



# SERFILCO® CASE HISTORY

## PWB manufacturer doubles production with "less is more" approach

When market forces and strained production capability combined to hamper Triad Circuits' ability to meet their customers' delivery requirements, the management of this Round Lake, Illinois, manufacturer of printed circuit boards faced some challenging decisions.

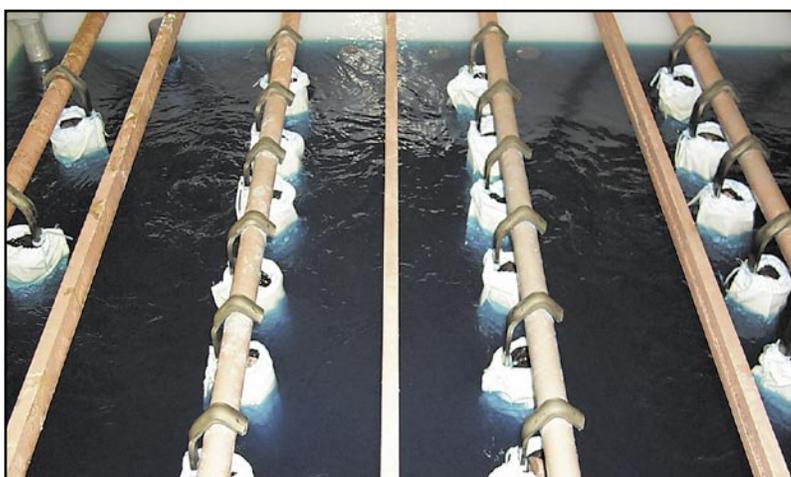
In business since 1982, Triad Circuits, owned and managed by Walter and Garth Uhwat, was suffering the growing pains of a supplier servicing the electronics driven new economy. The Uhwats realized that in order to stay competitive and grow their business, they needed to increase productivity. The two major "pinch points" in their operation were identified as electroplating and Liquid Photoimagable Solder Mask (LPI). However, they discovered that the cost to automate both areas was prohibitive. Also, the plating area had limited room for expansion.

To help solve their plating dilemma, they enlisted the services of an independent consultant, Boro Vujasin of Environmental Compliance Ltd., Des Plaines, Illinois, who specializes in improving productivity and quality in the "wet processing" of printed circuit boards. After reviewing Triad's plating operation, Vujasin concluded that some relatively inexpensive changes could result in a significant improvement in productivity and quality.

The existing manual plating facility included four (4) electrolytic acid copper plating tanks — one 700 gallon tank, two 500 gallon tanks and one 400 gallon tank for a total of 2,100 gallons of copper plating solution. Plating production amounted to 500 panels per day. In order to reach the desired goal of 1,000 panels per day, two shifts would be required. This was undesirable.

The first step in the plan to increase production was to design a high speed plating tank. A new 1,000 gallon tank was constructed and an existing 500 gallon tank was modified to a high speed plating tank with 800 gallons. Both tanks were configured to accept 18" x 24" panels. The remaining tanks were removed. Total gallonage of copper solution was reduced from 2100 gallons to 1800 gallons. However, soon after the installation, the production rate from the electrolytic copper plate doubled!

There are several reasons for this seeming wizardry — first, the new tank was designed to accommodate two (2) 18" x 24" panels per rack, "over and under" vs. the one deep construction of the older tanks. This was made possible by installing a simple manual hoist over the tank. Second, TRIAD CIRCUITS installed a SERFILCO Ser-Ductor® airless agitation system, consisting of a pump and eductor nozzles strategically placed in the tank to optimize the volume and velocity of solution that flows across the board surface. The theory behind this is that the solution movement will sweep away the spent cathodic film, which is saturated with hydrogen gas, and continuously replace it with a fresh cathodic film, rich with ionic copper for deposition. Eductors enhance the deposition by creating a venturi like effect in the holes. This allows faster plating from higher current densities.



*High speed electrolytic copper tank with Ser-Ductor agitation.*



*Original conventional, air agitated electrolytic copper tank*

Previously, Triad was plating at 13 ASF (amps/sq. ft.) to obtain uniform copper distribution on the surface and in the holes. This resulted in a dwell time of 90 minutes per load for a minimum of .001" in the holes and limited production to 500 panels per shift. Based on his experience and working with application engineers at SERFILCO, Ltd., Vujasin specified the proper pump and eductor nozzle layout to obtain maximum benefit. Triad personnel also worked with him to fine tune the process. The result was a dramatic reduction in dwell time. A dwell time of 90 minutes was reduced to 30 minutes/load to produce .001" minimum in-hole deposition with uniform surface to hole distribution across the panel.

Before the Ser-Ductor system, in-hole thickness distribution ranged from .001" to .0015" for 18" x 24" pattern plated panels. With the high speed plating tanks, at current density of up to 40 ASF, the typical range on the panel is .001" to .0012". Triad uses a CMI Hole Thickness Tester to check the copper deposit on every load it produces. This non-destructive bench top unit is used to check copper hole thickness point-to-point and corner-to-corner. Verification is by microsection.

Triad processes all of their pattern plated panels through the new high speed plating tanks. They use 1.5 mil dry film photo resist on the panels without "mushrooming" in the high current density areas. High speed plating has allowed them to eliminate the need for more costly 2.0 mil dry film. In fact, Triad has reduced both photo resist and copper anode material costs, as well as increasing productivity and yields.

Based on experiments, Triad is now capable of achieving a 15:1 aspect ratio with their new high speed copper plating system. They have already successfully plated up to 10:1 in a production mode and average design density of 5 mil lines and spaces is now considered "garden variety" work. When they operated the air agitated, conventional electrolytic copper plating baths, they were challenged by this level of density. Shorts from bridging in the high current density areas have been virtually eliminated.

Another benefit of the Ser-Ductor agitation system worth noting is that the fumes from the acid copper tanks have been reduced significantly due to the combination of less chemical surface area from the smaller number of plating tanks, as well as the elimination of the air agitation. However, the most significant benefit from this entire project was that, because of the relatively low capital investment to improve productivity in the plating operation, as well as the rapid payback from increased productivity, yields and material savings, Triad was able to address the second "pinch point" by purchasing and installing an automated LPI system.

The goal of Triad Circuits is to maintain a consistently high level of quality with on-time deliveries. Perhaps the greatest contributor to this goal is the new high speed electrolytic copper plating line with Ser-Ductor agitation.

According to Garth Uhwat, "it is one of the best investments we have ever made. We are happy, and more importantly, our customers are happy."



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