surface performance

Unimetal Turns "Enabling Technology" Into Competitive Edge

In 2008, two Connecticut job shops, Donham Craft, a metal finisher, and Quality Rolling & Deburring, merged to become Unimetal. But it was a second alliance, this time with a supplier, that enabled the merged entity to truly transform itself; specifically to evolve from being one of many shops wrestling with tight margins to a place where customer relationships are stable, value is king, and annual growth is consistently in the double-digits. No mean feat for a New England finisher.

Unimetal's "second" alliance had its genesis when a customer, who was moving into the high frequency market, needed a replacement for silver for its HF connectors. Pat Hayden, Unimetal's Vice President and CTO explains. "This was the cell tower business, a great fit for our capabilities. We considered various solutions, and installed a 50-gallon tank of chemistry we believed would meet the specs. After working through iterations of parts, and repeated testing, however, the customer was not satisfied, and went back to silver."

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New, Reformulated CL-NC Plates Aluminum Without Zincates

CL-NC Alkaline Copper is a cyanide-free, semi-bright copper electroplating process that plates directly on aluminum and most aluminum alloys that contain <1% silicon, including 6061, 5052, 2024 and 1008. **It is an ideal base for bright nickel and chrome, and, when used with a nickel barrier, as a base for gold.** It replaces the cyanide copper strike used prior to zinc die cast plating.

CL-NC has a neutral pH, operates at 140-158°F, and is compatible with both rack and barrel processing. Wheels, plumbing fixtures, bicycle hubs, appliances and clothing fasteners are ideal applications.

For details and test processing, contact your Uyemura representative.

"Two years later," Hayden continues, "Uyemura approached us with an alternative, a well known trimetal, popular in Europe, that had recently been reformulated. Preliminary tests showed we could reduce the deposit by .0003 to .0006". We also found we could keep the tin component down to down to the low end of the customer specification. We started with a 50-gallon hand line, and results were excellent. Over time, we built that business to a 200-gallon inline system. Then, we went from 1 to 2 to 3 plating cells of the material."

Gravity-hung copper-plated HF connectors are Miralloy plated.

The "material" is Miralloy, a copper-tin-zinc electrolyte sold exclusively throughout North America by Uyemura. The 5-component Miralloy bath is both flexible, in terms of runnable ratios, and exceptionally stable. "It plates at higher current density, and concentrations hold well," offers Hayden. "We do analyticals once a day, and know the metal consumption based on amp hours. So the bath is easily maintained." It also has greater longevity than competitor products. "While shops we know routinely have to dump or cut the bath due to contaminants from break-down, we have none of this. The Miralloy bath easily gives us 2 to 3 times the life of competitive chemistries."

> *"Uyemura supported us in a big way. As a result, we could pursue other electronic parts and the broader cellular market."*

Miralloy deposits also have important distinguishing characteristics. "High hardness, excellent thickness distribution, even for components with complex shapes, and low porosity are most important for our applications," says Hayden. Miralloy deposits are also diamagnetic, solderable and weldable, and have excellent long-term resistance to abrasion, wear and corrosion.

Success with its original Miralloy program set the stage for other work Hayden wanted to pursue. "Uyemura supported us in a big way, with analytical support calibrating our process and equipment, and with new business development. As a result, we were able to pursue programs with other electronic parts, medical diagnostics components, and the broader '50 ohm' cellular market." In the latter case, Miralloy reduced PIM*, significantly reducing the incidence of noise and dropped calls – the holy grail of cell networks.

Miralloy has become a Unimetal core technology, with 2 of its highest capacity finishing lines dedicated to the process. "95% of our Miralloy work is electronics," Hayden reports, "and this sector continues to hold up well for us. The remaining 5% is pre-gold processing – essentially a replacement for nickel under-coats."

Unimetal also does passivation, and plates copper, tin, nickel, acid and alkaline zinc, zinc alloys, and precious metals in addition to cleaning, and mechanical finishing.

The company has made two ambitious investments in recent months. A new mechanical zinc line in 2016 doubled its capacity for processing fasteners. It also purchased a custom Roll vapor degreaser – a showpiece for advanced closed loop vacuum degreasing. The system consumes just 2 drums of chemistry per year – a huge advancement over the former non-vacuum degreaser, which used 12-16 drums per month.

The degreaser allowed Unimetal to exit a Title V air permit requirement. "Most plating and heavy cleaning applications are outsourced due to air and wastewater restrictions," says Hayden, "and these new systems have given us a clear advantage."

Automatic barrel chloride zinc line with 10 plating stations.

** Passive Inter Modulation*

Mechanical finishing systems at Unimetal.

The next step, according to Unimetal President George LaCapra Jr. is “a closed loop operation that employs R-O membrane technology to filter out metals and organics, and that recycles 70% of the water.” A pilot study is slated for completion in late 2017.

Unimetal has also kept its competitive advantage by adopting the industry’s most important quality standards. “We earned certifications for ISO 9001: 2008, and complied with RoHS, WEEE & ELV directives also GMW 3044, before they were commonplace,” explains Hayden. “We earned NADCAP certification for medical device passivation programs, and we’re working on ISO 2015. We were also quick to support European REACH initiatives, and are seeking products that help with that.”

Currently under consideration in that regard is Sealing 691 from Uyemura. “We’re looking at that as a potential solution with blind holes,” explains Hayden.

Sealing 691 is an organic nanotechnology process that indefinitely preserves metal brightness, and allows significant reductions in PM use. It also seals thin gold's inherent porosity.

Engineered nanopolymers absorb on the metal surface, crosslinking to form an invisible, undetectable layer. By penetrating the grain structure, it prevents oxidation of the underlying nickel or copper, so when gold is applied, plated parts exhibit high levels of corrosion resistance. And while a layer of protection a few nanometers thick is what’s most often specified, the use of current allows the building of a layer many molecules thick.

Sealing 691 is aqueous, chrome-free, and RoHS compliant. Because it preserves metal's inherent lubricity and leaves technical characteristics unaffected, it has substantial advantages for electronic applications such as plug connectors.

“Customers today want to know they’re being prioritized,” says LaCapra. “Everyone wants everything immediately, while the demand for zero defects gets tighter than ever. It's important to be structured to respond, and Unimetal is. It's costly to maintain full QC, and full purchasing, and experienced customer service – and to invest time looking at new processes – *and* new equipment to improve processes. But we want to be the largest metal finisher in the US - and we are built to make that happen.”

Unimetal operates a 105,000 sq. ft. facility in Thomaston, CT and a 35,000 sq. ft. facility in Naugatuck, CT.

New Film “Shape” Has Exceptional Micro-Uniformity, Corrosion Resistance

New developments in nickel over-plates and co-deposited blackening agents have made possible a process that produces a low-reflectance, dark black surface with extraordinarily hardness values and highly dense topography. This was the news earlier this year, when scientists at the Uyemura Tech Center announced a new ultra black finish trade-named BlackNight.

The BlackNight process uses a standard EN underplate followed by a thin mid phos electroless Ni-P deposit layer. The 5 micron electroless Ni-P overplate is lead-free ELV, WEE and RoHS compliant, and serves as both the seed layer and the topography matrix for the blackening deposit. A hardness of 600-80HV is achievable.

BlackNight’s low reflectance results from a deposited matrix that uses a specific mid phos electroless Ni-P overplate, and a blackening agent electrolyte.The blackening electrolyte converts the E-Ni over-plate to a jet black Ni2O3-enriched surface layer. Post processing includes a heating step, which results in a hardened, dark black wear- resistant deposit.

Uyemura is the performance leader in black finish technology, with Nickstar black nickel and Nicostar, which uses Nickstar chemistry with cobalt for enhanced hardness.

Essentials of REACH Compliance

By: Rich DePoto
Manager of Business Development, Uyemura USA

REACH (registration, evaluation, authorization and restriction of chemicals) is now reality for 31 countries, and a must for US companies who want to sell into Europe.

The goal of **REACH**, a regulation of the European Union, is to protect health and the environment through better identification of chemicals.

Manufacturers are required to gather information on chemical properties, and register the information. The Regulation also calls for the progressive substitution of the most dangerous chemicals when there are alternatives.

REACH requires the registration of chemical substances made or imported into the EU in quantities greater than 1 metric ton per year. Registration applies to chemical substances as such, in preparations and to finished products incorporating those substances.

REACH assigns the obligation to register on the EU-based manufacturer or importer. Non-EU based companies may appoint a representative to manage their registration. Registration deadline is May 31, 2018.

Evaluation

ECHA (European Chemicals Agency) performs a compliance check on 5% of the dossiers submitted for registration. For substance evaluation, ECHA selects chemical substances for placement on the Community Rolling Action Plan ("CoRAP") for further evaluation. The focus is common chemicals prone to bioaccumulation.

Among the most useful REACH compliant processes are Miralloy 2844, a copper-tin-zinc electrolyte and ACF-800, a pure palladium electrolyte.

Miralloy 2844 is diamagnetic, solderable, and weldable, with high reflectivity and hardness. Miralloy 2844 has excellent throwing power, and good covering capability. Deposits are low in porosity, and provide excellent protection from corrosion.

ACF-800 is a neutral pure palladium electrolyte that is ammonia-free and chloride-free. It plates at high speed, directly on nickel, copper or copper alloys. Deposits are ultra-bright, crack-free and have low internal stress.

Both of these plated deposits offer great options for European REACH compliance.

Authorization

U.S. companies that wish to export or use within the EU chemicals identified as a "substance of very high concern" (SVHC) must obtain a "use authorization." Importers of finished products containing Candidate List Substances have additional legal obligations.

Restriction

Restriction allows the European Commission to control dangerous chemicals. Any chemical substance on its own, in a preparation or product may be subject to use restrictions.

Chemical substances subject to restrictions can be found in REACH Annex XVII. The registration deadline for phase-in substances manufactured or imported in the EU in quantities of at least one metric ton is May 31, 2018. For assistance visit: http://echa.europa.eu/reach-2018.

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