

# SPRAY TIME

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



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## NEW CAMFIL APC RESPONSIVE WEB SITE SHOWCASES DUST COLLECTION TECHNOLOGIES, EXPANDED PRODUCT OFFERINGS

Camfil Air Pollution Control (APC) has launched a new web site designed to showcase the company's expanded family of dust, mist and fume collection equipment for a full range of manufacturing industries. It is a responsive web site, designed for all types of devices: Whether viewed on a computer monitor, tablet or smartphone, the web page detects the browser type and automatically reformats for optimum viewing. The new site is online at [www.camfilapc.com](http://www.camfilapc.com).

Camfil APC's new site provides instant access from the home page to the five key product lines: the company's recently added lines of mist collectors, wet scrubbers and compact dust collectors with cleanable filter systems, as well as the flagship line of Farr

Gold Series® cartridge dust collectors.

The viewer can readily browse key industries and applications for all products, as well as installation photos, processes, and lists of common dusts to locate relevant information. Case studies and tutorials, regulatory updates on emission control and combustible dust, and a video library can also be accessed from the home page. A search function and new "Quick Links" tab make it easy to drill deeper into related content. Image carousels, expandable captions and other visual enhancements make it easy to interact with the site and load information quickly. ▲

Camfil APC is a leading global manufacturer of dust, mist and fume collection equipment and is part of Camfil, the world's largest air filtration company.



For further information, contact **Camfil APC** at 1-800-479-6801 (U.S./Canada) or 1-870-933-8048 (international); email [filterman@camfil.com](mailto:filterman@camfil.com), [www.camfilapc.com](http://www.camfilapc.com).



## CENTERLINE RE-QUALIFIES TO MAINTAIN STATUS AS A BEST MANAGED COMPANY

CenterLine (Windsor) Limited is pleased to announce that as a winner of Canada's Best Managed Companies program in 2013 it has again Requalified in 2015 to maintain its status as a Best Managed company.

This prestigious national award is sponsored by Deloitte, CIBC, National Post, Queen's School of Business and MacKay CEO Forums.

"Best Managed companies embrace innovation, seize opportunities and inspire talent. They really set the bar high," said Peter Brown, Partner, Deloitte and Co-Leader, Canada's Best Managed Companies program

CenterLine congratulates its dedicated and talented staff for its outstanding work and commitment to excellence as well as its many valued suppliers and customers that contribute to our overall success. ▲



About CenterLine CenterLine (headquartered in Windsor, Ontario) is a Canadian based, privately held, corporation specializing in advanced

automation processes and technologies that satisfy resistance welding, metal forming and cold spray application needs. It is established internationally with manufacturing and service support facilities situated in the USA, Mexico, Brazil, Germany, Romania, India and China which help support our customer's international operations. With nearly 60 years of business experience, CenterLine continues to develop technologies and processes that assist our customers in maintaining their competitive advantage.



For more information, visit website [www.cntrline.com](http://www.cntrline.com)



## DEWAL INDUSTRIES INTRODUCES NEW SILICONE-FREE TAPES

DeWAL Industries introduces a new line of High Temperature, Silicone-free adhesive tapes for the Aerospace Composite Industry. The tapes are ideal for low out-gassing applications requiring EMS 595. The group includes a woven glass tape, a foil/glass

laminate tape, a red polyester tape and High Density PTFE.

It is becoming an ever increasing problem in sensitive manufacturing processes to introduce silicone elements. DeWAL has addressed this issue by formulating the most popular tapes in versions which contain no silicone. While ideal for the Aerospace Composite Industry, they are additionally used in Automotive and Electronic applications where silicone can also be of concern.

DeWAL's new polyester tapes for composite Lay-up are DW 915-1 and DW915-2.

They are 100 % silicone free, offering a high temperature, high bond, clean release acrylic adhesive. Both pass the ASTM E595 Low Outgassing Test for no outgassing contamination.

They use a 1 mil film and 2 mil film respectively, both are very conformable.

DeWAL's PTFE tape for use as composite Tool Coat is DW716-2HD. The printable glass tape, DW379 is used in aerospace blanket seaming and also as a wire harness and transformer wrap.

The fourth tape is this new series, DW417, is a flexible dead soft foil supplied on a release liner.

The aluminum laminate makes it an ideal heat shield tape.

As with the polyester tapes, the other three tapes also pass the EMS 595 requirement and offer low out-gassing, silicone free operation. ▲



For more information please contact DeWAL's sales team at DeWAL Industries, 15 Ray Trainor Drive, Narragansett, RI 02882, 800-366-8356, usa1@dewal.com

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## **I METALLISATION PROVIDES TURNKEY HVOF PROJECT**

**Metallisation** Ltd has been providing thermal spray solutions around the globe for over 90 years and has just completed its latest turnkey project with B&B Coatings in Huddersfield. B&B Coatings is a specialist in the application of thermal spray coatings. The company has extensive in-house manufacturing, analysis and test facilities, backed by an on-site Metallurgical Laboratory. B&B Coatings offers engineered coating solutions for a wide range of industrial applications and has extensive experience in thermal spray solutions.

The new HVOF blasting and spraying facility, supplied by **Metallisation** Ltd, in cooperation with blasting equipment specialists Sciteex S.p. z.o.o., has enabled B&B Coatings to expand its service offering and increase the range of thermal spray solutions to its customers. There is already an established market for HVOF coatings, which they can now tap into and offer their quality service and coating analysis facilities. With their technical background and expertise they are also able to expand and develop previously undiscovered or underdeveloped applications to offer even more quality coatings and save clients' money.



B&B Coatings has already transferred some of its customers from expensive solid Tungsten Carbide and Inconel625 parts to more effective steel items coated with WCCoCr and Inconel625 coatings respectively, as a result of the new equipment. Components thermal sprayed by the company include, pump shafts, hydraulic pistons for agricultural machines and presses, pump rams for slurry pumps, chutes and guides for the aluminium casting industry, wire drawing blocks and guides and pump sleeves.

The unique aspect that **Metallisation** offers is the involvement of the customer, in this case, B&B Coatings, from the initial specification, design and installation through to the thorough after sales service and technical support. B&B Coatings chose **Metallisation** following extensive discussion and comparison with a number of suppliers. The attraction to **Metallisation** was its ability to offer the complete design, project management, installation and commissioning of the project. **Metallisation** came out on top across the whole process.

**Metallisation** supplied the blast booth, spray room and extractor, as well as the Met-PCC (HVOF-L) liquid fuel spray system, an MK74 powder flame spray system and a Kuka robot. Another key attraction for B&B Coatings was the Met-PCC (HVOF-L) system due to the easy operator interface providing a reliable, repeatable mass flow control in the background. The control of the HVOF unit is via an intuitive touchscreen interface that runs on Windows OS, which is easy to integrate into the existing factory network. The system provides full process SPC data that enables the operator to produce a 'birth certificate' for every job showing the parameters used at every stage of the coating. The simplicity of the METJET-4L HVOF pistol was also appealing to B&B Coatings and has since proven itself to be reliable, easy to operate and maintain. An MK74 hand held or robot mounted powder flame spray system was also supplied to enable the company to cost effectively market a good quality ceramic coating for a relatively small investment. A mass-flow powder feeder was also supplied that can feed either the HVOF or the MK74 powder flame spray pistol.

Initially B&B Coatings had considered project managing and sourcing each of the items separately. However, following a detailed discussion with **Metallisation** it was felt that it would be more cost effective and efficient to proceed with the turnkey facility. The Optiblast blasting room, the

spray booth and spray booth extraction system were engineered and delivered in cooperation with Sciteex. The Optiblast blasting room has in-floor grit recovery but sits on a flat floor at the B&B Coatings site, which meant that no civil excavations were required prior to the installation, saving both time and money. The grit is recovered, cleaned and recycled automatically back to the integrated blast pot. Dust is extracted via the integrated extraction system, which combined with the high quality in-booth lighting, significantly increases the operator viewing experience.

The standalone acoustic spray booth is 14ft 9in. (4.5m) wide, 11ft 6in. (3.5m) deep and 9ft 6in. (2.9m) high and is designed to reduce noise levels, which means that hearing protection is not required outside the spray room. This is an important aspect of the installation as the HVOF process produces around 130dBa of noise. Similar quality of lighting is included in the spray booth to ensure a bright working environment. The extraction system supplied, complete with integral extraction hood, takes away virtually all of the process dust from the spray area resulting in a clean working environment but, more importantly, incredibly clean and uncontaminated coatings. A packaged water chiller was also supplied as part of the HVOF system. The chiller is a pre-assembled, self-contained, integral unit that pumps cooling demineralised water to the pistol via a water/water heat exchanger. Steven Haigh, Managing Director at B&B Coatings is a qualified metallurgist and his experience has led to the move into the HVOF coatings market. As Steven explains "There is a huge business opportunity for a quality coating supplier who has a sound metallurgical understanding and we are excellently placed to maximise these opportunities. It's all a part of our strong commitment to developing and optimising coatings and spray parameters. I see HVOF coatings growing rapidly, enabling us to save clients' money and providing an even more diverse range of coatings. I am thrilled with the whole **Metallisation** service. We were consulted and involved in every single stage of the project, which has resulted in an excellent facility. I would happily recommend **Metallisation** and its expert team."

With **Metallisation's** High Velocity Oxygen Fuel (HVOF) Spray Systems, liquid fuel and oxygen are fed into a combustion chamber. In the chamber they are ignited to produce a hot, high pressure gas stream, which is passed through a converging /diverging



nozzle. Powder is then injected into the accelerated gas stream which heats and accelerates the powder particles

so that they impact with tremendous kinetic energy upon the substrate material. The HVOF process does not melt the powders, it just softens them, resulting in minimal oxidation and decomposition of the coating material. The heat source used in the Met-JET4L HVOF process is liquid kerosene and oxygen. **Metallisation** can also supply systems with gas fuel and oxygen.

Stuart Milton, Sales Director, **Metallisation**, says: "We were delighted to work with B&B Coatings and are very proud of the final project. The company has a very similar ethos to our own and they have a very strong focus on optimising thermal spray coatings. They have successfully repeatedly produced Stellite6 coatings with significantly less than 0.5% porosity – a fantastic achievement. It's always a pleasure to see a project through from start to finish and to see such excellent results, particularly when the customer is so pleased with what we have achieved together." B&B Coatings' on-site full lab facility offers a huge advantage and enables the company to develop and optimise coatings and spray parameters. It also provides the facility to evaluate coating quality and offers a coating inspection and traceability service to its customers. This, alongside the new blast room and spraying facility, offers greater advantage to B&B Coatings and an improved service to its customers. ▲

## Metallisation

Thermal spray equipment and consumables

For more information on the **Metallisation** HVOF systems or thermal spraying equipment and consumables, visit [www.metallisation.com](http://www.metallisation.com) or call Stuart Milton on 01384 252 464



The KM-PCS installed at NAVAIR FRCSW, ready to go

## NAVY COMPLETES THIRD KINETIC METALLIZATION INSTALLATION

Santa Barbara, California - March 9, 2016 **Inovati** recently installed another Kinetic Metallization (KM) system for the US Navy. This is the initial system delivered to NAVSEA, located at Naval Undersea Warfare Center (NUWC, KPWA), Keyport, WA; prior to this, two systems were installed at **NAVAIR** Fleet Readiness Center SouthWest (FRCSW) in San Diego, CA. These KM systems provide the Navy with new capabilities for repair and restoration of high-value, long lead time components on submarines and aircraft, respectively.

FRCSW is currently using KM to repair five flight-critical components on fleet deployed F/A-18 aircraft. Repairs are performed on gear boxes and brake carriers with KM aluminum-based metal matrix composites, specially formulated for each component. High strength steel components, including hydraulic pump gear shafts, are repaired with **Inovati's** proprietary WC-Co. **Inovati** and **NAVAIR** are codeveloping repairs on five additional components



The KM-PCS in use at NAVAIR FRCSW

critical to flight readiness. **NAVAIR** reports that KM repairs deliver better results than alternative

material repair processes, including electrolytic hard chrome and thermal spray WC-Co, and also that KM coatings have superior machinability and eliminate the need for masking.

The first KM system installed at **NAVAIR FRCSW** has already saved over \$3 million, far exceeding the US Navy investment in this equipment. **NAVSEA** expects to generate comparable savings over the next year. Moreover, these savings are expected to multiply in the future as additional components are repaired with KM processes. Further, **KPWA** and **FRCSW** plan on cooperating in order to leverage the Navy investment and shorten the development time for new parts and repairs at each locations.

**Inovati** is based in Santa Barbara, CA and sells Kinetic Metallization equipment and feedstocks. KM is a unique process that deposits metals and metal matrix composites for Coatings, Dimensional Restoration, and Additive Manufacturing at low temperatures and pressures. KM equipment typically operates at 50-130 PSIG and 300-1800°F. Though this is a lower pressure range than competing cold spray technology and significantly lower temperature range than thermal spray, Kinetic Metallization produces substantially better deposits. KM equipment is also known for being able to reliably deposit WC-Co without any decarburization or segregation, increasing this coating's hardness beyond that of thermally sprayed WC-Co or hard chrome coatings. ▲



For more information about Kinetic Metallization, visit [www.inovati.com](http://www.inovati.com) or contact Sten Hansen, [shansen@inovati.com](mailto:shansen@inovati.com), 805.571.6200 ext-17, 1501 Cook Pl., Santa Barbara, CA 93117



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## I GTP AND DYNALLOY ANNOUNCE DISTRIBUTION PARTNERSHIP

**Global Tungsten & Powders Corporation**, a leading manufacturer of tungsten and molybdenum products in the western world, is pleased to announce our partnership with **Dynalloy Industries, Inc.** for the distribution of **GTP's** Thermal Spray Powders. "The addition of **Dynalloy**, as a partner, will complement **GTP's** growth initiative for thermal spray powders with **Dynalloy's** strength as a global provider of cutting and wear-resistant products," said Stacy Garrity, **GTP's** Director of Sales and Marketing. Strategically located in Houston, Texas, **Dynalloy** will also provide service to Louisiana, Arkansas, Oklahoma and regions of Canada. "We're very proud to be partnering with **GTP** and adding their best-in-class thermal spray powders to our portfolio of hardfacing solutions. **GTP's** 40 years of powders experience combined with our industry knowledge, local distribution and support, provides a partnership that will benefit our customers greatly," said Chris Leija, **Dynalloy's** Vice President of Sales and Marketing. ▲

About **Dynalloy Industries, Inc:** **Dynalloy Industries, Inc.** was founded over 45 years ago and is the industry's premier Tungsten Carbide processor. **Dynalloy** has earned a global reputation for providing the highest quality cutting and wear-resistant products throughout the Oil & Gas, Flow Control, Agricultural, GET/Mining, and Size Reduction industries. **Dynalloy** strives to provide innovative, engineered solutions for your hard wear problems. **Dynalloy** maintains a robust inventory of hardfacing consumable options, primarily categorized by application method. Whether PTA, GMAW, Thermal Spray, Laser Clad or Oxy-Torch **Dynalloy** has the hardfacing materials to serve your needs in a timely manner and with world-class customer support.



For more information, visit [www.dynalloyinc.com](http://www.dynalloyinc.com).

About **Global Tungsten and Powders Corp:** Established since 1916, **GTP** is a world leader in high-temperature metallurgy and inorganic chemistry. A vertically integrated supplier, from ore to powder, **GTP** provides the market with a stability of supply and tightly controlled process that very few manufacturers can match. The recent acquisition of Tikomet Oy, Finland, a high quality zinc reclaim producer, allows **GTP** to utilize versatility in zinc processing, in addition to their established North American chemical processing. Located in Northeastern Pennsylvania, **GTP** is a division of the Austrian based Plansee Group. Focused on growth in the thermal spray powder market, **GTP** is a high quality manufacturer of Tungsten Carbide, Molybdenum Carbide and Chrome Carbide powders. Problem solving through applications engineering, collaboration in research and development initiatives and focus on core competencies, provides **GTP** with the structure for success.



For more information, visit [www.globaltungsten.com](http://www.globaltungsten.com)



...use tantalum capacitor powder from H.C. Starck.

## I H.C. STARCK RECEIVES CERTIFICATION FOR PROCESSING CONFLICT-FREE TANTALUM RAW MATERIALS FOR THE FIFTH TIME

**H.C. Starck**, one of the world's leading manufacturers of technology metals and advanced ceramics, has received certification for processing "conflict-free" tantalum raw materials for the fifth time in a row. The corresponding audit was performed by the Electronics Industry Citizenship Coalition (EICC), an independent organization, and the Global e-Sustainability Initiative (GeSI) as part of the Conflict Free Smelter Program (CFSP).

"Fair and responsible purchasing of raw materials from conflict-free sources is an unshakeable principle of our raw materials strategy," explained Dr. Andreas Meier,

CEO of **H.C. Starck**. "We are delighted to have received this certification for the fifth year in a row. It proves that our strategy of focusing on sustainability in procurement of raw materials is the right one," he added. Independent auditors commissioned by EICC and GeSI visited the **H.C. Starck** locations that process tantalum in the United States, Germany, Japan, and Thailand in late 2015, checking in detail whether the locations meet the two organizations' stringent requirements for processing of conflict-free raw materials. There were various steps the company had to complete in order to receive the certification, including proving that **H.C. Starck** has integrated a

strategy that applies worldwide for avoiding raw materials that serve to finance or otherwise benefit armed groups into its business processes. The company also had to demonstrate that it has an appropriate system that can be used to trace the origin of the raw materials used all the way back to the mine. In addition, **H.C. Starck** is under an obligation to be able to document that all of the raw materials purchased and processed come from conflict-free sources.

Alongside its cooperation with established, audited mine operators, recycling of secondary raw materials is another pillar of the **H.C. Starck** raw materials strategy. "Sustainability in the supply of raw materials is also expressed in one of our core

competencies: recycling of technology metals,” Dr. Meier continued. “We use innovative methods to process production residue, slag, and scrap into high-quality, high-performance metal powders. Our goal in doing this is to make a significant contribution to practices of sourcing raw materials sustainably and with reduced environmental impact.”

**H.C. Starck** fully endorses the position of the EICC and the OECD not to purchase, process, or resell any raw materials used to finance or benefit armed groups. The company actively supports its customers in fulfilling their duties of care and disclosure in line with the guidelines issued by the U.S. Securities and Exchange Commission. **H.C. Starck** is a member of the ITRI Tin Supply Chain Initiative (iTSCi), which has developed a due diligence system to bring transparency to procurement of raw materials from conflict areas and regularly checks to ensure that member companies are implementing it. ▲

About **H.C. Starck**: The **H.C. Starck** Group is a leading global supplier of technology metals and technical ceramics from its own production facilities in Europe, North America and Asia, supplying growing sectors such as the electronics, chemical and auto industries, medical technology, the aerospace industry, energy and environmental technology, and mechanical engineering and tool making. In 2014, the company had about 2,700 employees in the U.S., Canada, the United Kingdom, Germany, China, Thailand, Vietnam and Japan.



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## POWDER ALLOY CORPORATION EXPANDS AND LAUNCHES ADDITIVE MANUFACTURING POWDER LINE

Cincinnati-based **Powder Alloy Corp. (PAC)** has launched a new line of Additive Manufacturing Powders. **PAC** is capitalizing on its highly successful aerospace processing and quality control technology to produce nickel, cobalt, and stainless steel alloys for rapidly emerging 3D Additive Manufacturing demands from the aerospace, medical, and automotive industrial marketplace. Inert gas atomized spherical powders are now available to standard and customized chemistries and sized to exact customer equipment specifications. **PAC** recently completed a 35,000 square foot manufacturing addition to support R&D, innovation and continued commitment to serve its expanding Additive Manufacturing customer base.

**PAC** is a manufacturer and global supplier of metal, ceramics, and carbide powders serving the aerospace, industrial gas turbine, additive manufacturing, biomedical, power and energy, and oil and gas industries for more than 40 years. ▲



For more information, please contact **Powder Alloy Corporation**  
Customer Service at 513-984-4016 or  
visit our website at [www.powderalloy.com](http://www.powderalloy.com).

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## BECOME A MEMBER OF THE



Your company should join the **International Thermal Spray Association (ITSA)** now! **ITSA** is now a Standing Committee of the **American Welding Society** expanding the benefits of company benefits. As a company-member professional industrial association, our mission is dedicated to expanding the use of thermal spray technologies for the benefit of industry and society.

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

See pages 12 – 14

59<sup>th</sup> Annual Technical Conference, Indiana Convention Center, Indianapolis, IN, USA

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## I HB COATINGS – NEW THERMAL SPRAY COMPANY

After the closing of St. Louis Metallizing, many companies have been left without a reliable partner for processing their parts that require coatings, grinding and machining. We are pleased to announce that a group of 6 former employees from St. Louis Metallizing have started up a new shop in the St. Louis area to help fill this void. The name of the new shop is **HB Coatings, LLC**. And is located at 932 Fairway Park Drive in Madison, IL. 62060.

**HB Coatings, LLC** would like the opportunity to again earn the trust and business that many of you have given to St. Louis Metallizing through the years. **HB Coatings, LLC** has retained employees from the thermal spray, machining and grinding areas. Namely, Duane Boehnke who is one of the most sought after person in the thermal spray industry. With over 26 years of experience, he is a managing member of **HB Coatings**. Jason Hunsaker, the other managing member, has over 14 years of experience in

engineering and sales. Our top welder is John Obernefuemann who has 28 years of experience in welding, fusing and thermal spray. Tim Phillips brings his 31 years of experience in thermal spray including HVOF, plasma, flame spray and arc spray experience. Paul Engelman has both sales and grinding/machining experience in many industries but has honed his craft in the printing industry with 29 years of cylinder rebuilds under his belt. Gary Tepen has over 31 years of machining and grinding experience on pumps, glass manufacturing parts and long shafting. Together our employees have a total of over 150 years of experience working on general industrial, printing, power generation, glass manufacturing, and oil and gas components. The resources of **HB Coatings, LLC** is not limited to our current employee base, but we also have the ability to work with many of the employees that have retired from St. Louis Metallizing.

Your requirements of quick turns and high quality are very familiar to us and we will strive to meet all of your needs. We know and understand your parts and have worked on them or similar parts through the years. Repair and overhaul is not a simple thing but it requires a special know-how and the ability to apply knowledge learned over the years to bring parts back into working order. This ability is not something that can be bought or transferred easily. We have that ability. ▲

For more information, visit our website [www.hbcoatings.com](http://www.hbcoatings.com) or contact Jason Hunsaker at 314-313-1380 - [jhunsaker@hbcoatings.com](mailto:jhunsaker@hbcoatings.com), Paul Engelman at 314-220-9718 and Duane Boehnke at 314-780-3955 - [dboehnke@hbcoatings.com](mailto:dboehnke@hbcoatings.com).



We hope that you will again give us the opportunity to work with you on your projects and look forward to hearing from you soon.

## I INTERNATIONAL THERMAL SPRAY ASSOCIATION WELCOMES NEW MEMBERS

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The managing director, Dr. Andrew Verstak, has been involved in thermal spray since 1983. He holds an MS in Metallurgy and a PhD in Materials Science. His work experience includes the Powder Metallurgy Association (Minsk, Belarus), Aachen Technical University (Aachen, Germany), Drexel University (Philadelphia, PA), Metalspray (Richmond, VA), and UniqueCoat Technologies (Oilville, VA).

Dr. Verstak holds eleven patents and published over eighty papers in the USA, Europe, and Japan. He has first-hand experience in air and vacuum plasma spraying, underwater plasma spraying and synthesis, high-velocity oxygen-fuel (HVOF) and electric arc spraying. He is a co-inventor of the Activated Combustion HVOF process. Dr. Verstak is the ITSA Company Representative. ▲

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## ITSA Mission Statement

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# MEMBERSHIP



Chairman Mosier

The **International Thermal Spray Association** is closely interwoven with the history of thermal spray development in this hemisphere. Founded in 1948, and once known as Metallizing Service Contractors, the association has been closely tied to most major advances in thermal spray technology, equipment and materials, industry events, education, standards and market development.

A company-member association, **ITSA** invites all interested companies to talk with our officers, and company representatives to better understand member benefits. A complete list of ITSA member companies and their representatives can be found at their website [www.thermalspray.org](http://www.thermalspray.org)

## 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.

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Chairman: **Bill Mosier**, *Polymet Corporation*  
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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 [www.thermalspray.org](http://www.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 which 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 over 30 different spray guns and miscellaneous equipment, a variety of spray gun manuals, hundreds of photographs, and several historic thermal spray publications and reference books.

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

## ITSA SPRAYTIME NEWSLETTER

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

## BECOME A MEMBER OF THE INTERNATIONAL THERMAL SPRAY ASSOCIATION

Your company should join the **International Thermal Spray Association (ITSA)** now! As a company-member, professional industrial association, our mission is dedicated to expanding the use of thermal spray technologies for the benefit of industry and society. **ITSA** members invite and welcome your company to join us in this endeavor.

**NEW** – All **ITSA** company members are now also Supporting Members of the **American Welding Society**.

Whether you are a job shop, a captive in-house facility, an equipment or materials supplier, an educational campus, or a surface engineering consultant, **ITSA** membership will be of value to your organization.

Our annual membership meetings provide a mutually rewarding experience for all attendees - both business and personal. Our one-day technical program and half-day business meeting balanced by social activities provide numerous opportunities to discuss the needs and practices of thermal spray equipment and processes with one another.

As an **ITSA** member, your company has excellent marketing exposure by being listed centerfold in the **SPRAYTIME** newsletter.

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For more information, contact Kathy Dusa 440.357.5400 or visit the membership section at [www.thermalspray.org](http://www.thermalspray.org).



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## THERMAL SPRAY WELDING – WHY NOT?

In the past 60 years, the thermal spray industry has made excellent advances in spraying of powder. These advances commenced with Union Carbide's detonation equipment, which produced supersonic flame jets resulting in much higher powder particle velocities against the workpiece. Only a few years later Merle Thorpe, President of Thermal Dynamics, invented a commercially reliable plasma-spraying method with funds provided by Metco. The higher temperature jets of plasma improved the quality of many commonly sprayed coatings, particularly for ceramics. In the early 1980s, HVOF technology allowed increasing supersonic flame jet momentum values, thus increasing impact velocities even further.

In addition to improving the thermal spraying of powders, a laminar plasma with a flame jet length more than 15 inches long was found to make excellent welds by introducing powder material directly into the laminar jet. This was a single-stage process to provide the necessary heating of both the spray particles and the workpiece surface to required temperatures to allow the powder to bond the welded pieces together. Unfortunately, industry paid little attention to the new welding method at that time.

For powder spraying (except for welding), these advances in technology rapidly enlarged the thermal spray market. The same

level of effort has not been paid to increase the effectiveness of wire spraying. In a recent article published by Praxair-TAFA, porosity of wire-produced coatings has decreased from 10% for open-atmosphere flame spraying to about 4% for the twin-wire arc. Switching to powder spray using the HVOF process reduces porosity to less than 1%.

The important parameters for reducing porosity include the reduction of particle size and increasing the impact velocity of the particles, as well as controlling the particle temperature. Wire particle size reduction is dependent on the jet momentum, which in turn is dependent on combustion pressure. HVOF combustion pressures have risen from an initial level of under 100 psig for Stellite's Jet Kote gun, to 200 psig for TAFA's JP-5000 gun, and to 300 psig for Metco's latest models. I believe that increasing the pressure to 500 psig would reduce wire particle diameters down to 20 microns, which is small even for present powder spraying. While the average particle diameter for wire-arc is about 100 microns, it has been reduced to 40 microns for a 200 psig HVOF pressure. The workpiece has no way of knowing what spray method is in use except for the particle impact velocity, temperature, and size. So, if wire can be used in place of powder, the hope is that combustion pressures can be raised an acceptable amount for welding purposes. In addition, it is probable that the workpiece surface temperature must be increased to close to its melting point prior to introducing the metal to be sprayed.

(cont' to page 18)

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"Agents exists in all Principle countries"

(Cont' from pg 16)

A major improvement in coating quality has resulted from the process referred to as "cold spray" or "impact fusion", in which the spray particles are not allowed to melt, and the particle velocity is increased to provide sufficient impact energy to fuse the particles together to form the coating. This process is used by TAFE's JP-5000 unit as well as by recent HVOF equipment sold by Metco. I believe that Professor H. Kreye of Hamburg, Germany was the first to announce the "cold spray" and "impact fusion" processes to be basically the same. The particles are heated to just below their melting points and accelerated to extreme impact velocities to fuse them together to form a nearly oxide-free coating. An excellent description of these events is given in an article by T.C. Hanson and G.S. Settles.

**SUGGESTED LABORATORY TESTING PROGRAM TO DETERMINE THE FEASIBILITY OF THERMAL SPRAY WELDING OF METALS**

What I believe to be a straightforward approach to determining the feasibility of the thermal spray welding process is presented below. It would be foolish of me to suggest specific spraying tests to the market that I am addressing. I have never done professional metalizing itself, but have only developed ways to provide heat and velocity as might help the process.

A set of tests which should lead to definitive results would use several different thermal spray processes to determine the relative importance of particle impact velocity and temperature, for workpieces heated to a wide range of surface temperatures. The equipment to be tested includes plasma, HVOF capable of operation at 200 psig oxygen inlet pressure (TAFE's JP-5000) or Metco's newest guns which operate at 300 psig, and twin-wire arc for wire capabilities. Depending on results achieved from examination of photo-micrographs of the resulting deposited metal, it is hoped that a positive trend of increasing fusion-bonding to the workpiece as well as bonding of the particles to each other will become obvious. If not, it may be advisable to test the ability to increase velocities further by using oxygen pressures to more than 500 psig.

**The Tests**

I. Prepare about 10 samples in the same fashion as currently used to produce optimal thermal spray coatings. Use, perhaps, 3/16" thick flat steel workpieces of relatively small area (1"-2" diameter). A plasma torch is then used without particle addition to preheat the workpiece as indicated below, and subsequently employed to spray relatively small size Inconel powder (or any other adaptable metal) onto the previously-heated workpiece surface. The tests compare the fusing of the particles for various degrees of preheating:

- A. No preheat at all
- B. To just below a surface temperature where a red radiation would appear
- C. To a mid-red surface
- D. To a bright red just before any melting of the surface is evident

To the point where evidence of melting appears

II. Repeat those preheating steps of series I which appear, upon thorough examination, to show promise for best fusing results. In this series, use 200 psig or 300 psig HVOF powder spray units, which provide higher impact velocities than plasma spraying. Perhaps somewhat thicker samples should be used in this test series to allow inspection of fusion between particles well away from the workpiece surface (for example, a high stand-off distance of the gun may not keep the deposited particles sufficiently hot).

III. Using a twin-wire arc, spray wire-produced particles against samples preheated to the optimal degree. The impact velocity is relatively low.

IV. Using one of the HVOF units tested in series II, feed a wire into the exiting flame jet just beyond the nozzle exit. The impact velocity is quite high.

Even in the event that the results are not encouraging for fusion welding, it is possible that the suggested testing will produce an avenue for improving the quality of normal thermal-spraying applications. For example, I am 99.9% certain that raising the working oxygen pressure of HVOF spraying to over 500 psig is quite worthwhile. If the reader should agree, perhaps a license to U.S. Patent 8,455,056 would be of considerable value, particularly when nearly order-of-magnitude increases in wire spray rates are possible.

**Closure**

If the answer to the question posed in the title of this report is "Yes! Thermal spraying should be adaptable for metal welding.", then the teachings of U.S. Patent 8,455,056 would include improved thermal spray coatings, particularly by boosting wire spray rates to well over 100 pounds per hour when the gun is machine held. Hand-held operation is probably limited to 75 pounds per hour, as the jet thrust becomes too great at higher spray rates. Additional benefits of the '056 method include operation without the need for water cooling, a safe means for preventing "back flash" when axially-fed wire passes through the combustion nozzle bore length for maximum pre-heating, and operation without the need of complex consoles to help keep system operating prices to something a bit more than one half that of a twin-wire arc system.

Sale of the '056 patent rights is mainly based on the design completion by a capable company with the promise of adequate marketing of the various designs developed, rather than using the patent to prevent the use of these advances.

If the reader is further interested in bringing modern methods to present wire-spray users, as well as advancing powder spraying with a single system capability to produce (with attachments mounted on the exit nozzle of the gun) the three common modes of operation, "cold spray", "warm spray", and "hot spray", please request an unpublished report covering all these details. The unpublished article will be accompanied by a recent issue of Spraytime magazine which discusses results obtained over ten years ago spraying at combustion pressures above 1,000 psi. The reader should note the coating qualities shown in Figures 2 and 3 of the Spraytime article. ▲

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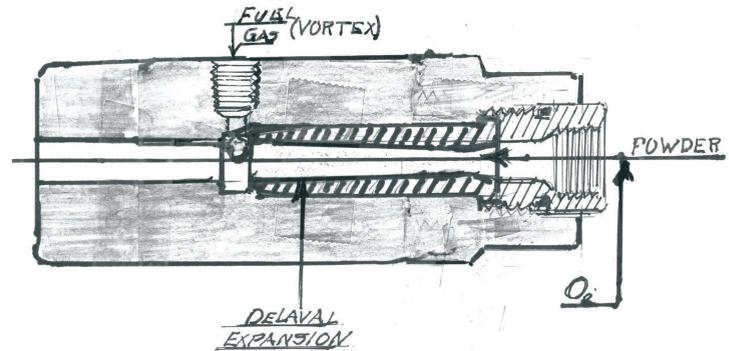
## OXY-ACETYLENE TORCH FOR THERMAL SPRAYING OF CERAMIC POWDERS

*This short discussion is distinct from the topic of the possible use of thermal spray for fusion welding of metals.*

A major disadvantage of all HVOF processes is that the use of extremely high combustion pressures results in high drops of jet temperatures prior to impaction at the workpiece surface - perhaps more than 1,000F below the melting point of the material being used. The higher the pressure, the lower the range of materials benefitted. This becomes a serious matter where high melting-point ceramics are concerned. Speculating on the possible use of acetylene, a fuel about 1,000F hotter than other fuels (except cyanogen, a poison) a possible torch design is sketched below.

This torch would use high-pressure oxygen injection containing the ceramic powder, passing the oxygen stream through an extended de Laval nozzle to raise the particle velocities appreciably. The unburned oxygen is directed into an extended bore after its pressure has dropped, by expansion, to about atmospheric. A vortex flow of the acetylene is injected at its safe pressure of about 30 psig into the bore to combust with the supersonic oxygen flow. (Problems? Yes, but they are solvable.)

It is believed that thermal spraying of high melting-point ceramics should be possible using a new type of HVOF process where



a supersonic oxygen jet (without fuel) accelerates fine ceramic powder particles prior to their entering the combustion bore. This is a reversal of conventional HVOF equipment. Currently, the best ceramic spray system is a 250 kW plasma unit sold by TAFA, costing more than \$150,000 per system. If this new approach proves possible, it could greatly expand ceramics spraying. The main problem is making two reactant streams having very different velocities ignite and combust effectively. ▲

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*ps. In addition to ceramic powders, some high melting-point metals, for example molybdenum and tungsten, might benefit from this method.*



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Michael can be contacted at [Michael.Breitsameter@hcstarck.com](mailto:Michael.Breitsameter@hcstarck.com) or via his mobile/cell on +1 617 8937367.

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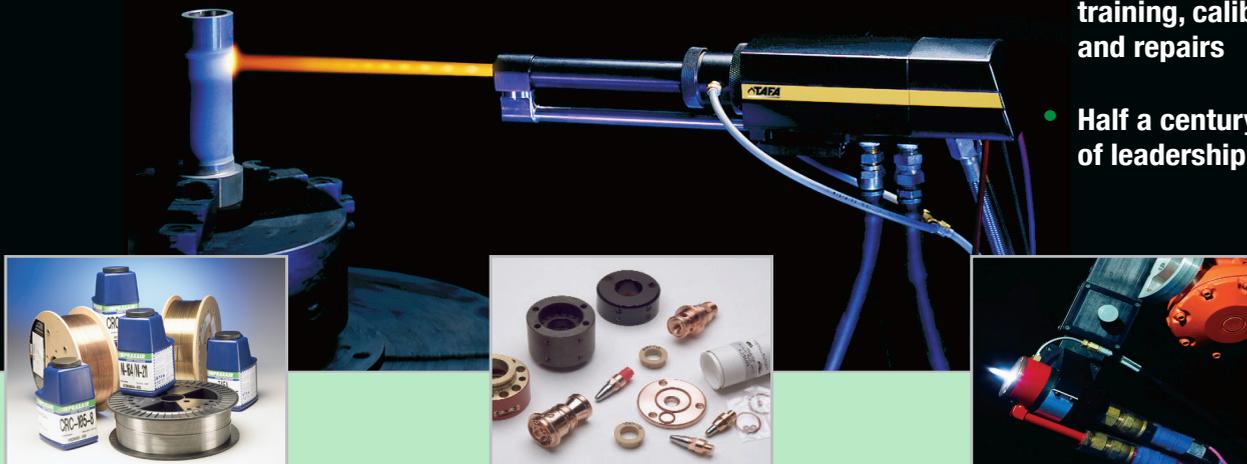
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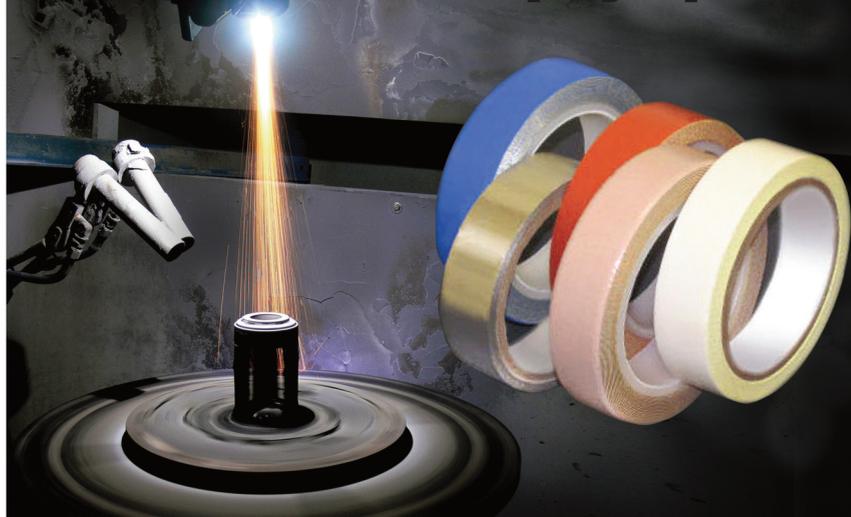


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