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EDITORIAL SUBMISSION GUIDE



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Electroplaters, anodizers, liquid and powder coaters have all come to rely on *Products Finishing* magazine as their No. 1 source for surface finishing news and technology for more than 80 years. That's because our feature stories and how-to case studies resonate with our readers: the job shop owners and OEMs who specialize in coatings.

We encourage editorial submissions from industry professionals. The content must deal with some aspect of industrial finishing, including electroplating, liquid and powder coating, anodizing, passivation, electrocoating, buffing/polishing, deburring, vibratory finishing, cleaning/pretreatment, metal spraying, vacuum metalizing, printed circuit production, etching and related processes.

This guide will help you better understand how to provide our editorial staff with pertinent information about your company that will reach our 28,000+ monthly print readers and our 83,000+ monthly online visitors.

Please look over the information and samples that covers items such as:

- News
- Innovations
- Clinic Experts
- Technical Papers
- Case Studies

If you have any questions, please contact me and I'll be happy to help.



Tim Pennington
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Products Finishing
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News

This section covers time-sensitive industry events and developments, and news about companies, including acquisitions, expansions, relocations and personnel changes.

Word count: 100-250 with at least one hi-res image required.

Anodizing Helps Yo-yos Make a Colorful Comeback

By Hannah Coombs, Assistant Editor

Yo-yos are making a comeback, thanks to a unique anodizing application resulting in more colorful and durable toys.

Toy industry analysts say sales are cyclical. In 1985, less than 500,000 yo-yos were sold worldwide, but in 1990 it jumped to 12 million. In 2010 sales climbed back over 10 million and have remained steady.

One Drop YoYos in Eugene, Oregon, is a leading high-end yo-yo manufacturer—yes, there is a high-end yo-yo industry—selling some for as much as \$300, with materials ranging from plastic to titanium. It gets some of the 8,000 products it makes finished at Gruntbull Anodizing in Gettysburg, Ohio, whose splash anodizing process combines as many as six colors on the same part. The result is a piece of art.

Gruntbull owner Ted Luginbuhl started the process in his friend's garage 10 years ago, working with several colors and designs for paintball markers. In 2009, Gruntbull Anodizing was born, but the yo-yos came later.

"We tried our hand at it and it didn't turn out so good the first time," he says.

Even a buildup of 0.0002" can affect the balance of a yo-yo if not coordinated with the manufacturing of the part.

Splash anodizing is an increasingly popular finishing technique, similar to the Easter egg process. Gruntbull dyes the part with a solid color, then masks areas where the next color will fill. The product is anodized, bleached, neutralized and then the steps

are repeated.

"It looks like you just splashed paint on it; there's no indication that it was ever masked," Luginbuhl says.

One Drop YoYos co-owner David Metz, says the tolerances are very tight, considering it's a toy.

"It's a gyroscope, it's a spinning toy and our customers are educated," he says. "They know the difference between a balanced and non-balanced yo-yo."

The weight of the toy is the key to its fluid motion as it rolls along the string. Without a balance of concentricity, weight and motion, the toy vibrates, which can affect how it moves.



Gruntbull dyes the part with a solid color, then masks areas where the next color will fill. The part is anodized, bleached, neutralized and then the steps are repeated.

Luginbuhl began to learn more about how anodizing affects the weight and balance of the product, particularly with a toy that relies heavily on precision. Even a buildup of 0.0002" can affect the balance if not coordinated with the manufacturing of the part.

Before sending the parts to anodizers like Gruntbull, Metz says One Drop works with the anodizer to predict buildup.

"You have to do a little prediction. If the anodizing will change the thickness X amount, then we have to build it within that window."

Another challenge includes finding a balance within the splash process itself.

"Getting the cycle down is tricky," Luginbuhl says. "If you bleach too much, you end up with a white line around the first color because the bleach will go through the masking."

For Luginbuhl, the technical side can be straightforward, a series of steps and repetition. The result, however, requires an elevated artistic sense.

"It's really about design and quality," he says. "It requires someone artistically inclined and willing to come up with new ideas."

For more information, visit gruntbull.com.



Chris Capalbo

TOP SHOPS SPOTLIGHT New Method Plating

When a Massachusetts business was failing in 1931, 17-year-old Ralph Capalbo advised the owner on how to save it. The amused owner told him to do it himself. Capalbo started New Method Plating in the basement of his parent's house, and in 1940, he moved it to its present location. Visit newmethodplating.com.



Find more information at
short.PFonline.com/top_shops

Top Shops Benchmarking Survey Now Underway

The *Products Finishing* Top Shops Benchmarking Survey, which highlights the attributes shared by leading U.S. and North American finishing businesses, is now underway at PFonline.com.

Job shops, captive shops and contract shops specializing in electroplating operations should complete the survey by Dec. 31; the liquid and powder coating survey will occur in the summer.

The benchmarking survey covers several areas in the finishing industry. In return for completing the survey, shops will be provided a series of reports to benchmark their operations performance against other shops in the industry, a great tool for shops that want to improve efficiencies and increase productivity.

The survey covers four areas of shop operations:

- Finishing technology and equipment
- Finishing practices and performances
- Business strategies and performances
- Training and human resources

Products Finishing will also recognize those shops designated as Top Shops based on responses to help all shops benchmark their operation against some of the best in the finishing business. Several shops will also be selected for special profiles in an upcoming issue. Visit PFonline.com/zones/top-shops.

Praxair, GE Aviation Launch Joint Surface Technologies Venture

Praxair Surface Technologies and GE Aviation announced the creation of PG Technologies, a joint venture that will focus on development, support and application of specialized coatings tailored for GE Aviation's and CFM International's current and future engine models, including the GE9X and LEAP engines. CFM International is a 50/50 joint venture company between GE and Safran Aircraft Engines of France.

"This joint venture will take the leadership role in the next generation of coating technology applications and will invest in new coating production capacity to meet the needs of the burgeoning aviation sector," says Praxair Surface Technologies president, Pierre Luthi.

"PG Technologies will play an important role in GE Aviation's engine manufacturing system," says Colleen Athans, vice president and general manager of GE Aviation's supply chain. "With engine production volume levels growing, GE's need for specialized coatings will also increase, and this joint venture will ensure we meet our commitments on the performance and durability of our engines."

For more information, visit praxairsurfacetechologies.com or ge.com/aviation.



Classes at Axalta's Powder Coating Learning and Development Center are designed to give students hands-on experience with the latest application techniques using advanced powder coating technology.

Axalta Coating Systems Opens Powder Coating Learning and Development Center

Axalta Coating Systems celebrated the grand opening of its Powder Coating Learning and Development Center on Oct. 28 adjacent to its powder manufacturing headquarters in Houston, Texas.

Axalta officials say the facility will attract thousands of powder coating professionals to the Houston area for single-day and multi-day classes taught by industry experts. Classes are designed to give students hands-on experience with the latest application techniques using advanced powder coating technology, including a Nordson Colormax II spray booth, a Gema batch booth and a 512-cubic-foot gas oven for curing. The center also features classrooms equipped with innovative seating pods to encourage and support collaboration and relationship building.

The facility opened to Axalta employees, customers and guests with a program that featured tours and guest speaker Rick Dale, star of History Channel show *American Restoration*.

"We are thrilled to open this dedicated powder coating learning and development center and to offer Axalta's respected powder coating expertise to those who need it," says Michael Cash, Axalta president of Industrial Coatings.

For more information on the Powder Coating Learning and Development Center, visit axalta.us/powder/trainingcenter.



Axalta's Michael Cash, left, and Michael Bolan, right, with Rick Dale, star of *American Restoration*.



Mike Woodruff

Asterion Appoints Mike Woodruff as Technical Sales Representative

Asterion has hired **Mike Woodruff** as technical sales representative. He will be responsible for the sales and support of the company's plating processes, pretreatment chemistry and powder coatings products.

Woodruff joins Asterion with experience on equipment design, chemical sales, technical support and production management. Prior to Asterion, Woodruff was a technical sales engineer with Associated Rack Corp.

Blair Vandivier, president and CEO of Asterion says, "The in-depth knowledge Mike has amassed during his impressive career gives him a unique appreciation of our industry's increasingly demanding requirements."

Asterion provides plating applications, pretreatment chemistry, and powder coatings to the surface finishing industry.

Bill Oney Joins Therma-Tron-X as Sales Engineer



Bill Oney

Therma-Tron-X in Sturgeon Bay, Wisconsin, has hired **Bill Oney** as sales engineer. Oney comes with an interdisciplinary background in the finishing industry and is a retired Marine Corp Chief Warrant Officer Third Grade with almost 21 years of combined active and reserve time.

Oney began his finishing career as an assistant on a paint line, and was also trained in welding and fabricating. He began his career at American Finishing

Resources in Wisconsin as a welder/fabricator, supervisor of paint stripping and fabrication, product design and then sales.

Oney is an active member of the Chemical Coaters Association International (CCAI) and is a past president of the Wisconsin Chapter board. He also serves on the national CCAI board of directors as vice president for its 600-plus members.

PPG Announces New Executive Appointments

PPG Industries announces the appointment of two new executive positions.

Jane Valenta currently vice president, environment, health and safety (EHS), has been appointed as vice president of technical, global architectural coatings. Valenta will lead the global architectural coatings technical teams in developing product-innovation processes and new technologies.



Jane Valenta

Mark Cancilla will become vice president, environment, health and safety. Cancilla will replace Valenta as vice president, EHS, overseeing PPG's global EHS organization. Cancilla is currently global platform director for coatings in PPG's aerospace business.

PPG Industries is a global manufacturer of paints, coatings, optical products and specialty products, serving customers in construction, consumer products, industrial and transportation markets.



Mark Cancilla

Greenkote Adds Major Anti-Corrosion Coating Capacity in Ohio

Greenkote PLC, a provider of anti-corrosion metal coatings, says that it has more than doubled capacity at its headquarters production facility in Brook Park, Ohio. The company says the expansion has come in response to increasing demands from the industry as well as a surge in the use of its products.

"Greenkote usage is showing a strong rise in the markets we serve," says Greenkote PLC CEO Mark Gore. "Over the past year, we've seen a steady increase in orders for anti-corrosion and metal protection coatings, and our new state-of-the-art coating line will help us keep pace with the need."

The company also pointed to eco-friendliness as another reason for the surge in Greenkote usage, claiming older coating processes use toxic chemicals and other pollutants that are increasingly being regulated.

The company says that the added equipment will multiply current capacity by nearly two and a half times, enabling the Brook Park facility to process more than 150 tons of parts per



Greenkote PLC provides coating services for construction, automotive, rail, utilities and a range of other industries where products are exposed to harsh environments.

month. It will also support the application of specialized topcoats and sealers to the Greenkote coatings to further enhance coating performance. For more information, visit greenkote.com.

NSA Industries Expands to New Hampshire

Fabricator and powder coater, NSA Industries in St. Johnsbury, Vermont, is expanding operations to Groveton, New Hampshire. The company is bringing at least 40 new jobs to a 73,000-square-foot facility at a former paper mill site with the help of Chapman Development.

As NSA Industries considered expanding to Groveton, the New Hampshire Department of Resources and Economic Development (DRED) and New Hampshire Employment Security (NHES) worked to help the company address its workforce needs, hosting two job fairs coordinated by the NHES Berlin office that attracted approximately 300 job applicants. In addition, DRED worked to facilitate contact between NSA Industries and the New Hampshire Business Finance Authority, which is assisting with financing for the facility.

Bob Chapman, owner of Chapman Development, purchased the entire mill site in 2014, with the intent of creating a commercial/industrial complex to attract new business. "This is my backyard, and I want to do what I can to bring the jobs and economic activity back to the region," he says.

"This is great news and I thank NSA Industries for choosing to expand in Groveton," says state Senator Jeff Woodburn. "For far too long, we have seen manufacturing jobs leave us in the North Country, but today's announcement shows that we can bring good-paying manufacturing jobs back to our region."



From left to right, Benoit Lamontagne, New Hampshire Division of Economic Development; Bob Chapman, Groveton site owner; Jim Moroney, CEO NSA Industries; and Michael Bergeron, New Hampshire Division of Economic Development.

Founded in 1982 in St. Johnsbury, Vermont by Neal S. Austin, NSA Industries grew from its initial customer, the manufacturer of the Garden Way Garden Cart, to the only metal fabrication, machining and powder coating operation of its kind in Northern New England. It is now owned by a small group of shareholders and management.

For more information, visit nsaindustries.com.

Mecaplast Group Purchases Key Plastics Corp.

Mecaplast Group, a global supplier of plastic components for the automotive industry, announced that it has entered into an agreement to purchase Michigan-based Key Plastics Corp., manufacturer of automotive interior, exterior and under-the-hood plastic injection molded components including its painting application services.

Through the transaction, Mecaplast Group plans to expand its presence in key markets in countries such as the United States, Germany and China, and aims to diversify its customer portfolio. The combined Mecaplast and Key Plastics groups will service major global automotive manufacturers from facilities in several international markets, offering a broad portfolio of product capabilities.

Closing of the transaction is subject to approvals by competition authorities in certain countries and other customary closing conditions.

For more information, visit mecaplast.com.

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Trojan Powder Coating Collaborates with Artist Stephen Glassman

Trojan Powder Coating in New York City worked on an architectural project alongside artist Stephen Glassman commissioned by The Durst Organization (TDO).

The 60-by-60-foot sculpture, titled *Flows Two Ways*, was designed by Glassman and marks his first permanent, large-scale art project in New York. Glassman and his studio collaborated with Trojan Powder Coating on the custom color palette for the project.

Inspired by the Hudson River's Native American name and meaning—Muh-he-kun-ne-tuk, or the river that flows both ways—*Flows Two Ways* demonstrates the connection and symbiosis between the city and the water.

The sculpture showcases bright and earthy tones of blues, greys, yellow and black that appear to change as the sun moves. The array of colors mimic the Hudson River's glow at sunset.

Trojan Powder Coating created and applied the custom shades for the project, coating the aluminum, steel and metal tubing comprised in the sculpture, including 35 interlocking aluminum panels, nearly 400 sixty-foot pipe clusters rolled and flowing in three axes, and faceted metal boulders.

"We were excited to partner with the Glassman Studio on this innovative sculpture," says Keith Rein, Trojan's vice president, who oversaw powder coating production for *Flows Two Ways*. "The project was executed over a short time period and our team worked diligently to ensure the color quality and coating was precisely what Stephen and his team had envisioned. We're extremely proud of the finished product."

For more information, visit trojanpowder.com.



You can find *Flows Two Ways* in New York City at 601 West 57th Street, injecting the West Side with a sense of energy and optimism.

Hubbard-Hall Awarded 2016 Top Workplaces Honor

Hubbard-Hall has been awarded a 2016 Top Workplaces honor by Hearst Media Services based on the results of an employee feedback survey administered by WorkplaceDynamics, a leading research firm specializing in organizational health and workplace improvement. Several aspects of workplace culture were measured such as alignment, execution, and connection.

"To be a Top Workplace, organizations must meet our strict standards for organizational health," says Doug Claffey, CEO of WorkplaceDynamics. "And who better to ask about work life than the people who live the culture every day—the employees."

A self-proclaimed lean company, Hubbard-Hall's mantra is "Better, Safer, Faster" with a focus on personal growth and continuous improvement.

"Our company's success starts and ends with our people," says Hubbard-Hall president and CEO, Molly Kellogg. "We have a talented and progressive team in place and we are thrilled to be receiving this recognition."

For more information, visit hubbardhall.com.



Molly Kellogg

John Cole Named UM-Dearborn 2016 CECS Alumnus of the Year

Parker Ionics president John Cole, a 1976 graduate of the University of Michigan at Dearborn, was named the UM-Dearborn 2016 CECS Alumnus of the Year.

Cole is president and chief operating officer of Parkwood Engineering Development Corp. He was previously vice president, engineering and development, for Kolene Corp., where he worked for 35 years.

Cole has been awarded the State of Michigan's Professional Engineers in Industry "Outstanding Engineering Award" and the Detroit Metro Chapter's "Engineer of the Year" award. He is involved in many trade organizations, including SME, SAE, and the Industrial Heating Equipment Association, where he served as national president in 2003.

For more information, visit parkerionics.com.



Cole helped the college facilitate the annual Engineering/Computer Science Experience and contest for high school students, offering scholarships to the winners.

Henkel Hosts Smart Chemistry Event

Leaders in automotive pretreatment converged at Henkel's North American Adhesive Technologies headquarters in Madison Heights, Michigan, for the company's Smart Chemistry Spotlight Event in September. The event focused on the role of surface treatments in achieving light weight and sustainability.

Representatives from Henkel, Ford, GM, Novelis and researchers from Oak Ridge National Research Laboratory (ONRL) presented on research innovations that enable multiple different lightweight materials to function together without compromising safety or appearance, especially in the paint finish.

During a break-out session, participants toured several Henkel onsite labs to observe explorations and innovations, and tools in place to validate and/or troubleshoot customers' processes. Validation testing ensures that Henkel's processes integrate seamlessly with those of OEMs and suppliers for Henkel's coatings to perform optimally. Henkel is a global supplier in adhesives for consumers, craftsmen and industrial applications.

For more information, visit henkel-northamerica.com. **PF 80**



Kirk Kramer, Henkel technical manager, adhesives research, material science and engineering, discussing ceramic coatings for aluminum alloys.

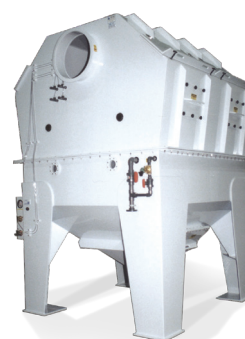


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Innovations

This section highlights new products and technologies on the market as well as improvements or upgrades to existing products.

Word count: 100-250 with at least one hi-res image required.



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Lincoln Industries | Lincoln, Nebraska
402-475-3671 | lincolnindustries.com

Genesis offers protection against external corrosion caused by moisture buildup on the surface of insulated equipment.

Thermal Insulating Coating Protects Against Heat, External Corrosion

Lincoln Industries's ThermoLinc Genesis supports temperatures as high as 400°F.

BY HANNAH COOMBS ASSISTANT EDITOR

According to metal finisher Lincoln Industries, heat management goes beyond maintaining temperature.

In Lincoln's "Catalyst" newsletter, John Wilson, director of technology and innovation, says that heat management takes several different forms.

"There are elements of rider comfort, safety, performance and functionality," he says.

To achieve those elements, Lincoln is licensing ThermoLinc Genesis, a thermal insulating coating with unique protective properties for service temperatures as high as 400°F. But the product also aims to provide elevated insulation and protection against moisture, corrosion and abrasion.

ThermoLinc Genesis serves vehicular exhaust systems where keeping heat or protecting nearby components from heat is essential. The coating uses a moisture-activated resin chemistry that forms into a glass matrix, with insulating materials and other key ingredients that deliver a durable, low thermal conductivity coating.

The product also provides thermal and corrosion under insulation protection against external corrosion caused by moisture buildup on the surface of insulated equipment. The technology is said to be lightweight, pliable and able to expand and contract with changes in the substrate.

Launched two years ago, Lincoln's innovation team developed the coating after working with a customer and understanding the issue from the customer's point of view.

"Our current customer was having heat challenges within their engine and the surrounding components and is using this coating to keep heat maintained within their engine," says Chad Nadgwick, director of business development.

Originally designed to meet the needs of automotive and truck manufacturers, Genesis is an alternative to ineffective thermal insulating jackets used to reduce condensation within venturi passages with products such as EGR components, engine manifolds, exhaust pipes and industrial pipes.

"We look at the vehicle or system and use data collection instruments to gather and analyze data. It's all a part of our process and helps us to understand what potential solutions to apply," Wilson says.

Thermal Properties of ThermoLinc Genesis

ID and Condition	Nominal Temperature (OC)	Actual Temperature (OC)	Specimen Resistance (m ² -K/W)	Specimen Conductivity (W/m ² -K)
Coating on Al Substrate Using Original Thickness	-40	-40	0.0421	0.0701
	25	25	0.0364	0.0810
	100	100	0.0264	0.1119
	200	200	0.0178	0.1660

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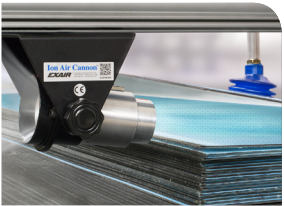
Ion Air Cannon Designed to Eliminate Static Electricity

Exair introduces its Ion Air Cannon designed to eliminate static electricity and clean at distances up to 15 ft. for spaces requiring a concentrated flow of static eliminating ions.

Features include a metal armored, high-voltage cable designed to protect against abrasion and cuts, a replaceable emitter point, integrated ground connection and electromagnetic shielding. The product incorporates Exair's Super Air Amplifier said to minimize compressed air use by inducing surrounding airflow at a ratio of 22:1. The amplified airflow carries ions to the target, enabling the

product to quickly eliminate static charges.

Exair Corp. / 800-903-9247 / exair.com



Omegasonics Introduces Cleaning Detergent

Omegasonics, introduces the OmegaSupreme ultrasonic cleaning detergent, designed to remove oils, light grease, dirt, grime, carbon and other contaminants from a variety of metals. The non-Hazmat formula can be used for cleaning stainless steel, titanium, carbon steel or plastic parts.

Omegasonics / 800-669-8227 / omegasonics.com

Robotic Blasting System Uses Media Cyclone

Guyson presents its RB-9, robotic blasting systems using a high-performance model 75/12 media cyclone.

In the cabinet, the part is held by Guyson's custom-designed fixture. Ensuring the part is mounted for a direct blast in the right sections, the system includes a continuous servo for part rotation.

The company's cyclone reclaimers are lined with high durometer urethane, providing maximum abrasive resistance. The longer cone design creates a high-velocity separation of fines and fractured media from reusable material.

Fine-tuning vents on the cyclone enable adjustments for separation, as well as a tuning vortex for media grit size adjustments.

Guyson Corp. / 800-228-7894 / guyson.com

Grieve Presents Electric Batch, Gas Cabinet Ovens

Grieve presents the No. 839 and the No. 915 oven. No. 839 is an electrically heated, 850°F walk-in oven for high temperature heat treating and batch baking. 120 kW are installed in Incoloy-sheathed tubular heating elements. A 12,500-CFM, 10-hp recirculating blower provides horizontal/vertical airflow to the workload.

No. 915 is a gas-fired, 650°F cabinet oven, used for testing paint coupons. 100,000 BTU/hr. are installed in a modulating natural gas burner, while a 1,000-CFM, 1-hp recirculating blower provides vertical upward airflow.

Grieve Corp. / 847-546-8225 / grievcorp.com



Hemco Introduces MicroFlow II Ductless Workstation

Hemco's MicroFlow II is a Class 1 ductless carbon filtered workstation equipped with activated carbon filtration for fumes, odors and non-hazardous chemical vapors. According to the company, the product is completely self-contained with a recessed work surface to contain spills.

A clear hood surrounds the work area and includes a hinged viewing sash for user protection, and the sash can be conformed for use with a microscope. Variable speed fan control enables high-speed, 100-fpm air flow through the sash opening, or medium and low flow for sensitive operations.

Hemco Corp. / 800-779-4362 / hemcocorp.com



Alicat Adds Backlit Monochrome Display

Alicat Scientific adds backlighting on monochrome LCD displays for its core range of mass flow meters, mass flow controllers and pressure controllers. The backlighting illuminates Alicat's full-information, menu-driven, multi-parameter LCD display screens for easy reading, regardless of lighting conditions.

Alicat Scientific / 888-290-6060 / alicat.com

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Clinics

How-To Clinics are written by a technical expert to answer a hot topic in a related process by giving technical and “how-to” advice. The topic must be approved by our editors in advance, and must have no commercial reference. Author and company contact info will be given.

Word count: 900-1,100.



JOHN OWED

paintingclinic@pfonline.com

Increasing Liquid Coating Production

Q. We want to increase our production rate but we cannot increase the length of our existing curing oven. The paint system we use is landlocked in our building. Are there any options?

A. Without the detailed specifications of your particular process, I can only offer a variety of options that would allow you to increase production within your current system. Options include evaluating oven type/design, coating material type, part racking/density and color change process.

Oven Type/Design. Since the length of your oven is fixed, you must ensure that it is operating efficiently. As a first step, I would recommend that you have an oven heat profile run using a data pack that will chart out the heat profile of your oven. Some companies conduct this evaluation on a regular basis themselves or bring in an outside resource. The process involves connecting thermocouples to your part and reading the actual surface temperature of the part through the curing process.

This data can then be compared to the recommended time and temperature for the coating material. If you find that you are exceeding the recommended cycle, you may be able to increase your line speed.

If you do not meet the recommended time at temperature, you could look to add a booster oven in front of or within the entrance of your existing oven. An infrared booster oven can be used to raise the part temperature quicker, reducing the curing cycle, which could then allow you to increase conveyor speed.

Coating Material. Although it may not be easy to make a change in this area, due to your part substrate or performance requirements needed in the coating, it is worth noting. For example, if you are using a traditional material that requires a part temperature of 320°F for 20 minutes to cure (perhaps requiring a total cycle of 30 minutes, depending on how long it takes the part to ramp up to temperature), you could look at some other options. Alternative coating options such as plural component or UV curable coatings can be cured more quickly.

Plural component materials, typically consisting of two components, a resin and a catalyst once mixed, will cure through chemical cross linking. Heat is used to help speed up the curing process. This may allow you to increase your conveyor speed.

UV curable coatings are specially formulated and utilize a photo initiator to cure. Once the coating material is exposed to high-intensity ultraviolet

light sources, the coating will cure instantaneously. This drastically reduces the curing cycle; however, it would

require an investment in a UV lamp system. There are also hybrid UV curable coatings that will use a combination of traditional curing ovens (convection or IR lamps) in conjunction with the UV light source. The curing cycle is still reduced when compared to traditional coating/curing options.

Part Racking/Density. With regard to improving the

productivity of a coating line, an area often overlooked is the part racking and density. I would encourage you to take a look at how you currently hang your parts and present them for the finishing process. Can you hang more parts per rack without compromising coverage? Increasing your rack density will allow you to improve throughput without increasing conveyor speed.

As a rule of thumb, you should space adjoining parts a minimum of $2.5 \times$ the depth. For instance, if you are spraying panels that are 1 inch in depth, you should allow a minimum of 2.5 inches between two neighboring panels. This spacing typically allows for good access to coat the edge with a conventional or electrostatic application.

I recall working with a customer in our lab that was coating the structural end pieces for pallet and store-type racking. These large pieces were hung individually in horizontal orientation. During our lab demonstration, we double hung the parts back-to-back, slightly staggered, and achieved exceptional results very close to the same fluid flow rates. This dual hanging method significantly improved productivity while increasing transfer efficiency.

Color Change Process. How many times per day do you change colors and how long does it take? Some manufacturers have a single or only a few colors and this does not significantly impact their productivity. Other manufacturers change colors frequently, and depending on the amount of time it takes, it can significantly impact their productivity.

How long should it take to change colors? This is normally dictated by the industry and the investment that a company is willing to make in equipment.

Color Change Process

MARKET	LENGTH OF TIME	COMMENT:
Automotive Assembly Plant	7 – 10 sec.	Change colors between vehicle bodies
Tier 1 Automotive	15 – 45 sec.	Typically leave one rack gap in line
General Industrial (Automated)	0.5 – 5 min.	Time-dependent on level of automation
General Industrial (Manual)	2 – 10 min.	Time-dependent on hardware and training

Let's assume there is a general industrial company that changes color 10 times per day and it takes five minutes each

Technical Papers

Technical Article may be written by a technical expert from a company and should discuss finishing technology from that company's perspective; however, commercialism must be kept to a minimum. It is strongly recommended that submission of a synopsis before completing a manuscript is done; this gives our editors an opportunity to direct the author's efforts and generally results in a better, more informative article.

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Better Alloy Control of Alkaline Zinc Nickel Baths

The factors that influence nickel content in deposits from alkaline non-cyanide zinc nickel baths.

**BY DR. LAWRENCE SEGER,
MARK SCHARIO, LAURA BONNEY,
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COLUMBIA CHEMICAL

ABOVE: The automotive, agricultural equipment and other durable goods industries continue to focus heavily on zinc nickel plated deposits.

In the deposition of the zinc nickel layer in an alkaline zinc nickel bath, corrosion protection is related, in part, to the percentage of nickel in the deposit. Therefore, an understanding of the elements that control that percentage are helpful in constructing the most effective layer.

The automotive, agricultural equipment and other durable goods industries continue to focus heavily on zinc nickel plated deposits. This has been the catalyst for the zinc nickel plating market to have more than doubled in North America in the last five years. As zinc nickel plating chemistries have improved, the cost to operate compared to the performance benefits has become much more attractive. This trend is important especially in the automobile sector where longer warranty periods will continue to drive demand for the level of corrosion resistance provided by this deposit.

Research has found that the most influential component of the overall nickel content is control of the percentage of nickel content in the bath. Current density and temperature also play a role in the overall process. Additions of sulfate and carbonate yield increased levels of nickel to a lesser degree, but the addition of more or less

Year	Author	% Nickel
1990	Vlad, C. M.	10%-16%
1991	Pushpavanam, M.	18%
1994	Alfantazi, A. M.	14%-20%
1997	H. Park	13%-15%
1999	Benballa, M.	13%
2003	Sohi, M. H.	13%

Table 1: Percentage of nickel determined to provide optimum corrosion resistance.

Current Density (A/ft ²)	7.5 × 10 ⁴ (mg/L)	1.1 × 10 ⁵ (mg/L)	1.5 × 10 ⁵ (mg/L)
2	12.38%	12.09%	12.26%
8	12.89%	12.59%	12.89%
20	13.63%	13.27%	13.61%
40	14.51%	14.49%	14.62%
80	15.09%	15.23%	15.29%

Table 3: Impact of caustic concentration on percentage of nickel incorporated in deposit.

caustic demonstrated little impact on the overall nickel incorporation. The investigation of these factors is crucial in the development of zinc nickel plating technologies that will continue to meet the growing demand for this deposit on automotive-related components.

Zinc nickel alloy plating may be one of the more common methods for corrosion protection these days, but this has not always been the case. Alloy plating has a rich history dating back to the early 1800s. Early records of alloy plating report the issuance of a patent in England in 1838 to George Richards Elkington and Oglethorpe Barratt, who prepared coatings of copper and zinc by immersing them into a boiling solution of zinc chloride.

In 1869, chemist Alfred Roseleur summarily dismissed zinc nickel alloy, stating that “this application is without industrial importance because nickel costs about five times as much as copper of which it possesses all of the disadvantages, and in particular its poisonous properties.”

Automotive Industry Demand

Investigation into zinc nickel alloy electrodeposition remained largely a source of academic interest until the early 1980s, when its role in satisfying the demand for a corrosion-resistant alloy plating for the automobile industry began to emerge. Due to excellent corrosion resistance and self-lubricating properties, cadmium was the metal of choice for corrosion protection applications, particularly in the fastener industry, but restrictions to the exposure of cadmium in the United States, Europe and Japan created a demand for a suitable substitute. In fact, the alkaline zinc nickel alloy plating process

Operating Parameters	Range
Zinc Metal	6.0-9.75 g/L
Caustic Soda	75-135 g/L
Nickel Metal	800-1600 ppm
Operating Temperature	70-95°F (21-34°C)
Proprietary Additives (Organics)	
Makeup	6.0% - 10.0% by volume
Replenisher	0.6% -1.2% by volume
Brightener	0.2% - 0.3% by volume
Booster	0.2% - 0.5% by volume

Table 2: Operating parameters for alkaline zinc nickel bath.

The most influential component of the nickel content is control of the percentage of nickel content in the bath.



addressed two separate environmental issues including cadmium exposure and exposure to cyanide baths.

Today, protection of steel from corrosion is big business, and 50 percent of the world's zinc consumption is applied toward this goal. The electroplating of steel covers between 25 percent and 30 percent of total zinc production.

Two primary examples of zinc nickel baths prevail. Acid zinc nickel baths typically deposit nickel from 10 percent to 14 percent, whereas the alkaline baths deposit nickel from the 6-percent to 15-percent range. The correlation of nickel content (and its ideal percentage) to corrosion protection has been included in many studies, some of which are shown in Table 1. Generally, the corrosion protection of steel will increase with increasing nickel content up to about 15 percent, after which the deposit becomes more noble than the substrate, losing its sacrificial properties.

Alkaline zinc nickel baths offer a ductile deposit, corrosion resistance in salt spray (ASTM B 117) up to 3,000 hours, and the ability to plate in deep, low current density regions. Control over the nickel content, however, is a matter of genuine concern, since higher nickel content may, for example, lead to limited ductility (above 20-percent nickel), or difficulty passivating the deposit, which becomes impossible in alloys containing over 25-percent nickel. For this work, we focus on those factors that affect and control the deposition of nickel in alkaline zinc nickel baths.

Dominant Factors Influencing Ni in the Deposit

A typical alkaline zinc nickel bath may be prepared according to the components in Table 2.

Over the course of a bath's life, components change or are depleted either through consumption or dragout. This results in change in performance of the plated parts, and requires the proper addition or makeup of replacement materials. Because there are so many variables, often all changing simultaneously, it is sometimes difficult to ascribe a performance change to a single component cause.

To track the property and material relationship in an alkaline zinc nickel bath, we prepared a model alkaline non-cyanide plating process. Zinc-nickel alloy thickness and percent-nickel composition in the deposit were measured against nickel concentration in the bath, current density, bath temperature, sulfate, caustic and carbonate load. Samples were prepared on steel Hull cell panels and plated at 2 amps for 10 minutes for comparison. Metal contents and percentages are determined by X-ray fluorescence.

Baths are prepared according to the guidance in Table 2, except for

Current Density (A/ft ²)	0.0 (mg/L)	2.2 × 10 ⁴ (mg/L)	6.7 × 10 ⁴ (mg/L)
2	11.92	12	12.25
8	12.37	12.68	12.78
20	13.26	13.47	13.69
40	14.16	14.37	14.41
80	15.06	15.31	15.24

Table 4: Impact of sulfate concentration on percentage of nickel incorporated in deposit.

Table 5: Impact of carbonate concentration on percentage of nickel incorporated in deposit.

Current Density (A/ft ²)	0.0 (mg/L)	2.2 × 10 ⁴ (mg/L)	4.5 × 10 ⁴ (mg/L)	6.7 × 10 ⁴ (mg/L)
2	11.92	12.7	14.8	12.9
8	12.37	13.25	15.04	14.25
20	13.26	13.8	15.04	15.14
40	14.16	14.48	15.2	15.99
80	15.06	15.24	16.01	16.81

the experimental variable. Percentage of nickel content in the alloy is a valuable metric in the determination of corrosion resistance, so control of this parameter is important. Generally, it is agreed that values between 12 percent and 15 percent provide optimum protection, with a drop in corrosion resistance in deposits greater than 15 percent.

It is little surprise that increased nickel content in the bath results in increased nickel content in the deposit (see Figure 1).



Similar values were obtained in a study by Hwa Young Lee and Sung Gyu Kim, who measured the effect of nickel concentration on nickel content in an alkaline bath at 80°F. Lee further identified the profile of the nickel deposition to be 85-percent nickel within the first 0.5 seconds of deposition, and then constant at a rate of 10 percent through the remainder of the deposit. Baths that fall below a threshold of 500-ppm nickel are unable to plate into the desired 12-percent to 15-percent goal in the bulk, regardless of current density. Baths prepared at 850-ppm nickel, however, deposit the desired percent-nickel composition at all

Figure 1: Ni content in alloy deposits as a function of current density and nickel concentration in the bath.

Figure 2: Impact of bath temperature of percentage of nickel incorporation in zinc nickel alloy deposit.

Figure 1

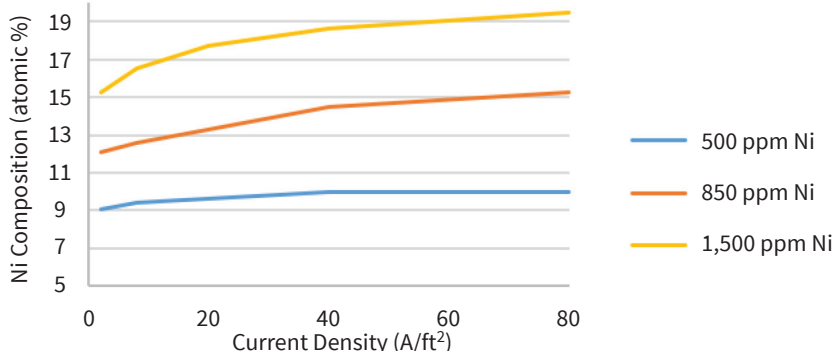
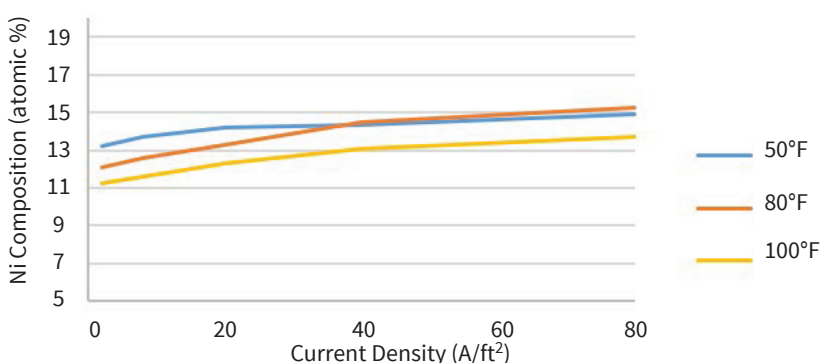


Figure 2



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current densities, while nickel-rich baths (1,500-ppm nickel and above) plate at target concentrations at lower current densities, but exceed the target as current densities increase. Therefore, to meet the target of between 12-percent and 15-percent nickel, it would be necessary to maintain the nickel concentration at 850 mg/L at a current density of between 20 and 60 A/ft².

Effect of Temperature on Nickel Content

Another variable investigated was the impact of temperature on incorporation of nickel in the deposit. For a bath consisting of 7,500-ppm zinc, 850-ppm nickel, and 10-percent proprietary organics, bath temperatures varied from 50°F to 100°F. The panel was plated at 2 amps for 10 minutes and measurements were taken at 2, 8, 20, 40 and 80 A/ft². Some minor influence of nickel incorporation was observed with temperatures over the range of current densities. Although our experi-

The single most significant influence of the nickel incorporation into the deposit was the concentration of nickel in the plating bath.

ments were not performed above 80°F (27°C), Lee also reports a slight rise in nickel content with increasing temperature

from 77°F through 122°F, but then a sharp increase from 140°F and higher. This was ascribed to the redissolution of zinc deposited by the alkali at elevated temperature. Results are shown in Figure 2.

Effect of Caustic, Sulfate and Other Factors

The percent of nickel in the deposit was evaluated as a function of caustic, sulfate and carbonate concentration. While the pH of the alkaline bath is very high, the effect of caustic concentration (as 50-percent NaOH) on nickel incorporation was studied (see Table 3). The optimum prescribed concentration for caustic in the bath is 112 g/L. Steel panels were run from Hull cells containing 75 g/L, and 150 g/L

caustic to observe the low and high range on performance. While nickel incorporation increased as a function of applied current density, very little impact on percentage of nickel in the deposit was noticed as a result of caustic concentration.

Sulfate buildup occurs as the nickel plates over time, leaving the residual anion. To replicate the buildup of sulfates in the bath, additions of sodium sulfate were added to the bath as 0 mg/L, 2.25×10^4 mg/L, and 6.74×10^4 mg/L. The amount of nickel in the plating deposit varied only slightly from sample to sample, and increased slightly as current density increased (Table 4).

Finally, high concentrations of carbonates may slow plating speeds or lead to poor cathode efficiency. Carbon dioxide reacts with water to create carbonic acid, H₂CO₃, which then reacts with the alkaline solution to form carbonates. To a smaller degree, oxygen formed at the anode may react with organic materials intentionally introduced to the bath as additives. Excessive agitation and high current densities also contribute to the development of carbonate formation. Concentrations of carbonates above 75 g/L can quickly reduce plating speed. However, their impact on nickel incorporation into the deposit is found to be minimal (see Table 5). The percentage of nickel increases slightly at every measured current density, and as current densities increase within a single carbonate concentration experiment.

The factors influencing the incorporation of nickel into an alkaline-cyanide-free zinc nickel deposit were observed under controlled conditions. The single most significant influence of the nickel incorporation into the deposit was the concentration of nickel in the plating bath. In all cases, an increase in current density resulted in an increase of nickel percentage in the deposit. Increased nickel was also observed relative to temperature, sulfate, and carbonates, but to a smaller degree. Within the range of caustic applied for this work, no significant changes in nickel incorporation were observed. ■

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Time Machines

Mazak Corp. achieves faster throughput with new powder coating line.

BY TIM PENNINGTON EDITOR

There is probably no better indicator of how well the U.S. manufacturing industry has rebounded from hard economic times than to walk through Mazak Corp.'s North American manufacturing plant and see all the new machine tool models waiting to be shipped out the door.

Mazak's North American headquarters, located across the Ohio River from Cincinnati in Florence, Kentucky, was producing 135 machines per month. But with a huge finishing bottleneck, the company knew it could do better.

The machine tool designer and maker recently underwent a major expansion, including a larger powder coating and painting facility, which will increase its capacity to more than 200 machines per month. The expansion began in 2012, on the heels of significant growth in customer demand, and it coincided with more customer service and support in its National Technology Center and Center for Multi-Tasking and Manufacturing Excellence and its North American Parts Center, which will add 200,000 square feet to its campus, bringing the total to more than 800,000 square feet—and making it one of the largest machine tool factories in the U.S.

Evolving Needs

Brian Papke, president of Mazak Corp., says the expansion allows Mazak to more efficiently fulfill customers' evolving needs for advanced machine tool technology, with many of those customers centered in the energy, aerospace, construction and agriculture equipment, automotive and medical industries.

Part of the manufacturing facility expansion involved moving existing shop production offices to a built-on addition, creating a spacious center aisle within the manufacturing building.

The bonus floor space enabled installation of additional manufacturing equipment, which includes a highly advanced manufacturing cell called Pallettech that is unique to the industry and produced by Mazak. The modular system allows dissimilar machine tools to be integrated into the same manufacturing cell.

Opened in 1996, Mazak's National Technology Center is the hub for the company's eight Regional Technology Centers. It doubled in size after a 2006 expansion, and, after recent growth, now boasts more than 100,000 square feet, including seven new high bay areas, a second story office section and more square footage for demonstrating Mazak's technology to its customers.

Increased Capacity

Mazak's North American Parts Center grew its storage capacity by 25 percent with the addition of two fully-automated vertical lift module storage systems, which boost small-parts capacity by 5,600 parts to more than 50,000 unique part numbers in stock—all available for same-day delivery for 97 percent of the company's orders.

Papke says that Mazak's original goal for the U.S. manufacturing campus was to allow it to be completely integrated into the market, thus better serving manufacturers.

"We have maintained our commitment to this goal over the years, which is evident in the sustained growth and expansion of our facilities," he says. "As are our customers, we remain committed to continuous improvement, and providing them with the resources they need as business evolves."

A big part of that growth was expanding Mazak industrial coating application processes, which included building a new automated powder coating line and moving an existing batch system to the new addition.

Ben Schawe, Mazak's vice president of manufacturing, says the previous powder coating line had a much smaller capacity for part sizes, measuring roughly 10 x 5 x 6 feet. The old system had two booths, and with two basic colors, the changeover took about 20 minutes to switch powder colors by shuttling the two different booths in and out.

"We coat special colors on request, so anytime we had a special color, we had to change the whole cartridge out and blow the entire booth down, which took us over an hour," Schawe says. "The line speed was about five feet per minute, and we wanted to improve on that."

Modular Construction

To get a new system designed and implemented, Mazak went back to the company that installed the original equipment, Midwest Finishing Systems, in Mishawaka, Indiana.

MFS specializes in designing, engineering, fabricating and installing powder coating systems in one turn-key approach. The company constructs its systems in a modular way so that it can build the system at its Indiana headquarters and test it before shipment.

The new automated line that MFS designed for the Mazak project is more than 870 feet in

Once automatically coated, the part enters the manual coating station, customized to accommodate two operators and provide "hi-lo" coating capability.



Ben Schawe, left, and Dave Osborne say the new powder coating line at Mazak has sped up production.

length, running on a 3-inch I-beam conveyor, and runs at about 8 feet per minute—more than 60 percent faster than the previous system.

Russ Green, regional sales manager for MFS, says the new line has a work opening size of about 7 x 7 feet, and that the longest part it can handle would be about 16 feet long.

"We knew they wanted to increase their production volumes, and one of the things we looked at was the size of the parts they needed to coat," Green says. "From there, we could size the system to meet those specifications and any production



schedules they were wanting to meet. We went through three or four scenarios based on the floor space before we finally selected one that would work the best.”

That size improvement was great news for Schawe and his team, which included Dave Osborne, Mazak’s fabrication manager, who also oversees the finishing operations. If they had large parts to powder coat previously, it often meant some maneuvering on the shop floor.

Accommodating Large Parts

“We had a stand-alone system that we would manually move parts into, and it could handle the larger parts,” Schawe says. “We still have that system, but it only handles eight or 10 parts that we can’t get into the new system.”

Osborne says the installation started in November 2013, and getting the bigger parts through the system was the impetus for investing in a new line. It went online in July with testing and training. And now: “At 16 feet, we’ve been able to accommodate any part that we currently make in our fabrication shop,” he says.

The new system has 10 OptiFlex Series automatic powder coating guns supplied from Gema (Indianapolis), and

Overspray enters into the EquiFlow balanced airflow and is recovered continuously, providing Mazak with immediate return of the reclaimed powder.



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includes a light curtain that detects the size of the part entering the booth and only triggers those guns that will be needed to coat the part, thus reducing wasted powder coating. There are also two manual guns run by operators who touch up parts when needed.

Gema's Joe Mallee says the Mazak application was unique, and to meet the company's performance criteria, a different approach was required to manage both the application of the coating and the powder recovery process.

"Mazak's objective was to add automation to powder coat their products, thus increasing productivity and quality while reducing manual coating reinforcement," Mallee says. "Due to the large size of certain machine center weldments and frames, Mazak chose to incorporate manual coating after the automatic application equipment. Another critical aspect to their performance criteria was the ability to meet increasing demand from their customers to provide more custom color capability."

Mallee says that given the sheer area of coverage and volume of powder involved to coat Mazak's products, a multi-color application would only be cost effective if it could be reclaimed with minimum production downtime during the color-change process.

To achieve the desired film thickness and uniformity, as well as the necessary color-change capability, a customized system was required. Specifically, a booth was needed that

could maximize automatic application efficiency of the powder, minimize the amount of powder in process, and facilitate quick color changes.

"The uniqueness of the Mazak system is that 10 OptiFlex series automatic guns, mounted on two Gema ZA series reciprocators, are automatically triggered based on product information," Mallee says. "Target distance for each reciprocator is automatically communicated to provide consistent tip-to-part uniformity, allowing for contouring on the various products coated."



Watch Mazak's New Powder Coating Line In Action

Mazak's Ben Schawe and Dave Osborne explain the benefits of the company's new powder coating line. Visit short.pfonline.com/mazak or scan the QR code with your smartphone to watch the video.



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Once automatically coated, the part enters the manual coating station, which is customized to accommodate two operators and provides “hi-lo” coating capability. To maximize the operator flexibility and minimize the elevation of the conveyor, the entire booth was lowered, allowing the operators to easily go from the lower position of the manual coating station directly onto the plant floor.

“This arrangement allows the operator to stand in a comfortable position and address the underside of certain product geometries, and then proceed to a raised platform for addressing the upper regions of the product when needed,” Mallee says. “If future production capacity is required all four stations may be manned. The advantage offered to the operators is greater visibility and range of motion, ensuring that all products requiring touchup are coated properly.”

The unique cabin configuration coupled with the manual stations was carefully designed so the recovery of the overspray powder from the manual coating station is drawn into the automatic coating section, keeping the powder in process.

Mallee says all oversprayed powder enters into the EquiFlow balanced airflow and is recovered continuously without accumulation, providing Mazak with immediate return of the reclaimed powder, automatically blending it with fresh material using the OptiCenter powder management system.

The OptiSpeeder feed hopper, continuous reclaim and constant balance with virgin powder provides Mazak unparalleled material process equilibrium, improving reclaim powder quality and shortening the color change time of the entire system, he says.

“The biggest gain with the new system is that we went from two booths to one, and now we can change over color in about 30 minutes instead of the hour it took before,” Schawe says.

Reducing Heat

One distinctive design feature is that the parts are loaded on the line in one building, then travel through a large opening in a concrete wall to be cleaned, oven dried and moved into the coating line before being cured in another oven.

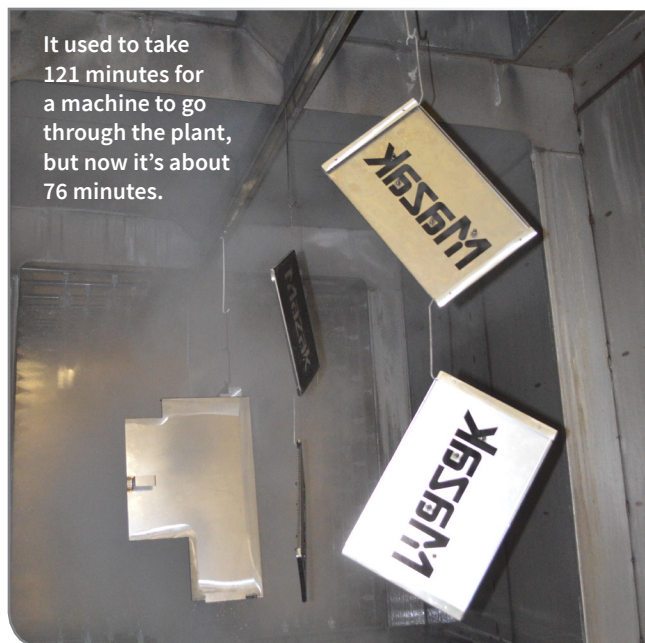
Green says the wall separation was designed into the system to keep all the heat into one part of the facility and not in the area where parts were loaded, thus keeping that work area cooler.

“The goal was to keep some of the heat out of the main part of the plant,” he says. “We recommended that configuration, and then we had to set up the necessary air makeup back in the curing area.”

Although the area was considered new space, it still presented a challenge for MFS and Mazak to get everything to fit just right; the manufacturing operation had parts coming on and off the line, and the batch system needed to be integrated into the floor plan, too.

“The biggest challenge was getting everything that was needed to fit in a certain corner of the facility,” Green says.

The new system included a 5-stage all stainless steel washer, a 10-minute straight pass dry-off oven, and a 20-minute convection cure oven.



It used to take 121 minutes for a machine to go through the plant, but now it's about 76 minutes.

“It is the same process we had before, but we can now handle the larger parts in the cleaning process, too,” Schawe says.

Equipment Upgrade

At the same time as the new system went in, MFS moved the batch system to the coating area. The system was upgraded with a Gorbelt manual shuttle system with two bridges and one new stainless steel manual wash station with clear walls that measures 34 feet long, 16 feet wide and more than 14 feet tall.

MFS also installed a new liquid batch booth that is 30 feet long, 12 feet wide and 14 feet high. Green says the work opening on the batch system is 10 by 10 feet, and the longest part it can handle is 30 feet long.

The new coating line was vital to Mazak's overall goal of increased machine production. Schawe says the manufacturing plant was producing about 135 machines a month before the improvements, but he estimates that it could now go as high as 235 a month—a 74 percent production increase.

“It used to take roughly 121 minutes for a machine to go through the plant, but now it's about 76 minutes,” he says. “The new line has been a tremendous boost for us.” ■■

For more information on Mazak Corp., visit mazakusa.com. Supplier information: Midwest Finishing Systems, powder-coating.com; Gema, gemapowdercoating.us.

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