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RoHS: The Really Obnoxious and Highly Suspect Directive

Sometimes the cure is more harmful than the disease.

"The lesser of two evils is still evil." – Jerry Garcia

Once upon a time, in 1998, the European Union, in its infinite and collective wisdom, decided alarming amounts of hazardous waste were being dumped into landfills. A trend analysis concluded that the volume of this hazardous waste would grow at a rate three to five times faster than the average municipal garbage. In response, came the Waste from Electrical and Electronics Equipment (WEEE) Directive.

The stated purpose of WEEE was to create systems to improve treatment, refuse and recycling of said hazardous materials. It would call for separation of electronics waste from other "stuff." So far, so good. It went on to state that manufacturers would be responsible for certain phases of waste management. OK, not fun, but when it comes to recycling not everyone's a do-gooder, so this is acceptable even though it translates to more cost to the consumer.

Emboldened, the EU endeavored to "improve" manufacturers' designs to reduce the creation of waste. And those legislative bureaucrats and environmental fundamentalists created RoHS (Restriction of Hazardous Substances) – likely the scariest thing to hit our industry in anyone's memory.

The directive – the acronym could also mean Really Obnoxious and Highly Suspect – is often called the "lead-free" legislation. It does encompass lead-free products but it is more, much more. Other "hazardous" substances include mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBE) and polybrominated diphenyl ethers (PBDE). So, besides lead, your products may have further afflictions. Mercury is found in certain contact switches as well as certain types of fluorescent lighting. Cadmium is used on some contact surfaces as well as batteries of that genre. Hexavalent chromium may be found in the hardware section of your product – screws, nuts, bolts, sheet metal. PBEs and PDBEs are predominant in flame-retardants used in molding compounds and circuit board laminate.

Indeed, the most difficult part of RoHS compliance is neither alloy selection nor reliability testing (no picnic, either); it is logistics. Extracting technical specifications from component manufacturers has always been challenging but that is what it will take to review every item on every BoM for every product – at least the ones sold in the EU after July 1, 2006. To comply with RoHS, the aforementioned materials must either be eliminated or reduced to within specific concentrations. For lead, mercury, hexavalant chromium, PBB and PDBE, this comes to 0.1% by weight in homogeneous materials. Homogeneous materials cannot be mechanically disjointed into different materials (as in recycling). This number did not come from the ambiguous RoHS text but rather from the U.K. government and has been "accepted" by the industry.

Lead in high-temperature solders is exempt from WEEE. Huh?

The WEEE Directive specifically targets equipment with a voltage rating not exceeding 1500V DC or 1000V AC. Lead in solders used for network infrastructure equipment for switching and signaling appears to be exempt and lead in solders for servers, storage and storage array systems have been granted an exemption until 2010. But here's a baffler: lead in high-melting temperature solders such as tin-lead alloys containing more than 85% lead are exempt. Huh? Not sure why that is, but too bad the vast majority of our industry missed it by 22 percentage points of lead.

A number of manufacturers, including those whose products might be exempt, are examining the practicality of resisting conversion. Some assemblers proclaim the unavailability of lead-free components. While quite a few components are not available with lead-free lead finishes (and some will never be lead-free), many parts now being delivered comply with

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RoHS. Problem is, many carry no designation or change in nomenclature to signify that they are lead-free. There is no notification to the customer by either the component manufacturer or distributor. Some procurement people periodically check component manufacturers' Websites for updates (a good practice) but in many cases, the first indication of a change in the component lead finish is after reflow – or rather non-reflow. The unexpected lead-free lead finish, requiring a higher reflow temperature, will exhibit inadequate wetting. Further investigation will likely reveal a switcheroo by the component manufacturer. (Some responsible suppliers have changed the nomenclature, typically by adding a suffix to designate lead-free surface finish.) Passives, SOICs and QFPs are bad enough, but it has happened with BGAs and other area arrays, which makes for unpleasant and expensive rework. So rather than fret about not getting components in lead-free finish, be concerned with ones you already have – without knowing it.

Economics is the driver. If most applications (commercial and otherwise) go lead-free, demand for lead-free components (and boards) will drive out leaded configurations. Lead-bearing components will still be available, but in diminishing variety and eventually higher prices. Some will vanish all together. Look at the plight of leaded passives with the advent of SMT.

If you are seeking exemptions, you have to ask how long those exemptions will be in place. Expect growing adoption of lead-free legislation. China and Korea, of all places, already have bills pending. And similar legislation is appearing at the state level in the good ole U.S.

Ultimately, with the current direction, there will be few true exemptions. The vast majority will either have to get with RoHS compliance or get out of the way. But remember, we're all in this together. ■