Plating NEWS

2020 and 2021 Highlights

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Covid Year

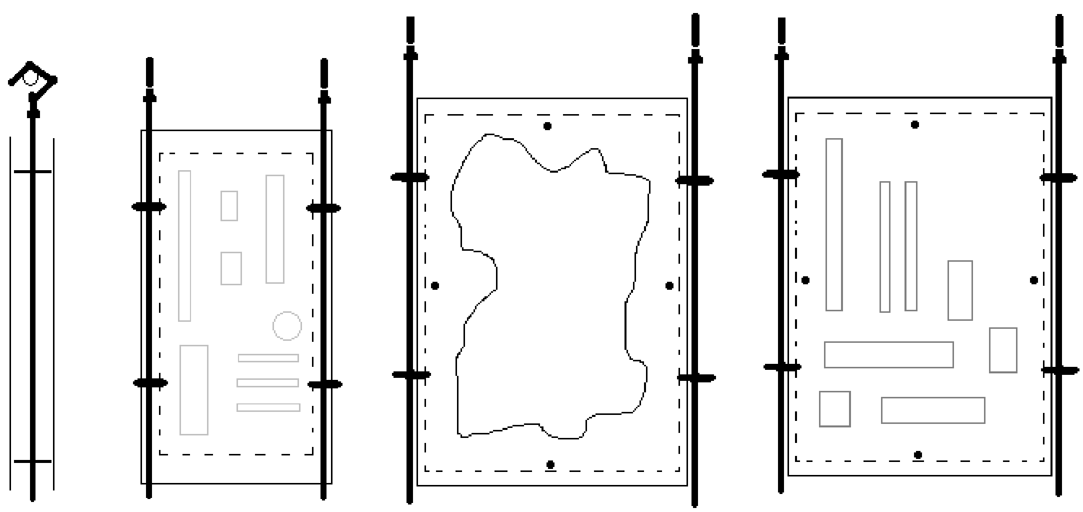
Little more can be said about our Covid Year that hasn't already been stated. It's unlike anything that most of us have ever experienced…….in our entire lifetimes. The pandemic has been affecting all businesses but in many different ways. Adaptations have been needed and duly exercised by most. The finishing industry overall has stayed alive and is beginning to prosper again. Our message is "be well and stay well".

PWB Advanced Plating Technology

Electroplating circuit boards, along with many other PWB manufacturing processes, has seen significant innovation and improvement in the last few years. Our interest initially focused on improving pwb plating thickness uniformity using simple plating shields. These are the "smart" cathode shields discussed in previous issues of Plating NEWS: flat, non-conductive physical barriers strategically placed to redirect plating current flow.

It doesn't take much for a plating shield to be a "smart" shield as long as it redirects current preferentially. For circuit boards, and as it turns out for most other rack plating applications, flat shields can be affixed to a plating rack or a flight bar of plating racks. Shields usually have openings that allow current to flow to the cathode toward specific areas. Some areas might typically be "shaded" or even underplated on a large flight bar.

The diagrams below represent: (a) plating rack, side view with flat shields attached, (b) plating rack, front view with openings, (c) plating rack, front view with one irregular opening, (d) plating rack, front view with openings.



(a) (b) (c) (d)

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Plating shields (b) and (d), as seen on the previous page, were used to preferentially plate heavy deposits in specific areas of flat substrates. They were not circuit boards. The deposit was gold and better accuracy was achieved. Plating shield (c) was configured for a high-density circuit board, mostly to keep the board perimeter from overplating.

Also of note, PWB manufacturers that are good at copper plating are more frequently employing pulse power rectification and getting better plating thickness uniformity results. Pulse power would seem to have been around forever. This author remembers a long-ago plating equipment sales engineer who was processing a customer quotation and was strongly lamenting that "pulse plating power had reared its ugly head again." The prospective customer asked for some improved rectification and pulse was simply on his checklist.

The PWB manufacturers aren't the first platers to use electroplating computer simulations. In fact, they lagged behind but have made great strides recently by integrating the design of the board with how it is to be plated. They're calling it copper "balancing". It's a GREAT idea being put into practice.

Copper balancing is subsequently achieved by integrating the design of the board with its plateability. It's well accepted that the plating equipment is mostly "fixed", meaning the plating tank walls, anodes, cathode bars, electrolyte circulation/filtration equipment etc. Some of these fixtures can be "adjusted" of course but this is not easily practiced in a higher production facility, moving anodes around etc.

The Initial Perceptions of Plating Simulation Models

It's been 20 years since we first introduced the use of 3D computer plating simulations. Some will remember L-Cad from the late 1980's and 1990's, others have asked us occasionally about AccuPlate 3D. We're told they are around in some form but are not readily available.

Initially in the U.S 3D computer plating simulations were directed at the US circuit board industry. Subsequently it became obvious to industrial electroplating metal finishers that computer simulations could be a valuable tool in improving quality and reducing costs for their industries as well.

Circuit board platers and industrial metal finishers with plating facilities invariably asked:

- "What do we do with these simulations? We thickness check so we know how bad it is" or,
- "Does the simulation model demonstrate what to do next?"

These are excellent questions and one of the reasons we've pursued simple shield technology as a means to achieving better electroplating performance. The early shields seen by this author, created without the benefit of computer simulations, were far ahead of their time. Their designs were successfully derived by trial and error for two simple cathodes, but this over the course of several months. Trial and error is simply not practical however for any kind of production environment.

Plating simulation showed us promise for many different electroplating applications. We've wanted plating simulation software to tell us how to configure plating shields.

There's one problem. The most sophisticated of the simulation software that we're familiar with can't produce a shield design. Their simulations are wonderful and their software, in our opinion, should be on the desk of many more electroplaters but they say, "Send us your shield design and we'll tell you how it works."

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As outlined in the "Virtual Plating" paper, available at smartcatshield.com, we envisioned shields that could be constructed for circuit board plating using the materials available at the time: unclad laminate, drilled and/or routed to make flat shields specific to certain board designs.

It must be remembered that at the time, the interconnect industry was struggling to produce higher density, thicker boards with smaller holes. Plating thickness non-uniformity became a huge problem. Some of the fabs even took to mechanically sanding surface thickness problems as it was not unusual for an 18X24 board to have over a 2 mil. difference in plating thickness from the perimeter of the board to the center.

We're impressed with how adaptive the pwb manufacturers have been in meeting plating challenges.

- **Shields and 3D Objects**

We've been asked again to discuss the subject of shields and plating current re-direction using 3D objects affixed either to the racks or to the parts themselves. The challenges of doing this on a large production scale are enormous but apparently not as challenging as designing shield parameters from scratch using the output of a simulation model. Initial plating tests with "objects" have shown promise but there's lots of trial and error still in the future.

In the next issue of Plating NEWS there will be a reprise of shield potentials, information we learned from some of the production platers. Stay tuned and…

THANKS FOR READING

This edition of Plating NEWS has been written and edited by Roger Mouton and guest staff at Advanced Plating Technologies. We welcome submissions for publication in future issues of Plating NEWS.

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