Plating NEWS

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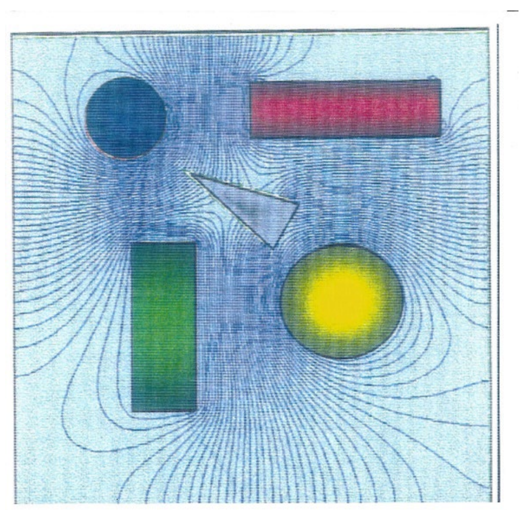
Computer Plating Simulations and the "Early Years"

In some circles it became better known, sometime around the 1980's, that there was more in-depth understanding of the nuances of current density in the plating environment. We don't just mean looking at a Hull Cell panel and interpreting results for the purpose of, let's say making plating bath chemical additions. We're talking about making an accurate computer aided representation or model that can predict how any plateable substrate or rack of parts will accept electrodeposits.

We first became aware of the computer "modeling" of electroplating in the late 1980's. It was largely unknown to most industry observers. With some amusement at electroplating trade shows, the first presenters portrayed that magic would happen if their two-dimensional plating simulations were understood and subsequently used. There was even some "Genie" graphic in their displays. Sadly, it received too little attention, but it was a first step.

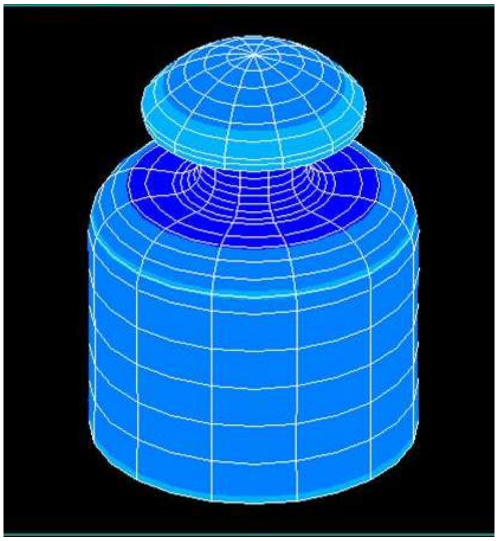


As it turned out, these 2 dimensional models weren't practical for everyday use, and they were certainly not practical in a production plating environment where the work mix can change rapidly.

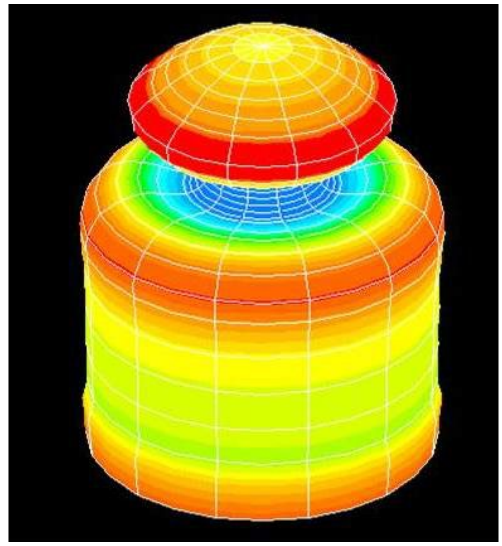
In any plating environment, especially a production plating environment, there will be current density variations throughout the plating cell. These variations affect plating deposit thickness uniformity, not only on specific parts but entire racks or flight bars of these parts.

Since the plating industry has generally been so accustomed to accepting this as a way of life, we say to the industry, "You're not paying enough attention to overplating".

Yes, overplating is more common than most people think. A minimum deposit thickness is almost always required, not only for substrate coverage in general but to achieve a measurable physical property such as corrosion resistance or hardness.



(a)



(b)

In observing the two plating test mandrels (a) and (b) above, please note: example (a) has just begun the plating cycle and example (b) has been electroplating for a much longer period of time.

An example by comparison of the two graphics above might be to say the specified plating thickness was in the green zone. Anything orange or red is overplated, anything blue is underplated. These colors can represent either the actual plated thickness or the current density, depending on how the software output is configured.

On a macro scale and working in the production environment, it is widely known that anode metal costs go down considerably if the plating department is not excessively overplating and is working more “efficiently”.

Think of it. If you’re a production plater you can measure your known platable surface area. Then add the desired or specified plating thickness to the equation. For example, let’s say it’s .005” of nickel plated over the known surface area with perfect deposit thickness uniformity on each part.

We know of a medium sized automotive industry production plater that did this exercise. The difference between the hypothetical, with uniform plating thickness and the actual plated result was staggering. This plater was spending over $1,000,000 more for nickel than he theorized he should. Uniform plating thickness over each part is seldom achieved but this demonstrates what plating thickness non-uniformity can do to metal costs. Overplating definitely can be mitigated by improvements using modern computer modeling and simulations.

Fast forward to the 21st century. A useful, 3D computer plating simulation product entered the market in the year 2000. Initially, industry exposure to this technology came through an automated plating equipment manufacturer. It would seem a natural fit, especially because an equipment manufacturer could demonstrate optimum equipment designs that would produce greater plating efficiency with the newest, 3D plating technology.

At about the same, other state-of-the-art plating equipment design was being introduced. “Floating” plating shields were an innovative introduction to circuit board plating machines, engineered by one of the other plating equipment manufacturers. And finally, one of the big Pacific NW circuit board manufacturers made some significant improvements with a perforated shield used on an automated rack plating machine.

The 3D software introduction made via the plating equipment manufacturing venture ultimately failed to adequately to support the marketing and sales of such sophisticated software.

There were instances where this manufacturer realized that improving a potential equipment customer's set-up could often preclude the need for new equipment altogether. Improved plating via computer modeling could suggest practical moves to improve overall results, e.g., anode sizes and placement, number of anodes, anode to cathode distance, rack placements etc.

Sadly, once this plating equipment manufacturer declared mandatory the purchase of new plating equipment in order to get access to the new software, interest waned fast. Numerous other business issues, unrelated to the new 3D plating software technology, led to the company's demise.

There will be more background to discuss in subsequent issues of Plating NEWS and the "Early Years" …

Ancillary Improvements using Advanced Plating Technology

We're working with some of our more sophisticated clients to better consider and understand other changes in their plating operations, the ancillary improvements as we call them. Organic plating additives, sometimes referred to as brighteners, are specifically formulated to enhance different electrodeposit characteristics, e.g., color, brightness, leveling, ductility.

The individual components of these additives are largely designed and formulated to function in specific ranges of current densities. Consider this fact:

High current density additive concentrations could go largely unused if the current density extremes were minimized.

A simpler, "cleaner" additive has sufficed in installations where there are minimal high current density extremes. This makes for longer, cleaner organic plating bath life and it minimizes additive consumption. Due to certain confidentiality agreements, we only published minimal data about this ancillary improvement. We hope to be able to share some relevant comparison numbers in the future.

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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