In The News

Thermal Spray Literature

Protection of Steel by Thermal Spray

This guide can be used to select, plan and control thermal sprayed coatings for the preservation of steel. The "Guide for the Protection of Steel with Thermal Sprayed Coatings of Aluminum and Zinc and Their Alloys and Composites", ANSI/AWS C2.18-93, was prepared by the AWS Committee on Thermal Spraying.

Thermal sprayed coatings of aluminum and zinc are proven to protect iron and steel over long periods against sea water, chemicals, wear and abrasion, industrial pollutants, and other corrosives. Features of this soft bound guide include (i) an easy selection guide for various service environments, (ii) 9 critical quality control check points, (iii) 11 important maintenance and repair steps, (iv) 13 key tables, (v) an example of job control records, (vi) information on operator qualification and certification, (vii) step-by-step surface preparation and thermal spraying applications methods, and (vii) debris containment and control instructions.

Call (800) 334-9353 or fax (305) 443-7559 for shipping information. AWS also has available the AWS C2.16-92 Guide for Thermal Spray Operator Qualification which features operator qualification forms and coating analysis forms.

Powder Technology Processes 1993 Industry Report

Worldwide commercial and research activities relating to the development, analysis, and application of powder metallurgy processes, materials, and components are presented in a new Industry Report titled "Powder Technology Processes 1993". Powder Technology Processes 1993 joins a growing number of Industry Reports. The series provides comprehensive, organized corporate intelligence on materials-and/or process-related topics for specific industries. The content is based on a comprehensive search of technical and business-related published literature (journal, conference, patent, technical book) in the Materials Information databases, including METADEX (Metals Abstracts/Metals Abstracts Index), and MBF (Materials Business File).

The report is published by Materials Information, a joint service of ASM International and the Institute of Materials (UK). Powder Technology Processes 1993 offers an international look at the current expertise and research efforts now available or under development with regard to designing, characterizing, selecting and producing powder metallurgy materials and components.

The report provides a world-wide guide to the technology and application of atomizing, compaction, pressing and sintering operations for the manufacture of metal powders. It highlights the design and fabrication of powder metals (steels and ferrous and nonferrous alloys), composites and ceramics, and analyzes the advantages and limitations of powder metallurgy parts for specific industries, including automotive, electronics and aerospace.

Powder Technology Processes 1993 covers technical and business-related developments in powder metallurgy derived from international databases between the period June 1992 - June 1993. The activities of more than 800 corporate organizations are represented as they relate to research, advances, and commercial enterprise in the production of powders, powder materials, and products. The information is arranged by materials and source in a tabular format. The tables serve as an international directory to the array of materials involved in powder technology processes and to the individual manufacturers, suppliers, companies, universities, institutes, and associations involved in related research, development and commercial ventures worldwide. Also included in the report is an introduction summarizing powder metallurgy processes, developments, and applications, along with an appendix featuring acronyms, a glossary, list of powder metallurgy societies, and addresses of organizations cited in the contents.

The personal computer (PC) disks with the report include the entire database of documents found in the research section and offers expanded search capabilities.

To order Powder Technology Processes 1993 contact Ms. Debbie Barthelmes; Materials Information, ASM International, Materials Park, OH 44073-0002. Telephone: (216) 338-5151, ext. 532. Fax: (216) 338-4634 or Ms. Julie Lee, Materials Information, The Institute of Materials, 1 Carlton House Terrace, London SW1Y 5DB, England. Tel.: 071-839-4071; Fax: 071-839-2289.

Thermal Plasmas Fundamentals and Applications Volume 1

Edited by Maher I. Boulos, Universite de Sherbrooke, Quebec, Canada, Pierre Fauchais, Universite de Limoges, France, and Emil Pfender, University of Minnesota, Minneapolis

In recent years, thermal plasma technology has evolved into an advanced interdisciplinary science, marked by current research progress in such areas as plasma synthesis of fine particles down to the nanometer size range, the plasma chemical vapor deposition of thin films, and the plasma destruction of toxic waste materials. This first-of-its-kind text integrates thermal plasma technology research that encompasses a wide range of disciplines, including materials science, plasma physics, statistical thermodynamics, high temperature chemical kinetics, and advanced transport phenomena. The authors use their extensive teaching experience and diverse backgrounds to provide a single reference/textbook devoted to the fundamentals and applications of thermal plasma technology. This first of two companion technology. This first of two companion volumes covers the fundamental concepts of plasma physics and gaseous electronics, thermodynamics, and transport properties of plasma. A key appendix features tables of the most up-to-date values of these properties for selected gases and gas mixtures. Practicing engineers and research scientists will appreciate the clear presentation of principal concepts, and graduate students will find this book an easily accessible introduction to the subject.

CONTENTS: Introduction. *The Plasma State*: Preliminary Definition of the Plasma State. Generation of Thermal Plasmas. Properties of Thermal Plasmas. Thermal Plasma Technology. *Basic Atomic and Molecular Theory*: Atomic Models. The Hydrogen Atom and Its Eigen Functions. The Structure of More Complex Atoms. Excited States of Diatomic Molecules. *Kinetic Theory*: Particles and Collisions, Cross Sections and Collision Frequencies. Elementary Processes for Elastic Collisions. Elementary Processes for Inelastic Collisions. Distribution Functions. Reaction Rates. *Fundamental Concepts in Gaseous Electronics*: Generation of Charge Carriers. Loss of Charge Carriers. Motion of Charge Carriers. Thermal Excitation and Ionization. Rigorous Definition of the Plasma State. Quasi-Neutrality. Plasma Sheaths. *Derivation of the Plasma Equations*: Definitions. Conservation Equations. Onsager's Reciprocity Relations and Phenomenological Theorems. Heat of Transition and Energy Fluxes. Diffusion and Energy Fluxes in Chemically Reacting Gases. An Example of Mass and Energy Fluxes in a Chemically Reacting Gas. Transport Equations for Fully Ionized Plasmas. Determination of Transport Coefficients. *Thermodynamic Properties*: Definitions. Thermodynamic Functions for CTE. Composition of Plasmas in CTE. Thermodynamic Properties of Plasmas in CTE. Composition and Thermodynamic Properties of a Two-Temperature Plasma. *Transport Properties*: Definitions. Simplified Derivation of the Transport Coefficients. Derivation of the Transport Coefficients from the Boltzmann's Equation. Contribution of Other Transport Mechanisms to Thermal Conductivity. Transport Coefficients of Simples Gases and Complex Gas Mixtures in CTE. *Transport Coefficients for Two-Temperature Plasma*: Example for an Ar-H, Plasma Mixture. *Radiation Transport*: General Concepts. Radiation Mechanisms in Plasmas. Radiation Emission and Absorption. Examples of Results. Blackbody Radiation of High Temperature Gases. Each chapter contains references. Index.

Contact: Plenum Publishing Corporation, 233 Spring Street, New York, NY 10013-1578. Phone (212) 620-8047.

New Book On Thermal Plasma And Technology

The results of research carried out in the former Soviet Union and now the CIS in the area of thermal plasma and all its application areas are scattered through various monographs and journals published in Russian. Thermal Plasma and New Materials Technology is a collection in the English language of the most important results obtained in this area and provides the reader with a clear and comprehensive picture of numerous achievements by scientists from Russia, Ukraine and other countries of the former Soviet Union and the CIS. The collection consists of two volumes which include a directory of scientists and institutes working in this area and the following studies.

The editors of the book are Professor M. F. Zhukov and Professor O. P. Solonenko, both from the Institute of Thermophysics, Siberian branch of the Russian Academy of Sciences, Novosibirsk.

Contents of Volume 1: Investigations and Design of Thermal Plasma Generators

1. Zhukov, M.F. (Inst. of Thermophysics, Novosibirsk) "Linear direct current plasmatrons"
2. Engelsht, V.S. (Inst. of Physics, Bishkek), "The theory of the electric arc column"
3. Novikov, O.Ya. (Kuibyshev Polytechnic) "Stability of the electric arc"
4. Timoshevskii, A.N. (Inst. of Thermophysics, Novosibirsk) "Material erosion and dynamics of the electric arc discharge in cylindrical electrodes"
5. Samsonov, M.A. (Inst. of Physics, Bishkek) "Thermophysical processes in the electric arc with metal vapour"
6. Zhainakov, A.Zh. (Kirghiz Centre of New Inf Technol, Bishkek) "Mathematical modelling of electric-arc plasma flows"
7. Lelevkin, V.M. (Inst. of Physics, Bishkek) "Mathematical modelling of the high-frequency, superhigh-frequency and optical plasma torches"
8. Kharin, V.N. (Inst. of Theoretical and Applied Mathematics, Almaty) "Mathematical models of transient arc erosion and intraelectrode phenomena"
9. Panevin, I.G. (Aviation Inst., Moscow) "Near electrode processes"
10. Put'ko, V.F. (Kuibyshev Polytechnic) "Electric arc in dynamic magnetic fields"
11. Zheenbaev, Zh.Zh. (Inst. of Physics, Bishkek) "The state and future of plasma technological processes investigations in Kirghizstan"
12. Dautov, G.Yu. (Aviation Inst., Kazan) "The low current plasma generators"
13. Pustogarov, A.V. (Luch Science and Production Assoc., Moscow) "Plasma torches with regenerative cooling by plasma-forming gas"
14. Koroteev, A.S. (Inst. of Thermal Processes, Moscow) "High-power dc plasma generators"
15. Svirchuk, Yu.S. (Inst. of Thermal Processes, Moscow) "Three-phase electric arc plasmatrons"
16. Rutberg, F.G. (Inst. of Power Eng., Saint-Petersburg) "High-power three-phase and pulsed plasma generators"
17. Konotop, V.A. (Nitrogen Industry Inst., Moscow) "Coaxial plasma torches"
18. Sorokin, L.M. (Baikov Inst. of Metallurgy, Moscow) "Radio-frequency capacitively-coupled plasma generators: Research, development, and applications"
19. Lysov, G .V. (Toriy Science and Production Assoc., Moscow) "Atmospheric pressure microwave plasmatrons"

Contents of Volume 2: Investigations and Design of Thermal Plasma Technologies

1. Solonenko, O.P. (Inst. of Thermophysics, Novosibirsk) "The state-of-art of thermophysical fundamentals of plasma spraying"
2. Polak, L.S. (Inst. of Petrochemical Synthesis, Moscow) "Chemical reactions and processes in thermal plasma"

3. Gnedovets, A.G. (Baikov Inst. of Metallurgy, Moscow) "The heat and momentum transfer to particles in supersonic and plasma flows with cold ions"
4. Ovsyanikov, A.A. (Inst. of Petrochemical Synthesis, Moscow) "Diagnostics of thermal plasma"
5. Melnikova, T.S. (Inst. of Thermophysics, Novosibirsk) "Plasma tomography"
6. Karp, I.N. (Inst. of Gas, Kiev) "Gas-air plasma equipment and technology for thermal spraying"
7. Pekshev, P.Yu. (Baikov Inst. of Metallurgy, Moscow) "Relation between structure and properties of plasma-sprayed thermal barrier coatings"
8. Kudinov, V.V. (Baikov Inst. of Metallurgy, Moscow) "Plasma production of high-temperature superconducting materials"
9. Borisov, Yu.S. (E.O. Paton Electric Welding Inst., Kiev) "Amorphous coatings produced by thermal spraying"
10. Vursel, F.B. (Inst. of Glass Materials, Moscow) "Plasma treatment and spraying of ceramic materials by plasma jets"
11. Klimyenov, V.A. (Inst. of Physics of Strength & Materials Science, Tomsk) "The structure and properties of plasma sprayed coatings for constructional applications"
12. Suris, A.L. (Inst. Chemical Eng., Moscow) "Calculation and modelling of different technological applications of plasmochemical reactors"
13. Tsvetkov, Yu.V. (Baikov Inst. of Metallurgy, Moscow) "Plasma processes in metallurgy"
14. Litvinov, V.K. (Inst. of Mining and Metallurgy, Magnitogorsk) "The out-of-furnace plasma treatment of steel and alloys"
15. Messerle, V.E. (Kazakh Power Inst., Almaty) "Ignition and stabilisation of combustion of pulverised coal fuels by thermal plasma"
16. Mikhailov, B.I. (Inst. of Thermophysics, Novosibirsk) "Plasma gasification of coal"
17. Mosse, A.L. (Lykov Inst. of Heat and Mass Transfer, Minsk) "Plasmochemical reactors of the multi-jet type for technological processes"
18. Volchkov, E.P. (Inst. of Thermophysics, Novosibirsk) "The vortex plasma chemical reactors"
19. Galevski, G.V. (Kemerovo Polytechnic) "The multi-jet plasma chemical reactors and the synthesis of ultradispersed powders"
20. Parkhomenko, V.D. (Inst. of Inorganic Chemistry, Kiev) "The synthesis and modification of inorganic materials"
21. Troitski, V.N. (Inst. of Composite Materials, Moscow) "Production of ultra-fine nitride powders in SHF-discharge plasma flow"
22. Shevtsov, V.P. (Kazakh Power Inst., Almaty) "Industrial plasma treatment of refractory materials"
23. Kulik, P.P. ('Plazma Dinamika' Eng. Centre, Moscow) "Dynamic plasma treatment of surfaces"
24. Tokmakov, V.P. (Irkutsk Polytechnic) "Plasma hardening of cutting tools"
25. Volokitin, G.G. (Inst. of Construction Eng., Tomsk) "Treatment of constructional materials by the electric arc"

Contact: Cambridge Interscience Publishing, 7 Meadow Walk, Great Abington, Cambridge CB1 6AZ, England. Phone and Fax +44 223 893 295.

Digest of Problems & Successful Solutions

A technical note from Hobart Tafa Technologies lists a few examples of the problem-solving versatility of thermal spray. Some examples follow.

Problem: To galvanize seam-welded tubing.

Solution: A completely automated turnkey system sprays zinc at from 80-300 feet per minute (24 to 90 meters per minute) to lay down a dense, sharply focused coating.

Economy: One pound of zinc will galvanize approximately 300 feet (90 meters) of seam. Electricity consumption is less than 3 kW/hr.

Problem: To metal coat flat surfaces with uniform, high quality coatings without dependence on operator technique.

Solution: A high production rate X-Y movement which is both simplified and rugged. Can be set to spray in one or two directions, vertically and horizontally with automatic spray-off between strokes. Stroke length can be programmed 0 - 44 inches (0 - 112 cm) horizontally, 0 - 20 inches (0 - 51 cm) vertically. Speed can be programmed in three ranges: high, medium, low.

Problem: To coat components of aircraft engines to ensure durable protection from high temperatures, corrosive gases and wear.

Solution: Depending on specific performance requirements, arc spray with one of the recently developed cored wires. The cored wires consist of fine metal tubes filled with mixtures of formulated elements (e.g., FeCrAl; NiCrAl; NiAlMo; NiCrAlY; FeCrNiMo). Each wire has defined major functions/applications and are self-bonding to yield single-step coatings.

Contact: Hobart Tafa Technologies, 146 Pembroke Road, Concord, NH 03301. Phone (603) 224-9585, Fax (603) 225-4342.

Capabilities List from Wall Colmoney Corp.

Specialized thermal spraying, furnace brazing, and heat treating services are featured in a new capabilities list available from Wall Colmonoy Corporation, Fairless Hill, Pennsylvania.

The list describes operating parameters for vacuum and gas-fired furnaces, welding capabilities, non-destructive testing and specialized furnace-fused coating and nitriding services. Industries served include the aerospace, chemical, plastics and food processing industries.

Contact: Wall Colmonoy Corp., Att. Tanya Anandan, 30261 Stephenson Highway, Madison Heights, MI 48071-1650. Phone (215) 295-1103, Fax (215) 295-8260.

New Plasma System

Hobart Tafa introduces a new plasma system capable of extended operation at power levels over 200 kW; the PlazJet High Power Plasma. It is suited for spraying virtually pore-free coatings of ceramics and other materials at high production rates. The system includes a high power plasma gun, a PLC based control console, a specially designed power supply and other components. The system provides fully-automatic, closed-loop spraying and assures reproducible, high quality coatings.

Contact: Hobart Tafa Technologies, 146 Pembroke Road, Concord, NH 03301. Phone (603) 224-9585, Fax (603) 225-4342.

New Liner on Thermal Spray Mask Tape

Furon's CHR Division (Rolling Meadows, IL) has introduced a new, easy to remove liner for its fiberglass thermal spray masking tape with silicone adhesive on sides. The tape's primary application is to mask off areas on aircraft engine parts prior to thermal spraying. The new liner for product #23819 offers much improved release from the substrate, making the masking process faster and easier.

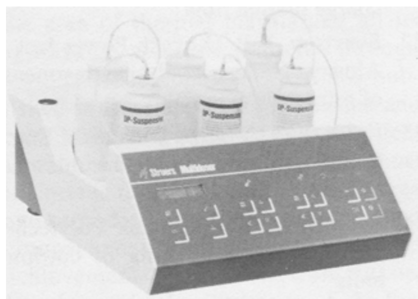
With a total thickness of 8.5 mils (0.22 mm) and a backing thickness of 5 mils (0.13 mm), #23819 operates in a temperature range of -100 to +500F (-73 to 260C) and is available in 36 yards (32 m) rolls and can be slit to order from 1/4" or 36" wide (6.3 or 914 mm).

Furon CHR is a leading supplier of high performance silicone rubber products, coated fabrics and belting materials and specialty pressure sensitive tapes serving numerous general industrial, aircraft/aerospace, electrical and electronic market applications.

Contact: Furon CHR Division, 3660 Edison Place, Rolling Meadows, IL 60008. Phone (800) 323-1650, Fax (708) 392-0403

Microprocessor-controlled Dosing Unit for Polishing

Struers, a Division of Radiometer America Inc., has developed a new method of dispensing diamond suspensions, lubricants and oxide polishing compounds during materialographic sample preparation. The Multidoser is an external dosing unit that uses peristaltic pumps to deliver the precise amount of lubricant and abrasive every time.



Struers

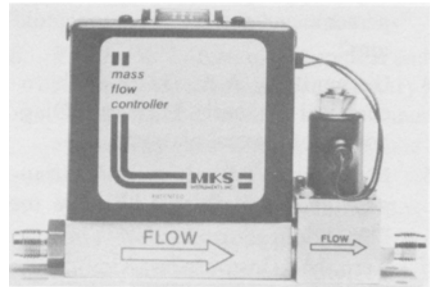
Stringent control in the application of abrasives and lubricants is critical to achieving reproducible specimens and true microstructures. Traditional dosing methods vaporize the liquids, creating wasteful spray mist. With Multidoser, the correct, measured amount of liquid is transported through the tubes and drips onto the polishing cloth. There is no mist and no waste - saving considerably on consumables costs. Sample reproducibility is improved. Multidoser also accurately dispenses oxide polishing suspensions with no clogging.

Multidoser has been designed to communicate with Struers new line of semiautomatic and automatic sample preparation equipment, and it is flexible enough to work with other manufacturers' preparation equipment.

Contact: Struers, Inc., 26100 First Street; Westlake, OH 44145-1438. Phone (800) 321-5834 or (216) 871-0071, Fax (216) 871-8188.

Instrumentation for Plasma Spray Systems

MKS Instruments, Inc. (Andover, MA) offers Mass-Flo controllers in full scale ranges from 10 sccm to 200 slm that are used to automate and improve coating repeatability in plasma spray systems. MKS gas mass flow controllers (MFC's) feature a high level electronic output to facilitate data recording and controlling as well as provide for remote display of flow conditions. In addition, electronic thermal-based MFC's are used in place of rotameters because they measure mass directly and eliminate the need for pressure and temperature corrections.



MKS Instruments, Inc.

Contact: Amanda Singer, Six Shattuck Road, Andover, MA 01810. Phone (508) 975-2350 x577, Fax (508) 975-0093.

Victrex Peek Powder Coating Technology

The unique properties of ICI's Victrex PEEK thermoplastic has fueled its use in specialized processes such as powder coating. Processing by electrostatic fluidized bed, electrostatic spray, flame spray and thermal spray coating are all possible with Victrex PEEK and are finding use in a diverse number of industries. These include chemical processing, transportation, industrial processing, aerospace and nuclear.

Victrex PEEK is a proprietary high temperature thermoplastic supplied by ICI worldwide and is distributed in the U.S. from its West Deptford (NJ) headquarters. Victrex PEEK has temperature resistance above 500°F (260°C) and chemical resistance to acids, bases, chlorinated solvents, and organic solvents. This, combined with high strength and toughness properties make it highly desirable for a wide range of applications. It also has excellent abrasion and radiation resistance, and electrical properties.

Contact: ICI Americas Inc., 286 Mantua Road, West Deptford, NJ 08066. Phone (800) VICTREX, Fax (609) 423-8598.

Bondcoat Feedstock

BONDRITE is a composite nickel-aluminum wire for use as a bond coat material. Made with a solid nickel wire as core with an aluminum sheath, this wire does not sputter like the powder-filled wire. This results in a very homogenous spray pattern which enhances the bond strength. Results have shown a bond strength of over 12000 psi (83 MPa) over a grit blasted surface. Available in 80-20 composition in 1/8" size on 10 lb spools (3.2 mm on 4.5 kg spools) and in 95-5 composition in 1/16" size on 25 lb spools (1.6 mm on 11 kg spools) for the arc-spray process.

Contact: V.T. Mayor, Plasma Powders & Systems, Inc., Boundary Road, P.O. Box 132, Marlboro, NJ 07746. Phone (908) 431-0992, Fax (908) 308-1075.

Company News

Osprey Powders

Formed in 1974 to develop and license the Osprey Preform Process, Osprey Metals Ltd. diversified into the development of technology for the production of gas atomised metal powders in 1977. Since that time Osprey's Powder Division has built up a comprehensive argon and nitrogen gas atomising production facility supported by ongoing research and development into the fundamentals of the atomising process. While the company is small enough to provide a fast and flexible response to customers, as a wholly owned subsiary of the Sandvik Group since 1985, it is backed by the resources of a worldwide production and marketing organization.

Osprey has made a substantial contribution to a number of new production techniques by working closely with customers, under conditions of commercial secrecy, and continue to welcome such collaborative projects. In addition, Osprey has their own programmes of research and development which, most recently, have resulted in the company being able to add to their product range alloy powders tailored specially to the M.I.M. and HVOF processes at commercially attractive prices. One of the key features of Osprey's atomising technology is the ability to maximise the production yield of powders within the different particle size ranges required for different applications. Expertise in this area makes Osprey a powerful partner for fabricators striving to improve product quality and production economics, particularly in areas requiring ultrafine (minus 22 micron) powders.

Osprey's quality assurance procedures are totally geared to fulfilling the customers needs. The company is accredited to ISO 9001 standard (B55750 Part 1) and thus offers quality assurance on both its production and research activities to the highest internationally recognized standards.

Osprey Powder Division has drawn on the atomising expertise derived from the development of the Osprey Preform Process to develop "state-of-the-art" gas atomised powder production technology. Powders are produced in melt sizes ranging from 15 to 500 kg using either argon or nitrogen as the atomising medium and where appropriate alloys can be melted, dispensed and the resulting powder stored and sieved, or classified, under argon. The resulting product is a high quality, spheroidal powder with the composition and particle size distribution designed to provide the optimum solution to the customer's needs.

The end applications for Osprey Powders are as diverse as the product range indicates. The following serve to illustrate the range of processes in which they are applied; Brazing, Diamond setting, Infiltrations, Powder welding, Fuse welding, Carbide setting, Spray fusing, Furnace fusing, Sprinkle fuse, Plasma spray, Plasma transferred arc, HVOF, Detonation gun, Metallising, Laser coating, Plating, Thermal cutting, Blast cleaning, HIP consolidation and coating, Metal injection moulding, Press and sinter, CIP and Extrusion.

Contact: Osprey Metals Ltd., A Sandvik Group Company, Red Jacket Works, Millands Road, Neath, W.Glamorgan, SA11 INJ, U.K. Phone 0639 634121, Fax 0639 630100.

Sermatech is Awarded Contract for Coatings

The Tennessee Valley Authority (TVA) has awarded a contract in excess of $1 million to Sermatech International for thermal coating services and technology. Under the contract, Sermatech Technical Services (STS) will support TVA's Power Service Shop in Muscle Shoals, AL by providing training of utility personnel and technical assistance in the application of coatings to reduce solid particle erosion (SPE). These SPE-resistant coatings will be applied using Sermatech's patented Gator-Gard coating process.

TVA will be granted a license to apply the coatings using Sermatech's Gator-Gard thermal spray system. Gator-Gard technology uses a high-energy, tightly controlled plasma spray to apply coatings of high bond strength and density. Sermatech also will provide technical assistance in developing coatings for other specific applications.

Initial plans call for the application of protective coatings to steam turbine blades, diaphragms and valve components to prevent SPE and reduce maintenance costs in fossil-fired generating stations. Coating services eventually will be expanded into other applications including gas turbines, boilers, coal and ash handling equipment and hydroelectric components.

This first-of-a-kind agreement for TVA will allow the utility to become more self-sufficient in performing turbine/generator improvements. In the past, TVA has shipped turbine components to vendor facilities to be coated and then returned. Under this agreement, the coatings will be applied at the Power Service Shop which will result in lower costs, improved cycle times, and reduced risk of component damage due to extended shipments. The STS Southeast facility in Boynton Beach, FL will lead the company's efforts in fulfilling the contact.

Contact: Don Ochar (407) 582-6080. (Article adapted from Sermatech Review, NUMBER 46-1 FALL 1993. Sermatech International Inc., 155 S. Limerick Road, Limerick, PA 19468-1669. Phone (215) 948-5100, Fax (215) 948-2771.)

Cerac Opens New Facility

Cerac, Incorporated, (Milwaukee, WI) a manufacturer of specialty inorganic chemicals, has opened a new 30,000 sq. ft. manufacturing facility. The facility houses new quality assurance and manufacturing equipment for production quantities of materials.

The facility is located directly across from the company's main 66,000 sq. ft. manufacturing plant, which has been occupied by Cerac since their move there in 1975. This is Cerac's second expansion to the Milwaukee site.

Cerac manufactures small-lot and production quantities of specialty inorganic chemicals for fields such as aerospace technology, engineered coatings, optics, and electronics. They manufacture thousands of materials including metals, alloys, lubricants, high temperature compounds and thin-film materials.

Contact: Nora Bauer (414)289-9800

Air Products' Chemicals Group Reorganizes

In a strategic move to increase international expansion and improve market focus, Air Products and Chemicals, Inc. (Allentown, PA) has reorganized its billion dollar chemicals business. The reorganization streamlines the business from four to three divisions and aligns technology and business management for a better focus on customer requirements. Financial and human resources from the reorganization will be invested in extending Air Products' chemicals business internationally and in two key technology initiatives - industrial coatings and N-vinyl formamide - that the company currently has underway.

With this reorganization, Air Products' chemicals business is now comprised of three divisions - Polymer Chemicals, Polyurethane and Performance Chemicals, and Industrial Chemicals. The company's broad line of polyurethane additives are now part of the new Polyurethane and Performance Chemicals Division with Joseph H. McMakin as General Manager. Victor A. Bonanni has been named General Manager of the Industrial Chemicals Division which now includes the company's polyurethane intermediates business. William J. Cantwell continues as General Manager of the Polymer Chemicals Division.

Additionally, Hugh P. Gallagher has been appointed Vice President and General Manager of Air Products' European chemicals business and will be based at Air Products' offices in Utrecht, Netherlands. Mr. Gallagher will also chair Air Products' Polyurethane Council, created to ensure a continued market focus on the worldwide polyurethane chemicals business. Mr. McMakin and Mr. Bonanni will be the other council executives.

The reorganization also anticipates the sale of the company's relatively small agricultural chemicals business. Air Products' chemicals business is growing at a rate of more than two times the world GDP. International sales, which include exports to over 75 countries, now account for almost a quarter of the Group's total revenues. In addition to chemicals, Air Products is a major international supplier of industrial gases and related equipment, and environmental and energy systems. A Fortune 200 company, Air Products has sales of more than $3.3 billion and operations in 29 countries.

Contact: Air Products and Chemical, Inc., Att. Elizabeth G. Mitchell, 7201 Hamilton Boulevard, Allentown, PA 18195-1501. Phone (215) 481-6724.

AIRCO/BOC Opens Thermal Spray Center in England

Airco/BOC (Murry Hill, N.J.) recently demonstrated the state-of-the-art thermal spray technology at its new Thermal Spray Center in Morden, England. The Center, which is part of the recently refurbished Group Center of Excellence for gas applications development, was set up in collaboration with Miller Thermal (Europe), a marketer and producer of thermal spray equipment. Miller Thermal (Europe) is a subsidiary of Miller Thermal, Inc., a Miller Group Ltd. company (Appleton, WI) and the welding equipment manufacturer.

The Thermal Spray Center will couple Miller Thermal's latest high-velocity oxy-fuel (HVOF) system (the HV 2000) and an 80 kW model 3620 critical-orifice gas-controlled plasma spray unit with BOC's substantial expertise in laser processing, welding, cryogenics, analysis and process modeling to offer total support to thermal spray customers worldwide. For example, BOC's laser processing section can conduct studies of post-coating treatment, and offers access to hot isostatic pressing facilities. The welding group's sophisticated monitoring equipment is available for studying gas flow patterns as well as fume evaluation. BOC engineers are on hand to provide assistance and advice on equipment and procedures for substrate cooling using carbon dioxide or liquid nitrogen.

Airco is a leading manufacturer and supplier of industrial gases and gas handling technology in the United States. The company's primary gas products include cryogenic and non-cryogenic nitrogen and oxygen, as well as argon, carbon dioxide, helium, hydrogen and a variety of medical, rare and special gases. Airco is a member of The BOC Group, the worldwide industrial gases, health care, vacuum technology and distribution services company operating in more than 60 countries and with sales last year of $5.2 billion.

Contact: Airco Gases, Att. Tom McDonough, 575 Mountain Avenue, Murray Hill, NJ 07974. Phone (908) 771-1094, Fax (908) 771-1460.

Air Products and Chemicals, Inc.

Air Products & Chemicals, Inc. of Allentown, PA has been member of the CPPM since 1988 and is a multinational supplier of industrial gases, chemicals, equipment and technology with operations in 25 countries. Air Product's thermal spray activities fall into 5 main areas.

HVOF: Air Products is a leading supplier of oxygen, propylene and hydrogen to HVOF users and has thoroughly reviewed the gas supply requirements

CPPM since 1988 and is a multinational supplier of industrial gases, chemicals, equipment and technology with operations in 25 countries. Air Product's thermal spray activities fall into 5 main areas.

HVOF: Air Products is a leading supplier of oxygen, propylene and hydrogen to HVOF users and has thoroughly reviewed the gas supply requirements for this fast growing area of thermal spray technology. Air Products offers expertise in the areas of gas storage and associated vaporization, distribution and safety considerations. Portable gas supply equipment for on-site HVOF spraying is also available. Air Products has evaluated various HVOF fuel gases, including hydrogen, propane and propylene and mixtures of these, and has studied the effects of impurities in the gas supply. Research is on going and results are passed directly to customers.

Plasma: Air Products is a major supplier of argon, helium, hydrogen and nitrogen to the plasma spray industry. Extensive studies of the effects of gaseous impurities such as hydrocarbons and oxygen in the argon used in plasma spray systems have been carried out.

Electric-Arc Spray: Traditionally, air has been used to atomize the metal spray stream in electric arc, or wire-arc, spraying. Air Products has pioneered the use of inert gases for this application resulting in improved coating quality and performance. Coating advances include increased density, lower oxide content, improved deposit efficiency and increased thermal and electrical conductivity. Air Products has developed inert/reactive gas shrouds which enable the quality of certain electric-arc sprayed coatings to rival those deposited by plasma or HVOF.

Ceramarc Coatings: Air Products has developed and patented a family of electric-arc sprayed metallic and metal-matrix composite (MMC) coatings which provide wear resistance and high temperature oxidation and sulfidation corrosion protection at a fraction of the cost of other processes. Air Products' arc-sprayed Ti_xN Metal Matrix Composite coatings (U.S. Pat. 5,066,513) and Al-Mg based corrosion resistance technology (U.S. Pat. 4,992,337) have been applied in several commercial applications. Other materials and applications have benefited from Air Products' research, including engine cylinders, plastic metallization, mold making and 0.8% carbon steel coatings. The latter can be deposited at 2-3 times the rate of conventional flame sprayed coatings and exhibit hardnesses in excess of 700 Vickers. The Ceramarc Coating technology has now been exclusively licensed to Hobart Tafa Technologies, Inc. of Concord, NH.

Custom Projects: Air Products is continually reviewing opportunities for Joint Development Projects which would benefit from Air Products' expertise in the areas of gas supply, equipment and technology. New applications such as inert/reactive wire-arc sprayed coatings are being developed.

Summary of Air Products' Expertise & Services:

Industrial Gases: (Ar, N_2, H_2, He, C_3H_6 etc.); Process Technical Support: (HVOF, Plasma, Electric-Arc, Flame Spray).; Gas Supply Equipment: (Blenders, Vaporizers, Manifolds, Regulators); Cryogenic Cooling Technology: Spraycool; R&D Services: (Contract Research, Mechanical, Corrosion and Chemical Testing); Electric-Arc Spray Lab.: (Contract Research, Prototype Spraying, Technology Developments); Ceramic Electric Arc Spray Coatings: (Available for Licensing); Full Metallographic, SEM, Surface Analysis and Thermal Cycling Capabilities.

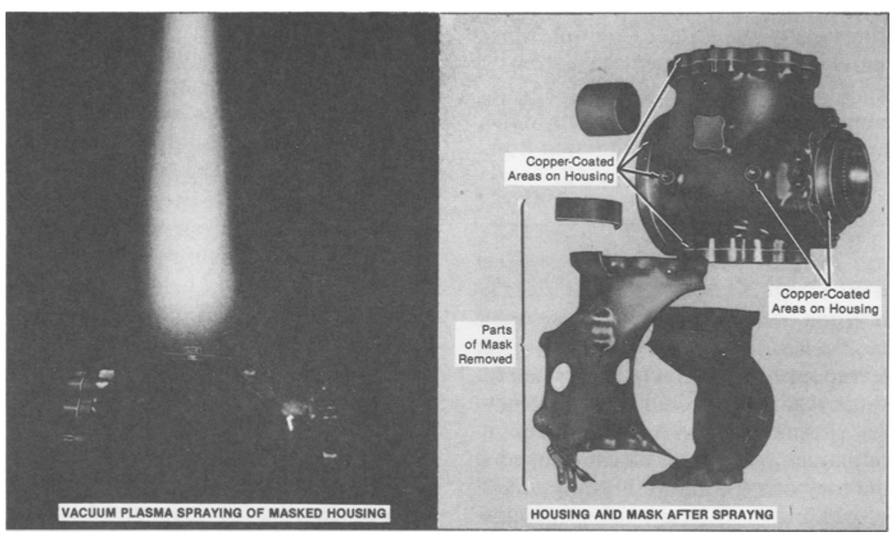
Contact: Edward A. Hayduk, Jr., Program Manager, Barriers and Coatings, Air Products and Chemicals, Inc., 7201 Hamilton boulevard, Allentown, PA 18195-1501. Phone, (215) 481-4114, Fax (215) 481-2556. [Adapted from CPPM Quarterly Newsletter, 2[2] (1993)]

News Items

News from NASA

Oxidation and the concomitant brittleness are eliminated by vacuum plasma spraying of copper onto titanium as reported by work performed by Chris Power, W. H. Woodford, Richard R. Holmes, David H. Burns, Timothy N. McKechnie, and Ron Daniel of Marshall Space Flight Center, Alabama.

Vacuum plasma spraying has proved successful in depositing a tenacious copper coat on the flanges and other selected areas of a titanium valve housing. (In this particular application, the copper coat is needed as a base for electrodeposition of a nickel coat that is to protect a layer of insulation and anchor the nickel to the housing, because electrodeposited nickel does not adhere to titanium.) Heretofore, the copper coat has been deposited by air plasma spray-



Vacuum plasma spraying forms a copper coat on exposed areas of titanium housing.

ing, but oxidation of both the copper and the titanium during the spraying process has resulted in a brittle layer of copper that has adhered poorly to the titanium.

In preparation for vacuum plasma spraying, the parts of the titanium housing not to be coated with copper are masked. The housing is placed in the vacuum chamber, where it is heated to a temperature of 850°F (454°C) by use of the plasma gun. Oxides and other contaminants on the surface of the housing are then removed by reverse-polarity, transferred-arc cleaning.

The plasma used in spraying (see figure) is generated by passing a carrier gas of 80 percent argon and 20 percent helium through an electrical discharge in the chamber. In the low-pressure [40 torr (5 kPa)] environment of the chamber, the plasma is accelerated toward the target to be sprayed (in this case, the titanium housing) and reaches speeds as great as mach 3. Highly pure copper powder is injected into the plasma, which accelerates the powder particles toward the target.

The length of the plasma plume is adjusted by variation of the pressure in the chamber (around the nominal 40 torr): the purpose of this adjustment is to make the particles of powder stay in the plume for just enough time to be softened by heating to a thoroughly malleable condition (and not to be heated to a liquid condition in which they splatter upon impact on the target). The particles attain a speed of about mach 1.5 just before impact. The combination of high purity, high impact speed, and absence of reactive gases results in a tenacious coat that can be removed only by machining.

Inquires concerning rights for the commercial use of this invention should be addressed to the Patent Counsel, Marshall Space Flight Center, Att. Robert L. Broad, Jr., Mail Code CC01, AL 35812, Phone (205) 544-0021. Refer to MFS-28664. Reprinted with permission from NASA Tech Briefs, 17[11] p.38.

Lead Paint Removal from Bridges

In response to the increasing cost of bridge maintenance and the stringency of environmental and worker protection regulations, a company has developed a new method of abrasive blasting wide-flanged bridge structures using robotics and computer technology. The developers of the machine have run preliminary tests; the machine is now being marketed.

From Concept to Machine

The idea of building a robotic blasting machine for bridge work was born out of a practical need, says Doug Coke of D&S Services, Inc. (Kentwood, MI), the developer and manufacturer of the machine. The company uses existing machinery and robotics to create an automatic blast machine that would increase the speed of surface preparation and eliminate the need for workers operating in containment. In March 1992, the company assembled a prototype of the machine, which is composed of a walkway, drive mechanisms, 8 blasting nozzles, and a sealed control panel. The manufacturer has used field testing to work out bugs in the machinery. Preliminary field tests have led to modifications of the drive mechanism and suspension assembly. To date, an entire bridge has not been cleaned with the robotic blasters. Several demonstrations have been conducted, however, proving that the machine is both applicable to and functional on bridge restoration projects.

Positioning and Operation of the Machine

Once transported to a site, the blast machine can be moved into position under a wide-flanged bridge with a two ton (1,800 kg) hoist. The machine is connected to the outer bridge girders by its drive motor assemblies. These drive motors permit the machine to adjust to different bridge sizes. The machine features 1 motor drive that "floats" so that it can be secured in the proper position in relation to different types of bridge spans. Each drive assembly is also adjustable to accommodate different flange widths and setting up the machine requires approximately 2 hours.

Powered by a 5,500 watt generator, the blast machine operates by rolling along the bridge flanges on three inch (eight millimeter) wheels. The machine is controlled by a computer program that can be modified by the operator to correspond to the measurements of the bridge. Using a hand-held radio transmitter, the operator of the machine can direct it to move along the bridge at 2 different speeds to handle various rust and paint conditions. The blasting speed is also adjustable from 2 to 55 ft (0.6 to 16.5 m) per minute to achieve specified surface profiles. Other control options include the use of manual controls, which are operated on board the blast machine. As the machine travels, sensors monitor the approach of right angle obstructions and stop the machine before it makes contact with bridge diaphragms or piers. For added control, the drive mechanisms are equipped with individual brakes that regulate precision of motion. The machine can blast up to 4,000 sq. ft (360 sq. m) of steel beam in approximately 50 minutes, while completing roughly 80 percent to 85 percent of the blasting requirement. The remaining 15 to 20 percent of the blasting is accomplished through touch-up work.

The machine uses almost all types of abrasive, including recyclable abrasives. The machine's working parts and drive motors are protected from abrasive contamination by seals that keep out dust, dirt, and other contaminants. In addition to operating as an automatic surface preparation machine, the blast machine also serves as a work platform for touch-up cleaning. A worker uses a foot pedal switch or a pennant on the machine to maneuver the platform into the proper position. The abrasive blast nozzles, held in place during automatic blasting by a positioning mechanism, can be released and used for touch-up work.

Possible Limitations

In a recent paper, John V. Cignatta of DataNet Engineering (Baltimore, MD) notes that a disadvantage of the machinery is that it cannot be programmed to determine the level of preparation necessary on steel that may display various surface conditions. Because the machine cannot regulate the degree of its surface preparation, greater amounts of conventional abrasives may be consumed than are absolutely necessary. However, he also emphasizes that the use of the machine may decrease the need for touch-up cleaning, thus compensating for the higher cost of abrasive consumption.

Testing the Machine

In October 1992, the manufacturer of the machine carried out its first demonstration. Officials from the Michigan Department of Transportation provided the use of one span of a freeway ramp that was being abrasive blasted by conventional means. According to Frederick Weber, an engineer for the state, the machine provided a near white surface preparation (SSPC-SP 10) that met the specifications of the project. The machine used 4 blast nozzles with operating pressures of 105 psi (731 kPa). Surface profiles ranged from 1.9 to 2.1 mils (48 to 53 microns), according to a report issued by the department. The amount of abrasive material used, the report states, was similar to that used by 4 workers blasting the same area.

Weber sees an advantage to using the robotic surface preparation machine. "It looks like a really positive innovation," he says, because it would reduce the problem of exposing workers to lead dust within bridge containments.

Coke of D&S Services, Inc. plans for continual research and development of the machine to provide a more user-friendly computer program and to refine its mechanical performance. The company looks forward to receiving feedback from its customers.

Based on an article that appeared in JPCL, 10[10], (1993) pp.46-50.

Fire Protective Coatings Under Investigation by Shipbuilding Committee

Fire retardant protective coatings have been used since the early 1940s in a variety of applications to improve the safety of a wide range of materials. Coatings can be blended into materials such as house paint or used in their unaltered state for many commercial, industrial, utility and military applications. Fire safety code enforcement has increased, causing coatings to be used more and more in order to meet code requirements.

Fire protection on-board ships is no exception and to investigate the need for standards in this area, a new task group has been established within ASTM Subcommittee F25.01 on Coatings/Processes, part of Committee F-25 on Shipbuilding. The U.S. Navy has been especially interested in such standards, says Rogers Moore, chairman of the task group. "What they are looking at is how to reduce any type of thermal transmission from one side of the bulkhead to the other side," he says. And with the Navy's recent down-sizing, it's looking for ways to get more protection for less money, adds the chairman.

One of the most important applications of coatings aboard ship is in non-watertight collars which hold a multitude of cables, explains Moore. "There's a tremendous cable load, with a tremendous amount of metal heat transfer due to all the copper contained inside. This is one of the most important areas that needs protecting." Bulkheads, substrates, stuffing tubes and shafing collars are other items that may also need to be addressed.

Existing standards addressing fire protective coatings include those from the American Nuclear Insurers, Factory Mutual, the Department of Defense, the Occupational Safety and Health Administration and others. "How these standards are all interrelated is really what we have to look at," says Moore. Once the fire protective coatings task group is up and running, Moore hopes to conduct a similar activity concerning through penetration fire stop barriers.

Contact: Rogers Moore, GS Nelson Firestop Products, P.0. Box 726, Tulsa, OK. 74101, Phone (918) 627-5530; or Teresa Cendrowska, ASTM (215) 299-5546. Based on an article that appeared in ASTM Standardization News, (1993) 21[11] p.20.

SSPC Research: Center For Protective Coatings

Announcing a new name

The Center for Protective Coatings (CPC) was formed on January 1, 1993, as a more visible research program attuned to member interests and needs. The CPC is probably better known to SSPC members under its original names of SSPC Research or the SSPC Laboratory.

For the majority of SSPC members the most common contact with the laboratory staff occurred when a request for technical information was fulfilled. The CPC staff continue to perform that function on behalf of SSPC. To reach this technical information service, and for additional information about SSPC/CPC research and testing programs contact Dr. Simon K. Boocock at (412) 268-3479.

Activities of the CPC

The CPC conducts two primary kinds of research and testing activity: sponsored contract work and SSPC funded/directed research; referred to as internal research.

Sponsored research activity

In 1993 sponsored research activities by the Center for Protective Coatings have focussed on contracts with National Shipbuilding Research Program (NSRP), the U.S. Army Construction Engineering Research Laboratory (CERL), and the International Lead Zinc Research Organization (ILZRO).

NSRP

The NSRP programs are intended to improve the quality and efficiency of shipbuilding operations in the United States. The CPC contribution to these efforts includes a project to develop a Quality Program for Shipyard Painters and a related project to provide a Surface Preparation and Coating Manual for shipyards.

The first of these projects will allow US shipyards to conduct self-auditing of their surface preparation and coating operations using the criteria from the SSPC Printing Contractor Certification Program as a basis for assessing in-house capabilities. In addition SSPC/CPC will demonstrate training programs to the shipyards to permit them to implement the quality program elements of the project. Products of the project will include a list of criteria for acceptable quality, customized for the unique operations in a shipyard and a set of skill level requirements for shipyard surface preparation and painting workers. In addition the project will deliver a comprehensive set of training materials or teaching aids which are pitched to the "deck-plate" level; that is, the person actually doing the blasting or coating work.

The Surface Preparation & Coating Handbook will be a stand-alone document that will contain essential information about preparing marine vessels for painting and achieving adequate coating quality in a shipyard setting. The handbook will be presented at a level and in such a manner that allows use in a deck-plate or office setting.

CERL

The research arm of the Corps of Engineers has been a supporter of SSPC programs to foster development of improved testing methods and performance specifications for distinct classes of coating products. The most recent CERL sponsored CPC activities in this area have looked at determining the performance capabilities of "surface tolerant" coatings. CERL's problems were that the evaluation of "surface tolerant coatings" was often a hit and miss affair.

grams to foster development of improved testing methods and performance specifications for distinct classes of coating products. The most recent CERL sponsored CPC activities in this area have looked at determining the performance capabilities of "surface tolerant" coatings. CERL's problems were that the evaluation of "surface tolerant coatings" was often a hit and miss affair. Performance data would be delivered from individual coating products applied over a wide variety of original surface conditions, then exposed to a set of unique and variable environments. This made sample to sample comparisons very difficult to accomplish. Under this research program SSPC/CPC has attempted to achieve two aims: first, determine the performance of surface tolerant coatings applied to previously coated surfaces or hand tool cleaned rusted steel; second, develop a standard test substrate and test regimen for evaluation of surface tolerant coatings. The coating samples were exposed to recently developed cyclic accelerated tests and to severe industrial or marine environments. The information developed will be of use in showing the predictive value of the new accelerated test methods. In addition the work will provide the data for writing a performance specification for surface tolerant coatings based on a uniform reproducible test.

ILZRO

SSPC/CPC has maintained an active research program sponsored by ILZRO, an organization which has focused on effective use of zinc materials in manufacturing, engineering, and construction. CPC projects have been evaluating the long-term performance of zinc-rich coatings in severe marine and industrial exposures. A report is being prepared which describes performance of the topcoated zinc-rich systems after sixteen years of exterior exposure. A second report, close to publication, examines the effect of zinc loading on system performance.

Internal research - SSPC sponsored activities

SSPC continues to sponsor research efforts at the CPC. These research efforts are typically of smaller scope and are intended to provide vital information for improving or developing SSPC standards and specifications.

Work was continued under three programs of internal research in 1993. The first program involves evaluation of methods for determining the purity of recycled abrasive. The second program involves preparation of standard surfaces for a variety of visual standards. Work continued on a third internal research project which involves evaluation of retrieval methods for soluble salts.

Other internal research projects which are to be conducted this year include a preliminary evaluation of the requirements for cure of concrete before coating. This project would examine the advisability of and criteria on which a common specification requirement for a "28 day cure" is called for before coating work can take place.

Lead Paint Removal Consortium

Mailings have begun in collaboration with SSPC to organize a consortium of DOT, governmental and industry organizations with a need for expertise in lead paint removal or infrastructure preservation. The program is organized on an annual subscription basis; although maximum and minimum suggested annual subscriptions are yet to be set. Some of the funds would also be used to subcontract to outside services as needed. For a more complete description of the program elements and the anticipated costs, contact the SSPC main offices: (412) 687-1113.

Contact: Dr. Simon Boocock, Steel Structures Painting Council, 4516 Henry Street, Suite 301, Pittsburgh, PA 15213-3728. (Adapted from SSPC Bulletin, Fall 1993, pp.3-4.)

SSPC News

First Contractor Qualified for Lead Paint Removal under New SSPC Standard

R.J. Wildner, Inc. of Johnstown. PA is the first painting contractor to be certified by the Steel Structures Painting Council (SSPC) to the Council's industrial lead abatement qualification consensus standard (QP 2) under SSPC's Painting Contractor Certification Program (PCCP). Specifiers now have a way to assess a contractor's competence to protect workers and the environment while successfully completing industrial lead paint and similar hazardous paint removal projects.

Contractors certified to QP 2 will have the programs and procedures necessary to meet the worker protection requirements of the new Occupational Safety and Health Administration Interim Final Rule on Lead in Construction, 29 CFR 1926.62. as well as Environmental Protection Agency (EPA) requirements to protect air, water, and soil during lead paint abatement.

The new program establishes 3 qualification categories based on the likely amount of dust and debris generated. At the heart of the standard, however, is the contractor's ability to provide a competent person, independent of production, on the job site to oversee hazardous paint removal work. A "competent person" is capable of identifying existing and predictable hazards in the surroundings, or working conditions that are unsanitary, hazardous, or dangerous to employees. The competent person also has the authorization to take prompt corrective measures to eliminate the hazards.

SSPC plans to offer both interim and full status certification. The interim certification would confirm that the contractor has lead paint abatement experience, has trained its employees, and has the written programs necessary to comply with QP 2. The interim status would be removed once the contractor has demonstrated that all aspects of the QP 2 program are operational in the field for at least 6 months.

The QP 2 certification program is designed to be flexible enough to incorporate proposed EPA individual training requirements for workers and supervisors scheduled to be implemented in April 1994. QP 2 certification will also be valuable to states when setting up proposed EPA contractor certification requirements mandated by Title X of the 1992 Housing and Community Development Act.

Facility owners who have announced their intention to require contractors certified to QP 2 are the Connecticut DOT (required beginning January 1994), the North Carolina DOT (required beginning in 1994), the Oklahoma DOT (required beginning January 1994), and the West Virginia DOT (required beginning January 1995).

SSPC Conference on Compliant Coatings

In response to environmental regulations that affect the formulation of industrial coatings, SSPC will hold a conference on "Evaluating Coatings for Environmental Compliance" in Orlando, FL on June 13-15, 1994, according to Bernard R. Appleman, Executive Director of SSPC.

The conference is intended for coating specifies; testing and research laboratories; coating, resin, and pigment manufacturers; maintenance, materials, and corrosion engineers; and procurement personnel from public and private facility owners.

Appleman points out that environmental regulations (e.g., volatile organic compound [VOC] and lead abatement) are having major impacts on selection and performance of industrial protective coatings. The Environmental Protection Agency's new rule on industrial maintenance coatings, for instance, which might be proposed as early as spring of 1994, is expected to limit VOCs to 350 g/l (2.9 lb/gal), significantly below levels in many systems currently used. By 1996, the expected implementation date, formulators and end users will need to have tested and selected compliant systems. Regulations are also affecting strategies for maintaining bridges coated with lead-based paint. Alternative materials are being sought for recoating existing structures previously coated with lead paint and those surfaces contaminated with soluble salts.

The keys to identifying, selecting, and evaluating new coatings are effective accelerated laboratory and field test procedures, along with means for characterizing the coating condition, both *in situ* and under laboratory conditions. This SSPC conference will focus on critical technologies needed to successfully evaluate protective coatings under the above conditions. The conference will focus on the following: (i) the influence of soluble salts on coating lifetime and the effectiveness of detecting and removing the salts; (ii) advances in cyclic corrosion and weathering testing and the use of electrochemical impedance spectroscopy to characterize aged coatings; (iii) detecting early failure or changes in fundamental coating properties; and (iv) elucidating factors that influence compatibility, adhesion, and other interactions between an existing system and an overcoating system.

Prospective authors are invited to submit papers on the following topics: Assessing or Mitigating the Effects of Soluble Salts, New Methods and Approaches for Accelerated Testing, Evaluating Water-Borne Zinc-Rich Coatings, Performance of Coatings Meeting VOC Limits, Durability of Overcoating for Lead-Coated Structures, Impact of VOC Rules for Architectural and Industrial Maintenance Coatings, Non-Destructive Methods for Evaluating Coating Degradation, Advances in Electrochemical Impedance Spectroscopy for Coating Performance, and Advances in Statistics for Evaluating Coating Performance.

The conference will feature SSPC tutorials on subjects such as lead paint removal, the effects of environmental regulations on the protective coatings industry, coating failure analysis, and developing a performance evaluation testing program.

Contact Krista Hughes or Dee Boyle, SSPC, 4516 Henry St., Pittsburgh, PA 15213-3728. Phone (412) 687-1113. (Adapted from JPCL, 10[11] (1993) p.5.)

Editor's note: This important meeting appears close to the publication date of this issue.

Attendance Statistics from NTSC'93

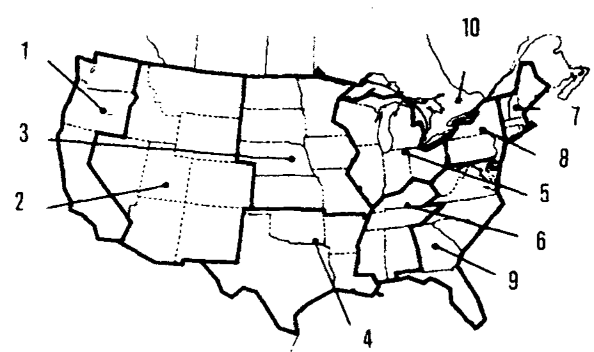
1. Pacific - 34%
2. Mountain - 45%
3. West North Central - 2%
4. West South Central - 3%
5. East North Central - 18%
6. East South Central - 3%
7. New England - 8%
8. Mid Atlantic - 11%
9. South Atlantic - 5%
10. Canada - 4%

Primary Company Function:

34% - Fabricated Products or Related Processes
20% - Primary Metals
14% - Transportation Systems, of JTST OEM/Supplier
8% - Contractor or Government R&D Lab
6% - Engineered Materials
5% - University
4% - Heat Treating
4% - Electronic Materials and Processing
2% - Materials Testing/Quality/Reliability
1% - Machinery, except Electrical

Primary Job Function:

24% - Research & Development
17% - Corporate Management
16% - Sales & Marketing
9% - Manufacturing or Service Management
8% - Metallurgical/Materials Selection/Evaluation
6% - R&D Management



NTSC attendance

6% - Product Design Engineering
5% - Consulting
3% - Professor
2% - Quality Reliability Engineering
2% - Purchasing
2% - Student

News from the CPPM

The Center for the Plasma Processing of Materials (CPPM) is pleased to acknowledge and thank a number of companies for recent donations and loans of equipment to the CPPM. UTP Welding Technology, Stafford, TX and the CPPM are negotiating for the CPPM to become the U.S. demonstration site for UTP's Top-Gun HVOF system. Automatix, Inc., Billerica, MA has donated Version 8.1 of its Image Analyst image analysis software to support the CMMP's research on the measurement of particle velocity and trajectory in thermal spray processes. Air Products & Chemicals, Inc., Allentown, PA (a CPPM member) has loaned the CPPM its gas shroud for use in Task 2.0 (Process Development) of its work on "Lightweight Plasma Sprayed Coatings for Lightweight Structural materials" in ERC Thrust Area 3. Miller Thermal, Inc., Appleton, WI, has donated an SG-100 Plasma gun and matching shroud, which is also being used in ERC Thrust Area 3. This donation has enabled experiments to be carried out in conjunction with thrust Area 3 investigators at the University of Minnesota.

Contact: CPPM, Drexel University, Phone (215) 895-2184, Fax (215) 895-1473.

News from the NSF/ERC

The CPPM began working in Thrust Area 3 "Plasma Spray Coating Technology" of the National Science Foundation's (NSF's) Engineering Research Center (ERC) for Plasma-Aided Manufacturing at the University of Wisconsin-Madison in October of 1992. In this Thrust Area, research is being conducted to develop plasma spray processes for producing a new class of lightweight coatings for lightweight structural materials. Several developments concerning the interaction of the CPPM with the ERC are detailed below.

Industrial Membership of the CPPM and ERC for Plasma-Aided Manufacturing and the resources and research of the two Centers have to date been kept separate. The CPPM and ERC for Plasma-Aided Manufacturing, however, recognize the potential benefit for many companies of co-membership, and consequently soon plan to announce joint membership. Companies would pay one fee to belong to both the CPPM and the ERC, thus participating in a larger R&D effort and having access to considerably more resources.

Lightweight coatings: TiC/Ti and TiC/NiCrBSi coatings with up to 80 vol% of TiC are being proposed as coatings to protect aluminum, titanium and even polymeric: Carbon composites against wear. Coatings on polymeric/carbon composites will also begin looking at special substrate preparation and cooling techniques such as Air Product's liquid nitrogen Spraycool system.

Shrouded Plasma Spraying: Thrust Area 3 is currently investigating Miller Thermal, Inc.'s and Air Products and chemicals, Inc.'s inert gas shrouds for plasma sprayed coatings. Since many of the lightweight wear-resistant coating material systems proposed are reactive, and highly susceptible to oxidation, improvements in nonchamber plasma spraying of these materials are needed. Coating comparisons of TiC/Ti and NiCrBSi/TiC sprayed under air and low pressure plasma spray will determine the improvements resulting from the use of shrouds. Improved shroud designs for typical spraying parameters are being considered and control of the entrainment of air into plasma jets will be a key feature. Mixing studies have been conducted in conjunction with other ERC Thrust Area 3 researchers.

Plasma Spray Mixing Studies: Mahesh Mohanty, Drexel Graduate (Ph.D.) Student, recently spent 2 months at the University of Minnesota in Minneapolis conducting "mixing studies" experiments on a Miller Thermal SG-100 plasma gun as part of Thrust Area 3. High plasma jet temperatures and entrainment of cold gas due to turbulence result in rapid oxidation of heated/molten particles in-flight under air plasma spray (APS) conditions. Reactive metals such as Ti are particularly susceptible to oxidation. The reaction of such metal particles with the local atmosphere, particularly the degree of oxidation, has a profound effect on the properties of the coating produced. Particle oxidation may be reduced by the use of "shrouded" plasma torches, where a sheath of inert gas, typically Argon, is used to protect particles in-flight and reduce or eliminate oxidation.

Experiments were carried out to measure oxygen concentration at various locations within a plasma jet operating in air with and without a shroud. Measurements were carried out on a conventional Miller Thermal, Inc. SG-100 plasma spray gun using torch operating parameters optimized for spraying Ti in air, and on the same gun fitted with a shroud. Commercial purity (CP) Ti powder was sprayed at various shroud gas flow rates. The structure (see opposite) and composition of the coatings produced are also being evaluated and will be correlated with shroud gas flow rate. The design and use of shrouds have to date been based on empirical data. Results from this work should enable optimized shroud parameters to be developed. An understanding of shroud characteristics will also eventually lead to improved shroud designs.

R. McPherson, 1930 - 1993

Readers will be sorry to hear that Reg McPherson died at his home in Melbourne, Australia, in November 1993 of cancer. Reg started his professional career at the University of Melbourne but from 1963 to 1989 he was in the Department of Materials Engineering at Monash University. After his departure from Monash he worked at the C.S.I.R.O. laboratories in Melbourne, mainly on thermal spraying and on plasma processing. He was very much part of the international community and did much to achieve recognition outside the country for Australian materials engineering. He was a regular traveler to conferences in Europe, North America and the Far East, served on at least five Government Technical overseas delegations and had published over 150 papers in international Journals and conference Proceedings. Indeed, a paper is currently being completed by one of his co-workers, so we have not yet heard the last of him.

Reg's interests in materials were exceptionally wide. In ceramics, be made important contributions in the field of wear and in a range of topics involving plasma processing. His plasma interests started in the late 60s and generated a series of projects on the production of fine powders condensed from the vapour, and the study of their phase composition and sintering properties. The plasma research led to work on thermal spraying and important observations of the structure and mode of adhesion of plasma and flame sprayed coatings. More recently, Reg had been working on the use of plasmas for the processing of a range of minerals, including zircon, and on the reduction of chromium and iron oxides.

Readers of a ceramics journal may not be familiar with Reg's considerations in metallurgy. He worked on a range of problems associated with re-heat cracking of low alloy steels and was one of the first to identify the role of boron in this area. He also worked in welding metallurgy, including research on solidification cracking and on nucleation processes in the weld pool.

Reg's contributions to the teaching of Materials Engineering in Australia were immense. He was involved in setting up the Department at Monash University - the first of its kind in the country - and its continued success is due to its strong foundations. He was an inspirational teacher at both the undergraduate and graduate level and he was held in enormous respect and affection by his students. His final lecture at Monash was an extraordinary affair including a bagpiper in full regalia and a series of laudatory speeches. Reg was a man of eclectic tastes and was knowledgeable in many of the fine arts. He was a lover of music, art and the cinema and was an avid reader. He was also a skilled handyman and his hobbies included woodwork, radio and old cars. All this, together with a ready wit and sense of humour made Reg a stimulating friend and colleague and he will be sadly missed. Our sympathies go to his wife, Sandra, and to his daughter and two sons.

(Submitted by J.R.Griffiths, Brisbane, Australia)

Parker Moves to Top Post at General Plasma

Derlan Industries Limited of Toronto, Ontario, Canada, has announced the appointment of Daniel W. Parker as president of the Coating Division of Derlan Aerospace/U.S. The Coating Division comprises General Plasma Inc., Advanced Plasma Inc. and Sun Bioscience. Mr. Parker replaces Terrence P. Swain who has been promoted to the position of President & CEO of Derlan Aerospace/U.S.

A leading international supplier of contract thermal spray coating services, General Plasma supplies its coatings to the aerospace, gas turbine, medical and automotive markets from its coating facilities in Connecticut and Massachusetts. Advanced Plasma Inc. provides coatings to the textile, gas turbine and military markets from its facilities in North Carolina and Florida. Sun Bioscience manufactures and sells products to the biotechnology market. The coating technology employed at General Plasma allows the application of metallics, carbides, ceramics and plastics to almost any substrate, a capability which has enabled General Plasma to grow in a down-sized aerospace market.

Mr. Parker has served as the chairman of the International Thermal Spray Association and is presently serving as chairman of the National Thermal Spray Conference scheduled to be held in Boston in June of 1994.
