

SPRAYTIME

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

THERMAL SPRAY LIVE DEMONSTRATION AT FABTECH 2015



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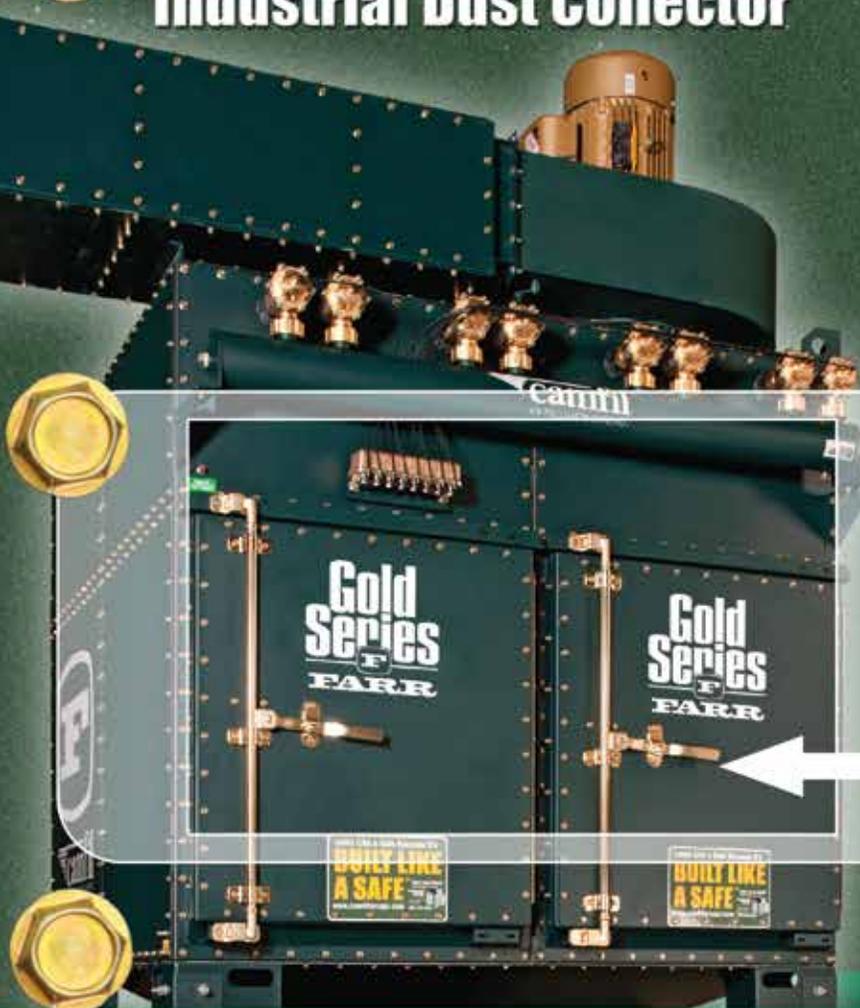
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A Standing Committee of the American Welding Society**

Mission: 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.

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■ THERMAL SPRAY CENTER FINLAND

A new collaboration platform between Tampere University of Technology (TUT), Department of Materials Science, and VTT Technical Research Centre of Finland Ltd.

This strategic collaboration platform in the form of **Thermal Spray Center of Finland (TSCF)** is aimed to be at the leading edge of thermal spray research and development thus creating a perfect platform for international high-impact research and remarkable national industrial influence.

Intensive target-oriented co-operation combining profound science and critical future needs of industry creates a unique competence platform which is tightly linked with international key players exploiting the recent knowledge in the field, and capable of implementing the results effectively for the benefit of the industrial companies. Expertise and laboratory facilities include:

Thermal spray materials – research, development and manufacturing (spray drying, gas atomizing)

Thermal spray coating processing – a wide range of thermal spray deposition technologies are available at **TSCF** – plasma spraying, HVOF and HVAF spraying (several systems), cold spraying (several systems incl. laser-assisted process), wire arc spraying, powder and wire flame spraying (several processes), novel processes (suspension and solution precursor spraying), diagnostic tools for thermal spray monitoring, etc.

Thermal spray coating characterization, testing and evaluation – state-of-the-art materials re-search methods (OM, SEM, FE-SEM, TEM, XRD, etc.), numerous other testing and evaluation methods available at TUT and VTT (adhesion strength, hardness, thickness, roughness, mechanical strength, wear resistance by various wear test methods, corrosion in aqueous and gas environments at low and high temperatures, surface energy, friction, etc.)

Thermal spray coating design and modeling – Integrated Computational Material Engineering (ICME) tool ProperTune™ for performance based design of thermal spray coatings providing reduced product development time, systematic optimization and profound understanding of degradation mechanisms, e.g., wear, fatigue and fracture.

Thermal spray coating industrial and new applications – help industrial partners to develop new applications in customer projects

Thermal spray coating expert education and training – ensure world class knowledge and skilled network (master's thesis, doctoral dissertation, etc.)

Thermal spray coating collaborative projects (national, EU, international) – an essential target of being successful in national and EU Framework Programmes with Finnish industry to ensure necessary research volume and collaboration in the thermal spray business. ▲

TSCF
Thermal Spray Center Finland

For more information, contact Prof. Petri Vuoristo, tel. +358-40-8490044, petri.vuoristo@tut.fi and visit www.tut.fi/thermalspray and www.tscf.fi (under construction)

■ FISHER BARTON TECHNOLOGY CENTER GRAND OPENING

Fisher Barton Group (FBG) has formed a new entity, **Fisher Barton Technology Center (FBTC)**, continuing a legacy of over forty years of materials innovation. The Tech Center is the brain child of Dick Wilkey, owner and founder of the **FBG**. His long time vision has been to develop a research capability to serve the nine existing companies with the goal to advance materials, surfacing technology, and materials processing for the benefit of all divisions. **FBTC** staffing was pulled from other **Fisher Barton Group** companies including TST, Fisher Barton Specially Products, and Fisher Barton Blades.

The Tech Center is located in the original Fisher Barton Blades building, originally built in 1906 and housed Washington Cutlery/Village Blacksmith. Mr. Wilkey purchased



FBTC Staff L to R: Ray Meuer, Tyler Dabney (co-op), Irina Downs, Brandon Rose, Beth Aperavich, Daryl Crawmer, Igor Zelenovskiy, Derek Landwehr, Dave Walford, Ashley Stangler, Jim Watts, Dick Wilkey

the building in 1974. The building has undergone a ten month, multimillion dollar renovation. **FBTC** juxtaposes the glass and stainless steel of a modern facility with the brick and timber of the blacksmith shop.

The **Fisher Barton Group** website (www.fisher-barton.com) has more information about the history and mission of the ten **Fisher Barton Group** companies.

FBTC has three significant, state-of-the-art components: the laboratory, process area, and training center. The analytical and testing labs include mechanical testing, abrasive and erosion testing, and a complete materials lab. The materials lab includes optical metallography and scanning electron microscopy (SEM), x-ray diffraction and fluorescence (XRD/XRF), gas discharge spectrometry and depth profiling (GDS/GDP), carbon and nitrogen analyzers, laser microscope, hardness testing, and so on.

The process area houses a 6 kW, 1 μ m, dual-fiber laser with cladding, heat treating, and welding capability and a seven-axis CNC manipulator. In addition to the laser capability FBTC has a thermal spray cell with plasma-arc (APS), high-velocity, oxy-fuel (HVOF), electric-arc spray (EAS), six-

axis robot and powder and wire flame spray capability and a DPV-2000 vision system. Next to the thermal spray cell is plasma transferred arc cell (PTA) with a six-axis robot.

One major thrust area is coatings and overlays which is driving the development of new materials, advanced processes and controls, and modifications to commercial coating and devices to make them production worthy. The **Fisher Barton Group** companies are high-volume, OEM manufactures serving agriculture, lawn and garden, medical, transportation, printing, food, pharmaceutical, and many other industries. The significant technologies within **FBG** are coating, stamping, fabrication, heat treating, and machining.

Fisher Barton Technology Center is staffed and equipped to address the technical challenges of materials and process development to meet the evolving needs of the industries we serve. ▲



For further information contact
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izelenovskiy@fisher-barton.com

IMAXX DUST COLLECTOR OFFICIALLY CERTIFIED IDA COMPLIANT

The **CMAXX Dust Collector** from Imperial Systems, Inc recently proved to withstand a deflagration up to 185 KST with an internal pressure exceeding 4 PSI!

Imperial Systems, Inc. tested the **CMAXX Dust Collector** with IDA DeltaMAXX Filters and found that in all tests, the filters could stop a flame front and isolate a deflagration, a term describing a subsonic explosion. There was no trace of flame or spark transmission downstream of the IDA filters or in the clean air plenum.

Using the **CMAXX** unit's body, without explosion venting, the Collector was proven to withstand a deflagration of corn starch at 185 KST with pressures exceeding 4 PSI. The entire explosion diverted through the IDA DeltaMAXX Filters, which showed no signs of deformation. The internal cages of the filters remained in perfect shape and the seals did not deform or melt whatsoever.

"Putting the CMAXX Collector through the third party explosion testing has been one of the most exciting things we have done here at Imperial Systems," says Jeremiah Wann, President and CEO. "No one knows the **CMAXX** better than myself, but when you expose it to such extreme conditions such as combustible dust testing, you will find

weaknesses and strengths that you had no idea existed". We have compiled the data from the tests and have made improvements to the **CMAXX Collector** that now makes it the best built, toughest dust collector in the industry. We are more confident than ever before that our **CMAXX Collector** can withstand the toughest applications and that we are protecting your workers and work facility.

All testing, proving that the **CMAXX Collector** can be used as a flame front deflagration arrester when used in conjunction with IDA DeltaMAXX Filters, is backed by third party testing. All reports and test results are available by request. ▲

About Imperial Systems, Inc: Located just north of Pittsburgh, Pennsylvania in the small town of Jackson Center, Imperial Systems is among the top dust collection equipment manufacturing businesses in North America. Our values are built on designing and installing custom industrial dust collection systems with the strongest, most durable, fabrication to meet our customer's needs.

We design innovative but practical and useful dust collection solutions for just about every industry, including, but not limited to: recycling, seed, grain, carpentry, welding, CNC plasma/laser cutting, thermal spray, grinding, mining, aggregate, sand blasting, aluminum, powder coating, biofuels, food processing, pet food, fiberglass, agricultural, chemical processing, paper scrap, fiberglass and many more.



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LIVE THERMAL SPRAY DEMONSTRATION

The **International Thermal Spray Association**, a standing committee of the **American Welding Society**, exhibited a live demonstration of a thermal spray process during the Chicago FABTECH event in November.

“After eight years of hosting a Thermal Spray Pavilion on the welding show floor and six years of presenting the “What Is Thermal Spray” class, we are thrilled to expand upon our efforts to show everyone what thermal spray looks like and educate on what can be done with the process. We were always excited to tell our story, but being able to let people see and feel the process takes it to another level” stated Bill Mosier, **ITSA** Chairman and President of **Polymet Corporation** in Cincinnati, Ohio.



Caption: Jim Caron of Praxair Surface Technologies, TAFE Division is assembling their model 9910i CoArc System paired with the Model 9935 Arc Spray Gun featuring a reliable 350 Amp DC servo motor wire drive, integrated enhanced ArcJet® spray attachment, quick disconnect wire conduits and a simplified maintenance design. The 9910i, with a 10.4” touchscreen, gives the operator complete control of the spray process with features such as gun feedback, optional data acquisition, closed loop control and easy to use maintenance schedules.

ITSA was spraying business cards with zinc every hour on the hour during the exposition so that everyone could leave with an actual coating example. Additionally, industry representative were on hand to narrate and answer questions from the attendees.

All of the **ITSA** member companies supported the costs of this live demonstration. In addition, the air filtration system was donated by **Camfil**, the thermal spray gun and wire by **Praxair Surface Technologies**, and the spray booth by **Hayden Corporation**. Overspray collection by **Ardleigh Minerals**. A tremendous amount of volunteer hours are involved in the set up and dismantling of this on-site facility and we would like to recognize specifically Jim Caron of **Praxair Surface Technologies**, Dan Hayden of **Hayden Corporation** and Josh Delson and Luis Diaz of **Camfil**. It is a mighty and challenging task!

This live demonstration exhibition was extremely successful and provided numerous opportunities to talk about thermal spray processes and benefits for all industries.

ITSA plans to repeat this live exhibition next year at FABTECH 2016 November in Las Vegas November 16-18 to further thermal spray education in the industrial community. FABTECH provides a convenient venue where you can meet with world-class suppliers, see the latest industry products and developments, and find the tools to improve productivity, increase profits and discover new solutions to all of your metal forming, fabricating, welding, thermal spray and finishing needs. The Las Vegas event will offer more than 1,300 exhibitors and 28,000 attendees full access to over 550,000 net square feet of floor space.

We hope you will join us by exhibiting your company in the thermal spray live demonstration area in Las Vegas FABTECH. ▲

For more information about booth space in this designated area, contact Joe Krall, email jkrall@aws.org



Caption: Camfil group working the Live Demonstration booth. (left to right: Josh Delson, Jon Ladwig, Kevin Tucker, Tomm Frungillo, Kathy Dusa (ITSA), Matt Caulfield, Chris Fluarty, Greg Schreier, Phil Ramsey)



Caption: Larry Stiles of **Praxair Surface Technologies** setting attendee business cards in place to be sprayed with zinc.



Caption: Dan Hayden of **Hayden Corporation** assembling the spray booth.



Caption: Josh Delson of **Camfil** working with rigger to get the air filtration unit put together successfully.



WATSON GRINDING CELEBRATES 55 YEARS IN BUSINESS

Watson Grinding and Manufacturing celebrated their fifty-fifth year anniversary on November 4, 2015.



The company was founded on November 4, 1960, by James L. Watson, as a small grinding shop in his home garage. Today, the company is located in more than 84,000 square feet of facilities, which now include a full-scale machine shop offering specialty thermal spray coatings, and an on-site metallurgical coatings laboratory. The company currently employs more than 125 people.

“Over the past few decades, we have remained strong through the many ups and downs in the economic climate,” said John Watson, President of Watson Grinding and Manufacturing, “I attribute our success and longevity to the good people we have working here – we could not have done it on our own.”

As **Watson Grinding** grew, it began to specialize in the manufacture and service of components used in severe service processes. James Watson was instrumentally involved in the development of High Velocity Oxygen Fuel (HVOF) coatings in the early 1980s. Strategic investments and technical innovations have consistently enhanced Watson Grinding’s capabilities. The addition of a robotic HVOF and plasma thermal spray facility and metallurgical lab in recent years has made the company an industry leader in the precision application of thermal spray coatings. HVOF applied coatings are used to extend the service life of parts used in highly corrosive or wear intensive service environments.

Watson Grinding has always been a family business, and today the company is owned and operated by the founder’s son, John Watson; son-in-law, Bob White; and grandson, Jason White. Kelly Watson, granddaughter, joined the company in 2011. James Watson passed away on November 28, 2014, during his company’s 54th year in business. ▲

For more about **Watson Grinding** visit www.watsongrinding.com



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OERLIKON STRENGTHENS ITS MARKET ACCESS WITH LASER CLADDING SERVICES, LLC.

Oerlikon announced that it has signed an agreement to acquire the business of **Laser Cladding Services, LLC.**, in Houston, Texas, USA – a company specialized in laser cladding applications for the energy industry. The acquisition extends and improves the Surface Solutions Segment’s service offering in laser cladding and opens up access to key customers in the US energy sector.

Oerlikon continues the strategic development of its surface solutions services business and further expands its laser cladding technology expertise through the acquisition of the business of **Laser Cladding Services, LLC.** The acquisition not only strengthens the Oerlikon Surface Solutions Segment’s existing laser cladding business, but is also complementary with its thermal

spray offering, thereby broadening the Segment’s portfolio of services for customers.

The acquisition allows **Oerlikon** to extend its footprint in North America and also in the energy and oil and gas sectors, in which laser cladding is largely applied. Both parties have agreed not to disclose the purchase price.

Dr. Brice Koch, CEO of the **Oerlikon Group**, said: “One of our strategic focus is to reinforce the foundation of our surface solutions business in order to ensure its further growth. The acquisition is another important step in our investments for the Surface Solutions Segment, allowing us to strengthen our offering and foothold, particularly in the US.”

Laser cladding is a state-of-the-art surface technology using a laser beam to deposit materials and layers onto a substrate or to fabricate near-net shape parts. The method enables a full metallurgical bond to the base material, which in turn improves corrosion-resistance and wear properties. In addition, laser cladding makes it possible to coat thin-walled components and also thinner layers can be applied. These advantages make laser cladding particularly suitable for applications in demanding areas where a high degree of accuracy and performance is needed, such as with turbine blades, drilling equipment and pump components in the energy sector.

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"The business of **Laser Cladding Services, LLC.**, is an ideal fit to our existing surface solutions business. It enhances our existing laser cladding offering and broadens our service portfolio. Furthermore, it opens up attractive business opportunities in the energy market and in other geographic regions and industries," comments Dr. Roland Herb, CEO of **Oerlikon** Surface Solutions Segment. ▲

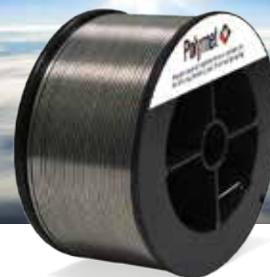
About Oerlikon: Oerlikon (SIX: OERL) is a leading global technology Group, focusing on providing market-leading technologies and services for surface solutions, manmade fibers manufacturing, drive systems and vacuum pumps and components in growth markets. These cutting-edge technologies benefit customers by improving their product performance, productivity, efficient use of energy and resources, and also by contributing to a more sustainable environment. A Swiss company with over 100 years of tradition, Oerlikon has a global footprint of over 15 500 employees at more than 200 locations in 36 countries and sales of CHF 3.2 billion in 2014. The company invested CHF 121 million in R&D in 2014 and has over 1 300 specialists developing innovative and customer-oriented products and services.

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THE NASSAU COMMUNITY COLLEGE ANNOUNCES PLASMA CERTIFICATE PROGRAM

Nassau Community College (NCC), a two year school with approximately 23,000 students (and some 10,000 Continuing Ed students) is the largest single campus school in the State University system (SUNY). They are located in Garden City, NY (Long Island, 25 miles east of Manhattan).

Development of the operator/ technician certificate program commenced in 2014 at a slow pace paying particular attention to what is needed in industry. Through the efforts of many, a plasma lab has been established as part of our STEM lab at NCC and the curriculum developed with the assistance/ input of Oerlikon Metco.

There has been much enthusiasm by the grass roots group involved in the development of the program and while the potential and opportunities seem abundant

in general, we are now attempting to pinpoint the following specific items:

- 1) identification of participants who would be attracted to the program (drivers of the dollars and cents required to launch a new program) and
- 2) job opportunities available to participants once they complete the program.

When we finish our due diligence on these two items, (and if the resultant information is positive concerning lab participants and job opportunities), we will decide on the timing of launching the certificate program. We hope this exercise can be completed in January of 2016 with the launch date decided closely thereafter.

To complete this last step we will be assessing reams of information provided by Daryl Crawmer, a co-founder of ASM Thermal Spray Society and former Director of TST Engineered Coating Solutions; directly communicating with companies utilizing plasma technology; meeting with key players in the industry and surveying members of industry associations.

We feel we hit our first objective - develop a solid entry level program which is needed by the industry. One that provides participants "real" basic knowledge - practical, theoretical and hopefully some "hands on" experience. A program when completed that will allow someone to hit the ground ready to assimilate into an organization and quickly ascend to being productive. This of course would, hopefully, lead to accomplishing the next objective develop career alternatives for students that will land them in the workforce - rather than their parent's couch. This aligns itself with one of the workforce mission objectives handed down by SUNY and identified by other communities as well as the federal government. ▲



To be continued...
Curriculum outline available
on request via email
James.Behrens@ncc.edu

■ THERMAL SPRAY WEAR COATINGS FACE COMPETITION FROM NEW PLATING TECHNOLOGIES

A recently published study by **Thintri, Inc.**, *Markets in Wear Coatings: Hard Chrome and its Alternatives, 2016*, analyzes the state of markets in thermal spray wear coatings and also highlights growing threats to those markets.

In 2016, the global thermal spray industry is well, but growth is uneven, with some sectors depressed while others show promise. An important component of thermal spray markets is wear coatings, the deposition of coatings with the intent of providing wear-resistant, low-friction coatings for demanding applications like hydraulic rods, aircraft landing gear, etc. Today, at least in the wear coating sector, thermal spray use is growing but faces new threats from emerging plating technologies.

One prime market driver of thermal spray wear coatings is chrome replacement, the elimination of hard chrome wear coatings based on hexavalent chromium plating. Hex chrome-based plating has been found to be a significant health and environmental threat, and was particularly hazardous for the workers in hex chrome plating shops. As a result, legislation has tightened rules around worker exposure to the mists created during the plating operations. The consequent increases in cost and loss of sales in complying with the rules drove many platers out of the US and often out of business, but the industry has since stabilized, with most remaining shops now profitable, after adapting to the new environment.

Nevertheless, many users of chrome wear coatings wish to eliminate chrome plating from their businesses altogether and continue to seek alternatives to hard chrome. Thermal spray, in particular HVOF, has absorbed a lot of that new demand. HVOF can apply useful wear coatings with no use of hexavalent chromium, using a range of materials that can, to an extent, be customized to the application at hand. Other forms of thermal spray, including high energy plasma and twin wire arc coatings, also fill in for hard chrome.

The balance between hard chrome plating and thermal spray has been fairly consistent, with both markets growing at a satisfactory rate in the years following the recession but with a continuing gradual migration from chrome to thermal spray, the chief chrome alternative. However, according to the **Thintri** study, for the first time since the original version of this report in 2003, within the forecast period hard hex chrome markets are facing a period of actual negative growth, as chrome alternatives

capture markets (*Fig. 1*). What's also new in this period is that the new, emerging wear coatings are presenting a significant competitive threat to thermal spray wear coating markets as well.

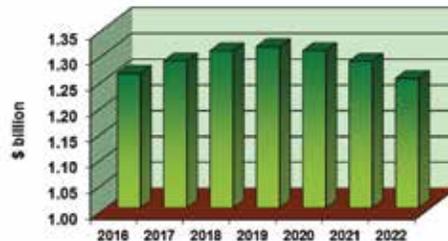


Figure 1. Global Market Forecast, Hexavalent Chrome Consumables

The reason that both hard chrome and thermal spray wear coatings markets are threatened is due to the near-simultaneous emergence of a range of alternative coating systems, mostly using plating technologies. These technologies have been under development for many years, and in some cases have acquired enough experience to quickly capture markets, while others are just now entering commercial production but are able to reach their end user markets quickly.

What makes these technologies so threatening to established chrome alternatives like HVOF is that they are relatively low cost, high-performing systems that capitalize on the weaknesses of both hard hex chrome and thermal spray.

Chrome plate's properties are generally good, but hardly ever excellent. Chrome's limited hardness and corrosion resistance are increasingly unsatisfactory in today's more demanding wear environments. Chrome's slow rates of deposition and long bakes add to cost of ownership and turnaround times. Coating non-uniformity often forces followup machining to meet dimensional tolerances.

Those weaknesses, combined with a newly hostile regulatory environment, drove many users to thermal spray but thermal spray has its own limitations. It is relatively costly, throughput can be good in some situations but it does not lend itself to large-scale production. For chrome plating, on the other hand, small parts can be shoveled into a tank, with significant economies of scale. Thermal spray is also largely restricted to line of sight, making it difficult to coat complex shapes and inner diameters. On top of all that, some who have switched from hard chrome to thermal spray have

been disappointed with the results, such as having to devise new hydraulic seals to compensate for the higher friction in HVOF coatings.

The balance of benefits and liabilities in hard chrome versus thermal spray led to a slow but steady movement from the former to the latter, with consistent growth in thermal spray markets but not enough to seriously degrade hard chrome, which has still maintained growth, up to now.

The new set of wear coating technologies will upset the balance to the detriment of both hard chrome and thermal spray. The chief advantage is that they are plated, thus avoiding the main pitfalls of thermal spray, such as low production throughout, high cost and uneven performance. The new technologies can also improve on chrome in both performance and cost.

For example, plated technologies based on cobalt, such as electrodeposited nanocrystalline cobalt-phosphorus (NCoP), which is specifically targeted at inner diameters, involves raw materials that are significantly more costly than chrome. Cobalt salts cost a lot more than chromic acid. However, the efficiency of the NCoP process is more than 90%, compared to 20% for chrome, and throughputs are higher. A conventional chrome coating of 20 mils would take a full 24 hours, but with NCoP would be brought down to a couple of hours, more than making up for the higher up-front material costs. And the coatings offer essentially the same hardness. The NCoP coating technology is already commercially available.

For another example, electroless nickel (EN) plating is an autocatalytic process, using no electricity, and thus eliminates the directionality and uneven thicknesses of electroplated coatings. More importantly, EN composite coatings can improve on and tune the wear properties of the coating by adding small particles. Teflon particles can be added to the coating to improve lubricity, while the addition of diamond or silicon carbide particles can greatly improve wear resistance. Electroless nickel and electroless nickel composite coatings are also now commercially available.

The Holy Grail for wear coatings has been the development of a hard, trivalent chrome. Most users of hex chrome would not have considered moving to thermal spray or other plating methods if they could have obtained the same coatings with a safer approach. The industry has longed for a safer chrome coating that would eliminate the need to do away with chrome entirely.

By eliminating the use of hexavalent chrome, trivalent chrome does not present the safety and environmental risks of

hexavalent chrome, while offering a coating of the same material. Development of hard trivalent chrome coatings has been hampered by technical issues such as poor color match to hex chrome (although with no effect on performance), a different microcrack structure compared to hex chrome, and more complicated chemistry, with higher cost. These issues have basically been ironed out and hard trivalent chrome has already been demonstrated in high volume production.

None of the alternatives is perfect. For some, cost is still an issue. Those that have targeted the aerospace industry must wade through a lengthy approval process. For trivalent chrome, even though it avoids the legislative restriction of hex chrome – at least in the US – many plating customers are suspicious of any chromium content at all and want it replaced completely.

There are no perfect solutions for wear coatings, and all the new technologies have their own limitations. For example, the newer plating technologies that use nickel and cobalt may face legislative obstacles similar to those that restricted hex chrome. REACH in Europe placed cobalt salts on a list of materials that were proposed for restriction, although most industry experts believe an accommodation will be reached.

Thermal spray wear coating markets themselves are in flux. Markets for thermal spray overall, and thermal spray wear coating markets, are growing faster than the economy in general, at about 8.5%. However, that growth is distributed unevenly. Many markets have been impacted by the economic slowdown in China, but the effect will be limited for a time since so much thermal spray is used for repair rather

than on new products. Some markets, like aerospace, are still fairly robust. And there are markets with limited dependence on exports that are suffering as well.

For example, compare consumables in two prominent thermal spray wear coating markets. One is the powder (or wire) used in heavy equipment found in mining and earth moving (mostly for hydraulic cylinders) and the other is thermal spray consumables in forestry and logging. Mining and earth moving have slowed somewhat due to international economic factors but are still promising in the rest of the decade. By comparison, forestry and paper have been quite depressed, mainly due to the move away from paper media to digital. While industry respondents have stated that the drop in thermal spray consumables in this sector has slowed and shows signs of stabilizing, recovery to the healthier levels of a few years ago is highly unlikely. **Figure 2** compares the fortunes of both sectors in thermal spray consumable sales.

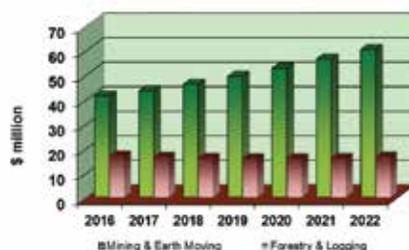


Figure 2. Market Forecast, Thermal Spray Consumables, Mining and Earth Moving, vs. Forestry and Logging

The oil and gas sector was the most dynamic wear coating market up until recently, when a worldwide oil glut caused

revenue to plummet. With the lifting of sanctions against Iran following the recent nuclear deal, the entry of an enormous new oil supplier is unlikely to help the situation much. In any case, oil and gas will still be drilled, and repairs needed, so there will be some stabilization of markets but limited recovery compared to the activity in recent years.

Overall, the **Thintri** study projects most wear coating markets in thermal spray equipment, consumables and services for wear coatings will still maintain reasonably healthy growth through the forecast period, slowed somewhat by the penetration of alternatives.

The most likely outcome in terms of processes is that an array of wear coating technologies will be available to the user, who can then choose the best option according to cost, performance, throughput and other considerations. No technology will dominate as before, and those that dominate today will lose market share, but each technology can make a good case for being the best approach to specific applications. ▲

About **Thintri, Inc.** **Thintri, Inc.** (www.thintri.com), is a full-service consulting firm specializing in market research and custom consulting, covering topics in materials, aerospace, electronics and semiconductors, telecommunications, manufacturing, imaging, security and many other markets.



I W

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 or contact Jason Hunsaker at 314-313-1380 - jhunsaker@hbcoatings.com, Paul Engelman at 314-220-9718 and Duane Boehnke at 314-780-3955 - 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.



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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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

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.

OFFICERS

Chairman: **Bill Mosier**, *Polymet Corporation*
 Vice-Chairman: **Jim Ryan**, *Carpenter Powder Products*
 Corporate Secretary: **Kathy Dusa**

EXECUTIVE COMMITTEE (above officers plus the following)

Larry Grimenstein, *Nation Coating Systems*
Dan Hayden, *Hayden Corporation*
Peter Ruggiero, *Curtiss-Wright Surface Technologies*
David Wright, *Accuwright Industries, Inc.*

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 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.

ITSA member companies are also highlighted in the **ITSA** booth at several trade shows throughout the year.

For more information, contact Kathy Dusa 440.357.5400 or visit the membership section at www.thermalspray.org.



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PLACKART THERMAL SPRAYS OIL TREATMENT VESSEL

Plackart, a Russian company, applied stainless steel coating on the internal surfaces of an oil treatment vessel for Petrotel Lukoil, Romania in November of 2015.

Plackart is well known for its on-site thermal spray coating works in Russia, Belorussia and Kazakhstan. This was the first job for Plackart in the European Union.

Thermal spray has proven successful for corrosion protection of oil and gas treatment vessels, especially for high-sulphur oil.

Plackart provides both manual and automated coating works with HVOF, HVAF, flame spray and arc wire spray of metals and cermets. ▲



For more information, visit
www.plackart.com/plnews/246-romania.html



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ASM
INTERNATIONAL

THERMAL SPRAY SOCIETY
HALL OF FAME

The Thermal Spray Hall of Fame, established in 1993 by the Thermal Spray Society of ASM International, is a means of recognizing and honoring outstanding leaders who have made significant contributions to the science, technology, practice, education, management and advancement of Thermal Spraying. It represents the highest honor provided by ASM to the thermal spray community. Over the last 20 years almost 50 individuals both living and deceased has been inducted into the hall-of-fame. These three leaders were inducted in the 2015 TSS Hall of Fame.



■ **Christian Coddet**, LERMPS, University of Technology of Belfort-Montbéliard
"For developing innovative thermal spray techniques and applications and for developing international collaboration programs dedicated to thermal spray research in developing countries."

collaboration programs dedicated to thermal spray research in developing countries."

Christian CODDET was awarded a PhD degree by the University of Grenoble in 1973 and he started his academic career as a lecturer in this University the same year. Then he moved to the Technological University of Compiègne in 1975 and to the University of Reims where he was appointed full professor in 1984. During this first part of his career, his research work was devoted mainly to high temperature corrosion of metals and alloys, a domain to which he brought several innovations such as the use of acoustic emission to study the mechanical behaviour of oxide scales at high temperature. At this time he was often invited to participate in the Gordon Conferences on corrosion in New Hampshire.

In 1986 he was recruited by the newly born University of Technology of Belfort Montbéliard (UTBM) to set up a laboratory devoted to the development of coatings. Research activities were focused on dry surface engineering processes, namely thermal spray and physical vapour deposition. Activity comprises modelling at the level of the process development, characterization of the properties and performances of the elaborated coatings, study and manufacturing of the precursor materials (powders) and of the related surface pre or post treatments (surface preparations by lasers, control of thermal flows and surface states by pre-heating or cryogenic cooling, etc...), together with the development of applications, in close collaboration with industry. This laboratory, the LERMPS, is nowadays one of the best

equipped Thermal Spray laboratory in the world incorporating most of TS equipment (2 LPPS, 2 HVOF, 4 APS, 3 CS, 3 WAS, DPV2000, plume Spector ...).

Christian CODDET is also in this domain the origin of several innovations such as the in situ surface preparation by lasers. More recently, its research activity was oriented towards additive manufacturing using of course thermal spray and particularly cold spray but also layer by layer techniques such as selective laser melting. He is the author or co-author of 21 patents and more than 500 industrial reports and 400 papers published in international journals. Since 2009 he is also an adjunct professor of the Xi'an Jiao tong University in China.

When he has the possibility to find some free time, Christian appreciate sailing in the Mediterranean sea with his son David or traveling in the air across Europe or Africa as a pilot of a small aircraft. ▲

For more information, contact Christian via email Christian.coddet@utbm.fr



■ **Lech Pawlowski**, University of Limoges, European Centre de la Céramique
"For sustained and innovative thermal spray research and development and

significant contributions to the fundamental and technical advancement of thermal spraying."

Professor Pawlowski summarizes his career as follows: My career has been bound since September 1973, i.e. from the moment of choice of the diploma research project, to the technology of thermal spraying. In this field I carried my action as researcher, engineer and manager, and, finally, as an educator. Let me show it in a chronological order.

My education and formation stage started in 1974 on the end of my study of electronic engineering in Poland and had lasted up to 1985 when I got the DSc diploma and France. To this stage must be counted a period 1988-1989 in the University Monash where I updated my knowledge in materials science under direction of an outstanding professor Reg McPherson. During this time I learned the fundamental of technology of plasma spraying in air and under vacuum and created simple models of plasma - solid particles interaction. I got familiar with sophisticated tools of coatings properties, such as diffusivity by a method of flash laser.

The stage, by far most important of my career, was an appointment as project manager in W. Haldenwanger in Berlin Germany starting from 1985 by 1988. I developed two original technologies of coatings onto anilox and corona rolls used in printing industry. The management gave me a free hand in the choice of technology and characterization tools. As a result I developed the technologies which made earned money to the society for next 15 years. A few years later I created, together with a group of my Polish friends a society Ceramtech in Wrocław (Poland) which produced powders to thermal spraying. In this period I worked as a consultant for an Italian society Centro Sviluppo Materiali in Trento. This period was finished by an appointment as a manager of a French society H.T.I. in Ambazac (87) which lasted a few months and was followed by nearly two years unemployment period. During this period I could have ordered my personal life, got remarried and wrote a book The Science and Engineering of Thermal Spray Coatings, published in 1994 which has been cited by today 1059 times and was translated in Chinese in 2010.

The present stage of formation others started in 1995 by an appointment as a university professor by The University of Artois. In this university, then, later on, in The High School of Engineers of Chemistry

and, finally, in the University of Limoges I follow the same career. In this period I could polish my communication skills and, most of all, could have started to do the research on my way. The way is characterized by practical goals (electronic emitters, bioactive and photocatalytic coatings). Moreover, I stick to high quality of coatings and try to test them with many methods, in order to get entire information about them. Finally, I try to understand the phenomena occurring at processing using mathematical modeling. The papers written and published after 2003 are well cited and confirm their high quality. The communication skills are well confirmed by a meeting which I created in 2003, i.e. Rencontres Internationales de la Projection Thermique (RIPT). The meeting started in Lille continues in Limoges with a frequency of one meeting every two years. Basing onto this meeting I co-created in December 2009 the European Thermal Spray Association (<http://etsa-thermal-spray.org/>) and was elected its first president. ▲

For more information, contact lech.pawlowski@unilim.fr



■ **Sanjay Sampath**, Center for Thermal Spray Research, State University of New York
"For innovative interdisciplinary thermal spray research bridging the gap between

fundamental science and industrial practice through better understanding of coating properties and the development of advanced diagnostic tools."

Professor Sampath has been involved in thermal spray technology for the last 30 years starting with his graduate work at Stony Brook under the guidance of Professor Herman, who was the first hall-of-fame recipient in 1993. Following his Ph.D. Sanjay worked as a research engineer at GTE Sylvania in Towanda Pennsylvania (presently Global Tungsten Products) where he was involved in development of engineered refractory powders for thermal spray and other applications. He returned to Stony Brook as a faculty member in 1993 where he has led research to further fundamentals of thermal spray, mentor students in the field and expand applications.

Upon joining the faculty at Stony Brook, Dr. Sampath has directed research efforts on various federal and industrially funded programs. Under the auspices of the National Science Foundation Materials Research Science and Engineering Center, he directed a group of a dozen or so interdisciplinary faculty members towards fundamental understanding of thermal spray

processes, materials and applications. The self-sustaining Center is home to the Industrial Consortium for Thermal Spray Technology comprising of 36 leading companies aimed at knowledge transfer from fundamental research to application engineering. He was also principal investigator on a major Defense Advanced Research Projects Agency grant aimed at developing new processing tools for direct writing of mesoscale electronics and sensors. This technology has now found commercial use.

Dr. Sampath has over 200 publications to his credit, 15 patents and several best paper awards. He has mentored over 25 PhD students and equal number of post-docs and masters research students and exposed over 100 undergraduate students to capabilities of thermal spray technology. Many of graduates from Prof. Sampath's group have continued to participate and contribute to thermal spray technology. He received the SUNY Chancellor's Award for excellence in scholarship and creative activities in its inaugural year, elected Fellow of ASM International and in 2007 was recipient of an R&D 100 award for developing the direct write technology. He was also inducted as Fellow of the American Ceramic Society and recently recognized as a Distinguished Professor of the State University of New York system, the highest faculty recognition within the State University of New York. ▲

For more information, contact ssampath@ms.cc.sunysb.edu



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PETER RUGGIERO APPOINTED TO INTERNATIONAL THERMAL SPRAY ASSOCIATION EXECUTIVE COMMITTEE



■ **Peter Ruggiero** has accepted an appointment to the International Thermal Spray Association (ITSA) Executive Committee.
"Peter's experience and expertise will certainly

prove to be a valuable leadership asset for the ITSA membership" stated Bill Mosier, ITSA Chairman.

Peter Ruggiero is a Regional Manager for Curtiss-Wright Surface Technologies (CWST) with responsibility for four thermal spray business units located in East Windsor, CT; Wilmington MA; Duncan SC; and Phoenix AZ. These facilities provide thermal spray coating services and develop new coating applications primarily for the aerospace & industrial gas turbine markets.

With 34 years of experience in the thermal spray industry, Peter has developed expertise in business development, general management, and commercial sales and marketing of thermal spray coatings. With a background in both engineering and manufacturing, Peter has facilitated the development of new thermal spray applications for CWST, including chrome replacement, advanced clearance control abrasives & numerous thermal barrier coating systems.

Peter has chaired and organized company conference events to promote new market segments such as chrome replacement for landing gear. He has developed and co-published multiple industry articles & technical papers on thermal spray coating applications and holds a patent for his work on corrosion resistant coatings.

Peter received his Master of Business Administration and Bachelor of Science degrees from Western New England College. He also has an Associate of Science degree in Mechanical Engineering from Hartford State Technical College, and a Mechanical Design degree from Porter and Chester Institute. ▲

For more information, contact peter.ruggiero@cwst.com

IN MEMORIAM

■ **Walter L. Riggs, II (Dub)**, passed away on Dec. 25, 2015, at his home in Rural Hall, N.C., at the age of 64.

Dub was born on April 26, 1951 in El Dorado to Walter Landon and Alyce (Wedding) Riggs. Dub had recently been diagnosed with Parkinson's disease, but continued to work as a Metallurgical Engineer.

Dub attended school in Leon and Augusta, graduating in May of 1969 from Augusta High School. He earned his Bachelor's in engineering from the University of Missouri and his Master's in engineering from the University of Illinois.

Active in the surface engineering and thermal spray industry all of his life, his work took him to many parts of the world, as he developed metal coatings for various companies.

Dub, one of six children, was preceded in death by his parents, Walter Landon and Alyce M. Riggs; two brothers, John F. and Curt N. Riggs; and his nephew, Neil T. Riggs. Dub is survived by son Eric (Melody) Riggs and children Cate, Brennan and Elizabeth of Cincinnati, Ohio; and daughter Dr. Kristin (Josh) Miller and children Lenora, Cecily and Emory of El Reno, Okla.; three sisters, Priscilla Templin of Augusta, Paige Hundemer of Spring, Texas, Allyson (Jeff) Robinson of Misson, Kan.; sister in law, Judy Riggs of Augusta; and many nieces, nephews and cousins.

Private family graveside services at Elmwood Cemetery will be held at a later date.



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ICMCTF TROPICAL SYMPOSIUM ON THERMAL SPRAY TECHNOLOGIES AND COATINGS
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- 25-29 | San Diego, CA USA
ICMCTF'16 - INTERNATIONAL CONFERENCE ON METALLURGICAL COATINGS & THIN FILMS
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www.svc.org/Conferences/Exhibits/2016

- 10-12 | Shanghai, China
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- 16-19 | Malaysia
ISCC 2016 INT'L SYMPOSIUM ON COATINGS
www.imtce2016.org
- 23-25 | Bellevue, WA USA
AEROMAT 2016
www.asminternational.org/web/aeromat-2016
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