INTRODUCING PORTABLE, COMPACT & ECONOMICAL
MASSFLOW CONTROLLED HVOF SYSTEM

- Closed loop control system for process gas equipped with MassFlow Controller.
- Selection of different Spray Guns is possible at the time of ordering.
- Recipe / Diagnosis / Trial mode available for operation process.
- PLC Controlled process with HMI touch screen operation.
- Process parameter generation & recipe selection.
- Control Console Equipped with volumetric control powder feeder as integral part.
- External Integration available with auxiliary equipments.
- CE Compliant.

METLIZING EQUIPMENT CO. PVT. LTD.
sales@mecpl.com, marketing@mecpl.com, trade@mecpl.com
Web: www.mecpl.com
# Features

Chemical Stripping of Plasma Coatings .............................................. 4
Aerospace Takes Center Stage at ITSA's 3rd Annual Advanced Coatings Symposium ...................................... 8

# Departments

Industry News ........................................................................................... 11
Product Spotlight ...................................................................................... 14
ITSA Member News ................................................................................. 16
People in the News .................................................................................. 19
ITSA Membership..................................................................................... 20
Calendar ...................................................................................................... 22

Cover photo: A platinum plating system. (Photo courtesy of Aeromet Technologies Inc.)

---

**Published by International Thermal Spray Association, A Standing Committee of the American Welding Society**

**Mission:** To be the flagship thermal spray industry publication providing company, event, people, product, research, and membership news of interest to industrial leaders, engineers, researchers, scholars, policymakers, and the public thermal spray community.

**OFFICERS**

Chairman: David Lee
Vice-Chairman: Ana Duminie, North American Höganäs

**EXECUTIVE COMMITTEE** (above officers plus the following)

Jim Ryan, TechMet Alloys
Dan Hayden, Hayden Corporation
Bill Mosier, Polymet Corporation
Peter Ruggiero, Curtiss-Wright Surface Technologies

**SPRAYTIME®**

Publisher Mary Ruth Johnsen
Editor Cindy Weihl

**SPRAYTIME® Editorial Staff**

Kristin Campbell Katie Pacheco Roline Pascal

**Technical Editor** Daniel Hayden
**Designer** Willie Chinn
**Advertising** Kim Daniele

**SPRAYTIME®** (ISSN 1532-9585) is a quarterly publication of the International Thermal Spray Association. Printed on Recycled Paper. Copyright© 2019 by the International Thermal Spray Association. Starred (*) items excluded from copyright.

The International Thermal Spray Association is not responsible for the accuracy of information in the editorial, articles, and advertising sections of this publication. Readers should independently evaluate the accuracy of any statement in the editorial, articles, and advertising sections of this publication that are important to him/her and rely on his/her independent evaluation.

Article submissions (subject to acceptance and edit), advertising insertions, address correspondence, subscription request, back issue copies, and changes of address should be sent to:

**American Welding Society**

Att: SPRAYTIME
8669 NW 36 Street, #130, Miami, Florida 33166-6672
Phone: 800-443-9353 or 305-443-9353 | spraytime.org

A subscription to SPRAYTIME® is free for individuals interested in the thermal spray and coatings industry. Visit spraytime.org to subscribe.

**AWS Claims Policy:** All hardcopy editions are shipped FOB Origin. Publisher reserves the right to investigate and make a determination on all claims submitted for missing editions not received by a subscribing member or institution. Any claim request determined to be valid will be fulfilled with a digital copy of the edition. Publisher will NOT send any hardcopy replacement issues for any reason.
Chemical stripping is often needed to remove a thermal sprayed coating from a part to be repaired or refitted with a new coating where damage to the substrate is a key concern. Typically, there are two circumstances that necessitate the stripping of a coating: mistakes or problems in production and repair operations that require complete removal of the coating prior to reapplication. It is possible to remove many thermal spray coatings using grit blasting, but to eliminate overblasting that may adversely impact the dimensions of the product, stripping by immersion in a chemical bath is preferred.

In stripping, our objective is to remove the coating without damaging the substrate. For this purpose, we would like to have the coating be active within a chemical bath and the substrate to be passive, and it is often possible to find a chemical recipe that will remove the coating effectively and leave the substrate absolutely unaffected. Unfortunately, for some plasma and high-velocity oxyfuel (HVOF) coatings, this is not completely possible.

In many cases we can effect stripping by using an acid. Acids, when added to water, undergo hydrolysis, forming a new molecule that typically fits under the broad definition of a “salt” (not to be confused with table salt, sodium chloride). Iron sulfate is a common example of a salt formed by the dissolution of steel in a sulfuric acid solution.

Put in simple terms, when we dissolve a metal in an acid, we form a new molecule, described in literature on the subject as a Werner complex. We provide a portion, called a “ligand,” created by hydrolizing the acid. Hydrochloric acid, for instance, hydrolizes to form a chloride ion, valence -1, which is a ligand. If the valence of the coating is, say, +3, then three chloride ions will be needed to form the stable Werner complex, M-Ligand₃.

The basis for understanding the behavior of chemical stripping is corrosion. Two academic texts that discuss corrosion mechanisms as they apply to these processes are *Principles and Prevention of Corrosion*, by Denny A. Jones, and *Electrochemical Methods: Fundamentals and Applications*, by Allen J. Bard and Larry R. Faulkner. According to these texts, a layer is formed at the interface of the corrosive and the material being corroded, called the Nernst diffusion layer, where water and the ligands form the Werner complexes. As the complex molecules are formed and separated, one layer is removed at a time.

Recently, our firm installed a platinum plating line at a facility in Singapore. The customer required that we prepare a document of key process variables (KPV)s. Electrochemical stripping is essentially the opposite process to electroplating, and so the same KPVs apply. These are as follows: 1. the ligand species, 2. the concentration of the ligand within the aqueous solution, 3. the temperature of the solution, 4. nature of agitation used, and 5. the open cell potential of the system.
Improvements

Optimization of these KPVs can be a matter of trial and error. Agitation and temperature can be manipulated to ensure the process is fast and effective but not harmful to the substrate. Selection of a ligand can begin with locating the desired active material (coating) in the inorganic chemical section of the *Handbook of Chemistry and Physics* and finding the potential Werner complexes that have been identified. Some rules of thumb also apply — pure nickel is readily dissolved by nitric acid, for instance. Concentration of the ligand directly impacts cost and may affect governmental reporting requirements (such as REACH in Europe). In general, it is better for the environment if we can minimize the acid concentration while maintaining effectiveness.

Concentration is also a concern for disposal, as the acid must be completely neutralized before the stripping solution can be disposed of; greater acid concentration requires greater effort and cost to neutralize. (Anecdotally, it has been my experience that the disposal cost for a bath is about four times the cost to create it.) Open cell potential is a tabulated value that is most often found in reference literature. One common source is *Quantitative Chemical Analysis*, by Daniel C. Harris.

Our firm has also discovered that the addition of a graphite plate at the bottom of the tank permitted the acid to be diluted. For most circumstances, the use of the graphite plate, as described by U.S. Patent 6,294,072, and authored by me, permits the further dilution of the acid while enhancing stripping effectiveness. Doing so adds about 1.77 V to the E value (open cell potential). Provided the potential does not exceed 5 V, there should be no pitting, as long as there is no chloride in the water.

During the stripping operation, a residue or “smut” is formed on the exterior of the coating. If left in place, this residue retards the rate of removal. Removing the item from the bath and either rinsing the surface or rubbing it with Scotch-Brite™ will restore the speed of the removal. Some newer system designs incorporate a method of capturing this residue from the fluid. The residue can often be sold to a recycler to offset the cost of the stripping process. This also reduces neutralization and disposal costs. Even newer system designs replace immersion tanks with spraying, allowing the smut to be captured immediately and continuously.

A further enhancement has been the recent migration from acidic baths to caustic baths. Work for United States governmental specifications on the removal of WCCo, WCCoCr, and CrC-NiCr has demonstrated a cost benefit by switching to caustic solutions. In addition, these baths have been found to be effective in the removal of MCrAlYs.

One issue to consider in the design of immersion systems is the possibility of the formation of air or gas pockets that may form underneath closed features of a submerged part. If trapped gas prevents the solution from contacting the surface, the coating will not be removed. Spray systems, rather than immersion systems, will eliminate this concern.

Our firm completed a large project in Sharjah, United Arab Emirates, to process mud pump augurs for removal of both CrC and WCCo. These pipes, which have a value in excess of $30,000 each, can weigh up to 10,000 lb and be as long as 32 ft. The minimum size of the immersion tank for this application is between 5 and 7000 gal. The cost to fabricate such a tank can be more than $2000. Switching from full immersion to spraying can reduce the amount of fluid needed to 1/10th, and simplify construction.
Other Issues

In general, electrochemical stripping methods will not work on ceramics, which are nonconductive. Our firm has created a process to remove the bond coating beneath the environmental barrier coatings being used on new airfoil designs by some manufacturers. However, most ceramics will need to be stripped by mechanical means (blasting).

With regard to reclamation of the stripped material, some metal recyclers can recover materials such as WCCo from chemical stripping processes. This material may be used by some 3D printing systems to produce tungsten articles.

The use of caustic stripping solutions can reduce the need for ventilation. However, one common process using Rochelle salts does typically create a white residue of caustic powder on walls and ceilings in the vicinity of the stripping tank. In these applications, our firm has found that less toxic citrate-ion solutions are effective for removing WCCo without the concern for the hazardous residue.

Finally, internal coatings are, by their nature, difficult to remove effectively. One key asset of the chemical process is that there is little to constrain the scope or scale of the system or of the parts that can be treated within it. Careful consideration of the materials and chemicals involved, and the design of the tanks and allied process equipment will ensure that systems work effectively for many years. For one customer, our firm built a stripping system the size of a shoe box, with a peculiar chemical recipe. The system could strip 40,000 engine compressor blades per year. Each operation would take about 10 min for complete coating removal, and the substrate was left perfectly clean and undamaged.

Conclusion

Advancements in chemical stripping technology have enabled greater protection of the substrate, reduced the use of environmentally damaging acids, and reduced the time and cost of both the process and chemical disposal. In many cases, a process can be developed in beaker studies to determine solution species and concentration and ensure substrate safety. Then, the process can be scaled as desired into a full-sized system. In short, stripping is a field that has rarely been plowed.

Dave Fairbourn (dfairbourn@aeromettech.com) is president, Aeromet Technologies Inc., Sandy, Utah.
Guidelines for submitting a SPRAYTIME® feature article

Have you thought about writing a feature article for consideration in SPRAYTIME? If so, our staff stays on the lookout for original, noncommercial, practical, and hands-on stories. Potential ideas to focus on include a case study, recent company project, tips for handling a particular process, and so on.

Here's an easy breakdown of our guidelines:

- The text of the article should be about 1500 to 2000 words and provided in a Word document.
- Line drawings, graphs, and photos should be sent in high-resolution jpeg or tiff files with a resolution of 300 or more dots per inch.
- Plan on one figure for every 500 words, and provide captions for every image. Also, if a nice lead photo is available, please include it for review.
- The authors’ names, along with the companies they work for and their positions, should be listed.

If you’d like to discuss a particular idea or email a submission for evaluation, please contact Editor Cindy Weihl at cweihl@thermalspray.org.
Aerospace Takes Center Stage at ITSA’s 3rd Annual Advanced Coatings Symposium

By Cindy Weihl

In early October, the International Thermal Spray Association (ITSA) hosted its 3rd Annual Advanced Coatings Symposium as well as its Annual Membership Meeting. Held on October 7–10 at the MGM – Springfield in Springfield, Mass., the symposium focused on the aerospace industry, including the latest technology in aerospace repair, along with high-temperature, wear-resistant, and clearance-control coatings. The hot topics drew in 111 industry professionals from across the U.S. and the world to New England for the event.

**Annual Business Meeting**

On October 7, more than 40 members attended the annual business meeting and discussed topics including financials, yearly scholarships, and new members — Fig. 1. For the first time ever, ITSA held the meeting the day before the start of the symposium. According to ITSA Chair Dave Lee, this was a good move, as the member attendance numbers were higher than in past years when the meeting followed the symposium.

Once the annual meeting concluded, members had a chance to meet with exhibitors and network during an evening reception that included drinks and hors d’oeuvres.

**Exhibits and Sponsors**

Throughout the course of the event, an exhibit area with tabletop displays was set up. Attendees had the opportunity to stop by during breaks to meet with exhibitors showcasing their products and services. Fourteen exhibitors took part in the event, including Aimtek Inc., Alloy Coating Supply, Ardleigh Minerals...

Sponsors of the 2019 symposium were as follows: diamond sponsor, Superior Shot Peening & Coatings Intl.; silver sponsors, Alloy Coating Supply and Höganäs; hospitality sponsor, Hayden Corp.; and bag sponsor, Ardleigh Minerals Inc.

Aerospace Applications Focus

Twenty-one speakers would present over the two-day symposium, which kicked off on Tuesday, October 8. After welcoming remarks by Lee, the conference began with keynote speaker Brian Hazel, a technical fellow in the coatings in materials and process engineering group, Pratt & Whitney — Fig. 2.

Hazel has 19 years of experience in gas turbine material development, including work in thermal barrier coatings, environmental barrier coatings, bond/corrosion-resistant coatings, and single crystal superalloys. His many accomplishments include more than 40 patents in the area of high-temperature coatings.

Hazel’s presentation, titled “Microstructural Challenges in Spraying of Suspensions,” focused on utilizing suspension plasma spraying, which has demonstrated the ability to produce a range of coating microstructures.

Following Hazel’s keynote address, the rest of the day’s educational presentations were broken down into two focus areas: high-temperature coatings and aerospace repair.

Day two of the conference included a keynote presentation from Dmitri Novikov of Pratt & Whitney. The talk focused on process modeling, data analytics, and process control for the future of materials and manufacturing engineering. The day’s presentations were on clearance control coatings and aerospace repair.

Industry Tours

Tying into the aerospace theme, day one of the symposium concluded with dinner and a tour of the New England Air Museum in Windsor Locks, Conn. — Fig. 3. Attendees were led in groups through the aerospace museum consisting of three display hangars that house 66 aircrafts, 26 helicopters, and a variety of missiles, ejection seats, and other pieces of flight-related equipment. Exhibits included the history of the Sikorsky aircraft, computer-based flight simulators, the Tuskegee Airmen, and early French aviation. The museum also houses books, periodicals, technical manuals, and National Air and Space Museum photographs.

On the second day of the symposium, attendees were treated to a hospitality reception and tour of Hayden Corp. in West Springfield, Mass. The company, which is a member of ITSA, specializes in thermal spray coatings and laser cladding (see sidebar).
C2 Committee on Thermal Spraying

This year, the American Welding Society (AWS) C2 Committee on Thermal Spraying held its annual meeting in conjunction with the ITSA symposium. The committee is responsible for creating and revising thermal spray standards. With many of its members attending the symposium, it was decided for the meeting to align with the annual event. The committee met on October 10.

Conclusion

As the successful 3rd Annual Advanced Coatings Symposium wrapped up, ITSA’s planning committee began discussing plans for the 2020 event. The annual meeting and symposium will take place next fall on the United States’ West Coast. Anyone interested in providing program input or assisting with the organization of the event is encouraged to contact ITSA Program Manager Alfred Nieves, itsa@thermalspray.org.

Cindy Weihl (cweihl@aws.org) is the editor of SPRAYTIME.

Hayden Corp. Welcomes Symposium Attendees; Marks 100th Anniversary

Hayden Corp., a member of ITSA, welcomed attendees of the 3rd Annual Advanced Coatings Symposium to its West Springfield, Mass., headquarters the evening of October 9. Participants were treated to food and drinks as well as a facility tour.

The company is an ISO 9002-2008 registered provider of thermal spray coatings and other wear and corrosion control surfaces, providing comprehensive pre- and post-surfacing services, including preparatory machining, laser cladding, finish grinding, and metallurgical coating quality analysis.

2019 is a special year for Hayden Corp. as the company marks its 100th anniversary. Founded by Charles E. Hayden in 1919, it is now in its fourth generation of family ownership.

The company started as Hayden Wire Works and served the booming paper industry. Over the next several decades, it pioneered metallizing solutions for paper mill machinery, eventually developing thermal spray processes in the 1960s. Over the years, the company grew, offering coating services to new industries. In 2008, it added laser cladding services. Today, Hayden Corp. serves users in dozens of industries.

Retired Company President John Hayden (left), and his son, President Daniel Hayden, welcomed ITSA symposium attendees to its West Springfield, Mass., headquarters.
Army Awards Rowan Engineering $14.5 Million

Rowan University, Glassboro, N.J., has been awarded $14.5 million to lead a Department of Defense/Army Research Lab project that has the potential to create new materials and ways to process them.

“This award marks the largest-ever research award made to Rowan University. Indeed, when we began our research mission a few short years ago, this is what we envisioned. The work being done reflects our commitment to practical research that impacts our neighbors, while serving the common good, and demonstrates the capabilities of our faculty and university community,” said Rowan University President Ali Houshmand.

Under a U.S. Army Combat Capabilities Development Command Army Research Laboratory (ARL) cooperative agreement, a team led by the university will work with collaborators on developing materials using cold-spray advanced manufacturing technologies. Its work will focus on polymers, starting with polystyrene, to develop basic insights and move on to more advanced composite materials and systems.

The project, “Advancing Structural Materials for Army Modernization Priorities via Direct-Write Approaches,” teams the university with PPG, Pittsburgh, Pa., a global supplier of paints, coatings, and specialty materials; Drexel University, Philadelphia, Pa.; Northeastern University, Boston, Mass.; and the University of Massachusetts Amherst.

“The high particle velocity of cold spray enables rapid cure and adhesion of polymers. This should result in fast and efficient production of high-performance composite parts or repair of parts,” said John La Scala, associate chief of the ARL's Materials and Manufacturing Sciences Division and cooperative agreement manager for the research program. “Additionally, this novel manufacturing methodology is a layer-by-layer production of composites, which should reduce void and flaw content. This should improve strength and durability significantly, thereby opening the potential of using this manufacturing technique to prepare composites for extreme conditions, while replacing the current expensive manufacturing methods with a much more economical methodology.”

In the Cold-Spray Additive Manufacturing Research Lab at the South Jersey Technology Park at Rowan University, and other labs in the Henry M. Rowan College of Engineering Glassboro campus, Joe Stanzione, associate professor of chemical engineering, will work with the following team: Francis “Mac” Haas, assistant professor of mechanical engineering; William Riddell, associate professor of civil and environmental engineering; Ratneshwar Jha, professor and department head of mechanical engineering; a project manager; three post-doctoral researchers; four doctoral students; six master’s students; and close to two dozen funded undergraduate students during the life of the project.

Materials developed through the research program may be used for making military equipment stronger and lighter, soldiers more agile, and vehicles more durable, along with the potential for dual-use spinoffs into economic sectors such as civil aviation, automobiles, health care, and space exploration.

To view a video in relation to this news, visit Rowan University’s YouTube channel.
A letter of intent announcing the creation in Limoges, France, for a joint research laboratory, Protheis, and a technology platform, Safir, has been signed. The two organizations specialize in surface treatments for aerospace applications.

These following individuals were part of the process: Stéphane Cueille, Safran senior executive vice president, R&T and innovation; Roland Fischer, CEO of Oerlikon; Jean-Luc Moullet, chief technology transfer officer at the French National Center for Scientific Research (CNRS); and Alain Celerier, president of the University of Limoges.

“The planned creation of a joint Safran/Oerlikon/CNRS/University of Limoges research lab, specializing in thermal spray coating technologies, is the culmination of a long-standing partnership that started over 15 years ago with a number of research contracts and doctoral theses,” Moullet said.

The ceremony was also attended by Agnès Pannier-Runacher, secretary of state reporting to the French minister of the economy and finance, in charge of innovation, and Alain Rousset, president of the Nouvelle-Aquitaine region in southwest France.

The two new entities will help Safran enhance its surface treatment capabilities, to make lighter and longer-lasting products capable of reducing noise and nitrogen oxide emissions, compliant with the European regulation REACH, and capable of addressing the requirements of all types of aerospace applications. Oerlikon expects the collaboration to advance its support of the aerospace industry along the entire value chain. For the CNRS and the University of Limoges, which operate a joint research unit, the aim is to foster scientific and technical discussions on surface treatments with national and international laboratories.

Additionally, in other news from Oerlikon, an agreement has been signed to acquire AMT AG, Kleindöttingen, Switzerland. The company will become part of the Oerlikon Metco Aero & Energy business unit but continue to operate as AMT AG until the end of 2020.

“The acquisition is highly complementary with our current portfolio of thermal spray equipment,” said Carsten Schultes, Oerlikon Metco’s head of equipment business.

---

DuraCoatings Earns Repair Station Certification

DuraCoatings Holdings LLC, Oklahoma City, Okla., has revealed DCI Industries, its subsidiary, received approval and designation by the European Aviation Safety Agency as a Part 145 Repair Station.

The company will be able to provide users dual-release and return-to-service components for European and domestic aircraft. In addition, it has a limited rating with specialized services to provide chrome and sulfamate-nickel plating, zinc and manganese-phosphate coatings, and thermal spray coating for landing gears, airframes, and other airplane components.
ASB Industries Sets Up Boring-Milling Machine

A horizontal boring-milling machine has been installed at ASB Industries Inc., Barberton, Ohio. It was placed on an existing cement pad, replacing a horizontal mill no longer able to meet machining tolerances. This manual machine is equipped with a digital readout for all axes. The mill also has a 4.3-in. spindle, with a 43- x 47-in. table, and a weight capacity of approximately 9000 lb. Projects include general machining that supports ASB hard surfacing thermal spray services.

The new boring-milling machine at ASB Industries features a digital readout for all axes. (Credit: ASB.)

NRC, Polycontrols Partner for Cold Spray Additive Manufacturing

The National Research Council of Canada (NRC) and Polycontrols, a Quebec-based company specializing in surface engineering solutions and equipment integration, have joined forces to build a collaborative research facility to help manufacturers and researchers study, adopt, and deploy cold spray additive manufacturing (CSAM) technology.

Expected to open in February 2020, the Poly/CSAM facility will be located at the NRC’s Boucherville site in Quebec. It will focus on scaling the CSAM process by helping industry adapt laboratory-developed technology to meet factory and mass production requirements. The six-year venture will also offer training for manufacturers to ensure the technology is implemented safely and securely.

With the support of Investissement Québec, the Business Development Bank of Canada, and Bank of Montreal, Polycontrols is able to launch the first phase of this initiative with an initial investment estimated at $4 million over the next six years. The NRC, which will house the facility, will support technology development as well as provide strategic advice and technical services with a professional team of more than 40 experts. Poly/CSAM will offer technologies such as surface preparation; coating and 3D buildup by cold spray; local, laser-based thermal treatment; in-situ robotic machining and surface finishing; sensor technologies; data logging and analytics; and machine learning.

Poly/CSAM, a metal additive manufacturing facility, is set to open in February 2020. (Credit: CNW Group/National Research Council Canada.)

UnitedCoatings Group Acquires CoorsTek Medical

UnitedCoatings Group, Rubbiano, Italy, a global provider of thermal spray solutions and related services, along with its medical division (Eurocoating SpA, Surface Dynamics, NanoSurfaces Industries, Anteco, and Eurocoating Medical Technology Wuxi), a global supplier of integrated contract manufacturing solutions to medical device original equipment manufacturers, has acquired 100% of CoorsTek Medical LLC, Fort Worth, Tex., from CoorsTek LLC. It previously acquired NanoSurfaces from CoorsTek Medical in 2018.

The company’s service offerings include casting and machining a variety of implants and instruments, along with a range of product development services.

In part, Nelso Antolotti, founder and executive chairman of UnitedCoatings Group, said the following: “This is our biggest acquisition to date and a major step in our internationalization strategy.”

thermalspray.org
Product Spotlight

Small ID HVOF Spray Gun Produces Quality Coatings

The ID-Nova high-velocity oxygen fuel (HVOF) spray gun has axial powder feed and is designed for coating small internal diameters at high power levels. Developed to meet a demand for high-quality coating, specifically WC-10Co-4Cr, the gun brings together functionality, robustness, and reliability to the HVOF process. The product can be operated on existing controllers that deliver hydrogen and oxygen. It can also be supplied with an extension arm. A cost-effective way to upgrade your thermal spray capabilities to internal spray coating, the gun can be fitted to a variety of existing systems.

SprayWerx
spraywerx.com / (604) 306-2061

SSPC Releases 2020 Training and Certification Catalog

The Society for Protective Coatings (SSPC) 2020 Training and Certification Catalog covers training, certification, and recertification schedules and course descriptions. This includes the Thermal Spray Applicator Training and Thermal Spray Inspector Training courses. The 63-page catalog also provides information for online training and recertification opportunities, upcoming 2020 eCourses and webinars, agencies that recognize SSPC credentials, and how to register for SSPC training. The catalog can be accessed at the website listed below.

The Society for Protective Coatings (SSPC)
shop.sspc.org/training-and-certification-catalog / (412) 281-2331

New Coating Process Offers Protection for Brake Discs

Extreme High-Speed Laser Material Deposition (EHLA) is ideal for use in the automotive industry, especially for coating brake discs. With the EHLA process, the powder particles of the coating material are melted directly in the laser beam, allowing the coating process to be faster, rising to as much as 500 m/min. This also reduces the exposure to heat of the material being coated. Thermal exposure with the EHLA process remains in the micrometer range, which enables the use of entirely new material combinations such as coatings for aluminum or, as with the brake discs, cast-iron alloys. Additionally, the process produces very thin layers of between 25 and 250 micrometers. As a result, the coating is both purer and smoother, with roughness reduced to around one-tenth of its previous value. Moreover, the new process uses as much as 90% of the fed powder material. It is, therefore, more resource-efficient and economic.

Fraunhofer Institute for Laser Technology ILT
ilt.fraunhofer.de/en.html / +49 241 8906-0

Report Predicts Growth for the Thermal Spray Coatings Market by 2026

According to Thermal Spray Coatings Market by Materials (Ceramics, Metals, and Alloys), by Process (Combustion, Flame, and Electrical), and by Application (Aerospace, Healthcare, Automotive, Energy & Power, and Electronics), 2016–2026, the global thermal spray coatings market is forecasted to reach $16.04 billion by 2026. The report suggests the market size reached $9.76 billion with a compound annual growth rate of 6.3% in 2018, based on the adoption of new measures to conserve energy and harness renewable energy sources. The market for thermal spray coatings is influenced by the growing aerospace industry and the usage of thermal spray coatings mainly for jet engine components, turbine blades, and landing gears, among other products. The increasing usage of components, such as engine parts, cylinders, transmission components, and suspension systems in the automotive industry, are collectively creating opportunities for the market to grow while stringent regulations from the government side are posing limitations in the market. The North America region represented the largest regional market for global thermal spray coatings in 2018. The United States is expected to remain the primary market for thermal spray coatings in the region, attributed to the expanding interest for improved execution at competitive expenses and meeting all the guidelines and industry norms. Segments covered in the report include materials, process, and applications outlook.

Reports and Data
reportsanddata.com / (800) 819-3052
Sulzer provides cutting-edge maintenance and repair solutions for turbines, compressors, pumps, motors, and generators dedicated to increasing customers’ life-cycle cost effectiveness. The company’s core strengths are flow control and applicators. It specializes in pumping solutions and services for rotating equipment, as well as separation, mixing, and application technology. Sulzer is a service specialist known for its technology-based solutions, fast execution, and expertise in complex maintenance projects. The company has a network of more than 100 service sites around the world. It has been headquartered in Winterthur, Switzerland, since 1834.

11518 Old La Porte Rd.
La Porte, TX 77571
281.848.3716 / sulzer.com

BECOME A MEMBER OF THE

Your company should join the International Thermal Spray Association (ITSA) now!

ITSA is now a Standing Committee of the American Welding Society expanding the benefits of company benefits. As a company-member professional industrial association, our mission is dedicated to expanding the use of thermal spray technologies for the benefit of industry and society.

ITSA members invite your company to join us in this endeavor.

See pages 20 – 21

CALL US TODAY

sales@uniquecoat.com  Tel +1 804 784 0997  www.uniquecoat.com

Gravimetric Powder Feeder

Our patented G4 gravimetric powder feeder provides highly accurate and consistent powder flows.

Short powder flow stabilization time!

No wearing seals, extremely low maintenance.

Reliably feeds all standard thermal spray powders including HVOF, HVAF, flame spray, laser cladding, plasma and cold spray. 1000 PSI version is available!

Our customers tell us - “it is simply the best powder feeder that they have ever used”.

Better coatings start with a better powder feeder!
The ITSA annual membership meeting and symposium held October 7–10 concluded as a successful event for the organization and I hope those who were in attendance agree. Historically, the membership meeting has taken place after the symposium, but this year it was moved to the day before the event. I wasn’t sure if moving the meeting was going to work but it did. There were many more members in attendance this year. Thank you all for the support.

On behalf of the ITSA executive committee, I also wish to thank the speakers, especially our keynote speaker Brian Hazel from Pratt & Whitney and sponsors Superior Shot Peening & Coatings International, Alloy Coating Supply, Höganas, Ardleigh Mineral Inc., and Hayden Corp. Hayden Corp. also hosted a plant tour of its thermal spray and laser welding facility.

Additionally, I want to thank AWS staff and the ITSA meeting/symposium planning committee for their hard work getting together an exceptional program on aerospace applications. Members, attendees, speakers, and 14 exhibitors helped make this event a success. This year’s event demonstrated its global reach with attendees hailing from Australia, Canada, Japan, and Poland.

Next year’s annual meeting and symposium will likely take place on the United States’ West Coast. The planning committee is currently looking for program input as well as assistance in organizing this event. If you are interested in assisting or have a suggestion, please contact ITSA Program Manager Alfred Nieves, itsa@thermalspray.org.

On a personal note, thank you to those who have stepped up to support me during my recent career transition. I’m grateful to those at the American Welding Society, the ITSA executive committee, and many others from whom I received encouragement and support.

**ITSA MISSION STATEMENT**

The International Thermal Spray Association, a standing committee of the American Welding Society, is a professional industrial organization dedicated to expanding the use of thermal spray technologies for the benefit of industry and society. ITSA invites all interested companies to talk with our officers and company representatives to better understand member benefits.

**OFFICERS**

**Chairman:** David A. Lee  
**Vice-Chairman:** Ana Duminie, *North American Höganäs*

**EXECUTIVE COMMITTEE** (above officers plus the following)

- Jim Ryan, *TechMet Alloys*
- Dan Hayden, *Hayden Corp.*
- Bill Mosier, *Polyemt Corp.*
- Peter Ruggiero, *Curtiss-Wright Surface Technologies*

**ITSA MEMBER NEWS**

**Tradeshow Assessment for ITSA Members Eliminated**

ITSA Members were invited to participate in the ITSA Member Satisfaction Survey, in which they were asked to rate the value of various member benefits. Based on feedback received on the value of ITSA Booth participation at industry tradeshows, at its April 20, 2016, meeting, the ITSA Executive Committee unanimously decided to discontinue ITSA booth activity at tradeshows effective July 2016. As ITSA Members subsidized the cost of ITSA booth activity via annual assessments, this move will result in the elimination of these costly annual ITSA Member assessments going forward.

In lieu of booth representation at tradeshows, ITSA will proactively participate in alternative ways at key industry events. For example, a series of educational presentations promoting thermal spray are being scheduled as free, half-day sessions at tradeshows like FABTECH, POWER-GEN International, and CORROSION.

**ITSA SCHOLARSHIP OPPORTUNITIES**

The International Thermal Spray Association offers annual graduate scholarships. Since 1992, the ITSA scholarship program has contributed to the growth of the thermal spray community, especially in the development of new technologists and engineers. ITSA is very proud of this education partnership and encourages all eligible participants to apply. Please visit thermalspray.org for criteria information and a printable application form.

**ITSA THERMAL SPRAY HISTORICAL COLLECTION**

In April 2000, the International Thermal Spray Association announced the establishment of a Thermal Spray Historical Collection that is now on display at the State University of New York at Stony Brook in the Thermal Spray Research Center, USA.

Growing in size and value, there are now more than 30 different spray guns and miscellaneous equipment, a variety of spray gun manuals, hundreds of photographs, and several historic thermal spray publications and reference books.

Future plans include a virtual tour of the collection on the ITSA website for the entire global community to visit. This is a worldwide industry collection, and we welcome donations from the entire thermal spray community.

**ITSA SPRAYTIME**

Since 1992, the International Thermal Spray Association has been publishing SPRAYTIME for the thermal spray industry. The mission is to be the flagship thermal spray industry publication providing company, event, people, product, research, and membership news of interest to the thermal spray community.
JOIN THE INTERNATIONAL THERMAL SPRAY ASSOCIATION

ITSA is a professional, industrial association dedicated to expanding the use of thermal spray technologies for the benefit of industry and society. ITSA Membership is open to companies involved in all facets of the industry — equipment and materials suppliers, job shops, in-house facilities, educational institutions, industry consultants, and others.

Engage with dozens of like-minded industry professionals at the Annual ITSA Membership Meeting, where there's ample time for business and personal discussions. Learn about industry advancements through the one-day technical program, participate in the half-day business meeting, and enjoy your peers in a relaxed atmosphere complete with fun social events.

Build awareness of your company and its products and services through valuable promotional opportunities — a centerfold listing in the SPRAYTIME Newsletter, exposure on the ITSA website, and recognition at industry trade shows.

Plus, ITSA Membership comes with an American Welding Society (AWS) Supporting Company Membership and up to five AWS Individual Memberships to give to your best employees, colleagues, or customers. Visit aws.org/membership/supportingcompany for a complete listing of additional AWS benefits.

For more information, contact Alfred Nieves at 800.443.9353, ext. 467, or itsa@thermalspray.org. For an ITSA Membership Application, visit the membership section at thermalspray.org.
NOW ACCEPTING SCHOLARSHIP APPLICATIONS

Since 1991, ITSA has provided scholarship assistance to technologists and engineers who are pursuing a postgraduate degree in either thermal spray processes (plasma, flame, arc, HVOF) or materials at an accredited United States university.

Up to three (3) scholarships
$2,000.00 each

Application Deadline: July 16th, 2020

For more eligibility information or to apply, visit thermalspray.org/scholarship
OBITUARY

Alain Duggan of Johannesburg, South Africa, passed away on May 3. He was 88. Duggan worked for Norton as a refractory salesman during the early 1960s. It is there that he acquired a passion for refectory applications, including thermal spray. Around 1965, he became the principal founder of RARE (Refractory Abrasion Resistant Engineering), a company instrumental in the thermal spray application growth in mining and other industries in South Africa. Duggan sold the company in 1992 and then aided the growth of Alkin Carbide Africa. Throughout his life, he continued to work on thermal spray coating development and improvements.

Your One-Stop Shop for
Thermal Spray Equipment
and Consumables

- TAFA® thermal spray coating equipment
- Genie- and TAFA®-brand spare parts
- Powder and wire consumables for HVOF • Arc Spray • Plasma
- Complete, custom thermal spray cells

Turn to Praxair Surface Technologies for thermal spray solutions with versatile applications and precise results, backed by 50 years of coating R&D.

bit.ly/PSTTSEC   603.224.9585   psti-info@praxair.com
ITSA Membership

JOB SHOP MEMBER COMPANIES

ACCURIGHT INDUSTRIES INC.
Gilbert, AZ
Mr. David Wright | dave@accuright.com
480.892.9595 | accuright.com

ATLAS MACHINE & SUPPLY INC.
Louisville, KY
Mr. Richie Gimmel | richie@atlasmachine.com
502.584.7262 | atlasmachine.com

BENDER CCP INC.
Vernon, CA
Mr. Doug Martin | dmartin@benderus.com
323.232.2371 | benderus.com

BYRON PRODUCTS
Fairfield, OH
Mr. Keith King | kking@byronproducts.com
513.870.9111 | byronproducts.com

CINCINNATI THERMAL SPRAY INC.
Cincinnati, OH
Mr. Kirk Fick | kfick@cts-inc.net
513.699.3992 | cts-inc.net

CURTISS-WRIGHT SURFACE TECHNOLOGIES
Windsor, CT
Mr. Peter Ruggiero | peter.ruggiero@cwst.com
860.623.9901 | cwst.com

ELLISON SURFACE TECHNOLOGIES INC.
Mason, OH
Mr. John Langello | jlangello@ellisonsurfacetech.com
513.770.4928 | ellisonsurfacetech.com

EXLINE INC.
Salina, KS
Mr. Brent Hilbig | b.hilbig@exline-inc.com
785.245.4683 | exline-inc.com

FUSION INC.
Houston, TX
Mr. Jeff Fenner | jfenner@fusionhouston.com
713.691.6547 | fusionhouston.com

HAYDEN CORP.
West Springfield, MA
Mr. Dan Hayden | daniel.hayden@haydencorp.com
413.734.4981 | haydencorp.com

HFW INDUSTRIES INC.
Buffalo, NY
Mr. Matt Watson | mwatson@hfwindustries.com
716.875.3380 | hfwindustries.com

KERMETICO INC.
Benicia, CA
Mr. Andrew Verstak | averstak@kermetico.com
707.745.3862 | kermetico.com

METCUT RESEARCH INC.
Cincinnati, OH
Mr. Triratna Shrestha | tshrestha@metcut.com
513.271.5100 | metcut.com

MIDIS ENERGY SERVICES LTD.
Lagos, Nigeria
Mr. Atamuno Atamuno
atamuno@midisenergyservices.com
midisenergyervices.com

NATION COATING SYSTEMS
Franklin, OH
Mr. Pat Pelzer | patp@nationcoating.com
937.746.7632 | nationcoatingsystems.com

PRAXAIR SURFACE TECHNOLOGIES (INDIANAPOLIS)
Indianapolis, IN
Mr. Michael Brennan
michael.brennan@praxair.com
317.240.2500 | praxairsurfacetechologies.com

SULZER
La Porte, TX
Mr. Garret Haegelin | garret.haegelin@sulzer.com
218.848.3700 | sulzers.com

SUPERIOR SHOT PEENING INC.
Houston, TX
Ms. Mollie Blasingame
mmb@suspeirorshootpeening.com
281.449.6559 | superiorshotpeening.com

SUPPLIER MEMBER COMPANIES

SURFACE ENGINEERING AND ALLOY CO.
St. Petersburg, FL
727.528.7998 | surfaceengineering.com

SURFACE MODIFICATION SYSTEMS INC.
Santa Fe Springs, CA
Ms. Adriana Udaive
adriana@surfacemodificationsystems.com
562.946.7472 | surfacemodificationsystems.com

WHITE ENGINEERING SURFACE CORP.
Newtown, PA
Ms. Colby Nyland-Elliott
cnylande@whiteengineering.com
215.968.5021 | whiteengineering.com

AAF INTERNATIONAL
Louisville, KY
Mr. David Kolstad | dkolstad@aaaintl.com
800.477.1214 | aaaintl.com

ALLOY COATING SUPPLY
Spring, TX
Mr. Jeffrey Noto | jnoto@alloycoatingsupply.com
281.528.0980 | alloycoatingsupply.com

AMETEK INC.
Eighty-Four, PA
Ms. Cindy Freeby | cindy.freeby@ametek.com
724.225.8400 | ametekmetals.com

ARC SPECIALTIES
Houston, TX
Mr. Daniel Allford | dan@arc specialties.com
713.631.7575 | arc specialties.com

ARDELEIGH MINERALS
Beachwood, OH
Mr. Ernie Petrey | epetrey@ardeleigh.net
216.464.2300 | ardleigh.net

CARPENTER POWDER PRODUCTS
Pittsburgh, PA
Mr. Jason Simmons | jsimmons@cartech.com
412.257.5102 | carpenterpowder.com

CENTERLINE (WINDSOR) LTD.
Windsor, ON, Canada
Mr. Julio Villafuerte | julio.villafuerte@cntrline.com
519.734.8464 | supersonicspray.com

DEWAL INDUSTRIES INC.
Narragansett, RI
Ms. Rebecca Auger | rebecca.auger@rogerscorp.com
401.789.9736 | dewal.com
DONALDSON TORIT
Minneapolis, MN
Mr. Paul Richard | paul.richard@donaldson.com
603.343.2448 | donaldsontorit.com

GLOBAL TUNGSTEN AND POWDERS CORP.
Towanda, PA
Ms. Laura Morelli
laura.morelli@globaltungsten.com
570.268.5182 | globaltungsten.com

GLOBE METAL INC.
Sainte-Catherine, QC, Canada
Mr. Josh Lifshitz | josh@globemetal.com
450.635.9397 | globemetal.com

GREEN BELTING INDUSTRIES LTD.
Mississauga, ON, Canada
Mr. Tim Connelly | tconnelly@greenbelting.com
905.564.6712 | greenbelting.com

HAYNES INTERNATIONAL
Mountain Home, AR
Mr. Brandon Purr | bfpurr@haynesintl.com
713.977.7597 | haynesintl.com

IMERYS FUSED MINERALS
Greeneville, TN
Mr. Mitch Krieg | mitch.krieg@imerys.com
imerys.com

IMPERIAL SYSTEMS
Jackson Center, PA
Mr. Jeremiah Wann | jwann@isystemsweb.com
724.992.1721 | isystemsweb.com

KENNAMETAL STELLITE COMPANY INC.
Gothenburg, Sweden
Mr. David A. Lee | david.a.lee@kennametal.com
574.534.8631 | stellite.com

LINCOLN ELECTRIC
Cleveland, OH
Mr. Thomas Brown
thomas_brown@lincolnelectric.com
216.383.2951 | lincolnelectric.com

LINEAGE ALLOYS
Baytown, TX
Mr. Scott Miller | smiller@lineagealloysllc.com
281.426.5535 | lineagealloys.com

METALLISATION LTD.
Dudley West Midlands, United Kingdom
Mr. Stuart Milton | sales@metallisation.com
+44.1384.252464 | metallisation.com

NORTH AMERICAN HÖGANÄS
Hollspool, PA
Mr. Andy Hoffman | andy.hoffman@nah.com
814.361.6875 | hoganas.com

OERLIKON METCO (US) INC.
Westbury, NY
Ms. Karen Sender | karen.sender@oerlikon.com
516.334.1300 | oerlikon.com/metco

POLYMET CORP.
West Chester, OH
Mr. Bob Unger | runger@polymet.us
513.874.3586 | polymet.us

PRAXAIR SURFACE TECHNOLOGIES
Concord, NH
Mr. Richard Thorpe | richard_thorpe@praxair.com
603.224.9585 | praxairsurfacetech.com

ROCKWELL CARBIDE POWDERS
Ontario, Canada
Mr. Frank Shao | sales@rockwellpowders.ca
905.470.8885 | rockwellpowders.ca

SAINT-GOBAIN CERAMIC MATERIALS
Worcester, MA
Ms. Shari Fowler-Hutchinson
shari.fowler-hutchinson@saint-gobain.com
508.795.2551 | coatingsolutions.saint-gobain.com

TECHMET ALLOYS LLC
Sealy, TX
Mr. James Ryan | j.ryan@techmet-alloys.com
979.885.7180 | techmet-alloys.com

THERMACH INC.
Appleton, WI
Mr. David Lewis | davelewis@thermach.com
920.779.4299 | thermach.com

THERMION
Silverdale, WA
Mr. Dean Hooks | dhooks@thermioninc.com
360.692.6469 | thermioninc.com

AIRGLIDE
Fort Lauderdale, FL
Mr. John Dixon | jionedairglide.com
954.249.0127 | airglide.com

DAVID LEE (CONSULTANT)
Ligonier, IN
Mr. David Lee | dllee@daltsc.com
574.849.3636

FLORIDA INSTITUTE OF TECHNOLOGY
Melbourne, FL
Mr. Frank Accornero | faccornero@fit.edu
386.506.6900 | fit.edu

MASON GLOBAL MANAGEMENT LLC
Killingworth, CT
Mr. Richard P. Mason
rmason@masonglobalmanagementllc.com
724.554.9439 | masonglobalmanagementllc.com

THE MOZOLIC GROUP
Londonderry, NH
Ms. Jean Mozolic | jean.mozolic@comcast.net
508.254.4375

STATE UNIVERSITY OF NEW YORK AT STONY BROOK
Stony Brook, NY
Prof. Sanjay Sampath | ssampath@ms.cc.sunysb.edu
631.632.8480 | ctsr.sunysb.edu

STRONGHOLD COATING SYSTEMS
Franklin, OH
Mr. Larry Grimenstein | strongholdone@cs.com
937.704.4020 | strongholdone.com

ASSOCIATE MEMBER ORGANIZATIONS

ADVANCED MATERIALS AND TECHNOLOGY SERVICES INC.
Simi Valley, CA
Dr. Robert Gansert | rgansert@adv-mts.com
805.433.5251 | adv-mts.com

DAVID LEE (CONSULTANT)
Ligonier, IN
Mr. David Lee | dllee@daltsc.com
574.849.3636

FLORIDA INSTITUTE OF TECHNOLOGY
Melbourne, FL
Mr. Frank Accornero | faccornero@fit.edu
386.506.6900 | fit.edu

MASON GLOBAL MANAGEMENT LLC
Killingworth, CT
Mr. Richard P. Mason
rmason@masonglobalmanagementllc.com
724.554.9439 | masonglobalmanagementllc.com

THE MOZOLIC GROUP
Londonderry, NH
Ms. Jean Mozolic | jean.mozolic@comcast.net
508.254.4375

STATE UNIVERSITY OF NEW YORK AT STONY BROOK
Stony Brook, NY
Prof. Sanjay Sampath | ssampath@ms.cc.sunysb.edu
631.632.8480 | ctsr.sunysb.edu

STRONGHOLD COATING SYSTEMS
Franklin, OH
Mr. Larry Grimenstein | strongholdone@cs.com
937.704.4020 | strongholdone.com

SUPPORTING MEMBER SOCIETIES

DVS, THE GERMAN WELDING SOCIETY
Mr. Jens Jerzembeck
jens.jerzembeck@dvs-hg.de
die-verbindungs-specialisten.de

GTS E.V., THE ASSOCIATION OF THERMAL SPRAYERS
Mr. Werner Kroemmer
werner.kroemmer@gts-ev.de
+49.89.31001.5203 | gts-ev.de

IMM, INSTITUTE OF MATERIALS MALAYSIA
Mr. Jobar Juhari | jobar_juhari@petronas.com.my
603.5882.3584 | iomm.org.my

JTSS, JAPAN THERMAL SPRAY SOCIETY
Mr. Nick Yumiba | jtss@mb8.seikyou.ne.jp
+81.6.6722.0096 | jtss.or.jp

MPIF, METAL POWDER INDUSTRIES FEDERATION
Mr. James R. Dale | jdale@mpif.org
609.452.7700 | mpif.org

TSCC – THERMAL SPRAYING COMMITTEE OF CHINA SURFACE ENGINEERING ASSOCIATION
Prof. Huang Xiao | xiaoou@chinathermalspray.org
+86.10.64892554 | chinathermalspray.org
Calendar

JANUARY 2020

■ International Conference on Advances in Thermal Spray Technologies
  January 20, 21
  London, United Kingdom
  waset.org/advances-in-thermal-spray-technologies-conference-in-january-2020-in-london

FEBRUARY 2020

■ Coatings+ 2020
  February 3–6 / Long Beach, CA
  sspec.org/events

■ Powder Coating Week 2020
  February 17–20 / Orlando, FL
  conference.powdercoating.org

MARCH 2020

■ CORROSION 2020
  March 15–19 / Houston, TX
  nacecorrosion.org

APRIL 2020

■ 63rd Annual Society of Vacuum Coaters Technical Conference – TechCon 2020
  April 18–23 / Chicago, IL
  svc.org

■ International Conference on Metallurgical Coatings and Thin Films (ICMCTF)
  April 26–May 1 / San Diego, CA
  icmctf2020.avs.org

MAY 2020

■ Offshore Technology Conference (OTC)
  May 4–7 / Houston, TX
  2020.otcnet.org

■ FABTECH MEXICO
  May 12–14 / Mexico City, Mexico
  mexico.fabtechexpo.com

JUNE 2020

■ ITSC 2020
  June 10–12 / Vienna, Austria
  asminternational.org/web/itsc/home

■ FABTECH Canada
  June 16–18 / Toronto, Canada
  canada.fabtechexpo.com

■ 16th Coatings Science International 2020
  June 22–26
  Noordwijk, The Netherlands
  coatings-science.com

■ World Congress on Powder Metallurgy and Particulate Materials (WorldPM2020)
  June 27–July 1 / Montreal, Canada
  mpif.org/events

SEPTEMBER 2020

■ North American Cold Spray Conference 2020
  September 15, 16 / Cleveland, OH
  asminternational.org/web/coldspray

OCTOBER 2020

■ EuroBLECH 2020
  October 27–30 / Hanover, Germany
  euroblech.com

NOVEMBER 2020

■ FABTECH
  November 18–20 / Las Vegas, NV
  fabtechexpo.com

DECEMBER 2020

■ POWER-GEN
  December 8–10 / Orlando, FL
  power-gen.com

IS YOUR EVENT LISTED?
Send calendar notices to SPRAYTIME® at spraytime@thermalspray.org
Your **SPRAYTIME** publication is provided to you at no charge by our advertisers. We encourage you to thank these advertisers by visiting, contacting, and referring their products and services at every opportunity.

Alloy Coating Supply........................................ 7
DeWAL........................................................... 23
F. J. Broadman & Co......................................... 19
Metallizing Equipment Co.
   Pvt Ltd................................. *Inside Front Cover*
Polymet Corp............................................... 17
Praxair Surface Technologies...................... 19
Thermach Inc............................................ 17
Uniquecoat Technologies............................ 15

WHERE IS YOUR ADVERTISEMENT?

From classified to business card to full-page sizes, we can work with your format.

Please visit [spraytime.org](http://spraytime.org) for rate information, or email the **SPRAYTIME**® publishing office via kim.daniele@mci-group.com.
We’ve Come a Long Way…

For more than 70 years our history has been synonymous with thermal spray innovation, education, and standards development. As we celebrate this milestone and the progress we’ve made over the years, we invite you to learn more about us and our impact on the thermal spray industry.

Read our history at go.aws.org/AboutITSA
or find out more about us at go.aws.org/itsavid