The Double Edged Sword for Green Initiatives

By Chris Rehl, CIMTEK

The green movement sweeping across companies worldwide may be politically and environmentally correct, but it also is creating some concerns among electronic manufacturers who are at the front line of these initiatives.

At issue are increasing regulations that limit or restrict the use of materials in the assembly of electronic circuit boards, reinventing the wheel for most manufacturers. Materials like lead, mercury, and cadmium — all core components to the most traditional development processes — now are deemed hazardous and unacceptable.

Alternatives to these materials include aluminum ion deposition, zinc/nickel, and tin/nickel, although using them can severely impact how manufacturers reduce risk on their product development cycles. New materials can disrupt testing and manufacturing procedures, and strain quality control (QC) efforts.

A Global Call for Green

Executives from a range of electronics manufacturers came together this summer in Brussels to discuss the issue and address recommendations to expand the existing ROHS directive from the current list of six materials non grata to an extensive menu of restricted substances. This updated list includes a flame retardant that protects up to 80% of all PCBs and organic compounds containing chlorine and bromine, according to reports.

The hazardous materials recommendations come from a study sponsored by the European Union Commission, which is charged with reviewing requests for materials exemptions, the use of alternative materials and the impact these restrictions might have on the performance and quality control of final products.

Efforts to eliminate the use of specific materials in the European electronics industry date back to the year 2000, although ROHS rules were enacted in mid-2006 with a detailed directive that banned the use of certain hazardous substances in all electronics sold in the EU.

Other actions aimed at eliminating hazardous materials in the European electronics industries include Waste Electrical and Electronic Equipment (WEEE) regulations and the Regulation on Registration, Evaluation, Authorization and Restriction of Chemicals (REACH), which directly targets both the producers and users of hazardous chemicals.

In the U.S., the state of California is at the forefront in the battle to limit or eliminate hazardous waste both at the production and manufacturing end and disposal. Legislators drafted tough new regulations in 1997 as part of the state's Hazardous Waster Control Law (HWCL) initiatives. These restrictions add muscle to federal mandates and specifically target product categories like photovoltaic (PV) modules, components of which include thin-film silicon wafers that many consider a hazardous waste during disposal.

Further east, in August 2008 China reportedly approved a draft regulation covering the management of electronics waste, setting up a formal system to encourage recycling and centralized treatment. This imposes tough new responsibilities on manufacturers, retailers, and customer service providers of all types of electronics equipment. The new regulations stem from China's early involvement (2004) in WEEE regulations and its own rules that govern the import and use of hazardous materials.

While beneficial for the environment, all of these efforts are putting manufacturers in a tricky spot — between the need to adopt green policies and meet the key factors driving competitive business today, such as maintaining quality control, meeting shrinking time-to-market windows, and cutting costs.

Product Test Sets the Tone for Performance Predictability

To strike this tricky balance, more electronic manufactures are turning to product lifecycle test strategies, where everyday manufacturing and test data drive product design and assembly.

Some of the most common examples include relying more on QC data provided by component producers, carefully monitoring assembly line activities (often in real time), and implementing comprehensive final testing procedures that ensure product reliability. These efforts are backed by after-sales service, repair, and support data that feeds information back into the process, punching up the lifecycle quality management and
improving manufacturing efficiency.

This is no small task when you consider the shrinking price margins of electronics manufacturing, as well as a reluctance by some consumers to pay too much of a premium for green products. In a survey conducted earlier this year by Canalysis, for example, slightly more than half (55%) of the consumers contacted in France, Germany, Italy, Spain, and the U.K. expressed a willingness to pay 10% more for environmentally correct products. Younger consumers took a more green stance than older ones.

Pricing pressures and market demands may force manufacturers to cut corners to achieve production goals and therefore sacrifice quality, reliability, and performance. By incorporating newer and more innovative lifecycle testing procedures, however, they will avoid this unforgiving possibility and gain the ability to track quality control from the component level to completed product. This is a way to eliminate common missteps, which lead to increased production costs and product failure.

**Going Beyond the Consumer Market**

Lifecycle testing approaches and green manufacturing techniques are not restricted to the price-sensitive consumer market. They now have become a mandate at organizations targeting business and enterprise markets as well.

Several years ago, IBM launched an effort to develop more environmentally sensitive servers and mainframe computers for its customers and for internal use. The idea was to make use of advancements in CMOS design, multiple core centralization, cooling techniques, newer components and materials, and even software virtualization, according to an IBM executive charged with directing the company's internal green IT initiatives.

They aimed to reduce power requirements in the typical data center by designing systems that were smaller and more efficient. In the process, however, IBM also incorporated new manufacturing and testing techniques that maintained a high level of quality control and product reliability.

As a result of its green movement, IBM evaluated 16,000 server systems at use throughout its worldwide organization and determined that improved manufacturing and testing techniques could eliminate 9,000 of these by producing improved and more cost-efficient systems. Roughly half of these systems have already been retired in IBM's first green wave late last year, says IBM's green evangelist.

IBM's effort led to a more formal green plan that kicked off in May 2007, called Project Big Green, which is a $1 billion per year effort targeting corporate data centers worldwide and involving manufacture of efficient and environmentally correct systems for global customer IT data centers.

**Conclusion**

As seen in IBM's case, improved and intuitive lifecycle testing techniques are an essential ingredient to the development of an effective green manufacturing strategy — especially in light of increasing restrictions on the use of hazardous materials. A holistic cradle-to-consumer approach to manufacturing quality control and proactive testing can result directly in:

- improvements in product design and performance that not only reduce work cycles and manufacturing costs, but result in a more competitively positioned final product;
- a significant reduction in the use of material waste and toxins, which complies with current and pending regulations and eliminates hazardous working conditions for employees;
- improved customer satisfaction and less demand on an organization's service and support structure to provide after-sales activities to customers;
- a more cost-effective and leaner manufacturing process — supported by just-in-time testing activities — that can result in less labor and material consumption, prevent over-production, and avoid excess inventory;
- overall, a smarter and more balanced manufacturing operation that is more in tune with a company's sales, marketing, and production activities and more able to keep pace in challenging economic conditions.

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