



TECHNICALLY SPEAKING

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What's Driving the Push Toward Lead-Free Soldering?

It's probably no surprise to you that "lead-free soldering" is now the current buzz-phrase in the electronics industry. Everyone seems to be talking about lead-free solders and asking for lead-free compatible products. Manufacturer's are moving quickly to adopt lead-free soldering into their manufacturing operations, so I'm getting an increasing number of inquiries regarding the use of our soldering and desoldering products with the new lead-free solder alloys. But what, you may ask, is suddenly driving this push to lead-free soldering? Is it just a new vogue or are there concrete reasons for investing the time and money required to make this change?

What is mainly driving the push to lead-free soldering is the implementation of new environmental regulations in Europe. In 2005 we will see the enactment of the WEEE (Waste Electronic and Electrical Equipment) regulations and in 2006 the RoHS (Restrictions on the use of Hazardous Substances) laws throughout the European Community. These new regulations attempt to restrict the burying of certain hazardous substances in landfills by banning their use in the manufacture of electronic and electrical devices. Of these six specifically banned chemicals, the lead used in solder is the one that is of primary concern to the electronics industry. Lead and the other five targeted chemicals can leach out of the buried devices and contaminate ground water. Consumer electronic devices, especially cell phones, are become disposable commodities, since they are too cheap to repair. One source I consulted said that cell phones account for up to 40% of all the "electronic" waste disposed today, and this number will only grow with time. The lead in the solder now used in the manufacture of printed circuit boards is the primary source of lead contamination in landfills, so the new regulations seek to eliminate this hazardous component from the manufacturing process.

So what does it matter if the Europeans are banning the use of lead in solder? How does this effect us here in the U.S.? Well, for one thing, there is growing concern that similar regulations will be enacted by Congress within the foreseeable future. It is better and less costly to be proactive now in making the change than to wait until new laws force manufacturers to make the change. Also, if a manufacturer currently sells to European customers, he will be forced to compete in the new lead-free marketplace. The implementation of WEEE and RoHS will establish "de-facto" trade barriers by excluding electronic and electrical devices that are manufactured with conventional leaded solders, in favor of "greener" products manufactured with lead-free alloys. If the domestic supplier doesn't make the change to lead-free soldering he will not be able to sell in the European market.



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Already many European companies are deriving a competitive advantage by advertising their products as 'lead-free' or RoHS Compliant. It is perceived that environmentally conscious consumers are now opting for the greener products even before the new regulations take effect, so U.S. products may experience a short-term reduction in sales until the American manufacturers can "catch-up" in adopting the new soldering processes. Rather than lose more sales and face increased operating costs foreign and domestic companies are already planning for future disposal of obsolescent items in the initial design and construction phase of new consumer products. Germany already has laws that require companies to take back old products for disposal. This greatly adds to the cost of doing business, therefore companies are finding that it is less costly in the long term to plan for the disposal of a product before its initial manufacturing begins. Products are now being designed and constructed to make their eventual disposal less costly and time consuming by standardizing parts and eliminating environmentally questionable substances from the manufacturing process.

In the U.S. the challenges faced in converting to lead-free soldering are many and complex, especially when you consider the seventy-year+ comfort level that has developed with conventional tin/lead eutectic solder. Lead-free solders are more costly than conventional tin/lead alloys, they do not generally wet as well as tin/lead solder and they require higher temperatures for melting, necessitating the replacement of existing soldering equipment with higher wattage equipment. Operating at the higher melting temperatures will also shorten the life of the soldering equipment being used. Many of the new lead-free alloys are patented and not licensed for wide use. Further complicating the patent situation is that the patents may not only cover alloy composition but also cover its specific use in forming solder joints, so selection of a specific alloy to get around alloy composition restrictions may inadvertently violate the patent restriction on the use of the alloy for soldering.

There are many lead-free solder alloys proposed as replacements for leaded solders and all have different properties in terms of melting points, solidification temperatures, wetting performance and reliability. No single alloy has yet been found to be a "drop-in" replacement for tin/lead solder, though the industry seems to be looking at the Sn/Ag/Cu (tin-silver-copper) alloys more than others. The difference in physical characteristics demonstrated by the new lead-free solder alloys means that operating procedures will have to be reviewed and the soldering processes will have to be modified. New soldering fluxes will have to be developed, requiring changes in cleaning processes. Re-work and repair technicians will have to be re-trained in soldering and desoldering with these new soldering products. Manufacturers of lead-free solder alloys and other products that are required when using the new lead-free alloys, such as flux solutions and desoldering braid, are ready to offer assistance and information so that the transition time for developing a good "comfort level" with these new solders is as short as possible.