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A large, grey metal ship hull dominates the background. A worker in a dark suit and helmet stands on a red hydraulic lift platform, positioned against the hull. The hull has the name "MALENE S" and "BERGEN" partially visible. The sky is blue with some clouds.

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Cover: Thermal Spray Zinc Protects Fishing Trawler

Turkish shipyard Celiktrans recently sprayed a 3,588 ton fishing trawler. Approximately 53,820 sq ft (5000m²) of zinc was applied to internal and external surfaces of the vessel. The long supplies pack, unique to the Metallisation ARC140 system, enabled the operators to efficiently access hard to reach areas.

See article page 4.

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Metallisation Equipment Protecting Ships and Trawlers From Corrosion

Thermal spraying is a technology, which protects or extends the life of a wide variety of structures in the most hostile environments and in situations where coatings are vital for safety and performance. Thermal spraying is carried out in a wide range of anti-corrosion or engineering markets. Typical marine applications include the spraying of ships, trawlers and other ocean going vessels.

The anti-corrosive properties of the thermal spraying process are widely recognised in the shipping and marine industry, where steel super structures and vessels are subjected to very damaging corrosion from the sea and salt laden air of the world's shipping and fishing industries.

Metallisation's arcspray equipment is regularly used within the shipping industry to protect ships and trawlers from corrosion and has been involved in a number of recent projects. One of those saw Chorro Naval, a customer of Metallisation's Spanish distributor, Descon Quimica S.L, thermal spraying a wide range of vessels using the Arcspray 140 system. Chorro Naval is a renowned shipyard based in Vigo, Spain, and has many years' experience in maintaining, repairing, restoring and building ships. The company has vast expertise in maintaining all types of ship including, fishing trawlers, merchant ships, cement

carriers, supply ships, ferries and chemical carriers. The company offers a wide range of services to the shipyard industry including, hull shot blasting in dry dock, tank coating and a wide range of ship restoration and painting services.

In five separate projects, Chorro Naval has thermal sprayed a variety of shipping components with pure zinc. On a Spanish tuna fishing boat they thermal sprayed the inside of the tunnel and the fishing hold with a zinc aluminium alloy (85/15). On two trawlers, built in a Vigo shipyard and destined for the Faroe Islands, Chorro Naval thermal sprayed all external areas of the boats with zinc.

The external areas of a Danish patrol boat and an oceanographic Spanish ship were also sprayed with pure zinc. The final ship the 'Ronja Polares', a Norwegian fish carrier, was also thermal sprayed at the Vigo dry dock, which is fully kitted out to accommodate restoration and thermal spraying work. The external areas thermal sprayed during these projects included the hull, all external decks, super-structures, the bridge, mast and chimney.

Prior to thermal spraying, surfaces of the ship's components, both internal and external, were shot blasted to Standard SA 2.5 to clean and prepare the surface. The zinc and zinc aluminium alloy coatings were then applied using the Arcspray system.

In Turkey, Metallisation customer, Celiktrans Shipyard, an expert shipyard that builds specialised vessels for local and foreign ship owners, recently thermal sprayed a 3,588 ton Norwegian fishing trawler. Using the Arcspray 140 system, Celiktrans thermal sprayed nearly 53,820 sq ft (5000m²) of zinc to the internal and external surfaces of the vessel. The long supplies pack, unique to Metallisation, enabled the operators to thermal spray this large capacity vessel efficiently and safely, as the energiser could remain securely located on the ground. Celiktrans is a specialist ship builder and provides, supply vessels, fishing vessels, ferries, tugboats and offers complex tailor made building projects to its customers.

Cem Unver, Shipyard Manager at Celiktrans Shipyard, says: "We were very pleased with the two ARC 140-350 systems we bought specifically for this project. We have never had any problems with the equipment or the process. In fact, we have been surprised by the user-friendly operation of the equipment and the technical assistance provided by Metallisation. We are especially impressed with the 65ft (20m) supplies pack, which also influenced our decision to buy the ARC 140 systems. The length of the supplies cables helped us a lot during the coating of interior spaces, such as the cofferdams and tanks. We have easily coated even the most difficult to reach areas because of the long cables and the easy to operate light weight spray guns. We would like to say a huge thank you to all at Metallisation and hope to see them as our solution partner for the future."

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In the Arcspray process, two electrically charged wires are driven and guided so that they converge at a point and form an arc. An air nozzle atomizes the molten metal produced from the wire and projects it towards the work piece using high pressure air. This spray solidifies when it hits the surface of the work piece to form a dense coating, which protects against corrosion. The driving of the wires is typically either by air motor or electric motor and gearbox arrangement.

Major advantages of the arcspray process are that the coatings are available for almost immediate use. There is no drying or curing time, no risk of damaging the component and the deposits possess a higher degree of bond strength than many other sprayed coatings.

For more information on the Arcspray projects, processes or equipment, please contact Stuart Milton, Sales Director on + 44 (0) 1384 252 464 or visit www.metallisation.com

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Ferris and Ultrasonics

It may help to revisit ultrasonic cleaning. Ultrasonic cleaning, cleaning with high frequency sound waves, has become a staple of the manufacturing plant. Many of us consider it indispensable for reliable, rugged thermal spray processes. We are reporting a few results of ongoing studies performed at Plasma Technology Inc. in Torrance CA.

Ultrasonic cleaning is often a necessity to optimize aqueous-based cleaning processes; and it is useful for solvent cleaning as well. By the way, as a heads-up to those using trichloroethylene (TCE), the U.S. EPA recently did a residual risk assessment of the impact of TCE on worker safety (1) and held an experts workshop; their workshop may provide an indication of things to come (2-3).

Ferris Buhler the Scientist

Too often, we select ultrasonic systems and cleaning chemistries based only on the advice of the sales reps. The assertion that "everybody" is using high frequency ultrasonics doesn't mean that high frequency is right for your applications, for your customer requirements. The technical rep who sets up the cleaning system may specify the design of the system, the chemistry, temperature and the power settings. He or she may then say something like "don't change anything and don't touch any of these settings." There are many variables to ultrasonic systems; and that means many choices. Some of these variables are listed in Table 1.

Table 1 Some Ultrasonic Process Variables

Variable	Comments
Frequency	Higher frequency, smaller bubbles means less aggressive cleaning
Amplitude (loudness)	Higher amplitude means more aggressive cleaning
Power density	Power per unit volume
Physical and chemical properties of liquid	May have positive or negative effects on cavitation
Temperature	Impacts cavitation
Time	Impacts soil removal
Soil	Viscosity
Substrate	Mix of materials, size, shape
Substrate fixturing	Materials of construction, configuration

When we suggest the idea of testing ultrasonic variables with the idea of making your own decision about the cleaning process, the initial response can resemble fear, terror, even a sense of mischief. With due respect, we suggest that you are not Ferris Buhler ogling the new family sound system and the technical reps are not Ferris's dad. Evaluating a new ultrasonic system, making sure a current system is optimized, and testing to see that your current system is doing the job involves emulating Ferris a little bit, albeit in a more, mature, systematic manner.

Continued on Page 6



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Approach

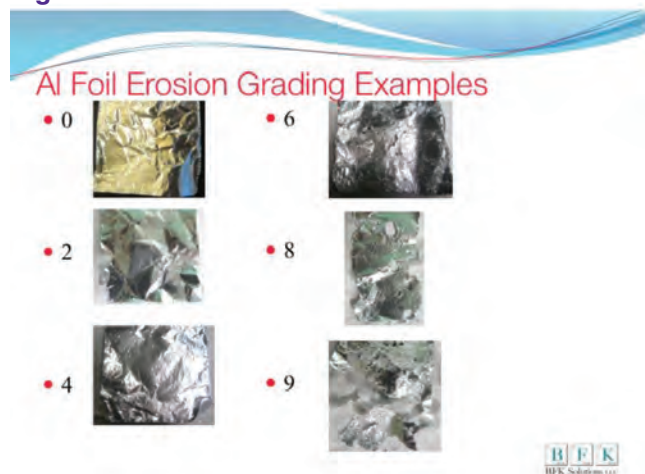
We have been testing the variables - not, of course, using actual hardware - but instead using coupons and scrap. We are presenting the results in a somewhat less formal manner than would happen in an actual journal article, in part to keep things less cumbersome and in part because practical surface preparation would benefit from both the logic of science and from the spirit of adventure of Ferris.

The current studies used water or aqueous-based cleaning agents with ultrasonics. We tested two frequencies, 40KHz and 132 KHz with sweep, in Crest benchtop ultrasonic tank (4). We have assembled a number of cleaning agents (5); a few of which were used in the initial tests reported in this paper. The "coupon" was regular weight (not heavy duty) aluminum foil. Although cavitation meters are available and can give quantifiable results, aluminum foil is inexpensive and readily available. Therefore, observing the orange peel pattern of aluminum foil is still the most commonly-used test for ultrasonic effectiveness.

Foil cavitation

The test material (in this case, aluminum foil) was placed in a glass beaker containing the cleaning agent. The beaker was placed in the ultrasonic tank that was filled with a solution of deionized water and surfactant. Surfactant was added to the water in the ultrasonic tank because conventional wisdom holds that surfactant lowers the surface tension, allowing for more effective cavitation. Results were graded visually. Figure 1 shows examples of the grading system for foil (6). Even though your product is probably less fragile than aluminum foil and is therefore less susceptible to ultrasonic erosion, ultrasonic damage can happen. Therefore, observing a level of '9' might be a warning sign that perhaps you are overdoing it with the ultrasonics.

Figure 1. Levels of Foil Erosion



On the other hand, a level of zero or even two could indicate that something is wrong, that ultrasonics are

not being effective. For example, the ultrasonic transducers could be malfunctioning. You can't tell from the noise (unless you have extremely unusual hearing); what you hear is more likely to be secondary harmonics. There could be other sources of low-to no orange peel pattern associated with the physical properties of the cleaning chemistry or design of the fixtures.

Chemistry and Frequency Comparison

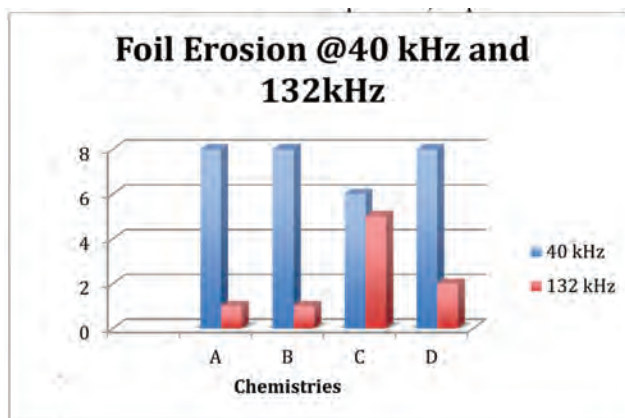
Water and three aqueous chemistries were tested, all using a 10% dilution by volume. The aqueous chemistries tested are indicated in Table 2. Identities are coded because this study is meant to show some variables to consider; it is not an "Iron Chef" contest among cleaning agent formulators.

Table 2. Aqueous Chemistries, Initial Tests

Code	Description
A	Deionized water
B	Mildly alkaline (pH ca 11.5)
C	Mildly alkaline (pH ca 10)
D	Mildly alkaline (pH ca 9)

We tested the impact of water and the three mildly alkaline cleaning chemistries on foil erosion at 40KHz and 132 KHz. Testing was at 55°C, 85 w/gal (full power), 9 min of cavitation. Results are shown in Figure 2. Conventional wisdom (the equivalent of Ferris Buhler's father) is that higher frequencies produce less ultrasonic damage; and this held true in the current study.

Figure 2. Foil Erosion at Two Different Frequencies, Impact of Chemistry



Time

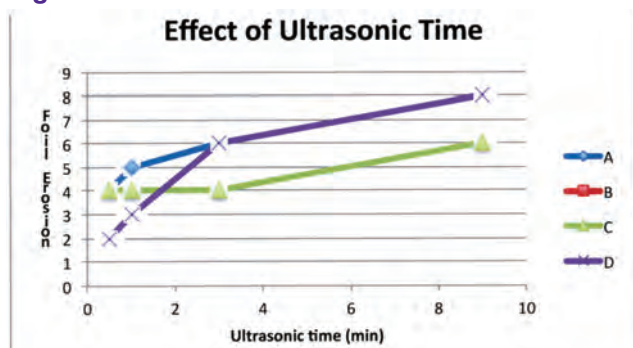
In general most suppliers of ultrasonic equipment claim that almost all of the cleaning action occurs within a short time; some say that 30 seconds of cleaning is plenty; others claim 3 minutes is sufficient.

Using water and the same three aqueous cleaning agents, cavitation of foil was evaluated at several times, between 30 seconds and 9 minutes. As indicated in Figure 3, there was more cavitation with increasing time. However, results were non-linear; and they were chemistry dependent.

Some people use ultrasonics generically in that they

assume that if a short time with ultrasonics is good, a lot more time is better. There are flaws in this reasoning. For one thing, ultrasonic product damage, while controllable, is possible. The longer the time exposure, the more likelihood you are to see product damage. Unnecessarily long cleaning process times hold up production and use energy. This costs money. Therefore, you may want to test your process using a few different cleaning chemistries in combination with ultrasonics.

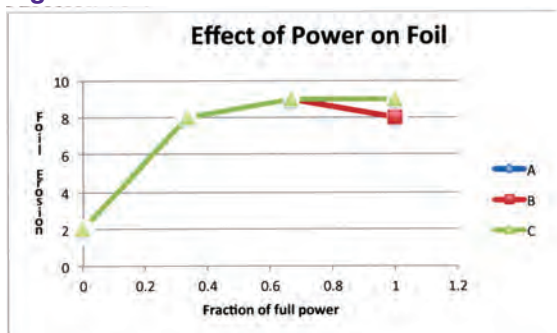
Figure 3. Foil Erosion Versus Time



Power

Many ultrasonic units come with a power setting that allow you to vary the power from zero to 100%. Using the 40 KHz tank, we varied the power between zero and 100% and cleaned for nine minutes. We looked at water and two aqueous formulations. Results are shown in Figure 4. In the tank we tested, there was some cavitation even at the setting for zero power. In addition, results were non-linear; and we saw very little impact of chemistry.

Figure 4. Foil Erosion Versus Per Cent Power



Ongoing studies

There are some cases where you want to moderate Ferris's spirit of adventure. For one thing, you should set the parameters, then set up the process, then cast the variables in stone. In addition, be aware that most ultrasonic systems are not recommended for use with flammable or combustible solvents. If you do need flammable solvents, purchase a system designed for that purpose. Low-flashpoint systems cost more money, but it's cheaper than rebuilding the facility; and you can't replace your workers. A bit of practical advice: don't test ultrasonics by putting foil directly in the tank. Put the foil in a beaker full of cleaning agent;

and suspend the beaker in the tank. Otherwise, you could end up contaminating the whole process tank with messy crumpled foil or bits of foil "glitter."

Finally, and this bears repeating: never, never ever clean actual hardware while you are testing the variables. Until you have set up the actual cleaning system, use coupons or scrap parts; and, be aware that you may have to run more than one or two tests to get the right conditions. Unexpected, and not necessarily desirable results can happen during test development. If we always got it right the first time, there would be no "re" in "research."

We have shown you a few results, hopefully enough to interest you in doing your own testing. Our own work is ongoing; we have an assortment of cleaning agents provided by a number of suppliers. We expect to report back to you periodically.

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3. B. Kanegsberg, "Process-Based Risk Reduction for Cleaning," Presentation at TCE Workshop, July 29, 2014 (in docket of Ref 2).
4. Thanks to Crest Ultrasonics for providing the ultrasonics tanks for evaluation and to Ajit Shahani, eChem, for arranging for transport of the cleaning equipment.
5. We appreciate cleaning agents provided for evaluation by Alconox, Brulin, eChem, Kyzen, Mirachem, and Petroferm.
6. Figures are from: B. Kanegsberg and E. Kanegsberg, "Is Ultrasonic Cleaning the Answer for Light Metals Finishing?" presented at SUR/FIN, June 9, 2014, Cleveland, OH.

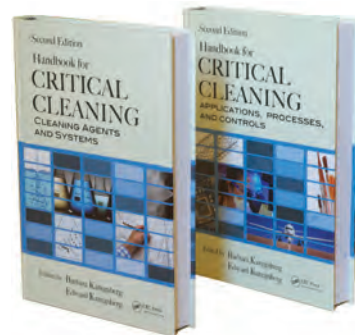
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Barbara Kanegsberg and Ed Kanegsberg **Ph.D.**, "the Cleaning Lady and the Rocket Scientist" of BFK Solutions LLC (founded in 1994), are industry leaders both in critical/precision and industrial product cleaning. BFK Solutions has

several times made presentations to ITSA and has contributed to the SPRAYTIME newsletter.

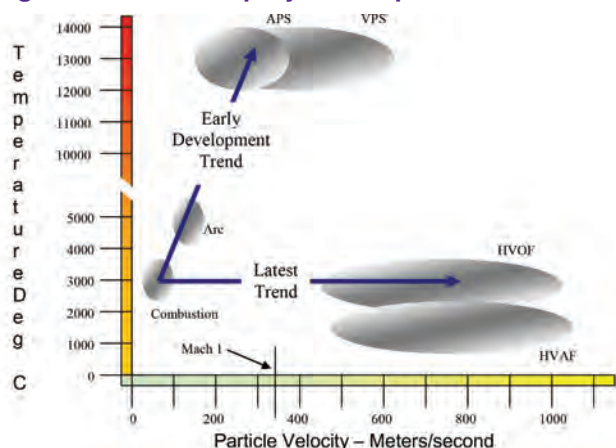
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Progress Report, HVOF, Advancing From the Teen Years to a Responsible Adult

Similar to what happened to Mark Twain when he stated "The report of my death was an exaggeration", a recent discussion on the "sudden demise" of High-Velocity Thermal Spray Equipment (HVOF)⁽¹⁾ was incorrect. HVOF is alive and well, taking on new challenges on a regular basis in the oil fields of Texas.

Figure 1. Thermal Spray Development Trends

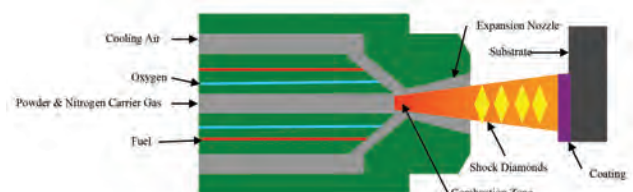


The High Velocity Air/Fuel (HVOF) process is one of the youngest thermal spray processes in use today. It really is an offspring of the High Velocity Oxy/Fuel

(HVOF) process and has rapidly advanced into maturity.

In the early years of Thermal Spray, advances were primarily along the line of increasing the flame or exit gas temperature; from combustion to arc to plasma (Fig. 1). This was followed by the development of the HVOF process where kinetic energy became a prominent factor. (Fig. 2)

Figure 2. Air Cooled HVOF Gun (Some guns use water cooling)



The development of the HVOF has been extremely successful, advancing the coating with compounds of tungsten carbide and other transition (high melting point) metal coatings. One case was replacing the environmentally unfriendly wet-chrome process with a "green", rapidly applied, Tungsten Carbide Cobalt coating using the HVOF process⁽²⁾.

The one problem encountered with the HVOF process was continued occurrence of oxides and

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products of decarburization in the coating, compromising the integrity of some coatings. Since oxidation and decarburization development is directly related to temperature, significantly increasing as temperatures approach the melting point of the coating material, attenuation of the temperature was desired. In one case, this was achieved by introducing a room temperature, inert gas into the combustion gases of the HVOF gun. Some refer to this process as "Warm Spray"⁽³⁾. One problem with the Warm Spray process is the complexity and cost of introducing an additional primary gas line. Also the velocity would be attenuated in addition to attenuation of the temperature.

The HVAF process was also developed as a process that retained the kinetic energy of the HVOF process but with reduced temperature to avoid the problems with oxidation and decarburization.

One supplier defines the HVAF process as "A thermal spray process in which a fuel gas is mixed with air and delivered at high pressure to the HVOF gun and ignited to form a high velocity gas stream in to which thermal spray powders are introduced and propelled on to the substrate"⁽⁴⁾. However, this presents a problem since the combustion process using air is not readily sustainable. The HVAF gun needed to be different than the HVOF gun.

The difference comes down to the flame propagation rate or the rate that a flame would achieve when moving in a column of fuel and oxidizer. The flame propagation rate for oxygen and a gaseous fuel, such as propane, is approximately ten times the rate for the same fuel with air⁽⁵⁾⁽⁶⁾. This difference is dramatically demonstrated at the Orlando (Florida) Science Center in their "KaBoom" show. For their "Science Live" show, latex balloons filled with stoichiometric mixtures of air and fuel are exploded with a variety of metal powders for a variety of visual effects in addition

to the "boom". The grand finale is the explosion of a balloon filled with a stoichiometric mixture of fuel and oxygen. Before this final act, the "instructor" puts on additional safety equipment including special ear muffs and safety glasses, uses a longer wand to light the mixture and warns any with heart problems that they might want to exit the theater. The resulting sonic explosion from the high (explosive) flame propagation rate of the fuel/oxygen mix is rather dramatic to say the least.

For the HVOF gun, the propagation rate is so fast, that it is possible to light the gun externally at the outlet using a simple spark tool. (The gas velocity at the exit



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only becomes sonic after combustion takes place). Once ignited, the flame moves into the gun tube faster than the gases coming out of the gun nozzle and combustion is sustained as long as the fuel/oxygen mixture is fed to the gun.

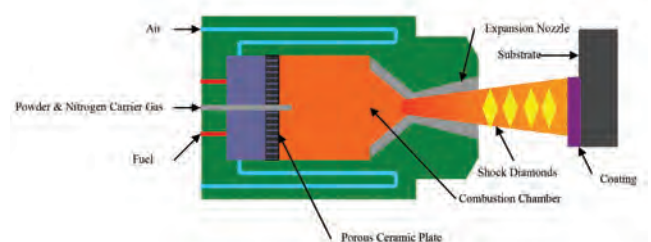
If air (23% oxygen, 75% Nitrogen) is the source of the oxygen, the flame velocity is so low, that the combustion gases do not allow the flame to enter the gun. Combustion is not sustained inside the gun. Consider the common natural gas kitchen stove burner. Even though a combustible mixture exists inside the burner, combustion takes place only external to the burner, not on the inside of the burner. There is no “flashback”. This would not be the case if pure oxygen was used as the oxidizer in a standard range burner.

Since combustion could not be sustained in a standard HVOF gun using air as the source of oxygen, a new thermal spray process was needed. This resulted in the development of a gun in which a large volume, low velocity combustion chamber is used. An internal pilot light or glow-plug provides the condition to initiate and sustain the combustion.

Early HVOF guns used an oxygen-hydrogen pilot flame for continuous re-ignition of the air-fuel mixture ⁽⁷⁾. These guns were used for both grit blasting and coating. Another HVOF gun design incorporates a side-mounted fueled glow plug. ⁽⁸⁾ In all of these cases, a separately powered pilot or glow plug was essential to sustain combustion.

A more recent design incorporates a catalytic ceramic insert with holes at the entrance of the combustion chamber. ⁽⁹⁾ (Figures 3 and 4). The catalyst lowers the auto-ignition temperature and allows the combustion to occur at lower temperatures. The familiar catalytic converter in automobile exhausts is an example of this process. In the automotive case, the converter promotes combustion of unburned fuel in the exhaust.

Figure 3. HVOF



The development of the HVOF process has been quite successful. One institutional study summarized the results as: “This study compares three types of WC-10Co4Cr coatings deposited with high-velocity oxygen fuel (HVOF) and high-velocity air fuel (HVOF) spraying processes. The experimental results indicated that the decarburisation (sic) of the WC in the WC-10Co4Cr coating was dramatically influenced

Figure 4. HVOF Gun coating conveyor screw



by the spraying equipment, and the non-WC phase content in the as-sprayed coatings greatly influenced their performances. The HVOF-sprayed WC-10Co-4Cr coating revealed the lowest degree of decarburisation, (sic) achieving the best properties in terms of hardness, fracture toughness, abrasive and sliding wear as well as electrochemical corrosion resistance when compared to the two HVOF-sprayed WC-10Co-4Cr coatings.” ⁽⁹⁾

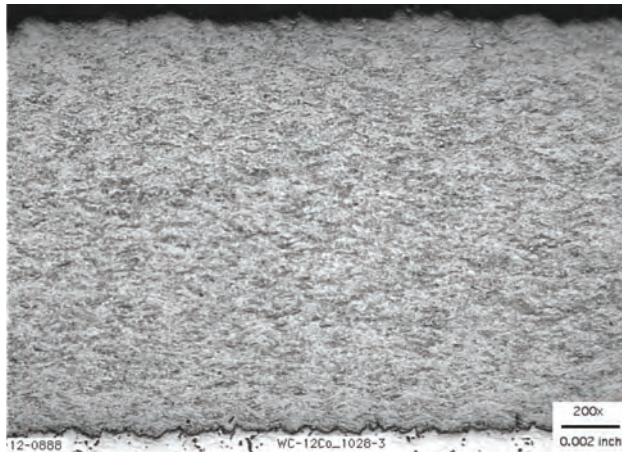
While HVOF is identified with carbides and other transition compounds, it has also been of benefit for coating with Zinc/Aluminum alloys for applying anti-corrosion protection for large structures. ⁽¹⁰⁾ In this process, the material is introduced into the combustion zone as wire through a feed tube and, unlike the HVOF carbide process, the material is melted. The conclusion from this study was “The HVOF process can be efficiently used for thermal spraying of Zn-Al to produce coatings of high quality and productivity.

The obtained coatings have low porosity, and possess very good adhesion to steel substrates with an average adhesion tensile strength of 16.5 MPa, which is considerably higher than for Zn-Al coatings typically obtained with Twin-Wire Arc systems. Tests also indicated that the coatings have good corrosion resistance, which can be attributed to a dense and homogeneous layer morphology as a result of high particles velocities obtained in the HVOF jet. During HVOF thermal spraying, the substrate is not subjected to high temperatures because of the long spray distance, the high spray rate, large spray patterns and short dwell time. This is a definite advantage of this method indicating that substrates with low melting point, such as bronzes, plastics, plaster, and wood, can be coated. Parts made of such materials often require metallic protective coatings.”

The primary concern about HVOF is the air consumption. ⁽⁸⁾ The air consumption is on the same order of consumption for a medium size jackhammer so a large but not unreasonable air compressor will be required. ⁽¹²⁾

Coatings developed using the HVOF processes continue to advance. Figure 5 is a section showing the

Figure 5. Section of HVOF Coating



dense coating that can be achieved using this process. The porosity was measured as being less than 0.0140% via Image Analysis and the interface contamination less than 1%.⁽¹³⁾

To summarize the advantages of the HVOF process:

1. The lower processing temperature of the HVOF gun reduces decarburization and oxidation. "The HVOF sprayed coatings are without brittle and oxidized phases, which are attributed to low gas temperatures."⁽⁸⁾
2. The efficient heating of spray particles in the HVOF combustion chamber due to its size and improved heat transfer at increased pressure permits high application rates. "Usual spray rates are 15-30 kg/hr."⁽¹⁴⁾
3. The low particle speed in the combustion chamber along with the extended exit nozzle allows the particles to reach temperature without "force heating", providing more uniform heating through the particles and avoiding their unnecessary surface overheating.
4. The larger diameter of the exit tube insures a uniform velocity profile at the exit, resulting in a more uniform coating. "The large nozzle diameter minimizes the influence of the nozzle walls on the spray particle acceleration, providing even distribution of the particle velocity (the ratio of the particle stream diameter to the nozzle diameter is reduced to 0.2)."⁽¹⁴⁾ Besides, the larger nozzle diameter allows using longer nozzles for more efficient acceleration of spray particles.

Will HVOF be replacing HVOF? In some cases, yes, because of superior coatings. However, it will take some time to occur. Many military and industrial applications are a result of years of development and testing. Coating certification can be expensive. Adoption of the HVOF process will be especially slow in cases where the coating specification is based on a specific gun. However, where the specification is based on the coating quality and coating performance, adoption of the HVOF process will occur in the near term. This is especially true where thermal spray is

supporting the oil and gas industry. The recent expansions being made with this industry are continually pushing for improved coatings without concern as to which gun is used.

While the HVOF process is mature, advancement continues to be made. One paper noted "New HVOF gun setups are developed, which accelerates the spray particles up to 1200-1300 m/s. This results in improvement of coatings quality. The cemented carbide coatings are non-permeable to gas at thickness as low as 40-50 micrometers. The WC-10Co-4Cr coating hardness is increased to 1300-1500 HV300 and Cr3C2-25NiCr coating hardness – to 1000-1100 HV300. The traditional and new coating markets in the oil and gas industry accepted the HVOF coatings on many critical components. The new coating applications include the plates and gates of the catalyst towers, hydraulic rods of dock cranes, sulfur condenser vessels of sulfur recovery plant, high-temperature pump impeller hubs and housings, valve stems and seats."⁽¹⁴⁾

For more information, contact author Dale R. Moody via email DaleRMoody@aol.com

In summary, HVOF is alive and well and we can expect to see more coatings produced by the HVOF process.

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- (13) Protech Lab. Report for Kermetico: 12-0888, Protech Lab Corp Hilton Head, SC
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FW Gartner Licenses Technology for Lser Cladding of Steel Rolls From South Africa's CSIR

FW Gartner Thermal Spraying, Houston, and South Africa's Council for Scientific and Industrial Research (CSIR) have signed a licensing agreement on a laser cladding technology developed at CSIR. The agreement follows the earlier development of a novel laser-based process for the cladding of steel processing rolls, a key component in steelmaking, CSIR said. The technology was tested and proven at ArcelorMittal's Vanderbijlpark plant over the past five years.

CSIR signed the agreement with FW Gartner Thermal Spraying of Houston, a unit of Curtiss Wright Surface Technologies that provides thermal spray and cladding technologies. "We aim to commercialize this unique technology, providing it to the broadest possible industrial audience," said Michael Breitsameter, director of sales and marketing for FW Gartner Thermal Spraying.

"The application of laser cladding for the surfacing of continuous caster rolls has significantly exceeded all expectations where it had been applied so far," said Pieter Venter, ArcelorMittal South Africa manager of materials engineering and authorized welding coordinator. "Alloying flexibility matched with caster-specific environmental conditions is a key strength of this technology, which has resulted in at least a twofold increase in caster roll life. While the improvement in MTBF [mean time between failures] of critical plant is always an important objective, the availability of laser technology to continuous casters is expected to play an important role for future improvement initiatives."

For more information, visit www.fwgts.com

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Curtiss-Wright Acquires Component Coating and Repair Services Limited

Curtiss-Wright Corporation recently announced that it has completed the acquisition of 100% of the shares of Component Coating and Repair Services Limited (CCRS). CCRS is a leading UK provider of ultra-smooth and corrosion resistant coatings and precision airfoil repair services for aerospace and industrial turbine applications. The acquired business will operate within Curtiss-Wright's Commercial/Industrial segment.

"The acquisition of CCRS adds new high-technology services to our Surface Technologies business that complement those of our existing engineered coatings offerings," said David C. Adams, President and CEO of Curtiss-Wright Corporation. "This is consistent with our stated acquisition strategy to target strategic, bolt-on companies that we believe will enable us to achieve our objectives of margin expansion, strong cash generation and solid returns. We intend to leverage the synergies that exist between our coatings businesses, while also supporting Surface Technologies' strategic objective to advance up the technological chain and expand the breadth of their technology and customer bases. Further, these technologies can be bundled with Curtiss-Wright's existing thermal spray and shot peening technologies to create additional opportunities for technology insertion into our world-

wide service network."

Founded in 1995, CCRS currently operates two divisions within the United Kingdom. The Glasgow, Scotland facility specializes in the application of sacrificial aluminum coatings for aerospace turbine engines. A second facility based in Alfreton, England focuses on turnkey component repairs for Industrial Gas Turbines utilized in power generation and oil and gas applications. Both facilities have excellent reputations with their original equipment manufacturer (OEM) customer base for providing high quality service and fast turntimes.

CCRS has approximately 100 employees and is expected to generate sales of approximately £7 million (approximately \$11 million) in 2014.

About Curtiss-Wright Corporation

Curtiss-Wright Corporation (NYSE: CW) is an innovative engineering company that provides highly engineered, critical function products, systems and services to the defense, energy and commercial/industrial markets. The legacy company of Glenn Curtiss and the Wright brothers, Curtiss-Wright has a long tradition of design and manufacturing innovation and prides itself on long-standing customer relationships. The company employs approximately 10,000 people worldwide.

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Belt Grinding Systems Save Time, Add Capacity and Payback in Three Months or Less

As the economy slowly grows, the need for more grinding capacity at thermal spray job shops will increase as well. While sales growth at most shops will be very welcome, it won't be big enough or fast enough to justify large capital projects to expand capacity. So how can a job shop increase capacity without laying out hundreds of thousands of dollars to buy a new grinder?

One option is belt grinding attachments. Belt grinding attachments are becoming very popular with coating shops. Belt grinding attachments are added onto an existing grinder. New belt technology allows for faster finishing of thermal spray coatings. This means less cost and shorter delivery times.

Belt grinding systems are uniquely suited for finishing or stripping ceramic plasma spray and tungsten carbide or chrome carbide HVOF applied coatings. Due to their high hardness these coatings are ideal because of how they fail. The cutting action of the diamond belts makes quick work of the coatings. Conventional grinding removes the coating by compressively failing the coatings. Belt grinders cut the coatings in a shearing action, which is much more efficient. Thermal spray coatings fail faster in shear than in compression.



So the cutting action of a belt grinder can reduce the time to strip or finish a typical size roll by 60% or more. Changing belts can be done in 2-3 minutes. Compare that to changing a diamond wheel on a conventional grinder, dressing the new wheel, or moving the part to another grinder with the right wheel and you can clearly see the time advantage belt grinding systems offer. Most thermal spray coated parts can be finished with a roughing belt 70 microns and a finishing belt 20 microns. Thermal spray coatings require diamond belts.

In a timed test a belt grinding system was able to remove 0.017 in. per side of tungsten carbide HVOF coating in 90 minutes. The roll was 8 in. OD x 65 in. face length. Typically, it would have taken several hours to strip this much tungsten carbide. In another

test a 6 in. OD x 70 face length roll was finished from an as-coated state to 18 microinches Ra in two hours. Again, this size roll would normally have taken 4-6 hours to grind. Taper on both rolls were held within the specified TIR of 0.0015 in. Another WC coated roll was finished from the as coated state to less than 1 microinch Ra in 2 hr 30 min without having to change grinding wheels or moving the part to another grinder and without Superfinishing. Three diamond belts were used in this case. Typically, only two are needed.

The belt on a belt grinding system is changed by simply stopping the grinder, opening the safety guard door, releasing the pneumatic tension on the belt and removing the belt to be changed. Then reverse the process. Slip the new belt onto the grinding wheel and around the idlers in the belt tensioning system and re-tension. Close the safety guard door and go back to work. Simple as that.



Belt grinding attachments are added to an existing cylindrical grinder. The cost for belt grinding attachments are about 1/10th that of a new grinder. It is simply an attachment. Installation takes 1 to 2 days. The grinder wheel is used as the platen which drives the belt at speeds similar to those used when finishing a roll or part with the grinder when using the wheel. If a part must be finished with a conventional grinding wheel, just remove the belt, back off the belt attachment and use the grinder as it was in the past.

Belts to finish hard chrome plating are available as well. Belt grinding systems are becoming especially popular with coaters and chrome platers who repair aircraft landing gear.

Tests conducted by the USAF at Hill AFB in Utah produced some very exciting results. Several tungsten carbide coated diameters on B1-B axles were first ground by conventional grinding wheels and the time recorded. The areas took a total of 4 hours to grind. Then axles of the same part number were finished with a belt grinding system which took a total of 13.4 min. Estimated time savings on each axle were 3.75 hr. See Figure next page.



The conclusions of the USAF tests were:

- Dramatic reduction of grinding times with belt compared to standard wheel;
- Surface finishes were very good without a great degree of optimization;
- Burns were not found where most aggressive grinding took place;
- Belt change took approximately 2.5 min.

Another benefit of belt grinding systems is that it is nearly impossible to create grinding burn in a part. This is because there is considerable less load friction created with a belt compared to a grinding wheel. Burns in parts, also known as over tempering, can cause cracking and reduce fatigue life. Burning is an especially dangerous condition for aircraft parts since burns in exotic metals, unlike ferrous materials, are usually invisible. Aircraft parts which have grinding burns must be scrapped. That can get very expensive.

So if you are considering expanding your grinding capabilities you might want to take a look at belt grinding attachments. ROIs are typically measured in months.

Author Scott McLaughlin is managing partner at McLaughlin & Associates Thermal Spray, Inc. based in Naperville, IL. He is an occasional contributor to the SPRAYTIME newsletter. The company was founded in 2007 and offers technical assistance, high quality equipment and materials to the thermal spray industry in North America.

For more information on belt grinding attachments including Versagrind belt grinder, Scott can be reached via phone at 630-922-7198, via email scott@mclaughlinthermalspray.com and visit web www.mclaughlinthermalspray.com

Become a Member of the International Thermal Spray Association

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

ITSA members invite your company to join us in this endeavor. See pages 14-15, 18.

MEC Acquires Whertec, Inc.

MEC Group through its Division Castolin Eutectic announces the acquisition of Whertec, Inc., a privately owned company with headquarters in Jacksonville, Florida. The company will operate as a subsidiary of Eutectic Corporation, USA.

Whertec was founded in 1996 and specializes in the application of coatings to protect against excessive wear, corrosion and erosion at elevated temperatures. Over the past years Whertec has secured a leading position in the boiler coatings market covering the power, recycling, biomass, steel and pulp and paper industries. Whertec's competences compliment the strength of the Castolin Eutectic group which has an established reputation for welding, brazing and coating technologies covering a wide range of industrial applications. Castolin Eutectic is a technology based organization with over 108 years' experience developing metallurgical solutions for industry.

Combining the forces of Castolin Eutectic and Whertec will create the market leader in surface protection solutions for boilers and pressure vessels covering all technologies – we are especially proud that combining the forces of Castolin Eutectic and Whertec will create potentially the largest laser coating company in the world. Whertec has an established reputation for reliability through the completion of projects on time and by meeting with the specified quality standards.

In announcing this acquisition, Siegfried Schabel, MEC CEO stated, "We are extremely excited by this acquisition which will further strengthen our position in key market sectors. It will significantly expand our capability to undertake on-site service contracts. We have the technology, and with Whertec we add operational expertise which will help with the next phase of our global expansion".

Pete Castiglione, sole owner of Whertec, Inc. comments, "Whertec has consistently grown since its inception in 1996 and the time is right for the next step by taking the company into international markets. MEC provides the ideal partner with its global network and a range of high technology products that compliment the operational expertise that we have developed over many years. I am pleased to be taking the business and our employees into a wellrespected, privately owned company that is prepared to support our vision for expansion."

For further information on the activities of Eutectic and Whertec please direct your inquiries to the following websites: www.eutectic.com and www.whertec.com

Where is your article? We encourage you to send articles, news, announcements and information to spraytime@thermalspray.org.



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.



Chairman Mosier

found at their website www.thermalspray.org

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

ITSA Mission Statement

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The International Thermal Spray Association offers annual Graduate Scholarships. Since 1992, the ITSA scholarship program has contributed to the growth of the thermal spray community, especially in the development of new technologists and engineers. ITSA is very proud of this education partnership and encourages all eligible participants to apply. Please visit www.thermalspray.org 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.

Lincoln Electric has Joined the International Thermal Spray Association



Lincoln Electric is the world leader in the design, development and manufacture of arc welding products, robotic arc welding systems, plasma and oxy-fuel cutting equipment and has a leading global position in the brazing and soldering alloys market. Headquartered in Cleveland, Ohio, Lincoln has 48 manufacturing locations, including operations and joint ventures in 19 countries and a worldwide network of distributors and sales offices covering more than 160 countries.

Recently, Lincoln Electric and The NanoSteel® Company announced that Lincoln Electric has been granted an exclusive worldwide license to NanoSteel's proprietary steel coatings technology for weld overlay and thermal spray applications.

For more information about Lincoln Electric and its products and services, visit the Company's website at www.lincolnelectric.com

The ITSA Company Representative is Tom Brown, thomas_brown@lincolnelectric.com.

Exline Joins Forces with Exterran Turbo

Exline, Inc., a family owned business based in Salina, Kansas is proud to announce a new partnership with Exterran Turbo, a global leader in the natural gas industry. This new partnership provides our customers with both on-site turbocharger removal and installation services, as well as re-manufacturing and testing services from Exterran's McPherson, KS Turbo facility. Operationally, Exline, Inc. has announced that they are providing expertise regarding on-site turbocharger removal and installation services, as well as transportation. The Exterran turbo group is managing remanufacturing processes and testing at their facility in McPherson, Kansas.

Exline continues to apply ThermEx® Thermal spray coatings and manufacture new turbocharger parts at their industrial facility in Salina. "The members of Exline are excited about the opportunity to work with Exterran," said Rob Exline, the President and CEO of Exline, Inc. "Much of our success through the years can be attributed to the partnerships we have developed, and the quality of work that we provide. This opportunity allows us to do what we do best, and work with a great team at Exterran." Exline has partnered with Exterran in an effort to better serve

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organizations in the municipal power generation and oil and gas industries. Both partners offer parts and services to keep turbochargers and turbocharger equipped engines up and running. Yet, their newly combined efforts will offer customers the benefit of a full-service experience for all turbocharger models. Mitch Opat, General Manager for Exterran's Turbo Charger Group, stated, "I'm extremely delighted about the opportunity to work with Exline, Inc." Opat continued, "This arrangement allows both companies to build off our long standing relationship while leveraging each other's strengths and core competencies. I couldn't be more excited about the future."

For more information, visit www.exline-inc.com

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.

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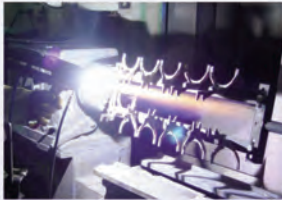
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CALENDAR OF EVENTS 2014

NOVEMBER 2014

11-13 Atlanta, GA USA *FABTECH with a Thermal Spray Pavilion and Conference* - visit www.fabtech-expo.com

14-20 Montreal, Canada *ASME 2014 Int'l Mechanical Engineering Congress and Exposition* - visit www.asme.org

2015

JANUARY 2015

10-13 Dubai UAE *Arabia Essen Welding and Cutting co-located with 5th Int'l Trade Fair for Tube and Pipe Industries, 2nd Int'l Trade Fair for Joining, Cutting, Surfacing* - visit www.arabia-essen-welding-cutting.com

FEBRUARY 2015

TBD Doha, Qatar *Middle East TurboMachinery Symposium* **METS 2015** - visit middleeastturbo.tamu.edu

MARCH 2015

4-5 Lake Buena Vista Orlando, FL USA *LAM 2015 Laser Additive Mfg Workshop* - visit www.lia.org

15-19 Dallas, TX USA *Corrosion 2015* - visit www.nacecorrosion.org

APRIL 2015

25-30 Santa Clara, CA USA *58th SVC Annual Technical Conference* - visit www.svc.org

26-29 Helsingør, Denmark *JOM-18 18th Int'l Conference on Joining Materials* - contact jom_aws@post10.tele.dk

MAY 2015

11-14 Long Beach, CA USA *ITSC2015 Int'l Thermal Spray Conference co-located with Aeromat 2015 and Microstructural Characterization of Aerospace Materials and Coatings Conferences and Expositions* - www.asminternational.org/web/itsc-2015

JUNE 2015

1-4 Shanghai, China *Beijing Essen Welding and Cutting* - visit www.beijing-essen-welding-cutting.com

15-19 Montreal, Canada *Turbo Expo 2015* - visit www.asmeconferences.org/TE2015

SEPTEMBER 2015

14-17 Houston, TX USA *44th TurboMachinery and 31st Pump Symposium* - visit www.pumpturbo.tamu.edu

SEP 29- OCT 1 Mississauga, Ontario Canada *CMTS Canadian Manufacturing Technology Show* - visit www.cmts.ca

OCTOBER 2015

20-23 São Paulo, Brazil *Brazil Welding Show* - visit www.brazil-welding-show.com

2016

MAY 2016

May St. Petersburg, Russia *Essen Welding Pavilion at SVARKA* - visit www.svarka.de

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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.

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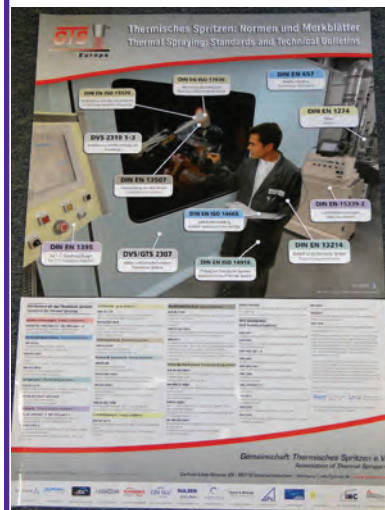
GTS – the Association of Thermal Sprayers – has produced this spectacular new poster of “**Thermal Spraying: Standards and Technical Bulletins**”.

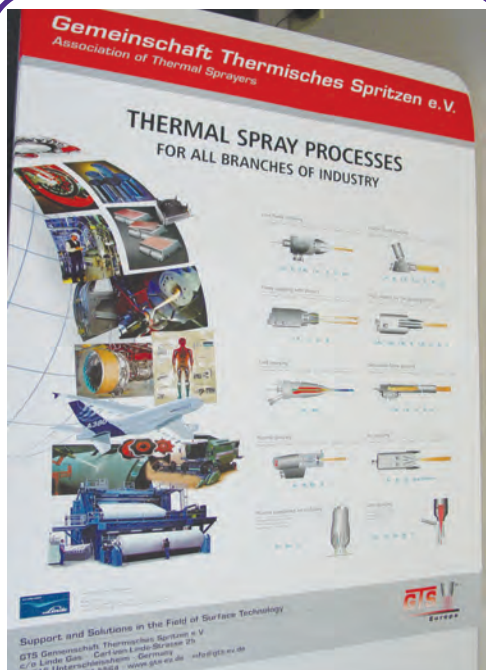
The poster identifies DIN Standards for Thermal Spraying and the DVS Technical Bulletins. The standards/bulletin names are in German and in English.

The poster provides contact information for obtaining the complete version Standards and Bulletins.

The International Thermal Spray Association is proud to be one of the sponsors of this project.

Send request for poster to itsa@thermalspray.org.





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From Linde and the GTS (Association of Thermal Sprayers) illustrates the different thermal spray processes (suitable for framing). Send request for poster via email to itsa@thermalspray.org



Free NEW Poster from Flame Spray Technologies illustrating various spray guns and including typical coatings and application data. Suitable for framing. Send request for poster to itsa@thermalspray.org.

Journal of Thermal Spray Technology®

A publication of the **ASM Thermal Spray Society**
Mechanical Property of HVOF Inconel 718 Coating for Aeronautic Repair

Christophe Lyphout, Angelica Fasth, and Per Nylen

The module of elasticity is one of the most important mechanical properties defining the strength of a material which is a prerequisite to design a component from its early stage of conception to its field of application. When a material is to be thermally sprayed, mechanical properties of the deposited layers differ from the bulk material, mainly due to the anisotropy of the highly textured coating microstructure. The mechanical response of the deposited layers significantly influences the overall performance of the coated components. It is, therefore, of importance to evaluate the effective module of elasticity of the coating. Conventional experimental methods such as microindentation, nanoindentation and four-point bending tests have been investigated and their results vary significantly, mainly due to inhomogeneous characteristics of the coating microstructure. Synchrotron radiation coupled with a tensile test rig has been proposed as an alternative method to determine the coating anisotropic elastic behavior dependence on crystallographic orientations. The investigation was performed on Inconel 718 (IN718) HVOF coating sprayed on IN 718 substrates. Combining these experimental techniques yield a deeper understanding of the nature of the HVOF coating Young's modulus and thus a tool for Design Practice for repair applications.

Read the entire article in the February 2014 Issue

Visit www.asminternational/tss

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Become a Member of the International Thermal Spray Association

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

ITSA members invite your company to join us in this endeavor. See pages 14-15, 18.

5 Ways to Get Strong Referrals—And Lots of ‘Em

Running a small business in today’s economy requires a departure from conventional business rules. In order to sell a product or service, businesses can no longer rely upon old-school sales tactics of bygone eras: Prospects are overwhelmingly distrustful of the traditional sales pitch, they’re busier than ever and they have access to more information than ever before.

As a result, small business owners must master a new set of tactics in order to make sales. The key is to start with strong referrals.

It’s no secret that getting referrals from clients who believe in your services is an effective way to connect with new clients. But in today’s business world, it’s not enough to just get referrals -- they have to be strong, and there have to be lots of ‘em! Here are five ways to get lots of strong referrals:

1. Stop calling them "referrals"! Salespeople often tell me that when they ask for a referral, all they get is a name, a phone number and an instruction to "tell him I sent you." This is not a referral -- it is, at best, a warm lead. The term "referral" is vague and unclear, which is why requests for them can frequently lead to disappointing outcomes. Instead of asking for referrals, ask for introductions. You want to be introduced directly to the person you want to meet, after all. The introduction can take place via face-to-face meeting, phone call, email exchange, or social media, but the key is that an actual introduction is made. Now, promise yourself you'll never ask for a "referral" again!
2. Get over your fear and ask! I've done extensive research on what holds people back from getting more introductions, and it always comes back to the same issue: fear. Asking for introductions shows vulnerability and can feel uncomfortable. But the reality is that if you don't ask, people will not think to introduce you. It's your job to ask everyone in your network for introductions on a regular basis. The more you ask, the easier it becomes. In all of my years as a sales strategist, I've never heard of someone losing a client because they asked for an introduction. So what do you have to lose?
3. An introduction a day...really adds up. I have a challenge for you: Ask for one introduction every workday. It's a task that takes less than five minutes, but it holds enormous potential for your business. Here's how: One introduction per day equals five per week; five introductions per week equals 250 introductions per year. That's a lot of introductions! Let's say that you receive only one-in-five of the introductions you ask for -- that still means you'll receive 50 introductions in one year. If you turn half of those introductions into sales, then you'll have closed 25 new pieces of business. What are you waiting for?

4. Ask for help. Help. That simple four-letter word is one of the most powerful in the English language. When you ask for help, people generally want to give it to you. On the other hand, people are turned off by phony confidence and a reluctance to accept assistance. So ask for help when it comes to introductions, just as you would in any other context. Start the introduction conversation by saying, "I'm wondering if you might be able to give me a little help." Let the person say that she is happy to help -- which she probably will be if you have any relationship at all. Then ask for the introduction to the type of prospect you're looking to meet.

5. Help people help you. Salespeople frequently squander the chance to get introductions by not clearly explaining the exact type of prospect they're looking to meet. When someone says that he's willing to help you out with introductions, don't respond, "Well, who do you know?" This forces the person to have to figure out which of the 1,000 people he knows to introduce you to. Instead, be laser-focused on the exact type of person you want to be introduced to. For example, you might say, "I'm looking to meet CEOs of companies with \$10M-\$40M in revenues in the healthcare space that are looking to grow sales." When you get very specific, you narrow a person's mental rolodex down to 1-3 people. Bingo!

When you focus on receiving more introductions (and actually take action!), your business can grow exponentially. If each of your clients introduced you to one new client, your business would double. By following these five simple strategies, you can bring on more clients without a massive effort.

How do you get more introductions? Please share below in the comments.

About the Author:

Marc Wayshak [<http://www.marcwayshak.com/>] is a sales strategist who created the Game Plan Selling System. He is the author of two books on sales and leadership including his latest book, *Game Plan Selling* [<http://amzn.to/15MdhA9>] and a regular online contributor to *Entrepreneur Magazine* and the *Huffington Post Business* section.

Get his free eBook on 25 Tips to Crush Your Sales Goal at <http://gameplanselling.com/>. (Twitter: @MarcWayshak)

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Scot Crabtree **New Plant Manager at** **CTS-East**



CTS is pleased to announce the hiring of **Scot Crabtree** as the General Manager of CTS-East located in Springfield, NJ. Scot came to CTS by way of Rolls Royce Energy Systems out of Houston, Texas where he most recently held the title of Repair and Overhaul Operations Manager.

During his time at Rolls Royce, Scot had responsibilities related to P&L, customer service, quality, on-time delivery, and establishing key performance indicators to better manage the business. Scot developed a multitude of team building techniques while at Rolls Royce that we expect to be very applicable while implementing our business growth strategies within the New Jersey facility. We anticipate Scot will quickly establish excellent rapport with our customers, and also be a hands-on type of leader necessary to drive improvements in the shop.

CTS is very excited to have someone of Scot's caliber join our team in a leadership position. We look forward to all of Scot's future successes.

Will Reed **Promotion to Plant Manager** **CTS-North Carolina**



CTS is pleased to announce the promotion of **Will Reed** to Plant Manager of CTS-South in North Carolina. Will previously held the title of Engineering Manager at CTS-South. Throughout his 9 years with CTS, Will has successfully lead the effort to drive business improvements through the implementation of new

technologies. The advancements Will has achieved within the engineering group have enabled CTS-South to better support initiatives related to quality, turn time, and new product introductions for our customers. In addition to his technical success, Will has driven himself to continually improve as a manager, a leader, and a professional.

CTS is very excited to elevate Will into this new leadership role.

Cincinnati Thermal Spray, Inc. (CTS) provides high technology coatings to improve the performance of products throughout a variety of industries. We provide solutions in the form of thermal spray coating, dry film lubricants, porcelain enamels, anti-corrosion paints, and protective sealers, along with turnkey service to machine and coat a final product. CTS is a service based company with more than 30 years of industry knowledge and experience.

For more information, contact Shane Elbel, Vice President via email selbel@cts-inc.net or visit www.cts-inc.net



Eutectic Canada **Expands** **Technical Support**

Gary Tydings joined the Eutectic Canada sales team as National Coatings Specialist. In this position, he is responsible for providing technical support to the Coatings Division of the company, which includes a wide range of products, equipment and services for electric arc spray, flame spray, HVOF and plasma transferred arc welding processes.



Gary provides support to the International Coatings Group, bringing new engineered solutions to the direct sales force and customers across Canada. Technical support and expertise is a core belief of Eutectic Castolin and is essential to meeting the company's objectives for Engineered Solutions in wear and corrosion applications. Gary has over 18 years thermal spray experience in the aerospace industry in gas turbine engine repairs. He has a Master of Science degree in Aerospace Materials Engineering from Cranfield University in the UK.

About Eutectic Castolin:

Eutectic Castolin is a worldwide leader of application solutions in maintenance, repair and wear protection. More than 100 years of experience in welding, brazing and thermal spraying technologies stand for professional and innovative solutions. Castolin Eutectic is your partner with industrial expertise in surface protection, repair and joining solutions. We employ more than 1,500 people worldwide in over 100 countries. Our motto is: Quality, Service and Technical Leadership = Customer Value Added.

For more information, please contact Gary Tydings at 204-990-1873, email at gttydings@eutectic-na.com or dial our toll free number 800-361-9439.

Academic Promotion Announcement: University Distinguished Professor Christopher Berndt



It is with great pride that I share with you the news that **Professor Christopher Berndt** has been awarded the title of University Distinguished Professor as part of our recent Academic Promotions process.

University Distinguished Professor (UDP) is the highest honour that can be awarded to academic staff at Swinburne and the title

serves to recognise the significance and international leadership impact of UDP Berndt's work in Thermal Spray studies within the field of Materials Science and Engineering.

UDP Berndt joined Swinburne University of Technology in early 2008 as the founding Professor of Surface Science and Interface Engineering.

He is an internationally renowned metallurgist, with expertise in protective coatings, particularly thermal spray, has over 450 publications, an 'H' index of 44 with over 6,900 citations, and has graduated a total of 21 PhD graduates as their primary supervisor.

UDP Berndt was elected President of ASM International (ASM) in 2011 for a one year term, representing 36,000 members and considered the pre-eminent professional body for material science. He considers this the hallmark of his international activities and recognition and was only the second President in history to be elected outside the USA in the 100 year history of the ASM.

He has been recognised by many professional societies for his contribution to engineering and material science internationally, including being inducted into the ASM International Thermal Spray Hall of Fame in 2007.

Please join me in congratulating University Distinguished Professor Christopher Berndt on this significant and inspirational achievement.

Professor Linda Kristjanson

Vice-Chancellor and President, Swinburne University

About Professor Berndt

Berndt's professional interests gravitate around manufacturing; especially in the area of protective coatings. He was inducted into the Thermal Spray Hall of Fame in 2007. He was the President of Thermal Spray Society (an affiliate of ASM International) in 2002 through to 2004. He has been the Chair or Co-Chair of 5 International Conferences. He was appointed as a Trustee (the Board of Directors) of ASM Int. (aka "the American Society of Materials") for 2005-2008. Chris became the Vice-President of ASM Int. and progressed to President in October 2011. Berndt was also the President of the Australian Ceramic Society from mid-2008 through to mid-2010. He stepped back into this position in July of 2014 for another 2-year term.

Berndt is a Member of 10 professional societies in the materials, mechanical, manufacturing and bioengineering fields. He is a Fellow of the Australian Institution of Engineers, Fellow of ASM International, Fellow of the Institute of Materials, Minerals and Mining (UK), Fellow of the Australian Ceramic Society, Fellow of the American Ceramic Society (USA), Fellow of the American Society of Mechanical Engineers, and a Fellow of Alpha Sigma Mu (The Materials Engineering Honor Society). He was nominated by the student members of Stony Brook University to become a member of Tau Beta Pi (the Engineering Technology Honor Society) as an "Eminent Engineer". He is also a Chartered Engineer (UK), a Chartered Professional Engineer (Australia), and a Member of the College of Bioengineers (Australia). Berndt has held guest positions as a Faculty Fellow of Oak Ridge National Laboratory and as a Guest Scientist of Brookhaven National Laboratory.

Berndt's major discipline area is "Materials Engineering" or "Manufacturing Engineering" with a sub-disciplinary expertise in the topics of ceramics, biomaterials, thick coatings, and thermal spray technology. He is considered as a world authority in the sub-specialty of thermal spray technology. He has provided 1 to 3 day courses around the world for the past 25 years; e.g., 3 are scheduled for 2014.

Berndt has in excess of 490 publications. He is the Editor/Co-editor of 10 conference proceedings on thermal spray. Berndt has an 'h-index' of 46 and more than 7,400 citations to his work. He is especially proud of his students and post docs who have achieved professional prominence and earned good lives over the past 30 years.

For more information, email cberndt@swin.edu.au

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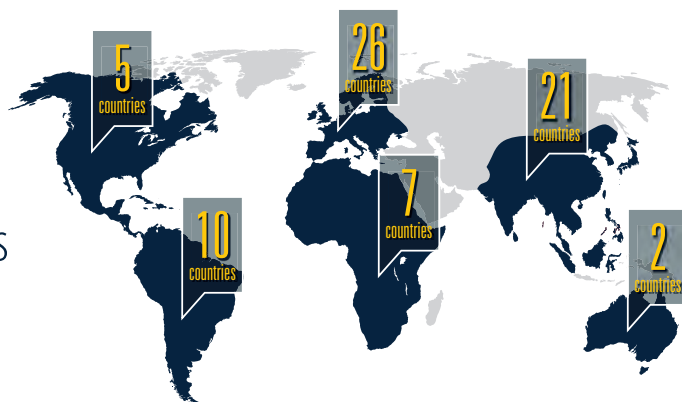
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