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SPRAYTIME

PUBLISHED BY THE INTERNATIONAL THERMAL SPRAY ASSOCIATION, A STANDING COMMITTEE OF THE AMERICAN WELDING SOCIETY



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ITSA 2018
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On the cover: An Oerlikon Metco employee demonstrates the spray and fuse process during ITSA's facility tour of Superior Shot Peening & Coatings International. Oerlikon joined five other ITSA member companies in presenting table top displays and demonstrations.

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The direct and consequential annual loss due to wear and corrosion in the United States is \$500 billion (Ref. 1). The tribology surveys conducted in 1978 by the U.S. Department of Energy (DOE) (Ref. 2) indicated that the estimated direct and indirect losses of energy caused by simple wear and friction that year was more than four quadrillion British thermal units (BTU). To reduce energy losses, the survey report recommended “exploit[ing] energy conservation potential of new surface modifications.” In the United States, it has been estimated that about 11% of total energy can be saved in the major areas of transportation, turbo machinery, power generation, and industrial processes through these innovative technologies (Ref. 2). It would be appropriate to use a green tag for energy, resource and ecology savings, surface modification processes such as thermal spray, and weld surfacing.

Green weld surfacing and thermal spraying are the two main processes (Refs. 3, 4) for minimizing wear and friction as well as improving the working life of critical machine components in service.

Green Thermal Spraying

In thermal spraying, the coating materials are deposited onto the required surface by spraying through 1) an oxyfuel combustion flame at moderate (oxyacetylene spray gun) to high velocity (HVOF), 2) a plasma flame (plasma spray) using argon as the plasma gas, 3) a supersonic jet of heated helium or nitrogen (cold spray), and 4) a high-pressure jet of atomized molten metal formed by the arc between two ends of consumable wire (Refs. 1, 4). The fusion of sprayed deposits by an oxyacetylene torch is a widely used process (Ref. 4). The cold spray process has few proven applications in areas to be covered in this article and thus

is not included. Another high-velocity ($v = 2\text{HVOF}$) spray process using electromagnetic force-enabling fusion bonding of sprayed particles to substrate has not been commercialized (Refs. 2, 6).

An initial coat of bonding material, such as Mo, Ni-5Al, 80Ni-20Al, CoCrAlY, or NiCrAlY is normally required to form adhesive bonding between a top coat to a substrate. A sprayed deposit shows a lamellar microstructure. A wide range of materials, from soft polymers through hard metals and alloys to super-hard ceramics, can be sprayed onto each other because the base material remains cold. More than 50% of applications for depositing ceramic materials onto metallic substrates are carried out through thermal spraying. In comparison, vapor-phase deposition of ceramic materials is limited to approximately 25% of applications (Ref. 1).

Industrial Applications

Major fossil fuel consuming and emitting sectors, such as energy, transportation, and manufacturing, account for 89% of total global emissions (Refs. 1, 5). Selected thermal spraying applications that can help make these industries and others greener are to be discussed in the following sections.

Thermal Power Plants

The top emitting (40% of CO_2) coal-fired power plants have a life cycle between 50 and 100 years (Ref. 5). Hence, these plants need to be maintained more efficiently for a long plant lifetime.

In fossil-fuel boilers, corrosion by high sulfur (S) or erosion by high quartz in flue gas results in tube wall thinning and premature failure — Fig. 1 and Table 1 (Ref. 1). Corrosive wear rates in high S ranging from less than 50 to 300 nm/h and more

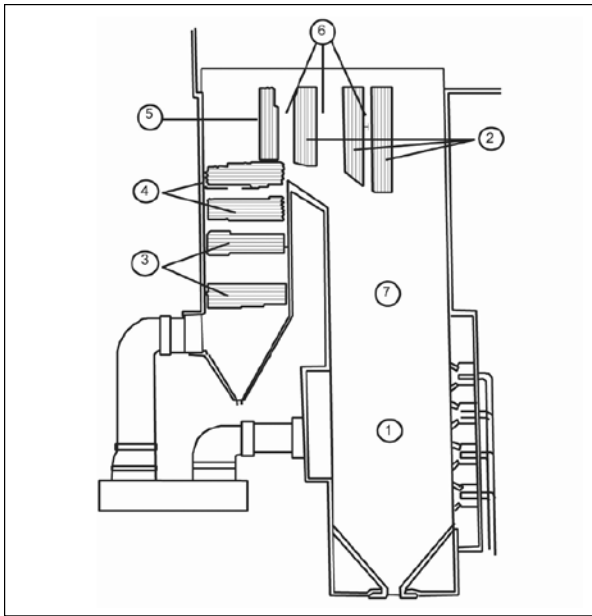


Fig. 1 — Typical wear-prone areas of a coal-fired boiler. 1 — waterwalls (combustion chamber); 2 — secondary superheater; 3 — economizer; 4 — primary superheater; 5 — reheater; 6 — soot blowers (superheaters); 7 — soot blowers (combustion chamber).

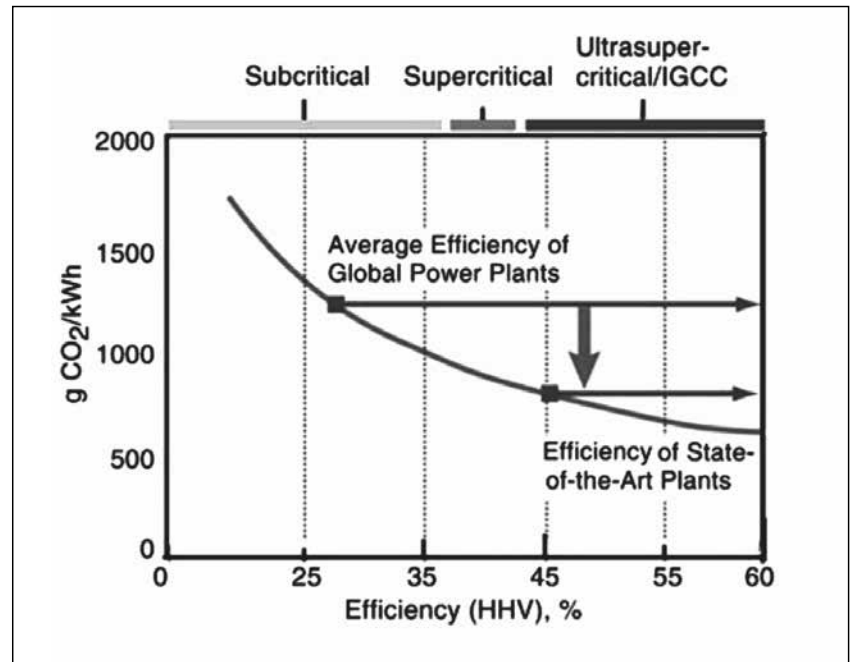


Fig. 2 — Efficiency (HHV) vs. emission reduction in supercritical and ultra-supercritical boilers. HHV = higher heating value. Note: 1% efficiency increase = 2–3% less emission.

result in tube lives from more than ten years to two years or less (Ref. 1). Erosive wear of 0.02 to 0.28 wear units were observed for 40 to 50% quartz, whereas 0.04 to 0.28 wear units were found in ash containing 50 to 60% quartz (Ref. 1). In the United States, it is high-S coal corrosion, whereas in India it is erosion by high-quartz coal (Ref. 3). The best protection against erosion is provided by thermal spraying of a 0.75-mm-thick coating of a mixture of Cr_3C_2 + 25% Inconel®, and for corrosion Ni50Cr50 or FeCrAl alloy.

The life cycle can be extended from two to six times depending on the severity of the wear condition. Resurfacing at a maintenance and repair facility can enable boiler tubes to perform efficiently until the end of its plant life.

Cooling Water Systems

Thermal spray polymeric coatings of epoxy, polyester, or polyurethanes resist corrosion in cooling water systems where sea or estuarine water is the cooling medium and prolongs life span by two to three times (Ref. 1). Induced-draft fan blade life can be extended by a protective spray fusion deposit of NiCrBSiC + 50%

WC against severe erosion in high-quartz flue (Ref. 3).

Ultra-Supercritical Boilers

The supercritical boiler refers to use of operating parameters beyond critical temperature and pressure where water and its vapor exist together as a homogenous fluid. A supercritical steam temperature of 1050°F and pressure of 3500–4000 lb/in.² improves power generation efficiency to 45% from 27% in normal coal-fired plants. An ultra-supercritical operating temperature at 1289°F efficiency can be further improved to 55% and more — Fig. 2 (Ref. 1). The mega units of ultra-supercritical plants cut down drastically the fossil fuel requirement by more than 25%, thus producing cheap electricity units with greenhouse gas emissions reduced by more than 25%.

Sprayed coatings on selected base materials enable supercritical boilers to operate at a high temperature and pressure for prolonged periods in extreme work environments.

Ferritic stainless steels benefit most from coatings, and austenitic steels may benefit as well, while Ni-based alloys are not likely to need coatings at all. The coating materials include Al_2O_3 -

Table 1 — Selected Boiler Components, Wear, and Thermal Spray Coatings

Components	Wear Mode	Coating Material
Economizer and primary superheater tubes	Fly ash erosion	75CrC + Inconel® (80Ni-20Cr)
Reheater (at 650°C) and secondary superheater	S-corrosion/oxidation Ash erosion	50Ni-50Cr/Fe-Cr-Al 75CrC + Inconel
Soot blower (sec. superheater)	Steam erosion	75CrC + Inconel
Combustion chamber soot blower	Steam erosion	75CrC + Inconel
Combustion chamber waterwalls	Corrosion/sulfidation	50Ni-50Cr/Fe-Cr-Al

Table 2 — Selected Thermal Spray Applications of Automobile Components

Component	Coating Type/Wear Mode	Coating Material/Spray Gun
Piston crown (Al-alloy)	Insulation	NiAl bond coat + graded coating of MgO-Stabilized ZrO ₂ /Plasma, HVOF
Piston ring	Adhesion/friction	Mo + NiCrBSiC*, Mo + MoO NiCr + CrC/Plasma, HVOF
Cam follower	Adhesion	Mo, Mo + NiCrBSiC*, Plasma, HVOF
Piston ring groove	Adhesion	Mo, Mo + NiCrBSiC*, Plasma, HVOF
T V H	Adhesion	Mo + NiCrBSiC, Plasma, HVOF
Synchronize ring (inner surface)	Adhesion	50Al-Si alloy + 50 Mo, Plasma/HVOF
Valve lifter (Al-alloy)	Peripheral wear and scuffing	Fe-C wire/Electric Arc Spray

* NiCrBSiC = Ni-based fusable self-fluxing alloy

forming iron aluminide by HVOF, SiO₂-forming Mo-Si-B coating by air plasma spraying, and Cr₂O₃-forming Ni-50%Cr by HVOF or HVOF-sprayed FeCrAl-forming Al₂O₃ and Cr₂O₃ (Refs. 1, 7).

Transportation Industry

The transportation industry is the largest end-user sector emitting CO₂, the most prevalent greenhouse gas (GHG). In the United States, the transportation sector consumed 28.8 quadrillion BTU and emitted 1856 million tons of carbon dioxide in 2008 (Ref. 5).

Automotive Industry

The need to comply with exhaust emission regulations and to generate a higher power per unit of fossil fuel has led to the use of higher cylinder pressure and temperature, resulting in more severe wear environments.

The majority of energy loss is due to friction. Frictional loss in running engine components is around 35% of input energy (Ref. 1). A thermal spray coating can substantially reduce the friction

loss. An estimated reduction in 10% of energy loss leads to substantial fuel savings and decreased GHG emissions.

Automobile engine components, such as the piston rings, cylinder bore, and valve train components, have a relatively large effect on the amount of frictional loss in the practical driving range of 2000 revolutions per minute (rpm). Antifriction coating on piston group components can cut down the fuel consumption by 0.7–1.4 L (0.186 to 0.372 gal) per 100 km during city driving — Table 2 (Ref. 1).

Piston rings. The power cylinder in internal combustion engines includes one or more piston rings, which slide against the cylinder liner while maintaining a tight seal to prevent the escape of flue gas from the combustion chamber, and the consequential energy loss. Adhesive wear and friction in extreme cases can cause seizures and scuffing.

A high-hardness coating is required to resist scuffing and wear. A flame-sprayed Mo coating containing 8 to 10% oxygen has a hardness of 950 VPN in comparison to 400 VPN for plasma-sprayed Mo (1% O₂) (Ref. 4). Hence, for plasma spraying, preoxidized Mo (8 to 10% O₂) is used. Alternatively, high hardness Mo + NiCrBSiC (790 VPN) or Cr₃C₂ + NiCr is used (Ref. 4).

Table 3 — Selected Thermal Spray Coating in Jet Engine Turbines

Purpose	Material	Application
Thermal barrier coating	Y ₂ O ₃ -stabilized ZrO ₂	All metallic components in the hottest section of the turbine, such as combustor, guide vanes, rotating blade, etc.
Bond coat	MCrAlY (M = Ni or Cr)	All above applications as the intermediate layer to bond the top YSZ to the base material
Diffusion barrier coating	Bond coat above, MCrAlY, forms thermally grown oxide (TGO), Al ₂ O ₃ , as diff. barrier layer	All above applications
Abradable coating	Ni-graphite (700°C)** NiCrAlY + RA* + Polymer (700°C)** YSZ RA* + Polymer (1200°C)**	Closing gap between rotating blades and casing
Antifretting	WC-Co ^{NiCrAlY}	Mid-span damper

* RA = Releasing agent; ** Maximum Operating Temperature

Air Transport

In the United States, air transport accounts for 12% of the total GHG emissions in the transportation sector, making it the second largest area, after automobiles, in terms of GHG emissions in transportation.

Gas Turbines

In energy-efficient modern jet engines, the turbine entry temperature (TET) of gas following combustion is much higher than the temperature turbine material can withstand. A thermal barrier coating (TBC) of Y₂O₃-stabilized ZrO₂ reduces the surface temperature of the component to a tolerable limit. A 0.4-mm-thick ceramic layer can typically give a ΔT of 100° – 300°C, enabling a modern engine to run at a TET 300°C higher than its predecessor. An increase in TET by 20°C leads to about a 0.5% improvement in fuel efficiency and corresponding emission reduction (Ref. 9). A decrease in the turbine material (Nimonic® alloy) temperature of 1000° to 870°C results in a 100-fold increase in creep life (Ref. 1).

The April 2018 failure of a broken jet engine blade during a Southwest Airlines flight stresses the need for protecting the components of highly efficient modern jet engines operating in severe environments of high TET from early failure (Ref. 8).

Thermal Barrier Coatings

Thermal barrier coatings of high TET jet engines consist of a top coat Y₂O₃-stabilized ZrO₂ and a bond coat of MCrAlY (M = Co or Ni). The bond coat layer of MCrAlY at a high temperature forms a thin, thermally grown oxide (TGO) layer of alpha Al₂O₃, which acts as an effective diffusion barrier of oxygen between the coating and substrate. Plasma spraying is a well-established process for coating jet engine components. Components include those in the hottest part of the turbine, such as the combustor, stationary guide vanes, rotating blades, blade outer air seals, and shrouds in the high-pressure section behind the combustor, as well as afterburners in the tail section of the jet engines. For maximum fuel efficiency, a sacrificial abradable coating is used to tighten internal clearances between moving parts. An extra gap of 0.005 in. between the rotating blades and the engine casing can increase fuel consumption by 0.5%. For high TET flue, a sacrificial coating of YSZ + RA + Polymer is used to close the gap (Table 3). A coating thickness of 2 mm (maximum) with 20–25% porosity is normally used. To cut an abrasive sacrificial coating, blade tips are coated by injecting hard ceramic particles while

melting by laser beam. A release agent is not necessary in this coating because ceramics wear in a brittle manner (Ref. 10).

Manufacturing Industries

Steel

The energy-intensive iron and steel industry accounts for 4% of global emissions. Selected thermal spraying applications are listed in Table 4.

Light merchant mill (LMM) rolls. LMM carrying hot strips are protected from wear by a spray-fused deposit of self-fluxing Ni9Cr2B3Si0.3C alloy of 40–45 HRC. The process is automated by motorizing an oxyacetylene torch transversely. The heat-resistant alloy has excellent abrasive and friction wear resistance (Table 4).

Continuous annealing processing line rolls. In vertical-type continuously annealing furnaces operating at 900°C (1650°F), the rolled steel strip is carried into the furnace by hearth rolls arranged at the top and bottom. A sprayed coating of CoCrAlY + Y₂O₃ + CrB₂ on rolls increases coating life by two times more than the earlier coating of CoCrAlY + Al₂O₃ (Ref. 4).

Continuous galvanizing line sink rolls. Sink rolls carry steel strips in a continuous hot-dip galvanizing line required to operate in a molten zinc pot at 460° to 500°C (860° to 930°F). An HVOF or plasma spray deposit of WC-Co protects the surface against corrosive wear by hot molten zinc. A postspray annealing (860°C or 1580°F) in an inert atmosphere causes recrystallization and improves the life span (Ref. 1).

Paper and Pulp

In the United States, paper mills account for around 11% of manufacturing energy use. Moreover, they add to deforestation, thus shrinking major GHG sink. Protective coatings are used to extend service life in severe working environments.

The following two examples of thermal spray coatings extend working life in this industry:

Machine-glazed cylinders. Cast iron steam-heated cylinders (15 × 20 ft), rotating at a maximum of 100 rpm, are used for drying the wet paper, especially tissue paper at a maximum rate of 6000 ft/min (Ref. 4). The cylinder surface is subjected to adhesive wear due to the scraping dry paper by a doctor blade, the abrasive action of the paper and felt, and the corrosive action of the liquid (3.5 to 8.5 pH). The list of successful

Table 4 — Selected Thermal Spray Applications in the Steel Industry

Coating Material	Thermal Spray System	Application
Atomized alloy of self-fluxing Ni-10Cr2B4Si0.4C alloy Deposit harness 40–45 HRC	High-capacity oxyacetylene spray torch plus fusing torch	Light merchant mill (LMM) rolls
CoCrAlY + Y ₂ O ₃ + CrB ₂	HVOF/plasma	CAPL hearth rolls
	Ditto	Sink roll
BN + NiCrFe + Al		Self-cleaning rolls in SS annealing furnace
NiCrBSiC + Cr ₂ C ₃	HVOF/plasma	Con-cast mold

coating materials on MG cylinders include flame-sprayed NiCrBSi alloy of 40 HRC hardness, arc-sprayed AISI 420 of 35 HRC hardness, and plasma-sprayed Mo-NiCr materials of 45 HRC hardness. Mo-NiCr coatings showed a superior heat transfer rate, better sheet adhesion and release, longer doctor blade life, and increased wear resistance.

Black liquor recovery boiler. This is used to recover inorganic parts as sodium sulphide by burning black liquor. Fe-22Cr-6Al (Kanthal® type) coatings of 0.3–0.5 mm by arc spray have been found to minimize sulphur corrosion and improve life of boiler tubes. The self-bonded iron-based alloy has almost identical thermal coefficients with that of tube material, thus a reduced risk of spalling (Refs. 1, 5).

Conclusion

Life cycle improvements by green surfacing of critical components at original equipment manufacturers, followed by resurfacing at a maintenance and repair facility, enables energy saving operation in severe wear envelope, improves operating efficiency and productivity, produces products with low carbon (energy), dollar, and resource footprints, and requires virtually no spares in the plant or equipment lifetime and consequently leads to huge savings in resources required to produce spare parts. ▲

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Ram Chattopadhyay PhD (London) (ramchattopadhyay@gmail.com) is an eminent author of books on green engineering and the environment; member of the UN Environment on Life Cycle Initiative; honorary professor at Simon Bolivar University, Caracas, Venezuela; and adviser for American Cladding Technologies, East Granby, Conn.

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Symposium Highlights the Latest in Coatings for the Oil and Gas Industries

By Cindy Wehl



Fig. 1 — More than 100 attendees listened to 18 presentations during the two-day symposium.

Attendees of the International Thermal Spray Association's (ITSA) 2nd Annual Advanced Coating Symposium were offered myriad insights into coating applications in the oil and gas industry.

The symposium, which for the first time was held in conjunction with ITSA's Annual Meeting, took place October 9–11 at The Woodlands Resort in The Woodlands, Tex., and featured 18 speakers sharing knowledge, ideas, and opportunities for the thermal spray industry — Fig. 1.

The three-day event kicked off with ITSA Chair David Lee welcoming more than 100 attendees to a full day of technical presentations. Lee gave a special thanks to the organizing committee of the event and its 11 company sponsors as well as to 12 exhibiting companies.

Oil and Gas Coatings Focus

Past Chair Jim Ryan introduced Krutibas Panda, keynote speaker and a technical advisor with Halliburton – Sperry Drilling Services in Houston, Tex. Panda presented “Addressing Wear in Upstream Oil and Gas: Current Trends & Future Prospects for Thermal Spray Coatings.” The presentation included successful case studies highlighting the unique advantages thermal spray coatings offer, ongoing developments, and future development needs.

Over the two-day symposium, technical presentations were led by industry experts, including Daming Wang, Praxair Surface Technologies Inc.; Dan Hayden, Hayden Corp.; Dan Allford, Arc Specialties; Shawn O'Hanlon, Cincinnati Thermal Spray; Andrew Verstak, Kermetico; Bill Lenling, TST Engineered Coatings; Evelina Vogli, Liquid Metal Group Holdings Inc.; Dave Fairborn, Aeromet; Sunil Musali and Josh Mayne, FW Gartner Thermal Spraying, Surface Technologies; Martin Lohrman, Surface Coating Application Specialist, Höganäs Corp.; David Lee, Kennametal Stellite; Chris Farris, Uniquecoat Technologies LLC; Brian Frazier, AIM-MRO; Rob Leonard, Protech Lab Corp.; Vincent Lawless, TechMet Alloys; Joe Scott, White Horse Technology LLC; and Jean-Marc Tetevuide, Lineage Alloys.

Networking Opportunities Abound

This year's symposium allowed plenty of time for networking during meals, social events, and tours. With the help of sponsors, including Superior Shot Peening & Coatings International, Curtiss-Wright, Hayden Corp., Polymet, and TechMet Alloys LLC, ITSA hosted a Tuesday night reception that allowed speakers, attendees, and guests to create and grow new relationships — Fig. 2. Superior Shot Peening & Coatings International also hosted a special tour of its Cleveland, Tex., location, which included a Texas-style lunch and allowed symposium attendees to get to know one another better — see sidebar.

The lunch and tour were then followed by a hospitality suite happy hour sponsored by Superior Shot Peening and CTS.

The final social networking opportunity came on the last day of the three-day event when attendees were invited to tour the Houston Museum of Natural Science.



Fig. 2 — Meeting attendees (from left) Jose Fuentes and Daming Wang, Praxair Surface Technologies; George Qiao, Mogas Industries; and Steve Jaroszewski, TechMet Alloys, mingled during ITSA's welcome reception.



Fig. 3 — New ITSA members include (from left) Phil Bretz, Metcut Research Inc.; Travis White, Scot Miler, and Rocky Johnson, Surface Engineering and Alloy Co.; and Tri Shrestha, Metcut Research Inc.

Annual Business Meeting

For the first time, ITSA combined its annual symposium with its annual business meeting. The meeting was called to order by Lee, who presented a special plaque to Past Chair Jim Ryan for his service to the organization.

Meeting attendees discussed financials, scholarships, updates, and introduced new member companies Metcut

Research Inc., Praxair Surface Technologies (Indianapolis), and Surface Engineering and Alloy Co. — Fig. 3.

Members voted to once again combine the annual symposium and business meeting for 2019, and they plan to host it on the east coast. ▲

Cindy Wehl (cwehl@thermalspray.org) is the editor of **SPRAYTIME®**.

Superior Shot Peening Opens its Doors to ITSA

Superior Shot Peening & Coatings International epitomized good ole' Texas hospitality when it welcomed ITSA symposium and meeting attendees to its Cleveland, Tex., facility on October 9.

As the bus carrying attendees arrived at the shop, two cowgirls and a cowboy stood ready to suit up visitors with a hat and bandana. Once inside, attendees were met by a waterin' hole featuring a variety of drinks; a Texas-themed lunch that included pulled pork sliders, brisket, and a taco station; and a musician singing and strumming classic rock and roll and country songs on his guitar.

The company opened its doors not only to symposium attendees but also to local exhibitors looking to show off and discuss their products and services. The tour included a look at Superior's thermal spray booths, peening operations, corrosion coatings application area, grinding and finishing building, and its metallurgical laboratory.

Superior was founded in 1990 by Jack Blasingame and Albert Johnson on the basis of a "better idea." They were both working in the surface preparation industry and saw a need for a better approach and an opportunity for a company that could better serve the surface preparation requirements of Houston-area industries by providing superior quality. Superior is a 24/7, one-stop shop offering a variety of treatments, coatings, testing, and consulting to industries including oil and gas, aviation, chemical, energy, and manufacturing. Its thermal spray capabilities include high-velocity oxygen and air fuel, plasma, and twin arc.

The company has a total of 100 employees among its three locations — Cleveland, Tex., Houston, Tex., and Changzhou,

China — and prides itself on a team atmosphere that fosters new ideas for improving processes. According to Superior's Director of Quality Mollie Blasingame, many of the company's employees have been there for more than ten years and help ensure it maintains consistent work quality and output.

Blasingame is an active member of both ITSA and the American Welding Society's C2 Committee on Thermal Spraying. When the Houston area was chosen as the location for ITSA's 2nd Annual Advanced Coatings Symposium, she and her brother Van decided to open the doors of their facility to attendees.

"My brother Van and I have been around ITSA since childhood. Our father, Jack Blasingame, was a member of Metallizing Service Contractors in the 1970s that evolved into ITSA. He recognized the importance of networking and developing relationships with colleagues in the industry," she explained. "ITSA provides a forum for discussing current technology and assists in industry problem solving."



Superior Shot Peening & Coatings International welcomed attendees of ITSA's 2nd Advanced Coatings Symposium to its Cleveland, Tex., facility.

Flame Spray North America to Expand Operations



The thermal spray coating manufacturer, located in Fountain Inn, S.C., is creating new jobs by adding a second location within the next three years.

Flame Spray North America, a producer of thermal spray coatings for industrial gas turbines and aircraft components, is growing its existing manufacturing facility in Laurens County, South Carolina.

The company foresees a total investment of \$4 million, and the hiring of 20 new employees, within the next three years. It recently purchased neighboring property to the existing facility in Woodfield Industrial Park; this will increase capabilities to service the United States aerospace market by treating aircraft-engine components with thermal spray coatings.

"I would like to thank the County of Laurens for their continued support offered since the establishment of Flame Spray North America Inc. in 2011. With this new acquisition, we look forward to accelerating our strategic plan to expand our business into the aircraft market, as well as growing the job market, by creating new jobs and boosting the economy in Laurens County," said Marco Prosperini, president and CEO of Flame Spray North America.

In late 2013, the company had its first expansion and an additional investment of \$9.1 million, with expectations to create 45 jobs.



Surface One has been acknowledged for adding to the quality, efficiency, usability, and safety of the thermal spray process.

Oerlikon Metco Wins International Design Awards

Oerlikon Metco's Surface One, a new machine for thermal spray coatings, is the winner of two international design honors.

The Red Dot Design Award and the International Design Excellence Awards recognized the product's design for its contribution to the quality, efficiency, usability, and safety of the thermal spray process.

"Breaking the mould in regard to design in order to enhance the effectiveness and user-friendliness of the technology — this has been superbly achieved by Surface One," read the verdict of the Red Dot Design Award jury.

The unit features a compact design that fits in a shipping container, a customizable user interface with integrated operator guidance, safety enhancements, and usability improvements that make part lifting/handling simple.

"Our customers expect productivity improvements, consistent quality, and process safety; and they want their coating process to be ready for the factory of the future," added Martin Tempus, Oerlikon Metco's head of equipment business.

H. C. Starck Analytical Services to become ChemiLytics

The central laboratory of H. C. Starck, known as H. C. Starck Analytical Services, will become an independent company with the name ChemiLytics GmbH & Co. KG.

The new company will remain part of the H. C. Starck Group. Customers can still access the entire portfolio of services, and they will continue to be looked after by teams from the former Analytical Services.

This laboratory service provider division of H. C. Starck GmbH, based in Goslar, Germany, has increasingly been offering its internal company laboratory services to external companies. This test laboratory for anorganic element analysis and powder characterization has been credited for 23 years. It has approximately 70 employees in an operative area totaling more than 80,000 sq ft. The company's new website is chemilytics.com.



Platinum crucibles are shown in an electrically operated melting apparatus for sample preparation for x-ray fluorescence spectroscopy. (Credit: H. C. Starck.)

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A large image showing a thermal spray process. A bright, intense flame or plasma jet is directed at a white, ring-shaped component. Sparks are visible around the spray head. The DeWAL logo is prominently displayed at the top left of the advertisement.

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M.S. Marin Gets Hull Coating



The coating application for M.S. Marin's hull went smoothly, taking one day.

The Ecospeed coating system, a long-lasting, nontoxic protection for ship hulls, has been applied to Golden Gate Ferry's *M.S. Marin*. This aluminum-hulled, 750-passenger capacity, Spaulding-class ferry is owned and operated by the Golden Gate Bridge, Highway and Transportation District, San Rafael, Calif. The coating was chosen based on its environmental safety and durability.

"The application marks the first Ecospeed coating to a ferry operating in California. We have completed the application to the *Marin's* hull, and the operator will now evaluate performance," said Manuel Hof, Subsea Industries' production executive.

The application went smoothly, taking one day. The first coat was applied in the morning, with the second coat applied in the afternoon, according to Bay Ship & Yacht's Senior Project Manager David Elliott.

Curtiss-Wright Reveals Recent NADCAP Accreditations and OEM Approvals

FW Gartner Thermal Spraying, a Curtiss-Wright Surface Technologies business, Houston, Tex., and Bolt's Metallizing, a Curtiss-Wright Surface Technologies facility, Phoenix, Ariz., have earned NADCAP accreditations.

FW Gartner was founded in 1923 and began applying thermal spray coatings in the 1980s. In early 2013, the company was acquired by the Curtiss-Wright Corp., and is now operating as part of its Surface Technologies Division.

"In January of this year, we received NADCAP accreditation for our HVOF and plasma spray processes, grinding processes, and metallurgical evaluation processes. To achieve this, we also became accredited to AC7004, which is NADCAP's quality management system," said John Winne, quality manager.

"With our NADCAP accreditation in place, we are now in the process of adding aerospace OEM approvals. NADCAP accreditation has enabled us to diversify our overall business, while continuing our commitment to our industrial partners," he added.

Bolt's Metallizing has added many processes to its list of NADCAP accredited offerings for its gas tungsten arc welding and dry film lube processes. The two new capabilities add to the company's list of accredited processes, including brazing, thermal spray coatings, and heat treating.

"With our newest NADCAP accreditation, we have obtained additional approvals from OEM sources like UTSC/Pratt Whitney, Honeywell, and Rolls Royce," said Dean Hoffman III, general manager.

Bolt's Metallizing was established in 1980 to provide the aerospace and industrial markets with high-quality, cost-effective thermally sprayed coatings, metal joining, and metal treatment services. It was acquired by the Curtiss-Wright Corp. in 2015 and now operates as part of its Surface Technologies Division. ▲

Share your company news, facility improvements, acquisitions, and noteworthy events with us.

Email press releases to spraytime@thermalspray.org.

Product Spotlight

Torch Booster Raises Natural Gas Pressure for HVOF Thermal Spray



The fourth-generation TB-HVOF torch booster increases the standard $\frac{1}{4}$ lb/in.²/ 0.017 bar utility natural gas pressure to 150 lb/in.²/10 bar for high-velocity oxyfuel thermal spray. New features include a variable 1–150 lb/in.² pressure controller and an 80% reduction in annual

maintenance expenses in a redesigned, more functional single cabinet. The torch booster connects to the building natural gas supply, so operators don't run out of fuel or waste time changing cylinders. Coating performance is equal to propane/propylene with savings on fuel expense along with benefits in higher productivity and a safer workplace. The item is compact, measuring 50½ in. wide, 33 in. deep, and 32 in. tall; quiet; and normally installed near the spray booth without dedicated ventilation or expensive site preparation.

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frequent change, saving time and maintenance costs. The filters are available in a variety of media, including green for standard applications; extreme nanofiber to promote surface loading and release of ultrafine particles; flame-retardant for spark-generating applications; carbon-impregnated to dissipate static on applications like plastics or combustible dusts; and synthetic fibers for moist or abrasive applications.

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Report Shows Thermal Spray Coating Market to Reach \$13.61 Billion by 2022

Thermal Spray Coating Market (Polymer, Ceramic, Metal and Others) for Automotive, Aerospace, Industrial Gas Turbine and Other Applications: Global Market Perspective, Comprehensive Analysis and Forecast, 2016–2022 reports that the global thermal spray coating market was capitalized at \$8.53 billion in 2016 and is likely to cross \$13.61 billion in 2022, developing at a compound annual growth rate of 8.1% from 2017 to 2022. The research report provides a comprehensive understanding of the market in global regions such as North America, Middle East and Africa, Europe, Asia-Pacific, and Latin America. The study also provides a full, in-depth analysis of the parent market; important changes in market dynamics; segmentation details of the market; former, on-going, and projected market analysis in terms of volume and value; assessment of niche industry developments; market share analysis; key strategies of major players; emerging segments and regional markets; and company testimonials to fortify their foothold in the market. ▲

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ITSA Welcomes New Members



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ITSA Member News



Chairman David A. Lee

ITSA held its 2nd Advanced Coatings Symposium, “Oil and Gas,” in Houston, Tex., on October 9–11. For the first time, we merged it with our ITSA Annual Meeting — and what an event it turned out to be. The combination of a great meeting location and excellent timing as the industry is turning the corner and seeing upturn in growth for thermal spray and other related coating services led to a successful event.

Events like this take a lot of planning and so much gratitude goes out to the organizing committee for putting together a successful program, as well as the American Welding Society (AWS) and ITSA staff, who did a great job in working out meeting venue details and helping the plans come to fruition.

We had 18 speakers, including a keynote from Krutibus Panda of Halliburton who presented “Addressing Wear in Upstream Oil & Gas: Current Trends & Future Prospects for Thermal Spray Coatings.” There were also 12 tabletop exhibitors and 11 event sponsors. There was plenty of time to network, make business contacts, and catch up with friends and acquaintances.

The event welcomed three new members — Metcut Research Inc.; Praxair Surface Technologies, Indianapolis; and Surface Engineering and Alloy Co. Go to page 18 in this issue to learn more about them. A new membership application was also submitted on site, fulfilling a key objective of the organization.

A highlight of this year’s event was a tour of ITSA job shop member Superior Shot Peening & Coatings International. The company hosted attendees for a Texas-themed barbeque lunch that was over the top and nothing like any tour I’ve ever taken. They even had a great entertainer who sounded like Johnny Cash and later Roy Orbison, and many other great song writers.

The ITSA members have decided to once again combine our annual symposium and membership meeting for 2019. Planning for this event has begun, and details will be forthcoming. I hope to see you all there next year!

ITSA MISSION STATEMENT

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

OFFICERS

Chairman: David Lee, *Kennametal Stellite Company*

Vice-Chairman: Ana Duminie, *North American Höganäs*

EXECUTIVE COMMITTEE (above officers plus the following)

Jim Ryan, *TechMet Alloys*

Dan Hayden, *Hayden Corporation*

Bill Mosier, *Polymet Corporation*

Peter Ruggiero, *Curtiss-Wright Surface Technologies*

ITSA MEMBER NEWS

Tradeshow Assessment for ITSA Members Eliminated

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

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

ITSA SCHOLARSHIP OPPORTUNITIES

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

ITSA THERMAL SPRAY HISTORICAL COLLECTION

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

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

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

ITSA SPRAYTIME

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

JOIN THE INTERNATIONAL THERMAL SPRAY ASSOCIATION

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

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

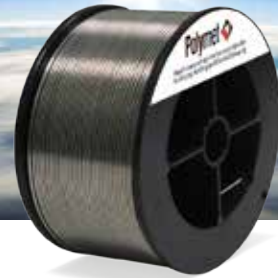
Build awareness of your company and its products and services through valuable promotional opportunities — a centerfold listing in the *SPRAYTIME* Newsletter, exposure on the ITSA website, and recognition at industry trade shows.

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

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

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People in the News

Reorganizational Changes Continue at SSPC



Morgan Stamm



Bree McCullough



Gina Merico



Melissa Pinolini



Nathan Wyman

The Society for Protective Coatings (SSPC), Pittsburgh, Pa., has made several changes related to its spring reorganization. Donald Molinari has been named technical service specialist. He will be responsible for providing technical support for SSPC members and staff, as well as developing written, technical information pertaining to good practice and emerging technologies in the field. In addition, Cara Blyzwick has been named individual membership specialist; Diane McGuire is now organizational membership specialist; Morgan Stamm is marketing communications specialist; Bree McCullough is multimedia specialist; and Gina Merico, Melissa Pinolini, and Troy Eisenhauer are program delivery coordinators. Taylor Braxton joins as member services assistant/publications coordinator. Nathan Wyman, who has been with SSPC for three years, will take on his new role as assistant-controller within the finance and operations department.

Chemcoaters Director Retires



Bill Krippes

Chemcoaters, Gary, Ind., longtime Director of New Product Development Bill Krippes has retired. Krippes was with the company for 16 years and has been in the coil and mill-applied coating industry for more than 46 years serving in R&D, technical service, and sales roles. He will continue to serve as a new business development consultant for Chemcoaters, helping the company's customers find coating solutions to overcome issues with stamping and corrosion. As Krippes moves into his new consulting role, Brit Capizzano will move into the role of R&D manager. Capizzano has spent the last six years under Krippes's guidance and mentorship.

McLaughlin & Associates Welcomes Customer Service Specialist



Mike Battista

McLaughlin & Associates Thermal Spray Inc., Indianapolis, Ind., which specializes in the thermal spray coatings industry and provides a variety of products and services to coating job shops throughout North America, has welcomed Mike Battista as a customer service specialist. Battista has more than 25 years of experience in the thermal spray industry and previously worked for Praxair Surface Technologies for 16 years as a customer service technician. In his new role, he will service existing customers and prospect for new opportunities. Battista is based in the south suburbs of Chicago, Ill.

Ardleigh Minerals Adds Customer Service Representative



Morgan L. Piper

Ardleigh Minerals, Cleveland, Ohio, a full-service industrial recycling company, including for thermal spray plasma dust, has added Morgan L. Piper to its customer service team. In her new role, Piper will serve as a vendor liaison as well as a link between customers and the company. In addition, she will coordinate samplings and monitor approval processes for customers. Piper previously worked as a survey research associate for the University of Alaska Fairbanks, interviewing with visitors and residents in the 222-million acres of federal public lands in the state. Prior to that, she was a lab technician at Sherwin-Williams. ▲

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ITSA Membership



ITSA Mission Statement

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Mr. Dan Hayden | daniel.hayden@haydencorp.com
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Mr. Triratna Shrestha | tshrestha@metcut.com
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 Mr. Mitch Krieg | mitch.krieg@imerys.com
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 Mr. Jeremiah Wann | jwann@isystemswb.com
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Goshen, IN
 Mr. David A. Lee | david.a.lee@kenametal.com
 574.534.8631 | stellite.com

LINCOLN ELECTRIC

Cleveland, OH
 Mr. Thomas Brown
thomas_brown@lincolnelectric.com
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LINEAGE ALLOYS

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 Mr. Jean-Marc Tetevuide
jtetevuide@lineagealloysllc.com
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Dudley West Midlands, United Kingdom
 Mr. Stuart Milton | sales@metallisation.com
 +44.1384.252464 | metallisation.com

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Jodhpur, India
 Mr. S. C. Modi | scmodi@mecpl.com
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 Ms. Karen Sender | karen.sender@oerlikon.com
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 Mr. Bob Unger | runger@polymet.us
 513.874.3586 | polymet.us

PRAXAIR SURFACE TECHNOLOGIES

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 Mr. Richard Thorpe | richard_thorpe@praxair.com
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Worcester, MA
 Mr. Howard Wallar
howard.wallar@saint-gobain.com
 508.795.2351 | coatingsolutions.saint-gobain.com

TECHMET ALLOYS LLC

Sealy, TX
 Mr. James Ryan | j.ryan@techmet-alloys.com
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jens.jerzembeck@dvs-hg.de
die-verbindungs-spezialisten.de

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Mr. Werner Kroemmer
werner.kroemmer@gts-ev.de
 +49.89.31001.5203 | gts-ev.de

IMM, INSTITUTE OF MATERIALS MALAYSIA

Mr. Johar Juhari | johar_juhari@petronas.com.my
 603.5882.3584 | iommm.org.my

JTSS, JAPAN THERMAL SPRAY SOCIETY

Mr. Nick Yumiba | jtss@mb8.seikyoku.ne.jp
 +81.6.6722.0096 | jtss.or.jp

MPIF, METAL POWDER INDUSTRIES FEDERATION

Mr. James R. Dale | jdale@mpif.org
 609.452.7700 | mpif.org

TSCC - THERMAL SPRAYING COMMITTEE OF CHINA SURFACE ENGINEERING ASSOCIATION

Prof. Huang Xiao | xiaoo@chinathermalspray.org
 +86.10.64882554 | chinathermalspray.org

Calendar



NOVEMBER 2018

- **Metal Additive Manufacturing Conference**
November 21–23 / Vienna, Austria
mamc2018.org

DECEMBER 2018

- **POWER-GEN International**
December 4–6 / Orlando, FL
power-gen.com

MARCH 2019

- **Corrosion 2019**
March 24–28 / Nashville, TN
nacecorrosion.org

APRIL 2019

- **2019 62nd Annual Society of Vacuum Coaters Technical Conference**
April 27–May 2 / Long Beach, CA
svc.org

MAY 2019

- **Offshore Technology Conference (OTC)**
May 6–9 / Houston, TX
2019.otcnet.org

- **FABTECH MEXICO**
May 7–9 / Monterrey, Mexico
fabtechexpo.com

- **ICMCTF 46th International Conference on Metallurgical Coatings and Thin Films**
May 19–24 / San Diego, CA
www2.avs.org

JUNE 2019

- **Additive Manufacturing with Powder Metallurgy**
June 23–26 / Phoenix, AZ
mpif.org

SEPTEMBER 2019

- **EUROCORR 2019**
September 8–13 / Seville, Spain
efcweb.org

OCTOBER 2019

- **2019 PM Management Summit**
October 26–29 / Miami, FL
mpif.org

NOVEMBER 2019

- **FABTECH**
November 11–14 / Chicago, IL
fabtechexpo.com

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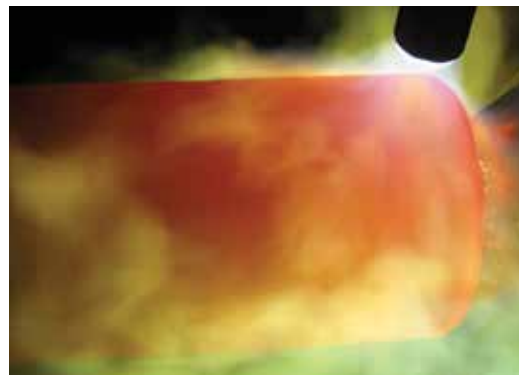
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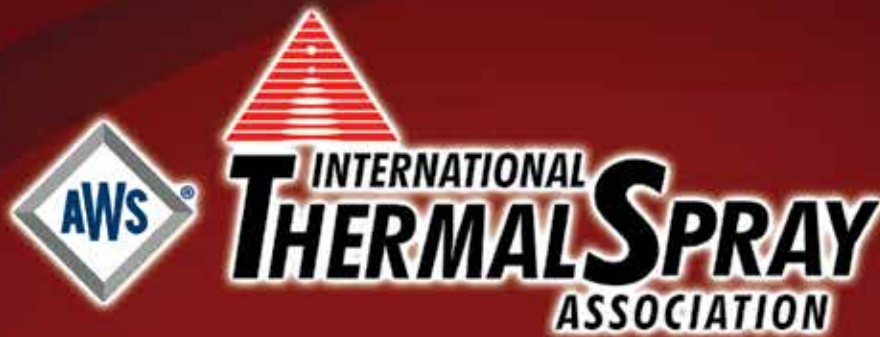
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