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In The News

New Literature

International Journal of Applied Ceramic Technology

The American Ceramic Society's new quarterly periodical, the *International Journal of Applied Ceramic Technology,* provides the most recent information on ceramic product development and commercialization for engineers, manufacturers and research and development scientists.

Each issue focuses on a high-interest, high-impact topic plus a range of papers detailing applications of ceramics. Featured topics for upcoming issues include:

- Issue 1: Fuel cells,
- Issue 2: Nanotechnology,
- Issue 3: Ceramic armor, and
- Issue 4: Thermal and environmental barrier coatings.

The *International Journal of Applied Ceramic Technology* is led by an editorial board of experts from industry, government, and universities. Both invited and selected papers are peer reviewed by at least two referees to ensure technical quality.

Contact: American Ceramic Society, tel: 614/794-5890; Web: www.ceramics.org/publications.

Joint Thermal Spray Coatings Standard Issued by Groups

A new thermal spray coatings standard, "Specification for the Application of Thermal Spray Coating (Metallizing) of Aluminum, Zinc, and Their Alloys and Composites for the Corrosion Protection of Steel," has been issued by the Society for Protective Coatings (SSPC), the American Welding Society, and NACE International. The standard is called SSPC-CS 23.00/AWS C2.23M/NACE No. 12.

The new standard states requirements for equipment, application procedures, and in-process quality control checkpoints for thermal spray coatings. It is meant to be used by facility owners, fabricators, engineers, and others who maintain steel structures. The standard presents a fill-in-the-blanks model procurement specification and provides an illustrated overview of the process. It also explains and illustrates nine key production and quality control checkpoints.

Contact: Publication Sales Office, SSPC, Forty 24th St., 6th Flr., Pittsburgh, PA 15222-4656; tel: 412/281-2331; fax: 412/281-9992; e-mail: books@sspc.org; Web: www.sspc.org.

Handbook of Thermal Spray Technology

J.R. Davis, Ed. Thermal Spray Society and ASM International. 2004. Approx. 350 pages. ISBN: 0-87170-795-0. $167. ASM Member: $134.

This reference handbook is a complete guide to thermal spray technology. It covers principles, processes, types of coatings, applications, performance, and testing/analysis. Developed under the guidance of the Thermal Spray Society Training Committee, the handbook provides an excellent introduction and guidebook for those who are new to thermal spray. It also provides enough in-depth coverage and data that it should be of great value to specifiers and users of thermal spray coatings and to thermal spray experts who need additional background in certain areas.

Contents:

- **Introduction:** Introduction to Thermal Spray Processing and Surface Science; Guide to General Information Sources,
- **Coatings, Equipment, and Theory:** Coating Structures, Properties, and Materials; Thermal Spray Processes; Cold Spray Process; Process Control Equipment; Health and Safety Equipment,
- **Processing and Design:** Coating Processing; Coating Operations; Postcoating Operations,
- **Materials Production for Thermal Spray Processes:** Introduction; Feedstock Material Considerations; Material Categories for Thermally Sprayed Coatings; Material Production Processes; Particle Characterization,
- **Applications for Thermal Spray Processing:** Overview of Applications; Applications Case Studies,
- **Testing and Characterization:** Metallography and Image Analysis; Destructive and Nondestructive Testing of Coatings; Powder Testing and Characterization,
- **Reference Information:** Glossary of Terms; Abbreviations and Symbols; Metric Conversion Guide, and
- **Index**

Contact: Customer Service Center, ASM International; tel: 800/336-5152; fax: 440/338-4634; Web: www.asminternational.org.

Heat Treating and Surface Engineering

N.B. Dahotre, R.J. Gaster, R.A. Hill, and O.O. Popoola, Ed. Proceedings of the 22nd Heat Treating Society Conference and the Second International Surface Engineering Conference, 15-17 Sept 2003. ASM International. 2004. 604 pages. ISBN: 0-87170-797-7. $185. ASM Member: $148.

This volume provides the latest knowledge and information on scientific ad-

vances, technology innovations, and commercial practice in heat treating and surface engineering. These proceedings feature contributions from leading experts from around the world.

Contents:

- **Heat Treating:** Advances in Surface Engineering Technology; Furnace Atmospheres; Brazing; Captive and Commercial Heat Treating; Conventional Heat Treating; Energy Issues; Induction Heating; Modeling; Heat Treating of Nonferrous Alloys; Quenching Technologies; Vacuum Heat Treating and
- **Surface Engineering:** Case Hardening; Plating/Conversion Coating; Thermal Spray; Ion Beam Deposition; Physical Vapor Deposition; Chemical Vapor Deposition.

Contact: Customer Service Center, ASM International; tel: 800/336-5152; fax: 440/338-4634; Web: www.asminternational.org.

Thermal Spray 2003: Advancing the Science and Applying the Technology

Proceedings of the International Thermal Spray Conference 2003. B.R. Marple and C. Moreau, Ed. ASM International. 2003. Vol 1, 845 pages; Vol 2, 864 pages. ISBN: 0-87170-785-3. $275. ASM members: $220.

More than 240 papers covering the full spectrum of topics on the science and technology of thermal spray are presented in this book. The contributions highlight a number of areas, including recent advances in the basic science of spraying, diagnostics, process control, particle impact, microstructure, and properties; results on degradation mechanisms, testing and performance evaluation; and developments in new materials, processes, equipment, and applications. In short, this collection of papers presents a snapshot of the current state of advancement of the thermal spray field.

Contents: *Volume 1:* Cold Spray (16 papers), Applications (15 papers), Corrosion and Wear Protective Coatings (46 papers), Equipment and Processes (17 papers), Feedstocks and Novel Materials (15 papers), High-Velocity (HVOF) Spraying (14 papers); *Volume 2:* Science and Applications of Thermal Spray (34 papers), Sensors and Controls (26 papers), Testing and Characterization (24 papers), Thermal and Environmental Barrier Coatings (26 papers), Thermal Spraying of Polymers (10 papers).

Contact: Customer Service Center, ASM International; tel: 800/336-5152; fax: 440/338-4634; Web: www.asminternational.org.

Protective Coatings for Turbine Blades

Y. Tamarin. ASM International. 2002. 244 pages. ISBN: 0-87170-759-4. $160. ASM Members: $128.

This book addresses the problem of surface protection for aircraft engine turbine blades. It is based on the author's 30+ years of work on the development and application of coatings to protect against oxidation and hot corrosion. It describes and details a methodology for optimizing turbine blade surface protection.

Contents: Choosing Proper Coatings for Modern Aircraft Engine Turbine Blades; Production Processes for Electron Beam and Electric Arc Evaporation Coatings; Phase Composition of Coatings on Superalloys; Phase and Structural Changes in Coatings During High-Temperature Tests; Turbine Blade Coating Protective Properties; Effect of Protective Coatings on the Mechanical Properties of Turbine Blade Superalloys; Thermal Barrier Coatings; Strength Designing of Turbine Blade Protective Coatings.

Contact: Customer Service Center, ASM International; tel: 800/336-5152; fax: 440/338-4634; Web: www.asminternational.org.

Conference/Workshop Information

The 2004 Gordon Research Conference (GRC) on Plasma Processing Science

1-6 August 2004, Waterville, Maine

Areas of interest include high-temperature science such as molecules and clusters, synthesis, properties, and application of advanced materials, coatings, high-temperature devices (e.g., solid oxide fuel cell, combustion), corrosion, oxidation, diffusion, and thermodynamic measurements.

This conference has been endorsed by the Materials Research Society (MRS), The Electrochemical Society (ECS), The Minerals, Metals & Materials Society (TMS), and the Deutsche Gesellschaft für Materialkunde (DGM).

Contact: Gordon Research Conference website: www.grc.org.

International Surface Engineering Congress

2-4 August 2004, Orlando, Florida

ASM International's third annual International Surface Engineering Congress focuses on the practical applications of surface science and engineering. The processes include thermal spray, physical vapor deposition, chemical vapor deposition, electrochemical treatments, laser peening, and other surface enhancements—even the insertion of hard inserts. It has been found in recent years that processes that were once considered cost prohibitive, such as some electrophoretic processes, are now affordable and appropriate for many applications.

Subjects to be discussed include:

- Failure Analysis and Materials Testing (new this year!),
- Biomedical Applications,
- Tribological Coatings,
- Characterization of Surface, Thin Films and Coatings,
- Thermal Spray,
- Corrosion,
- High-Energy Photonic Processing for Surface Modification,
- Electroplating/Electrodeposition, and
- PVD/CVD.

Organizing committee chair: Dr. Oludele Popoola, General Chair, ASM Surface Engineering Event Organizing Committee, Orthopedic Tribology Department Manager, Zimmer, Inc.

Contact: ASM International; Web: www.asminternational.org/surface/technical.htm.

2004 ASM Materials and Processes for Medical Devices (MPMD) Conference

25-27 August 2004, St. Paul, Minnesota

This conference focuses on metallic materials used in medical devices, including their processing, testing, and properties.

Topics include:

- Fatigue Life and Durability of Medical Implants,
- Corrosion Resistance and Galvanic Reactions of Medical Implants,
- Surface Engineering and Coatings of Medical Devices,
- Joining Methods for Medical Devices,
- Forming Processes Used in Medical Devices,
- Heat Treatment Methods Used in Medical Implants,
- Effect of Materials on Surgical Techniques,
- Biocompatibility of Implant Materials,
- Imaging Compatibility and Visibility,
- Regulatory Affairs as Related to Materials,
- Nanotechnology, Micro-Electro-Mechanical Systems and Nano-Electro-Mechanical Systems,
- Metal on Metal Wear Issues,
- Bioceramics,
- Bioactive Surfaces and Drug Delivery Systems,
- Active Implant Materials, and
- Materials Modeling—Finite Element Analysis.

Materials covered include stainless steels, titanium alloys, cobalt-chromium alloys, nickel titanium alloys, surface coatings, bioceramics, refractory metals, and noble metals.

Contact: ASM International; Web: www.asminternational.org/meddevices.

56th Pacific Coast Regional & Basic Science Division (with Fall Meeting of the American Ceramic Society

12-15 September 2004, Seattle, Washington

This conference incorporates several sessions of relevance to thermal sprayers.

Novel Ceramic Processing

The focus of this symposium is on synthesis, processing, and fabrication techniques that are designed to produce materials with higher purity, lower processing temperatures, net shape, or improved performance compared to conventional routes. Topics of interest include sol-gel processing, preceramic polymers, bioinspired materials, fibrous monoliths, direct fabrication techniques, reaction-based processes, and materials designed for extreme environments. The emphasis should be on processing science, development of new processing routes, application of existing routes to new systems, experimental validation of theoretical designs, or understanding the role of processing in property development.

Porous Ceramics

Porous ceramics are increasingly becoming crucial components in various enabling engineering applications. The aim of this symposium is to bring together research in the area of highly porous ceramics ranging from nanoporous to macroporous systems. The symposium focus is on current efforts in processing, microstructure, properties, and applications of these materials. This symposium intends to address porous ceramics used in structural applications, thermal management, biomedical applications, filtering and chemical applications, energy and environmental applications, as well as other specialty and novel applications.

Ceramics for Energy Applications

The focus of this symposium is on the development and characterization of ceramics for emerging power-generation and energy-conversion and storage technologies. Sessions include development of ceramic materials and components for nuclear fusion, high-temperature fuel cells, advanced gas turbines, microturbines, coal gasification, supercapacitors, photovoltaics, and hydrogen production, separation, and storage. Contributions on ceramics for advancements in existing energy technologies, such as next-generation nuclear fission and advanced batteries are also sought. Additional topics of interest include development of ceramic materials for extreme environments, such as high temperatures in corrosive atmospheres, high radiation environments, or severe thermal stress; development of ceramics for high-performance ceramic components, such as high-flux ionic or mixed-conducting membranes, low overpotential solid-oxide fuel cell cathodes, and sulfur-tolerant reformation catalysts; and development of novel materials and compounds for high-capacity hydrogen storage.

Microstructural Effects on Ceramic Properties

Electronic, magnetic, optical, and mechanical properties of ceramics are often strongly impacted by microstructure. As these properties and the functional properties that intersect between them, for example, piezoelectricity, magnetostriction, photoelasticity, and so forth, become better understood, there is increasing recognition of how little is understood about microstructural effects. Grain size, grain orientation, grain-boundary phases, domains, and precipitates all can impact properties of ceramic materials. Improvements to and new development of microstructural evaluation tools has enabled microstructure-property correlations that were previously impossible.

Contact: The American Ceramic Society; Web: www.ceramics.org/meetings/pcrm2004.

Materials Solutions 2004

18-21 October 2004, Columbus, Ohio

ASM International's annual event features materials research and applications with 18 symposia including:

- Materials for Hydrogen Economy,
- Fuel Cells and Hybrid Systems,
- Nanocrystalline Materials,
- Green Engineering for Materials Processing,
- Advanced Materials for Homeland Security,
- Joining of Advanced and Specialty Materials, and
- Materials for Energy Efficiency.

Contact: ASM International; Web: www.asminternational.org/materialssolutions.

Materials Property Databases Symposium

18-21 October 2004, Columbus, Ohio

The symposium "Developments in Web-Based Material Property Databases" is being held at the ASM Materials Solutions 2004, Conference and Exposition. This symposium is the sixth in a series of symposia on this topic. Areas of interest span the entire spectrum of functionality for material property databases and the scope of properties of interest to designers, materials engineers, and the modeling and simulation community. Properties of interest include stress-strain curves, fatigue, fracture, thermal, corrosion, creep properties, thermochemical, and so forth.

Contact: ASM International; Web: www.asminternational.org/materialssolutions.

The 17th International Acoustic Emission Symposium (IAES-17)

9-12 November 2004, Tokyo, Japan

Topics to be discussed at the symposium (IAES-17) cover all the areas of acoustic emission testing, including: Materials Research, Structures, Manufacturing, Diagnostics, Instrumentation, Code and Standards, Applications to Medical Field, Geo-structures, Civil Engineering, and so on.

Contact: Prof A. Shuichi Wakayama, Dept. of Mechanical Engineering, Tokyo Metropolitan University, 1-1, Minami-Ohsawa, Hachioji, Tokyo 192-0397, Japan; tel: +81-426-77-2714; fax: +81-426-77-2701; e-mail: wakayama@ecomp.metro-u.ac.jp; Web: www.eng.metro-u.ac.jp/iaes/.

Heat Treatment and Surface Engineering in Automotive Applications

20-22 June 2005, Riva del Garda, Italy

This conference deals with innovation in heat treatment, with special reference to automotive applications. Topic guidelines include:

- Metals and heat treatment process for the automotive industry,
- Carburizing processes,
- Nitriding and nitrocarburizing processes,
- Vacuum processes for dies, tools, and components,
- PVD, PVC, plasma, multilayer coatings,
- Mechanical surface modification,
- Bulk heat treatment,
- Heat treatment process control,
- Environmental impact of heat treatment,
- Surface hardening by phase transformation,
- Mechanical properties and automotive applications,
- Innovations in automotive requirements, and
- Heat treatment and vehicle end-of-life European Directive 2000/53.

Contact: P. le Rodolfo Morandi 2, 20121 Milano, Italy, tel: +39 02.7602.1132 or +39 02.7639.7770; fax: +39 02.7602.0551; e-mail: aim@aimnet.it; Web: www.aimnet.it/aim_ifhtse.htm.

Materials Science & Technology 2005

26-28 September 2005, Pittsburgh, Pennsylvania

ASM International, The Minerals, Metals, and Materials Society (TMS), and the American Ceramic Society (ACerS) are partnering to create this event. Materials Science & Technology 2005 (MS&T) features ASM's annual technical meeting, the TMS Fall Meeting, the ASM Heat Treating Society Conference and Exposition. The ACerS is supporting and participating in MS&T 2005 by cooperating on joint symposia. More than 10,000 engineers, scientists, and other materials professionals are expected to attend as presenters, exhibitors, and attendees.

Contact: Christine Schnitzer, Meetings & Expositions, The American Ceramic Society, P.O. Box 6136, Westerville OH 43086-6136; tel: 614/794-5819; fax: 614/794-5882; e-mail: cschnitzer@ceramics.org; Web: www.ceramics.org.

Recent Conferences

First International Thermal Spray Meeting

4-5 December 2003, Lille, France

The First International Thermal Spray Meeting (Les Premieres Rencontres Internationales sur la Projection Thermique) was held at Ecole Nationale Supérieure de Chimie in Lille (ENSCL). The event, organized conjointly by ENSCL (Prof. L. Pawlowski), University Lille 1 (Prof. J. Lesage), and Cetim (Dr. P. Orlans) was attended by approximately by 100 participants from academia and industry. Thirty speakers from seven countries were invited to present the recent studies. Two days of plenary sessions covered a wide range of topics concerning thermal spray science and technology. The meeting gave an opportunity for discussions between researchers and industry representatives active in the area of thermal spraying and also to present the activity in this area in the region of Lille.

Prof. L. Pawlowski (ENSCL, France) outlined the current state of the art and perspectives of thermal spray industry in North of France, showing the great potential of this technology for improvement of the production tools.

Prof. P. Fauchais (SPCTS Limoges, France) described nanostructured coatings. The potentially superior properties of those materials have attracted high interest in the last few years, but the technology needs further investigation and optimization before being applied in industry.

Dr. G. Montavon (LERMPS Belfort, France) demonstrated possible harmful risks for workers in thermal spraying. He said that the major risks are related to the inhalation of harmful feedstock materials. The study, prepared with help of specialized physicians, was based on a survey conducted in thermal spray companies.

Dr. A. Denoirjean's (SPCTS Limoges, France) presentation dealt with the oxidation and nitridation during spraying in open and reactive atmospheres. The author underlined the fact that these reac-

From left: P. Fauchais, L. Pawlowski, and B. Bousmaha enjoy the conference dinner.

tions take place in liquid phase and are accompanied by convection movement of plasma.

Dr. H. Liao (LERMPS Belfort, France) presented an optimization procedure of the spraying procedure by a preheating/spraying/cooling process, named HEATCOOL. The speaker illustrated his talk by the images of disk-shaped splats that result in better adhesion/cohesion of the coatings.

Dr. F. Machi's (IREPA LESER Illikirch, France) presentation concentrated on application and perspectives of thick laser coatings. One of the perspectives discussed was the possibility of rapid prototyping, which permits preparation of complicated prototypes directly from desired material.

Dr. Z. Znamirowski (Wroclaw University of Technology, Poland) showed a new application of plasma spraying for electron emitters. This technology seems to be the more cost-effective method in comparison with classical ones.

Prof. A. Leriche (LAMAC Maubeuge, France) reviewed preparation methods of the powders for thermal spray. The hot topic of agglomerated spherical powder was described in particular detail.

Two papers were devoted to diagnostics of the flame and in-flight particles. **Dr. S. Siegmann's** (EMPA Thun, Swiss) study focused on the DPV-2000 diagnostics system and influence of the particle velocity and temperature on final coating microstructure. On the other hand, **Prof. M. Vardelle** (SPCTS Limoges, France) reviewed all optical diagnostic methods applied in thermal spray. The measurements are very useful in evaluation of process model and development of online quality control systems.

Prof. R.-N. Vannier (ENSCL, France) presented fundamentals of x-ray diffraction of plasma sprayed coatings. She stressed the simplicity of microstructure characterization by this technique. The influence of crystals size and microconstrains on x-ray diagrams was discussed.

Prof. J. Lesage (University Lille 1, France) proved that interface indentation test can be well adapted for characterization of coating's adhesion. The simplicity of this method is one of many advantages of this technique.

Dr. V. Guipont (ENSMP Evry, France) took over the adhesion test topic in his presentation on LASAT (LAser Shock Adhesion Test). This technique uses pulse laser to create shock wave inside the coating. Their characterization provides information about the interface.

Dr. M. Ducos (Consultant, France) gave a lecture on cold spray technology. He concluded "Cold Spray is not a rival to other thermal spray methods, but a complementary technique which opens the perspectives on many industrial fields."

Dr. A. Freslon (CEA Monts, France) took over this important subject by reporting about corrosion-resistant coatings achieved by this technique.

Prof. R. Gadow (IFKB Stuttgart, Germany) showed the results of development of a high-velocity oxyfuel process for spraying of coatings inside the automobile cylinder liners. This approach permits one to obtain cost-effective functional coatings that are ready to be implemented in a series production process.

Dr. A. Killinger (IFKB Stuttgart, Germany) presented a study of thermally sprayed functional coatings on glass and glass ceramics substrates. His talk also included investigation results on adhesion and failure mechanism.

Modelization of thermal spraying process was addressed in two presentations. First, **Dr. B. Pateyron** (SPCTS Limoges, France) described the procedure of modeling the jet temperature and its interaction with powder. The second paper, by **Prof. I. Smurov** (ENI Saint Etienne), described the Plasma 2000 software as a useful tool in simulation of coating profile under plasma spraying.

Dr. S. Costil's (LERMPS Belfort, France) discussed the PROTAL laser treatment procedure. The study aimed at replacement of classical prespray procedures (degreasing and grit blasting) by laser cleaning carried out simultaneously with spraying.

Prof. T. Mäntylä (TUT Tampere, Finland) considered the issue of corrosion behavior of thermal sprayed ceramic oxide coatings. These materials are mostly chemically stable; however, electrochemical corrosion may appear due to their microstructural imperfection.

Dr. M. Tului (CSM Rome, Italy) showed results of investigation on optical properties of ceramics sprayed under different atmospheres. The work, based on the Ph.D. given recently in ENSCL, demonstrated the possibility of the application of plasma sprayed coatings that possess optical properties that are dependent on the wavelength.

A wide range of applications of thermal spray technology were presented by industry representatives.

D. Murano (TLS, Villeneuve le Roi, France) reviewed application fields of thermal spray technology in mechanical industry.

G. Bertrand (Sulzer Metco, Bron, France) reviewed the needs of automotive industry with regard to thermal spray technology.

J.-P. Janssen's (Advanced Coating, Liège, Belgium) speech enabled an insight into the problems of coatings for steel industry, especially with regard to the regeneration of worn parts.

Dr. F. Crabos (Turbomeca, Bordes, France) reviewed the coatings for high-temperature oxidation/corrosion-resistant applications.

The different possibilities of replacement of galvanic chromium films by thermal spray coatings were presented by **G. Grasset** (Praxair, Saint Etienne, France).

J. Moens (MEDICOAT, Suisse) described use of APS and VPS techniques for deposition of bioactive coatings for medical applications.

The organization committee is starting to plan the Second International Thermal Spray Meeting. The event will hopefully be held by the end of 2005 again in Lille.

Contact: L. Pawlowski at e-mail: Lech.Pawlowski@ensc-lille.fr or P. Orlans at e-mail: Patrick.Orlans@cetim.fr. for proceedings copies.

Web Sources and Resources

Elastomeric Mask for Thermal Spray Coating

When spraying a surface with a stream of molten particles, one can protect some areas from the spray by putting a protective shield in place. This shield material is easy to work with and easy to install, remove, and clean.

Technology Benefits

Thermal spraying is widely used in many industries to form coatings and restore components to their original dimensions. In the spraying process, the flexible elastomeric mask of this technology is used to protect selected parts of the surface and to prevent the spray material from adhering except where desired. Compared to previous methods, this approach is easy to install and easy to remove and clean. The mask works well for protecting parts of complex shape and moving parts. It does not accumulate overspray. The mask can be given a magnetic coating to make it easy to protect small isolated areas.

Technology Differentiation and Uniqueness

Other methods have included a mask formed of metal to cover the equipment and surrounding area. Unfortunately, such masks are difficult to make and represent a waste of time and labor. Still other methods have employed a mask consisting of layers of adhesive, metal sheet, perforated metal sheet, and a sacrificial polymer, all bonded together to form a cohesive laminate sheet that has to be die cut to form a mask. These masks are difficult to use because they are rigid and not flexible enough to install and remove from the equipment in an efficient manner. Making such masks is material and time consuming.

The mask material of this technology is easy to install, remove, and clean. It can easily be used on moving parts, such as robotic arms, for example, and is flexible enough and durable enough to provide adequate protection to movable parts of the plasma spray equipment. The mask does not accumulate much overspray material. It can also be magnetized for protecting isolated areas.

Application and Potential Advantages

Aerospace: The combustion and turbine sections of all modern jet engines employ thermally sprayed coatings. This reusable mask technology is valuable where part shape is complex, for example, turbine blades and vanes. The masking method saves time and money, both in applying the mask and in obviating cleanup of overspray.

Energy: Gas turbines for electrical power generation have plasma sprayed ducts, blades, vanes, combustors, and injectors, all of which are sprayed in conjunction with some form of mask to protect certain areas on the part, as well as robotic systems, chucks, and support machinery. This technology is cost effective and user friendly.

Transportation: Ceramic thermal barrier coatings are applied to many high-performance internal combustion engine components such as valve faces, piston bowls, cylinder heads, and exhaust lines to reduce parasitic heat loss. This easy-to-use mask technology ensures that material is applied only where desired.

Mechanical: Wear surfaces, dimensional restoration, protective cladding, and surface modification of machine components (e.g., compressor, engine, pump, turbine, motor, and drive train applications) are examples where thermal spray is used, and where economical masking systems are needed during spraying.

Fossil Fuels: Thermally sprayed metallic, inorganic, ceramic, intermetallic, and polymeric coatings are applied to structural and functional components in petroleum production (e.g., downhole tubulars), oil and gas transmission (e.g., compressors, valves), and refining and chemical processing (e.g., process vessels, separators, reactors, pumps, etc.). This masking technology reduces the cost of applying these coatings.

Patent Information: US 5691018, "Silicone Mask for Thermal Spray Coating System," issued 25 November 1997. Technology provided by Caterpillar Inc.

Contact: yet2.com; tel: 617/557-3800; fax: 617/523-8232; Web: www.yet2.com.