

EPIG Nickel-Free PCB Coating Debuts at Superior Processing Finish is Gold Wire Bondable, Solderable



High frequency and medical device applications are first beneficiaries.

Superior Processing (Placentia, CA) provides precious metal PCB plating, from simple designs to ultra-high-reliability boards used in elite aerospace and military applications.

Its capabilities include ENIG, ENEPIG, EG, electrolytic nickel and gold plating (both hard and soft golds), immersion tin, immersion silver, and its newest addition, EPIG (Electroless Palladium, Immersion Gold) from Uyemura.

Superior Operations VP Gordon Simmons explains the impetus for the EPIG installation. "End users wanted a coating that was wire bondable and solderable, without a nickel layer and its attendant magnetic properties. Eliminating the nickel has opened up a wide design avenue for high frequency applications as well as designs with reduced spacing.

"There has never been a common immersion PCB coating without electroless nickel as its base," Simmons explains. "This EPIG process deposits palladium directly onto copper. We had confidence it would perform as specified, since we have a long track record with Uyemura's ENIG and ENEPIG chemistries."

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TWX-40 Reduction-assisted Gold Bath Meets Demand for Thicker Gold on ENEPIG

IPC 4556 for ENEPIG specifies 2-12 μ ins of palladium and 1.2 to 2.8 μ ins of gold. However, designers often demand a minimum 3-5 μ ins gold to widen their operating window, add process flexibility, and assure 100% success in the bonding process.

But with standard immersion gold processes, heavier deposits on palladium are problematic.

To produce thicker deposits, shops increase dwell time in the immersion gold, but with any porosity in the palladium layer, gold displaces the underlying nickel.

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Superior engineered and built a short run process line for EPIG, and will move the process to the full-scale production line as demand grows.

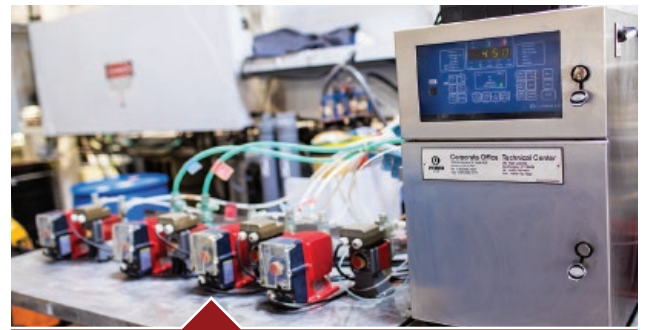
“So far, EPIG is all about high frequency design,” Simmons says, “also designs requiring tight clearances and tight feature spacing. **With EPIG eliminating the nickel, there’s less build-up on circuits, and circuits can be controlled with smaller geometries.** It’s a perfect fit in a market where smaller features and better clearances are what matter.”



ENIG/ENEPIG line at Superior Processing

EPIG is a leading-edge technology, and in its first 6 months in production, Superior has found it best suited for microwave applications, flex circuits, and end users requiring high purity levels.

“To meet all the demands of the industry, we realize we still have some development work ahead,” adds Simmons. “Improvements in the process for applications using EPIG on high layer count, mixed materials, and blind and buried via product are ongoing. We’re working closely with Uyumura’s technical personnel to accommodate these designs and associated process variables.”



UIC Starline DASH electroless nickel controller

Prior to EPIG, Superior provided electrolytic gold plating on copper for many high frequency designs. “To the end user,” says Simmons, “the downside of putting gold on copper is the potential for migration of the copper through the gold. The palladium layer in EPIG alleviates that risk, producing an excellent wire bondable, solderable finish.”

Superior’s EPIG process uses Uyumura TWX-40 gold over Talon 3 palladium. (See related story.) “We have found the practical limits on EPIG are 4-12 μin of gold – a much wider operating window than was previously possible using conventional immersion golds,” says Simmons.



Superior's immersion tin line

ENIG Audit is Opportunity Unique in the Industry

Uyumura has instituted a program, unique in North America, to provide an in-depth technical evaluation of all facets related to a facility's ENIG processing.

Audits are conducted by PCB experts who evaluate equipment (layout, tanks, heaters, pumps, material handling, controls) and equipment compatibility, also chemistry and chemistry maintenance, material consumption, disposal, operator techniques, quality processes, training, and other factors that affect production and rework.

The result is a comprehensive report – a situation analysis – detailing various “root cause” findings, along with recommended strategies for improving areas that management is most interested in, or the team has identified as having the greatest potential for improving board quality or reducing costs.

On-site evaluations do not interrupt or slow production. Results are strictly confidential. *For information, contact your Uyumura representative.*

In recent years, most of Superior's growth has been from ENIG and ENEPIG. "The popularity of ENEPIG is primarily thanks to the fact that it is both gold wire bondable and solderable," adds Simmons.

"Electronics has been hammered by offshore competition, but today, we're optimistic about the growth of projects here." Short-term, Superior is fine tuning its EPIG process to ensure the highest thickness repeatability. "The coating is new, and evolving," he says. "It offers excellent performance thick or thin, but ideal thickness has not yet been determined. As we work with more new customers, we're exploring this metric with them, dialing-in thicknesses that best meet their requirements."



Inspection following ENEPIG process

Superior has often been an industry trail blazer. "We were one of the 1st services to provide ENEPIG to the industry," says Simmons. "Our high-reliability customer base actively seeks out the most advanced coatings, and filling that need, while providing highest quality, is our highest priority."

In support of its focus on quality, Superior recently acquired a Vision Engineering LYNX microscope and an Advanced West PCS-424 high pressure rinser dryer.



Gordon Simmons, Operations VP, Superior Processing

UIC Strengthens Field Team With Veteran PCB Experts

Uyemura has intensified its service capacity in key west and southwest states with the additions of DX Tech Solutions and S1 Technology.

DX Tech Owner Doug McBride is an expert in microwave circuits and impedance control. UIC has engaged DX as its technical consultant for programs in Texas and Colorado.

DX Tech will provide field support, new business development and problem-solving capability based on McBride's 33 years in PCB chemistry.

"UIC has powerful name recognition," says McBride, "which is why joining their team was attractive. They also have a strong technical team – something that's rare in the board chemistry market. I have, in the past, represented all of UIC's main competitors. At the time, each was a solid organization. Today, the market is mostly run by bean counters – at the expense of technical depth."

To serve customers best, says McBride, "your #1 rule should be: never let accountants run roughshod over the technical team. UIC is the least likely of any company to do that."

McBride envisions excellent opportunities for UIC via fill technology, specifically EVF-R and EVF-N, in his market. He has long been an advocate for Uyemura ENIG and ENEPIG processes due to their superior stability and the company's depth of understanding of those processes. *DX Tech Solutions is headquartered in Rowlett, TX.*

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S1 Technology and its sister company, Salvage I Recycling provide the new metals needed to manufacture product, and a recycling service to manage scrap.

S1 Technology services PCB and metal finishing shops, providing plating anodes, solder bar,

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precious metals and supplies to customers in Northern California and Utah. Competition has intensified recently in both regions, a development that, ironically has benefitted S1.

The reason: its unique-to-the-industry 12-hour guarantee. Explains owner Chet McNamara, "if a customer's line goes down, we restore it from stock – in half a day. Recently, due to a fire, we restocked a line with 16,000 lbs. of copper – in 5 hours. Service is a huge competitive advantage for us.

"Ironically," McNamara continues, "service levels provided by chemical companies are down, overall. Among chemical vendors, with the exception of Uyemura, service is no longer regarded as a vital part of the equation."

S1 plans to be a stocking distributor for all UIC products. The company also stocks consignment at customer sites. *S1 Technology is based in Chino, CA.*



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Chemically speaking, gold to palladium is a difficult reaction, but gold to nickel is an easy road. The inevitable outcome is nickel corrosion, which often leads to wire bond lifts at the palladium-nickel interface.

The solution, now in use in shops in both the US and Asia, is a reduction-assisted immersion gold bath sold in the US as Uyemura TWX-40. Where traditional immersion gold exchanges with the substrate in a displacement reaction, TWX-40 deposits gold using both an immersion and an autocatalytic (electroless) reaction.

The autocatalytic aspect means it does not need to displace the substrate to deposit; it has its own driving force, and deposits gold without contribution from the basis metal.

TWX-40 is well documented in its ability to deposit up to 8 μm of gold over palladium without compromise of the underlying nickel.

TWX-40 has substantially widened the operating window for wire bonding by facilitating the deposition of thicker gold while maintaining the integrity of the underlying palladium and nickel.

It is broadly recommended for shops working with specifications outside IPC's gold thickness requirements.

Shops not encountering the thicker gold requirement for ENEPIG processing are well served with a standard immersion gold such as Uyemura's IPC-compliant TAM-55.

Visit us at IPC APEX, Booth 3725

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