

## The Impact of Lead-Free Legislation on Your Business

### Lead-Free Electronics: Towards a Cleaner Environment

Since 2006, global directives have been in effect to reduce electronics waste and hazardous substances such as lead (Pb), mercury, cadmium and others in the environment. Companies that wish to export their electronics-based products to the UK and European Union member states must ensure that their products comply with these directives.

As the requirements tighten, and as North American manufacturers seek international markets for mature products, lead-free inventories and processes are critical to OEMs. Many OEMs may lack the time and resources to study, understand and plan for these directives. This paper explains the drivers, challenges, and legislation pertaining to the adoption of lead-free electronics manufacturing.

### Lead and Electronics

The growth in consumer electronics in the last several decades has greatly increased electronics waste in the environment. Millions of computers containing toxic pollutants enter the waste stream every year, and their design makes them difficult and expensive to recycle.

When all consumer electronics devices are factored in, the volume of waste is staggering. The un-recovered lead from electronic devices in landfills today is more than two times that from car batteries. Electronics products have high turnover, with an average life expectancy of just two years for products like cell phones, computers and PDAs. This, coupled with the fact that electronics now reach into more and more products (children's games, kitchen appliances and even white boards), has brought lead-free initiatives to the forefront of political agendas around the world.

### Lead-Free Legislation: Where and When

Lead accumulates in the environment and in the blood stream.

Hence, population density plays a role in understanding the regional forces that are driving lead-free and related legislation. Countries such as Japan and the United Kingdom, and states such as California and New Jersey, are generally more sensitive to environmental issues due to their dense populations coupled with high use of computers and electronic goods.

Population density and use of electronics goods drive the adoption of lead-free and other environmental initiatives.

Several countries and regions have enacted initiatives to reduce or eliminate the use of lead in consumer products and to encourage the use of lead-free alloys. In some areas of the world, these initiatives are purely elective. In Japan, lead-free electronics manufacturing has been the norm, but not legislated, for some time. In other regions such as the European Union, bans on products containing hazardous materials are now legislated. The following is a brief overview of some of the initiatives being undertaken in geographies that are likely to affect North American producers and exporters of electronics-based goods.

#### Japan

Japanese industry and government have been sensitive to environmental issues for some years. Local companies have been actively acquiring certification under ISO14001, a standard that identifies the requirements for creating and maintaining an environmental management system. In fact, there are three





times more organizations in Japan that meet ISO14001 than anywhere else in the world. “Take-back” regulations mandate companies to recover and recycle environmentally hazardous materials, acting as a natural catalyst for companies to eliminate hazardous materials altogether. And on the business front, companies like Sony and Panasonic have begun marketing campaigns around lead-free products.

Companies that export goods to Japan may be subject to a mix of voluntary and mandatory measures pertaining to environmental waste management and the elimination of hazardous substances in their production cycle.

### European Union

In the European Union two major initiatives affect manufacturers. The EU legislation regarding Waste Electrical and Electronic Equipment (WEEE) and the Restriction of Hazardous Substances (RoHS) legislation came into effect in July 2006. The WEEE bill stipulates requirements for recycling and take-back of products, effectively forcing producers to be responsible for, and to cover costs associated with, electronic waste.

RoHS legislation bans products containing certain levels of particular hazardous substances, such as lead, cadmium, mercury and others..

WEEE identifies 10 affected product categories and holds producers accountable for waste streams.

WEEE legislation casts a broad net and affected products include: household appliances, electrical and electronics tools, toys, leisure and sports equipment, IT and telecom equipment, automatic dispensers and control instruments. Some products are exempt, but very few, such as those for military and medical use as well as large stationary machinery.

RoHS legislation addresses the root problem by banning lead and other hazardous substances from electronic products altogether. RoHS requirements have continuously tightened since 2006, with many of the initial exemptions being lifted over the past few years. It is in the best interest of the producer, and the vendor, to eliminate hazardous substances in manufacturing because doing so eliminates the need for take-back and recycling programs altogether. It is also more cost effective for manufacturers to maintain one RoHS-compliant product line than to develop different versions of products for North American, European and Asian markets.

### United States

While there is no formal legislation agreed upon in the United States, some senate bills in states such as California and New Jersey call for accountability by producers and vendors in recycling electrical and electronic equipment waste, and reducing hazardous materials altogether. The main driver for these initiatives in the U.S. is public safety. The most densely populated states are at the forefront in enacting bills that call for accountability in recycling and the elimination of source contaminants by producers and resellers. Examples include California’s e-belt, New Jersey, and Massachusetts.

If you are building products for resale in the United States, it makes good sense to adopt an environmentally conscious policy – and that starts with lead-free manufacturing of electronics products.

### China

China’s Ministry of Information Industry has created legislation similar to the EU’s, stipulating take-back and recovery initiatives as well as the ban of six hazardous substances, including lead. Since 2002, China has prohibited the importation of waste computers and other products and materials, commonly referred to as e-scrap. This initiative is designed to solve the problem of large quantities of electronic waste originating from recycling programs in North America ending up in less developed countries like China.



## Manufacturing Impact

The manufacturing industry for electronic goods is a primary user of lead-based products. Legislation such as RoHS and WEEE impacts manufacturing machinery, components, processes and personnel.

### Machinery

Lead-free soldering machines operate at higher temperatures than traditional machines. Washing and cleaning stations must also be capable of meeting more challenging process requirements.

### Components

Traditionally, electronics manufacturing components and solders have been based on lead alloys. Lead-free alloys may contain a mix of tin, silver and copper and require higher temperature processes. They are also more costly than traditional alloys. Each component in a bill of materials must be reviewed to determine whether a lead-free alternative needs to be sourced.

### Processes

The use of lead-free alloys in manufacturing requires higher operating temperatures. Parts need to withstand these higher assembly temperatures, as do printed circuit board substrates in order to resist warping. All machinery and materials involved in the assembly process must also be lead-free capable.

### Personnel

Training is critical for manufacturing staff as processes for manual soldering, assembly and inspection are different when dealing with lead-free components and processes. For example, changes in solder joint appearance and shape affect the inspection process. Operators need to be trained on how to avoid alloy contamination issues as well. Cleaning is altered because higher process temperatures tend to bake on residues.

## Supply Chain Impact

Companies building or sourcing products for export into regions that have, or which are sensitive to, legislation for hazardous substances, recycling and waste recovery, must fully understand the impact on their business by taking a tour of their supply chain.

### First Stop: Raw Materials

The spirit of these global changes affect not only manufacturing processes but also the raw materials used in manufacturing. Manufacturers are advised to begin using compliant (lead-free) parts in all products – whether or not they currently intend to export globally.

Raw materials will need to be reviewed to identify the components in a bill of materials that will be affected by the new initiatives. Based on the results of that review, compliant parts and new suppliers will be searched for and costed. For existing products, you or your manufacturer will need to develop strong raw materials inventory management controls in order to account for part numbering changes, compliance record keeping and compatibility requirements. Beyond parts and processes, PCBs and substrates also need to be compatible with the RoHS-compliant assembly process.

### Second Stop: Work In Progress (WIP)

Logistical planning is necessary to minimize the financial impact of handling concurrent product streams that are compliant and non-compliant. Effort must also be made to ensure accuracy during the period of transition when concurrent processes are being run. If a compliant board is accidentally assembled with non-compliant parts, that product will be rendered non-compliant.



### Third Step: Finished Goods

During the process of transition to lead-free manufacturing in your product lines, it will be necessary to carefully manage finished goods.

### Fourth Step: Field Inventory

Manufacturers must understand the expectations of their buyers, particularly if the buyers are governments or other regulated industries. The contract you sign may well stipulate compliance with a particular standard and may require that you take-back obsolete products or even be accountable for any recovery and waste disposal fees. Particularly as lead-free legislation tightens, manufacturers must understand their customer obligations and to stay abreast of changes in global – and local – legislation.

## The Next Steps

Lead-free standards represent a positive change for the environment and will not halt the march of technology. But they can stop a business cold if the requirements are not planned for up front. Following is a checklist of items to take into account as you evaluate your lead-free readiness:

### The Business of Selling

- ❑ Get the facts about the implications that lead-free standards will have on your products, business model and customers.
- ❑ Understand the implications of long-term supply contracts. Are the expectations clear? Do you and the buyer understand your fiscal responsibilities related to RoHS- and WEEE-compliant parts and processes?
- ❑ Develop a clear statement for your clients on how you and your suppliers support lead-free initiatives. Brand-name companies such as Intel, National, Sony and Panasonic have all developed clear statements about their contributions to a lead-free environment.
- ❑ Expect legislation to tighten, not loosen. Look to your manufacturing partner to keep you informed of changes in the legislation and how these affect your products.

#### Get by With Help From Friends

Now is a good time to establish or expand your relationship with a contract manufacturer. A strong CM partner is in an ideal position to keep abreast of the new directives and leverage its supply chain relationships to ensure you are on track.

### The Business of Building

Make sure your processes can accommodate the transition from non-compliant to compliant product streams. If you have a relationship with a trusted contract manufacturer (CM):

- ❑ Make sure that the CM has a clearly defined position on lead-free manufacturing.
- ❑ Look for transition services that will ease the effort and the risk in achieving your lead-free objectives.
- ❑ Get statements from your CM regarding equipment and process compatibility commitments for lead-free manufacturing.
- ❑ Progressive CMs will have a solid design for manufacture (DFM) program that speaks to the transition to lead-free manufacturing. Integrate yourself into this process.
- ❑ Use your CM to greater effect. You can dramatically reduce the burden of compliance by adopting a full turnkey service from your CM.
- ❑ Choose a CM that offers full services because lead-free compliance affects everything in the product chain: components, substrates, manufacturing process, machinery, inspection, repair and recovery.

## A Helping Hand

Your company does not have to bear the burden of these regulatory changes on its own. Talk to your contract electronics manufacturer today to learn more about how and when your products may be affected by lead-free directives, and leverage their expertise and supply chain relationships to ensure you are fully compliant and strongly positioned to respond to market opportunities no matter where around the globe they may be found.