RoHS — Is it Worth the Chaos it Can Cause?

Over the past several months I've been hearing increasingly more comments voicing concern over problems with non-leaded components in both military and non-military systems. Most recently, Bob Landman, a friend of my friend and mentor in this business, the late George Rostky (of *EETimes* "Charley" fame), sent a note describing lead-free manufacturing as a "cancer-like growth that will kill people." He goes on to say that it's a "perfect storm brewing that didn't have to happen." The culprit, of course, being the dreaded tin and/or zinc whiskers.

Landman backs up his assertion with a barrage of information from NASA, the U.S. Air Force, the U.S. Navy, GEIA and others. Much research has been devoted to problems on non-lead components dating back as far as the 1940s, so the problem is pretty well understood. However, when the EU promulgated its RoHS rules, it did exempt at least military and automotive systems. That turns out to be somewhat of a catch-22 as virtually all chip and passive component makers, in order to sell into the larger consumer market, have shifted over to non-leaded components. Further, RoHS regulations are exclusively an EU mandate and no one in the U.S. Government had the job of defending tin-lead at the EU—the U.S. has no membership and no standing according to Landman.

Solutions are few and far between. NASA and the Navy have been sending parts to specialty companies to have them tin-lead solder dipped at some significant set-up and production costs. And, different companies handle chips, passive components and specialty surface-mount parts further complicating the job of procuring conforming parts. Do these reworked parts have the same reliability/survivability as original equipment where things such as lead frames are treated before chips are bonded? And to make matters worse, Certificates of Conformance issued that parts are leaded (required by many NASA and DOD contracts) are false at a 3% or higher rate.

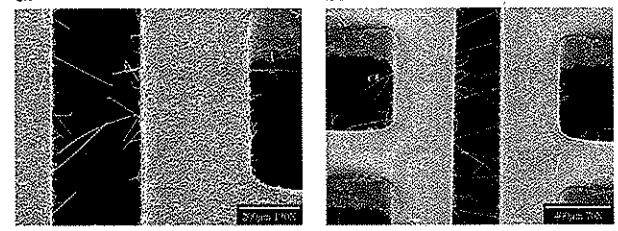

Figure 1 Whisker Growth--Photos courtesy NASA

Not for the Military Alone

The military has so far made the most noise—and even that's not much—but is not the only area suffering. Automotive applications, because of the severe environments, were also exempted by the EU. However, they suffer from the same problems. Telecom and medical instrumentation are not far behind. Raytheon Missile Systems, for example, hosts a teleconference for military/aerospace and medical device manufacturers addressing the problem—but with little coming out. And it's been reported that at least one major provider of telecommunications equipment has banned lead-free components from any subsystems and systems it purchases.

In all cases, failure of components can have disastrous consequences. Many suppliers of boards, subsystems and systems claim that their "green," lead-free products are fully as robust as leaded parts. That may be true, but reliability and longevity still need to be proven. Several Web sites are available that discuss different tin-plating techniques that ostensibly eliminate the tin-whisker problem (Figure 1). However, it's doubtful that they are able to change the physics of the problem.

There may well not be a simple solution. Chip and component makers are not about to set up a completely different facility

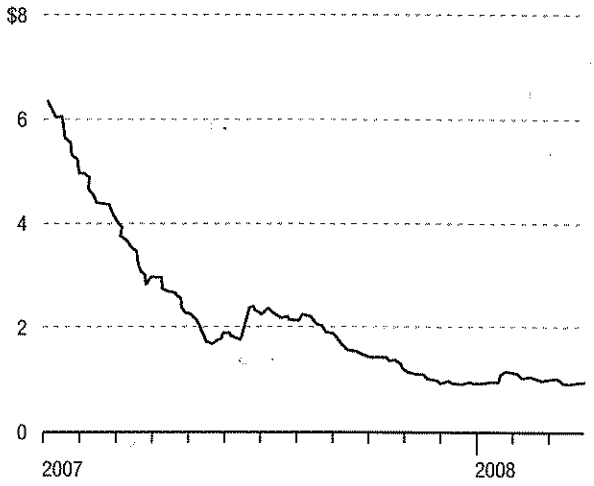

Figure 2 512-megabit DDR2-667 chip, daily averages.

for leaded versus non-leaded parts. And, if they do, it may well destroy the fabric of the "COTS" component mentality—using the latest and greatest technology developed for the consumer market and get the economies of scale in embedded systems be they military, aerospace, communications or medical.

More likely a second tier of products could emerge, essentially going back to what used to be the old mil-spec criterion. That was eliminated years ago as the government first allowed waivers for the use of commercial products and finally with then (1994) Defense Secretary Perry's order, *Acquisition Reform: A Mandate For Change,* which established a mandate to use commercial parts, and a waiver was needed to use mil-spec parts. At least one purpose of the change was to enable the military to take advantage of the latest technology. Going back to mil-spec means handcuffing the military and other industries to old and less than state-of-the-art technology, which our enemies will exploit. Are we going to move back 20-some years?

I think it's time that the industry wakes up to the potential pitfalls of using lead-free components in critical systems—and perhaps all electronic systems with an anticipated life expectancy of more than two years. The real threat of lead contamination both here and in the EU is the careless and haphazard disposal of bulk lead either from tailings or improper handling of storage batteries or other lead containing products. Today's environment of recycling and ecological concern largely preclude contamination due to mishandling. I don't know about other parts of the country, but where I live, disposing of electronics is handled in an easily and ecologically friendly way. This may be the area where more emphasis needs to be placed.

If anyone has a solution or consideration to the lead-free problem or would just like to chime in, I'd sure like hearing from you at warrena@rtcgroup.com. If there's enough interest, we'll look at working with industry leaders in finding areas that require more exploration that may lead to a real solution. More next issue.

Updates

I waxed a little long on my discussion of lead-free problems in our industry, but I feel strongly about it. Therefore my usual market and technology updates in this space will be a little truncated. Here are some of the headlines.

Sun Micro buys **Montalvo** hoping to break into the low-power, mobile x86 space with **Intel**, **AMD**, **VIA** and others.

Lower chip prices hurt **Toshiba** and **Elpida Memory's** bottom line. After a drop of 50% in the past year, NAND flash memory chips are expected to drop another 40% to 50% this year. At the same time, as shown in the chart, **DRAMeXchange** reports prices for DRAM also tumbled as ASPs dropped 60%.

Lower NAND prices also caused Korea's **Hynix Semiconductor** to shut down its NAND fab in the third quarter to reduce output.

Delayed **AMD** Server Chip, Barcelona, is ready for distribution. Initially scheduled for release last September, AMD's quad-core chip is now available at frequencies of 2.3 and 2.0 GHz.

Processor maker **VIA Technologies** is taking off on two fronts powering the new HP Mini-Note PC as well as a move into COM Express in the embedded market. VIA is among many processor makers including Intel, Sun (see above) and others targeting the low-cost, low-power market.

Despite announcement above, **AMD**'s first quarter revenue took a hit forcing the company to cut its work force by 10%.

SIA says chip sales show modest year-on-year gain—an increase of roughly 1.5%.

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