Design Engineering

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Custom Mass Plating (CMP) Is Becoming a Reality

Mass customization (MC) is the next logical step in "just-in-time" manufacturing. MC offers custom products to customers—the way they want it, when they want it and at a price they can afford. It is standard operating procedure in the fast-food, clothing and software industries, and is fast becoming a necessity. Where 40 custom units could be built in the past, now 4,000 are possible in the same amount of time. MC is gaining advantages via new computer technologies that enable mass modularity, component standardization, design for manufacturing, etc., and is becoming a strong basis for competition.

Who will be first? Anodizing has taken a strong role, and the connector industry has made strides, but is plating amendable to MC? The answer is definitely yes! Computers have made this concept a reality, from rapid prototyping through waste treatment. Although there is always room to better integrate steps and processes, each area for control needs to be optimized. Do-it-yourself (sort of) systems are available for programming logic into controllers. Also, multiple PLCs can use two wire digital field bus I/Os, and be networked using SCADA server and PC hierarchies. Following are some considerations that must be addressed to integrate manufacture design utilizing CMP.

After computer-aided design and manufacture (CAD/CAM/CAE), engineering of parts comes into play when a functional surface is needed. Let's assume plating is called for. The first steps in plating are cleaning and racking. A part is affixed to a rack for processing, and each rack is designed to get the most parts plated in a run. The fabricated rack allows full-current conduction, as calculated from the parts' surface area and process current density, as well as efficient solution drainage.

Rack design also considers plating tank dimensions and counter-electrode geometry and configuration. Obtaining the proper racks for specific parts can require the longest lead time for CMP, and because of this, computer-aided design will soon become a necessity in the rack industry.

Another area for control automates tank-to-tank work movement and applying current. Herein lie opportunities to lower process solution drag-out by programming correct tank exit rate for the viscous film, and timing water spray and air knives. Integrated rapid rinsing techniques use less area and can recover process solution, which decreases waste.

After standardizing process conditions, chemical consumption may be correlated to work throughput and quality. Automated accurate bath analysis can allow "real-time" replenishment. Using steady-state conditions, the bath composition may be varied to optimize its "window." This results in even better plate quality, with less ingredient consumption and drag-out. Finally, there is automated rinsewater recycling and complete waste treatment automation.

A plating shop computer could monitor and control all processing, as well as store plating condition information, part numbers, logging, recordkeeping, throughput and other ISO-related functions to help report effective plating parameters—including profit. **P&SF**

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