

## ***On The Forefront:*** August, 2003

By Phil Zarrow

### ***Beware the Jabberwocky***

This month I will answer some questions that have recently come my way.

***What do you think is the better reflow methodology for lead-free, especially in light of MSDs ?***

In general, thermal is thermal. I have often remarked that, theoretically, you could reflow circuit boards in a toaster oven. Of course, when we factor in ease, practicality and efficiency, the obvious modern choices are Convection Dominant ovens and Vapor Phase.

In terms of thermal performance I don't believe one has any advantage over the other. There are quite a few manufacturers of Convection Dominant ovens out there, including Heller, ATE, BTU, Vitronics-Soltec, Electrovert, Ersal, Seho, and others (whom I'll likely get nasty-grams from for not mentioning). Vapor Phase, the original reflow method for SMT has seen a slight resurrection (not quite a renaissance) in Europe with the manufacturer IBL.

Vapor Phase has the advantage of being a very even heating process in that the vapor the PCBA is immersed in heats very uniformly and not excessively (i.e. beyond the temperature of the vapor). Is it inherently "better" than Convection Dominant systems? If I had a very complex assembly in terms of mass and surface geometry and / or I wanted a very tight inert atmosphere (the vapor in vapor phase is usually less than 5 ppm Oxygen), I would certainly consider Vapor Phase and I would get a very low delta T across the PCBA. It would be very easy to profile – almost a no-brainer. But for the vast majority of applications out there, Convection Dominant is working fine and will continue to work very well with lead-free and for a lower cost and better ROI. Vapor Phase still uses electricity (to heat the vapor and for refrigeration coils to keep the vapor contained), albeit less than an oven, but you still have to add the chemical. Besides being expensive (about \$700 a pound the last time I looked) that's one of the things that, for the most part, killed vapor phase in North America – manufacturing and process engineers generally have an aversion to chemicals. Vapor phase proponents claim that it doesn't dry out solder paste. Well, neither will a Convection oven if you know what you're doing. Rob Rowland, Jim Hall, and I have been advocating the "Ramp" or "Tent" profile for years, particularly if you're using a water soluble flux formulation.

Everything in SMT is application specific and the better, surviving tools handle the widest range of applications efficiently = best bang for the buck. It is ridiculous when someone claims that their methodology is the only way to do something (BGAs, lead-free, MSDs, etc.) That just comes off as desperation. But hey, the choice is yours. Just be sure you can get whatever you buy fixed when it breaks, which brings us to our next question....

***What equipment manufacturers do you think will be around this time next year?***

Forget the seminars, tech sessions, working groups and keynote speakers – that was the biggest and most frequently asked question at APEX this past year. We are in the midst of the worst recession in our industry in, at least, the 28 years I've been in it. To make matters worse for North America (and Europe), most of the high-volume and a good deal of the mid-volume production is going over to China and a few other select places in Asia. Most of it is not likely to be coming back for the foreseeable future. I was just over in China at a facility that had over 100 high-speed/high-volume lines in just one building. When was the last time you saw that in North America (if ever)? And with operators and workers being paid the equivalent of US\$0.50 /hour over there, it's not likely you ever will.

This has resulted in a major crash in equipment sales in North America. Besides a diminished market for new equipment, there is a glut of used equipment for sale from domestic downsizing of OEMs and CEMs. One story going around APEX is that Fuji's biggest North American distributor of pick and place this past 2 years has been Solectron. Suffice it to say that there are a lot of engineers hanging up their smocks and a lot of sales reps parking their brief cases and putting on the orange aprons over at Home Depot.

So if an equipment manufacturer is not selling equipment in a particular market, how long can they maintain sales and service facilities and staff in the market? Not very long (unless they unlimited cash reserves) and soon, they have to pull up stakes and retreat back to the motherland. We call the resulting installed base in that abandoned territory "orphan machines". We've seen the same thing with automobile manufacturers whose success in US sales evaporated and they "went away": Fiat, Citroen, Puegot, Renault, Opel, the Mercury Capri, etc. Even during APEX there were manufacturers exhibiting (since the money for the show was already paid) that were closing up their North American operations. And several others have followed.

In some cases, they will attempt to support the machines in terms of parts and service from the factory in Europe, Korea or Japan or resort to third-party service. (Third-party service can be lots of fun. In Thailand, we had a third-party service organization out of Singapore that in addition to reportedly repairing ICT, also did radios and televisions.) So, if you are shopping for equipment, new or used, be sure that someone reliable, preferably the manufacturer, will be around to support it, ideally in the same continent as you. If not, be afraid, be very afraid.

A while back, your column discussed selective soldering but you short-changed selective soldering pallets.

We said that pallets are good but they have their limitations. If I had an existing wave-soldering machine and lacked capital to invest in a newer machine, I would definitely use masked pallets for soldering my through-hole components on mixed technology PCBAs. However, if I was thinking of buying or replacing a wave-soldering machine, I would definitely consider a selective soldering system. This is a newer methodology that I feel will be a replacement technology for wave-soldering in many applications. Besides, the column is called “*On The Forefront*” not “*Handyman’s Corner*” or “*This Old Machine*”.

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