

SlimKIC and Auto-Predict Test Report

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SCOPE

ITM, Inc. endeavored to test the KIC SlimKIC Thermal Profiler for KIC Thermal Profiling. Focus was placed on ease of use, accuracy of the system and performance of the Auto-Predict tool.

Tests were performed at Soltec-Vitronics' facility in Exeter, New Hampshire at two sessions, both in July 1998. Tests were performed using a Vitronics SMR-400 4 vertical heat zone convection dominant reflow oven and KIC SlimKIC, SlimKIC transmitter and receiver and appropriate KIC product hardware and KIC Version 2.2 software. Three (3) different circuit boards were run of varying complexity, one supplied by Vitronics, one jointly supplied by Vitronics and ITM and the third, supplied by ITM.

TESTS

ITM simulated a "new user" of the SlimKIC by working with a Vitronics technician and setting up the oven as well as the software. Initially, a small Vitronics supplied board (of medium mass, moderate surface geometry complexity) was instrumented and used. Additionally, a Vitronics/ITM configured "VTX" board which is a double-sided .063" x 18" x 16" substrate populated with PLCC84s in a difficult surface geometry was used. Finally, an ITM supplied 18" x 20" high mass, very complex surface geometry SMT assembly was used.

Thermal reporting accuracy and repeatability were established simply by running the 3 different boards, in turn, through the oven with the same oven settings and comparing similarity of profiles. Each board was run twice. This also gave us a feel for ease of use (hardware and software). Auto-predict software was run in both manual predict and auto-predict modes with all three assemblies. Oven settings were varied and "predictions" compared to actual profiles attained by super-imposing profiles as well as noting temperatures at strategic locations (i.e. peak temp of each TC).

OVERALL

In general, the SlimKIC "did what it was supposed to do" and did it well. The fundamental use of the system was relatively straightforward. Initial set-up of the oven was a bit encumbered but, it was likely as direct as could be expected. What difficulties were encountered by testing personnel during the initial set-up could have been easily remedied by referring to the KIC supplied User Manual (more on this later) or, if insufficient, through a call to the KIC 24 hour customer support line.

For all intents and purposes, the KIC system appeared to perform accurately and repeatably, which is the key concern with this type of instrumentation. This was regardless of the mass of the assembly or its surface geometry complexity. Launching the SlimKIC was simple and fairly foolproof. The radio transmission/reception

was very good and did not suffer from interference (RF or EMI) problems which we have previously experienced in earlier models. Data received was consistent, uninterrupted and accurate.

The software was not the easiest to discern with regard to navigation but in this regard, it was no worse than anyone else (ECD) that ITM has had experience with. Set-up was a little bit more involved as well. It definitely is not self-explanatory and requires consulting the User Manual to "make it work". The software was full-featured and really left little or nothing to be desired with regard to tools for profiling and analyzing profiles for reflow of PC board assemblies.

The User Manual for the SlimKIC was well put together. Good, functional table of contents for both the Software Tutorial and the User Manual. The use of color as well as good illustrations and sample screens greatly enhance the effectiveness of the manual in its goal of helping the user easily comprehend what to do. There were a few areas we wish were more elaborate but these are minor.

PREDICTION TOOLS

Prediction Feature

With 6 thermocouples attached to our first board (Vitronics supplied-moderate complexity), we set the machine up with a stock profile for this "type" (mass, size and surface geometry) board based upon our experience in profiling. We were able to achieve a decent profile. Then, to experiment with the prediction feature, we inputted a sped up conveyor speed – from 26 ipm to 30 ipm. The "predicted" temperatures were within 6.5-16.7 deg. C of the actual attained temperatures (3.3-7.1%) with the predicted temperatures cooler than the actual. We then slowed the conveyor back to the original 26 ipm and let the predictor do its work. This time, the predicted temperatures were within 3.1-7.3 deg C (1.4-3.5%) of the actual (predicted were cooler). The runs were repeated with near-identical results attained.

Auto-Predict

Using the VTX board with complex surface geometry (using 4 thermocouples), we again attained an starting profile which was adequate. We then submitted it to the Auto-Predict and ran the optimum predicted profile. The results were very impressive with the predicted temperatures within .6-2.3 deg C of the actual (.3-1.1%). The run was repeated, from start, and near identical results were obtained.

Using the "Boardzilla" (ITM supplied very massive and complex assembly) Auto-Predict was again used after a base profile was obtained. Choosing the optimum recommended profile that Auto-Predict came up with resulted in a deviation between predicted and actual of between 3.2-5.7 deg. C (1.6-2.7%). This was indeed a very good recipe (and resulting profile) for this board.

DISCUSSION

"Whoever this Schultz guy is, he sure knows how to index" was our reaction to the prediction accuracy of the Auto-Predict. The prediction accuracy of the system was observed to have declined a bit when board complexity (particularly mass) was increased. However, the error was so small that it does not adversely affect the effectiveness and usefulness of the system -- even on a PC board as "tough" as "Boardzilla" (a mainframe board on consignment to ITM from Cray).

Though time constraints and machine availability limited the amount of runs we would have liked to have run, from what was observed, the SlimKIC is an essential tool for anyone doing profiling. In addition, KIC's Auto-Predict system appears to work well and is not difficult to use. Certainly, anyone involved in profiling PC assemblies, regardless of experience level, will find this a welcome and time-saving tool.

RECOMMENDATIONS

The question then comes up, what can be done to expand the usage of the Auto-Prediction and thus improve KIC's market share. One problem lies in its usage by applications and related technical personnel at oven manufacturers' facilities. If Vitronics was typical, it appears that most personnel don't have time to play around and "learn" the software. They run the "essentials", such as the KIC and never take time to investigate the

powerful features that are right in front of them. They are not going to take the time (which they likely don't have) to sit down with the manual — no matter how well written it may be, and learn the features. ITM's recommendation is for KIC personnel to schedule one-on-one sessions with appropriate personnel at each manufacturer and walk them through it. Understand this will alleviate their occasional hostility towards the product that happens when the product embarrasses them (usually through their own mistakes).

Likely there are Users in the same dilemma. It is likely that KIC has done everything possible to make the software learning curve as gentle as possible but if more can be done, it should. It is not clear as to whether KIC offers (optional) on-site training for the SlimKIC but this might be considered. Perhaps incorporating the manual into the Help menus could promote this educational effort as well. Another possibility may be an instructional video or CD — the later playable on the User's computer in an interactive tutorial mode with the actual SlimKIC product.

Finally, ITM recommends that KIC consider conducting a survey of their customer base. Contact users and find out how they like the product, how they are using it, problems they have had, suggestions, etc. This could be accomplished very economically, perhaps using in-house personnel, and will provide some key direction towards filling in some product gaps and assuring KIC's position as leader in its field in our industry.

CONCLUSION

The SlimKIC itself is a powerful, essential tool for thermal profiling of reflow ovens used in soldering PC board assemblies. It has comprehensive software, is rugged, reliable and easy to use leaving little for the user to "goof up".

The "holy grail" of reflow has, for a long time been an oven that "self profiles". Needless to say, over the years there have been many approaches and attempts to achieve this, but all in vain. There have also been attempts at "prediction" software. While created with good intentions, their effectiveness was dubious. However, the KIC's Auto-Predict really works and works very well. It attained more than satisfactory results when tested with real PCB assembly applications and some particularly difficult ones at that. Any user wishing to save a great deal of time from the wearisome task of profiling should indulge in KIC's Auto-Predict system. When used properly it performed accurately, reliably and repeatably.

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ATTACHMENT A:

Regarding things that can be improved:

The variety of probes required for the oven might be something that could be consolidated. Of course, this was a Vitronics grumble and the typical user wouldn't incur this problem.

Vitronics also complained of embarrassing moments, like when the customer they are demoing for has a later version of the software than they do. It is imperative that you keep your applications lab (oven company customers) up to date. This was a major grievance, so to speak.

In general, anything that can be done to make navigation through the manual easier would be a big plus. Bear in mind that most engineers (being men) do not bother to read/refer to a manual unless all else fails. The busier they are, and the more hectic the surroundings, the more likely this is true.

One other observation I have made using KIC "wireless" systems — not on this project but in the past — is when two or more KIC "wireless" systems are being run in the same facility simultaneously, cross-talk was evident. The last time I experienced this was at BTU a couple of years ago — maybe it has since been improved.

I consider these items very trivial. I found the system a good one to use and have not hesitated to recommend it to my clients and readers of my column.