Plating NEWS

2019 Highlights

Summer/Fall 2019

IN THIS ISSUE:

Innovation, Advanced Plating Technology Review, Shields and 3D Objects

In a previous issue of Plating NEWS we asked if innovation is in our DNA? It's an interesting question! If it is not in our DNA then how do we come by it? The circumstances by which innovations have occurred in history are probably as varied as the number of innovations themselves. Innovations are not necessarily obvious. It took thousands of years before a common yolk, fastened to the necks of oxen, was used to enable them to pull together. Their combined output became more than 2X.

Sometimes innovations are the result of accidents. A simple mistake made in the maintenance addition to a chemical process had an enormous effect on the outcome of that process, as in the discovery of the micro-crystalline phosphate coating. This eventually revolutionized the paint coatings industry via a simple but significant surface preparation change. Yes, stuff like this happens in finishing too.

If we have any appreciable electrolytic background then we all can tell stories of one sort or another about plating thickness distribution anomalies. It was little known but in the South an obscure plating plant maintenance engineer/rack maker improved plating thickness distribution on flight bars carrying multiple plating racks by hanging metallic object(s), without any electrical contact, in the anode/cathode field(s). That's "witches brew" chemistry if ever I saw it but this method worked to an extent. With a little trial and error, he refined it a bit.

The guy initially discovered the trick after some routine maintenance procedures resulted in a wrench being left wedged onto a protruding, plastisol coated part of the rack. Somehow it made its way through several entire plating process cycles, non-electrolytically. Of course, the wrench had something of a micro-thin deposit on it because it was in the "field". But the effect that this non-electrolytic, or shall we say, non-electrified metal object had on surrounding parts was notable too. It robbed slightly without being connected cathodically, but it also appeared to disrupt the normal electrolytic field between the anodes and the real parts. There was enough disruption to present slight cosmetic differences, but these then led to discovery of plating thickness distribution improvements. The accident came because a "cosmetic" effect of something unintended presented an opportunity for positive change. Now the bad news…………..

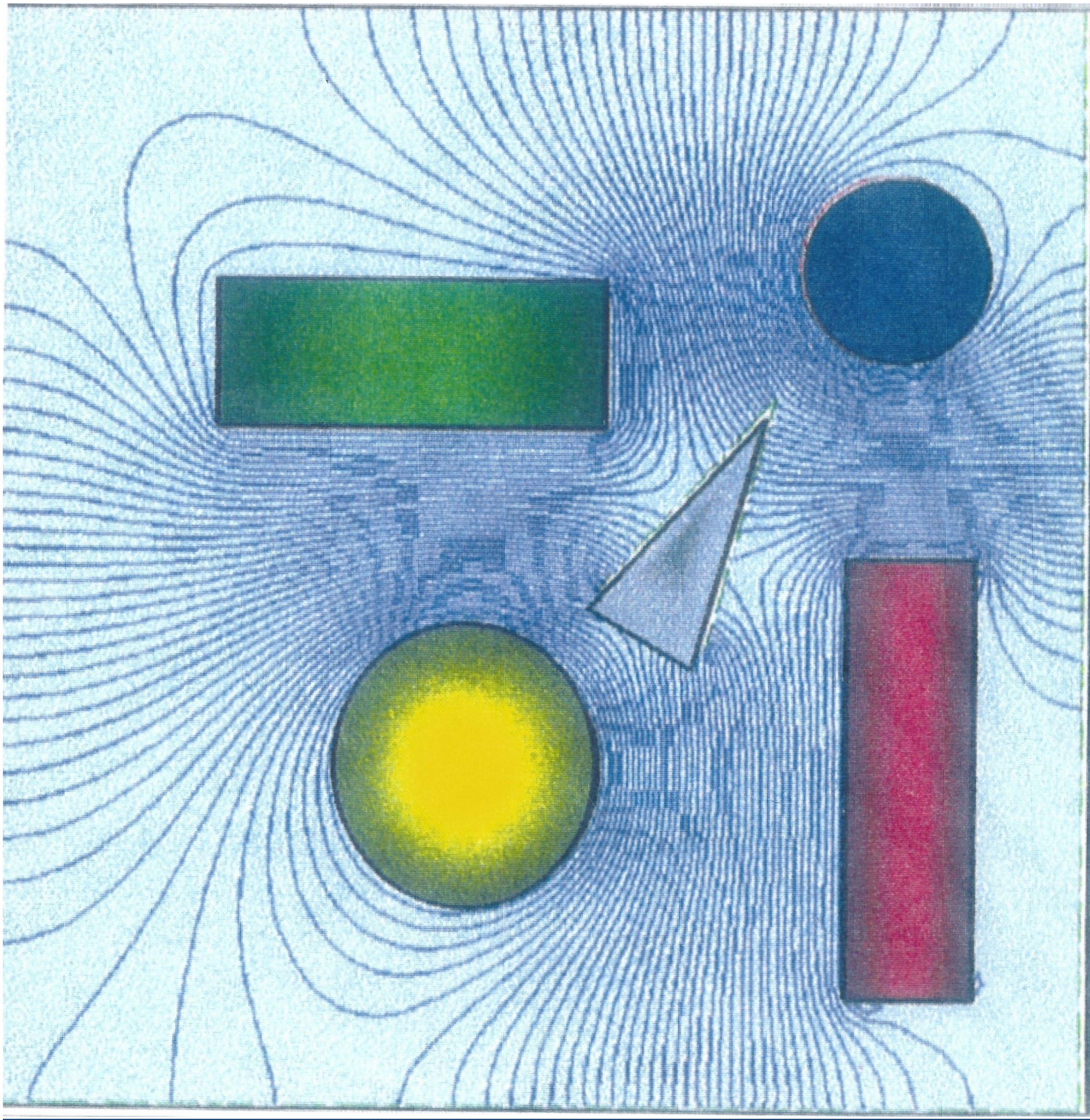
The innovative rack maker that figured this out left the company, the industry and retired. He was fairly old when he started doing it anyway. Alas, no one could ever follow in his footsteps. His secrets were that, as a plating process engineer, he did a LOT of trial and error and paid attention to what he found.

Electrolytic plating process engineering on this level doesn't have to be intuitive or trial and error. June 2000 saw the introduction of a 3D computer simulation and modeling program at SURFIN in Chicago. It was called AccuPlate3D ®. Real and practical information was gained using this product. Later it became known as useful electrochemical intelligence in some circles. You could predict how something would plate without having to plate it.

It would not be fair to exclude Uzi Landau, a true innovator, from this discussion. Dr. Uziel Landau was likely the very first to introduce graphic computer knowledge and sophistication to plating technology. At least it was the first seen by this author at a 1990's SURFIN. Dr. Landau had mapped out current flow in a number of different ways and he was presenting it at SURFIN. It did not have had industry-wide understanding or acceptance.

2019 Highlights, page 2

Innovation



This Landau graphic first caught our attention because, quite frankly, we were old Hull Cell people and thought we had lots of working knowledge of plating cells. As chemical laboratory plating control tools, Hull Cells were invaluable but none of us had ever seen plating flux lines depicted like this. We only saw the results of certain chemical additives at varying current densities. What was lacking and later innovated upon were graphic 3D representations of not only small plating cells but large production plating facilities.

2019 Highlights, page 3

Advanced Plating Technology

It will be helpful to review some of the improvements made with the advanced plating technology enabled by accurate computer modeling and simulations. The electroplaters that have incorporated such modeling and set up their lines accordingly have invariably realized the following:

- Improved plating thickness distribution
- Improved part quality
- Reduced scrap
- Raw material cost reduction

Improved plating thickness distribution has some serious benefits depending on the configuration of the parts being plated and how they're fixtured. Simply, improved thickness distribution results in less metal consumed per part. And it's measurable. Why build up excess plating thickness on any part in order to achieve a specified minimum thickness in a lower current density area?

Improved part quality and reduced scrap go somewhat hand in hand. Example: some parts that get overplated might have crimping operations in subsequent manufacturing steps. We've observed overplated areas that get crimped and have fractured or flakey deposits. Burning and shading of deposits on the same rack is not unusual.

Raw material cost reduction – the most obvious of these is reduced anode consumption. If you're distributing the metal more uniformly to achieve minimum plating thickness on all the parts, you'll naturally consume less overall. 20% is a realistic anode cost reduction for an identical level of plating production, before and after.

Shields

Precise, functioning plating shields were first seen by this author in a Silicon Valley research facility. It was a somewhat secret research arm for one of the big electronic corporations. What they did inside those walls was seen by very few. In those days vendors had gotten accustomed to telling their other prospective customers when someone was doing something new or different. There was no loose talk about this place, however.

We never thought much about the plating shields after that and subsequently this research facility closed. Years later a large pwb fab house had significant plating thickness problems with high density multilayer boards. Our shield experience leaped to the forefront. Some of today's pwb manufacturing people are even using shields effectively without having run computer simulation models.

At first we confined shield work to the immediate need at hand in the electronics industry. It quickly became obvious that anyone involved with electrolytic processing, plating and anodizing, would have similar deposit thickness or current distribution problems. In previous issues of Plating NEWS, we've talked about them and we will reprise some of the more obvious examples in a future issue.

3D Objects

3D shaped, inert objects, placed on a fixture in the current field, will radiate current depending on their shape and size. The goal of this would be to rack a part in close proximity to the 3D object and run the plating cycle. The 3D object will preferentially radiate the current to achieve optimum distribution on the part. This is similar to what a flat shield does in that the object is not electrolytic but is imposed into the plating current flowing to the cathode.

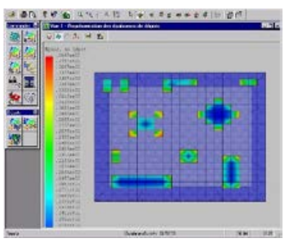
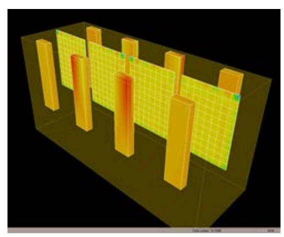
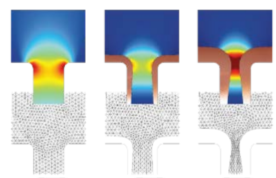
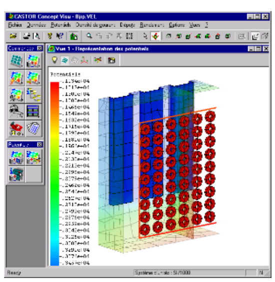
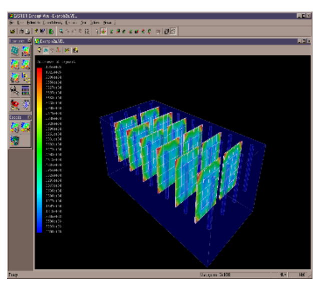
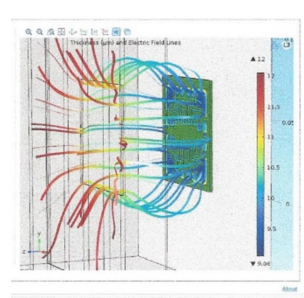
2019 Highlights, page 4

Having “flat” as a shield design is one thing. It’s easy to construct and plating current simply goes around or through openings in the shield. 3D objects however not only shield but, given their shape, they radiate as well. This can direct plating current to places it wouldn’t ordinarily go, like into part recesses that are typically low current density areas. In a future issue we’ll try to put up some graphics that accurately reflect this.

WHAT DOES THE FUTURE HOLD?

We should all be acquiring better electrochemical knowledge. Intelligently configured flat shields, Smart Cathode Shields and now 3D Objects, properly placed in the anode to cathode electrical field, will be future state-of-the-art. As we said in a previous issue, “If you got there without a computer model? All the better for you!"

It gratifies us to see adoption and use of plating shield technology on any level and by any means, including trial and error. We’re gratified to learn that some of the graphics below were inspiration to some of our readers to optimize their plating set-ups. We intend to publish additional graphics in future issues. If you’d like more information about what you see please give us a call. There’s a story behind each of these…….

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.

EIMC - Advanced Plating Technologies - www.smartcatshield.com

Your source for electrolytic process optimization**………..**

**** If you would like to add an associate or colleague to our distribution list please click on: info@smartcatshield.com and type the name and email address of that person in the text box.**

****** If you received this communication in error or you wish to be removed from our email Plating NEWS distribution list, click on info@smartcatshield.com and type REMOVE in the Subject box.**