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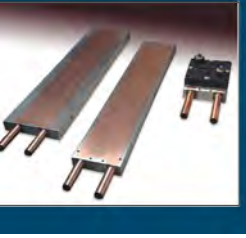

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Publisher	Todd Luciano *tluciano@pfonline.com*
Regional Vice President	Scott Walker *swalker@pfonline.com*
Editor	Tim Pennington *tim.pennington@pfonline.com*
Managing Editor	El McKenzie *emckenzie@pfonline.com*
Contributing Editor	Jim Lindsay *NASF Technical Editor*
Art Director	Aimee M. Reilly *areilly@pfonline.com*
Advertising Production Manager	Becky Helton *bhelton@gardnerweb.com*
Marketing Manager	Jessica Jeffries *jjeffries@gardnerweb.com*

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Richard G. Kline	CEO
Melissa Kline Skavlem	Chief Marketing Officer
Richard G. Kline, Jr.	President
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You Say You Want a Resolution?

I asked for finishers' New Year's resolves, and here are the responses.

TIM PENNINGTON / EDITOR
tim.pennington@pfonline.com

Henry Wadsworth Longfellow once said "Resolve, and thou art free." Obviously, Hank was like a lot of us, and needed to stop smoking or lose a few pounds.

We've all done it: set resolutions and then promptly broke them as soon as someone at work passed around birthday cake. We attempt to better ourselves and maybe pledge to be better to those around us.

I asked some of my friends in the finishing industry what type of resolutions they were imposing on themselves for the new year. Here's a sampling from those silly enough to share with me:

"In years past, it might have been losing a few pounds, or getting out and walking, or even to quit crushing beer cans on my head," says Ray Lucas, president, Valley Chrome. "But after pondering this, I have to say just to give a quick smile and an encouraging word to my siblings, who have also been my partners for the last 50 years."

Dallas Cooley, vice president of sales, Georgia Powder Coating, says he quit making resolutions a few years back because they were short-lived and never gained much traction. He now uses a free online goal planner called Clean Sweep. "This process always pulls the unspoken desires I have out on paper and formulates them into a goal," Cooley says.

Chuck Zinke, president, Perfection Industrial Finishing: "Read more and share books I feel have empowered me with my team."

Milt Stevenson Jr., vice president, Anoplate: "Business-wise, plate more; personally, plate less; I've added too much to my own 'bottom line' of late."

Kurt Weamer, director of marketing and sales, Wolkerstorfer: "Continue to build and enjoy the relationships I have, and enjoy when Notre Dame beats Syracuse. That would be a shot at Milt Stevenson."

Steffen Wolkerstorfer, owner, Wolkerstorfer: "Be more intentional about how I spend my time."

Michael Feldstein, president, Surface Technology: "Travel with my fantastic family and to valued customers."

Geoffrey Smith, general manager, Parker Trutec: "Text less and put my phone down in the evenings."

Kevin Cancino, business development manager, Electro Polish: "Kiss my wife more often, pray more, visit more customers, and better CRM."

Jeanne Bell, controller, Westside Finishing: "Get out and do more networking."

Richard Macary, president, Arlington Plating: "Be more 'in the moment.'"

Adam Adkisson, president, Metal Processing International: "Make more memories with my four kids."

Allan Phillips, president, The Metal Finishing Center: "Refrain from mentioning the president in any discussion."

Rick Hunter, president, A.M. Metal Finishing: "Have at least one planned three-day work week a month and one large trip a year."

Dan Atkinson, vice president, Silvex: "Teach my grandchildren how to play golf."

Joseph Manzoli, president, Colourfast: "Save the world, one color at a time."

Scott Rauter, principal, Micron Metal Finishing: "Get in shape and eat healthier. Last year I quit smoking, so I'm on a roll."

Keith Eidschun, president, Freedom Metal Finishing: "Take more time off from work. We can all wish."

Cory McCabe, vice president, Prime Powder Coating: "Cut back from two alarms in the morning to one."

Cole Scego, president, Select Powder Coating: "Coat more parts. Coat fewer of them twice."

Tom Lynde, president, Safeway Services: "Take time to enjoy all the little things in life."

Claude Fournier, president, Sixpro: "Take care of my health, and play golf with my friends on beautiful golf courses."

Phillip Brockman, president, Techmetals: "Sharpen the saw on our people, products and processes."

Lanny Woods, president, Pro-Kote: "Get out of this crazy finishing business and go to a beach."

Wayne Wallace, president, Augusta Coating: "Have all of our valued associates feel part of and participate in ACM's growth opportunities."

Ken Mantle, general manager, Coating Technologies: "Spend more time on the important things like faith, family and friends, and less time on 'stuff.'"

Al Johnson, president, Valmont/ACT: "Be a better listener."

Barry Kendall, president, BK Industrial: "Work less, and enjoy more time with my family."

Nick Salvati Jr., director of operations, Cadillac Plating: "Put more effort to reduce stress. Never happens. Such is life."

Bill Stock, president, Microfinish: "Spend less time in the office and more time outside enjoying God's beautiful creation."

John Heyer, president, Kettle Moraine Coatings: "Lock away more time for family and friends."

Francisco Hornelas, general manager, Censa: "Keep being a Top Shop."

Elliott Blackwelder, president, Seminole Metal Finishing: "Have more time for travel and leisure time with my wife, friends and family."

Eric Brand, vice president, Co-Line: "Invest more time with my kids; they are growing up fast."

Lee Bradshaw, general manager, Surtronics: "Explore somewhere new, reconnect with old friends, and make new friends."

Larry Dietz, general manager, Professional Plating: "Step back more often and let others give their input first rather than trying to jump ahead."

Best wishes to everyone this New Year.

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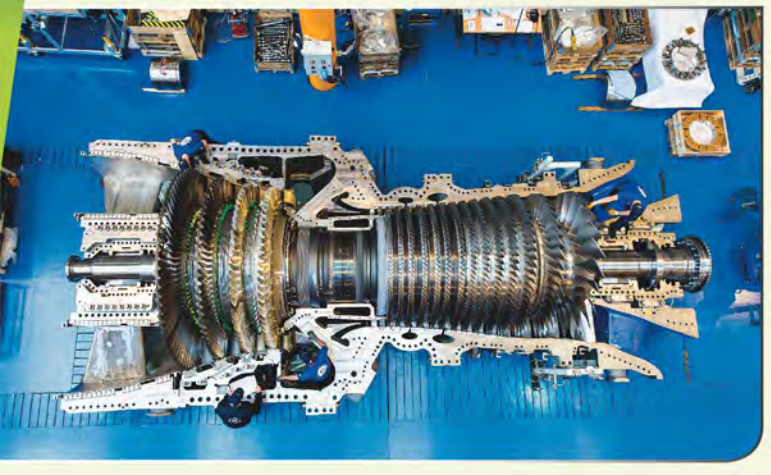
GE Aviation, Praxair Open Jet Engine Coatings Facility

GE Aviation and Praxair have opened a new facility in Ellisville, Mississippi, for their PG Technologies business, which specializes in producing advanced coatings that enable jet engines to withstand higher temperatures and stresses.

PG Technologies is a joint venture between Praxair Surface Technologies Inc., a wholly owned subsidiary of Praxair Inc., and GE Aviation. The new 300,000-square-foot facility is expected to employ at least 250 people to meet demand for the latest generation of jet engines, including the GE9X and the CFM LEAP.



"We are pleased to open a world-class coatings facility in Ellisville that will house the next generation of coating technologies and applications for the aviation industry," says Praxair chairman and CEO Steve Angel. "PG Technologies is a direct result of the long-standing and highly successful commercial relationship we have enjoyed with GE for over 20 years, and we look forward to driving steady growth in the business while supporting GE Aviation's needs."

Derek Hileman, PG Technologies managing director, adds: "We are excited to enter this next phase of our strategic plan. Our new facility in Ellisville will provide exceptional products, technology and service to GE Aviation with PG Technologies' advanced coating capabilities."

Tony Aiello, vice president and general manager for GE Aviation's global supply chain, notes that "the coating technology at this new facility is vital to enabling us to meet the demands of our customers, who expect industry-leading performance from GE Aviation. The engine components delivered from this plant will be in service for decades to come with our more than 400 airline customers all around the world."

NASF California Chapters Award Bright Design Competition Winners

The Metal Finishing Associations of Southern and Northern California awarded $15,000 in scholarships to the winners of the West Coast NASF Bright Design Challenge in December. The contest through the Art Center College of Design in Pasadena encourages students to incorporate finishing into new and innovative products.

Gergo Palkovics placed first and received a $6,500 scholarship. Georgia Adams Siapno received a $4,000 scholarship, and Adrian Contreras a $2,000 scholarship. Both Alissa Wang and Quanyi Wang took home $1,000 scholarships, and Brittany Lydster received a $500 scholarship. Judges for the competition were Vince Noonan, Sheffield Platers; Ray Lucas, Valley Chrome; and Terry McGuinness, Enviroserv.

The contest began last fall, when several NASF member shops began mentoring students from the college's product design program. This included tours of operational plating facilities, which exposed students to the plating materials and techniques that they will be able to use to increase the beauty, value and functionality of designs they will be making throughout their careers. Throughout the semester, students learned how to better prepare their design projects to meet product safety rules, catch eyes on store shelves, and endure real-world situations and environments. For judging, they presented functional prototypes of their finished products to to their mentors, professors and members of NASF.

In addition to the scholarships, winners' products will be included in the Bright Design Challenge product gallery at the Sur/Fin technology show in June.

Mankiewicz Coatings Undergoing $30M Expansion

Mankiewicz Coatings is undergoing a $30 million expansion project at its 10-acre Charleston Regional Business Center facility in Charleston, South Carolina. This expansion is quick, as the company only opened the initial $25 million, 90,000-square-foot facility in 2015.

"We thought we could stay in that building for the next 10 years, but literally after four years, we had to start looking for something bigger," says Fabian Grimm, managing director of the Charleston site. "We've experienced such fast growth since moving to Charleston—about 30 percent per year."

A global company headquartered in Germany, Mankiewicz Coatings serves the automobile, aviation and general industries. Mankiewicz customers include Airbus, Boeing, BMW, CNH, Ford and Hatteras Yachts.

For information on Mankiewicz, visit mankiewicz.com.

Former Astronaut Nicole Stott Featured at Florida Finishers Conference

Former NASA astronaut Nicole Stott will be the opening speaker at the annual Florida Finishers Corp. Mid-Winter Conference & Exposition, to be held February 7-8, at the St. Petersburg Marriott in Clearwater, Florida.

After 27 years with the space agency, Stott retired from NASA in 2015, having flown in two spaceflight missions, including a long-duration stint on the International Space Station (ISS). She will be presenting "Earth From Space" at 1:30 p.m. on Wednesday, February 7, at the Florida Finishers event. The keynote speaker for the session will be Beth Knauss from the Florida Department of Environmental Protection Southwest District. Thursday's keynote speaker will be *Products Finishing* Editor Tim Pennington.

To read about Stott and for information on the conference, visit floridafinisherscorp.com.

Vogel Paint Expansion Project Ahead of Schedule

Vogel Industrial Coatings says that Phase Three of a five-year, $29.3 million expansion plan for the powder coating operation located at its headquarters in Orange City, Iowa, will begin ahead of schedule.

The third phase of the four-phase project includes purchasing and installing additional powder production equipment for new processing lines in the recently completed expansion of the facility, and upgrades to the original processing lines. The new equipment is expected to be up and running in early 2019.

"It's very encouraging to see this project ahead of schedule," says Jeff Powell, Vogel Paint president. The initial two phases of the project included a 91,000-square-foot addition to the current building and the first portion of equipment for new production lines. For information, visit vogelpaint.com.

Ecoat18 Conference Registration Opens

Registration is open for Ecoat18, a two-day conference featuring electrocoat education and numerous networking opportunities, all centered around maximizing productivity, quality and profitability to enhance ecoat operations.

The event is scheduled for April 24–26, at the Innisbrook Golf and Spa Resort in Tampa, Florida. Visit ecoat18.com to register and for information on the comprehensive lineup of educational programming and networking events.

BASF Coatings Supplies New Belarus Auto Plant

Automotive manufacturer BelGee, a Chinese-Belarusian joint venture, has opened a new plant in Belarus that will build SUVs for the Russian, Belarusian, Ukrainian and Kazakh markets. BASF's coatings division is supplying all the layers for the vehicles, including electrocoat, primer, basecoat and clearcoat, as well as plastic parts.

The oint venture was founded by Geely, a leading Chinese car producer, and Belarusian automotive manufacturer Belaz.

"We are proud that we have BelGee as a new customer for our comprehensive layer portfolio to further strengthen our position in the Eastern European market," says Monika Pander, account manager for new business development with BASF Automotive OEM Coatings.

"We were able to show BelGee the quality of our products and our technological know-how," adds Ravil Bayazitov, local account manager for BASF Automotive OEM Coatings, Wostok.

The BelGee Belarusian site currently has capacity to produce 60,000 car bodies a year, with the option to expand.

For information on BASF, visit basf-coatings.com.

Uyemura CEO Tony Revier Honored for Service, Contributions

Uyemura International President and CEO Anthony Revier has been recognized twice by his alma mater, the University of La Verne, a California institution widely known for its influential business and public management programs.

Revier recently was honored as one of the university's 125 Most Notable Graduates at a ceremony commemorating its 125th anniversary. The awards were presented by university President Devorah Lieberman to alumni based on four criteria: The honorees had made unique and significant contributions to the university, had a distinguished history of community service, had excelled in business, and had created a positive work environment for their employees. The awards were announced at an alumni ceremony in October.

In May 2016, Revier was selected by the university to join its Board of Trustees. He received his MBA from La Verne in 1993 and has also served on its College of Business & Public Management Advisory Board. He has been CEO of Uyemura USA since 1988.

Heading to Sur/Fin 2018? Cleveland Is a Hot Ticket

The host city was named one of 21 best places to visit this year.

If you attend Sur/Fin in June, you will be visiting one of the 21 "must-see" places to visit this year, according to *National Geographic Traveler*. The magazine put the city on its 2018 Best of the World list, which appears in its December/January issue.

"The travel story of our time is about American urban renewal," says George Stone, *National Geographic Traveler* editor in chief, in a press release. "Few cities exemplify this as does Cleveland, an immigrant-established industrial city that pulsates with creative energy."

The National Association for Surface Finishing's Sur/Fin show will be held June 4-6, at Cleveland's Huntington Convention Center, and will host the largest gathering of experts and end users in the electroplating, anodizing and mechanical finishing industry in North America.

"We are very excited to be taking Sur/Fin to Cleveland in 2018," says Matt Akin, president of TrueLogic and chair of the Sur/Fin Steering Committee. "We knew the city would be a great place for those in the finishing community to visit, and we are glad Cleveland is being recognized."

"Platers and finishers who come to Sur/Fin in June will attend a fantastic event with experts from all facets of the finishing industry and great technical sessions, plus enjoy a great city to spend time in," says Steve Smith, vice president of American Plating Power and the committee's vice chair. "With the Sur/Fin program and a great location, this is shaping up to be a fantastic event in 2018."

Visit nasfsurfin.com for more information.

NASF TECHNICAL PAPERS

EDITED BY DR. JAMES LINDSAY, NASF TECHNICAL EDITOR

Crack Formation During Electrodeposition and Post-Deposition Aging of Thin Film Coatings – 6th Quarter Report

Prof. S.R. Brankovic, University of Houston

The NASF Research Board has funded this research project, the objective of which is to study fundamental and practical aspects of crack formation in electrodeposited thin films, with emphasis on chromium electrodeposits. The activities during this sixth quarter were focused on identifying the advantages of pulse deposition on the structural and compositional properties of chromium thin films. The results were compared to the ones deposited by the DC method. The full paper can be accessed at short.pfonline.com/NASF18Jan1.

The Technical Program at Sur/Fin 2017 featured nearly 80 presentations and talks covering the latest developments in our industry. Two of these presentations are summarized here:

Direct Metallization for Plating on Plastics

K. Schwarz, Atotech Deutschland, and J. Arnold, Atotech USA

A combination of copper immersion and autocatalytic copper-(I)-oxide deposition enables lower palladium concentrations in the activator bath, though the amount of copper deposited on the plastic surface can be as much as 10 times higher that predecessor processes. In this way. the drag-out cost of palladium is further minimized. This new combination of copper deposition mechanisms also enables a reduction in the surface resistivity of the resulting layer by a factor of about 10 compared to older direct-metallization processes. Besides easier direct plating on large plastic surfaces and PC-ABS blends, another major advantage is the process' high stability. This brief and the complete PowerPoint can be accessed at short.pfonline.com/NASF18Jan2.

Electrodeposited Inconel and Stellite-like Coatings for Improved Corrosion Resistance in Biocombustors

S.H. Vijapur, T.D. Hall, E.J. Taylor and M.E. Inman, Faraday Technology Inc.; and M. Brady, ORNL

This work deals with problems in the Third World—namely, improving the safety and efficiency of cookstoves. A scalable and economic process is required to apply coatings on low-cost stainless steel substrates for enhanced high-temperature corrosion resistance specifically targeted towards biomass combustion apparatus. Cost-effective, scalable and flexible electrodeposition-based coatings of various alloys [Ni/Co]-Cr-[Mo/Fe] that are able to withstand high-temperature corrosion and improve the functional lifetime of existing and next-generation bio-combustors components is a desirable technological advancement. Within this context, a wide array of electrolytes and processing parameters were evaluated to develop an ideal alloy coating. This brief and the complete PowerPoint can be accessed at short.pfonline.com/NASF18Jan3.

PCI's Powder Coating 2018 Gets Innovative

The Powder Coating Institute is hosting the Powder Coating 2018 Technical Conference, March 12–15, at the JW Marriott in Indianapolis, Indiana. The event will feature new and innovative programming that balances training and networking for powder coating professionals, including education, exhibits, general sessions and social gatherings.

The technical program begins Monday, March 12, with a general session featuring Dr. Amber Selking, who will discuss "Driving Consistent Performance Excellence." Tuesday starts with a general session and panel discussion featuring Michael Cravens titled "Responsibilities and Liabilities for Powder Coaters." The conference program will conclude on Wednesday with a presentation by *Products Finishing* columnist Matt Kirchner, "The Robots are Coming, IIoT, and Advanced Automation."

Beginning Wednesday afternoon is PCI's Powder Coating 101: Basic Essentials Workshop, which includes a day and a half of classroom instruction based on PCI's "Powder Coating: The Complete Finisher's Handbook," an evening reception where attendees can interact with workshop presenters and attendees, and breakfast and lunch on Thursday.

Attendees can select from a variety of registration options for the event, including the full technical conference, a one-day technical conference, tabletop exhibits only or the workshop. To register, visit powdercoating.org/powder-coating-2018.

Tabletop exhibitors include: ACT Test Panels; Arkema Coating Resins; Axalta Coating Systems; B.L. Downey; BCI Surface Technologies; Blasdel Enterprises; Caplugs/Shercon; Carlisle Fluid Technologies; Chemetall; Chemical Coaters Association International; Col-Met Engineered Finishing Solutions; DeFelsko; DuBois Chemicals; Echo Engineering & Production Supplies; Elcometer; Fischer Technology; Fostoria Process Equipment, Div. of TPI; Gema; Gemme Barium Sulfate; George Koch Sons; Global Finishing Solutions; Intek; IntelliFinishing; Midwest Finishing Systems; Nordson; Parker Ionics; Powder Coating Consultants, Division of Ninan; Powder Coating Institute; *Products Finishing*; Richards-Wilcox; RollSeal; Sames Kremlin; and Wagner Industrial Solutions.

Full conference registration includes a general session with Dr. Amber Selking, who will discuss "Driving Consistent Performance Excellence," as well as an evening at the Speedway Indoor Karting facility.

FINISHING INDUSTRY

ON THE MOVE

Magrone

Asterion has appointed **Angelo Magrone** as a technical sales representative, responsible for providing chemical and equipment support to customers throughout Illinois, Wisconsin and the Upper Midwest.

Chemeon Surface Technology has added **Dr. Catherine Munson** as a research chemist and **Joe Harrington** as an analytical chemist, and promoted **Shay Davis** to a product support chemist/business development manager.

Munson

Harrington

Davis

Elite Finishing/Reliable Plating Works has promoted **Scott Alberti** into a sales position and **Atiya Hasan** to run its scheduling department.

Alberti

Hasan

Bowman has named three "Million Dollar" sales awards winners, recognizing **Zach Dismukes** of **Bowman NA**, **Arthur He** of **Applied Scientific Instruments Co.** (Shanghai, China) and **DM Musale** of **Quantum Equipment Co.** (Mumbai, India).

Dismukes

He

Musale

Mahl

Scottie Mahl has joined the **Osborn** team as the director of marketing and product management.

Magic Rack/Production Plus Corp. has hired **John Schott** as its first vice president of business development.

Schott

Saltzman

Hubbard-Hall Inc. has added **Ted Saltzman** as market manager for Texas, Oklahoma and Arkansas.

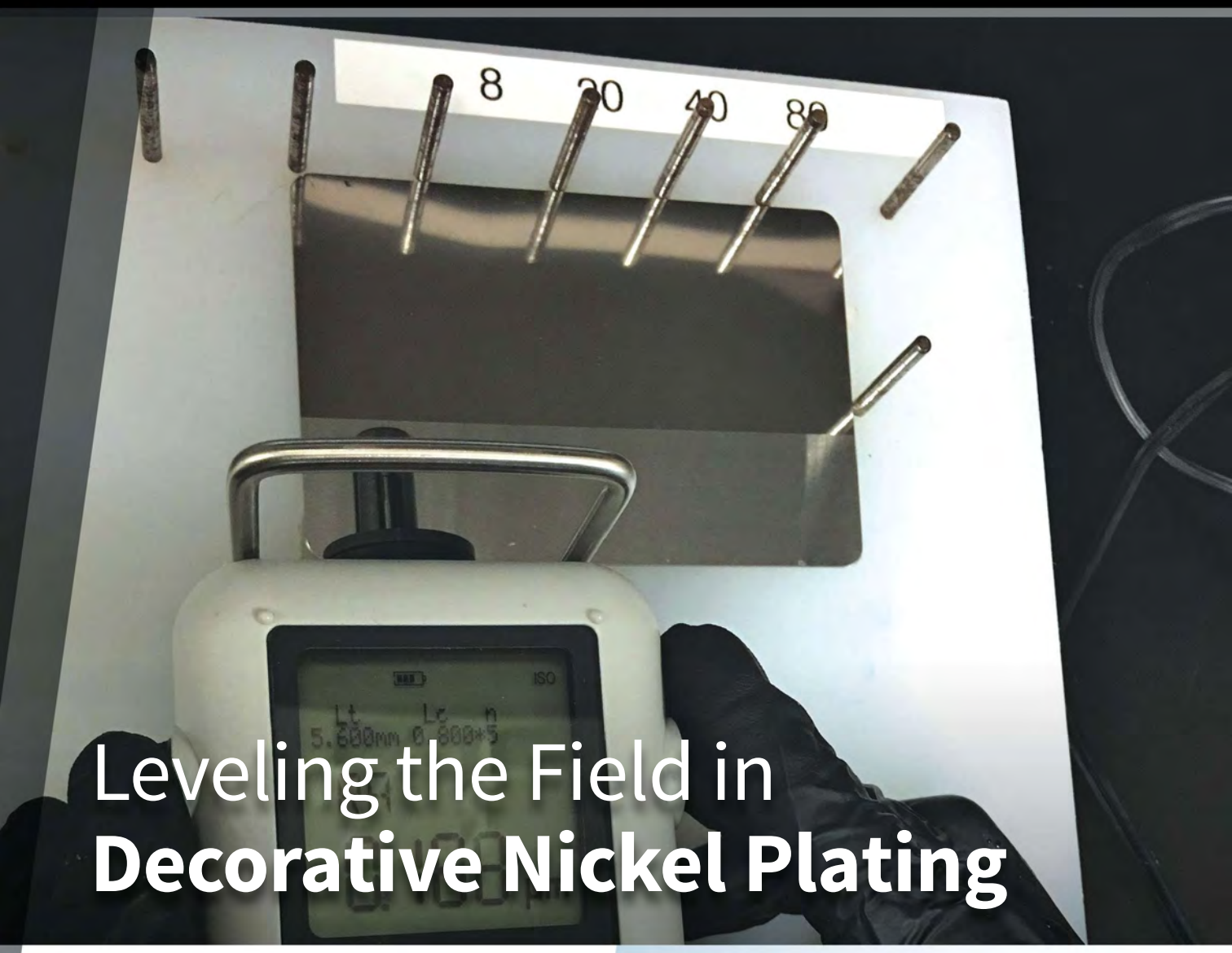
MicroCare Corp. has appointed **Don Phifer** as West Coast regional manager for its precision cleaning products.

Phifer

CCAI Chapters Brighten Holidays for Local Charities

Several chapters of the Chemical Coaters Association International held events in December to benefit charitable organizations. The Southern California, Central States and Wisconsin chapters each conducted toy drives during their events in the month, and the Twin Cities and Central States chapters made cash donations to local charity organizations. Combined, the chapters collected and contributed more than 1,500 toys and $1,300 to Toys for Tots and Kids 2 Kids charities. Each chapter organized a special event to bring association members together to support the organizations in need.

Joe Jeppson of Coral Chemical extends his thanks to marines both for their service and for collecting more than 700 Toys for Tots at the Southern California event.



Leveling the Field in **Decorative Nickel Plating**

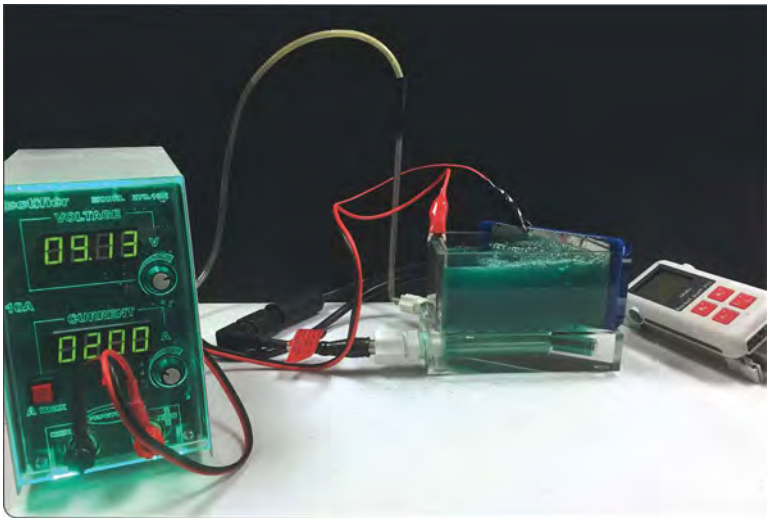
Profilometry helps determine the leveling characteristics of Watts nickel baths.

BY DR. LAWRENCE SEGER, MARK SCHARIO AND CHRISTIAN KISSIG, COLUMBIA CHEMICAL

Decorative nickel plating can yield one of the most beautiful surfaces possible by electroplating. Besides a lustrous or satin appearance, it produces a finish that is corrosion-resistant and versatile, and may be used as a base metal for a final decorative chromium deposit.

Unfortunately, many electrodeposited metallic coatings deposit more on surface peaks than on valleys, because the electric field strength (current density) is greatest in these areas. While control of the properties of nickel deposits has been well-chronicled, one important feature termed "leveling" makes nickel plating attractive and is different in its ability to cover imperfections over the plated surface.

Leveling is desirable in nickel plating because it reduces the amount of surface preparation that must happen before plating, and in cases where the top deposit will be chromium, it may eliminate an additional buffing step to the nickel. Here, we investigate the role of surface roughness and its measurement in determining the health of a nickel bath.

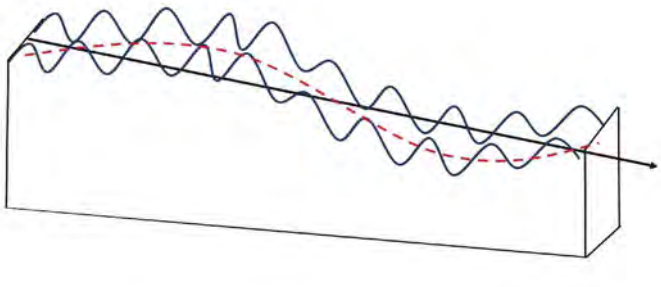


A handheld profilometer like the one shown on the left was used to measure surface roughness on a Hull cell panel. Five measurements were taken and averaged at current densities of 20, 40 and 80 amps/ft^2. The positioning jig allowed the panel to be measured at exactly the same place for each measurement.

Defining Roughness

Three irregularities are considered to make up the general term "surface texture." The first, which has the longest wavelength, is defined as the lay. The lay is the dominant pattern of texture on the surface. The second irregularity is waviness, which includes a more widely spaced (shorter wavelength) deviation from the ideal shape, usually considered to be a flat plane. Finally, the third component is roughness, which represents the finest irregularity (shortest wavelength) of a surface. We are confining this discussion strictly to roughness.

There are many parameters described in literature that address specific components of roughness and its calculation. The most common, one-dimensional form of roughness measurement in the United States is roughness average (Ra), which is defined in ASME B46.1 as "the arithmetic average of the absolute values of the profile height deviations from the mean line, recorded within the evaluation length." According to some sources, there are more than 100 methods for expressions of roughness.



There are three fundamental characteristics that define surface texture. The lay is defined by the straight black line, waviness is the red dashed line, and roughness is the high-frequency blue line.

Techniques for Measuring Roughness

Profilometry is the science of measuring roughness and is divided into two categories: optical profilometry and contact profilometry. Optical instruments are interferometric tools and provide three-dimensional images of a surface as well as its roughness data. One important advantage of an interferometric tool is that it uses the reflection of white light from the surface to form the image. This offers a non-destructive method for examining the surface. This feature is important when examining soft materials such as brass, for example, through which a stylus might scribe a groove.

Contact profilometry is a common technique for plated or surface-polished samples. A plating shop may, for example, wish to determine the improvement of surface texture from rough to smooth after a treatment or plating process. Contact profilometers use a stylus to examine the surface, much in the way a phonograph's needle travels over a record. As the stylus travels over surface features, the deflection of the stylus up and down is measured and recorded.

In a shop, the health of a decorative nickel bath may be evaluated by periodic chemical analysis of the bath components, but if there is a "canary in the coal mine" for nickel baths, it is the amount of leveling that is achieved on the

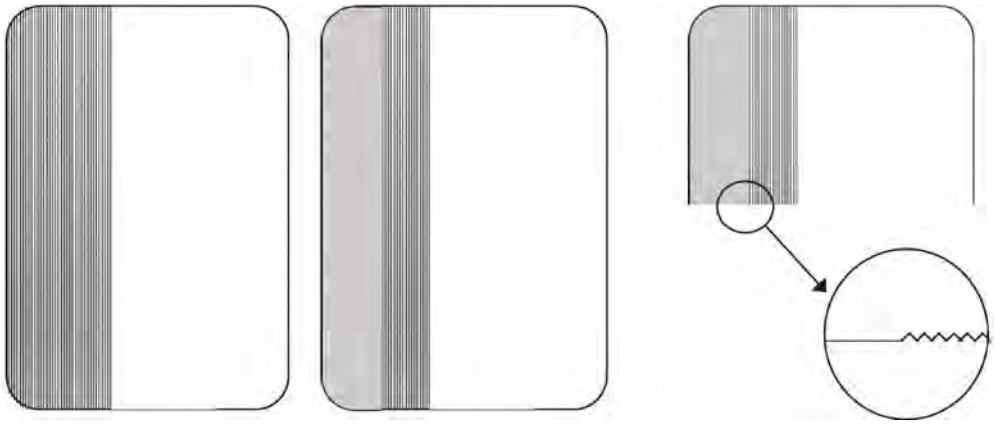


Fig. 1. In this illustration, the Hull cell panel on the left was scribed to a depth of 0.30 micron. Center, the bottom of the scribed panel was plated with nickel. Right top, the panel was bisected and polished. Right bottom is a representation of the anticipated result.

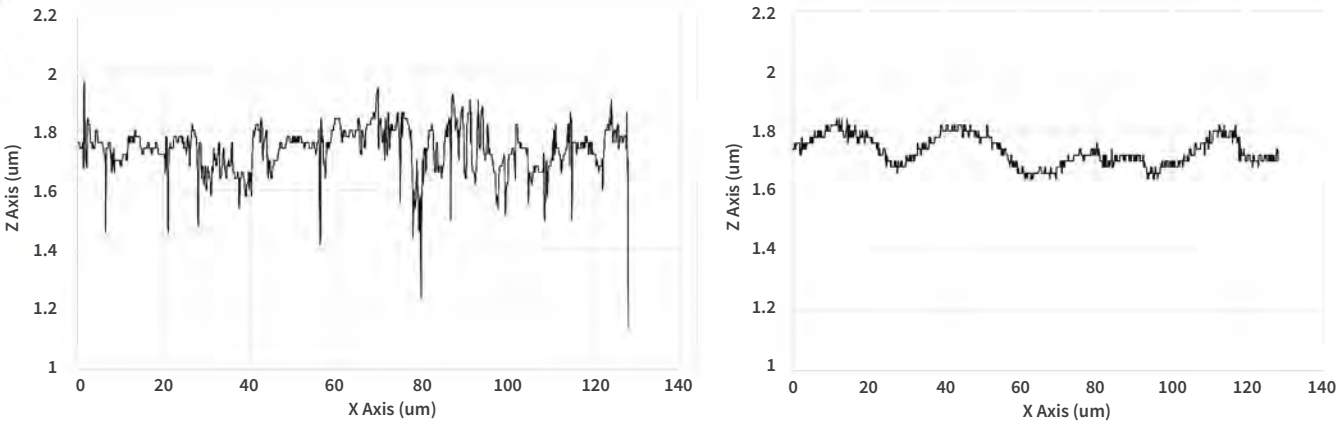


Fig. 2. In the plotted data above, the plot on the left represents the surface profile of a panel that was scratched mechanically before nickel plating. The plot on the right shows the data acquired after the nickel plate described in the text.

surface of the plated part. When technical experts in the field are called upon to troubleshoot nickel baths, it is highly valuable to first investigate the degree to which the bath can level a Hull cell panel. The analytical process includes steel Hull cell panels that have been mechanically scratched at a machine shop to achieve an Ra of approximately 0.30 micron; a jig that precisely positions the panel before and after measurements; and a handheld, battery-operated profilometer. First, the unplated Hull cells panels are tested for surface roughness, and the measurements are recorded for 20, 40 and 80 amps/ft^2. The panels are then nickel-plated and measured again. Reductions in surface roughness are recorded and reported as a percentage of improvement.

Profilometry in Product Development

To demonstrate the effect of the nickel layer on leveling the surface, we prepared a standard Hull cell panel in the following manner:

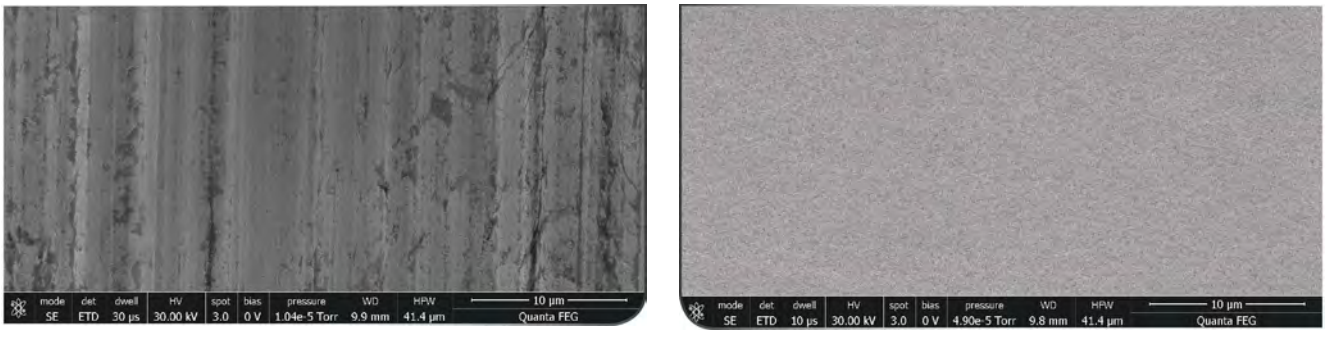
The bottom third of the panel was scratched with a grinding wheel to a depth of approximately 0.30 micron. The panel was placed in the mounting jig, and a roughness measurement was taken. The panel was then plated in a bright nickel bath at 5 amps for 150 seconds to obtain a nickel thickness of 6.34 microns, measured by x-ray fluorescence. This closely matched the anticipated theoretical thickness (based on Faraday's law and considering 100 percent cathodic efficiency) of 6.402 microns. The specimen was then returned to the mounting jig to the point of the original roughness measurement, and a second roughness measurement was taken.

The difference in surface profiles is shown in Figure 2. Note that, while some degree of waviness remained in the nickel-plated plot, the roughness, indicated by the travel of the stylus before plating, was mostly gone. Note also that a very small degree of lay was exposed in the plated measurement.

Scanning electron micrography offers visual confirmation of the results determined by the profilometer. Figure 3 illustrates the impact of the nickel plating described above. The micrograph on the left represents the panel after it had been scribed for roughness. The Ra value was determined by profilometry to be 0.377 micron. The sample on the right is the nickel-plated example measured to a surface roughness of 0.12 micron.

During the development of an optimum leveling package, we ask two questions: What is the correct additive or mixture

Fig. 3. Scanning electron micrographs of scribed panels taken before (left) and after (right) nickel electroplating demonstrates the ability of a nickel deposit to level rough surfaces.



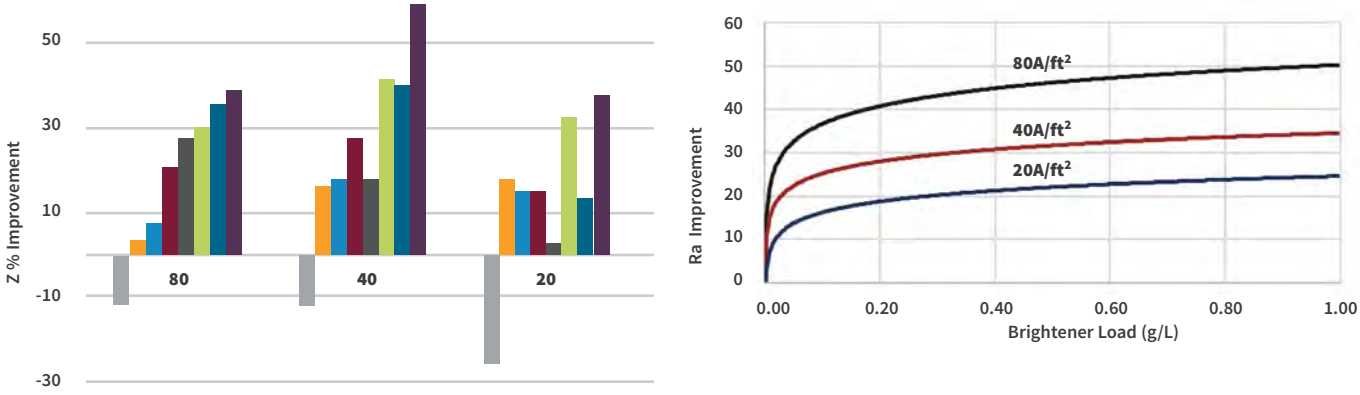


Fig. 4. The chart on the left illustrates the improvement in Ra value from the prescratched Hull cell panel before nickel plating and after plating. The graph on the right shows improvement in surface roughness as a function of brightener load.

of additives, and what is the proper concentration? Use of profilometry helps quantify this process.

In duplex nickel systems, brighteners are added to the semi-bright layer to give a uniform deposit. For the bright nickel layer, sulfur-containing carriers are added to give a fine and uniform grain structure. Sometimes a secondary brightener and leveler is added. An excellent (but not complete) list of brighteners can be found in the Jack W. Dini book "Electrodeposition Materials Science of Coatings and Substrates." An investigation into one family of reagents, the acetylenics, revealed that while some components are very effective at the upper ranges of current density, they offer little improvement at lower current densities and in some cases can even cause additional roughness (see Figure 4).

Some additive blends perform well only at higher current densities, while some offer enhanced leveling at lower current densities at the expense of high-current-density performance. With this data, the engineer can determine if the proper remedy to the problem is a single component or a combination of materials that takes advantage of the high- and low-current-density leveling abilities of multiple additives.

The leveling that is typically corrected by these additives improves roughness, but it is not efficient in correcting waviness and is of no help toward the improvement of lay. With the best leveling package selected, one can turn attention to the best concentration of the leveling package in the bath.

To determine the proper concentration of brightener, the best-performing material from a single current density was measured at different concentration loads. The results of that work are found in Figure 4. As expected, the best performance (greatest degree of leveling) occurred again at the highest current density. Note, however, that this work shows that beyond a certain load (approximately 0.2 g/L) there is very little benefit from increased doses of brightener. On the other hand, things go badly very quick if the load falls below 0.1g/L. Insufficient brightener can lead to dull parts or a finished product that requires buffing. Excessive brightener may mean little improvement in performance and create increased costs.

Similar results were reported by Oniciu and Muresan studying the role of thiourea as an additive for nickel solutions. They related leveling and brightening to the dimensions of the formed grains. Deposits with finer grain structure resulted from high current density, and additives adsorbed preferentially at micropeaks result in local resistance increasing current density in the depressed areas or grooves, thereby contributing to leveling.

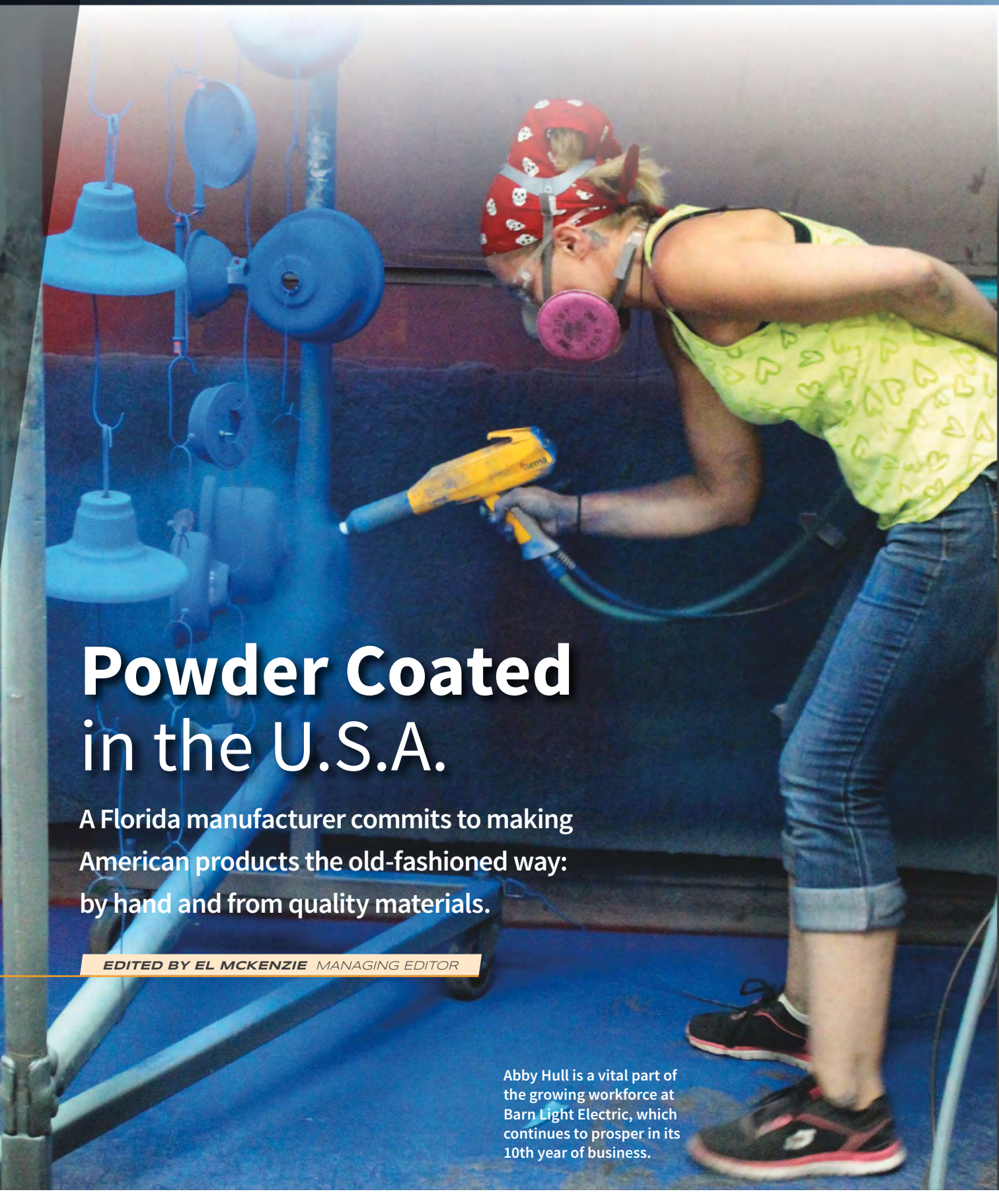
Bath Repair

Nothing beats a full chemical analysis to fully understand the balanced components in a bath, but a five-minute test with a Hull cell panel and a profilometer can indicate whether the quality of the plated parts is deteriorating. The addition of a secondary brightener before parts fall below acceptable quality-control limits helps reduce lost time and expense.

Watts-type nickel baths in combination with organic additive packages have the ability to level the high frequency imperfections below a nickel-plated surface, reducing roughness and improving brightness. Roughness may be quickly, economically and easily quantified by a handheld profilometer, useful in the laboratory or in the field. Compilation of the profilometry data allows the researcher to develop and prepare additive packages that are designed to improve surface roughness in high- or low-current-density regions, or address a broader current-density region through the blending of specific materials. Nickel baths that suffer from low brightener load, organic contamination, additive imbalance or organic consumption may be corrected by following deterioration of leveling performance.

For a list of references for this article, view the online version at short.pfonline.com/leveling.

Dr. Lawrence Seger, Mark Schario and Christian Kissig are with Columbia Chemical. For information, please visit columbiachemical.com.



Powder Coated in the U.S.A.

A Florida manufacturer commits to making American products the old-fashioned way: by hand and from quality materials.

EDITED BY EL MCKENZIE MANAGING EDITOR

Abby Hull is a vital part of the growing workforce at Barn Light Electric, which continues to prosper in its 10th year of business.

While Abby Hull fully enjoys her weekends off, she also looks forward to Mondays. Now the lead powder coater for Barn Light Electric in Titusville, Florida, Hull hasn't forgotten that it was just a few years ago that she didn't have a job to report to on Monday mornings.

Employment was hard to come by then in Hull's small hometown. About 8,000 jobs were lost when NASA's Space Shuttle program ended in 2011. Hull had heard that the new lighting manufacturer in town was hiring, so she stopped by.

"The lady at the desk told me the only open position was in powder coating," says Hull, who happened to have learned how to powder coat from a friend. "I told her that was great, because I had seven years of experience doing just that. The receptionist said, 'Don't move.'"

Hand-crafted, American-made

Hull is a vital part of the growing workforce at Barn Light Electric, which continues to prosper in its 10th year of business. According to owner Bryan Scott, the most important decision he made in the shop's early years was to remain committed to creating products that are made and manufactured in the United States.

"We've built a strong following here in the U.S. and even abroad with customers who want to buy American-made products," Scott says. "American-made means quality products, jobs for local people, and a strong local and state economy."

"We've built a strong following here in the U.S. and even abroad with customers who want to buy American-made products," owner Bryan Scott says.

Barn Light Electric powder coats light fixtures like this 12-inch light pendant in its Florida shop.

Scott and his wife, Donna, had left their previous careers in 2008 to turn their passion for vintage lighting into a full-time business. They say they always had been drawn to antique lights for their timeless designs and craftsmanship, and launched Barn Light to manufacture fixtures the old-fashioned way: by hand and from quality materials. They revived the art of metal spinning and introduced their own porcelain enamel operation in 2012. At that time, porcelain enamel lighting hadn't been manufactured in the U.S. for more than 50 years.

In early lighting manufacturing, lights were intended to last a lifetime in a particular setting, and they were hand-crafted from high-quality materials. Porcelain enamel provided an extra layer of protection to help keep the lights performing even in harsh industrial and agricultural settings. When cheaper materials and manufacturing techniques became available, new lighting fixtures lost this durability.

The Scotts wanted to return to that "original way of doing things," manufacturing fixtures with skill and artistry. In their shop, flat pieces of commercial-grade metal are spun on a lathe, and then carefully manipulated and sculpted into the desired shape. To fully replicate the quality of vintage lights, some of the hand-crafted shades are coated in porcelain. It's a meticulous process, but the Scotts say that ingrains a tangible sense of dependability and integrity directly into each light Barn Light produces.

The porcelain enamel is applied to the hand-crafted steel light shades and then permanently bonded through oven curing, providing a durable, protective finish and pleasing aesthetic. Other hand-applied finish options include powder coat, natural finishes for copper and brass shades, and a drip-paint technique.

The finishing has caught the eye of many in Florida and the southwest. Jeri Glatter and Steven Cohen of Rooster Designs discovered Barn Light when they were looking for unique industrial and authentic barn lighting for the restoration of a 100-year-old cottage.

"Our initial attraction was the superior design and the

This dual sconce is one of the many types of lighting fixtures offered by Barn Light Electric.

depth of finish options, however, it soon became evident we had come across an excellent resource," Glatter says. "In our contact with Barn Light, we found we were engaging with a team that possessed a true love of their product and what they were doing."

Passionate About the Work

While many manufacturers produce lighting fixtures less expensively overseas, Scott prefers to consider not only his profit margin, but his local community as well.

"We look at what we're doing for this town, the state of Florida and the more than 100 passionate people we put to work every day making quality, hand-crafted lighting," he says.

Hull counts herself as one of those passionate people. She says she loves what she does and the company she works for, too.

"Whenever we have a long weekend, I'm ready to come back to work," she says. "I love the team atmosphere here, and my co-workers have become my family."

She also says she enjoys being part of a company that plays an important role in her community and gives her the opportunity to be creative.

"Everyone here is an artist," she says. "We're not just pushing buttons on a machine to make something. We're building and creating. It's nice to see our work go from a raw piece of metal to something very eye-catching and beautiful. We're all proud to play our part in making these products right here at home."

For more information, visit barnlight.com.

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Using 3D to Design a Paint Shop

Laser scanning helps optimize planning in brownfield expansion projects.

EDITED BY EL MCKENZIE MANAGING EDITOR

In an age in which almost anything described as modern could also be described as 3D and fast, laser scanning could be considered the most modern method for measuring buildings. It is three-dimensional and fast, as well as precise, and that is why Dürr Systems AG says it is using the method worldwide in its paint shop modernization and expansion projects.

When the data collected from a laser scan is combined with plant plans in 3D, the resulting virtual models reveal potential challenges that can be addressed upfront. This can lead to shorter installation times, reduced conversion costs and smoother processes.

Highly precise laser scans show features and measurements that cannot easily be seen with the naked eye, like small tolerances in the floor.

Laser scanning has revolutionized property surveying, says Marc Altmann, who works in the engineering department at Dürr. The laser beam records all relevant features of an existing building, including parapet heights, doors or cable ducts, as well as existing production elements. It can even produce non-contact measurement of hard-to-access areas from distances of as much as 130 meters. A software program then generates detailed images from the scan data.

"When working on brownfield projects, we are frequently confronted with the situation where there is either no documentation for factories and the sections they contain, or just analog original plans that have never been updated," Altmann says. Laser scanning allows planners to create accurate, current outlines of these facilities.

Virtual Visit

Altmann says laser scans provide the ideal basis for planning. For large industrial buildings, the scan data consists of hundreds of individual scans that are precisely matched using reference points. He says they provide a way of reviewing if a customer's vision is compatible with the structural conditions and engineering of an existing painting line or final assembly line.

Dürr uses the method as early as during the tendering phase of a project. 3D laser scanners measure and collect the data on an existing site, and software then processes the large volume of data and transfers it as photo-realistic images or videos to what it calls a "powerwall" at the Dürr campus in Bietigheim-Bissingen, Germany.

"We can take a virtual tour of any building, no matter where it is in the world, together with our customers here in the Powerwall room," Altmann says. "This is much more visual than a plan on paper, and makes it possible to identify and discuss complications in advance and find a good solution. This means that a paint shop can be executed as planned with a high degree of certainty when it comes to quality, schedule and costs."

Identifying Eventualities

The scans have an accuracy of ±2 mm, Altmann says, a level of precision that conventional measurement using a ruler or manual laser could not reach. Forgotten measurements can also easily be added on the screen.

"We create 3D CAD models for a project's entire scope of delivery and merge them with the laser scans," he says. "We then integrate our plant virtually on the PC into the reality of the building situation. This lets us see where design problems might occur, for example, due to an air duct in the way of the planned constructional steel work."

In this way, engineers can visualize the entire layout of the plant with exact dimensions and interfering edges, as well as space for door openings and other requirements. Each individual part of the plant, as well as the plant in its entirety, can be visualized.

The highly precise laser scans also show features and measurements that cannot easily be seen with the naked eye, like small tolerances in the floor. This enables the design engineer to plan filler plates on the machines or specific minimum distances from the outset. It is not always possible to adapt the plant engineering to the building situation, however, Altmann points out.

"The laser scans let us see very clearly whether demolition will be necessary, which saves our customers time," he says. "This makes conversion work much easier than doing them while installation is under way."

Dürr says it is using laser scanning regularly in modifications and expansions to paint shops, which already come with a growing list of requirements and increasing demands for complexity. It has found that using this innovative measurement technology helps projects go smoothly on site.

For more information, visit durr-northamerica.com.

Mastering **Sanitary Stainless Steel** Finishes

Here's a primer on the types of finishes required for equipment used in sanitary applications.

BY JESSICA JACOBSON, DAVID FOULKES AND CORY BUCHHOLZ
APACHE STAINLESS EQUIPMENT CORP.

For many food and chemical producers, the level of finishing on processing equipment may be prescribed by federal, state and local regulatory agencies. In these sanitary applications, however, the finish as well as the material must also be designed for easy and reliable cleaning and sanitation.

Agencies require sanitary finishes to have a minimum roughness average (Ra), but processors also are seeing the advantages of exceeding regulatory compliance, in that higher-end finishes have been proven to decrease sanitation time and decrease bacteria risk.

Here, we provide an educational and informational reference that includes:

- Definitions of stainless finishes and measurement designations.
- An overview of surface textures of stainless steels.
- A general guide to stainless steel finishes.
- Roughness comparison data by finish type.

For original equipment manufacturers, the complexity involved in fabricating sanitary stainless steel equipment is significant. Each industry requires experience and controlled processes. Tooling, process and technique are very important.

The fabrication process starts with selection and handling of the metal. The fundamental process of working with stainless steel in applications with sanitary requirements includes careful handling to prevent contamination from the manufacturing environment and the use of protective surfaces throughout all processes.

Basic Definitions

In sanitary applications, the stainless steel equipment itself requires a sanitary finish. The term "sanitary finish" generally means a smooth, scratch-free, non-corrosive finish. There are several mechanical and chemical finishes that can fulfill agency requirements for sanitary specifications. In choosing the appropriate type of finish, it is important to understand basic definitions and the criteria for how finishes are designated:

Surface texture describes the surface of the material, including irregularities and deviations, and roughness and grain.

Grit is the size of the abrasive used in the polishing process. Typically more coarse, lower grit numbers are associated with grinding, and higher grit numbers are associated

In sanitary applications like food and chemical processing, federal, state and local regulatory agencies often require equipment finishes to be easy to clean and sanitize.

with polishing. Grit size alone, however, does not fully define the surface.

Roughness average (Ra) is a standard for an average of the peaks and valleys of the metal's surface, measured in microinches or micrometers.

Root mean square (RMS) is a machining standard used to diagnose machine operations and surface finish.

The fineness of the finish and ultimate sanitation effectiveness is measured in Ra by height in millionths of an inch or microinches. A profilometer determines values of small surface variations and calculates their average to determine overall roughness.

There are two different types of methods for achieving a polished finish: mechanical and chemical. Mechanical polishing involves the removal of material using an abrasive, mechanical process. Typically, grit sizes of 120 and finer are used for mechanical polishing. Chemical surface treatments remove the outer layer of corrosion on the material to preserve its integrity.

Below is a description of textures and finishes achieved through both mechanical and chemical methods, and commonly used to produce Apache's tank and vessel-processing equipment, as well as the Mepaco line of food processing equipment.

Types of Textures and Finishes

Mill finish has an unpolished, dull-gray, matte appearance. This finish is the basic supply condition for all stainless steel flat products and also is the basis for additional finishing operations. The material is hot- or cold-rolled with a Ra of more than 100 microinches, depending on its gauge. (Gauge refers to cold-rolled material; plate is hot-rolled material.)

2B mill finish, a widely used stainless steel finish, is common in industrial, chemical and food applications. It is corrosion-resistant and has a typcial Ra range of 40 (7 gauge) to 15 (16 gauge) microinches.

No. 3 finish uses a 120-grit abrasive. It is a semi-polished finish with an Ra range of 36–58 microinches.

No. 4 finish uses a 150-grit abrasive and shows as a polished, brushed surface. The Ra range is 29–40 microinches.

No. 4A/dairy finish, for processing industries, is required to meet the basic 3-A standards. It uses a 180-grit abrasive and has an Ra range of 18–31 microinches.

Stainless Steel Gauges

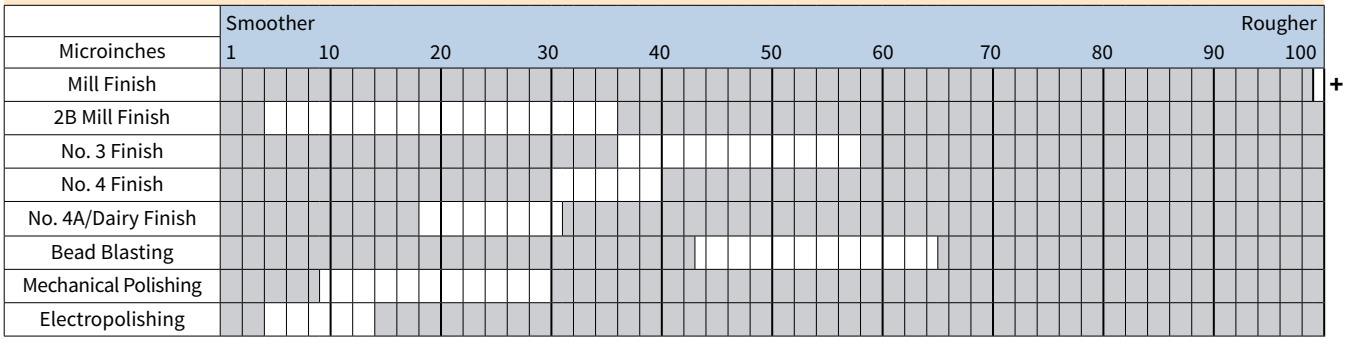
Gauge	Decimal Size
28	.015
26	.018
24	.024
22	.030
20	.036
18	.048
16	.060
14	.075
13	.090
12	.105
11	.120
10	.135
8	.165
7	.1874

Finish Designations

1-9 Ra (1-10 RMS)	#8
4-13 Ra (5-15 RMS)	2B (16 Ga. Sheet)
9-18 Ra (10-20 RMS)	2B (14 Ga. Sheet)
13-22 Ra (15-25 RMS)	2B (12 Ga. Sheet)
18-27 Ra (20-30 RMS)	2B (11 Ga. Sheet)
18-31 Ra (25-35 RMS)	2B (10 Ga. Sheet)
22-36 Ra (25-40 RMS)	2B (7 Ga. Sheet)
10-16 Ra (11-18 RMS)	#7 (320 Grit)
13-27 Ra (15-30 RMS)	#6 (240 Grit)
18-31 Ra (20-35 RMS)	#4 Dairy (180 Grit)
29-40 Ra (32-45 RMS)	#4 (150 Grit)
36-58 Ra (40-65 RMS)	#3 (120 Grit)
49-76 Ra (55-85 RMS)	2D (80 Grit)

The chart below compares Ra surface designations in a range of finishes. More precise values are dependent on the gauge of the material. The thinner the gauge material, the more rolling processes and cold reduction the material is subjected to, which creates a smoother surface.

Ra Surface Textures of Stainless Steel Finishes



Bead blasting uses bead material such as glass, ceramic beads or dry ice to produce a non-directional, textured surface with a soft, satin appearance and low reflectivity. The finer the blasting media, the more corrosion-resistant the surface performance. Ra values are typically greater than 45 microinches, but are dependent on the blasting process and the stainless material.

Passivation is the removal of excess iron or iron compounds from the surface of stainless steel by means of a chemical, typically acid-based solution. Unlike pickle passivation, no metal is removed from the surface during the process. It has little effect on the Ra values of the stainless material being passivated.

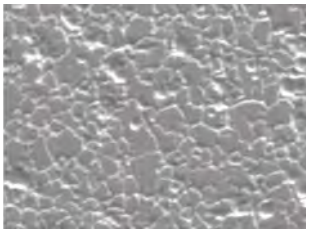
Pickle passivation is the immersion of the metal in a pickling bath or coating of the material with pickling solution, such as nitric-hydroflouric acid. The process removes both metallic contamination and heat-treating scales. Pickle-passivated stainless steel has a matte

Mechanical Finishes

Mill Finish	2B Finish	No. 4 Finish	No. 4A Finish
Description (Mill finish - Plate) The baseline for comparison, this is unfinished steel in basic supply condition.	**Description** (2B Finish -Gauge) Common corrosion resistant, heat resistant, smooth, (not brushed) steel	**Description** Characterized by short, polished brushed lines	**Description** Also characterized by short, polished brushed lines, the 4A finish uses a finer grit polish
Applications Structural	**Applications** Material handling, processing, direct food contact	**Applications** Used in clean rooms and in food processing equipment	**Applications** Used in clean rooms, processing equipment, used in Pharmaceutical industries and complies to 3A Dairy standards
Sanitation Environment None - not used in food contact areas	**Sanitation Environment** Suitable for caustic sanitary wash down procedures	**Sanitation Environment** Suitable for caustic sanitary wash down procedures	**Sanitation Environment** Suitable for caustic sanitary wash down procedures
RA >100 microinches Depending on material	**RA** 36 (7 gauge) to 15 (16 gauge) in microinches	**RA** 29 to 40 microinches	**RA** 18 - 31 microinches (3A standards require 32 or less)
Caution Does not meet sanitary, food contact or processing finishing requirements	**Caution** Note that 2B finishes can have the same RA as higher end finishes depending on gauge, compare economies when making material decisions unless otherwise required by compliance factions.	**Caution** Note that a No. 4 finish is not compliant for 3A standards; a 4A finish will satisfy RA requirements for the Dairy/ Cheese manufacturing industy.	**Caution** Welds are also required to be ground to a No. 4A finish to meet 3A Dairy standards

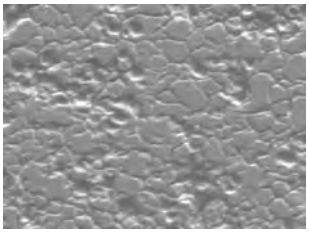
There are two different types of methods for achieving a polished finish: mechanical and chemical. Mechanical polishing involves the removal of material using an abrasive, mechanical process. Chemical treatments remove the outer layer of corrosion on the material to preserve its integrity.

Surface Smoothness Test Under 200× Magnification

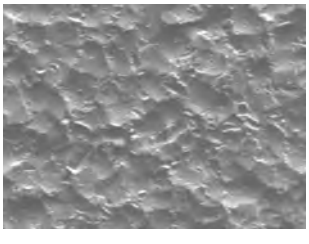


304 Stainless Steel
2B Finish
15–17 Ra (12 gauge)

304 Stainless Steel
Electropolished Finish
5–6 Ra



304 Stainless Steel
2B Finish
20–30 Ra (10 gauge)



304 Stainless Steel
Bead Blast Finish
35–45 Ra

Chemical Finishes

appearance. Apache's tests have confirmed improvements of as much as 25 percent in Ra readings on material that has been pickle-passivated.

Electropolishing is an electrochemical process that removes surface material from stainless steel. It includes an immersion of the stainless steel component into a temperature-controlled bath of electrolyte that is charged with a DC power supply. Electrolytes used in electropolishing are concentrated sulfuric and phosphoric acid solutions. The finish has a mirror appearance. Apache's before/after tests have shown improvements in Ra ranging to 50 percent; results vary depending on the stainless material.

Apache Testing

While surface standards such as 3-A require smooth, impervious material, free of cracks and crevices, processors also often need to choose the finish that meets those requirements and fits their cleaning processes, risk factors and overall business objectives.

The chart on the bottom of the facing page shows the results of a study conducted at Apache that compares four high-end finishes on 304 stainless steel under 200× magnification. In this study, the electropolished finish is more than six times smoother in Ra readings than the bead-blasted finish. These findings are only significant to a processor if smoother finishes provide the benefit to cleaning and sanitation in its manufacturing processes, however.

Food processing customers have more discretion in choosing equipment finishes, even in food-contact environments. The type of food product, bacterial count, manufacturing function and sanitation procedures all have an impact on their requirements in addition to the selection of equipment finishes.

For weighing the advantages of food-contact equipment finishes, the U.S. Department of Agriculture and Research Service offers a study conducted by the American Society of Mechanical Engineers on electropolishing and surface finishes. In this research, samples of stainless steel finishes were exposed to bacteria to evaluate growth. As microorganisms became attached to surfaces, they became more resistant to both physical and chemical sanitation practices. In testing of 11 different finishes, the electropolished surface was found to be the most resistant to bacterial attachment.

Jessica Jacobson, David Foulkes and Cory Buchholz are with Apache Stainless Equipment Corp. in Beaver Dam, Wisconsin. Visit apachestainless.com.

Understanding Liquid Film Defects

Q. We've recently started experiencing film defects in our liquid coating application. How do I define the cause of the defect and identify precautionary measures that can be taken?

A. You are not alone. Defects happen for various reasons in both electrostatic and non-electrostatic applications. The first thing to understand is that all defects are caused by a breakdown in the painting process. This breakdown could occur within the actual process, or due to an inadequacy in the coating material or substrate. The first step to understand the type of defect, identify the cause and then take precautionary measure to avoid defects in the future.

Types of Film Defects

Blisters are small, raised areas that contain, or once contained, moisture, oil, solvent or grease. With metal, they can be caused by contamination left on the surface before it is painted. With wood, they typically are caused by moisture escaping from within the wood onto its surface. When that moisture under the coating gets warm, it expands, and this exerts enough pressure to raise the film into a blister. To prevent blisters from forming, make sure the surface to be painted is free of contaminants and dry before applying the paint. When working with wood, it's also important to manage its moisture content through temperature and humidity, as well as identify another exit route for the moisture instead of pushing up through the paint.

Bubbles closely resemble blisters, however, bubbles (as well as craters) once contained solvent vapor rather than moisture. A **crater** is a small, concave, depressed area formerly covered by a bubble. Its rounded bottom and built up sides are caused by the breaking of the bubble. Bubbles tend to form during a bake cycle when the top layer of paint film skins over before most of the solvent has had time to escape. If, or when, they break, craters are formed.

Bubbles typically only form in baked coatings, not in air-dried finishes. Besides forming due to trapped solvent, bubbles and craters can also be caused by inadequate flash time before the bake cycle, as well as from an extra-heavy wet film application. Other causes could be a solvent blend that evaporates too slowly or an insufficient primer bake, which can leave an excessive amount of solvent in the primer, causing bubble formation in the topcoat during the topcoat bake cycle.

One way to prevent bubbles and craters is to allow enough flash time before a bake cycle. Allow the surface to rest first before baking, and apply the coating in several thin layers instead of in one heavy coat. Also, maintain specified primer bake cycles and use proper solvents.

Color mismatch is when several different batches of the "same" material are applied, yet the colors do not appear the same. Possible causes include variations in the degree of film wetness; inadequate agitation of the material; low film build; different application procedures; different substrates; different surface textures; or overbake. It can be prevented by consistency in paint agitation, degree of film wetness, film thickness and application procedures.

Dirt consists of any and all contaminants, including lint, dust, small clusters and overspray paint debris in or around painted surfaces. Causes of dirt contamination can be related to poor housekeeping, including in part preparation; inadequate facilities; or poor painting practices. The goal should be to eliminate any possible sources of lint or dust, or at least minimize them as much as possible. In addition, spray booth overspray should be kept at a minimum. Adequately stir the paint and use only recommended solvent for reducing paint, and paint should always be filtered prior to use. Keep extracurricular air or booth air at a minimum as well to reduce the risk of floating particles in the spray booth area.

Fisheyes are defects in the paint film that appear as small depressions with a mound in the center that resembles a fish eye, thus the term. Fisheyes are almost always caused by residual oil, grease or silicone products. The only method of prevention is to keep all silicone products out of the paint area.

Gloss variation is differences in the surface's ability to reflect light. Causes include wet spots in a base coat, insufficient oven makeup air, excessive humidity in the flash zone, insufficient film build or excessive oven temperature. Prevention is as simple as maintaining consistent film thickness or using proper paint application techniques. Also, avoid excessive humidity in flash zones and make certain that oven makeup air is sufficient. Lastly, operate bake ovens at specified temperatures.

Mottling occurs when metallic paint is applied excessively wet and the color pigments separate from the metallic flakes. Those metallic flakes form light regions in the center of dark rings. Mottling can most commonly be tracked back to applying paint too thick or extra wet, which indicates the paint contains excessive solvent. To

JUDITH LIETZKE
Carlisle Fluid Technologies

Judith is a senior product manager for Carlisle Fluid Technologies. Visit carlisleft.com

prevent mottling, do not apply paint too wet, or apply the initial coats at normal wetness and then apply the final wet-on-wet coat somewhat dry.

Orange peel is characterized by repetitive bumps and valleys, similar to the surface of an orange. Causes are related to excessive dry spray, poorly atomized spray, overly thin coating material or rough substrates. To prevent orange peel, do not dry spray, properly atomize the paint, carefully monitor paint thickness and check surface smoothness.

Runs or sags are the result of the downward flow of paint before the curing process hardens the film and stops that flow. Runs or sags can be caused by dirty applicators, buildup on the fluid tip; poor operator technique; the gun being too close to the object being painted; excessive solvent; insufficient air pressure; or inadequate flash time. Prevention is as simple as cleaning the applicator, using the correct amount of solvent, using correct air pressure, providing adequate flash time, warming parts or proper operator training.

Solvent pops, boils and pinholes are all tiny craters on the surface of the paint film. These are very small versions of bubbles and craters. The cause is overly rapid solvent loss from the wet paint. These defects may also be caused by pigment clusters, surface roughness, high or low solvent evaporation rates, high oven temperature, or trapped air. To prevent this type of defect then, avoid pigment clusters, check the surface roughness of the part, control solvent evaporation rates, and use correct oven temperatures.

Soft paint film occurs when the coating does not harden to the designated cure time. This can be related to low oven temperature, low oven air makeup, contaminated softening agents, excessive paint storage, excessive film build or insufficient cure time. Prevention can be as simple as monitoring oven temperature; maintaining oven air makeup; avoiding softening agents such as wax, grease or oil; using proper amounts of retarder solvent; applying proper film build; and curing as specified by the material manufacturer.

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Improving Corrosion Protection

Q. We make metal enclosures for a number of industrial applications, including control cabinets. We have an older powder coating system with a five-stage iron phosphate washer; dry-off oven; two powder booths with automatic and manual application equipment; and a convection cure oven. We apply a single coat of a high-quality, durable UV powder. Still, we have problems with corrosion on the cabinets, and we are not sure of the best way to tackle improvement on our system.

A. An organic coating over ferrous metal can provide a lot of protection against moisture penetration and oxidation, but some rules must be followed to get the best possible outcome. The surface has to be treated in a way that will ensure a good bond. All foreign matter (dirt, dust, oils, wax, markers, and so on) must be 100-percent removed to prevent setting up a corrosion cell. The surface can be enhanced with zinc phosphate or another superior, corrosion-inhibiting conversion coating. The coating material must be of high quality, and it must be applied completely and at the right thickness.

Start with the fabrication of your enclosures. Make sure all metal is free of excess burrs and sharp edges. If you must bend the sheet metal over into a tight fold, make sure the inside of that fold can be treated and covered with powder so rust cannot bleed out when it is exposed to the outdoors. Next, focus on cleaning. You can clean with a good chemical cleaner or by abrasive blast so long as all organic soils are removed and there is not scale, weld stains or other inorganic material left on the surface.

There are different ways to provide protection once the soils are removed. One way is to use a conversion coating that adds corrosion protection. Zinc phosphate, chrome treatment, zirconium treatment or similar materials can provide barrier protection under a powder film. You also can include a powder primer before you apply the topcoat. The primer will add significant protection, with or without a conversion coating.

In your case, the five-stage washer may do a decent job of cleaning, but the iron phosphate does not add significant corrosion resistance. It may be hard to convert to something better, however, because the equipment needs to be made of stainless steel, you need very high-quality water (deionized or reverse-osmosis filtered) and you have to have the right number and size of stages.

What I would add in your situation is blast and prime. If you do a good job of blasting, you will have a good surface for bonding. If you add a layer of zinc-rich powder primer, you will add major additional barrier to moisture penetration and a reactive layer of zinc for corrosion protection. This should be the most cost-effective and reliable way to improve your corrosion resistance.

Q. We need a method to determine the best possible line density of every part we run. Are there any guidelines or methods available to calculate this best possible density?

A. Everyone in the industry stresses that rack density helps achieve better efficiency, and this is true. But how do you determine how much surface to hang per foot? You could do it by common sense, trial and error, and learning as you go. Not all bad, but lacking in scientific support. You can add some time and motion study, recording of film-build control, and careful evaluation of rejects and causes for the light coating and the heavy coating. This will give you a step up in data and actual verification, but it still is somewhat lacking in methodology.

One way to support your racking setup and part spacing is to evaluate the number of guns and amount of time you have to spray (line speed). You will want to understand how much powder you can deliver per gun, how much surface has to be covered per part and how long the parts will be in front of the guns.

A critical part of this evaluation is to know the relative efficiency of your spray guns at a given output. Transfer efficiency is best at the lowest effective output. Ten pounds per hour per gun will provide better transfer efficiency (TE) than 20 pounds per hour per gun. If TE was the only goal, however, every coater would deliver a very low amount of powder. The problem is that it will take longer to coat the part. Time is an important factor due to production requirements and labor. So the gun has to be able to deliver enough powder to get the part coated in a reasonable length of time, and therefore we turn the gun up to get the job done.

The next step is to understand that there is a limit to how high we can go in output before the TE is so poor that it is no longer effective. Experience and lab testing have shown that at an output of around 40 pounds per hour, the TE begins to drop below 50 percent, and other problems begin to surface such as orange peel, inconsistent film build and poor coverage in Faraday areas. An effective limit to output is typically between 30 and 40 pounds per hour. Remember, lower output provides better TE, but we must accept some time limitations. So 20 is better than 30, and 30 is better than 40. Go as low as you practically can.

Once you have established a gun output rate and have a decent idea of TE, you can calculate how much surface you

RODGER TALBERT
Consultant

Rodger has more than 30 years of experience in the powder coating industry.

can cover per hour. You will also need to have a target film build and specific gravity for the powder:

- **Calculate coverage per pound:**

(192.3 × TE) ÷ (thickness in mils × specific gravity) = coverage per pound of powder

- **Determine total gun output:**

Number of guns × pounds per hour per gun = total gun output per hour (Gun output per hour ÷ 60 minutes = gun output per minute)

- **Determine how much surface can be covered:**

Pounds per minute of output ÷ coverage per pound of powder = potential square footage of coverage per minute

The final step is to calculate the surface area of your parts, factor in your line speed and make sure you do not exceed the potential that can be covered per minute with your planned racking arrangement. A difficulty factor may come into play. It may take longer to coat a complex part that has many Faraday areas, and that will reduce the potential coverage. There are probably three levels of difficulty: very simple (flat panel), somewhat difficult (bends or other geometry) and very difficult (deep recesses and complex shapes like castings). If you follow these guidelines, however, you will have a good idea of how many parts can be effectively hung and coated per minute on your line.

Options to Improve Passivate and Chromite Coatings

Q. What options are available to improve the quality of a passivate coating if there are mechanical limitations?

A. I'll focus on defining the passivate coating and maximizing its most crucial parameters and characteristics, including pH, concentration, agitation, immersion time, contamination and temperature.

Real-world plating facilities often fail to accommodate adjustments in passivate technology due to insurmountable restrictions in their existing lines. However, there are ways to manipulate these solutions without incurring substantial capital investment.

To increase the aggressiveness, reaction rate (speed) and activity of the passivate, take advantage of the following parameter values: lower pH, higher temperature, higher agitation level, longer immersion time, fresher solution (low built-up contaminants), higher concentration and fresher bright dip. To lower passivate aggressiveness, simply do the opposite.

Take, for example, a facility hemmed in by immersion times and/or temperature limitations. Slight modifications to pH and/or any of the other parameters listed above will increase the overall activity of the passivate, thus permitting proper film formation without drastic alterations to their current line setup. Here are some other considerations:

Passivate reaction. Trivalent chromium (tri-chrome) passivates are acidic solutions designed to partially dissolve metal (for example, a zinc deposit) upon immersion. This dissolution evolves hydrogen gas, which subsequently increases the pH at the interface between the solution and the part, which in turn precipitates the chromium constituents in the passivate, which then attach themselves and some of the other ingredients to the metal as a thin, gelatinous film. Many of the other chemical components act as activators, stabilizers, stimulants, complexants, buffering agents and catalysts.

pH. pH is the most critical parameter of the six mentioned, because it changes the most throughout the course of the plating cycle as work is being processed. A low pH, no matter the formula (high-build or blue-bright), lying outside the bounds of the recommended range, can be detrimental to the film, because this often results in purely dissolving the metal deposit and failing to form a film. High pHs induce an opposite effect, in that the film forms either too slowly, producing thin films, which impacts corrosion resistance, color and even adhesion (powdery), or no film is formed at all.

Concentration. Dragout is generally the fastest way a solution loses concentration, and the effect is more pronounced in those solutions that are made up at lower concentrations, which are often the blue-bright versions. Higher concentrations can help to alleviate contaminant buildup by the introduction of more chromium.

Agitation. The film will form faster with higher levels of agitation, because fresh solution is being brought into contact with the metal at the point that the reaction takes place. Agitation that is consistent and uniform produces the highest-quality coatings. Due to the softness of the film, barrel rotation speed should be limited to avoid damaging the coating through abrasion. The difficulty encountered with rack plating is that agitation levels are higher at the top, which creates a different coating both in color and thickness. Without agitation, it would take twice as long to achieve proper film thickness.

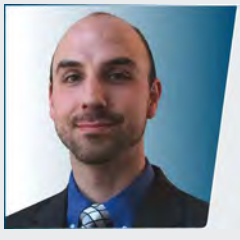
Immersion time. With all passivates, both bright and heavy-build iridescent, there is an optimum immersion time that is key for color, clarity, adhesion, brightness and thickness. Excessive time can produce unsightly discoloration (iridescence), powdery films and sometimes even thinner films. This is because the film begins to lose its integrity once the acidity no longer produces a film but begins to attack the film itself. Insufficient time without alterations to any other parameters will lead to thinner coatings, color variations and poor corrosion resistance.

Contamination. Zinc is an inevitable contaminant that will negatively impact passivate effectiveness but that can be overcome somewhat by increasing the concentration of the passivate, which will in turn increase the chromium content, which acts to counteract the zinc.

Iron contamination is common due to poor zinc coverage, especially on tubular steel parts. The acidic passivate attacks the steel leaching iron into the passivate. The threshold for many passivates is 100–500 ppm of iron, as it will begin to impact color uniformity and corrosion resistance.

Copper is even more pernicious and at much lower levels, leading to discoloration and heavy black bands in the recesses. Corrosion resistance can be catastrophically impacted with tolerances as low as 0.1 percent of the passivate's chromium content, which is often less than 5 ppm, especially with blue-bright formulas.

Temperature. Temperature is the last catalyst used to enhance passivate film formation. Higher temperatures increase the speed and intensity of the reaction, which



ADAM BLAKELEY
MacDermid Enthone

Adam is a technical service representative for MacDermid Enthone. Visit macdermidethone.com.

affects film thickness. However, rapid changes in temperature are uncommon. High-build passivates often require appreciable heat to ensure adequate reaction progress, but many passivates require no additional heat provided the ambient temperature is not colder than the minimum TDS requirement. Excessive heat can produce a thin and powdery film, but excessively low temperatures can produce thin or potentially no coating at all.

Bright dips. Bright dips are often neglected post-treatment options. They are dilute nitric or sulfuric acid, even hydrochloric, sulfamic and citric, designed to remove potential alkaline or organic films from the deposit to prepare it to receive the passivate uniformly and consistently, and to preserve the pH and cleanliness of the passivate tank, thus extending its longevity.

Given the information presented above, the applicator should have a better understanding of how passivates function, and can use that knowledge to adapt and amend those facets and components to achieve the color, film thickness and corrosion protection desired without resorting to extreme monetary investment, process innovation, or laborious instrumentation and retrofitting.

Solving Corrosion on Black-Dyed 7000 Series Alloy

Q. We anodize several different 7000 Series alloys. Recently, on a load of Type II anodized and black-dyed extrusions, some of the parts had small areas of heavy corrosion. This was only observed after the parts had been dyed black and sealed in hot deionized water. As far as we could tell, the parts did not have corrosion spots when they were racked. What might have caused this?

A. The photos you sent show small areas of heavy corrosion having a significant amount of "bloom." This does not appear to be electrolytic pitting (electrolysis), nor does it look like "blistering" that is sometimes seen on 7000 Series alloys.

Troubleshooting any defect that occurs in process is made somewhat easier if the tank where the defect first showed up can be pinpointed. If the anodizing line has no inspection aisles at strategic intervals, finding the location where the defect occurred is very difficult. If this is the case, it is sometimes necessary to bring the rinsed load back to the racking area after each process step to inspect for signs of corrosion or any other condition that might be occurring.

After further correspondence, we were able to surmise that the most probable place of occurrence was your black dye tank. There are three possible reasons for this. One, the black dye compound is relatively high in chlorides. As the bath gets older (as opposed to a newly made-up bath) the additions of dye increase the concentration of chlorides in the bath. Two, the use of titanium racks, or partially titanium racks, increases the probability of galvanic corrosion because of dissimilar metals. Three, the 7000 Series alloys (high zinc) can be particularly sensitive to pitting and galvanic corrosion. Edges of the parts are particularly sensitive to corrosion of this type.

You can be the judge of the condition of the bath regarding chlorides and buildup of other contaminants. The best way to reduce the chance of this type of corrosion would be to make up a new dye bath and then check for the presence of chlorides in the water that is used to make up that new bath. If the water is high quality, it will have no chlorides whatsoever. An easy way to do this is to get a sample of the makeup water in a small beaker and add a few drops of silver nitrate. The presence of any white cloudiness (silver chloride) will indicate that there are chlorides present. If chlorides are present in the bath makeup water, this water should not be used. Check the RO and/or DI water equipment and ensure that the outlet water is chloride-free.

The best rack for black dye will be made entirely of aluminum. It can be a difficult decision whether to use aluminum or titanium, however, because other factors also often come into play.

Q. Is there is a set standard for measuring and matching colors?

A. There has been confusion in the anodizing industry about the efficacy of using devices for measuring and matching the color of anodized finishes ever since machines were first marketed for that use in the 1970s. I have never compared the readings of different machine brands on the same anodized parts; machines of two different brands might not give the same results. I have found, however, and there are others in the industry who agree, that tri-stimulus colorimeters, in general, do not give reliable color value readings for anodized coatings. They are fine for opaque, applied organic coatings (paint), but the metallic, reflective nature of the substrate throws off the color value readings for anodized coatings. This makes it virtually impossible to obtain reliable color readings. This is also true for painted coatings with metallic, or mica, flakes. Even though these machines were advertised to the anodizing industry, there was nothing in the literature that stated they could be used effectively for color-matching anodized aluminum coatings. Colorimeters should not be used to gauge colors for anodized coatings.

You are not the first to have this problem or ask this question. I believe the use of color range samples and the good old "mark 1 eyeball" under consistent lighting conditions is the best way to evaluate anodized colors, including clear anodized finishes.

Q. Sometimes we have trouble stripping sealed or even unsealed Type III coatings completely off the substrate before parts have to be rerun. If the parts are left in the caustic etch bath for too long, they are often unusable, either because they are undersize or turn out too matte, or both. Occasionally, we find that some of the coating has been stripped and some still remains in patches. Even if these patches can eventually be removed, it takes so long to do so that too much metal is stripped away from those areas that were initially stripped. This leaves high and low areas on the stripped parts and renders them scrap. This usually is only a problem with coatings more than one mil (25 microns) in thickness. Is there an effective technique that can be used to strip the anodic coating from the parts completely on the first try?

LARRY CHESTERFIELD
Anodizing Technologies Inc.

Larry designs and builds anodizing equipment and systems, and provides technical consulting.

A. There is a way to do this that works most of the time, and it's pretty simple. The hardcoat coating is usually thick and dense, and can be very difficult to remove. If it is sealed, the task of stripping becomes even more difficult. Soak the parts to be stripped in a desmut tank with a strong acid bath for 30-45 minutes. This will break the seal, soften the coating and make it much easier to strip. After the acid soak, rinse the parts and then strip in the etch bath until the coating is completely removed. It helps to have the caustic etch bath at around 140°F (60°C). Lower than 130°F (55°C) usually won't work. It usually takes some practice in order to refine this technique and determine an appropriate soak time and strip time for different coating thicknesses. Keep at it until you find the most effective times. Hopefully, you will be pleased with the results.

An anodizing bath may be used in place of the desmut bath for soaking. No matter which bath is used, it could cause a slight disruption in production while the parts soak.

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Environmental Protection Considerations for a Rectifier

Q. Our shop is looking to purchase a new rectifier, and I was curious as to what environmental issues we should consider before making a purchase.

A. Understanding your environment is crucial when selecting a rectifier. Exposure to the vapors and particulates in a metal finishing facility can cause premature failure of the rectifier. Understanding this will aid in determining the type of protection needed and should help to decrease downtime.

Several environmental factors should be taken into consideration when considering the purchase and installation of a rectifier: They are the available space and location, temperature, and humidity. Understanding these factors and the types of available cooling methods will help to increase the longevity of the rectifier and your return on investment.

Many ask why they should worry about the degree of protection for a rectifier. The two primary reasons are: 1) the decision made can extend the life of the rectifier, and 2) the return on investment can be improved. Downtime and repair expenses also can be significantly reduced with proper protection.

Understanding the various types of cooling methods will help you determine the degree of protection required for the rectifier in your specific environment. That degree of protection can be defined by internationally recognized standards such as NEMA, IP or IEC.

Air-Cooled Rectifiers

Air-cooled rectifiers generally require a clean environment or air supply, as the components that are cooled by the surrounding air will be susceptible to any corrosive particles or fumes that may be in the general vicinity of the equipment. Air quality, air flow, available space (to prevent air flow restriction), ambient temperature and humidity should all be reviewed for compliance with the manufacturer's specifications. This will help in determining the correct air cooling design (convection-cooled, forced-air-cooled, air-to-water heat exchanger or ducted air) to suit your needs and environment.

Many modern designs incorporate variable-speed, thermostatically controlled cooling fans, which can greatly minimize the amount of air being drawn into the rectifier. In addition, a rectifier with direct air flow should be considered. With these types of rectifiers, air is directed through the heat sinks, only cooling the power components. The sensitive electronics are also isolated from the cooling air to improve the rectifier's longevity. Conformal-coated circuit boards will also greatly improve the rectifier's resistance to corrosive environments and improve life expectancy.

Preventative maintenance of an air-cooled rectifier is based on the air cooling design and should be scheduled according to the surrounding environment and manufacturer's specifications. This may include cleaning air inlet filters, and visual inspection of cooling fans and heat sinks on a weekly to monthly basis.

Water-Cooled Rectifiers

Unlike an air-cooled rectifiers, water-cooled rectifiers can be installed into a harsh environment with minimal susceptibility to corrosive particles. The rectifier enclosure is mostly sealed to completely sealed, depending on how it is specified, and adds a protective barrier from the environment. The choice between an open-loop or closed-loop water cooling system would be based on meeting the manufacturer's water-cooling specifications for optimal performance and longevity. If the quality of your cooling water does not meet the specifications required by the manufacturer, then a closed-loop system or an external water source will need to be considered. It is also strongly recommended to maintain the water temperature above dew point, as this will help prevent condensation inside the rectifier and resulting potential hazards.

Preventative maintenance of a water-cooled rectifier can be kept to a minimum, provided the water quality and temperature is within specification. Visual inspection for leaks of the internal and external water-cooling circuit will provide optimal performance and prevent any downtime, potential hazards and/or loss of water flow.

Oil-Cooled Rectifiers

Oil-cooled rectifiers are typically the largest of the mechanical packages offered, but the downside of this technology can be offset by its reliability. Unlike like air- and water-cooled designs, this type of rectifier can be installed in the most aggressive environments, because its power components are submersed into nonconductive oil. Heat is dissipated through fins that are external to the main rectifier enclosure, which is completely sealed from the environment and provides exceptional protection from any contaminants. Preventative maintenance is

RICKY VALENTIN
American Plating Power

Ricky is an application engineer for American Plating Power. Visit americanplatingpower.com.

almost nonexistent on oil-cooled rectifiers because they are completely sealed from the environment. The extent of this benefit varies based on the rectifier technology (thyristor or variable transformer) used for the power section. The manufacturer will specify the oil level, oil-change interval and/or other components that may need to be replaced, based on operation. It is recommended that any maintenance work be scheduled for during a plant shutdown so as to not disrupt production.

Rectifiers can be a substantial capital expense for any company and, depending on the process, can cost hundreds of thousands of dollars. Factors such as process control, ripple percentage, rectifier technology and any other options required for your process will also need to be considered in evaluating the return on investment. By taking into consideration the degree of protection required for the rectifier, you will help to minimize any disruption in production, and maintenance and repair expenses, as well as the hazards that are associated with the environment. This in turn will help increase your overall return on investment, improve your process results and achieve smoother running and lower cost of production.

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A Super Defense Against Corrosion and Abrasion

This eco-friendly PVD coating protects plastics without producing harmful fumes and waste.

BY EL MCKENZIE *MANAGING EDITOR*

It may not be faster than a speeding bullet or more powerful than a locomotive, but the strength of Vergason Technology's new SuperChrome PVD coating is the abrasion and corrosion resistance it provides in decorative plastic applications. Plus, the process used to apply it does not produce harmful fumes and waste, the company says, making it an eco-friendly replacement for electroplated hexavalent chromium.

Peter Witte, executive managing director at Mankiewicz Gebr. & Co., a manufacturer and supplier of coating systems for the industrial market, says he is sold on the coating. "Until experiencing SuperChrome PVD, we have not seen this level of success in replacing decorative electroplated chrome on polymer substrates," he says.

Eight years in the making, the two-layer, patented process currently is being used by European automakers on mirror housings and exterior trim components, says Gary Vergason, VTI's CEO. He says the Van Etten, New York, company received S1 OEM approval from Daimler earlier this year and is well into S2-level testing on service vehicles.

"Multiple Tier-One automotive suppliers have performed a thorough analysis of the SuperChrome PVD coating technology and concluded it offers at least a 10 percent cost advantage over traditional chrome plating on most parts," VTI President Mark Fitch says.

The coating is a direct color match for hexavalent chromium (by the GM 150 specification), and it is lighter in weight, Vergason says. "The two-step process uses a paint base coating that is 25–40 microns thick and a PVD layer that is ⅓-micron thick."

SuperChrome also is easier to recycle, provides the "feel" of metal, is comparable or lower in cost to produce, and offers lower scrap rates, he adds. It also does not require a protective topcoat, so users don't have to be concerned about interference with a chrome finish.

According to VTI, a variety of finishes, from bright to dark chrome, can be deposited using reactive magnetron sputtering, a PVD method. And because the PVD layer doesn't produce microcracking, it offers superior chemical resistance over electroplated chrome, Vergason says, easily passing copper-accelerated acetic acid (CASS) salt spray testing and Russian Mud testing at more than 300 hours (a standard for chloride resistance).

SuperChrome's abrasion resistance makes it suitable for both interior and exterior automotive applications. VTI says the coating has passed Gravelometer testing, designed to evaluate resistance to chipping caused by the impact of flying gravel and other debris, and 2,000 strokes of Crockmeter testing, which evaluates rub abrasion, scuffs and marring.

To apply the coating, VTI offers the SC660 SuperChrome sputtering system, which features a large coating zone of 2.5 square meters (660 mm in diameter by 1,220 mm in height), allowing for increased batch sizes and price points that Vergason says are lower than traditional chrome plating. The unit is available with manual doors, automatic doors or single-point loading for robotically controlled operation. A standard system can process parts as long as 1.2 meters; longer parts would simply require a taller vacuum chamber, he says.

In addition to plastics, SuperChrome PVD can be deposited on metallic substrates that can be base-coated with wet-chemistry paint or powder coating," he adds.

Pumps Recirculate Filtered Plating Solutions

OMG Co. offers 13 models of filter pumps specifically designed for electroplating, including nickel, copper, zinc, cadmium, tin, gold, silver and brass plating. The pumps suck the electrolytic solution out of the working bath and return it to the production cycle after it has been filtered and purified of waste such as "anode mud." Their filtering blocks use alternated inserts and papers, guaranteeing filtration to less than 1 micron, the company says.

The filter pumps are made of anti-corrosive materials, including polypropylene, polyvinyl chloride (PVC), AISI 316 L, AISI 304, silicon carbide for the mechanical seals, and a protective elastomer called ebonite that coats the filter-containing tank and its cover. These materials can withstand acids and other dangerous substances typically contained in galvanic baths, the company says.

O.M.G. di Gibogini / 39-0321-956241 / omgpomefiltro.it

Three-Zone Conveyor Oven Suited for Curing Coatings

Grieve's No. 865 is a 750°F (399°C) three-zone conveyor oven currently used for curing coatings at a customer's test facility. With workspace dimensions of 30" × 18 ft. × 15", the oven features 90 Kw (30 Kw per zone) installed in Incoloy-sheathed tubular heating elements, while three 1,500-cfm, 1½-hp recirculating blowers provide vertical downward airflow to the workload.

The oven has a 4-ft.-long open-belt loading zone and 4-ft.-long open unloading zone. Other features include three 6-ft.-long insulated heat zones with independent recirculated airflow and temperature control; 6" insulated walls; an aluminized steel exterior; a Type 304, 2B-finish stainless steel interior with continuously back-welded seams; and a 24"-wide, 1" × 1" 304 stainless steel flat-wire conveyor belt with ½-hp motor drive, variable from 0.1 to 2 fpm. Controls include digital indicating temperature controllers and a three-pen circular chart recorder.

The Grieve Corp. / 847-546-8225 / grievecorp.com

Acrylic Coating Provides Hard Finish for Extruded-Aluminum Products

Featuring a propriety resin system developed by Sherwin-Williams Coil and Extrusion Coatings, Valspar's Acrylicoat acrylic coating is designed to deliver a smooth, glass-like, extremely hard finish on extruded-aluminum architectural products. The company says the coating is well-suited for high-traffic areas such as window and door frames, metal panels, column covers and other aluminum extrusions, in both interior and exterior applications. The hard surface resists scratches, and meets or exceeds the American Architectural Manufacturers Association (AAMA) 2603-17 industry standard for high-performance coatings. The coating is offered in a range of gloss levels and 18 standard colors; custom solid and metallic colors also are available.

The Sherwin-Williams Coil and Extrusion Coatings division was created after the 2016 acquisition of Valspar by The Sherwin-Williams Co.

Valspar Corp./ 800-328-8044 / valsparindustrial.com

Combo System Provides Air for Both Safe Breathing and Paint Spray

Martech Services' Model 50-WB combination waterborne/breathable air system is designed to work with existing compressed air sources to properly filter and monitor compressed air to produce Grade D breathable air, plus it provides clean and dry air for spraying waterborne paints.

With all the features of the company's Model 50 series quality air breathing system, this combination unit removes moisture, oil vapors, gaseous hydrocarbons, dirt, rust, scale and other potentially dangerous contaminants, then lowers the dew point and relative humidity to allow for spraying of waterborne paints. The combo system can process as much as 50 scfm of breathable air or 35 scfm of clean and dry air, or any combination within those parameters, the company says. It also is available in an 80-scfm version.

Martech Services Co. / 800-831-1525 / breathingsystems.com

Balloon Masks Cover Difficult, Large Geometries

EPSI offers multiple balloon masks that enable operators to mask especially difficult or unusually large geometry. The five thin-walled, disposable silicone caps are designed to withstand typical finish-curing heat. They collectively stretch from ¾" to 17" and will replace 30+ standard silicone caps, the company says.

EPSI / 866-275-3774 / epsi.com

Water-based Shop Primer Inhibits Rust on Steel Surfaces

PPG's Aquacron 834 is a water-based industrial shop primer designed to inhibit rust in steel applications. Its quick-dry formula uses water for reduction and clean-up. With volatile organic compounds (VOCs) of only 2.8 lbs per gallon, the primer meets stringent environmental regulations while delivering robust protection in corrosive environments, the company says. It also provides excellent flow and leveling characteristics to create a smooth finish for steel fabrication, automotive racking, waste containers, industrial machinery, material-handling equipment and other metal applications.

The primer can be made in a variety of colors, and is said to work well with PPG's Aquacron 488, Aquacron 880 and Aquacron 890 Series topcoats.

PPG / 888-774-2001 / ppg.com/coatings/industrial

Epoxy Primer, Topcoat Suited for Weathering-Susceptible Substrates

Part of its Tufcote LV HG alkyd and polyurethane coatings series, Axalta Coating Systems' Tufcote 5100 epoxy topcoat and Tufcote LV PR 5187 epoxy primer are said to be well-suited for use in above-water conditions, on surfaces that are susceptible to weathering and corrosion, such as steel, wood, concrete, aluminum, fiberglass, storage tanks, machinery and piers.

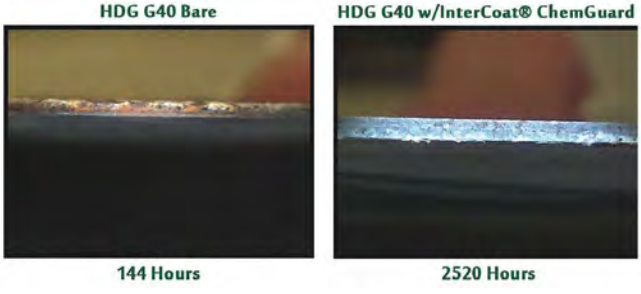
The topcoat is a two-part, heavy-duty, thixotropic solvent-borne coating that is formulated with a volatile organic compound (VOC) level of 0.4 lb per gallon (50 g/l) to comply with stringent U.S. regulatory requirements. It is available in three colors and may be applied by spray application, brush or roller. The epoxy primer is a light grey, two-part primer that has a 0.8 lb per gallon (100 g/l) VOC level. It is recommended for use under the Tufcote LV HG epoxy topcoat to maximize chemical and abrasion resistance.

Axalta Coating Systems / 800-247-3886 / axalta.us

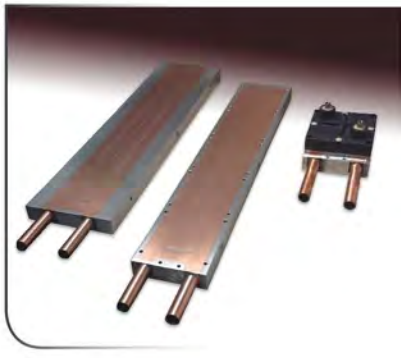
Coating Enhances Zinc Protection on Galvanized Steel

Chemcoaters Inc. offers InterCoat ChemGuard, a coating designed to enhanced the effectiveness of zinc and provide improved corrosion protection on galvanized steel. According to the company, heavy zinc coatings have typically been used to protect metal from corrosion. The InterCoat technology is applied over a light layer of zinc and reacts with it to form a permanent, covalent bond on the surface of the metal that cannot be washed or worn off. This allows bending, stamping, post-painting and even shearing while providing self-healing characteristics that help protect newly exposed zinc that naturally occurs during secondary processing, the company says. The product also is said to eliminate the need for temporary corrosion protection coatings often used in shipping and materials storage, including hexavalent chrome.

Chemcoaters Inc. / 877-411-2905 / chemcoaters.com



Liquid Cold Plates Provide Cooling for High-Power Electronics



D6 Industries' HydroTrak liquid cold plates are designed to better cool power electronics, including the delicate electronics of finishing equipment, to optimize their performance and protect their valuable electronic systems.

The plates feature a custom tube profile designed for increased cooling surface area and heat conduction angles, improving heat-transfer dynamics. They can be customized to offer "geographically focused cooling" on high-heat areas on the mounting surface and can have parallel-cooling-path options to maintain thermal performance and fluid pressure, the company says. The plates are said to be well-suited for high-power resistors, insulated-gate bipolar transistors, silicon-controlled rectifier diodes and other high-power-density applications.

The plates come in standard 3", 4" and 6" widths, and standard lengths to 20".

D6 Industries / 978-989-0981 / d6industries.com

Pretreatment Leads to Water-break-free Plating Surfaces

Asterion provides customized soak, spray and electrocleaning process solutions designed for cost-effective and fast removal of soils and contaminants from steel, copper alloys, zinc die cast and other substrates. Featuring phosphate and phosphate-free cleaners, the non-chelated processes are said to impart water-break-free surfaces for subsequent plating.

Suited for both rack and barrel operations, the pretreatment processes offer high oil retention and ease of handling, the company says.

Asterion / 317-875-0051 / asterionstc.com

Spray System Includes Electronically Integrated Proportioning

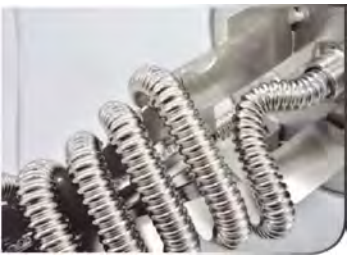
Featuring the company's SureFire heating system and Smart Select electronically integrated proportioning, Titan's plural-component Helix VR2.3 spray system is designed to apply protective coatings that require consistent, accurate material temperatures and precise variable-ratio control.

The variable-ratio proportioner enables continual communication between pumps of more than 60 times per revolution. For more consistent chemical processing, a smart-connect dual-pump system precisely meters the A and B components, improving accuracy. The spray system can be set for any ratio between 1:1 and 1:4. The heating system provides active heat throughout the entire system—at the pump, through the hose and to the gun, where the temperature can be verified and adjusted. The system's wrap-around design provides longer dwell time and a larger surface area for greater transfer of heat, while using less power, the company says. Heater blocks can be customized from 3 to 18 Kw and are modular, so blocks can be added or removed.

Titan / 800-526-5362 / titantool.com

Solution Removes Metalworking Oils, Inhibits Rust

Kyzen's Metalnox M6324CP is a heavy-duty alkaline cleaner and inhibitor formulated to remove paraffinic oils used in a range of machining, stamping and deep-draw operations, and provide long-term protection from rust.



The nonflammable, biodegradable aqueous solution can remove difficult soils including carbon smut and chlorinated oils, and provides effective steel corrosion protection for up to 90 days, the company says.

Kyzen Corp. / 800-845-5524 / kyzen.com

Program Collects Five Powder Products, Services Under One Umbrella

IFS Coatings's IFS Advance program is a collection of five different IFS products and services designed to advance and improve the powder coating process. Those five products are: IFS Appraise, IFS Enhance, IFS Fast Cure, IFS Match and IFS Co-Cure.

IFS Appraise employs the company's technical expertise in assessing a customer's powder coating process and making recommendations; IFS Enhance are powder products designed to improve the electrostatic charge distribution over a range of particle sizes; IFS Fast Cure are powder products that cure at lower temperatures; IFS Match is an exacting color-matching service; and IFS Co-Cure is a formulation technology that enables two coats of powder to be applied with only one cure cycle.

IFS Coatings / 940-668-1062 / ifscoatings.com

Combination Wheels Boost Cutting, Grinding Productivity

Saint-Gobain Abrasives' Norton Quantum3 (NQ3) line of depressed-center grinding wheels includes combination wheels designed for more efficient and faster cutting and grinding, resulting in increased productivity and longer wheel life.

According to the company, the wheels enable users to finish more pieces in less time, and the need for wheel changes is reduced, resulting in decreased downtime. They also are said to be easier to use. The wheels feature a proprietary grain along with a tougher bond system containing a unique combination of fillers and bonding agents, the company says. The grain tends to be more rounded than precision-shaped ceramic grain, allowing a more robust cutting action with less vibration for easier operator control. Sizes include 4½", 5", 6", 7" and 9" for hubbed and non-hubbed wheels.

Norton | Saint-Gobain / 800-446-1119 / nortonindustrial.com

Triple-Angle Glossmeter Measures Variety of Surfaces

The Novo-Gloss Trio glossmeter from Paul N. Gardner Co. is designed for gloss measurements of all surfaces, including matte and mirror surfaces. It is adjustable to angles of 20, 60 and 85 degrees to handle a variety of applications. According to the company, 60 degrees is considered the universal measurement angle, and it can be used as a basic gloss assessment for any surface in applications such as paints, coatings, plastics, automotive interiors and general manufacturing. For high-gloss measurements that require increased resolution, 20 degrees is recommended.

Paul N. Gardner Co. Inc. / 800-762-2478 / gardco.com

How Not to Quit Your Job

Shake your employer's hand and thank him or her for the opportunity provided.

MATTHEW KIRCHNER
Managing Director, Profit360
mkirchner@profit-360.com

"I'm calling to let you know I've accepted another job." That's how a Monday morning began as an employee shared the news over the phone.

"I'm sorry to hear that," I said. "When is your last day?"

"I'm giving two weeks notice," he said to my relief. "But here's the thing: I wanted to give two weeks notice last Monday, but you were on vacation last week, and I didn't want to ruin your vacation. So I'm giving retroactive two weeks notice. Since it's retroactive to last Monday, my last day will be this Friday."

Retroactive notice. That's a new one for me. Welcome back from vacation.

The list of bizarre resignations I've received doesn't begin or end with retroactive notice. There was the email from an employee who had a reputation for having a party lifestyle, received at 1:00 a.m. on a Saturday, only to be later rescinded.

My appreciation grows over time for the candor of the maintenance team member who shared his displeasure upon being asked to work a Saturday. "I refuse to work for Hitler," he said as he submitted his resignation to the operations manager requesting the overtime. Safe to say, about the only time you can refer to your boss as Hitler would be in submitting your resignation.

The customer service representative who placed a small bag of caramels on the hood of our vice president's automobile, together with a short note the she wouldn't be coming back to work the following day—or ever—earned points for creativity.

Between the notice and the departure dates, take care to transfer knowledge and information to those who will be assuming your responsibilities.

A conversation in the front office was once interrupted by the spouse of a vacationing employee who entered the front door, asked for the sweater his wife had left at her desk and then informed us that she was done working for our company. When I inquired as to the reason, he stated, "It's all been said." A decade later, I'm not quite sure what her gripe was.

The list goes on. It includes the sales team member who gave notice after working for us for only a few months, stated that his two weeks notice would include "unused vacation," and then sent his company computer back with the hard drive completely wiped, leaving us to wonder what activity he didn't want us to find on it. Also included is the 20-plus-year employee who simply didn't come to work one day. We never heard from him again.

Lest I be tagged an ogre, I've employed hundreds of people over the years, and, to my knowledge, the vast majority were perfectly happy working with me. The foregoing are the exceptions to the rule that there is a classy, professional way to part ways with an employer when the time comes, and then there is, well, see above.

Permanently paranoid about burning bridges, I have gone out of my way to ensure a smooth transition on the handful of occasions that I have made a career move. I still remember the uncomfortable meeting at which I gave notice to the contract manufacturing company I had led for a decade. That mid-January afternoon, I sat in our board chairman's living room, and we planned the transition that would end in my departure toward the end of March. I burned the candle at both ends for more than two months to ensure that everything would be completely in order for the person stepping into the role I left behind.

Eight years later, after communicating my planned departure from the company that had acquired my employer six months earlier, I remained on board for nearly seven months to ensure that neither my employer nor my coworkers nor our customers would suffer any ill effects of my resignation.

Expecting an employee to offer two to seven months notice of a departure is neither realistic nor necessary in most instances, but with the "Hitler resignation" at the other extreme, I think we can all agree that doing all one can to ensure a smooth transition is in the interest of both the employee and the employer.

After hiring a newly recruited employee, I am generally eager to add him or her to the team as soon as possible, although I not only understand but appreciate it when the new employee looks out for his or her former employer. After all, I would expect the same level of consideration should that new employee elect to move on at some future date. Feeling the same way, most employers will accommodate a request to push a start date back a week or two longer if necessary for a smooth transition.

Between the notice and the departure dates, take care to transfer knowledge and information to those who will be assuming your responsibilities. Organize emails, and electronic and paper files, and clean your office; I'll never forget the dead bird we found behind one departed sales team member's desk. To the extent your employer allows it, notify outside contacts, taking care to say nothing but positive things about the employer you're leaving.

Finally, almost regardless of how miserable your experience might have been, shake your employer's hand and thank him or her for the opportunity provided. You never know when that relationship might come in handy again.

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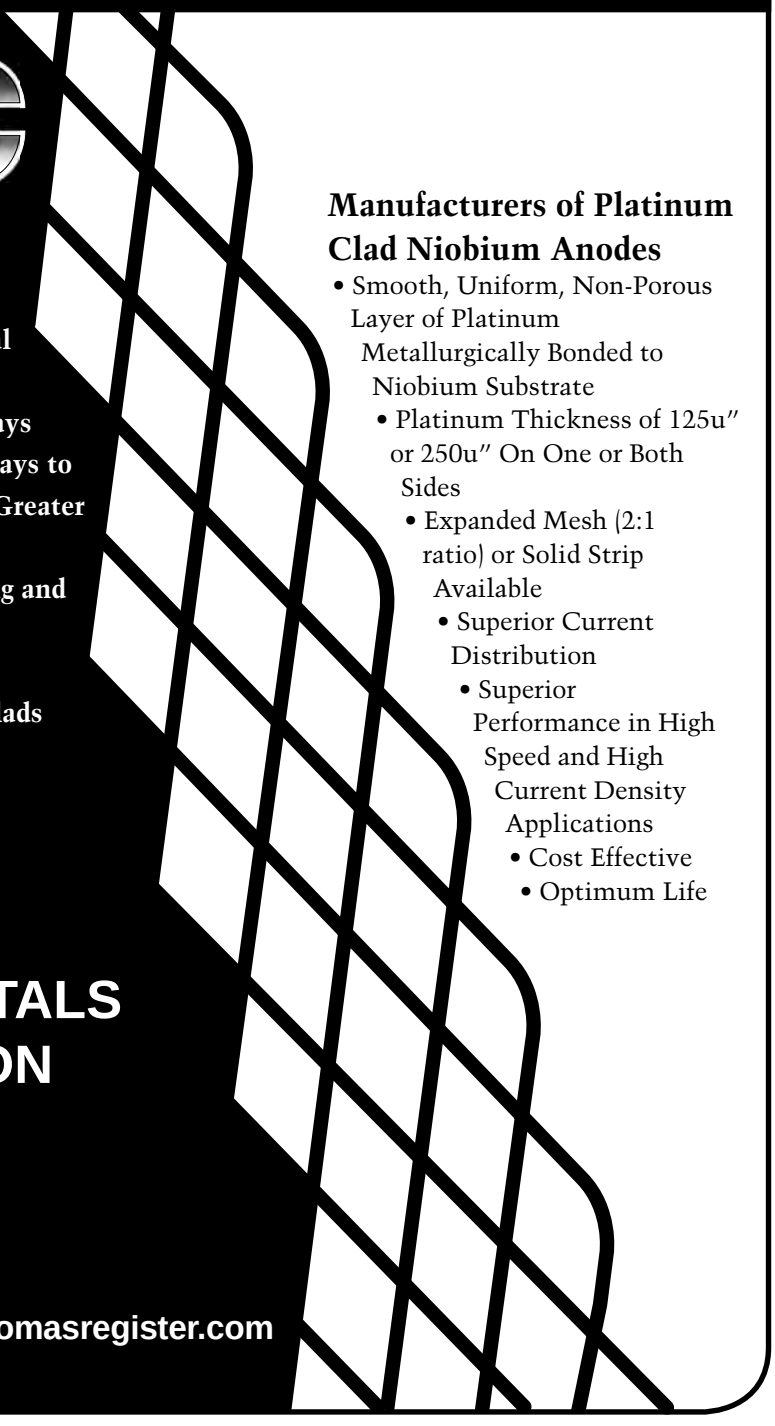

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Finishing Industry's Growth Slows

The Finishing Index registered 51.5 in November, coming down off a record-setting month.

Registering 51.5 for November, the Gardner Business Index (GBI): Finishing grew at its second slowest pace in 2017, beating only April's measure. Including this latest reading, the index's average for the year to date decreased to 54.0. This is significantly higher than the year-to-date averages in 2015 and 2016, and slightly higher than the 2014 average of 53.9. It is up approximately 5.1 percent for the year-to-date period. Gardner Intelligence's review of the underlying data for the month of November indicates that supplier deliveries, production and employment lifted the index higher, while new orders, backlog and exports pulled the index lower.

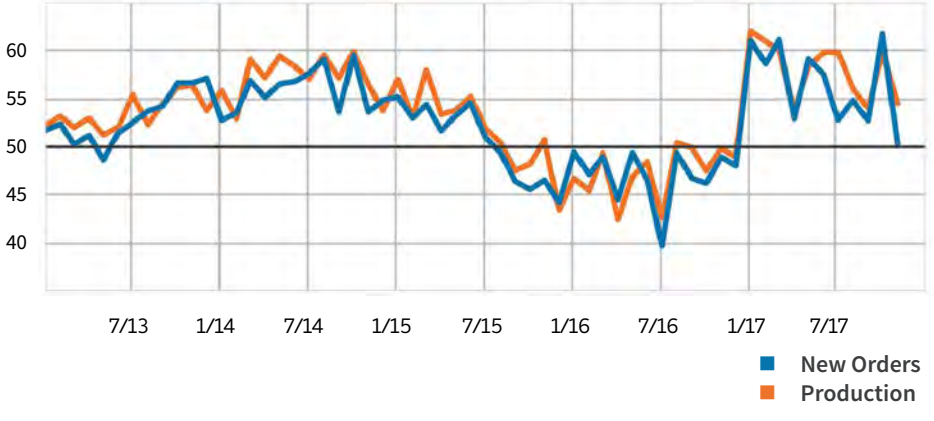
All components of the Finishing Index moved lower in November. Production and supplier deliveries, which have been key contributors to the index's growth in the year, both moved sharply lower in the month and well below their year-to-date average readings. New orders recorded their lowest reading for the year, remaining nearly unchanged in November at just a few tenths of a point above 50.

MICHAEL GUCKES, MBA
Chief Economist
Gardner Intelligence
Michael has performed economic analysis, modeling and forecasting work for nearly 20 years among a wide range of industries.
mguckes@gardnerweb.com

FINISHING INDEX

All components of the Finishing Index moved lower in November, sending it to its second-lowest reading of the year. The 51.5 reading for the month indicates that the industry was still growing, but more slowly.

NEW ORDERS AND PRODUCTION (3-month moving average)



The reading for new orders fell sharply in November to just above 50. This comes just after their multi-year high of more than 60 recorded in October.
For reference, a reading of 50 indicates no change in conditions.

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This issue of *Products Finishing* is being sent to nearly 28,000 subscribers in more than 19,000 plants—the largest circulation in the finishing industry.

A Conversation with …

Jason Gatton *Pneu-Mech Systems*

Jason Gatton is a special projects manager at Pneu-Mech Systems, having started with the company more than 20 years ago working in the field, learning how finishing systems are installed and operated. He moved into manufacturing, then design/estimating and then onto the sales team, where he currently is responsible for managing the design, sales and final acceptance of special projects related to automotive, electrocoat and global accounts.

PF: How did you get your start in the finishing industry?
JG: I was given the opportunity to travel with installation crews at Pneu-Mech in 1996. I gained hands-on experience with the equipment and got to see it in operation.

PF: How does it help having worked at many different levels in the industry and in your company?
JG: Experience designing, fabricating and installing paint systems is very helpful. It provides a tremendous advantage when communicating and connecting with colleagues, industry partners and customers. I feel that I can better discuss options for the customer and work with them to find solutions to their needs because I have seen it first-hand.

PF: As a member of the Products Finishing 40 Under 40 class, what advice would you give other young people?
JG: Being prepared, on time and a pleasure to be around is a great start. A willingness to learn and assist others has given me opportunities that I would not have otherwise had.

PF: What's the best piece of advice you have been given?
JG: Be willing to do things today that others will not do, so tomorrow you can do things that others can't do.

PF: What was your first job, and what did you learn from it?
JG: Refereeing soccer at 15. I learned to be on time and fair.

PF: What leadership traits have helped you along the way?
JG: I can work with a variety of people. The people you encounter in a work environment can each be unique. The challenge is to work with each one to achieve the desired results. My patience and flexibility allows me to lead people to complete the goal. I also focus on leading by example. I try to *show* people how things need to be done, not just tell them.

PF: What did you want to be when you grew up?
JG: An attorney.

PF: What organization or company, aside from your own, do you most admire?
JG: Apple.

Get to know Jason

- **Family:** Wife Erin, and daughters Ava and Addison
- **Favorite hobby:** Exercise
- **Favorite movie**: "The Godfather" series
- **Favorite book:** *The Operator*
- **What's playing in your car CD/radio:** Allman Brothers

PF: Who would you trade jobs with for a day?
JG: A fighter pilot.

PF: Where would we find you on a typical Saturday?
JG: Near the water with my wife and two daughters.

PF: Personal heroes?
JG: My grandfathers. Both were veterans.

PF: How do you motivate people?
JG: With my actions. The results will follow.

PF: How do you motivate yourself?
JG: By always thinking ahead and understanding what's next.

PF: Three greatest passions?
JG: Family, fitness and being better every day.

PF: Most unique office décor?
JG: A Naval Letter of Commendation that was given to one of my grandfathers.

PF: Best business decision?
JG: Being flexible and willing to learn different aspects of our industry by actually doing them.

PF: What word best describes you?
JG: Committed.

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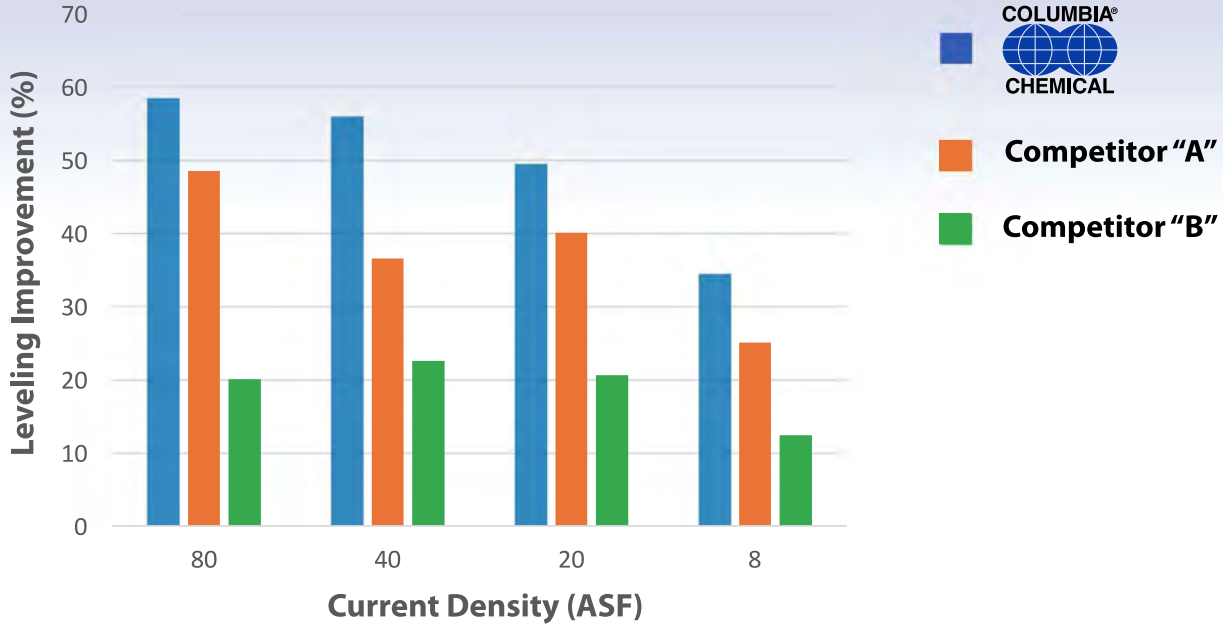

** See our feature article on page 14 for more information on our innovative approach to nickel leveling.*

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