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INTERNATIONAL THERMAL SPRAY ASSOCIATION

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ITSA Scholarship Spotlight

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CONTENTS

[FEATURES]

On the cover: ITSA scholarship recipient Abhijith Sukumaran adjusts the alignment of the plasma spray SG-100 gun in Florida International University's Plasma Forming Laboratory.

[DEPARTMENTS]

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

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

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ITSA MEMBER NEWS

Mollie Blasingame
Chair

By the time you receive this issue of *SPRAYTIME*, Kirk Fick will be your new ITSA chair. For the past two years, I have had the privilege to serve as chair, and I am so thankful to the ITSA board and members for their support throughout that time. As I reflect on my term, I am proud to have been a part of a positive growth trajectory for ITSA that included adding new members, developing new standards, and supporting the advancement of thermal spray technology. We also had a wonderful annual business meeting in Buffalo, N.Y., last year. It was the first face-to-face meeting for ITSA members post-COVID-19 pandemic. And preparations are underway for our 2024 gathering in Miami, Fla., this November.

I am also honored to follow in the footsteps of my father, Jack Blasingame, who was a member of ITSA for more than 40 years and served in various roles, including chair.

I welcome incoming Chair Kirk Fick, as he starts his term. I also invite you all to join us in November in Miami. On November 5, we will have an AWS C2 Committee on Thermal Spraying meeting and our ITSA Executive Committee meeting. On November 6, in conjunction with AMPP, ITSA will host a thermal spray symposium and group dinner. On November 7, we will host our annual business meeting and visit the Florida International University engineering campus for an exciting tour that will include their brand-new, state-of-the-art cold spray lab. I hope to see you all this fall.

Thank you again to the ITSA executive committee and our outstanding members for supporting me during my term as chair.

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.

OFFICER

Kirk Fick, chair, Cincinnati Thermal Spray Inc.

EXECUTIVE COMMITTEE (above officer 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 (800) 443-9353, ext. 295, or *itsa@thermalspray.org*.

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

Cold Spray Action Team: CSAT 2024

June 11, 12
Worcester, MA
coldsprayteam.com/csat-2024

AMPP Gulf Coast Conference

Aug. 5–7
Houston, TX
ampp.org/events/gulf-coast-conference

North American Cold Spray Conference 2024

Sept. 10, 11
Boucherville, Canada
www.asminternational.org/nacsc-2024

International Materials, Applications & Technologies: IMAT 2024

Sept. 30–Oct. 3
Cleveland, OH
www.asminternational.org/imat-2024

International Thermal Spray Association Annual Meeting

Nov. 6, 7
Miami, FL
thermalspray.org

South Florida's Additive Manufacturing Industry Discussed at FIU Conference

A workforce needs and development workshop is shown in session at the Pioneering Additive Manufacturing in South Florida conference.

Florida International University (FIU), Miami, Fla., held a conference on January 25–26 titled Pioneering Additive Manufacturing in South Florida. The conference highlighted the region's advanced manufacturing boom.

"I was struck by a [remark] yesterday stating, 'You know, often people associate North Florida with defense and South Florida with Mickey Mouse,' and that's clearly not the case here," said Neal Orringer, CEO of Applied Science & Technology Research Organization of America (ASTRO America), a research institute devoted to advancing the public interest through manufacturing technology and policy and organizer of the conference. "There's a substantial amount of research, development, and investment here, particularly in the Miami area alone."

The conference actively engaged local businesses and stakeholders in exploring expanding 3D printing capabilities and fostering local innovation ecosystems, shedding light on the significant impact of Florida's manufacturing sector on the state's economy. Manufacturing has notably outpaced key industries, including tourism, agriculture, and transportation, solidifying Florida's standing as a robust manufacturing state.

"Since 2014, the growth rate of GDP [gross domestic product] for manufacturing in the state of Florida has outpaced the growth rate of additive manufacturing in the top eleven states in the U.S.," said Matthew R. Rocco, president of the South Florida Manufacturers Association.

The event took place just months after the introduction of a new FIU lab dedicated to researching advanced manufacturing techniques. Headed by Professor Arvind Agarwal, the Cold Spray and Rapid Deposition Laboratory explores techniques such as cold spray, plasma spray, and wire arc additive manufacturing. It is funded by a five-year, $22.9 million grant from the U.S. Army Combat Capabilities Development Command Army Research Laboratory.

South Florida's additive manufacturing industry has transitioned from a once-fringe sector to a strong force, as evidenced by the substantial growth in GDP and the state's commitment to technological leadership. With a clear trajectory toward becoming one of the top five manufacturing states by 2030, the region's dedication to innovation ensures a promising future marked by a resilient economy, increased average wages, and amplified global trade opportunities.

Apply for a $2000 ITSA Scholarship

Applications for the International Thermal Spray Association's (ITSA's) Scholarship Program will be accepted until August 30. Up to three one-year scholarships worth $2000 each may be awarded. Since 1991, the ITSA Scholarship Program has contributed to the growth of the thermal spray community, especially the development of new technologists and engineers.

To be considered, applicants must meet all of the following criteria:

- Be actively pursuing a postgraduate degree in thermal spray processes (plasma, flame, arc, high-velocity oxygen fuel) or materials at an accredited U.S. university,
- Have at least one year of studies remaining after this year,
- Be recommended by a supervisor/professor of the university they are attending (the student's financial need must be verified by a professor. The student must also be recommended by at least one industrial source), and
- Present an essay about their interest in pursuing a career in thermal spray (maximum of three typed pages).

The application can be accessed at *aws.org/About/Industry-Partners/ITSA/ITSA-Scholarship*. Winners will be announced in the fall.

SSP Joins SEAM for Peening and Protective Coating Solution

Superior Shot Peening (SSP), Houston, Tex., has partnered with Surface Engineering for Advanced Materials (SEAM), Swin-

(From left) Chris Berndt (SEAM), Mollie Blasingame (SSP), Van Blasingame (SSP), and Andrew Ang (SEAM) give a thumbs up for their collaboration.

burne University, Melbourne, Australia. The industrial project focuses on developing peening and protective coating technologies for application in inside diameters of pipelines used in oil and gas industries. The collaboration aims to deliver a solution for addressing corrosion and durability issues in the field.

28th Maintenance Group's Additive Manufacturing Flight Uses Mobile Cold Spray System

A portable cold spray enclosure unit and dust collector sit inside a Mobile Cold Spray System trailer at Ellsworth Air Force Base, S.Dak. (U.S. Air Force photo by Airman 1st Class Dylan Maher)

The 28th Maintenance Group's (MXG's) Additive Manufacturing Flight (AMF) became the first field-level unit to utilize the new Mobile Cold Spray System (MCSS) at Ellsworth Air Force Base, S.Dak., on March 27.

This system is designed to enhance and streamline preventative maintenance of Department of Defense aircraft components. It was developed in partnership with VRC Metal Systems, South Dakota School of Mines & Technology, and the Advanced Manufacturing Program Office from Wright-Patterson Air Force Base.

"With mobile cold spray, we can take this technology to the warfighter," said AMF Director and Chief Dr. Brian James. "We're very excited and honored to work with VRC Metals Systems and the South Dakota School of Mines and Technology to make Ellsworth the first to implement the Mobile Cold Spray System for our airmen."

The MCSS is built from a convex box equipped with various workstations necessary to conduct cold spray techniques and other material testing procedures remotely from a conventional rooted laboratory. Due to its compact design and outfitted dimensions when resting on its trailer platform, the MCSS meets continental United States roadway and cargo plane transportation requirements.

The AMF currently conducts cold spray operations to support preventative maintenance on B-1 aircraft; however, transporting cold spray equipment from the laboratory to the flightline when necessary is not simple.

"Cold spray involves hoses, nozzles, and gas, which can take a significant amount of time to assemble," said Staff Sergeant Chynna Patterson, 28th MXG additive manufacturing lead technician. "Having the mobilized cold spray system accessible means that we can reduce equipment setup time when we need to perform on-site maintenance of the parked aircraft."

With the MCSS being designed, fabricated, and implemented at Ellsworth Air Force Base, the number of mission-capable aircraft will increase. — *Airman 1st Class Dylan Maher, Ellsworth Air Force Base 28th Bomb Wing*

Rice University Students Build Low-Cost Cold Spray Metal 3D Printer Prototype

A team of students from Rice University, Houston, Tex., has developed a cold spray metal 3D printing device that relies on pressure and velocity rather than temperature to create a metal part. Their work could help expand the repertoire of metal additive manufacturing techniques, reducing costs and enhancing the quality of making or repairing one-off complex metal parts.

Team AeroForge members — Eli Case, Julianna Dickman, Garrett French, Galio Guo, Douglas Hebda, Grant Samara, Davis Thames, and Aasha Zinke — used the device to successfully deposit copper, demonstrating the viability and potential of their prototype. The project won an Excellence in Capstone Engineering Award and first place in the Willy Revolution Award for Outstanding Innovation at the annual Huff OEDK Engineering Design Showcase. The project is also the recipient of this year's Hershel M. Rich Invention Award.

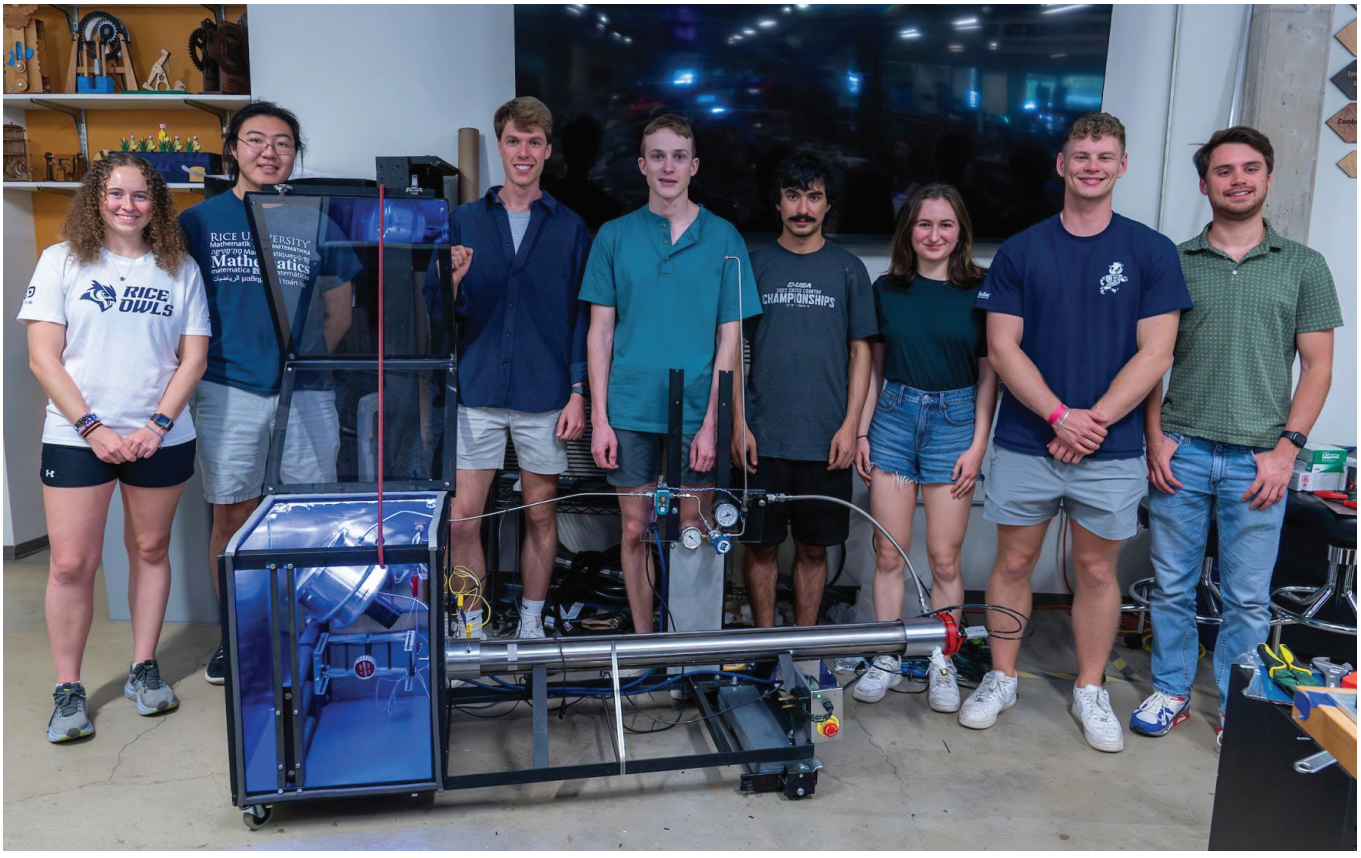
Applications for the device include the manufacture and repair of metal parts with a complex structure, such as components used in industrial assembly lines or vehicles or aircraft. Industries that rely on metal components — automotive, oil and gas, defense — can incur significant losses due to supply chain disruptions, so the team hopes its device can provide a viable, low-cost alternative for making or repairing parts on demand.

The device consists of a gas tank that feeds high-pressure nitrogen gas into the system; controls that regulate valves and monitor pressure and temperature; a pressure vessel that heats the gas to 842°F; a powder feeder designed to dispense metal powder into a nozzle at a precise rate; and a custom nozzle.

Many of the team's efforts focused on reducing costs, because most metal 3D printers can cost over $1 million. Team AeroForge built its device for less than $5000.

"One of our big innovations here is making the system so much cheaper," Samara said. "A lot of our parts were machined in house, for instance the pressure vessel, because that's potentially a very dangerous thing. Other parts, like the nozzle, are proprietary, so it's not something that you can find elsewhere. The nozzle is a very difficult part to manufacture; we had to develop new processes to make it."

Case, who worked on the nozzle and heater design and on the software, said that one of the main takeaways from the project for him was the importance of having people with different areas of expertise working together. Another takeaway was how critical it is to build more room for contingency in the



(From left) Julianna Dickman, Galio Guo, Davis Thames, Douglas Hebda, Grant Samara, Aasha Zinke, Garrett French, and Eli Case stand in front of their cold spray device prototype. (Photo by Gustavo Raskosky/Rice University.)

project timeline. Hebda confirmed that for the team, it had been "pedal to the metal trying to fix the designs that were not going to work."

French, who had a lot of hands-on hardware design experience as part of the engineering design minor, emphasized that "this team is just very motivated — it is a handpicked team, and this is also a student-pitched project . . . We are all people that signed up for a particularly hard project." — *Rice University*

Integrated Global Services Credited for Role in Mega Turnaround

Integrated Global Services (IGS), Richmond, Va., has been recognized as a major contributor to the successful Ras Tanura Refinery (RTR) 2024 mega turnaround and inspection (T&I) for Saudi Arabian Energy Co. (Aramco). The RTR complex is Aramco's largest refinery and the biggest in the Middle East.

The award was presented to IGS at a ceremony on May 7 for its support and efforts in helping lead the RTR 2024 mega T&I.

The RTR turnaround involved over 8000 workers, 6.9 million labor hours, and 5000+ scope items over a multiweek period. It is projected to yield over $26.7 million in benefits for the energy company through enhanced efficiency, optimized fuel consumption, reduced emissions, and other improvements.

(From left) Dennis Snijders, Al Muhannad Al Johani, and Dan Campbell accept the award for IGS's contribution to the success of the Ras Tanura Refinery 2024 mega turnaround and inspection project.

IGS's high-velocity thermal spray cladding technology and Cetek fired heater efficiency coating were highlighted as key innovations deployed during the turnaround. IGS's metal spray technology enhanced the integrity and lifespan of the crude unit desalination column overhead line, while the Cetek coating enhanced efficiency and optimized fuel consumption by 1 million standard cubic feet per day. The coatings also reduced greenhouse gas emissions by 19,722 metric tons per year.

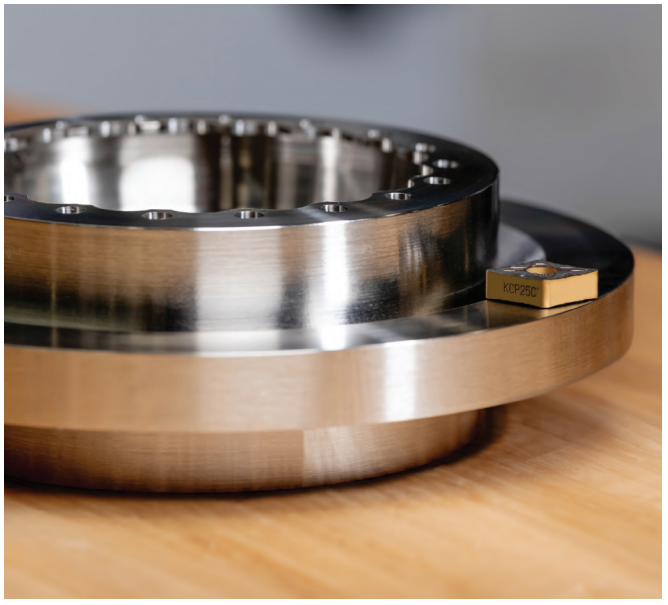
Al Muhannad Al Johani, general manager of IGS Saudi Arabia, said, "At IGS, we believe that true sustainability in the energy sector is achieved through partnership. Our collaboration with Aramco on the Ras Tanura Refinery's 2024 mega turnaround is a prime example of how combining our expertise with our client's objectives leads to groundbreaking results. Together, we've not only enhanced operational efficiency but also set new benchmarks in environmental conservation. This project underscores our commitment to working alongside our clients to forge a more sustainable and efficient future."

Aramco credited proper planning, collaboration, and innovation as critical factors allowing the mega turnaround to be completed safely, ahead of schedule, and with top results compared to global refinery benchmarks.

The incident-free project is being celebrated as a major achievement for Aramco's largest asset and a model for future turnarounds across the company's operations.

Kennametal Enhances Turning Platform with Coated Inserts

Kennametal Inc., Pittsburgh, Pa., has expanded one of its turning platforms with additional inserts. The KCP25C platform features advanced coating technology KENGold™, which improves toughness, abrasion resistance, and consistency.



KENGold coating technology applied to the KCP25C grade insert protects against flank wear, identifies worn or unused edges, and more.

"The KCP25C turning platform has set a new standard with its performance, achieving higher metal removal rates and improved wear resistance," said Scott Etling, Kennametal's vice president of global product management. "Growing the portfolio allows us to support customers' ever-evolving needs and address their toughest machining challenges."

The turning platform now includes additional ISO turning inserts to complete the portfolio, Top Notch™ profiling inserts, and railroad turning inserts.

Leveraging advanced pressing and honing technologies, the company has achieved consistently tight tolerance levels with KENGold, the advanced coating technology introduced last year.

"This next-generation coating technology is multilayer to not only protect against wear but act as a strong thermal barrier and resist chipping for more reliable, increased cutting speeds, higher metal removal rates, and consistent tool life," added Etling.

KCP25C is ideal for roughing, finishing, and medium finishing in general engineering, automotive oil and gas, and wind and solar industries.

Höganäs Honored as Partner of the Year by Mitsubishi Heavy Industries

Höganäs, Höganäs, Sweden, a metal powders producer, received the Partner of the Year award from the gas turbine combined cycle (GTCC) business division of Mitsubishi Heavy Industries (MHI), Tokyo, Japan.

Höganäs's Partner of the Year award recognized the company's stable supply of thermal spray powder for Mitsubishi Heavy Industries' gas turbine.

The Partner of the Year award signifies the collaboration between the two companies, highlighting the synergy, trust, and mutual respect that have defined the relationship between them. Höganäs received the award for its performance regarding quality and supply and the stable supply of thermal spray powder for MHI's gas turbine.

"We are immensely honored to be named Partner of the Year 2023 from the GTCC business division of Mitsubishi Heavy Industries," said Hans Keller, president of coating and brazing technologies. "This award is a reflection of the hard work, dedication, and passion exhibited by every member of our team. It reaffirms our commitment to forging strong partnerships and exceeding the expectations of our customers."

BY SCOTT McLAUGHLIN

How a BUSINESS PLAN Can Help You Make the Best Decisions for Your Coating Job Shop

I work with a lot of job shops that, for the most part, are also small businesses. A question I often get is, "Which spray process is the best and what equipment should I buy?" That might seem like a simple question but it's not. Should a shop consider high-velocity air fuel (HVAF) or high-velocity oxygen fuel (HVOF)? Laser cladding? How about twin wire arc vs. combustion flame spray? Maybe cold spray? There are many options, and so the question should really be, "what spray process makes the most sense for my business and customer?" Business owners want to make an investment that will return the most profit and business growth.

I stress to my customers they need to build, buy, or install processes that their customers will buy. While HVAF has a lot of impressive benefits, if it doesn't produce a coating that your customers will buy, it is not a good fit for your business. Don't do ready, fire, aim. Writing a business plan is the best formula for deciding any capital expense, including adding a spray cell — Fig. 1.

Writing a business plan is not as hard or time-consuming as one might think. You can also write a mini plan for a specific project. A full-blown macro business plan is not always necessary or helpful. Going through the process of developing a plan is the most sure-fire strategy to ensure the project will be a financial winner and grow sales with happy customers.

Fig. 1 — Writing a business plan is the best formula for deciding any capital expense, including adding a spray cell.

Business Plan Segments

There are four key segments to a traditional business plan — an executive summary, a financial plan, an operations plan, and a sales and marketing plan. This article will lay out details on how to develop each section with a coating job shop in mind. We'll start with the sales and marketing plan because it includes the voice of the customer.

Sales and Marketing

The primary output of the sales and marketing plan is how much additional sales revenue the addition produces. This is where the voice of the customer comes in. Getting feedback from your customers by asking them what they want or need from your shop is important.

Dan McQuiston, a professor emeritus of marketing at Butler University, said, "Make it a point to collaborate with customers to reach a successful solution. Working with customers to reach a successful solution gives them a sense of psychological ownership. They'll feel like the decision is theirs. So, ask them, 'What is the most important coating product you want from a coating shop?' And then build on the two to three things they tell you."

It's also important to get input from your company's inside sales representatives. Are customers needing parts coated that are larger and heavier than the company's current capabilities? Is the customer needing a quicker turnaround time or lower prices? If you only have HVOF and your customers are asking for lower prices maybe a more economical spray process is an acceptable substitute for HVOF. For instance, twin wire arc is much less expensive to operate than HVOF and, in many cases, will produce a coating that will perform nearly as well. Does the customer specify a specific spray process? Many customer engineering drawings specify HVOF, so using twin wire arc or HVAF would not be an option even if it would produce a better performing or less costly coating.

In summary, step one of a sales and marketing plan is to survey your customers and sales team to get an idea of what customers need for coating services. Then, figure out the estimated increase in annual sales that process will bring and save it for the financial plan. Next, figure out how to take the new process to market. This will include training your sales team on how to sell the new process to their customers, what sales tools (like literature and coating samples) they will need, and where to look for prospective clients that need this service.

Financial

There are two main components of the financial plan. Credits (sales revenue) and debits (capital expense costs and variable per part cost). Take the annual sales revenue estimated from the sales and marketing plan and subtract all the capital costs like a new spray booth, dust collector, spray system, and automation as well as variable part costs for powder and gases. If the resulting number is positive, you may have a winner. Next, you need to compare it to other projects to see if it is the best option.

Calculating a return on investment (ROI) and payback period are the key measurements of any capital project. If the ROI percentage is greater than 10%, that means you can make more money with the capital investment than just taking the same cash and investing it in the stock market. If the payback period is less than one year, it is also most likely a winner. Most successful companies and specifically large corporations have ROI and payback period standards that must be met before a project can be considered. A project that pays back the initial investment in three months or less is a solid winner and should

Fig. 2 — Some spray processes could require additional dust collector capacity, while others could use existing exhaust systems.

move forward. A project that pays back in two or more years presents a greater risk and should only be undertaken if that risk can be greatly reduced or eliminated. One way to reduce risk is to enter into a supplier contract with your customer where they agree to source their coatings from your shop for a set number of years.

Because funding at most companies is finite, various projects can be compared and ranked using ROI and payback period. Projects with higher ROI and shorter payback periods would be prioritized ahead of other projects and then approved by management/ownership for getting precious capital funding. This all but guarantees financial success with data-driven decisions.

Operations

Next is the operations plan, which entails listing and reviewing all the extra needs that producing coatings with the new spray process/cell may bring. This could include hiring additional spray technicians, training existing spray techs, creating job instructions, safety considerations, sourcing consumables, generating quality standards, and more. Some spray processes could also require additional dust collector capacity, while others could get by with using existing exhaust systems — Fig. 2. HVAF and HVOF generate a lot of heat (BTUs), and existing dust collectors may not provide enough exhaust air volume to prevent the dry cartridges from becoming burnt, which ruins their filtering capability. If spraying materials will produce a dust that is highly explosive (high KST value), the type of dust collector may need to be altered.

Another consideration is if the spray booth/sound enclosure is capable of keeping the noise outside the booth below Occupational Safety and Health Administration (OSHA) standards. HVAF and HVOF can both exceed 126–136 dBA at the device. Thermal spray processes are high-frequency noise generators. If the spray booth doors no longer close tightly, noise can leak out and affect spray operators. That may necessitate adding a new spray booth to the capital expense ledger. The operations plan will identify ancillary equipment that will be necessary and thus should be included in the cost roll up.

Executive Summary

The executive summary portion of the business plan should be written last. It will be used by lenders, upper management, and ownership to decide whether the project should be funded. It will summarize the results of the other three segments and how they dovetail. Assumptions and risks can be flagged in this section, too. ROI and payback period are major financial indicators that will be key in evaluating the financial benefit of the project and should be highlighted in the executive summary. Finally, the executive summary should make the case for moving forward or not with the project.

Conclusion

Investing in any capital project solely because you can get a good deal on it (like used equipment) is risky and a poor business practice. It may turn out to be profitable, but it could also backfire. When investing in new or used equipment, I recommend stacking the deck in favor of making a profit at the end. Make a plan and work it. If your company is short on human resources needed to write a business plan, consider hiring a college student as an intern. MBA programs at colleges often need projects and may take on your business plan as their capstone project. Developing and writing a business plan will ensure your business invests in projects that will give your company the best chance at financial success.

SCOTT McLAUGHLIN (*info@mclaughlinthermalspray.com*) is a principal at McLaughlin & Associates Thermal Spray Inc., Indianapolis, Ind.

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2023 ITSA Scholar Sees the Limitless Role of THERMAL SPRAY

Abhijith Kunneparambil Sukumaran from Florida International University (FIU), Miami, Fla., was selected as a 2023 ITSA scholarship recipient for his research and dedication to the thermal spray industry. He is a PhD candidate and graduate researcher in the Mechanical and Materials Engineering (MME) Department at FIU, working in the Plasma Forming Laboratory (PFL) and the Cold Spray and Rapid Deposition (ColRAD) Lab.

After earning his bachelor and master of technology in mechanical engineering from Mahatma Ghandi University and the College of Engineering Trivandrum, respectively, both in India, Sukumaran was drawn to the thermal spray world. He was attracted to its "scalability, adaptability, and economic significance . . . across various industries."

For the past two years, Sukumaran has been engaged in plasma-sprayed metallic composite coatings research. Beyond coating development, he focuses on testing for abrasive and erosion wear and radiation resistance. His research includes advanced surface engineering and tribological studies, which led to a project with two NASA centers: NASA Marshall Space Flight Center, Huntsville, Ala., and NASA Langley Research Center, Hampton, Va.

"I am developing APS [atmospheric plasma spray] and VPS [vacuum plasma spray] composite coatings with enhanced wear, erosion, and radiation-resistance properties, making them ideal for lunar rovers," he explained.

The project's coatings have been selected for Materials International Space Station Experiment-17 (MISSE-17) exposure testing at the International Space Station, where Sukumaran's samples will be evaluated in the extreme space environment.

"The potential real-world applications of this technology and its significance in enhancing aerospace materials resonated deeply with me," Sukumaran said. "My work with NASA showcased the practical implications of research and underscored the importance of pushing the boundaries of scientific understanding to solve real-world challenges."

Sukumaran's work is not going unnoticed by the thermal spray research community or FIU.

"Our work has gained recognition in esteemed publications, leading to submissions for patents and research articles," he shared. "I was also honored with the FIU Outstanding Graduate Project Award for my PhD project for 2024. The award recognizes students whose single, significant creative projects demonstrate excellence in their academic discipline."

His skills and active involvement in thermal spray research have earned him other honors as well, including serving on ASM International's Thermal Spray Society Board of Directors from 2022–2024. Additionally, as a member of Material Advantage FIU, Sukumaran organizes events and fosters students' interest in materials engineering and research.

"I aim to contribute to the expansion and evolution of this field to make a meaningful impact in the realm of advanced materials," he said. "I am committed to disseminating the advancements and achievements of our research and thermal spray technologies."

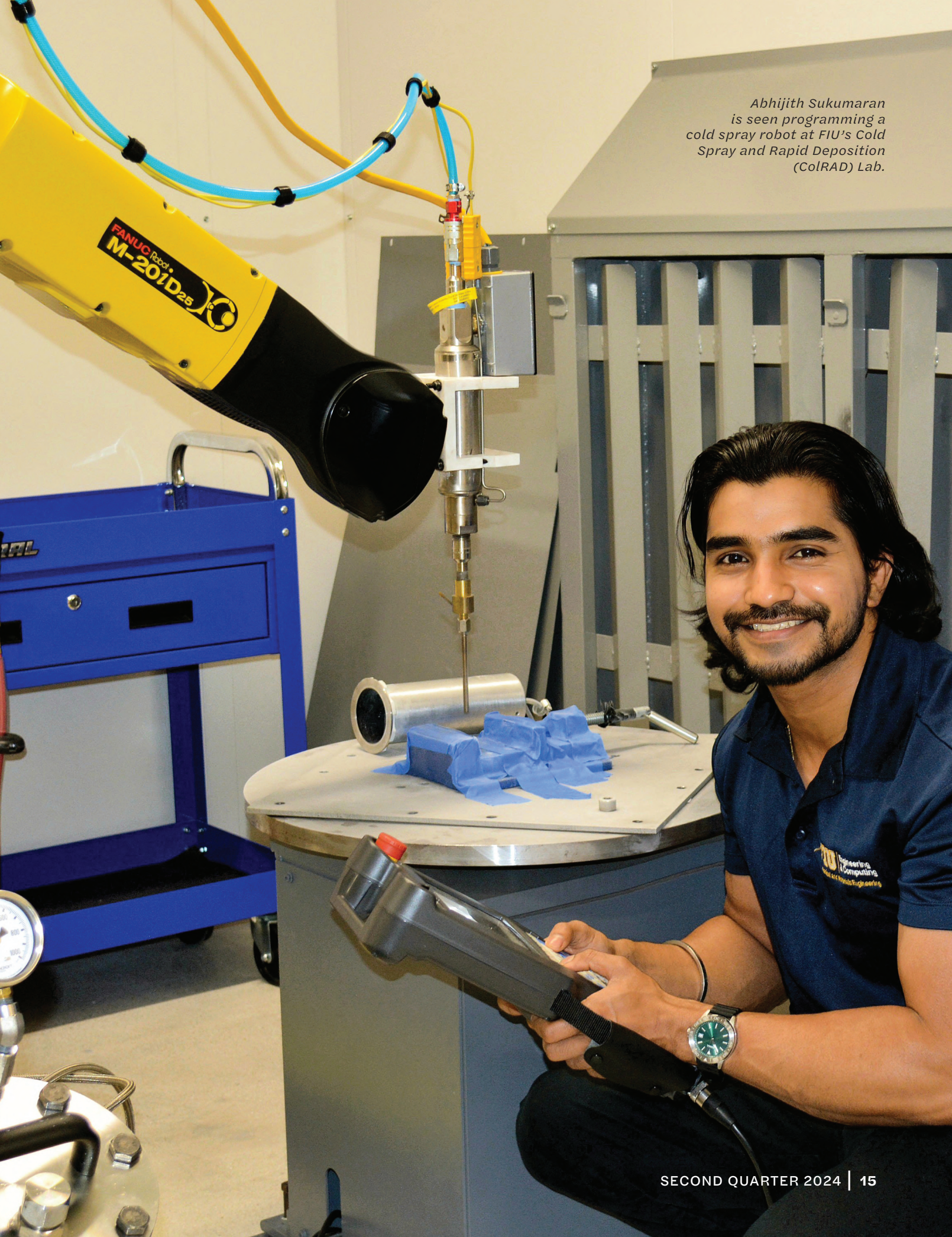
Sukumaran plans to work in the aerospace field with a focus on thermal spray technology to develop smart materials for extreme environments. But in the meantime, he's eager to learn advanced techniques such as cold spray and wire arc additive manufacturing at FIU's ColRAD Lab.

Sukumaran is grateful for his opportunities and recognition.

"I can shape the trajectory of the industry by leveraging new technologies, driving research initiatives, and fostering collaboration within the community," he said.

To future thermal spray students, Sukumaran advised, "Build a strong foundation in materials science and manufacturing processes. Explore internships and hands-on experiences in labs with thermal spray equipment. Stay open-minded about diverse applications across industries and embrace networking to establish relationships and future opportunities."

Sukumaran was one of two recipients of the 2023 ITSA scholarship. The second was Tyler Kleinsasser, a student at South Dakota School of Mines and Technology, Rapid City, S.Dak. Kleinsasser was also a 2022 recipient.



Abhijith Sukumaran is seen programming a cold spray robot at FIU's Cold Spray and Rapid Deposition (ColRAD) Lab.

AWS Releases New Thermal Spray Standard

C2.19/C2.19M:2023, *Specification for the Application of Thermal Spray Coatings to Machine Elements for OEM and Repair*, defines requirements for thermal spray coating systems for original equipment manufacturers (OEMs) and repair applications. Included are high-velocity oxygen fuel coatings that can be used as an alternative to hard chrome plating. The essential equipment, procedures for surface preparation, and the application of specific thermal spray coatings and sealers are detailed with in-process quality control checkpoints. This standard also presents management requirements and procedures for qualification, procedure approval, and documentation. Also covered are approved applications for thermal spray processes for OEMs and repair of machinery components, along with minimum training requirements for thermal spray operators and inspectors. This specification has several annexes on safety, protocols for the U.S. Navy shipboard machinery, bend testing, and bond testing.

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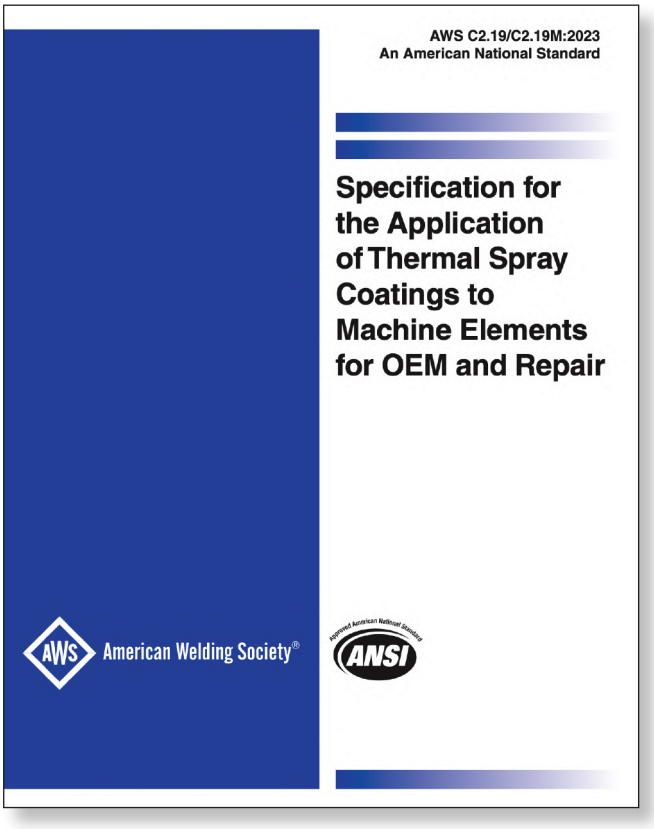

Thermal Spray Equipment Rises in the Global Market

Thermal Spray Equipment Market Size & Share Analysis — Growth Trends & Forecasts (2024–2029) estimates the market size to be at $413.46 million in 2024 and is expected to reach $530.46 million by 2029, growing at a compound annual growth rate of 5.11% during the 2024–2029 forecast period. The market was negatively impacted in 2020 because of the COVID-19 pandemic. The nationwide lockdowns and stringent social distancing mandates caused supply chain disruptions across various markets. However, in 2021, the demand from various sectors recovered and is expected to grow at a significant rate in the coming years. Major factors driving the market study are the rising popularity of thermal spray ceramic coatings, the increasing use of thermal spray coatings in the aerospace industry, and the evolution in the power generation sector. Additionally, current progress in solution precursor plasma spraying of cermets, advancements in the cold spray process, the emergence of high-velocity oxygen fuel coatings and systems, and growth prospects for twin wire arc thermal spraying systems are expected to offer various opportunities for the growth of the market studied. The Asia-Pacific region is expected to dominate the global market during the forecast period.

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Thermal Spray Coatings Market Valuation to Hit $16.22 Billion by 2032

Thermal Spray Coatings Market Share, Size, Trends, Industry Analysis Report, By Product (Flame Spray, Plasma Spray); By Material; By Application; By Region; Segment Forecast, 2024–2032 reveals the thermal spray coatings market size was projected to be valued at $10.9 billion in 2023 and is expected to rise to $16.22 billion by 2032. The market is expected to register a compound annual growth rate of 4.5% during the forecast period. Various factors are propelling the demand for thermal spray coatings, including the growing augmentation of thermal spray coatings. Additionally, the market is expanding because of a transference in consumer inclination from conventional chrome plating to thermal spray coatings. Key players in the thermal spray coatings industry are installing varied policies to obtain their objectives. The market segment is based on type, material, application, and region. By type analysis, the flame spray coatings segment accounted for the largest thermal spray coatings market share owing to the procedure, which utilizes an amalgamation of fuel gas and propellant gas to liquefy the coating substance before administering it to the substrate surface. By material analysis, the metals and alloys segment held a significant revenue share owing to their resistance to abrasion, robustness, and thermal attributes, which make them broadly utilized in domains such as energy, automotive, and aerospace.

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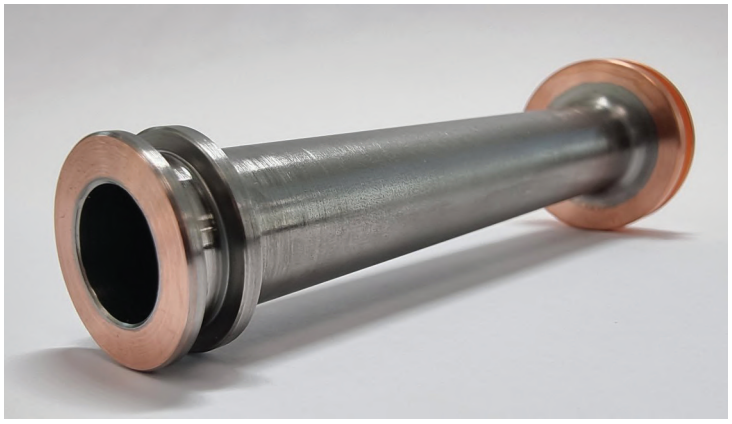

Hardide-Coated HVOF Copper Nozzle Extends Life by up to 40 Times

The JP-5000 4-in. copper nozzle can be used in high-velocity oxygen fuel (HVOF) thermal spray coating. The tungsten/tungsten carbide-based Hardide chemical vapor deposition coating will extend the operational life of HVOF thermal spray copper nozzles by 5 to 40 times when spraying carbide or metallic-based powders. The ready-coated nozzles include O-rings suitable to withstand the higher temperatures generated in longer periods of service. The coating's extremely hard and homogeneous properties minimize pickup inside the nozzle when spraying metallic materials. This prevents material dislodging and forming a defect in the HVOF coating, improving coating quality and reducing downtime and the cost of spraying. Moreover, the nozzle can be exchanged less often, which decreases the risk of breaking the water circuit. The lack of nozzle clogging reduces the likelihood of spits or unmelted agglomerations of powder becoming embedded in the spray coating, thereby eliminating the need for rework. The Hardide coating is compatible with a range of coating materials used in HVOF processes, enabling seamless integration with existing coating systems.

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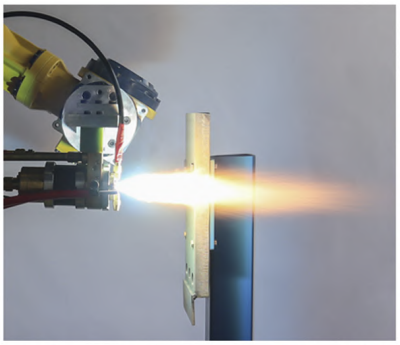

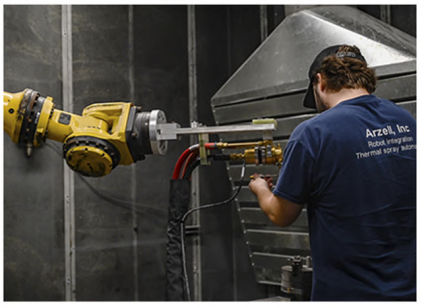

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