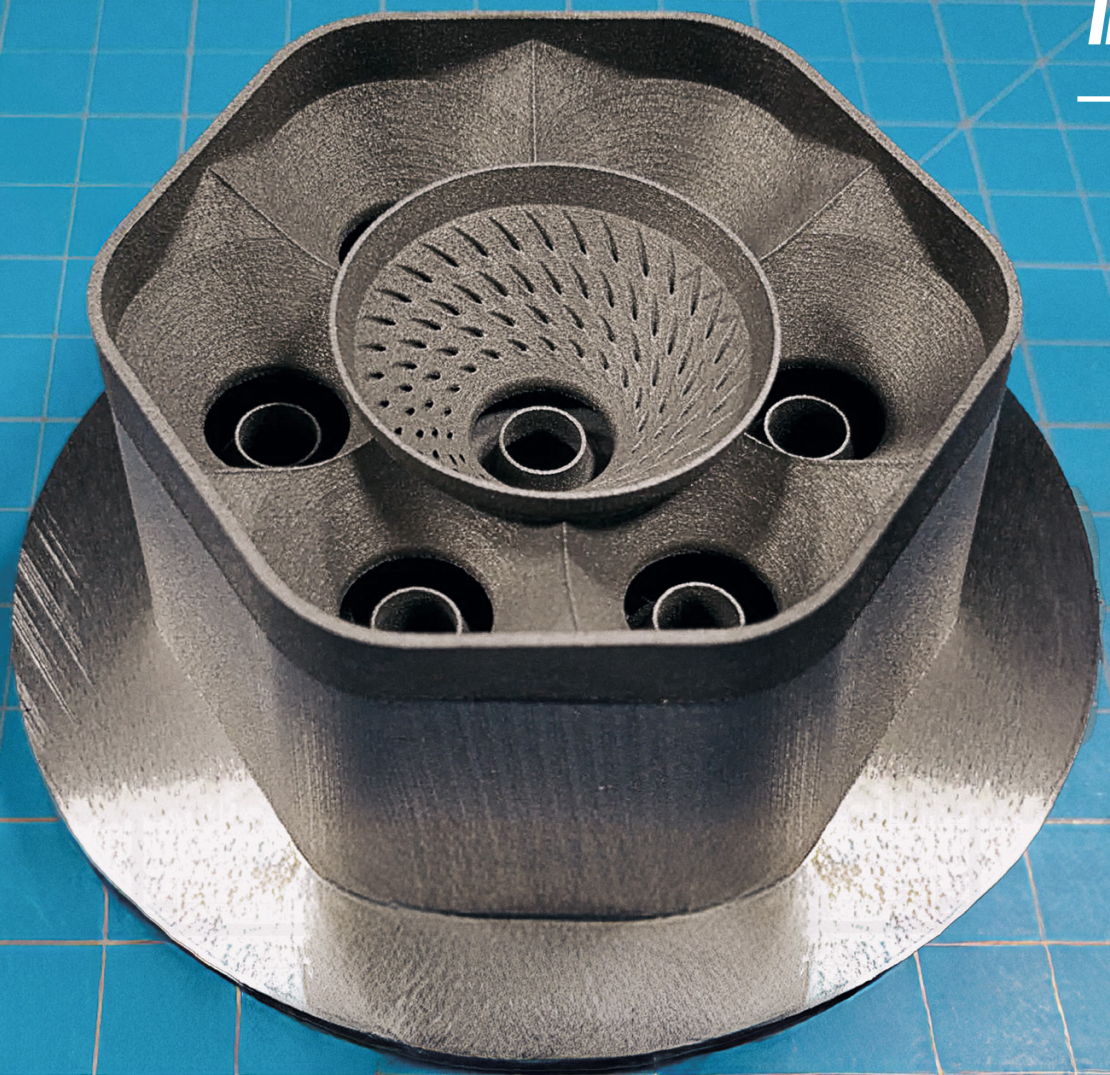
THIRD QUARTER 2025 | VOLUME 32

SPRAYTIME

INTERNATIONAL THERMAL SPRAY ASSOCIATION

AWS



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On the cover: This turbine engine combustor (fuel-air mixer) was 3D printed at NASA Glenn, Cleveland, Ohio, and is one example of a challenging component that can benefit from applying the new GRX-810 alloys. (Credit: NASA.)

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

Kirk Fick
Chair

With the 2025 ITSA Annual Meeting and Symposium fast approaching, I'm excited to share updates on what's ahead for our association. This year's event will be held November 10–12 at the Pere Marquette Hotel in Peoria, Ill., in partnership with AMPP. Our program will spotlight mining, agriculture, and overhaul/repair applications, three areas where thermal spray continues to provide real, measurable value. I'm especially pleased that Dan Sordelet of Caterpillar will be our keynote speaker, and attendees will have the chance to tour a Caterpillar production facility, offering a behind-the-scenes look at how coatings support modern manufacturing in heavy equipment.

As we prepare for Peoria, I also want to remind everyone of the upcoming 2025 ITSA Scholarship deadline on October 30. This is an important opportunity to support graduate students pursuing careers in thermal spray or related fields. Please take a moment to encourage qualified applicants in your network; it's one of the best ways we can invest in the future of our industry.

Another way you can contribute is by sharing your expertise through *SPRAYTIME*. Submitting articles, case studies, or updates is free and helps showcase the work being done across our community. Upcoming issues will focus on:

- Q4 (December 2025): Thermal spray powders
- Q1 (March 2026): Thermal spray repair

Contributions are typically due about two months before publication. For details on submissions and advertising opportunities, please get in touch with Cindy Weihl (*cweihl@aws.org*).

Thank you all for your continued support of ITSA. I look forward to seeing many of you in Peoria this fall as we come together to share ideas, strengthen connections, and advance the impact of thermal spray technology.

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.

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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*.

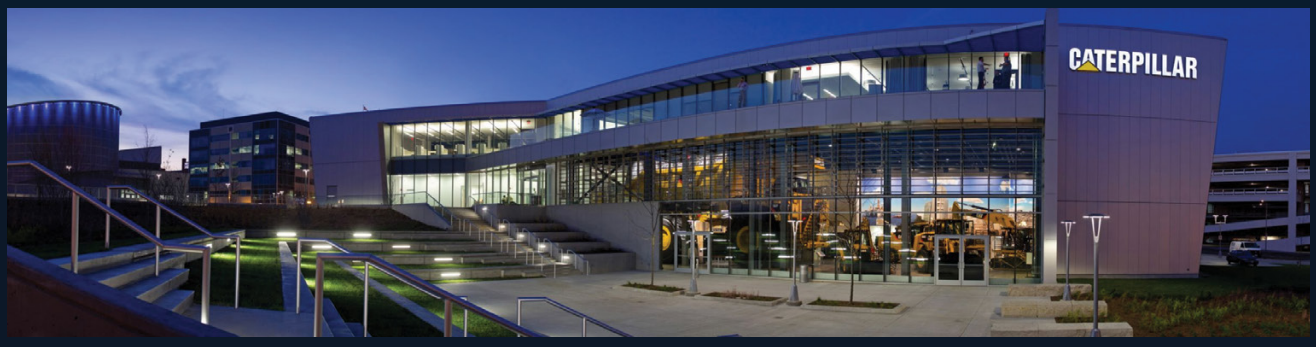
ITSA 2025

ANNUAL MEETING & SYMPOSIUM

November 10-12 | Peoria, IL

In partnership with AMPP and hosted by ITSA.

Join thermal spray industry leaders for two days of insights, innovation, and networking.



Exclusive tour of Caterpillar's Peoria Facility Included!

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Oerlikon Breaks Ground on New Production Hub

Oerlikon, Pfäffikon, Switzerland, has begun construction on its new production center for thermal spray systems and coating services at Campus Reichhold in Aargau, Switzerland.

The new facility will bring together approximately 250 employees currently located at three separate Swiss sites. The consolidated campus will integrate research and development, engineering, production, and customer services into a single hub. Construction of the facility is expected to be completed in Q4 2026, and operations are expected to commence in Q1 2027.

"This investment reflects our long-term commitment to Switzerland, where our roots run deep," said Dr. Michael Suess, executive chair of Oerlikon. "The new Campus Reichhold will be instrumental in advancing our aerospace and general industry businesses by unifying the entire value chain in one collaborative environment. It also reinforces our position as an attractive employer in the region."

The center will primarily serve customers in the aerospace, automotive, and general industrial markets. Among its features is a unique test rig for aerospace turbine components — a key asset for validating next-generation thermal spray coatings under real-world conditions.

Construction has begun on Oerlikon's new center for thermal spray and coatings, expected to open in Q1 2027.

At Campus Reichhold, Oerlikon will develop the next generation of thermal spray technologies (coatings and equipment) and laser-based technologies (directed energy deposition). Those developments will improve heat resistance, durability, and corrosion protection in high-performance components.

Sustainability will be a core focus of the new campus, with initiatives to reduce environmental impact across energy use, mobility, and resource management.

FRCSW Wins People's Choice Award for Cold Spray Technology

Fleet Readiness Center Southwest (FRCSW), a U.S. Navy maintenance, repair, and overhaul facility located at Naval Air Station North Island in Coronado, Calif., received the People's Choice Award at the 2024 Maintenance Innovation Challenge (MIC) for its presentation on cold spray technology.

The competition, held during the Department of Defense Maintenance Symposium in Salt Lake City, Utah, showcased five finalists presenting solutions to improve military sustainment and readiness. Attendees selected FRCSW's cold spray technology as the standout innovation.

"Cold spray is revolutionizing how we maintain and sustain fleet readiness," FRCSW Materials Engineer Matthew Chu said during the presentation. "It's a practical, cost-saving solution that addresses immediate repair needs and enhances long-term operational efficiency."

Cold spray has proven to be a game-changer for the Navy. It restores components previously deemed irreparable while improving fleet readiness and reducing reliance on limited supply chains. This technology has already repaired hundreds of parts and optimized procedures to ensure consistent quality.

As a People's Choice Award winner, FRCSW received $50,000 of in-kind support from the National Center for Manufacturing Sciences to further demonstrate and advance this innovative technology.

Wall Colmonoy Establishes Facility in Suzhou, China

Wall Colmonoy, Madison Heights, Mich., has opened Wall Colmonoy (Suzhou) Co. Ltd., a new facility in Changshu City, Suzhou, China. Formed as a joint venture with long-standing partner Gredmann Taiwan Ltd., the facility expands the company's manufacturing presence in the Asia-Pacific region.

"We're bringing our global expertise closer to our customers to deliver local solutions," said Nick Clark, president of Wall Colmonoy. "In an increasingly complex and regionally driven world, this approach helps us respond faster, improve service, and build greater resilience into our global supply chain."

The facility provides shorter lead times, reduced transit time for products, in-region technical support and training, and local production of Wall Colmonoy products.

Wall Colmonoy (Suzhou) Co. Ltd., located in Changshu City, China, will support Asian markets.

"As Asia continues to grow, having a local presence allows us to deliver faster, more responsive service," said Lydia Lee, general manager of the new facility. "With Wall Colmonoy Suzhou, we're better positioned to collaborate with customers, accelerate product development, and ensure optimal quality and performance in-region."

Titomic USA Expands Operations with New Global Headquarters

Titomic Ltd., a provider of cold spray additive manufacturing technology, has opened its new global headquarters in Huntsville, Ala. This milestone marks a significant expansion of Titomic's U.S. operations.

The 59,000-sq-ft Huntsville facility will support commercial and defense initiatives with advanced production capabilities, live equipment demonstrations, and regional training and customer support. It will be the only location where all Titomic Kinetic Fusion™ products are manufactured.

The ribbon-cutting ceremony, which was held on June 2, was attended by government officials, defense and aerospace industry personnel, and local partners. Following the ceremony, guests participated in live demonstrations of Titomic's systems.

The Huntsville facility has active partnerships underway with large defense primes and government agencies to produce critical components, such as titanium pressure vessels, domes, launcher coatings, and space-grade shielding.

Fraunhofer IWS Scientist Receives TSS President's Award

Dr. Filofteia-Laura Toma was honored with the TSS President's Award for Meritorious Service. (©Fraunhofer IWS)

Dr. Filofteia-Laura Toma, senior research scientist at the Fraunhofer Institute for Material and Beam Technology IWS in Dresden, Germany, has been named the recipient of the 2025 TSS President's Award for Meritorious Service. Presented by the U.S.-based Thermal Spray Society (TSS), the award honors her scientific excellence and long-standing leadership within the international materials engineering community.

Toma is an expert in thermal spray processes for high-performance ceramic and hardmetal coatings. At Fraunhofer IWS, she leads the development of advanced coating technologies for functionalizing fiber-reinforced composites and lightweight structures, which are key to applications in aerospace, energy, and mechanical engineering. Her current research focuses on combining laser structuring with high-velocity oxyfuel spraying and suspension plasma spraying. She also investigates suspension-based laser cladding to develop customized coatings for thermal barrier coating and hydrogen-related applications.

Beyond her lab work, Toma plays a vital role in shaping the global thermal spray community. She serves on the TSS board of directors. Furthermore, she has actively contributed to the *Journal of Thermal Spray Technology* (JTST) and ASM-TSS events for over a decade. Her editorial responsibilities have grown steadily, including roles as coeditor and guest editor for the *Proceedings of the International Thermal Spray Conferences* and JTST special issues. She also supports the TSS organizing committees and cofounded the TSS initiative Women in Thermal Spray. In addition, she serves on several national and international advisory and scientific boards.

"This award recognizes not only an outstanding scientist but also a dedicated bridge builder between research, application, and professional networks," said Christoph Leyens, director of Fraunhofer IWS. "We are proud to have Dr. Toma among us, a colleague who is continuously advancing thermal coating as a key technology for next-generation engineering."

The Future of Aerospace: NASA Glenn's GRX-810 Alloy

Now Available for Commercial Users

Various components built using GRX-810 (from left to right): Regeneratively-cooled nozzle, impinging injector, and combustor dome. (Courtesy NASA/AIAA SciTech 2024.)

Superalloys are known for their strength and corrosion resistance at elevated temperatures. They are often used in demanding environments. Thermal spray coatings further enhance these properties, allowing for higher operating temperatures and improved efficiency.

Developed by NASA's Glenn Research Center (GRC), Cleveland, Ohio, GRX-810 is a revolutionary, high-temperature alloy purpose-built for additive manufacturing (AM). It promises unprecedented performance in aerospace propulsion systems operating at high temperatures — the type of application where traditional superalloys have reached their limits.

Linde Advanced Material Technologies (Linde AMT) has played a critical role in scaling GRX-810 from a research breakthrough into a commercially available product, making it accessible for original equipment manufacturers (OEMs), designers, and engineers building the next generation of aerospace systems.

The Need for a Breakthrough Material

In propulsion and thermal systems — where temperatures routinely exceed 1000°C (1832°F) — materials must offer more than strength; they must deliver phase stability, oxidation resistance, and durability under extreme cyclic conditions. Traditional superalloys such as Inconel® 718 have been reliable but are being pushed to the edge of their performance capabilities.

Recognizing this challenge, NASA GRC embarked on a materials development initiative in 2018 to engineer an alloy that could overcome existing materials' thermal and mechanical limitations while remaining suitable for additive manufacturing. That effort resulted in GRX-810, a medium-entropy alloy (MEA) composed primarily of cobalt (Co), chromium (Cr), and nickel (Ni) in near-equal parts.

GRX-810 is also an oxide dispersion strengthened (ODS) alloy, reinforced with nano-scale ceramic oxide particles that are uniformly dispersed throughout

its microstructure. This advanced composition gives GRX-810 extraordinarily high-temperature properties and the structural stability necessary for complex geometries printed via AM processes.

High Performance at Elevated Temperatures

In 2022, NASA released groundbreaking, property data on GRX-810 that caught the attention of the global materials community. Compared to Inconel 718, GRX-810 offers two times the tensile strength, two times the oxidation resistance, and 1000 times the creep rupture life. These metrics are validated at operating temperatures of 1093°C (2000°F), where conventional materials quickly degrade. With this level of performance, GRX-810 opens doors for long-life, high-reliability components such as combustor domes, fuel injectors, nozzles, and torch tubes — all of which are critical in propulsion systems for aircraft and space vehicles.

Linde AMT's Collaboration with NASA

Bringing GRX-810 to the commercial market required more than a scientific breakthrough; it needed a partner with expertise in powder metallurgy, AM-specific atomization processes, and aerospace-grade quality standards. In 2023, NASA and Linde AMT initiated licensing discussions to collaborate on the scale-up and commercialization of GRX-810.

This partnership culminated in a licensing agreement in 2024, formally recognizing Linde AMT as a commercial partner for GRX-810 powder production and distribution.

Linde AMT's atomization facility in Indianapolis, Ind., is fueling the next generation of materials for critical industries.

As a global leader in vacuum induction melt argon gas atomization (VIM-AGA) technology, Linde AMT was uniquely positioned to take GRX-810 from bench-scale batches to commercial-scale powder production. With over five million pounds of powder atomized annually across multiple VIM units, and a robust infrastructure for AM-grade spherical powder production, they had the resources and technical capabilities to bring GRX-810 to market without compromise.

Enabling the Future of Aerospace

For engineers and design teams, GRX-810 represents a new design envelope that supports the creation of lighter, more durable, and more efficient components in various aerospace platforms.

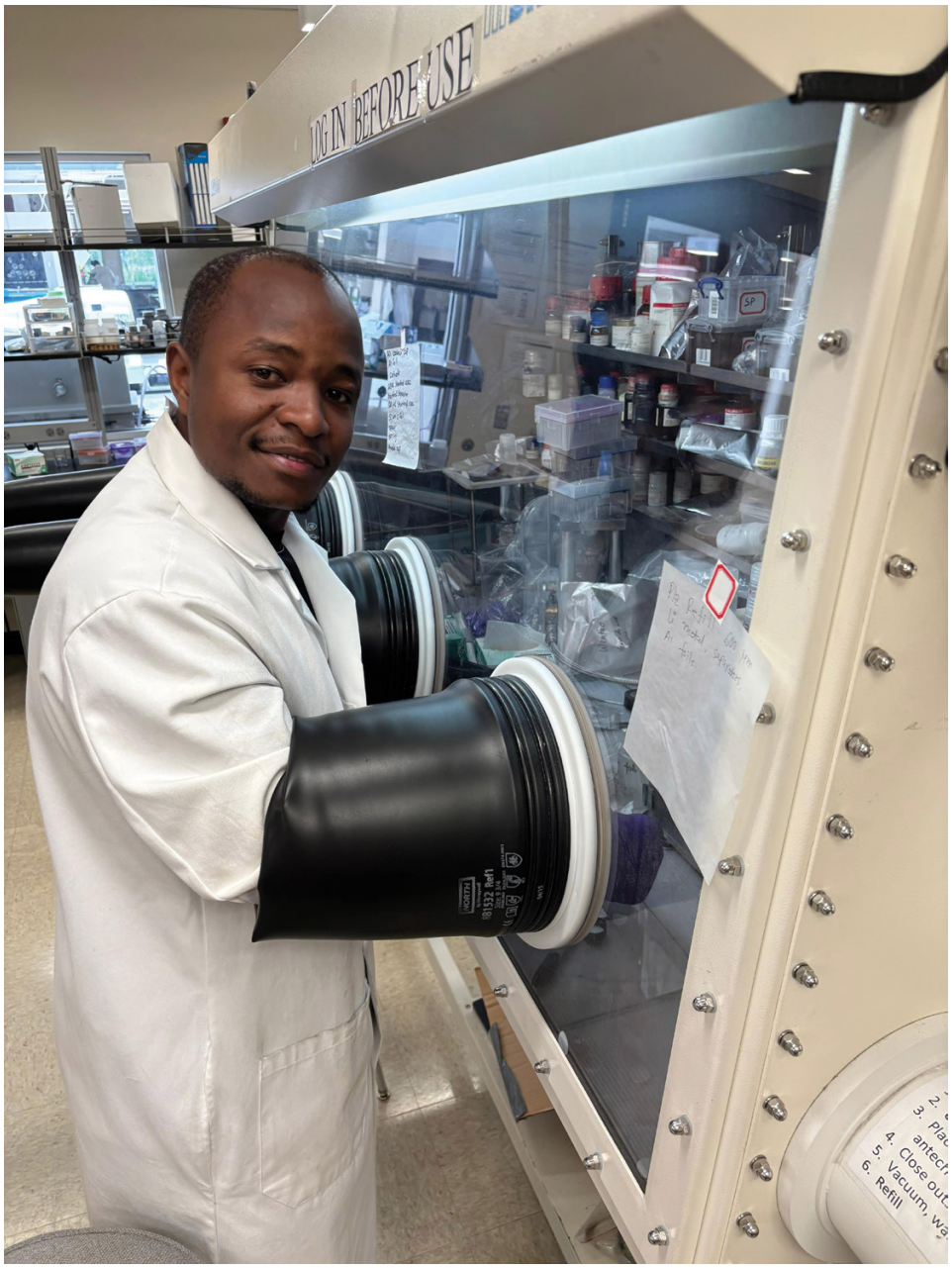
Its superior resistance to thermal fatigue and oxidation can extend service life, reduce maintenance costs, and contribute to more sustainable aerospace operations. It also paves the way for innovations in hypersonic flight, advanced propulsion systems, and space exploration missions — all of which demand materials that can perform under the most extreme conditions known to engineering.

For more information about GRX-810 powders and how to incorporate them into your AM or coating applications, visit *linde-amt.com/AM*.

This article was written by the Additive Manufacturing (AM) Group, Linde Advanced Material Technologies.

BY CINDY WEIHL

Global Ambitions Drive Tanzanian ITSA Scholarship Recipient



For Proches Nolasco Mkawe, a young engineer from Tanzania currently pursuing a master's degree in mechanical engineering at Binghamton University, State University of New York (SUNY), Binghamton, N.Y., receiving a 2024 ITSA Scholarship means more than just financial aid.

"[This scholarship] represents a gateway to networking with industry experts, accessing specialized resources, and participating in conferences that will further hone my skills. Being part of the American Welding Society community will expose me to cutting-edge research and foster connections that are essential for my growth as an engineer," said Mkawe.

Scholarship Support Opens New Doors

Financial constraints initially made pursuing advanced studies in the United States a significant challenge for Mkawe. Fortu-

2024 ITSA Scholarship recipient Proches Nolasco Mkawe is pictured in the dry room at the Innovative Technology Center at Binghampton University. Mkawe explored battery technology there this summer.

nately, receiving a 2024 ITSA scholarship not only alleviated some of the financial burden but also provided him with the resources to fully engage in research and professional development activities related to thermal spray.

"Receiving the ITSA scholarship was an incredibly good feeling. It not only acknowledged my academic efforts but also provided vital financial support that eased the burden of my studies . . . I am committed to leveraging this support to maximize my learning and make significant contributions to the thermal spray community," he said.

Finding a Passion for Thermal Spray

Mkawe earned a bachelor's in mechanical engineering from Dar es Salaam Institute of Technology in Tanzania, which equipped him with a strong foundation in materials processing and surface engineering. Throughout his studies and professional work, he has been particularly drawn to how thermal spray techniques enable advanced coatings for wear resistance, corrosion protection, and thermal management. The capabilities of thermal spray in aerospace, automotive, and renewable energy are sectors he is passionate about.

"Thermal spray coatings will offer a solution to sustainability challenges by enhancing the longevity and performance of critical components. I envision a career where I can apply these technologies to develop durable, high-performance materials that can withstand harsh environments while reducing resource consumption. At SUNY Binghamton, I am focused on how thermal spray coatings can be optimized for applications in energy systems, contributing to the development of more efficient and environmentally friendly technologies," he shared.

Mkawe is particularly fascinated by the versatility of thermal spray technology in improving surface properties and extending the life of components across various industries. One of the challenges lies in understanding the complex interactions between process parameters and coating properties, which requires a deep technical grasp and precision.

Since receiving the scholarship, Mkawe has been fully engaged in his graduate coursework, deepening his understanding of materials and manufacturing processes. He has also been actively seeking ways to get involved with ITSA, identifying areas where he can contribute meaningfully through academic involvement, research interests, and future professional goals.

"My focus has been on aligning my academic efforts with ITSA's mission and exploring how I can support the thermal spray community through research, collaboration, and potential volunteer opportunities," he stated.

Looking Ahead and Giving Back

Mkawe will graduate in May and hopes to significantly impact the industry.

"I'm especially interested in roles that allow me to develop high-performance coatings for aerospace or biomedical applications. I would also be open to academic positions where I can continue contributing through research and mentoring . . . I chose to pursue further education to deepen my expertise in manufacturing and materials engineering, with the goal of contributing to innovative and sustainable solutions in the field," he said. "My ultimate goal is to return to Tanzania and apply the knowledge I gain to improve manufacturing processes and energy systems in my home country."

"My ultimate goal is to return to Tanzania and apply the knowledge I gain to improve manufacturing processes and energy systems in my home country."

Carrying Forward a Legacy of Innovation

Being an ITSA scholarship recipient is an honor and responsibility for Mkawe. He feels motivated to carry forward the legacy of innovation and to help solve tomorrow's challenges by applying and advancing thermal spray technologies. He believes that being part of this industry means being at the frontier of material solutions that impact various sectors.

He's also looking to encourage other engineering students to pursue thermal spray studies.

"Explore the field with curiosity and persistence. It's a multidisciplinary domain with vast opportunities for research, innovation, and practical impact. Hands-on experience and strong fundamentals in materials science and engineering will be key to success," he said.

2025 Scholarship Opportunities

Applications for 2025 ITSA Scholarships will be accepted until October 30. Up to three one-year scholarships may be awarded. To apply, visit *aws.org/about/industry-partners/itsa/ITSA-Scholarship*. Winners will be announced in the fall.

CINDY WEIHL (*cweihl@aws.org*) is editor of *SPRAYTIME*.

IIoT-Enabled Thermal Spray Platform Enhances Capacity and Automation

Surface Two™ is a scalable, IIoT-integrated thermal spray platform with increased capacity and automation. It delivers the same thermal spray performance as its predecessor, the Surface One™, but scaled for larger parts and broader industrial applications. Engineered for industries such as aerospace, power generation, automotive, medical, and semiconductors, the thermal spray coating machine extends the benefits of modularity, smart manufacturing, and process consistency to customers processing medium-to-large components. Highlights include larger capacity with support for parts up to Ø2000 mm and 1500 mm in height, with handling options up to 5000 kg; smart platform-equipped with the MultiCoat™ 5 controller and embedded IIoT capabilities for data-driven operations; rapid deployment offering fast commission, minimizing installation time and shop floor disruption; flexible automation available in both standard and K2 configurations to support semi- or fully automated production environments; and next-gen usability featuring Clarity2™ user interface cleanroom-ready airflow design and minimal maintenance downtime. The thermal spray coating machine also retains the relocatable, skid-based architecture of the SurfaceOne along with standardized components and advanced airflow design, delivering a cleaner, safer, and more efficient operating environment.

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Thermal Spray eBook Showcases Sustainable Remanufacturing

The eBook *Enhanced Remanufacturing — A Sustainable and Resilient Alternative to Traditional Manufacturing* introduces enhanced remanufacturing as a sustainable focuses on reducing environmental impact, conserving resources, and leveraging existing industrial infrastructure. Expanding on the classic definition of remanufacturing, it explores broader benefits, including reduced CO_2 emissions, strategic material retention, supply chain stability, and improved working conditions. Special attention is given to high-energy, high-value materials such as superalloys and titanium used in aerospace and energy industries. The book features real-world applications from the Remanufacturing Center at University West in Sweden, including advanced welding, additive manufacturing, and thermal spray technologies. Thermal spray processes such as plasma spray and high-velocity air-fuel techniques are used to enhance surfaces and extend component life, with a focus on material recycling and circularity. Enhanced remanufacturing is presented as a critical tool for advancing sustainability and resilience in high-value manufacturing sectors.

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Cold Spray System Expands Possibilities for Field-Based Metallurgical Repair

The Dragonfly™ cold spray system is a modular, portable solution designed for point-of-need repairs in demanding field environments. Ideal for aerospace, maritime, energy, and MRO applications, the system expands the possibilities for field-based metallurgical repair. Housed in rugged, mil-spec Pelican cases, the electrical assembly and gas train modules are built to absorb shocks and vibrations. The system supports nitrogen, helium, or compressed air, making it versatile across applications. It also includes the PF2 powder feeder, capable of holding up to 1 L of powder, and a 21-kW heater that reaches temperatures up to 800°C (1472°F). It integrates seamlessly with the company's VARK™ portable wet-type dust collector, featuring 1000 ft^3/min airflow, NFPA44 compliance, and HEPA after-filter, as well as the portable spray enclosure, a three-foot-wide glove box with a down-draft table optimized for containing metal dust. Controlled via the pendant controller, the system offers simple operation with internal data logging, USB/non-USB transfer options, and storage for up to 100 cold spray recipes either user-defined or preapproved. It enables cold spray technicians to apply lab-developed processes in the field and comprises four main modular components, with the heaviest module weighing 94 lb.

VRC Metal Systems
vrcmetalsystems.com / (605) 716-0061

Thermal Spray System Market Report Unlocks New Applications and Performance Gains

HVOF Thermal Spray System Market projects a global market growth from $1.64 billion in 2025 to $2.79 billion by 2034, a compound annual growth rate of 7.9%. This 150-page report analyzes key trends, drivers, and innovations shaping the high velocity oxyfuel (HVOF) market, including rising demand in aerospace, automotive, energy, and industrial machinery sectors, driven by the need for wear resistance, durability, and environmental compliance. It highlights advancements such as automated control systems, real-time monitoring, and R&D in nano-structured and hybrid materials that are expanding high-performance applications. North America and Europe lead in adoption, while Asia-Pacific is emerging as a strong growth region. The report also offers detailed segmentation, competitive landscape analysis, and profiles of major players, providing valuable insights for manufacturers, service providers, and investors navigating this evolving market.

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EVENTS CALENDAR

2025

IMAT 2025
October 20–23
Detroit, MI
asminternational.org/imat-2025

ITSA Annnual Meeting & Symposium
November 10–12
Peoria, IL
thermalspray.org

Symposium on Emerging Materials and Innovations in Thermal Spray
December 1–3
Melbourne, Australia
asminternational.org

2026

AMPP Annual Conference + Expo
March 15–19
Houston, TX
ace.ampp.org/home

International Thermal Spray Conference and Exposition (ITSC 2026)
March 18–20
Bangkok, Thailand
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American Coatings Show + Conference
May 5–7
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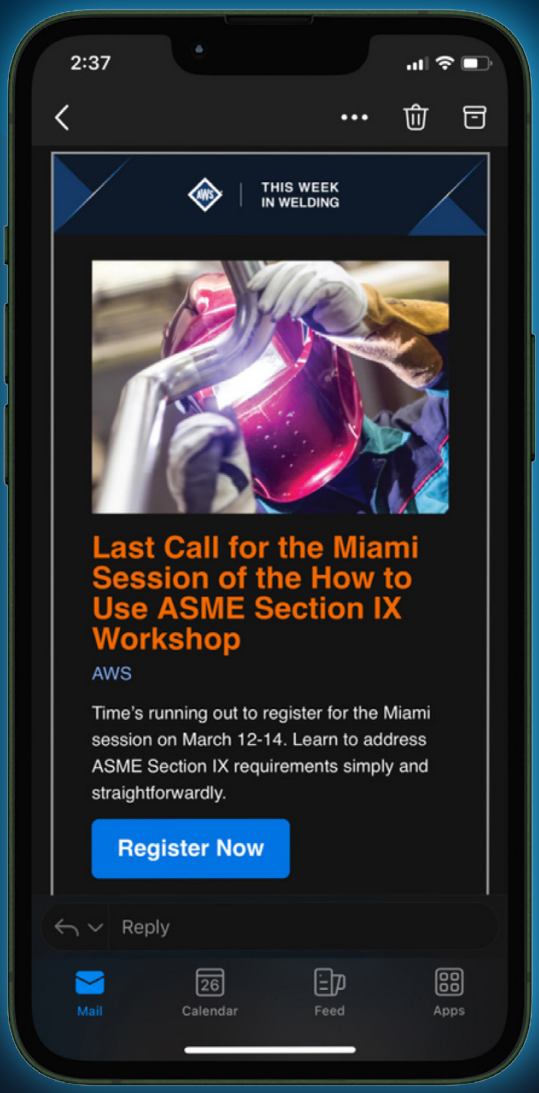

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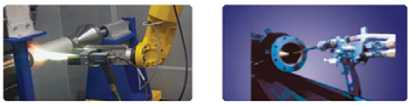

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