. 3)*. India, meanwhile, is cranking up its own RoHS, though little information is available on its hazardous substance directive. Newark & Farnell's Nevison says India is under pressure to do something similar to the EU's RoHS and that "there's a lot of activity in India aiming at developing its own RoHS."

Another EU directive, Energy Using Products (EuP), may end up having the biggest impact on engineers designing a broad range of electrical and electronic products.

Among other issues, EuP will demand that designers use low-power, more energy-efficient components and assemblies, and power-management devices. Product designers will also have to stay on top of the product categories that get added to the directives as they continue to be reviewed by EU environmental agencies.

In many cases, small incremental changes may not be enough to meet compliance requirements. Most recently, the EU's Council of Ministers adopted a resolution on the implementation of the EuP directive and energy labeling.

U.S. ROHS LEGISLATION?

What are the chances the United States will adopt legislation even closely comparable to the EU's RoHS or REACH programs? Unlikely, at least in the near future, according to most analysts who follow global environmental issues.

Perhaps the closest the U.S. Congress will come to RoHS would be to update the nation's 32-year-old Toxic Substances Control Act (TSCA). The EPA's Chemical Assessment and Management Program recently said it would update the TSCA inventory of industrial chemicals to more accurately reflect the chemicals currently being produced and imported.

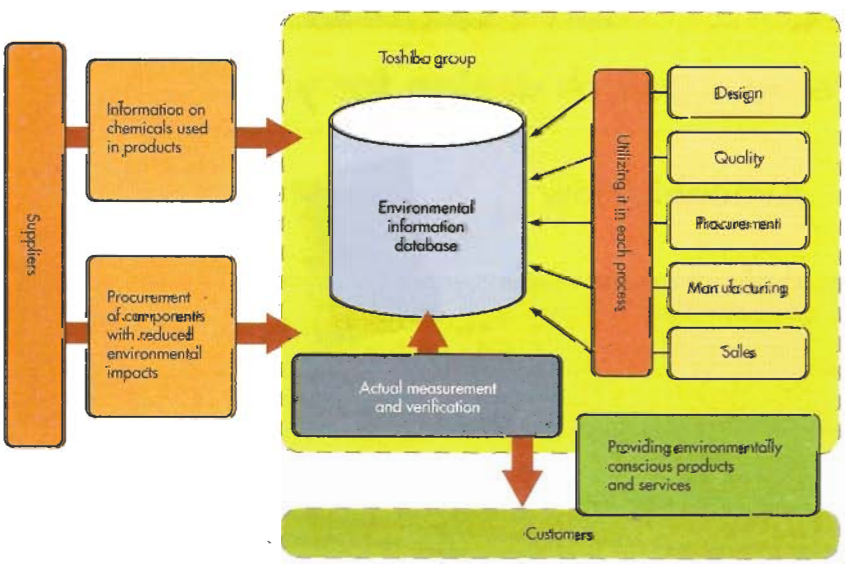
The Environmental Defense Fund has also urged Congress to update the TSCA, and it is pressing companies to proactively eliminate toxic chemicals from their products and develop safer alternatives. "Scrutiny of these chemicals is only going to grow, so chemical companies should support efforts to modernize the decades-old U.S. chemicals policy that has shielded chemicals from needed testing and appropriate control," says Richard A. Denison, the EDF's senior scientist.

For the time being, most e-waste (including recycling) rules will continue to be adopted at the local, regional, and state level, with few, much less ambitious, exceptions. In November, for example, the Basel Action Network announced that it will lead the development of a new recycling certification program for North American recyclers of e-waste called the "e-Stewards Initiative."

The initiative will be developed with the Electronics TakeBack Coalition and 32 electronics recyclers. A full-blown launch is scheduled for this year with plans for an ANSI-ASQ National Accreditation Board certification program with third-party auditing by 2010.

On a broader and higher political level, the U.S. House of Representatives Committee on Energy and Commerce and its Subcommittees on Environment and Hazardous Materials and Oversight and Investigations have launched an investigation of the Environmental Protection Agency's (EPA) implementation and enforcement of e-waste export regulations. The investigation follows concerns raised by the committee and subcommittee chairmen that most exported e-waste is unregulated and regulations governing the export of CRTs aren't being properly enforced.

One small victory for e-waste environmentalists is a U.S. Senate bill (S.906) known as the Mercury Export Ban, which prevents companies from sending mercury-tainted trash, much of it e-waste, to developing countries. It was voted into law by the U.S. Senate and signed by President George W. Bush on October 18, 2008. It amends the Toxic Substances Control Act to prohibit the export of elemental mercury (the pure form of mercury) from the United States. President Barack Obama introduced the bill when he was a member of the Senate.



3. The Toshiba Group is streamlining its system for complying with the EU's high-complex REACH program aimed at removing hazardous chemicals from its electronic products. *(courtesy of the Toshiba Environmental Report 2008)*