FOURTH QUARTER 2025 | VOLUME 32

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On the cover: TriplexPro™ advanced thermal spray technology for superior coating performance and reliability. Photo courtesy of Oerlikon Metco.

[DEPARTMENTS]

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ITSA MEMBER NEWS

Kirk Fick
Chair

As I write this, it has been less than a week since we held our annual meeting and symposium focusing on heavy machinery, overhaul, and mining applications in Peoria, Ill. I am grateful to be part of such a positive, engaged, and resilient organization like ITSA, and of the thermal spray community as a whole.

This year's meeting had 59 registered attendees, an increase from 49 in 2024 and 21 in 2023. The attendees included many direct competitors, yet the spirit of collaboration was clear, and the networking sessions were energetic and enjoyable.

I would like to extend my sincere thanks to our members for their continued support; to all attendees for taking the time to participate and for navigating travel and weather challenges; to the presenters for delivering insightful and informative sessions; to Caterpillar for allowing Dan Sordelet to present the keynote address and for hosting the tour of their assembly plant; and, finally, to the members of the ITSA board and planning committee for their dedication and hard work in ensuring the success of this event.

Planning is already underway for our 2026 meeting. During the business meeting, San Diego, Calif., emerged as the top choice after receiving the highest number of votes. The planning committee will provide updates as details are finalized.

It is also encouraging to see the continued growth of ITSA membership. We now have 31 member companies, with four new members joining in the past year, representing a 15% increase for 2025. Discussions with additional prospective members are ongoing, and we look forward to welcoming more organizations into our community.

We are currently reviewing applications for the 2025 ITSA scholarships, and recipients will be announced early next year. Registration for the next scholarship cycle will open in early 2026. If you know students pursuing a graduate degree in a thermal-spray-related field, please direct them to *thermalspray.org* to apply.

If your company has updates, articles, or other news to share, please contact Cindy Weihl at *cweihl@aws.org* to have it included in future publications.

ITSA MISSION STATEMENT

The International Thermal Spray Association (ITSA), 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

Kirk Fick, chair, Cincinnati Thermal Spray Inc.
Ashley Hunsaker, vice chair, HTS Coatings

EXECUTIVE COMMITTEE (previously listed officers plus the following)

Mollie Blasingame, Superior Shot Peening & Coatings
Ana Duminie, North American Höganäs
Jim Ryan, TechMet Alloys
David A. Lee, David Lee Consulting LLC
Bill Mosier, Polymet Corp.

ITSA SCHOLARSHIP OPPORTUNITIES

ITSA 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. Visit *thermalspray.org* for criteria information and a printable application form.

ITSA *SPRAYTIME*

Since 1992, ITSA has been publishing *SPRAYTIME* for the thermal spray industry. The mission is to be the flagship thermal spray industry publication providing company, event, personnel, product, research, and membership news of interest to the thermal spray community.

JOIN 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 listing in *SPRAYTIME*, exposure on the ITSA website, and recognition at industry trade shows.

Plus, ITSA Membership comes with an 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 Adrian Bustillo at (786) 937-9595 or *abustillo@aws.org*.

For an ITSA Membership application, visit the membership section at *thermalspray.org*.

NOW ACCEPTING
SCHOLARSHIP APPLICATIONS

Since 1991, ITSA has supported technologists and engineers by offering scholarships for postgraduate studies in thermal spray processes (plasma, flame, arc, HVOF) or materials science at accredited universities across the United States.

Up to three (3) scholarships

$2,000 each

Application Deadline: **October 30, 2026**

For more eligibility information or to apply,
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Elmet Technologies Granted U.S. Patent for Tungsten Heavy Metal Alloy Powders

Elmet Technologies, a tungsten and molybdenum manufacturer based in Lewiston, Maine, has secured U.S. Patent No. 12,359,290, titled "Tungsten Heavy Metal Alloy Powders and Methods of Forming Them." This is the fifth U.S. patent in this area, covering methods related to powders used in additive manufacturing and powder metallurgy applications.

The patented process leverages advanced spray drying and optional plasma densification techniques to produce substantially spherical, flowable, and highly densified composite particles. This material structure improves powder bed uniformity and thermal conductivity during sintering — key advantages for fabricating aerospace, defense, and industrial parts where mechanical strength and precision are critical.

"This patent reinforces Elmet Technologies' commitment to materials innovation," said Michael T. Stawovy, coinventor and director of research and development at Elmet Technologies. "Our approach enhances the production of tungsten heavy alloy powders with exceptional flowability and chemical uniformity — features essential to achieving repeatable, high-quality parts through additive manufacturing."

Key features of the patented invention include tailored alloy compositions, improved powder morphology, and superior densification.

The technology also addresses a long-standing challenge in metal additive manufacturing: producing highly pure, flowable powders that retain their shape and properties under extreme processing conditions.

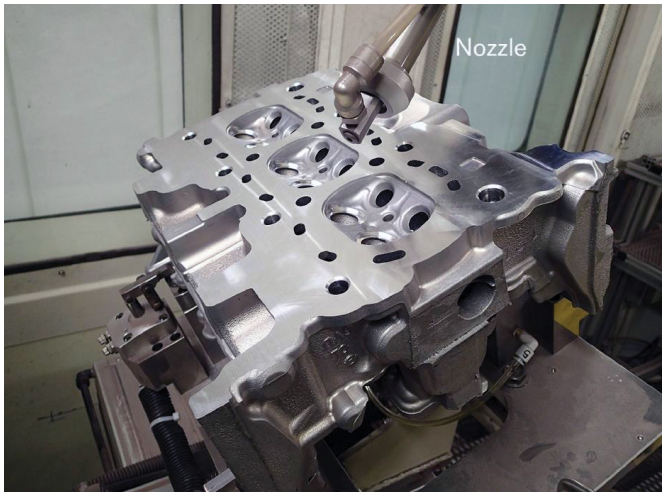
The resulting powders are suited for binder-jet printing and other powder-bed techniques, enabling the production of high-strength tungsten parts for extreme environments.

Nissan Introduces Cold-Sprayed Valve Seat in New e-POWER Engine

Nissan, Yokohama, Japan, is utilizing cold spray technology to manufacture valve seats in its new 1.5-liter turbocharged engine, designed exclusively for power generation within the third-generation e-POWER hybrid power train.

The first vehicle globally to feature this new e-POWER system is the Qashqai compact crossover, which began production at Nissan's Sunderland, UK, factory in July.

To enable optimal performance in the hybrid system, Nissan developed a new valve seat using cold spray technology, a move the company reports is a world's-first application in automotive engines. The process involves spraying dissimilar metal powders at supersonic speed onto the aluminum alloy cylinder head surface, forming a robust and durable coating that adheres strongly without melting the base material. This prevents the formation of excessive intermetallic compounds and porosity that are common in traditional fusion welding methods. As a result, cold spray coatings exhibit superior adhesion, durability, and reliability.



Cold spray processing of valve seats in a new 1.5-liter turbocharged engine.

The process incorporates a specially developed cobalt-free, copper-based alloy with excellent thermal conductivity, in-house nozzles inspired by polishing techniques used in forged mold production, and AI-driven quality assurance systems.

Thermal Spray Pioneer and Inventor Passes Away at 92

Daniel R. Marantz, a significant contributor to the thermal spray industry, passed away on July 4 at the age of 92.

His innovations included developing two-wire electric arc spraying for corrosion-resistant coatings on steel structures, advancing plasma-transferred arc welding for hardfacing applications, and creating novel plasma spray torch systems. Collaborating with engineers across disciplines, Marantz pioneered new approaches to hardfacing and corrosion protection that remain influential today.

Marantz attended Lafayette College, Easton, Pa., in the 1950s and later served two years in the U.S. Army Radio Corps. After his military service, he held several engineering positions before founding Flame Spray Industries Inc. (FSI) in 1964. A one-person operation until 1988, FSI grew steadily under Marantz's leadership, eventually employing a dedicated team. Though he officially retired in 2000, he continued to consult, advise, and regularly share his ideas

Daniel Marantz was a prominent inventor in the thermal spray industry.

with the FSI team as well as with other colleagues and friends.

He developed a large portfolio of devices and processes — many still in use today — including a composite feedstock for electric arc spraying, automated arc spray systems, plasma-transferred arc welding equipment, high-velocity oxygen fuel torch systems, internal-feed multiplasma spray torches, and the plasma-transferred wire arc internal diameter plasma spray torch.

Marantz's achievements were recognized with numerous patents and prestigious honors. He was named the 2009 Inventor of the Year by the Intellectual Property Owners Education Foundation and was inducted into the Thermal Spray Society's Hall of Fame.

Marantz was also passionate about education. At the State University of New York at Stony Brook, he supported undergraduate and graduate programs, mentoring students on senior design projects and advising graduate research in thermal spray technology. His generosity with time, knowledge, and encouragement left a lasting mark on future generations of engineers.

Höganäs AB Presents Global University Challenge to Unlock New Applications for Metal Powders

Höganäs AB, Höganäs, Sweden, a producer of ceramic and metal powders, recently launched PowdrIQ, an international university challenge inviting undergraduate, master's, and PhD students to propose innovative applications for metal powders.

Participants must identify new applications where metal powders are not currently used but could make a difference, focusing on three key areas: sustainability, performance and efficiency, and market needs.

"We are convinced that there is still significant potential for metal powders to contribute to more sustainable and innovative solutions across industries, and with PowdrIQ, we want to inspire students to explore new possibilities driving

positive change," said Emma Lefdal, VP group communication, brand and public affairs, Höganäs.

An internal Höganäs jury will evaluate submissions based on innovation, feasibility, sustainability impact, and industry relevance. Winners will receive cash prizes of up to €5000 (about $5796), with the first-place winner also awarded a study trip to a Höganäs site.

Arzell Marks 20 Years in Thermal Spray with New Modular Systems and EU Expansion

Arzell Inc., Cypress, Tex., a manufacturer of thermal spray systems, is celebrating its 20th anniversary with the launch of new modular systems and expansion into the European Union (EU) market.

The company develops proprietary equipment in-house, including plasma, high-velocity oxygen fuel, and combustion spray systems. It has recently introduced the Multus family of modular spray systems, including the Multus-C Cascade plasma system, featuring patented C+ and CV+ torches.

The company has also launched Arzell EU GmbH in Germany, strengthening its ability to serve customers across Europe, the Middle East, and Africa with faster response times and localized support.

Winners will be announced on Höganäs AB social media accounts in 2026.

GARDCO Transitions to PFAS-Free Products

Paul N. Gardner Co. USA (GARDCO), Columbia, Md., a manufacturer of physical and inspection instruments for the paint, coatings, and related industries, will phase out products containing per- and polyfluoroalkyl substances (PFAS) as of December 31. This move aligns with emerging international regulations and market expectations.

PFAS, known as "forever chemicals" for their persistence in the environment, cumulative nature, and ecological toxicity, have become the focus of increasingly stringent regulations worldwide. Several individual PFAS compounds are already restricted, and the European Union has set the first group-wide ban.

The transition to PFAS-free products offers advantages, including eliminating highly persistent and toxic chemicals and aligning with global standards. The company anticipates new business opportunities from customers seeking PFAS-free solutions and a reduction in regulatory workload across departments.

The company's PFAS phase-out began in June 2024. The transition affects all products containing Teflon (Tefcrom applicators, Teflon-coated thermometers, disperser blades, etc.). Effective non-stick alternatives to PFAS, such as Cerakote and other substitute materials, are already in place for the affected product lines.

ATL Turbine Services Expands Thermal Spray Capabilities with System Investment

ATL Turbine Services, based in Dundee, UK, has invested in the Surface Two™ thermal spray system from Oerlikon Metco, Wohlen, Switzerland. This purchase enables ATL to deliver high-performance, precision-engineered coating solutions for turbine components across the aerospace, energy, and industrial sectors.

The Surface Two™ system is designed for scalable, IIoT-enabled thermal spray applications and offers increased capacity, automation readiness, and consistent process performance. With the ability to handle components up to 2000 mm (78.74 in.) in diameter and 1500 mm (59.06 in.) in height, the system suits ATL's focus on servicing medium-to-large turbine parts.

The new system has been fully integrated into the company's production environment, supporting both refurbishment and new component coating processes.

ATL Turbine Services has increased its thermal spray capabilities with the Surface Two™ system, enabling advanced coating solutions for turbine components.

SPRAYTIME® Shines the Spotlight on Thermal Spray

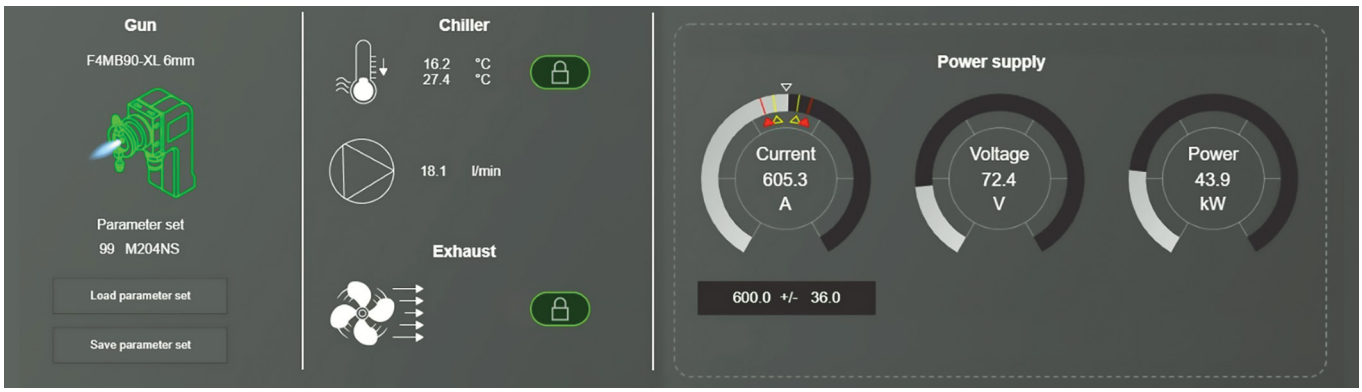
SPRAYTIME®, published by the International Thermal Spray Association, a Standing Committee of the American Welding Society, is the flagship international magazine for the thermal spray community.

Assembled on a quarterly basis, issues feature industry news, products, articles, and more. To view the current magazine, visit *thermalspray.org/spraytime/.*

In addition, if you have an article idea or a press release in relation to thermal spray, contact Editor Cindy Weihl at *cweihl@aws.org* or *spraytime@thermalspray.org.*

BY STEPHEN BOMFORD

COOKING UP A COATING:
Control of Key Process Variables



I remember sitting down once with a mental challenge of writing down the variables in the thermal spray process that could have a significant effect on the deposit being produced. After about two or three minutes, I had reached a total of 47, and I thought that was enough for a first effort.

What this means, of course, is that there are many factors to consider and control when attempting to produce a quality coating. Over the 40-plus years I've been involved in this process, I have witnessed significant strides in improving robustness, including advancements in mass flow controllers, PC-integrated systems, and diagnostic sensors. This is all fantastic stuff, but as thermal spray is not yet in the realms of CNC machining, the level of manual intervention still required means that some of the key techniques used back when I started in this business are still very relevant today.

In this article, I hope to provide an insight into the "recipe" of variables affecting air plasma spray (APS) and high-velocity oxygen fuel (HVOF). While I appreciate that these are only two of the many thermal spray coating processes out there, for brevity's sake, it's probably best to concentrate on a couple of the favorites.

The Coating Recipe

Just like baking a cake, any coating needs a starting recipe to make sure there is a good chance of getting what you expect when the coated component comes out of the "oven." For thermal spray, the usual format follows that of a spray parameter sheet — Fig. 1. Here, the idea is to control as many of the input parameters as possible to keep variability to a minimum. In this case, the parameter sheet calls up the material to be sprayed,

Coating Parameters
Metco™ 204NS ZrO_2 $8Y_2O_3$

Process	Atmospheric Plasma Spray
Spray Gun	F4-MB/F4MB-XL
System Platform	UniCoat™/MultiCoat™
Power Supply	TriStar-IPS 500/200
Parameter Type	High Porosity
Process Media	Argon/Hydrogen
Powder Feeder	Twin/Single 120A
Hoppers	2

Spray Parameters		
Nozzle	8 mm	
Electrode	Standard	
Gas Distribution Ring	Swirled 16 holes	
Injector		
Injection Angle	105°	
Position	12 and 6 o'clock	
Diameter	2 mm	
Distance	8 mm	
Amperage	520 A	
Voltage	56 ± 3 V	
Primary Gas – Argon		
Flow	24 NLPM	54.8 SCFH
Secondary Gas – Hydrogen		
Flow	6 NLPM	13.7 SCFH
Carrier Gas [a] – Argon		
Flow	1.5 NLPM	3.4 SCFH

Disk (Item #1003232)		
Type	Steel	
Size	16 mm width / 1.2 mm depth	
Suction/Spreader	NL16/1.2	
Stirrer	Stirrer	
Hose (Item #1004515)		
Size	6 mm OD / 4 mm ID	
Spray Distance	150 ± 3 mm	6 ± 0.125 in
Spray Rate		
Total	80 g/min	10.6 lb/h
Per Hopper	40 g/min	5.3 lb/h
Surface Speed	30 – 60 m/min	98 – 196 ft/min
Step Height	5 mm/rev	0.2 in/rev
Substrate	Low Carbon Steel	

[a] Carrier Gas should be set for local conditions

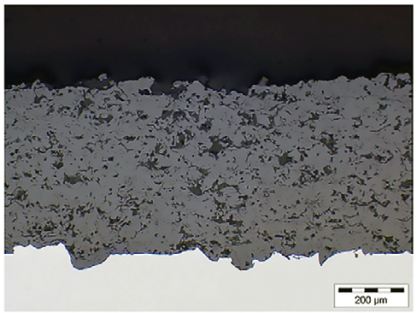


Fig. 1 — Coating parameter sheet for Metco 204NS sprayed through the F4-MB/F4MB-XL APS spray gun.

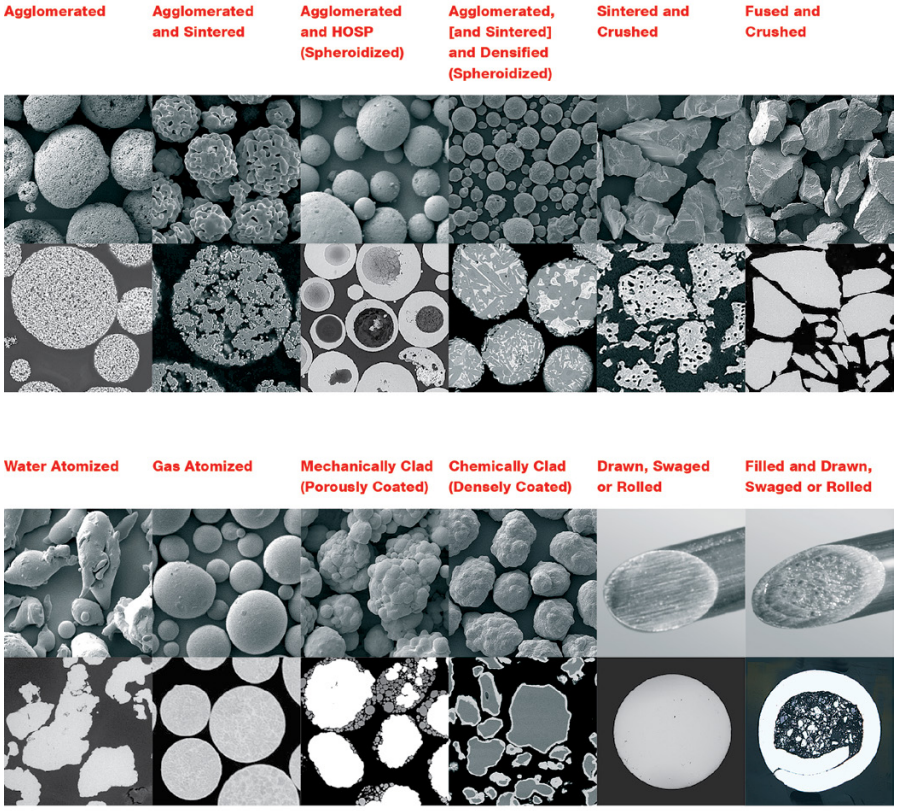


Fig. 2 — Thermal spray powder morphologies and cross section for typical manufacturing routes.

the gun hardware to be used, and the system input parameters required. Figure 1 also provides an indication of the resultant microstructure. Alongside this structural expectation, there will most likely be a set of coating properties that will need to be met. These will often be controlled by internal or customer test specifications.

The Starting Ingredients

Both APS and HVOF use powder as a consumable. Depending on the powder chemical composition and the required coating properties, powders can be manufactured using a wide variety of methods — Fig. 2. The manufacturing method used will have an impact on powder density, morphology, phase distribution, etc., and therefore also on the resultant deposit.

Once made, powders are subsequently sized to suit the process being used. Figure 3 shows typical sizing for a range of powder-consuming systems. For both APS and HVOF, the powder can be subsequently optimized to produce coatings with specific properties. For example, if an as-sprayed coating is required with a low surface roughness, then it makes sense to select a powder sized toward the bottom end of the usual size range. Of course, there are always other factors to be aware of. In this case, choosing a material that is too fine can cause hardware blocking issues for both APS and HVOF processes.

Overriding Principles

Once we have chosen our powder and thermal spray process, we need to carefully consider what happens when the two interact. The goal is to produce a functional coating, but how do we ensure we get what we want?

I already mentioned the 47 variables, but although this may seem like a long list, many of these have an influence (admittedly sometimes on multiple levels) on just two key factors: particle temperature (T) and particle velocity (V).

I always try to imagine myself as a particle in the spray plume and what external forces are acting upon me (strange, but true). The choice of hardware used (size of nozzles and powder injectors), flow of gases, current settings, etc., all influence powder particle thermal and kinetic energy levels, and therefore, the coating produced.

This overriding principle of particle temperature and velocity is not only the cornerstone of spray parameter control but also forms one of the fundamentals of flame sensing technology. As indicated in Fig. 4, infrared emissions from particles

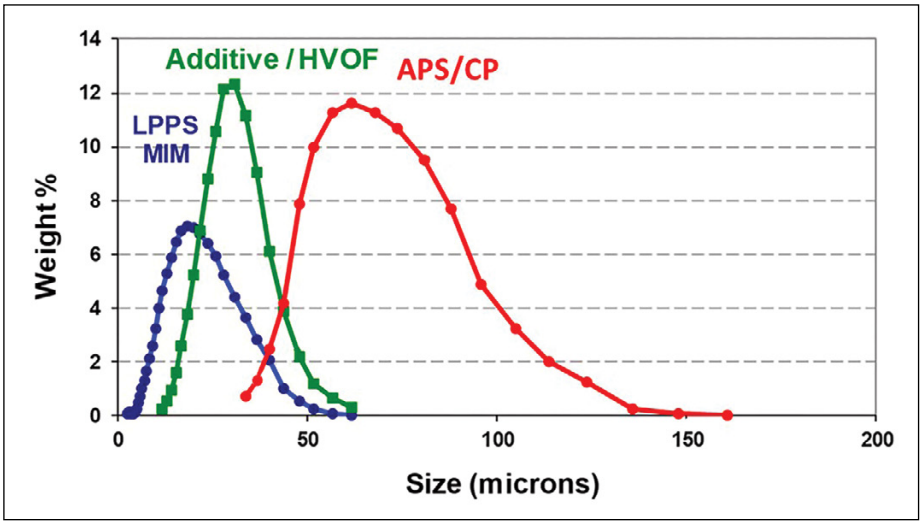


Fig. 3 — Typical powder size ranges for a selection of systems.

Fig. 4 — The Accuraspray 4.0 system (a trademark of Tecnar Automation Ltd.) highlighting particle temperature and velocity for an APS system.

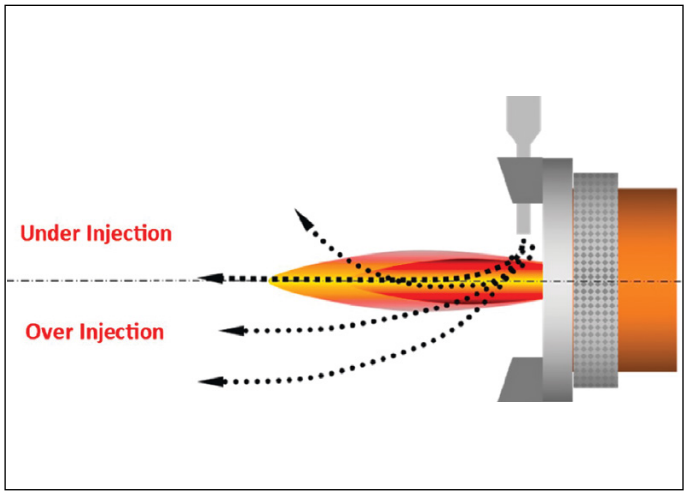


Fig. 5 — Injection conditions affecting coating quality in the APS process.

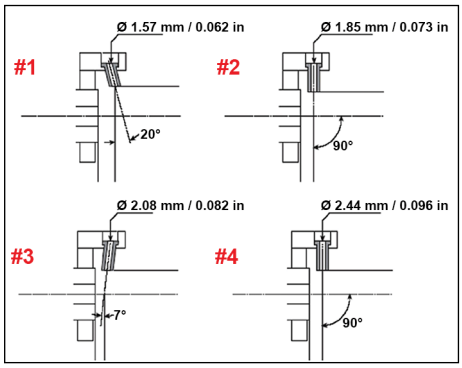


Fig. 6 — Powder port types for Metco 3MB and Metco 9MB type APS guns.

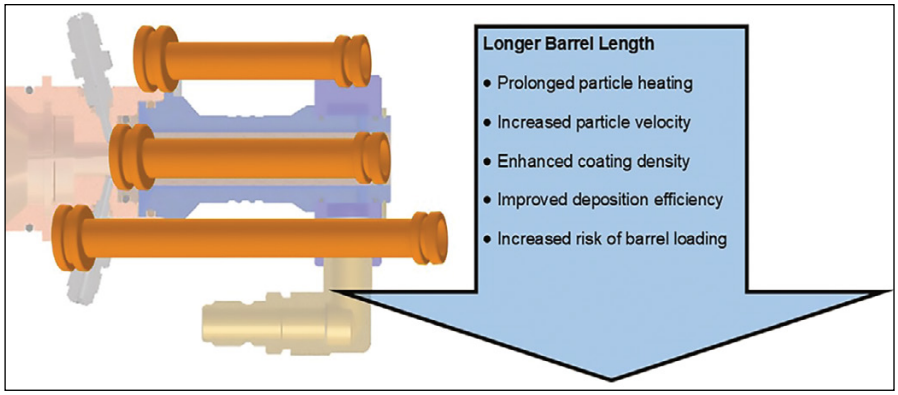


Fig. 7 — Process effects related to barrel length in HVOF hardware selection.

in the flame can be utilized to provide data on these two principal output variables. The general theory is that, if we can reduce variability in defined values of particle T and V, then we should end up with the coating we are expecting.

Picking the Correct Utensils

The working end of the thermal spray process is usually referred to as the spray gun or torch. Before we even think about what gases and power levels we are going to employ, we need to set the gun up with the right hardware.

When preparing an APS gun, hardware can be process gas specific. The choice of primary and secondary gas will affect plasma energy levels, and items such as nozzles (anodes), electrodes (cathodes), as well as parts such as gas swirl rings, will have to be chosen to reflect the gas combination used.

Returning to our T and V philosophy, the size of the nozzle bore (which can be the controlling orifice in the system) will have a profound effect on gas and, therefore, particle velocity. It will also affect the time the powder particles spend in the plasma "flame" (particle dwell time) and the amount of heat transferred.

The control of delivery of powder into the APS plume is also significant. The powder feed rate and injection methods are key to the process. As can be seen in Fig. 5, the choice of powder port/injector size (defined by through-hole diameter) as well as powder carrier gas flow will influence the position of injection in the plume. Nonoptimized powder injection usually leads to a nonoptimized coating (unmelted particles, nonuniform oxides, etc.). In addition to physical changes to carrier gas flow rates, leaks in the system, injector blockages, and wear will also affect injection. Powder feed system leaks are one of the more significant root causes of reported coating issues.

The positioning of the powder port in terms of distance from the plume as well as injection angle will also have an influence on particle heat transfer. In particular, powder port angles can be chosen to help control particle dwell time. It makes sense that a material requiring

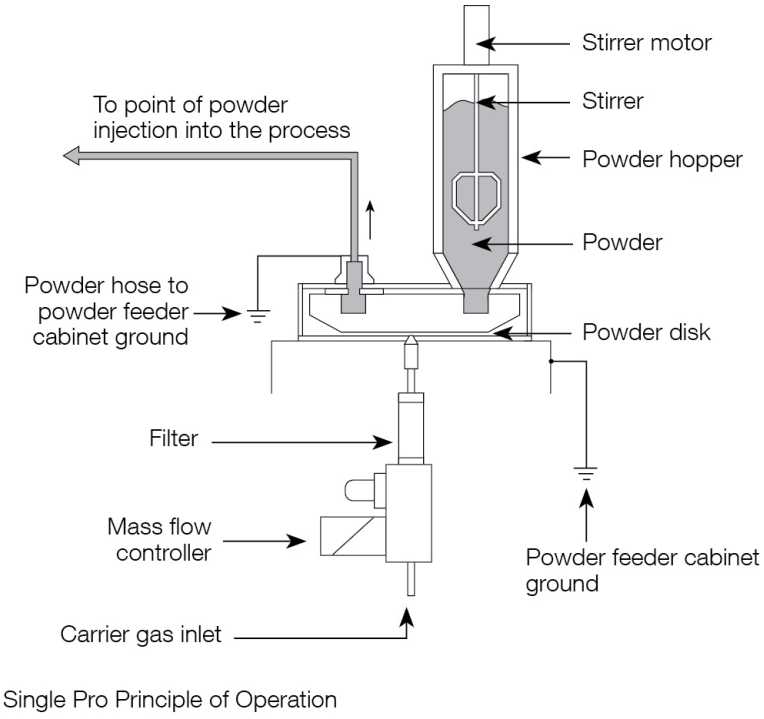


Fig. 8 — SinglePro powder feeder and principle of operation.

more heat input to soften would prefer to have a longer dwell time. On that basis, higher melting point materials such as ceramics tend to be injected backwards into the plume (for example, using a #3 port as shown in Fig. 6). The reverse is of course true for lower melting point materials.

The hardware choice for HVOF systems tends to be a little more straightforward but still follows the particle T and V trend. Once the design of the gun and choice of fuel have been established, the major hardware choice tends to be based on barrel length as well as particle dwell time and acceleration — Fig. 7.

Design of barrels (HVOF-LF) or extended aircaps (HVOF-GF) can also influence particle dynamics. Many HVOF gun designs utilize a de Laval (convergent/divergent) nozzle, which accelerates the hot, pressurized gas passing through it to a higher supersonic speed by converting the heat energy of the flow into kinetic energy.

Stirring the Mix

Irrespective of the process chosen, consideration of what happens when the powder enters the process is significant.

Powder feed rate is a key variable. Whether it is HVOF or APS, the process flame will have a fixed enthalpy level for a fixed parameter set. If the amount of powder delivered to the T and V source varies, then so will the heat transfer. This can have a profound effect on all coating properties. Proper management of powder delivery within control parameters is significant.

In addition to routine process control, the design of modern powder feeders helps reduce variability in powder feed rate — Fig. 8. As well as accurate material delivery systems, closed-loop "weigh as you spray" feeders help ensure that the

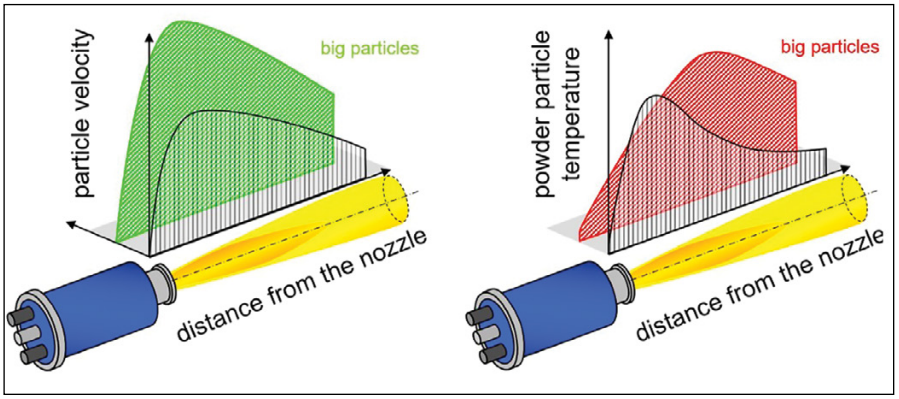


Fig. 9 — Spray distance and particle distribution interactions.

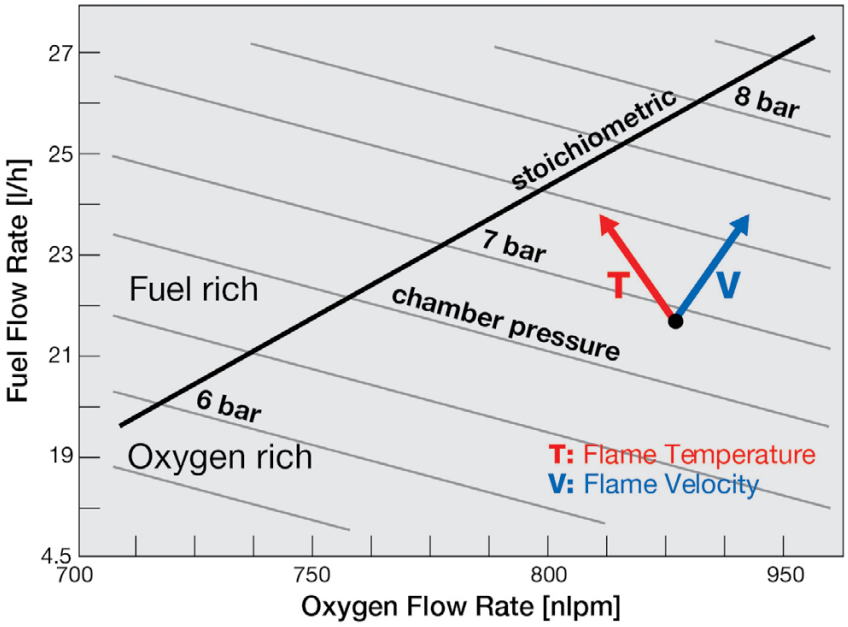


Fig. 10 — Oxygen/fuel flow conditions for a typical (WokaJet™) HVOF-LF system.

Fig. 12 — MultiCoat™ 5 APS interface screen.

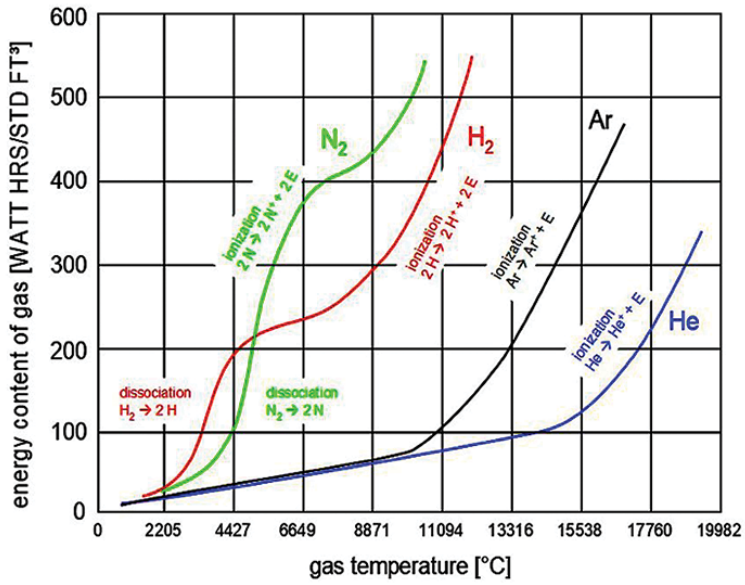


Fig. 11 — Energy content/temperature curves for the range of typical APS process gases.

desired feed rate is kept tightly within the defined tolerance.

Once the powder has entered the flame, again dwell time becomes a controlling factor. The time taken for the powder particles to strike the surface is affected by gas flows and hardware choice, as well as significantly by spray distance. As can be seen in Fig. 9, a complex interaction of powder size distributions will affect T and V conditions. The optimum particle properties do not, therefore, always coincide with the determined spray distance. Quite often, it is a compromise that can be overruled by part geometry and access issues.

Setting the Dials

Both APS and HVOF processes are enormously active thermodynamic systems. If we are generating 40 kW or more of energy at any one time, there must be a good reason for it.

A quick calculation shows that an HVOF powder particle traveling at 750 m/s over a spray distance of 375 mm (14.76 in.) takes less than a thousandth of a second to hit the substrate after leaving the end of the gun barrel. Not surprising then, that a great deal of energy (thermal and kinetic) is required to create the required coating.

HVOF processes rely on the combustion of fuel with oxygen to generate flame temperature and velocity. The amount of gas (and/or liquid) fed into the gun needs to be regulated to ensure optimum combustion occurs. This regulation within controlled tolerances is usually carried out via flowmeters (the latest being digital mass flow). Parameters chosen for any given material are not necessarily based on maximum gas temperatures or complete (stoichiometric) combustion. In

many cases, they have been empirically defined to produce the desired coating properties. That said, once developed, some clear rules exist that can be used to modify spraying conditions. Figure 10 shows a typical flowchart for an HVOF-LF system. Here, we can see how changes in flow rate and ratio affect flame (and therefore particle) temperature and velocity.

The diagram also indicates the availability of measured HVOF gas combustion pressure. This process feedback value can be enormously valuable in providing data on the health of the system. Suitable tolerances applied to the pressure value can indicate problems with hardware blockage or incorrect combustion conditions — a useful warning of problems on the horizon.

Moving on to APS, plasma spray is an electrical process, and its energy is derived from the ionization of gases. The amount of gas used helps define particle velocity, while the types of gases used determine energy levels.

Figure 11 is a historically well-viewed chart, but it provides a good indication of energy levels available in typical gases used in the APS process. The selection of primary and secondary gases will certainly affect the transfer of heat to the powder particles and consequently influence the coating properties and deposit efficiency. It makes sense, for example, that you would likely choose N_2 /H_2 (primary and secondary) gases when depositing a high melting point material such as yttria stabilized zirconia (e.g., Metco 204 NS) and Ar/He when spraying a temperature sensitive material such as Co/WC (e.g., Metco 73F NS-2).

Referring to our parameter sheet, detailed in Fig. 1, you can see that process gas flows and plasma energy levels need to be controlled. The latter is primarily defined by electrical power and as mentioned previously, is reported in watts (typically kW) calculated as current (A) multiplied by voltage (V). The voltage is produced as a result of the ionization process and is a good feedback tool for monitoring system robustness. This is especially true for traditional single electrode APS systems as the voltage (and therefore the power) tends to degrade as consumable hardware ages. This is not so much the case with cascaded plasma systems.

To help control the APS process, the defined parameters are entered into a process controller, such as that offered by the MultiCoat™ 5 user interface — Fig. 12. This interface links with a range of (in many cases) closed-loop devices that control and maintain set parameters within defined tolerances.

This type of interface is our primary tool for transferring the parameters that may have been supplied to us by the customer. Input of amperage, primary and secondary gas flows, carrier gas flows, and powder feed rates all transferred from the parameter sheet will provide control of a significant number of key process variables. The latest controllers offer features for setting and monitoring tolerances. Alarm warnings can be a really useful feature to ensure that any process drift is actioned before potentially affecting the coating (and incurring unexpected costs).

Despite technology, a good deal of attention is still required to choose the right powder, properly set up the gun hardware, set the correct spray distance, etc. (as well as considering the remainder of the 47 variables I've not had time to mention) to make sure we get the desired coating and all its required properties.

Tasting the Cake

The goal of all this effort is to produce our coating "cake" and make sure that the customer enjoys the "taste."

Conclusion

The aim of this article has been to provide an overview of the parameters that need keeping a careful eye on while baking our coating cake. A keen focus needs to be applied to all the variables that can affect the thermal spray process and great care needs to be taken to use a variety of methods to make sure they do not drift outside defined tolerance bands.

The use of parameter sheets is a great method to make sure our coating recipe is well defined, but setting up and keeping a proper eye on the process is invaluable in ensuring the expected coating with the desired properties is produced.

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Guidelines for Submitting a *SPRAYTIME* Feature Article

Have you ever 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 could include a case study, a recent company project, and tips for handling a particular process.

Here's an easy breakdown of our guidelines:

The text of the articles should be about 1000 words and provided in a Word document.

Line drawings, graphs, and photos should be high-resolution JPG or TIFF files with a resolution of 300 or more dots per inch.

Plan on about 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@aws.org*.

BY CINDY WEIHL

FROM SYMPOSIUM TO SHOP FLOOR:

Thermal Spray Leaders Gather in Peoria for the ITSA Annual Meeting and Symposium

Thermal spray industry leaders gathered in Peoria, Ill., for the International Thermal Spray Association (ITSA) Annual Meeting and Symposium held November 10–12.

Attendees traveled from across the United States, Canada, and Australia to learn about the latest developments in thermal spray technology, additive manufacturing, and other advancements.

Experts Share Insights and Solutions

The event took place at the historic Peoria Marriott Pere Marquette. As home to Caterpillar Inc., a manufacturer of construction and mining equipment, engines, and turbines, Peoria provided an ideal backdrop as this year's symposium focused on the impact of thermal spray technologies in heavy machinery, overhaul, and mining.

Attendees heard from over a dozen speakers on topics such as solutions for wear and corrosion resistance, hybrid coating technologies, leveraging cold

Attendees of the 2025 ITSA Annual Meeting and Symposium pose in front of a Cat® D10 dozer at the Caterpillar SS Building assembly facility in East Peoria, Ill.

ITSA Chair Kirk Fick welcomed symposium attendees and thanked the ITSA event planning committee members and the symposium speakers.

spray for heavy machinery, executing thermal spray work in the field, advances in high-velocity oxygen fuel (HVOF) coatings, and sustainability. Also of interest to many attendees was a session on new legislation and IRS guidelines related to the R&D credit and what the new law means for credit claims, compliance, and strategy.

Inside the Heart of Heavy Machinery

The keynote speaker was Dan Sordelet, engineering fellow with the advanced materials technology team at Caterpillar.

Keynote Speaker Dan Sordelet spoke about Caterpillar and what the company does before attendees headed off to visit one of its assembly facilities.

"With attendance more than doubling this year, our annual meeting and symposium demonstrated the remarkable growth and engagement within ITSA. The collaboration and energy among attendees made this year's event truly exceptional" — Kirk Fick, ITSA chair

Tour attendees were divided into four groups for a tour of Caterpillar's assembly facility. Above, one of the groups poses at a shop floor station.

Sordelet gave an overview of the company's 100-year history, its products, and the importance of and need for surface engineering, including at Cat Reman, Caterpillar's program for remanufacturing used parts. The process involves disassembling returned components, then cleaning, salvaging, or reconditioning all components before reassembling the part to meet original equipment manufacturer specifications.

Following Sordelet's keynote, symposium attendees toured Caterpillar's Building SS, the company's track-type tractor assembly facility. Participants received a guided tour around the plant to see how the company's mid- and large-sized tractors (dozers) are assembled from start to finish. The facility receives fabricated components, including parts which are welded, machined, and painted at its LL facility, and uses them to build heavy machinery in the SS building. It is a key manufacturing site for Caterpillar, especially for large dozers, and part of the company's long-standing presence in Peoria.

Opportunities Beyond the Sessions

Beyond the knowledge gained at this year's sessions and the unique opportunity to see how Caterpillar's largest dozers are assembled, the Peoria gathering allowed attendees to meet new people, reconnect with old friends, and gain new business relationships. The opportunity to connect with peers started with a welcome reception on the evening of November 10. Attendees greeted each other and visited several tabletop exhibitors and sponsors set up around the room. Event sponsors included CTS, Cincinnati, Ohio; Polymet, West Chester, Ohio; and Superior Shot Peening International, Cleveland, Tex. Exhibitors included Arzell Inc., Cypress, Tex.; Centerline, Windsor, Ontario, Canada; Progressive Surface, Kentwood, Mich.; SprayWerx Technologies Inc., North Vancouver, British Columbia, Canada; and Superior Shot Peening International, Cleveland, Tex.

Meeting attendees networked during a welcome reception and shared several networking breaks and meals together.

Attendees had additional opportunities to visit exhibitors throughout the two-day event and to network during lunch, dinner, and networking breaks. Attending the meeting for the first time were AWS Vice President J Jones and Past President Dr. Richard Polanin, both of whom emphasized the importance of engaging with thermal spray leaders.

"Attending the ITSA conference was important because thermal spray technology plays a critical role in advancing welding and materials performance across industries. Being here allowed us to engage directly with innovators, understand emerging trends, and strengthen collaboration between AWS and ITSA. One key takeaway is the growing emphasis on sustainability (including green initiatives engaged through powder recovery and recycled materials) and precision in coating applications, which aligns perfectly with AWS's mission to support cutting-edge solutions for manufacturing and repair," said Jones.

Annual Business Meeting

Official ITSA business was conducted during the Annual Business Meeting. More than 30 members gathered to discuss updates and future endeavors.

ITSA Program Manager Adrian Bustillo provided updates on action items and financials, ITSA Membership Chair Jim Ryan introduced new members, AWS C2 Committee on Thermal Spray Chair Daniel Hayden shared news on the committee, ITSA Scholarship Chair Mollie Blasingame discussed ITSA scholarship applicants and opportunities, Education Chair Ana Duminie shared information about educational material revisions and a thermal spray training course, and ITSA Vice Chair Ashley Hunsaker led a vote on possible locations for the 2026 ITSA Annual Meeting and Symposium.

C2 Committee on Thermal Spraying

Before the ITSA welcome reception, the AWS C2 Committee on Thermal Spray held its annual meeting in conjunction with the ITSA event. The committee is responsible for creating and revising thermal spray standards.

"Both ITSA and C2 are built to serve the needs of thermal spray applicators, and the contributions of ITSA members are an essential part of what keeps our documents and standards relevant to the shops that use them. As with the other AWS committees, job shops are at the core of the work we do," explained Hayden.

Looking Ahead

As the successful 2025 meeting wrapped up, ITSA's planning committee began planning for the 2026 event. The annual meeting and symposium will take place next fall. Anyone interested in providing program input or assisting with the organization of the event is encouraged to contact ITSA Program Manager Adrian Bustillo at *abustillo@aws.org*.

(From left) ITSA Program Manager Adrian Bustillo, C2 Chair Daniel Hayden, ITSA Chair Kirk Fick, ITSA Vice Chair Ashley Hunsaker, AWS Vice President J Jones, AWS Past President Dr. Richard Polanin, and C2 Program Manager Ady Celaya.

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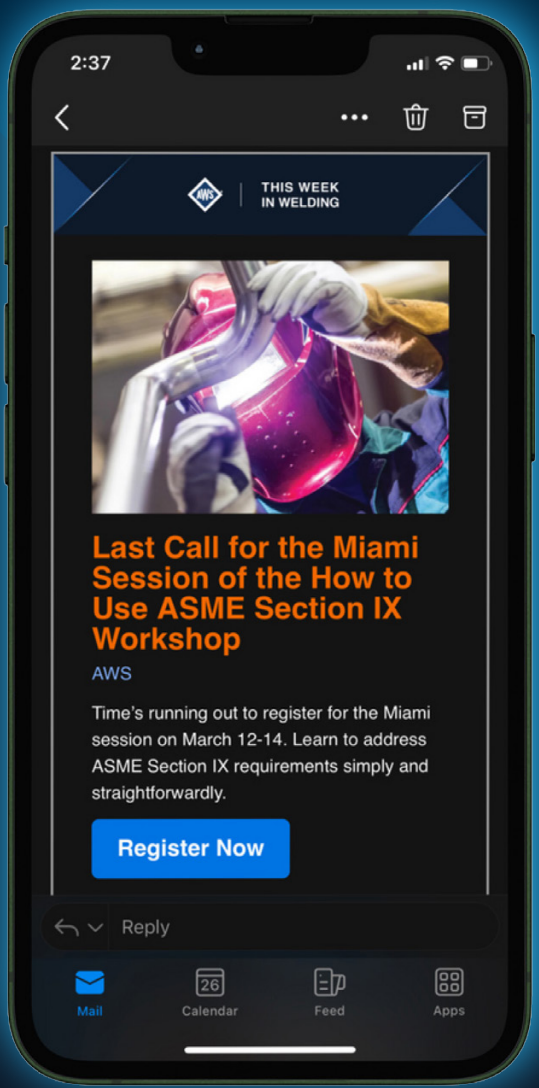

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asminternational.org

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Prague, Czech Republic
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Thermal Spray Powders Report Indicates Strong Global Growth

Thermal Spray Powders Market, By Material Type, By Thermal Spray Process, and By End-use Industry, Global Market Size, Share, Growth, Trends, Statistics Analysis Report, By Region, and Segment Forecasts 2025–2033 projects the global market to grow at a compound annual growth rate of 6.0% from 2025 to 2033. Growth is driven by rising demand for wear-resistant coatings, expansion in aerospace and automotive industries, and increasing adoption of thermal spray technologies in energy and medical applications. Valued at about $1.5 billion in 2024, the market is expected to reach $2.5 billion by 2033. North America holds the largest share, supported by its established aerospace, defense, and manufacturing sectors. The report highlights the growing use of powders in the renewable energy and power generation industries for high-temperature, wear-resistant coatings. Key growth factors include expansion of aerospace and automotive applications, rising energy and oil and gas demand, and the increasing use of eco-friendly coating solutions. The report identifies North America as the dominant region, while Asia-Pacific shows the fastest growth due to industrial expansion in China, India, and Japan. Overall, the report finds that the thermal spray powders market is set for steady, long-term growth as industries rely more on advanced coatings to enhance performance, reduce costs, and support sustainable manufacturing.

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A Flame Spray Torch Delivers Reliable, Cost-Effective Coatings

Designed for reliability and ease of use, the 6PII flame spray torch offers flexibility whether spraying wire or powder, making it one of the most adaptable tools in its class. Built for demanding industrial environments, the torch features a rugged design and adjustable flame control for precise spray parameters. Its dual capability supports both wire and powder feed configurations, providing operators with the versatility to handle varied coating requirements. Extension and angle head options make it easy to access hard-to-reach areas, while compatibility with common wire sizes 1⁄16, 3⁄32, and 1⁄8 in. ensures broad usability. Optional flame sensors add an extra layer of safety and process monitoring, particularly in automated or enclosed spray setups. Whether performing on-site maintenance or shop-based refurbishment, the torch delivers consistent, high-quality coatings with minimal maintenance.

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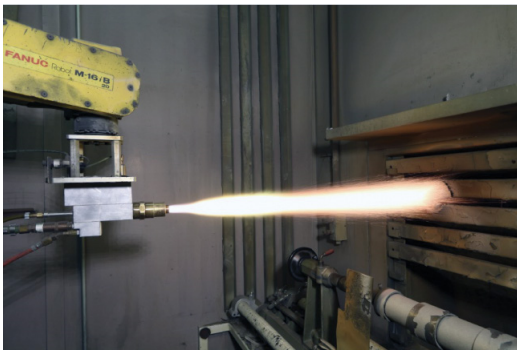

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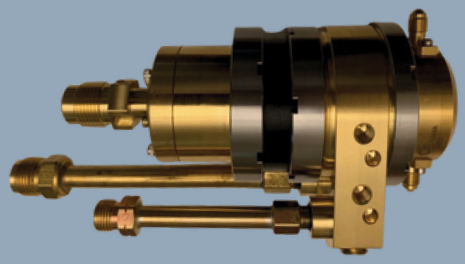

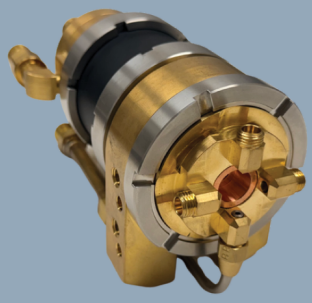

Redefining What Plasma Can Do

The Multus C+ and CV+ torches redefine what's possible in plasma spray technology. Built exclusively for the C+ platform, the system operates with low and high pressure capabilities that encompass the entire thermal spray materials' operating range requirements. It offers plasma versatility, HVOF performance, and safer operation without combustible gases.

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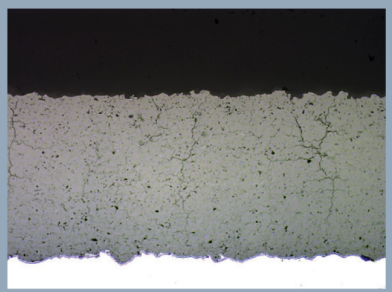

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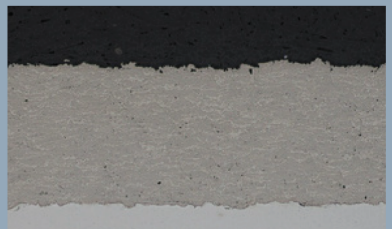

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