

# SPRAYTIME®

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## ***Thermal Spray Technology: High Performance Surfaces Conference November 3, 2010 • Atlanta, Georgia***

Conference Cochairmen: Daniel C. Hayden, David Wright

### ***SESSION I: Plenary - Keynote Speaker***

#### ***Thermal Spray Today***

Mark F. Smith, Senior Manager-Materials Science and Engineering Center, Sandia National Laboratory.

### ***SESSION II: Practical Applications in Industry Thermal Spray in the Fabrication Process***

Dale Moody, Systems Engineer, Plasma Powders and Systems Incorporated

DESCRIPTION: One definition of fabrication is "To construct by combining or assembling diverse, typically standardized parts." Typically, a coating, especially one applied using thermal spray, is not considered a "standardized part". Therefore, some may question having thermal spray included in the normal fabrication process. This paper addresses this question by reviewing how thermal spray has advanced from a highly specialized process to one that is standardized and able to be integrated into a fabrication shop. It summarizes the standard thermal spray processes now available to the fabricator and discusses how a fabricator can proceed from total dependence on an outside job-shop for coatings to having in-house thermal spray capability. It also addresses how a fabricator can work with material and equipment suppliers to support a wide range of applications.

### ***High Performance Cermet Coatings for Aerospace and Defense***

James S.B. Chew, Business Development – MesoCoat Inc., Vice President - Science and Technology, ATK; Co-authors: Andrew J. Sherman, President & CEO, Greg Engleman, Chief Technical Officer and Curtis P Glasgow, General Manager – Thermal Spray, all of MesoCoat Inc.

***continued on page 4***

## ***Stony Brook University: Center for Thermal Spray Research***

The Center for Thermal Spray Research (CTSR) at Stony Brook University was formed in 1996 through the highly competitive US National Science Foundation-Materials Research Science and Engineer Center (MRSEC) program which provided ~ \$10 million in funding for basic research into thermal spray materials and processes. The MRSEC infused much needed fundamental science into this important industrial technology and pointed to revolutionary capabilities of these rapidly quenched systems. Since 2007, CTSR transitioned to a self-sustaining NSF center with diversified financial support from government (DOE, DOD, NSF, SPIR) and industry (see



Consortium page 7). Significant advancements were made in the areas of process maps, in situ monitoring of deposit evolution dynamics and integrated process-property relationships.

CTSR's research philosophy is based on integrated and interdisciplinary approach to thermal spray processes and

***continued on page 7***



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**Editorial and Production Office**  
**Kathy M. Dusa, Managing Editor**

208 Third Street

Fairport Harbor, Ohio 44077

United States of America

voice: 440.357.5400

fax: 440.357.5430

email: [kathydusa@thermalspray.org](mailto:kathydusa@thermalspray.org)

[spraytime@thermalspray.org](mailto:spraytime@thermalspray.org)

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**Thermal Spray Technology continued from page 1**

**DESCRIPTION:** PComP™'s are newly developed and demonstrated (ceramic-metal) cermet developed specifically for an affordable, environmentally friendly hexavalent chromium replacement. The PComP cermets are fabricated into a hierarchical structure, using a patented process to engineer down to nanoscale. These materials are nano-structured ceramic-metal composites formed with a nanocomposite core and binder coating; which are made using combination of low friction, high wear resistance and excellent corrosion resistant materials. The nanocomposite core provides high wear resistance, low friction and light weight; and the binders provide corrosion resistance, toughness, ductility, resiliency, and improved deposition efficiency. This combination results in a high-toughness, ductile-phased toughened structure of high hardness tiles separated by ductile binder laminates; that offers revolutionary performance and cost breakthroughs. PComP™ is a very promising replacement for hexavalent chrome plating that is widely used in the aerospace sector; and can be applied using conventional thermal spray methods and can be machined using conventional machining methods. This paper presents a variety of cermet coatings applied to steel substrates for various aerospace and defense applications, and the resulting properties. These results will then be compared to traditionally processed materials and will conclude with a discussion of the advantages of cermet coatings as a hard chrome replacement.

**Thermally Applied Dispersed Oxide Coating System  
Used in the Mitigation of Corrosion**

David Urevich, President, Arc Melt

**DESCRIPTION:** Traditionally, protective oxide surface films provided adequate corrosion protection of alloy systems used in most process equipment. Today, however, industry has placed ever increasing demands on these systems to perform in broader, more dynamic, environments. The result has been that these protective oxide films are no longer capable of providing the corrosion protection required. This has spurred a new approach to corrosion protection through the provision of well bonded, composite cermet coatings. This presentation will discuss a fresh approach to surface treatment; including the manufacturing methodology of raw feedstock materials, application techniques and lab and field test results.

**Thermal Sprayed Active Metallic Coatings Against  
Environmental Corrosion**

Fred van Rodijnen, Global Business Development Manager  
Arc Portfolio , Sulzer Metco Europe GmbH

**DESCRIPTION:** Thermal spray coatings have been used for corrosion protection since their invention in the early 20th century. The power and solar power, to combat their biggest enemy - corrosion. A metallic coating of zinc, zinc/aluminum or aluminum provide long-lasting active corrosion protection with little or no maintenance or repair for its 20 to 50 years of protective life. Because maintenance and repair needs are eliminated, the carbon footprint from this protective system is very low. Thermal sprayed coatings are environmentally-friendly anti-corrosion systems for green energy providers.

**SESSION III: New Applications and Technologies  
New Thermal Spray – A Viable Alternative to  
Mechanical Devices for Oilwell Casing Centralization**

Joe L. Scott, Partner, WearSox LP

**DESCRIPTION:** In the development of oil and gas wells, a hole is drilled in the earth and steel casing is inserted into the open hole in successively smaller sizes. After these casing strings are inserted into the hole cement is pumped through the casing and forced to flow up and around the outside of the casing to seal off the formations. In order to keep the casing aligned in the center of the hole a variety of mechanical devices have been employed. These are of four principal types – bowspring, molded on epoxy, rotating and integral blade stabilizers. The integral blade stabilizers are threaded on each end and are screwed into the string between the joints of casing. These are very expensive and require additional make-up time on the rig floor. The same is true for the rotating type. The epoxy types have proven fragile and often break. The bowspring types slide over the casing and are held in place by collars with set screws. These often slide up the casing during insertion into the well and can bunch up causing a "train wreck". The new thermal spray material can be applied directly to the casing wherever needed, applied in the shape of blades, with thicknesses exceeding 3.0 in., is wear resistant and tough enough to make the trip intact. Work to date has proven the thermal spray technology to



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be superior in both onshore and deep water offshore wells. This paper describes the development, laboratory testing and field applications of this new technology in thermal spray which will be called TWAS-TWR (Twin Wire Arc Spray – Thick Wear Resistant).

***New Applications of Cold Gas-Dynamic Spray (Medium Pressure Cold Spray)***

David Wright, President, Accuwright Industries, Inc.

**DESCRIPTION:** Accuwright Industries, Inc. is a leader in research and development and production applications of low pressure and the new medium pressure cold spray processes. Developing the cold spray process to apply harder and more encompassing materials such as high strength and heat resistive base alloys in a more economical way. Accuwright is developing and pioneering repairs for stainless steel, superalloy, and titanium turbine engine parts and worn components with aerospace and industrial applications. We propose to describe a few of our developments and specific application successes to share practical potential in cold spray process capabilities.

***Cold Spray: A Solid State Metal Coating Process for Corrosion Protection in a Nuclear Application***

Ed Malison, Director of Business Development, NACE Certified Level II Coating Inspector No. 12392, CenterLine (Windsor) Limited

**DESCRIPTION:** Cold spray, or gas dynamic spray, is an established solid state coating process that uses a high-speed gas jet to accelerate powder particles towards a substrate. The kinetic energy is used to plastically deform the particles where they will be consolidated onto the surface to form a very dense, well-adhered coating. The particles never undergo a phase transformation throughout the process which means that the coating raw materials and substrate materials experience minimal thermal affects. We will be presenting an overview of the most recent advances in field-applied cold spray technology that utilizes remote robotic manipulation to apply an aluminum coating to nuclear reactor areas that are extremely difficult to access and where cold spray is, in all probability, the only practical method of coating application.

***Intelligent Gun Technology and Its Advantages for Thermal Spray Processing***

Steven Ort, Sulzer Metco (US) Inc

**DESCRIPTION:** As the requirements for consistency in thermal coatings become increasingly stringent, the ability to acquire more accurate data at higher speeds becomes increasingly important. To achieve this, process variables must be measured as close to the spray process as possible. This paper introduces a new technology that measures process variables directly inside a thermal spray gun and provides gun-specific data storage features. It explains the advantages of measuring the process variables inside the gun and describes the benefits of having relevant gun data stored on the gun itself. (Co-authors: Martin Koller and Andreas Kilchenmann, both of Sulzer Metco AG (Switzerland) in Wohlen)

***New Thermal Spray SiAl Powder Technology Will Advance Rotatable Sputter Target Coatings***

Daren Gansert, President – HAI Advanced Material Specialists, Inc.

**DESCRIPTION:** Rotatable sputtering targets and advanced rotatable magnetrons are used in vacuum coating processes for depositing thin films onto glass. Silicon is widely used for anti-reflection coatings, all-dielectric mirrors, and display glass. The production of SiAl targets by thermal spraying processing is “state-of-the-art”, but there are still many limiting factors that affect the end coated target. The desired functionality of the sputtering target can only be achieved by a well designed coating consisting of a finely dispersed, dense, and uniform coating microstructure. The most popular raw powder form is a blended powder composition of silicon with aluminum ranging from 0 – 19% by weight. Mechanically blending two dissimilar materials is quite useful but yet can provide many quality issues within the coating which include separation of particles in the plasma flame, over heating (evaporation) of lower melting point metals, e.g. Al, which can increase porosity levels, and inhomogeneous coating composition. One solution to decreasing target coating quality issues is to elim-

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inate using blended powders. This paper will discuss the manufacturing of unique powder formulations which combine both Si and Al into a single particle consisting of the proper chemical composition required for the target. Powder analysis and comparisons between the current blended powders versus single particles will be shown. Thermal sprayed coating cross sections, density and hardness results will be reported. Coating integrity and coating composition will be compared using EDAX and image analysis techniques. Cost comparison(s) will be provided for the raw powders and coated samples; including target efficiency, deposition efficiency and retained Al content remaining in the coated samples.

#### **SESSION IV: Working With Coatings**

##### ***Why Thermal Spray Coatings Often Fail***

Larry F. Grimenstein, President, Nation Coating Systems  
DESCRIPTION: Unfortunately many arc sprayed, plasma and even HVOF coatings actually fail rather than coating material wearing out. The cause of these failures is caused by a number of things but they condense to not asking the correct questions. In fact, often there were not any questions even asked. So who should be at fault? This is a joint failure of both the customer and the vendor. Now you are saying, I know that and I always do that therefore it will not fail, unfortunately you are wrong. Does the customer/vendor ask the right questions or even enough of them? This speech is to point out why these failures are

overlooked and do not need to happen if the proper materials and applications are done.

##### ***Machining Thermal Spray Coatings***

Daniel C. Hayden, President - Hayden Corporation,

Managing Partner - Hayden Laser Services, LLC

DESCRIPTION: A practical guide to using and finishing thermal sprayed coatings by tooling and grinding, this presentation covers one of the more challenging aspects of designing for and using thermal sprayed coatings. Machining coatings for use in OEM and repair applications is no more challenging than conventional machining, but some special properties of the coating itself require unconventional tool and wheel selection and gentler infeeding techniques, in order to ensure that the coating will perform as needed. The presentation covers specific techniques, rules of thumb, and standard practices to ensure that coatings will hold up to the tough challenges they face.

##### ***Advancements in Abrasive Belt Roll Grinding and Finishing Methods***

Nicholas A. Orf, 3M Company - Abrasive Systems Division  
DESCRIPTION: Roll grinding and finishing of steel, chrome plated and thermal sprayed rods, rolls and other cylindrical components has traditionally been accomplished with a variety of bonded abrasive wheel constructions. Recent developments in abrasive belt technology, applied to common roll grinding equipment has resulted in increased grinder functionality and productivity improvements for thermal spray providers. This presentation will discuss the abrasive belt technologies applied in roll grinding operations, conversion concepts enabling wheel grinders to run belts, and case studies describing abrasive belt grinding methods which achieve the geometry requirements of ground thermal sprayed components. The benefits of belt grinding and finishing methods including higher productivity and throughput, combined with enhanced roll grinder versatility enabled by the ability to quickly change belts according to the dimensioning, finishing or alloy needs will be tailored.

##### ***Thermal Spray Dust Collection Safety As It Pertains to NFPA (National Fire Protection Association) Rules and Regulations***

Tony Supine, Camfil FARR Air Pollution Control

DESCRIPTION: As the subject of combustible dust continues to escalate throughout the country, it is important to understand the severity of the risks of handling combustible dusts, know what standards are being defined to deal with them, and who is responsible for following and enforcing them. This presentation offers some insight to all of these points and answers the question; "To whom do these standards apply?", and "Are any parts of these standards and programs retroactive?" In addition, some small amount of history as to why the standards were developed will be covered along with several common examples of proper explosion protection techniques as defined by the National Fire Protection Association's guidelines and standards.

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**Stony Brook University continued from page 1**

materials R&D along with multilevel education, addressing problems that are both fundamental and practical engineering importance. The center seeks to link research to practice so as to enable: implementation of thermal spray coatings into the design cycle, utilization of robust processing methodologies and simple, yet scientifically based, characterization and property measurement tooling. Concurrently CTSR conducts a vibrant outreach program to both undergraduate and K-12 community to promote interest in thermal spray among the next generation of students. These outreach programs include field trips for school students, lectures and even summer internships.

**Consortium on Thermal Spray Technology**

CTSR has had a long history of formal and informal industrial cooperation. Since 2002, a formal partnership has been established through the Consortium for Thermal Spray Technology. From an initial group of 10 companies, the Consortium now has over 26 members and is entering its 9th year of a highly successful knowledge-transfer partnership. The Consortium's mission is to provide pre-competitive activities allowing interaction among the various organizations in a neutral framework. This initiative was in response to the recognition that the diversity of thermal spray applications worldwide, nominally an advantage, was resulting in application-specific and thus disconnected scientific work. The consortium acts to bridge the communities through:


- Introduction of new findings in process/materials science towards coating design and manufacturing.

- Networking of leading scientists (academia/industry) for enhanced understanding of TS implications.
- Promoting OEM, supply-chain interactions to enhance specifications for accelerated adoption of new concepts and technologies.
- Internships and employment of student scientists and researchers via orchestrated industrial exposure.

**Consortium Research Policy:** The program is precompetitive, science based and as such no formal IP agreements exist. A simplified membership agreement has been developed. Funding received from industry supports post-doctoral and MS level students, while PhD students are supported through NSF/University funds. Scientists from industry periodically serve as external examiners on students' theses. Members receive up to 6 months advance notice on Consortium-generated publications and receive firsthand training on detailed procedures with design/process methods, diagnostics, testing protocols and characterization procedures. Meetings are held twice a year where faculty, students and post-docs present scientific developments and applicability. Each year, a set of goals is established promoting transfer of what was learned on the scientific front to the commercial front.


**Field Trips with In Situ Coating Property Sensor**

Since summer of 2007, CTSR through its consortium initiated a novel field trip program to demonstrate the utility of advanced scientific concepts for industrial process efficiency and enhancing process/coating reliability. These field trips typically last 2-4 days and involve students and




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Alstom Power Systems including Sebastian Mihm, Alfredo Valarezo, and Joerg Sopka.

post-docs from CTSR working with industrial engineers and technicians to identify critical issues in industrial processes and the applicability advanced diagnostics, sensors and mapping methodology to address persistent problems in thermal spray and concurrently enable enhancements.

Over 18 field trips have been conducted over the last 3 years with CTSR consortium partners and collaborators. Small and large spray shops, equipment manufacturers and even OEMs have benefited from these field trip interactions.

Wide ranging materials and processes have been explored investigating both particle state sensors and in situ coating monitoring in production environment. Field trips have been extended to many facilities in Europe including both universities and industry. These field trips have proven to be very beneficial not only for students and associates at CTSR, but also for researchers and engineers at akin research facilities at universities, specialized labs, and industries. Photos from various field trips are illustrated above.

**For more information**, visit [www.sunysb.edu/ctsr](http://www.sunysb.edu/ctsr) or contact Professor Sanjay Sampath via email [ssampath@ms.cc.sunysb.edu](mailto:ssampath@ms.cc.sunysb.edu)



Sulzer Metco including Alexander Barth, Mischa Weder, and Alfredo Valarezo.



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## Thermal Spray Polymer Coatings on Concrete

by Jim Weber, Xiom Corporation

Traditional thermal spray coatings, metals and ceramics, can and are applied to almost any substrate. While metals are the most common substrates, others such as wood, plastic, composites, and cloth have all been coated successfully.

Concrete structures have also been effectively coated with anodic metals (zinc and zinc alloys) using the thermal spray process (arc and flame spray wire). These coatings are applied for the purpose of passive cathodic protection of the steel reinforcements buried within concrete structures and have proved to be very effective, especially in areas where there is a high chloride content. Examples include parking garages where roads use deicing salts, coastal bridges, chemical plants, etc.

Thermal spray polymer coatings have been around for over 50 years and there are many applications for these coatings on metal substrates. Over the past few years, practical methods to thermally spray polymer coatings of thermoplastics and some new hybrid thermoset materials to concrete have been developed and implemented. The most common thermoplastics that are modified and formulated for the thermal spray process and applied to concrete are:

- Polyethylene
- Polypropylene
- Nylon.

These coatings provide surfaces to concrete that can have one or more of these attributes:

- Sealed – preventing liquids and/or gasses from entering

in to the concrete matrix

- Softer to the Touch – More friendly to bare skin
- Harder – More wear and abrasion resistant
- Smoother or Nonstick – Provides a surface that is slippery and can more easily release sticky materials
- More Aggressive or Softer Nonskid Properties – Soft polymeric and aggressive abrasive based non-skid aggregate can be added to polymer thermal spray coatings.

While these are all interesting characteristics that one might need to add to concrete, finding the correct application techniques for them has met some challenges. One of the most challenging hurdles to overcome when coating concrete with a thermal spray polymer is concrete's tendency to outgas as heat is absorbed into it during the thermal spray process.

As concrete structures harden, water consumed during hydration produces microscopic pores in the concrete. The amount and size of the pores may also be influenced by air-entrapment additives that are purposely added to concrete to make it less prone to cracking. While these pores are helpful to the strength and fracture resistance of the concrete, they also make the concrete sponge-like, creating pathways for liquids and gasses to pass in and out of the concrete.

Previous to the most recent coating methods being developed, as thermal spray polymer coatings were being applied, the air entrapped in the concrete pores near the coating interface would heat and expand. This expanding gas, known as out-gassing, would bubble through the viscous, liquid hot polymer coating, forming unsightly and detrimental pores. These pinholes in thermal spray polymer coating limited the effectiveness of thermal spray polymer coatings on concrete. In applications where an impenetrable concrete sealing coating was needed, new thermal spray coating methods needed to be developed.

To conquer this problem, Xiom has developed and refined a moisture tolerant liquid 2-part epoxy concrete sealer known as X40 that can penetrate deeply into prepared concrete surfaces, sealing the pores near the coating interface. X40 treatment to the concrete eliminates out-gassing, and by using a unique primer-like thermal spray coating method described as "hot flocking", the adhesion of the thermal spray polymer coating is greatly enhanced.

Here's how the process works:

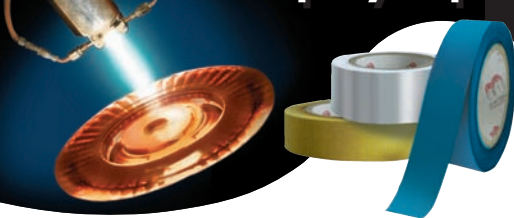
**Cleaning** – All concrete surfaces must be relatively clean and free from previous coatings, oil, grease, or anything else that would prevent the X40 from penetrating into it.

**Drying** - While X40 is moisture tolerant, surfaces should be reasonably dry, as the X40 will not be displace water that may be trapped in pores within the concrete. X40 relies on capillary action to be drawn into pores. In most cases, if no standing water is present, or was present within the last 24 hours, the concrete is considered to be dry enough for X40 to be drawn into it.

**X40 Application** – X40 is a 2-part liquid epoxy system, mixed in a 100-60 ratio. Once thoroughly blended, the X40 is typically rolled and/or brushed onto the concrete

continued on page 12

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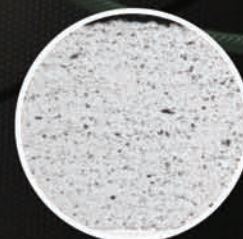


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### Thermal Spray Polymer Coatings continued from page 10

surface. Much of the X40 will be drawn into the concrete, however when applied properly a thin wet film of approximately 0.001 in. (25 microns) should be on top of the concrete. If the concrete appears to be somewhat dry looking a few minutes after the X40 is applied, an applicator may need to roll on a bit more X40 before it starts to cure, and conversely, if there is a large puddle it should be wiped up with rags or rolled out into adjacent areas to achieve the proper wet film thickness.

**Hot Flocking** – As the X40 coated surface catalyzes, it reaches a point where the X40 is in a tacky, gelled state. At this point, if you were to lightly touch the X40, you could leave a fingerprint in it, but your finger would not get X40 on it. This is when hot flocking begins.

Using the Xiom thermal spray gun, a thin layer of hot polymer coating (whatever coating the top coat will be) is thermally applied to the gelled X40. The hot polymer particles, traveling at high velocity, penetrate through the gelled X40 and impact the concrete surface beneath it. These hot particles deform when they hit the concrete and immediately cool. These particles expand after they get through the top of the X40 and hit the concrete, forming a shape that is keyed into the epoxy.

X40 does not adhere strongly to polymers such as Xiom X200 and X512 Series polyethylene's, which are the most popular concrete thermal spray polymers. The means of flocked particle adhesion is the mechanical interlocking of the deformed particles into the X40. In other words, the hole the particle made in the gelled X40 is smaller than the end of the particle that hit the concrete during spraying. It is important also to note that the hot flocking particles are only partially imbedded into the X40, with some portion protruding above the epoxy. This is shown in a contrasting

green color in Figure 1; the top coat and flocking coat are the same coating materials and will melt together to form a homogeneous coating during top coating.

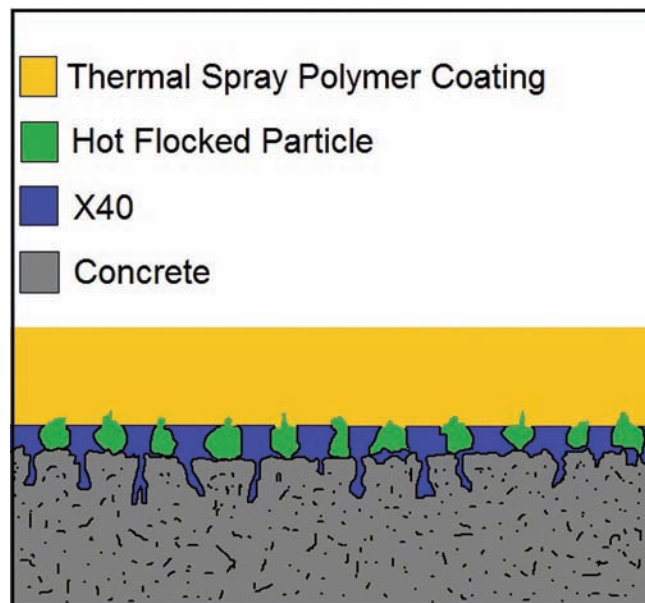


Figure 1 – The Concrete Coating System.

**Top Coating** – The hot flocking step greatly speeds up the catalyzing of the X40, causing it to harden enough for top

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coating soon after hot flocking. The top coat (shown in contrasting yellow in Figure 1) is applied on top of the hot flocked particle/X40 matrix, causing the exposed parts of the hot flocked particles to re-melt and alloy with the top coat.

This combination of an X40 sealed concrete surface with a keyed-in, well-bonded and pore-free thermal sprayed polymer coating enables field applicators to apply an excellent concrete coating system with many unique properties. To date, the most successful application for this coating system has been with EcoFinish™ polymer swimming pool linings.



Figure 2.

See Figure 2: Coating a swimming pool with EcoFinish Iridescent Mocha – The area to the left of the applicator has been X40 sealed and hot flocked; the area to the right is being top coated.

Xiom has developed a polyethylene line of swimming pool coatings exclusively for EcoFinish High Performance Pool Finishes. EcoFinish has been developing the swimming pool coating market, pool surface preparation methods, transportable spray trailers, training classes, and application techniques specifically tailored for swimming pools.

As of July 2010, over 100 concrete swimming pools have been coated with EcoFinish materials and methods. These pools have been coated by EcoFinish field coating teams and by their customers through the United States. Besides looking great, there are some very compelling reasons to apply a thermal spray polymer coating to a concrete pool.

**pH Neutral** – Unlike industry standard plaster finishes, EcoFinish coatings completely seal the concrete and keep the pool water away from it. Therefore, no pH changing concrete by-products will leach into the pool water, and pool chemicals will not cause the concrete to leach. This greatly reduces the need for pH control chemicals and mitigates hard water calcium staining.

EcoFinish pH neutral coatings are especially helpful during new pool construction, where newly poured concrete or

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fresh plaster finishes are very active for weeks after the pool is filled. During this time, special chemicals are added to pool water to control leaching. An owner of a newly built and filled pool may have to wait several weeks before entering the pool.

With EcoFinish, as soon as the pool is filled and the water balanced, it can be put in service. EcoFinish pools are routinely sprayed in one day and put in service the next day.

- **Soft to the Touch** – Unlike most other concrete pool coating systems, EcoFinish polyethylene is soft to the touch and gentle on bare skin. Although it is smooth, it is not slippery because it is thin enough to follow the concrete surface profile. If required, a soft or hard aggregate may be added to EcoFinish to increase its nonskid qualities.
- **No VOCs** – Since the thermal spray polymer coating is solvent-less, there are no VOCs entering the atmosphere as the coating cools and hardens.
- **Spider Crack Resistant** – The coating is very well adhered to the concrete, and it is also pliable and tough. It will never crack in normal service. If the concrete below the coating cracks, the EcoFinish can stretch and conform, with no cracks appearing in the coating.
- **Fade Resistant** – These coatings are made with resins and pigments that are greatly resistant to UV and chemical fading.
- **Repairable** – If there is ever any mechanical damage done to the coating, it can be easily repaired with a touchup thermal spray coating that will re-melt and alloy into the existing coating.
- **Recyclable** – If the pool is no longer wanted and dismantled, the EcoFinish coating can be heated, scraped off, and disposed of into the polyethylene recycling stream.
- **10 Year Warranty** – EcoFinish is so confident in the coating system, they are offering the best warranty in the industry.

Due to the great success of EcoFinish, other companies and industries are looking at where it would be beneficial to have a thermal spray polymer coating on concrete structures.

**Precast Concrete Waste Water Components** –  $H_2S$  (hydrogen sulphide) gas is generated in sewers with slow moving effluent and can easily permeate concrete, attacking the calcium carbonate constituents in cement. With the cement attacked and removed, concrete turns back into sand and rock and collapses.

Concrete used in these applications require a robust barrier to protect against  $H_2S$ , such as a polyethylene liner. While it is common to cast in specially designed 0.08 in. (2mm) thick polyethylene sheets, it is very difficult and time consuming to custom fit them to specialized components. These sheets are expensive, have to be hand fitted and seam welded, and often buckle and deform during the pre-casting process. They can also only be applied to concrete that is still wet and not cured.

**continued on page 24**



**Figure 3 – Hot flocking in a swimming pool.**



**Figure 4 - Precast manhole with yellow cast-in polyethylene liner.**

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**19-22 Chicago, IL USA** *PowderMet 2011* - contact Sandra Leatherman [sleatherman@mpif.org](mailto:sleatherman@mpif.org), [www.mpif.org](http://www.mpif.org)

**28JUN-2JUL Dusseldorf, Germany** *Int'l Foundry Trade Fair and Int'l Metallurgical Technology Trade Fair* - 312.781.5180, web [www.mdna.com](http://www.mdna.com)

### SEPTEMBER 2011

**26-29 Hamburg, Germany** *ITSC 2011 Int'l Thermal Spray Conference & Exposition with DVS Congress & DVS Expo 2011* - contact ASM em: [customerservice@asminternational.org](mailto:customerservice@asminternational.org), website: [www.asminternational.org/tss](http://www.asminternational.org/tss) or email DVS at [tagungen@dvs-hg.de](mailto:tagungen@dvs-hg.de)

### OCTOBER 2011

**2-5 San Diego, CA USA** *Titanium 2011* -contact Int'l. Titanium Assoc. 303.404.2221, email [ita@titanium.org](mailto:ita@titanium.org), web [www.titanium.org](http://www.titanium.org)

**18-21 Toulouse, France** *AeroTech 2011* - SAE [www.sae.org/events/atc/](http://www.sae.org/events/atc/)

### NOVEMBER 2011

**13-16 Chicago, IL USA** *FABTECH Int'l & AWS Welding Show with a Thermal Spray Pavilion and Conference* - organized by American Welding Society, [www.aws.org](http://www.aws.org), Fabricators and Mfgs Assoc, [www.fmafabtech.com](http://www.fmafabtech.com), Soc. of Mfg. Engineers, [www.sme.org/fabtech](http://www.sme.org/fabtech)



### 2012

### APRIL 2012

**28APR-3MAY Santa Clara, CA USA** *55th SVC Annual Technical Conference* - visit [www.svc.org](http://www.svc.org)

### JUNE 2012

**11-15 Copenhagen Denmark** *ASME TurboExpo 2012* - visit [www.turboexpo.org](http://www.turboexpo.org), email [igti@asme.org](mailto:igti@asme.org)



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**Chairman Hayden**

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 trade association, ITSA invites all interested companies to talk with our officers, committee chairs, and

company representatives to better understand member benefits. A complete list of ITSA member companies and their representatives are at [www.thermalspray.org](http://www.thermalspray.org)

#### **ITSA Mission Statement**

*The International Thermal Spray Association is a professional trade organization dedicated to expanding the use of thermal spray technologies for the benefit of industry and society.*

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#### **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 [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 their headquarters office in Fairport Harbor, Ohio 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 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 industrial leaders, engineers, researchers, scholars, policy-makers, and the public thermal spray community.

#### **ITSA Headquarters**

208 Third Street, Fairport Harbor, Ohio 44077 USA  
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[itsa@thermalspray.org](mailto:itsa@thermalspray.org) [www.thermalspray.org](http://www.thermalspray.org)



#### **Become a Member of The International Thermal Spray Association**

Your company should join the International Thermal Spray Association now! As a company-member, professional trade 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.

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.

The most valuable member asset is our annual membership meetings where the networking is priceless! Our 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 on our website along with a multitude of additional benefits.

ITSA member companies are also highlighted in the ITSA booth at several trade shows throughout the year (International Thermal Spray Conference ITSC, Fabtech International and AWS Welding Show Thermal Spray Pavilion, Weldmex Mexico, and TurboExpo in 2009).

*If you would like to discuss the benefits* of your company becoming a member of the International Thermal Spray Association, we suggest you contact Kathy Dusa at our headquarters office or visit the membership section of our [www.thermalspray.org](http://www.thermalspray.org) website.



## International Thermal Spray Association Welcomes Two New Members

**New England Plasma** has joined the International Thermal Spray Association.



New England Plasma is a full-service thermal spray coating organization located in Putnam, CT. Our coating expertise is based on decades of engineering services and development, providing our customers with state-of-the-art coating solutions. For over twenty years, we have successfully resolved coating development issues for our customers, using thermal spray applications including HVOF, electric arc and plasma. For those of our customers requiring finishing services, we also have an in-house machine shop for all machining and grinding needs.

New England Plasma welcomes the opportunity to assist customers on R&D projects, solving coating issues, and optimizing parameter development and testing. Our team is dedicated to providing our customers with quality coatings using innovative methods to satisfy customer needs cost-effectively and quickly. New England Plasma is an FAA Certified Repair Station and an EASA Certified Repair Station. Please visit [www.neplasma.com](http://www.neplasma.com) for a complete listing of services.

**For more information**, contact ITSA company representative Maureen Olszewski, [molszewski.nep@snet.net](mailto:molszewski.nep@snet.net), or visit website [www.neplasma.com](http://www.neplasma.com)

**VTC Surface Technologies P Ltd** has joined the International Thermal Spray Association.



VTC was founded by Sri V Narasimham, Chairman, VTC Group of industries and his illustrious brothers in 1987. Under his leadership VTC started as a trading company and diversified into many business areas like infrastructure development, turnkey solutions including design, supply, and installation and commissioning of electrical and mechanical equipment subsequently into education and surface engineering.

Since its inception VTC has developed and maintained a reputation industry wide for high quality performance and customer's satisfaction. Starting in a humble way the company has grown to a 6.7 million USD (300 million INR) group.

VTC Surface Technologies under the leadership of Sri V Ravi is poised to reach new heights. VTC Surface Technologies is a customer oriented company that prides itself not only in pledging exceptional quality and service

but in providing complete surface engineering solutions.

VTC Surf Tech offers advanced wear, corrosion and heat resistant coatings designed to protect aerospace, power generation, and industrial components operating in extremely severe environments. The organization has a technically proficient team of professionals and engineers, backed with continuous R&D and a highly motivated skilled workforce.

**For more information**, contact ITSA company representative Ravi K. Viswanadha, [ravi@vtcsurftec.com](mailto:ravi@vtcsurftec.com), or visit [www.vtcsurftec.com](http://www.vtcsurftec.com)

### LinkedIn Has Thermal Spray Group

Dear Thermal Spray Colleague,

Not sure if you are a member of the business social network "LinkedIn", but thought you would want to know that there is a group titled "Thermal Spray Coating" currently with 64 members and some discussions.

If you are interested, please visit [www.linkedin.com](http://www.linkedin.com) and join the network and then join the group.

### Finishing Online Website Now Includes Thermal Spray

The website "Finishing Online" ([www.finishingonline.com](http://www.finishingonline.com)) now includes "thermal spray" in an "industries" area. Everyone is eligible for a basic free listing for one year. Please go to their website to register and then get your free listing.

### ITSA On Facebook

Dear Thermal Spray Colleague,

Yes, we did it! The International Thermal Spray Association now has a very basic Facebook Page. If you are a Facebook user, you can simply type in thermal spray in the top search engine space and it will come up. At that point, select "like" and you will be connected to the ITSA page. Right now, we have our ITSA promotion video on the page, plus a few recent messages.

We are not sure how and to what extent this will be used, but it was apparent by some recent and continuing requests that we be there.

If you are a Facebook user, enjoy. If not, do not give it any concern.

### Thermal Spray Pavilion and Conference at Fabtech November 2-4, 2010 Atlanta, GA USA

**For more information**, visit [www.fabtechexpo.com](http://www.fabtechexpo.com)  
See page 1 for speakers and abstracts highlight.

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### Industrial Sales Representative Thermal Spray Coatings • Edmonton, AB



Eutectic Canada is one of the worlds leading manufacturers of welding, brazing, and thermal spray solutions. Our comprehensive product line provides economic solutions for industrial applications to help reduce the high cost of wear and equipment failure. As part of a new growth initiative, we are seeking to expand our sales and support in our Coatings Division. Eutectic Canada provides a competitive remuneration and benefits package.

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- Responsible for repair and trouble-shooting of Thermal Spray equipment and processes.
- Work as part of a team to ensure complete customer satisfaction with all of Eutectic Canada's products and services.

#### Requirements:

- Minimum 3 to 5 years sales experience.
  - Good computer skills and knowledge.
  - Thermal Spray equipment experience preferred.
  - Degree in materials technology will be an asset.
- If you are seeking an exciting career in industrial sales with a global leader, reply in confidence to:  
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Email: [spehlivanian@eutectic-na.com](mailto:spehlivanian@eutectic-na.com)  
Fax Number: 514-695-8793  
Only qualified candidates will be contacted.  
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### Free Poster

From Linde and the GTS (Association of Thermal Sprayers) illustrates the different thermal spray processes (suitable for framing).

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### Thermal Spray Polymer Coatings continued from page 14

It is much easier and less expensive to apply a tough, thermal spray polyethylene coating on pre-cast and cured concrete components, and these coatings will offer the same or better results than the cast-in liners. Several companies will be replacing 2mm liners with thermal spray polyethylene soon.

**Agricultural Concrete** – It is not uncommon to find many concrete structures throughout the agricultural industry. Some agricultural applications may be:

- **Animal feed troughs and pens** – Thermal spray polyethylene is nontoxic and tough, and some are FDA and NSF approved. Antimicrobial additives may also be integrated into the coating to reduce animal sicknesses.
- **Floors and walls in processing plants, silos and other places where food is stored or handled** – It is much easier to clean and sanitize concrete that is covered with a polymer coating, and the concrete won't absorb odors, bacteria, or other unwanted substances.

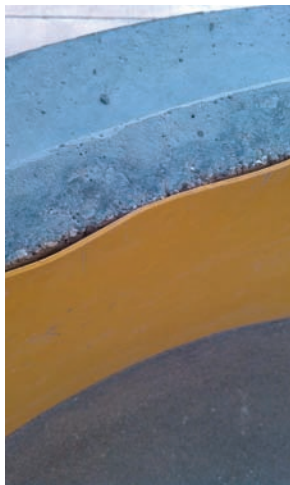


Figure 5 - Cast-in 0.08 in. (2mm) polyethylene liner separating from concrete.

- **Nonstick coatings on concrete chutes** – Allows products to flow more smoothly through these devices.

Recently, development has begun on a new family of coatings that may eliminate the need for the X40 sealer. Research has proven that a hybrid thermoplastic wax-like adhesive combined with a tough thermosetting polymer can penetrate deeply enough into a concrete structure to form a strong bond and still have film strength high enough to mitigate out-gassing. This primer-like coating also helps thermal spray polymer coatings adhere to other substrates, such as steel, without the normal preheating step.

These are just a few of the many places where these unique coatings can add value to a concrete structure. If anyone has any more ideas and would like to discuss them, please do not hesitate to contact us. For more information on EcoFinish pool applications, contact them directly.

**For more information on pool coatings**, please contact EcoFinish - 415 Constance Drive Warminster, PA 18974, 877.448.2521, [www.ecopoolfinish.com](http://www.ecopoolfinish.com)

**For more information about thermal spray coatings**, please contact Xiom Corp - 78 Lamar St, West Babylon, NY 11704, 631.643.4400, [www.xiom-corp.com](http://www.xiom-corp.com)

See advertisement page 29

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### **Journal of Thermal Spray Technology®**

A publication of the **ASM Thermal Spray Society**  
**The Influence of Spraying Angle on Properties of HVOF Sprayed Hardmetal Coatings**  
**S. Houdková, M. Kasparová, and F. Zaháňka**

The spraying angle is one of the deposition parameters that influence the quality of thermally sprayed coatings. In theory, decreasing the spraying angle results in lower process deposition efficiency, whereas the porosity of coatings increases, becoming a cause of poorer microstructure and mechanical properties. In this study, the dependence of microstructure together with the basic mechanical properties and wear of WC-Co and Cr<sub>3</sub>C<sub>2</sub>-NiCr high-velocity oxyfuel (HVOF) sprayed coatings on the spraying angle was investigated. For each coating, the maximum spraying angle was determined that can be used without significantly decreasing coating quality. Based on the changes in properties of coatings and requirements for the process deposition efficiency, a maximum 30° diversion from the normal spray direction is recommended for WC-Co and 15° diversion for Cr<sub>3</sub>C<sub>2</sub>-NiCr coatings.

**Read the entire article in the September 2010 Issue**

Visit [www.asminternational.org/tss](http://www.asminternational.org/tss)

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## Green Belting Announces HVMT Copper

Green Belting Industries Ltd. is pleased to announce the launch of HVMT Copper, the first reliable HVOF masking tape. This new pressure sensitive tape has proven effective in masking difficult profiles while surviving the high abrasion and extreme heat transfer associated with high velocity oxy fuel coatings.



HVMT Copper was tested at the University of Toronto versus common tapes used in the thermal spray industry. Dr. Larry Pershin of the U of T (Centre for Advanced Coating Technologies) noted that HVMT Copper released clean from the metal surfaces and left no adhesive residue. Also of note, the HVMT Copper effectively prevents "bridging of the coating". This new product also resists extremely abrasive grit blasting and is designed as a one-step masking tape.



At long last, thermal spray coating facilities now have an effective means of masking components for a variety of applications. Whether applying a wear coating to landing gear or hardfacing an industrial roller, HVMT Copper is capable of replacing sheet metal masking also referred to as "hard masking".

GBI Product Manager, Mr. Tim Connelly noted, "For years, thermal spray coating facilities have been forced to construct costly and time consuming masking for jobs that they simply may never spray again. HVMT Copper will allow job shops to efficiently and economically mask parts quickly and accurately."

GBI also offers a complete range of masking products for the thermal spray industry. Our tapes, fabrics, and

compounds are used extensively to protect parts versus grit blast, flame spray, arc spray, and plasma spray coatings. GBI also produces a wide range of PTFE and silicone coated fiberglass tapes, fabrics, and belts.

**To discuss your challenging masking applications further**, please contact Mr. Tim Connelly, Product Manager for Thermal Spray Masking Products: Canada (905) 564-6712 or United States (800) 668-1114, website [www.greenbelting.com](http://www.greenbelting.com).

## New Thermal Spray System for Repair of Damaged Coatings Saves Time and Money

Sulzer Metco's new Compact Plasma Spray System (CPS), a joint development with Pratt & Whitney, is the first plasma spray system specifically designed to repair coating damage. CPS can save as much as 90% of the cost of a traditional component strip and recoat. At the same time, it helps preserve production and delivery schedules.

CPS is a portable spray system that is quickly transported to the component and can be set up to spray in minutes. CPS only requires processing a localized area, which minimizes all processes associated with coating application. Until the introduction of CPS, the only viable method to repair coating damage was to completely strip and recoat the part, which is costly, can disrupt critical production schedules and jeopardize lead times. CPS offers significant cost and time advantages to repair coating damage compared to traditional component strip and recoat.

**continued on page 27**



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### Sulzer Metco Thermal Spray System continued from page 25

"Our ongoing goal is to bring technologies to our customers that will simplify their coating processes, reduce processing time and reduce costs. CPS is a perfect fit to our product portfolio," states Steven Ort, Sulzer Metco Product Line Manager Equipment Components. "Not only should customers consider the obvious time and cost savings, but also the reduction in environmental impact, as both consumables and utilities are significantly lower when coating damage is repaired using CPS."



**CPS Compact Plasma Spray System**

How CPS Works: The application of a thermal spray coating is generally one of the last manufacturing or overhaul steps. This is when component investment time and cost is at its maximum and parts can

become damaged during post-coat machining, transport or handling.

With the CPS process, masking is applied to the localized region, the area is grit-blasted, manually degreased and the coating applied. As a final step, the repaired region can be re-machined or simply smoothed using manual mechanical means, if necessary.

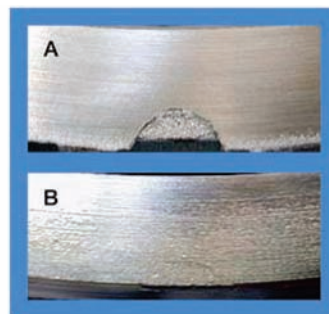
Pratt & Whitney, a world leader in the design, manufacture and service of aircraft engines, space propulsion systems and industrial gas turbines, has already included a number of CPS coating repairs in its turbine engine manuals.

CPS is available for immediate sale worldwide. With its low investment cost, customers will find that they can recover their investment return very quickly.

Sulzer Metco is a global leader in surface engineering solutions and services offering thermal spray and thin film equipment, materials and coating services; plasma heat-treatment services; engine components for industrial and aero turbines; and customer support services

Sulzer Metco provides a comprehensive manufacturing, distribution and service network, catering to aerospace, power generation, automotive and other strategic growth industries. Sulzer Metco is a division of Sulzer Ltd.

**For more information**, email [info@sulzermetco.com](mailto:info@sulzermetco.com) or visit [www.sulzermetco.com](http://www.sulzermetco.com).



**A. Chipped Component**  
**B. Chip after coating repair using CPS**  
Image courtesy of Pratt & Whitney  
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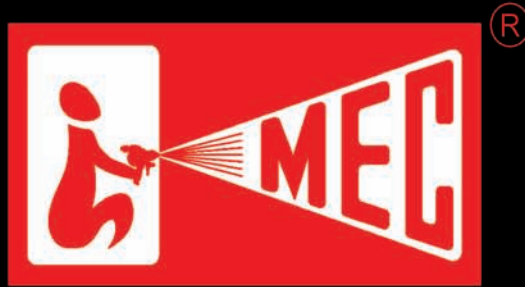
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## FW Gartner Appoints Marty Lohrman



FW Gartner Thermal Spraying LTD is pleased to announce the appointment of **Marty Lohrman** to the position of Welding Engineer. This role is a return to an industry that Marty has devoted himself to, for most of the last 30 years, after taking some time away with his family to pursue mission work in East Africa and Central America.

Marty's earliest experience in coatings/hardfacing materials, systems and applications were at Cabot Corp, followed by a long stint in a broad variety of roles at Stellite. The unique knowledge and experience in QC, R&D, applications, materials and parameter development that Marty has gathered during his career, will be invaluable to FW Gartner's customers as they push for ever better solutions to the wear problems that challenge industry on a daily basis.

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

## Thermico USA Appoints Michael Molnar as President



Thermico USA, a wholly owned subsidiary of Thermico GmbH & Co. KG, Dortmund Germany, a world leader in thermal spray innovation, has appointed **Michael Molnar** as President of the United States based corporation.

In his new position, Molnar will be responsible for establishing the company in North America, including building and staffing a state-of-the-art coatings center. The company plans to build in the Greensboro, NC area.

Molnar has more than 25 years of senior management and sales and marketing experience in the materials industry, serving the coatings, inks, paints, plastics and adhesives markets. A chemist by training, he has a real appreciation of material science and all the challenges required to make advanced materials in commercial quantities. After 25 years dealing all around the globe, representing Ciba Specialty Chemicals and then Altairnano, he understands the needs of all business partners in the value chain, and how important it is to be a reliable supplier.

As President, Molnar will continue to be active in the ITSA, ACS and the ASM Thermal Spray Society. He will speak in October at the Material Science and Technology Conference in Houston and in Brazil at the ASM TSS Conference in November.

*For more information*, contact Michael via email [Michael.molnar@thermico-us.com](mailto:Michael.molnar@thermico-us.com).

## Weartech Announces Paul Frame



Weartech is pleased to announce that **Paul Frame** has joined us in the Sales Department as a Technical Sales Representative, his main focus being on welding sales. Prior to joining Weartech, Paul was living in Glasgow, Scotland for a period of two years. Whilst there he was employed by Wurth UK.

Before going to Scotland Paul was employed by Bohler Uderholm in Durban for a period of nine years and serviced the whole of Kwa Zulu Natal as a welding representative. He has attended various training courses, including one at Fronius in Austria and training courses with the South African Institute of Welding.

Paul has also served on the SAIW Committee in Kwa Zulu Natal for a number of years. His field of expertise is welding machines, specialised welding consumables, in-company demonstrations as well as assisting with in-house training.

*For more information*, visit [www.weartech.co.za](http://www.weartech.co.za)

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See Xiom article page 10.



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## In Memoriam



**Lawrence Pollard**, age 62 died Friday, July 23, 2010. He is survived by his two children, Carly Szafranski and Craig Pollard; brothers, Ronald (Iris) Pollard, Kenneth (Kathleen) Pollard; sister, Evelyn (Carl) Hermanson and girlfriend Janice Keith. Larry was preceded in death by his parents.

He enjoyed traveling internationally both for work and pleasure. Larry was involved in membership in various thermal spray professional societies. He retired from Progressive Technologies in March. Larry was presented with a 43-year recognition plaque in April by the International Thermal Spray Association for dedication to the advancement of thermal spray technology and his outstanding contribution to the success of our industry. (see SPRAYTIME article page 29, Second Quarter 2010.)

**SPRAYTIME archives are searchable**

Visit [www.thermalspray.org](http://www.thermalspray.org) and choose **SPRAYTIME** to search previous issues for data.

## Jaren Wright Returns to Duty at Accuwright



Accuwright Industries, Inc. welcomes **Jaren Wright** back to work after completing a successful two year mission for his church. He served in Rosario, Argentina helping the people there build their homes, families, and lives. He returns a little skinny, but full of love and gratitude for the Argentine people and culture. He mastered the Spanish language and acquired a lifetime of memories. We are super excited to have him back to work. He is a natural at the flame spray processes. Here you see him setting up to spray with one of his all time favorite guns: the combustion wire gun. He plans to attend the community college again and work at Accuwright. Who knows, maybe he will make it a career choice.

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

## Flame Spray Technologies (FST) Welcomes Stephen Glancy



Flame Spray Technologies, a recognized leader in thermal spray systems, equipment, consumables and support services announces the appointment of **Stephen Glancy** to the position of Sales Engineer. He will be responsible for sales and customer support services for

the Eastern Coast of the United States from Maine to Florida including TN, AL and MS.

Stephen has over twenty years experience in material science applications and specializes in thermal spray evaluation. He has been involved in numerous ASM, ASTM and TSS thermal spray activities. His experience in sales and marketing covers an extensive range from research and development to military to heavy industry.

"We are confident the addition of Stephen to our sales team will promote our mission of being the leader in serving the thermal spray industry," says Terry Wilmert, President of Flame Spray Technologies, Inc. "He will be instrumental in providing the level of service and support that our customers have come to expect from FST."

**To Reach Stephen Glancy**, send an e mail to [s.glancy@fstincusa.com](mailto:s.glancy@fstincusa.com).

### About Flame Spray Technologies

FST is a dynamic, innovative, experienced and hands on company committed to quality and customer service. FST has long been at the forefront of supplying the thermal spray industry with: turn key systems, thermal spray equipment, auxiliary equipment, consumables, spare parts, service and calibration.

**For more information**, please visit the Flame spray Technologies website at [www.fst.nl](http://www.fst.nl)

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### Join the ASM Thermal Spray Society Online Community Forum

ASM TSS members welcome visitors to register and access the new **searchable** forum, as well as explore the new online community.

**To subscribe**, visit <http://tss.asminternational.org>, choose networking and forum for instructions.

### NEW "Supporting Societies" Membership

The International Thermal Spray Association is pleased to announce a new "Supporting Societies" membership category to establish communication with other associations/societies involved in thermal spray and surface engineering activities worldwide.

This is ideal for membership exchange between organizations. Contact Kathy Dusa at the headquarters office via email to [itsa@thermalspray.org](mailto:itsa@thermalspray.org)



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