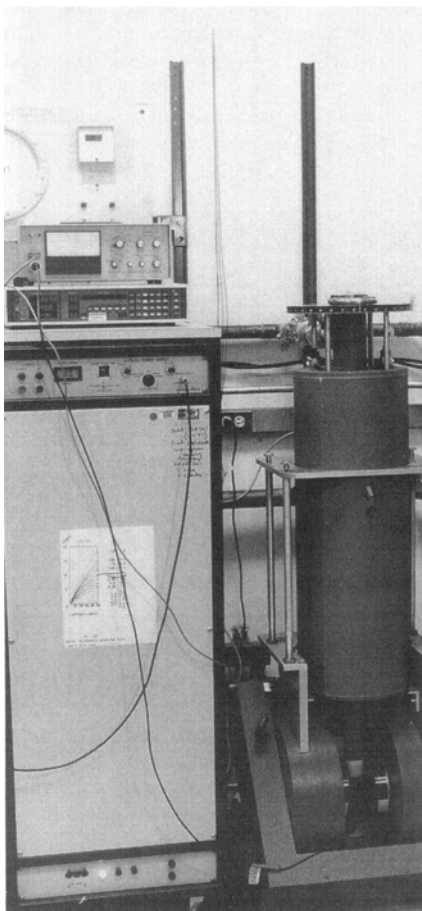


Materials/Products

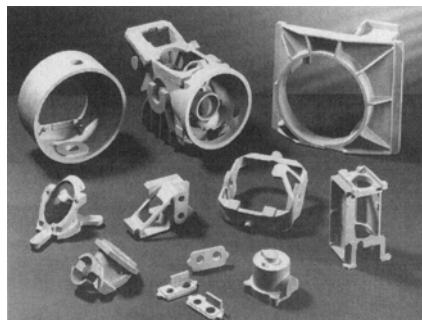
Walker Scientific's Model HF-7H Laboratory Electromagnet played a key role in the development of a high-temperature superconducting tape at the Los Alamos National Laboratory in New Mexico recently. The Walker Model HF-7H Laboratory Electromagnet **features a highly uniform field strength of 1 Tesla**, which allows the Los Alamos scientists to perform critical current anisotropy measurements. Those measurements relate to the alignment of magnetic domains within their new high temperature superconducting tape. The new superconducting tape reportedly carries more than one million amperes of current per square centimeter of cross section (copper wire of the same thickness carries less than 800 A). For more information,



Walker Scientific, Inc.

contact: Walker Scientific, Inc., Bruce A. Langley, Sales Manager, Rockdale St., Worcester, MA 01606; tel: 800/962-4638 or 508/852-3674.

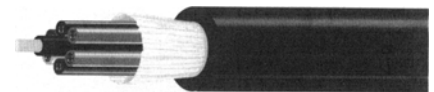
A new line of *investment castable beryllium-aluminum alloys for use in aerospace and aviation applications that provides 3½ times the stiffness of aluminum (A-356) with 22% less weight* has been introduced by **Nuclear Metals, Inc.** NMI's Beralcast Be-Al alloys are lighter than aluminum and titanium, have higher ductility than pure beryllium, and are much stiffer than either aluminum, magnesium or aluminum-base metal-matrix composites. Investment castable into complex shapes, these Be-Al alloys permit weight savings of up to 50% over conventional aluminum castings. Suitable for use as structural members in lightweight systems, NMI's Beralcast Be-Al alloys can be cast up to 40 lb with a maximum 32 in. OD and wall thicknesses from 0.040 to 0.500 in. These alloys exhibit a Young's modulus of 32.8 mpsi, 0.078 lb/in.³ density, 29 ksi yield strength, and 37 ksi tensile strength. For more information, contact: Nuclear Metals, Inc., John D. Nicholson, Mgr., Specialty Products 2229 Main St., Concord, MA 01742; tel: 508/369-5410.



Nuclear Metals, Inc.

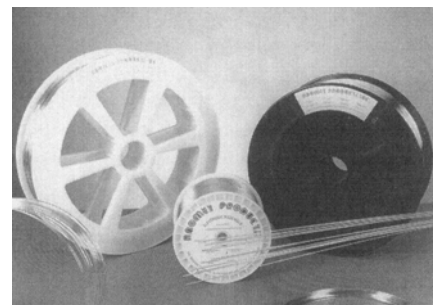
AdvanteX reinforcements with SoftStrand technology from **Owens-Corning** offer **enhanced abrasion resistance and maximum protection for optical fibers in telecommunications cable applications.**

SoftStrand technology is specially developed for Advantex reinforcements used in cable applications that require a helical overwrap. The proprietary impregnant allows this product to be conformable and more easily packed into the finished cable. The chemistry on the fiber reinforcement offers finer strand yield or lower denier versus competitive materials and superior packaging. Also, the new proprietary impregnant enables Advantex reinforcements to carry 50% less coating than standard reinforcements, thereby conserving costs. For further information, contact Owens-Corning, Fiberglass Tower, Toledo, OH 43659; tel: 419/248-8000.



Owens-Corning

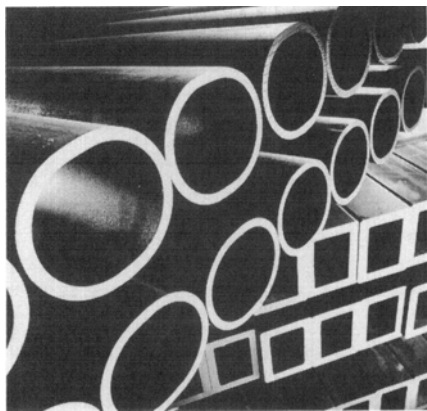
Metallurgically bonded precious metal clad wire that can be supplied for fabricating electrical contacts at a lower cost than using pure gold-plated wire is available from **Anomet Products, Inc.** Anomet Precious Metal Clad Wire features two or more precious metal layers of 25 µin. or better such as 10 to 24K gold, silver, platinum, palladium, and their alloys over copper-, nickel-base, and other core alloys. Available in any temper and round or flat shape, this metallurgically bonded wire provides the ductility necessary for bending, forming, and stamping. Offered in 0.005 to 0.125 in. diam sizes, Anomet Pre-



Anomet Products, Inc.

cious Metal Clad Wire can be supplied in quantities ranging from 10 Troy ounces to several hundred pounds. For more information, contact: Anomet Products, Inc., Robert F. Gallant, Marketing, 830 Boston Turnpike, Shrewsbury, MA 01545; tel: 508/842-3069; fax: 508/842-0847.

The Timken Company has *expanded its shaped tubing capabilities* and now also is specializing in complex outside diameter and inside diameter profiles on Timken seamless mechanical steel tubing. Timken is offering shaped steel tubing at mill order prices in a broad range of sizes—1.5 to 10 in.—in a variety of sizes, wall thicknesses, and profiles. The company also can provide mixed profiles—rectangles, ovals, squares, and hexagonals—on individual tubes. For further information, contact the Timken Company, P.O. Box 6927, Canton, OH 44706-0927; fax: 216/471-7032.



The Timken Company

ZYP Coatings, Inc. announces the introduction of their new line of *yttrium oxide (Y_2O_3) paints, pastes, aerosols, and cements for R&D and specialty production applications*. These products are ideal for providing a high temperature barrier up to 2000 °C to prevent reactions between ceramic, graphite, or metallic substrates with highly reactive materials such as niobium, uranium, and titanium. Yttrium oxide also offers an excellent stop-off barrier for diffusion bonding and brazing of titanium. Yttrium oxide offers the very best resistance to reactions at high temperatures, exhibiting the highest thermodynamic stability. Many product types ranging from water-based paints to aerosol sprays to pastes are available to meet most any need of users. ZYP has also introduced a line of boron nitride materials for similar applications. For further information, contact ZYP Coatings, Inc., 120 Valley Court, Oak

Ridge, TN 37830; tel: 423/482-5717; fax: 423/482-1281.

ORPAC, Inc. has introduced White Silk, *a fast-drying aerosol spray dry film lubricant and release agent usable to above 2000 °F in all atmospheres*. Coatings of White Silk remain flexible at all temperatures and exhibit very high electrical resistance. White Silk provides superb release with hot pressing and diffusion bonding processes. For further information, contact ORPAC, Inc., P.O. Box 5436, Oak Ridge, TN 37831; tel: 615/482-4635; fax: 615/482-1281.

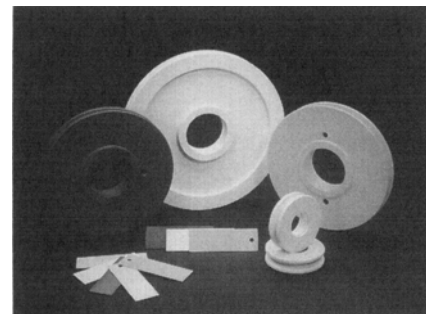
A unique water-based thermoplastic coating, CT-500, which *combines ease of application with exceptional performance characteristics in harsh service environments*, is available from **Corro Therm Inc.** Formulated from Ryton polyphenylene sulfide (PPS), Corro Therm's CT-500 exhibits outstanding chemical resistance, excellent abrasion resistance, and thermal stability. Once cured, CT-500 has no known solvent below 400 °F. CT-500 can be used as a protective coating for ferrous and nonferrous metals, applies readily with conventional spray equipment, can be applied in single or multiple coats, cleans up easily with water, is nontoxic, and has an indefinite shelf life. For information, contact Corro Therm, Inc., 175 Philmont Avenue, Feasterville, PA 19053; tel: 800/726-7948; fax: 215/322-3023.

Manufactured with technology developed by the **International Copper Association (ICA)**, electrophoretic-coated radiators are made with thin gage fins and tubes and are 35 to 40% lighter than traditional copper-brass radiators. If conventionally spray painted, radiators this light and thin could be particularly vulnerable to corrosion. Laboratory corrosion tests have always shown that conventional spray painting reduces corrosion resistance in radiators. Tests have shown that the corrosion resistance of electrophoretically coated copper-brass radiators was exceptional on all counts, even within seams and along sharp edges.

After exposure for 336 h to road environment pollutants (REP + sulfide test), no corrosion was found. When no degradation of the fins or other radiator components was apparent after an additional two weeks of exposure, the tests were halted. E-coated radiators have better heat transfer performance and lower air pressure

compared to standard painted radiators. Researchers estimate that *electrophoretic coating will increase the life of copper-brass radiators* and their advanced no-flux brazed generations to 10 years. For further information, contact Johan Scheel, Vice President of the International Copper Association, 260 Madison Avenue, New York, NY 10016; tel: 212/251-7240; fax: 212/251-7245.

MAGNAGLOW surface enhancements combine high visibility and outstanding resistance to corrosion and oxidation. Applied by **General Magnaplate Corp.**, MAGNAGLOW coated parts may be color-coded for applications in which similar shapes must be easily differentiated. Available in fluorescent-type pink, green, orange, and yellow, plus black, MAGNAGLOW coatings withstand up to 1500 h of salt-spray testing and high-temperature exposure, feature a smooth, semigloss finish, and have a hard dry-lubricated surface. MAGNAGLOW can be applied to a variety of metals, including aluminum, brass, copper, iron, magnesium, titanium, steel, and stainless, and may be combined with other Magnaplate surface enhancement treatments to add wear and abrasion resistance. Additional information about MAGNAGLOW is available from General Magnaplate Corp., 1331 Route 1, Linden, NJ 07036.



General Magnaplate Corp.

Flexfab is offering *a broad range of custom extruded, molded, and liquid injection molded silicone elastomer products*. Included are seals, gaskets, and tubing for demanding applications in construction, aerospace, automotive, appliance, food, marine, medical, and others. Functional, versatile, and attractive, Flexfab Silicone Products are ideal for environments where heat stability (−65 to +600 °F), weatherability, and long life are a con-

cern. Other capabilities include low compression set, resistance to dielectric breakdown, resistance to oxidation, and resistance to water and steam. Custom fade-resistant colors with UV protection are available. Silicone elastomers are also noncarcinogenic, environmentally safe, and recyclable. For more information, write Flexfab, c/o DPL, 100 Beckley Centre, Battle Creek, MI 49017.



Flexfab

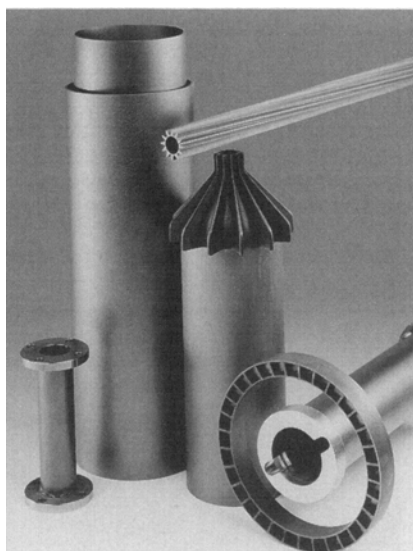
Constructed with a moisture-stable release liner on the acrylic adhesive side of the carrier and a polyester film release liner on the silicone adhesive side, **3M 9731 tape is ideal for many splicing, mounting, bonding, and temporary holding applications** in the paper, rubber, electronics, transportation, and medical industries. 3M 9731 is a clear, 5.5 mm thick, double-coated tape. It is available in widths ranging from $\frac{1}{4}$ to $\frac{3}{8}$ in. and comes in standard 36 yard lengths. For more information, contact Reed Schulke, 3M Industrial Tape and Specialties Division, 10701 Hampshire Avenue, South Bloomington, MN 55438; tel: 800/362-3550.



3M

Seamless extruded beryllium tubing that can be fabricated into truss structures with lighter and thinner walls than graphite composite materials for aerospace and related applications is available from Nu-

clear Metals, Inc. The tubing is strong, rigid, and lightweight, with a low coefficient of thermal expansion, making it superior to graphite composite materials in fabricating aerospace truss structures. For ease of attachment to related components, titanium and aluminum end fittings can be bonded or brazed to the tubing. Featuring a modulus of 44×10^6 psi and 100 to 120 Kpsi tensile strength, NMI Beryllium Tubing weighs 0.067 lb/in. and can be extruded in sizes from $\frac{1}{8}$ up to 6 in. OD. An effective heat sink, this tubing has an 11.6 $\mu\text{in./in./}^\circ\text{C}$ coefficient of thermal expansion and a specific heat of 0.45 cal/g/ $^\circ\text{C}$. For more information, contact: Nuclear Metals, Inc., John D. Nicholson, Mgr., Specialty Products 2229 Main St., Concord, MA 01742; tel: 508/369-5410; fax: 508/369-4045.



Nuclear Metals, Inc.

Hiperco Alloy 50-HS, developed by **Carpenter Technology Corp.**, is an **iron-cobalt-vanadium soft magnetic alloy which, in the annealed condition, has a unique combination of high yield strength and good magnetic and electrical properties** for a wide range of conventional power generation and magnetic bearing applications where rotational speeds are exceedingly high. This higher-strength alloy exhibits high magnetic saturation (24 kilogauss) comparable to that of the company's Hiperco Alloy 50, with only moderate core loss. When annealed at 7202 to 7409 $^\circ\text{C}$ (13,289 to 13,649 $^\circ\text{F}$) for about 2 h, the new alloy provides a room-temperature yield strength of 620 MPa (90 ksi). The new alloy—with a nominal composition of 2% V, 48.5% Co, and balance Fe—

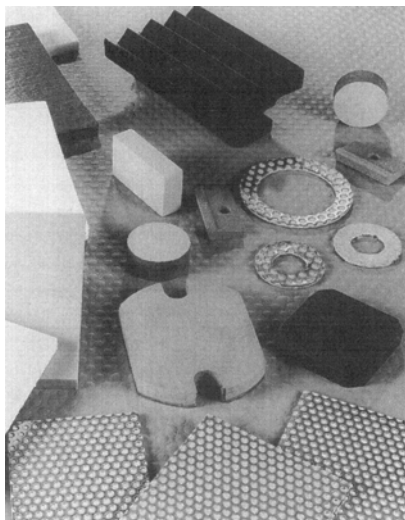
contains a small amount of niobium. This addition aids grain refinement during mill processing and final heat treating to produce a higher yield strength than that of conventional Hiperco Alloy 50. For further information, contact Carpenter Technology Corporation, P.O. Box 14662, Reading, Pennsylvania 19612-4662; tel: 610/208-2524; fax: 610/208-2858.

The most significant improvement in the machinability of stainless steels in the last 30 years has been announced by **Carpenter Technology Corp.** Alloys in the new Project 7000 stainless steel series **can be machined at speeds up to 50% faster** than possible with the company's own line of Project 700 stainless steels. Stainless types 303, 304, and 316 are offered initially in the Project 7000 stainless steel series. Improvements in other grades are also planned. For further information, contact Carpenter Technology Corporation, P.O. Box 14662, Reading, Pennsylvania 19612-4662; phone: 610/208-2524; fax: 610/208-2858.

ZYP Coatings, Inc. announces the introduction of its new line of **nonfluorocarbon aerosol high temperature ceramic paints**. For the first time, Y_2O_3 , Al_2O_3 , BN, and TiN paints are available packaged in an easy-to-use fast drying aerosol spray for user convenience. These paints are ideal for both R&D and specialty industrial application. Their many uses include protection of metals, ceramics, and graphite from reactions with reactive molten metals, glasses, salts, etc., or to provide high-temperature lubrication, or electrical and thermal insulation or conduction or in general to enhance the properties of substrates that do not alone meet the needed requirements. For further information, contact ZYP Coatings, Inc., P.O. Box 4005, Oak Ridge, TN 37831-4005; tel: 423/482-5717; fax: 615/482-1281.

Custom-engineered Teflon wear components that can be fabricated in various configurations and mechanically joined to perforated metal backings or bonded onto metal carriers are available from **Engineering Plastics, Inc.** EPI Teflon Wear Components are custom **extruded or molded with glass fillers to provide specific slip-resistance and hardness properties**. Fabricated into bearings, bushings, profiles, and strips, in a variety of shapes, they can be mechanically joined to perforated metal backings or bonded onto metal carriers. For more information, contact:

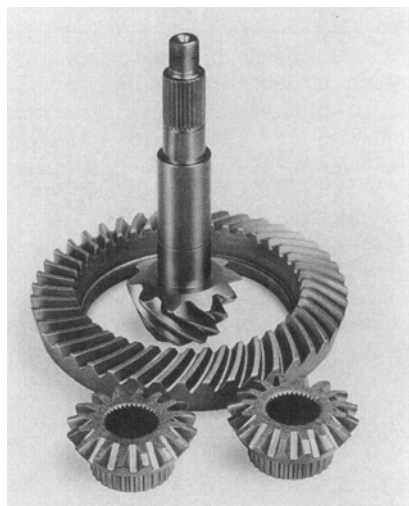
Engineering Plastics, Inc., John W. Morse III, Marketing, 190 Turnpike Rd., P.O. Box 1440, Westboro, MA 01581; tel: 508/366-4425; fax: 508/366-2575.



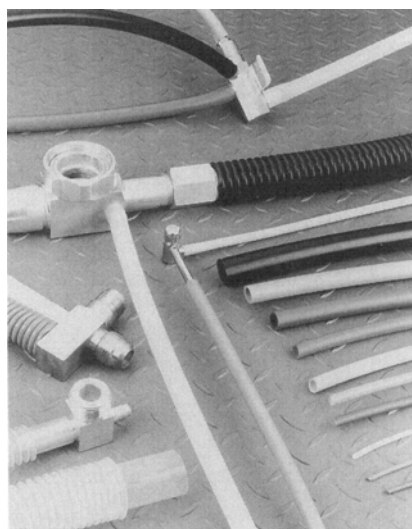
Engineering Plastics, Inc.

HI-T-LUBE, a patented dry film lubricant for metals, is available from **General Magnaplate**. Applied in a multilayer electrodeposition process to wear surfaces, HI-T-LUBE forms a metallic/oxide matrix of controlled thicknesses (± 0.0003 in. for 0.001 in. thickness range) with self-healing qualities, excellent adhesion, and near-perfect shear properties. The resulting malleable lubricating surface reduces wear and friction at extreme temperatures (from -360 up to $+10,000$ °F) by maintaining a coefficient of friction of 0.03 while withstanding compression loads in excess of 150 ksi. Parts treated with HI-T-LUBE can operate in a vacuum of 10^{-7} torr and in high radiation environments. Additional information concerning HI-T-LUBE coat-

ings is available from General Magnaplate, 1331 Route 1, Linden, NJ 07036.



General Magnaplate



M.M. Newman Corporation

A full line of extruded Teflon tubing that is **chemically inert and operates over a wide temperature range for handling a variety of liquids and gases** in critical applications is available from **M.M. Newman Corporation**. The tubing is nonflammable, chemically inert, unaffected by acids, alkalis, and other corrosive media, and operates at continuous temperatures up to 450 °F. Featuring varying degrees of flexibility and kink resistance, it comes in plain, corrugated, and convoluted styles and a variety of sizes. For more information, contact: M.M. Newman Corporation, Charles F. Loutrel, Sales Manager, 24 Tioga Way, P.O. Box 615, Marblehead, MA 01945; tel: 617/631-7100; fax: 617/631-8887.

DSM Engineering Plastics has introduced a new line of **rigid thermoplastic polyurethane-based, long glass fiber reinforced compounds** as part of its Fiberstran product line. The compounds offer a unique combination of strength and toughness due to the inherent properties of the polyurethane resin combined with the reinforcement structure of long glass fibers. Grades with up to 50% loading of long glass fibers are available. The company has also introduced a new family in its Electrafil line of conductive thermoplastics. These grades offer consistent, controlled resistivity within the static dissipative range (105 to 1012 Ω /square), eliminating the potential for the compound to become fully conductive (surface resistivity of less than 105 Ω /square) due to compounding or processing variability. The DSM-controlled resistivity compounds provide surface resistivity of between 105 and 1012 Ω /square, even at loadings above 20%. For more information, contact Steve Urdanoff at 800/333-4237.

Processing/Equipment

Corning Inc. has completed the first of two 8.1 m primary mirror blanks for the GEMINI Project telescope. The GEMINI project is an international partnership of the United States, the United Kingdom, Canada, Chile, Argentina, and Brazil. Both Gemini mirror blanks are being produced at Corning's Canton, NY, facility. **The mirror blanks are manufactured by fusing hexagonal pieces of zero-expansion glass in a high-temperature furnace.** The GEMINI II mirror blank is scheduled for delivery in 1997. For further informa-

tion, contact Corning Inc., Corning, NY 14831; tel: 607/974-9000.

Peddinghaus Corporation has developed the FPB 1500/3 plate punching and plasma cutting system. The FPB 1500/3 offers **an economical solution for automatic production of plate components** that require punching, burning, marking, and cutting to length. For the first time, heavy plate 60 in. wide by 1 1/4 in. thick can be processed in unlimited stock lengths.

FPB 1500/3 features include: Peddimat roller feed drive and measuring system; triple tool head; CNC control; and increased material capacity. For more information, contact Peddinghaus, 300 N. Washington Ave., Bradley IL 60915; tel: 815/937-3800; fax: 815/937-4003.

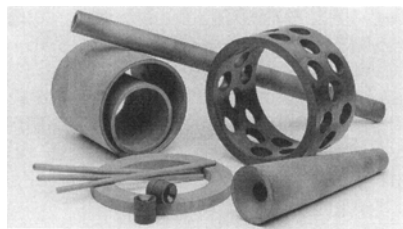
The Budd Company plans to use a \$2 million grant from the U.S. Department of Commerce to develop **a low cost method for manufacturing lightweight composite**

automobile components. The company plans to combine the benefits of three proven manufacturing processes for composite materials into an automated process called transfer/injection molding (TIM4). TIM4 would couple the outstanding surface finish, mechanical properties, and dimensional stability found in compression molded parts with the low cost and automation potential of injection and transfer molding. The award, granted through the Department's Advanced Technology Program, is part of a \$3 million, three-year effort. The funding will be used to shorten development time for TIM, which could stimulate increased use of composites in such parts as fenders, radiator supports, cross car instrument beams, valve covers, and grille opening panels, and provide for corresponding reductions in vehicle weight and fuel usage, capital expenditures and product development cycle times. For further information, contact the Budd Company, 3155 West Big Beaver Road, Troy, Michigan 48007-2601; tel: 810/643-3520; fax: 810/643-3545.

HEM, Inc. has introduced a computer-controlled head traverse system for its metal cutting band saws. The system is *designed for applications where extremely hard metals, abrasive, or exotic materials are to be cut.* The system consists of a ball screw controlled by a vector drive, controller, and brake mechanism. The desired cutting speed can be programmed from a key pad on the computer control console of the saw. All HE&M Saws with 40 in. capacities or larger will include the new computer-controlled traverse system as a standard feature. For further information, contact John Mangels, Product Manager, Advanced Products Division; tel: 714/549-0421, ext. 252.

Ceradyne Inc. announces an *expanded capability for the manufacture of very large silicon nitride components.* Components with diameters up to 12 in., lengths up to 30 in., and wall thickness up to 1.5 in. have been produced. These components have a minimum theoretical density of greater than 99.3% and average strengths of 100 ksi (700 MPa). These components are produced with "as fired" dimensional tolerances of $\pm 1\%$; precision machining can hold final tolerances to ± 0.001 in. Near-net shape fabrication processes combined with green machining techniques result in a unique, cost-effective, complex shape capability. For further information, contact Ceradyne, 3169 Red-

hill Avenue, Costa Mesa, CA 92626; tel: 714/549-0421; fax: 714/549-5787.



Ceradyne Inc.

To improve its JP-5000 High Pressure/High Velocity Oxygen Fuel (HP/HVOF) System, **TAFA Inc.** added new operational and safety features to its Model 5120 Control Console: *more accurate controls and monitors for all gas and fuel variables;* manual, automatic, and idle modes make setting and running parameters as easy as pushing a button; a new air purge feature to empty the water lines makes changing the gun parts much easier; hinged front and rear panels allow quick and easy access for maintenance or troubleshooting; automatic monitoring of all process variables; and an emergency stop switch. For additional information, contact: Joan Rich, TAFA Inc., 146 Pembroke Road, Concord, NH 03301; tel: 603/224-9585; fax: 603/225-4342.

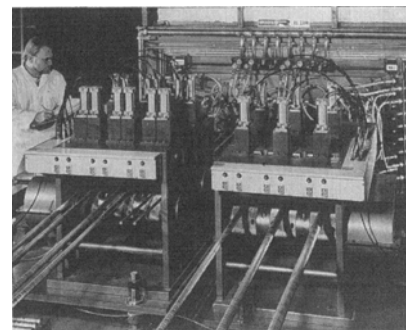
Technical Machine Products has introduced a line of rubber injection molding machines based on the European FIFO (first in-first out) design. The proven FIFO design *permits a direct flow of rubber to the nozzle using the shortest injection path,* thereby reducing the residence time



Technical Machine Products

of the rubber material and increasing efficiency significantly. Offering production flexibility, TMP rubber injection molding machines are designed so that material can be injected from the top, the bottom, or horizontally. Another important feature of the system is a cooling zone located near the nozzle to prevent premature curing. TMP rubber injection molding machines are available in vertical and horizontal models, with clamping forces from 50 to 600 tons. Shot volumes range from 9 to 214 in.³. For further information, contact Technical Machine Products, 5500 Walworth Road, Cleveland, OH 44102; tel: 216/281-9500; fax: 216/281-0408.

A series of *high-speed continuous rod casting machines that can eliminate several manufacturing steps* for producing multiple strands are being introduced by **Rautomead USA.** The machines operate at speeds up to 40+ IPM, depending upon the alloy and size of rods and are capable of producing from two to 12 strands. For many copper-base alloys, these machines eliminate the need for shaving or reduce the amount of material to be removed for higher yields. Suitable for producing rod from $\frac{3}{8}$ to 2 in., these machines utilize graphite crucibles and nitrogen bubbling to ensure a gas-free rod. This inert atmosphere optimizes crucible life and minimizes die degradation to lower operating costs and reduce downtime, claims the firm. For more information, contact: Rautomead USA, Jay Taylor, 125 Broad Common Rd., Bristol, RI 02809; tel: 401/253-8330; fax: 401/253-1840.

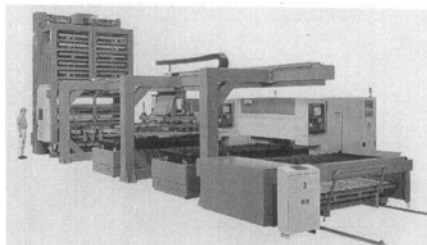


Rautomead USA

3D Systems Corporation has announced a new technology, called Multi-Jet Modeling (MJM), for use in a new office product, about the size of a copier, that *can print three dimensional solid objects designed in a computer.* Intended for use by product design engineers, the solid-object printer

will operate as a network peripheral to computer-aided design (CAD) workstations, automatically orienting the object to be created, preparing the computer input data, beginning the printing process within minutes of the engineer's request, and notifying the engineer when the job is completed. Part cleanup, after building, is simple, quick, and requires no special tools or chemicals. MJM is an ink-jet process that builds solid objects in successive layers using a thermopolymer material. For further information, contact 3D Systems Corporation, 26081 Avenue Hall, Valencia, CA 91355; tel: 805/295-5600; fax: 805/257-1200.

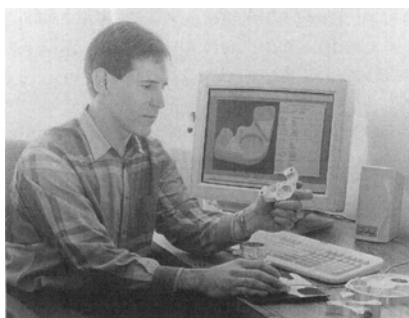
Mazak's new laser FMS Type A is designed to cut costs and lead times. One way it does so is by reducing "wait." The laser FMS reduces "wait" in several ways. It *reduces or eliminates interruptions of cutting time due to set ups*, loading the cutting program into the laser's control, retrieving and loading raw material, and unloading cut sheets. Optimizing the flexibility of lasers, the FMS system consists of 1 to 4 lasers served by automated load/unload equipment that traverses on an overhead rail. After it selects a sheet from the various materials shelved on the stocking tower, the system automatically transports it to the laser bed for cutting and to the finished goods table after cutting. A line controller automatically loads new cutting programs into an available laser and schedules each operation. "Wait" is reduced to only 35 s for each new sheet. For more information, contact Bob St. Aubin, Mazak Nissho Iwai, National Sales Manager; tel: 708/882-8777.



Mazak Nissho Iwai

Bridgeport Machines announces EZ-FeatureMILL, a feature-based CAM system for creating part programs. This revolutionary approach to CAM design *produces a 300% increase in manufacturing efficiency and a 500% increase in*

part program generation productivity. EZ-FeatureMILL's methods allow experienced and entry-level users to create and view solid, 3D models containing features such as bosses, pockets, patterns, and profiles, faster and easier than ever before. Currently only available for milling operations, EZ-FeatureMILL is the first in a series of parametric CAM programs that will be introduced by Bridgeport through a strategic alliance with Engineering Geometry Systems. Operators use English commands and feature descriptions to quickly and accurately create a graphic prototype. This allows users to make more complex and varied versions of parts in less time than was previously possible. For more information, contact Bridgeport Machines, Inc., 500 Lindley Street, Bridgeport, CT 06606; tel: 800/243-4292.

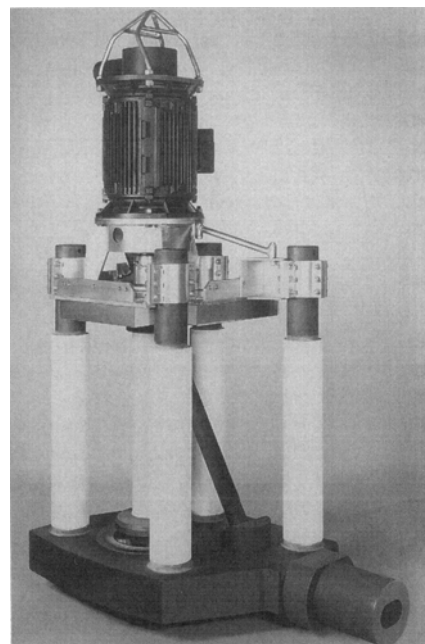


Bridgeport Machines, Inc.

In a move that will help manufacturers speed new products to market while greatly reducing product development costs, **DTM Corporation** announced the commercial availability of its new RapidTool technology. RapidTool customers *can create metal molds for plastic injection molding at a fraction of the time and cost of other methods.* Customers can then create multiple quantities of "true" prototypes, using the actual manufacturing process (plastic injection molding) and the exact same materials. These prototypes can be used for functional testing and verification of products in virtually any industry. The RapidTool process allows users to save anywhere from one-half to 60% of the development time in creating a new mold design. Users can also dramatically improve the quality of a design by performing many more iterations in the same amount of time that it would have previously taken to make just one part. In the RapidTool process, the metal particles are first loosely sintered together and bound with polymers to form a "green" or un-

cured part. This part is then infiltrated with molten copper in a furnace to form a fully dense metal mold that is capable of producing more than 50,000 injection molded parts. For more information, contact DTM Corporation; 1611 Headway Circle, Building 2; Austin, TX 78754; tel: 512/339-2922; fax: 512/832-6753.

As part of its continuing expansion of the L-Series molten metal pumps, **Metaullics Systems Co. L.P.** has introduced a new L-45GI model gas injection pump featuring new "6 x 4" technology. The design incorporates an exclusive six-bladed open impeller and four-sided spline that drives the shaft/impeller assembly. With six blades, more metal is moved. Being an open design, the impeller resists jamming by solids. The L-45GI pumps, which are especially *suited for degassing and degassing applications at secondary smelters and similar operations*, are built for rough-duty service. The new Metaullics L-45GI pumps can match the gas injection rates of the M-Series pumps they replace while running at 25% slower speeds. This slower speed, along with substantially larger and stronger components throughout the pumps, result in greater productivity. For more information, contact: Metaullics Systems Co. L.P., 31935 Aurora Rd., Solon, OH 44139; tel: 800/638-2859.

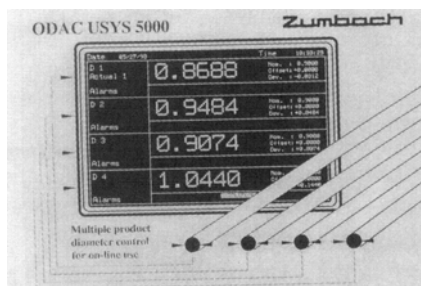


Metaullics Systems Co. L.P.

Measurement/Testing/Evaluation

LEO Electron Microscopy has introduced *an advanced variable pressure scanning electron microscope*. The LEO 43 5 VP utilizes differential pumping, which allows the specimen chamber pressure to be controlled at whatever value is sufficient to neutralize charging. This allows examination of almost any type of specimen with little or no preparation, even complete insulators such as glass or ceramic. The LEO 400 Series SEMs operate in a Microsoft Windows graphical environment, so operation is intuitive and easy, and all results can be stored, printed, or transferred to remote sites. For further information, contact Robert Brandon: tel: 800/356-1090 or Frank Coccia: tel: 410/437-7382; fax: 410/360-0265.

Zumbach Electronics Corp. has introduced the USYS 5000C-01B-D, a highly sophisticated diameter control system. This multiple object configuration *measures, monitors, and displays four diameters (or widths) simultaneously using only one noncontact measuring head*. The system has the intelligence to automatically alert the operator when any product is out of tolerance, mispositioned or missing altogether. Each product is monitored individually and compared against HI/LO tolerance alarms. Comprehensive SQC/SPC data are collected and analog outputs can be provided for each product. Up to four individual controllers can adjust the process through four fully integrated solid state regulating devices (optional) or by means of four conventional motorized potentiometers. The total measurement window can be as wide as 9.25 in. (235 mm), and the minimum product diameter possible is 0.002 in. (0.05 mm). For further information, contact: Zumbach Electronics Corp., 140 Kisco Ave., Mt. Kisco, NY 10549; tel: 914/241-7080; fax: 914/241-7096.



Zumbach Electronics Corp.

Foerster Instruments, Inc. has formed a new subsidiary, Foerster Systems, Inc., *to provide fully integrated nondestructive testing equipment and systems to United States and international markets*. Foerster Systems will utilize the most advanced gaging and NDT flaw testing technologies and related material handling systems for quality control testing of products during manufacturing and maintenance processes. Foerster Systems' nondestructive testing technologies are used primarily in the bar, tube, and wire, automotive components, metalworking, and metals-producing industries where QA/QC is critical. For more information, on Foerster Systems, contact William J. Kitson, Jr., President, Foerster Instruments, Inc., 140 Industry Drive, RIDC Park, Pittsburgh, PA 15275-1028; tel: 800/635-0613; outside the U.S.: 412/788-8976; fax: 412/788-8984.

A four-color brochure describing the advanced features of the Model 84 Universal Impact Tester is available from **Tinius Olsen Testing Machine Co., Inc.** The brochure (Bulletin 99-B) describes the characteristics that have made Tinius Olsen's Model 84 the widely recognized industry standard for impact testing accuracy. Features which are explained and illustrated include the accuracy of the unit's rugged single-piece pendulum and integral anvil-base design, with minimal windage and frictional loss, and the testing versatility of its interchangeable tooling for Charpy, Izod and optional tension impact tests. Bulletin 99-B is available from Tinius Olsen Testing Machine Co., Inc., P.O. Box 429, Willow Grove, PA 19090-0429; tel: 215/675-7100; fax: 215/441-0899.

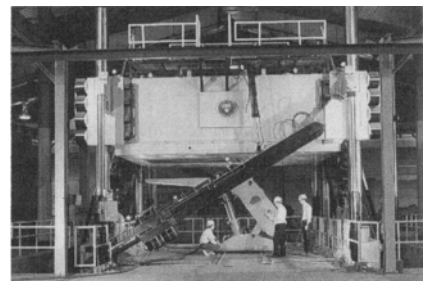
Nikon Inc. has introduced a new confocal microscope system. The new Optiphot 200C allows for *high-contrast, high-resolution confocal imaging of three-dimensional specimens in real time*. The new microscope offers accurate sub-half-micron resolution through the use of Nikon's CFO optics. These diffraction-grated, aberration-free optics combine both high numerical apertures and long working distances, for maximum productivity in the confocal environment. To ensure perfect lighting every time, a built-in aperture slider with pinholes of various diameters allows the user to adjust the system precisely according to the numerical aperture of the objective. For further information, contact Nikon Inc., Instrument Group,

1300 Walt Whitman Road, Melville, NY 11747; tel: 516/ 547-8531.



Nikon Inc.

The **U.S. Bureau of Mines** has opened its *Strategic Structures Testing Laboratory* to industry and other users on a cost-reimbursable basis. The laboratory, located in Pittsburgh, PA, features a massive hydraulic press—a unique tool for evaluating large-scale structures and equipment and testing bulk materials. Companies recently used the press to complete full-scale load verification tests for several components of a nuclear power plant. The press provides simultaneous vertical and horizontal loading. Its triaxial load frame incorporates two 20-by-20-foot platens and accommodates specimens up to 16 ft in height. Compressive loads up to 3 million lb, shear loads up to 1.6 million lb, and tension loads up to 1.6 million lb can be applied. Information on using the Strategic Structures Testing Laboratory can be obtained from the U.S. Bureau of Mines, P.O. Box 18070, Pittsburgh, PA 15236; tel: 412/892-6557 or 6550; fax 412/892-6891.



U.S. Bureau of Mines

Fischer Technology, Inc. introduces the Fischerscope X-Ray XUV System for *con-*

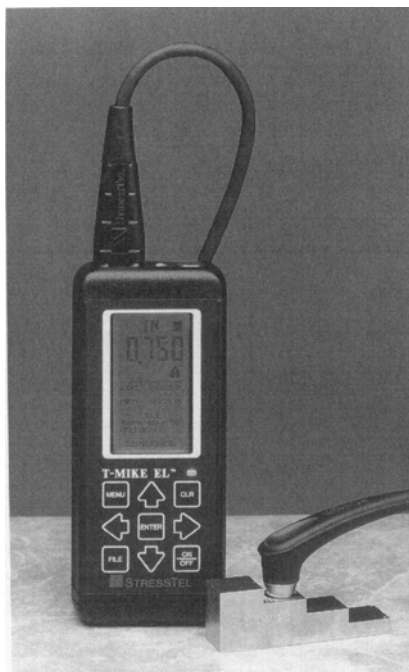
tact-free coating thickness measurement and coating alloy analysis that can be performed quickly, easily, accurately, while virtually eliminating the need for calibration standards. The Fischerscope X-Ray XUV System features Fischer's FTM (Fischer Thickness Management) PC-based operating software, which automates a wide variety of measurement and data evaluation functions. The use of this integrated software dramatically reduces the number of standards required for calibration, simplifies the measurement process, and saves the user time by allowing the user to program operating sequences for repetitive tasks. For more information, contact Fischer Technology, Inc., 750 Marshall Phelps Rd., Windsor, CT 06095; tel: 800/243-8417; in CT 203/683-0781; fax: 203/688-8496.



Fischer Technology, Inc.

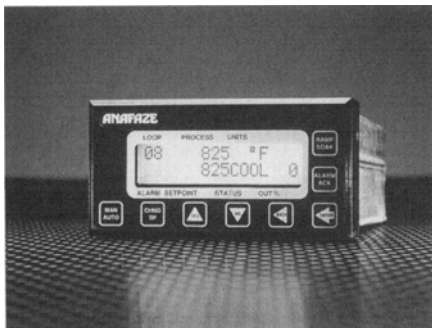
The T-Mike EL from StressTel sets **a new standard in ultrasonic thickness measurement gages.** The T-Mike EL comes complete with StressTel's newest software, preloaded and ready to use. A new data logging format offers the choice of sequential or grid format. A new Visual Alarm LED indicator, B-Scan for graphical representation of the material being measured, and sufficient built-in memory to store more than 40,000 readings are other features. To enhance ease of use in the field, the T-Mike EL also has a new, larger screen, with built-in backlight for low ambient conditions. For further information, contact StressTel Corporation, 225 Technology Circle, Scotts Valley,

California 95066; tel: 408/438-6300; fax: 408/438-7917.



StressTel Corporation

A portable threaded fastener test system, designed to provide fast and easy setup and operation along with high-speed sampling and high resolution graphics, has been introduced by RS Technologies, Inc. The Model 9404 FastLab transient recorder collects complete fastener test data for comprehensive analysis. The Model 9404 consists of a 486 computer in a ruggedized enclosure with built-in 5½ by 7 in. color flat panel display, 3.5 in. 1.44 MB floppy disk drive, 540 MB hard drive, and compact keyboard with full-size keys. The recorder enables measurement of input torque, clamp force, underhead friction torque, and angle of fastener rotation. The unit then calculates torque tension



RS Technologies, Ltd.

coefficient, thread friction coefficient, underhead friction coefficient, and thread friction torque. RS Technologies, Ltd. 37428 Hills Tech Drive, Farmington Hills, MI 48331; tel: 810/489-5511; fax: 810/489-5510.

The Watlow Anafaze CLS is a stand-alone 1/8 DIN size multichannel PID temperature controller available in 4, 8, and 16 channel versions. Each unit features dozens of advanced hardware and software features, so that even small machines, experiments, and processes can enjoy the advantages of modern computer-based control, including data acquisition and hook-up to PCs. The CLS can accept thermocouples, RTDs, linear current or voltage as sensor inputs. Each CLS has a built-in counter input, which can be used to measure speed, flow, and other pulse inputs. Thirty-four digital outputs can be programmed for heat/cool control, alarms, or ramp/soak events. For technical information, contact Watlow Anafaze, 334 Westridge Dr., Watsonville, CA 95076; tel: 408/724-3800; fax: 408/724-0320.



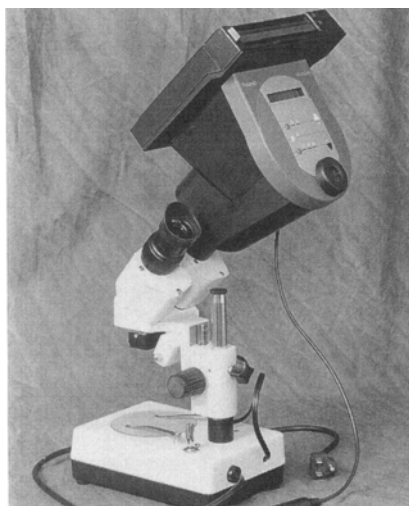
Watlow Anafaze

A rugged gas moisture analyzer with an easy-to-read digital display is available from the Sahara Air Dryer Division of the Henderson Engineering Company. The SAHARA Moisture Analyzer readout indicates dewpoints from -120 to 80 °F. The probe operates from -166 to +158 °F at pressures up to 5000 psig in air, nitrogen, methane, carbon dioxide, natural gas, and other gases. Measurement is at operating pressure, not at atmosphere, which eliminates correction charts. Erasable programmable read only memory technology (E-PROM), the units eliminates the need for time-consuming frequent calibrations. Producing a 4 to 20 mA output, the SAHARA can connect directly to chart recorders, constantly monitoring performance and producing hard copy output. For

further information, contact Chuck Henderson, V.P. SAHARA AIR DRYERS, 95 North Main Street, Sandwich IL 60548; tel: 800/544-4379; fax: 815/786-6117.

ASTM has released *The Metals Collection, a subset of the CD-ROM ASTM Standards Source*, includes all current standards from Sections 1, 2, and 3 and Volume 15.08 of the Annual Book of ASTM Standards, a total of 2400 metals standards. The package also includes an index disk to all 10,000 ASTM standards. The Metals Collection allows users to perform a search of the index by keyword or standard designation, and then retrieve the full text of the standard including all diagrams and photos. Advanced features include side-searching capability and an on-line notebook. To order, or for a free demo disk (CD-ROM format only), contact ASTM Customer Service, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959; fax: 610/832-9555.

A new book from Technomic Publishing Co. provides a detailed survey of damage tolerance assessment and characterization methods for advanced composites. Now published, *Damage Tolerance in Advanced Composites* presents an extensive examination of the role of damage tolerance in the design of composites. Topics covered include damage tolerance of composites, analytical methodology, and damage tolerance evaluation. To order contact Technomic Publishing Co., Inc., 851 New Holland Ave., Box 3535, Lancas-

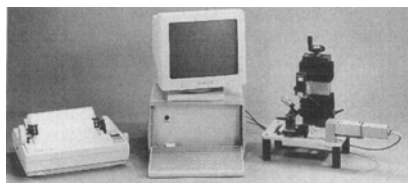


Optro-MechanicsUSA Corp.

ter, PA 17604; tel: 717/291-5609 or 800/233-9936; fax: 717/295-4538.

The new Polaroid MicroCam SIR is an easy-to-use, quality instant camera specifically made for microscopes. It fits virtually any microscope and takes a clear, 100 by 75 mm (4 by 3 in.) self-developing photo (black and white or color) in seconds. Features include: automatic exposure time ($\frac{1}{16}$ s to $16\frac{1}{2}$ min) and multiple language LED Display and camera instruction. Available through Optro-Mechanics (USA) Corp., 1 Blue Hill Plaza, Pearl River, NY 10965-8667; tel: 800/890-3333; fax: 914/620-1950.

Initially and specially developed for indexable cutting tools manufacturing plants the NOVAGRAPH II Profile Master is ideally suited to shop floor inspection of the shape and radius of the edge of cutting and stamping tools. Sturdy, easy-to-use though highly accurate equipment, it enables immediate checkup of machining results and consecutive machine-tool settings. Upgraded with NOVAG2 computer software, it offers engineers and R&D departments the possibility to also measure angles and lengths, compare and measure two contours placed on top of each other, trace chip-breaker grooves, and print and/or store all information. Distributed by: Optro-Mechanics, One Blue Hill Plaza, Pearl River, NY 10965-8667; tel: 800/890-3333; fax: 914/620-1950.



Optro-Mechanics

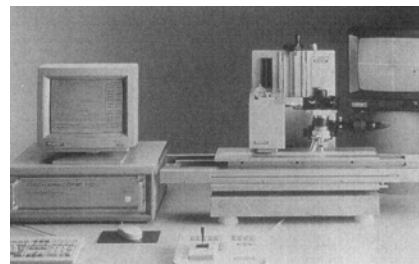
The Universal Eddy Current Sample and Standard Set is now available in a convenient kit form. Test samples for conductivity include ferrous and nonferrous materials. Other test samples include surface crack standards, conductive, and nonconductive coating thickness. A null sample is provided as well as five spaces for custom samples. Primary users include all lab and field users of eddy current products, schools, and training programs. For further information, contact UniWest, 330 W. Clark

St., Pasco, WA 99301-5627; tel: 509/544-0720; fax: 509/544-0868.



UniWest

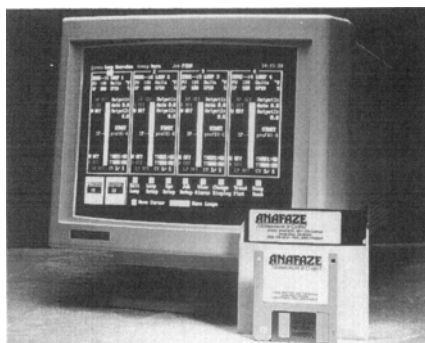
Fischer Technology announces the introduction of the reengineered Fischerscope H100. The new H100 includes upgraded software and positioning systems that allow for programmed testing. The H100 provides valuable material property data including hardness, elasticity, plasticity, and modulus of elasticity of very thin coatings. Measurements are made with the coating or plating in place, and results are unaffected by the substrate material. Overcoating of the test sample is not necessary. The Fischerscope H100 measures ultralow load hardness under test load, and with a load range of 0.4 to 1000 mN, provides maximum sensitivity over a wide range of materials and coatings. Test uncertainties are below 1% within this load range. For more information, contact Juliann Goodwill, Marketing Coordinator, Fischer Technology; tel: 800/243-8417.



Fischer Technology

The Watlow Anafaze MLS allows users to control up to 32 independent temperature channels with various types of sen-

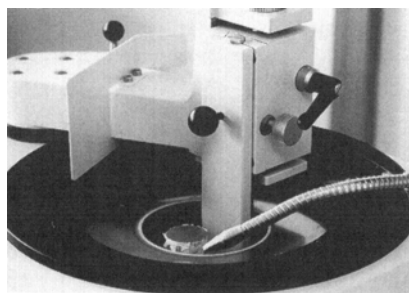
sensor inputs. This unit is often used when the number of zones exceeds the capacity of the Watlow Anafaze 16CLS or 8LS. The MLS has a 2×16 backlit LCD alphanumeric display for data setup and data monitoring. The MLS can accept thermocouples, RTDS, linear current, or voltage as sensor inputs. Users can order the MLS for either 16 or 32 channel versions. The company also offers ANASOFT, a software package designed to run on a standard MS-DOS-based PC. Anasoft enables a PC to communicate to all ANAFAZE loop systems and provides on-line trending, data logging, alarm reporting, recipe management, and quick controller setup. For technical information, contact Watlow Anafaze, 334 Westridge Drive, Watsonville, CA 95076; tel: 408/724-3800; fax: 408/724-0320.



Watlow Anafaze

The new **LEICA SP 1600 Saw Microtome** is ideal for slicing even the hardest materials for microscopic evaluation. The motorized LEICA SP 1600 can produce thin slices of hard samples without deformation, such as: decalcified or undecalcified bone; mineralogical samples; glass-fiber reinforced plastics; ceramics or porcelain. The LEICA SP 1600's operating principle is based on a rotating saw with a horizon-

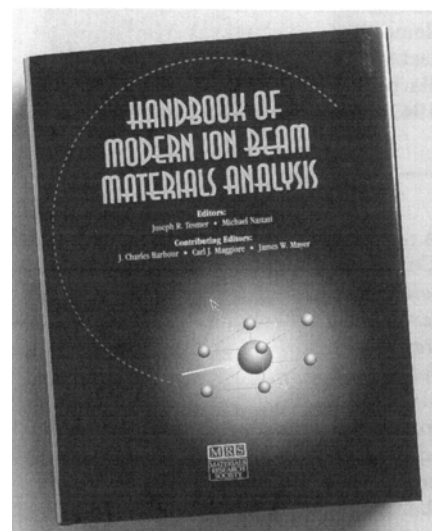
tal, diamond-coated saw blade that preserves the morphology of the sample and offers ideal conditions for microscopic evaluation. The speed of the specimen advance can be controlled by a hydraulic drive. A higher or lower speed can be selected depending on the material to be sliced. A built-in water system prevents overheating of the sample and carries sawdust away. For further information, contact Leica Inc., 111 Deer Lake Road, Deerfield, IL, 60015; tel: 800/248-0123; fax: 708/405-0030.



Leica Inc.

The **Materials Research Society (MRS)** has published the *Handbook of Modern Ion Beam Materials Analysis*—a compilation of updated techniques and data for use in the ion-beam analysis of materials. Numerous techniques are discussed, including elastic recoil detection and activation analysis. The Handbook of Modern Ion Beam Materials Analysis offers an excellent introduction to the lab practices and fundamentals of ion-beam analysis and is considered useful as a teaching text for undergraduate seniors or first-year graduate students. To order, contact Materials Research Society, 9800 McKnight Road, Pittsburgh, PA 15237; tel: 412/367-300; fax: 412/367-4373.

Special Nondestructive Testing Methods, Vol 9, 2nd ed., of *Nondestructive Testing Handbook* series, has been published by the **American Society for Nondestructive Testing, Inc. (ASNT)**. Methods discussed in this volume include acoustic holography, alloy identification, Barkhausen noise, holographic interferometry, infrared thermography, laser ultrasonics and photoacoustics, magnetic resonance imaging, moiré imaging, neutron diffraction testing, optical profilometry, photoelastic analysis, resistance strain gaging, shearography, speckle interferometry, tapping, vibration analysis, and others. For additional information, contact ASNT's Book Department; tel: 614/274-6003, or 800/222-2768 (USA only); fax: 614/274-6899.



Materials Research Society

International Research

The **R.G. Barry Corp.** and **Battelle** have formed a new joint venture, **ThermaStor Technologies, Ltd.**, a limited liability company, for the *development and licensing of thermal technology in medical, industrial, commercial, military, and other consumer areas*. The thermal technology, developed jointly by R.G. Barry and Battelle, consists of a family of award-winning patented technologies which, when preactivated with heat or cold, act as reservoirs that release heat or cold at constant temperatures for extended periods of time.

The primary heat source in current products is the microwave, and cold can be generated from freezers and refrigerators. Once activated, the materials are completely portable. Their unique characteristics include: lightweight, safe, nontoxic, chemically inert, nonflammable, and stabilities that allow for long shelf lives. A number of successful commercial applications of the thermal technology have been realized, and the basic technology provides almost limitless possibilities for the creation of new products. For further

information, contact Battelle, 505 King Avenue, Columbus, Ohio 43201-2693; tel: 614/424-5544; fax: 614/424-3889.

The **EPRI Center for Materials Production** has *developed a number of technologies for the metals industry*. CMP has developed a melter that uses a dc plasma arc to melt aluminum which offers many advantages over currently available systems. The melter offers high thermal efficiency, fast melting, low metal loss,

stirring action, and it can also process dross. A project has been initiated with Centerior Energy to demonstrate a 2000 lb/h low-dross melter at Wabash Alloys in Cleveland. Another project will look at using electricity for induction billet and slab heating. The proposed project will consist of several parts: an economic analysis model, a survey of companies presently using induction heating, a survey of equipment manufacturers, training to evaluate opportunities, and the identification of any needed technical work. A microwave system also has been developed and is being patented by EPRI for rapidly separating hot-strip rolling mill sludge and other wastes. CMP is conducting a collaborative project with the steel industry, EPRI utilities, and utilities and their customers for minimizing the generation of EAF dust, which is a major industry problem. Phase I is nearing completion, and plans are being made for Phase II. For more information, contact Joe Goodwill at 412/268-3435 or Bob Schmitt at 412/268-3243.

Scientists and engineers around the world are working on a new generation of **construction materials for bridges that will resist corrosion and last longer with less need for repair**. Canada, China, Japan, and Scotland are among nations that have built or are about to build bridges using polymer composites. In the near future, the suspension cables, support girders, and main deck of many bridges will be made of millions of braided, woven and fused strands of composite materials cooked up in laboratories by engineers. Nearly 40 laboratories across the United States are developing and testing these new materials through programs underwritten by the **National Science Foundation**. They include: California State University at Long Beach, which has developed synthetic cables to be installed on a suspension bridge, and composite materials for a deck on another bridge, contact Joseph Plecnick at 310/985-4406; Catholic University (Washington, D.C.), which is preparing to monitor and evaluate a new grid system developed for a full-scale bridge deck to be constructed in Washington, D.C., in 1996, using new fiber-reinforced plastic materials, contact Lawrence Bank at 202/319-4381; Lawrence Technological Institute (Southfield, Mich.), which is studying the use of glass and carbon fibers for an experimental bridge design, contact Nabil F. Grace at 810/204-2556; Pennsylvania State University, which is testing the durability and structural effects of novel polymer sheets used to reinforce damaged

concrete beams, contact Antonio Nanni at 814/863-2084; University of Arizona, which is developing techniques to strengthen masonry walls and concrete columns with carbon laminates, contact Hamid Saadatmanesh at 602/621-2148; University of California at San Diego, which is developing techniques to strengthen highway bridge columns by using carbon laminates to resist earthquake forces, contact Frieder Seible at 619/534-4640; West Virginia University, whose Construction Facilities Center studies the durability of new composite materials (such as fiberglass reinforced plastic bars) and concrete under freeze/thaw environmental conditions, contact Hota V.S. Gan-gaRao at 304/293-7608.

Strain gages are among the most widely used devices for determining how a material or device responds to its environment. As operating temperatures increase, however, conventional gage materials oxidize or change their structure. The PdCr Thin Film Strain Gauge from NASA Lewis Research Center **measures static and dynamic strain to 1040 °C**. This is 240 °C more than PdCr wire gages and 440 °C greater than gages made of other materials. Its temperature-induced resistance change is linear, repeatable, and insensitive to heating or cooling. Developed jointly with NYMA Inc., the thin-film nature of the PdCr strain gage allows it to be used in areas where larger devices would be disruptive. A wire strain gage, for example, can change the aerodynamic gas flow and temperature cracks, stress/strain distribution, and thermal effects on the surface of a test structure and give erroneous temperature readings. It also can be used as a pressure transducer and high-temperature extensometer.

Polyimides are known for their excellent mechanical properties, and while most have specific applications, one particular polyimide seems to be good for a wide variety of uses. The melt flow characteristics of LARC-SI soluble imide make it **the only polyimide that matches or exceeds the properties of conventional polyimides in film, resin, and self-bonding categories**. As a molded resin, for example, it has the highest tensile strength and second highest modulus. It also has high fracture toughness and fracture energy values. The material, developed at NASA Langley Research Center, can be extruded, injection molded, compression molded, and spun into fibers. It also has been used as a hot-melt adhesive to bond various metals, ceramics, and polyimide

films. While in-house NASA applications include use in microcomposites, thermal management, high-temperature composites, and electronic systems, commercial firms are evaluating its use in mechanical parts, electronics, adhesives, and coatings.

BIRL, Northwestern University's industrial research laboratory, has launched another Industrial Group Program **to develop commercial applications of hard and superhard coatings for industrial products** and is inviting companies to join the group. Applications include coatings for protective, metallurgical, thermal-barrier, solar-energy, optical, biomedical, semiconductor, sensor, and decorative uses. In one recent application, a company saved several million dollars per year on retooling costs by applying hard coatings to manufacturing tools. Several organizations have already become development partners in this second, two-year program, which officially began 30 Oct 1995. The goals and direction for the jointly funded precompetitive research are set by the participating companies. As part of the program, BIRL will provide performance data on commercial applications and assist member companies in adopting the best technologies for their particular products. For further information, contact Bill Sproul, Northwestern University, 1801 Maple Avenue, Evanston, IL 60201-3135; tel: 708/491-4108; fax: 708/467-1022.

Sandia National Laboratories have built **a gear powered by the first micro-motor to drivetemporal gearing and built entirely by microelectronic fabrication techniques**. So far, several hundred million rotations have been demonstrated by the smaller gears. The device is the first micromotor to be built with three levels of polycrystalline silicon—the first level contains the engine, the second the gears that the engine drives, and the third the linkages that connect the engine to gears or other linkages. The motor, which develops 0.5 μ W of power delivered through a gear 50 μ m in diameter, could be used to operate tiny micromedical pumps that function as drug delivery systems internal to the body and to act as low-cost, high-performance gyroscopes that could have a dramatic impact on the design of future automobiles and military systems. For further information, contact Paul McWhorter, 505/844-4683; Jeff Sniegowski, 505/844-2718; or Ernie Garcia, 505/844-0103.

University View

Researchers at **Pennsylvania State University** are looking for *more efficient ways to make building-block chemicals for new plastics*. Examples of these new materials are polyethylene naphthalate (PEN), polybutylene naphthalate (PBN), and liquid crystalline polymers (LCP). One problem faced in creating the building blocks, or monomers, for these advanced plastics is cost effectively producing high percentages of the exact chemical required. For example, with naphthalene and biphenyl, only one of the 10 possible dialkylated compounds is desirable for making PEN, PBN, and LCP. The problem is persuading the right molecule to attach to the right carbon atom, even when there is no chemical preference for one over the other. The research is looking at shape-selective alkylation of naphthalene and biphenyl using a molecular sieve catalyst of aluminum-depleted mordenite—a compound of aluminum, silicon, and oxygen that has many micropores and channels where reactions can take place. For further information, contact Dr. Song at 814/863-4466 or Dr. Schmitz at 814/863-836.

Taking advantage of recent catalyst technologies, **Penn State** researchers are *making combinations of plastics—block and graft copolymers—efficiently and uniformly for a wide variety of potential applications*. The way to produce polyolefins with desired characteristics is to combine them with other polymers that already have these properties. Polyolefins are attractive because they are a class of inexpensive plastics that include polyethylene and polypropylene. Combining previous work on borane polymers and living radicals with metallocene catalysts is producing uniform block copolymers that contain polyolefins. A copolymer consists of two chains of different polymers seamlessly drafted together to form a single chain. Metallocene catalysts are promising because they create unsaturated chain ends when polymerizing polyolefins. The unsaturated chain ends can then become sites for boron addition to the polymer, creating borane-terminated polyolefin. For further information, contact Dr. Chung at 814/863-1394.

An electronically controlled "intelligent" mechanical seal could increase the payload capacity of liquid-fueled space vehicles by reducing weight penalties imposed by the techniques now used to keep hot exhaust gases separate from liquid oxy-

gen. At the heart of the intelligent seal being developed at **Georgia Institute of Technology** is a piezoelectric crystal that deforms in proportion to the electrical voltage applied to it. Attached to one face of the seal, the crystal would adjust the spacing between critical moving parts in a rocket engine's turbopump. A closed-loop control system would constantly monitor conditions within the seal and determine the voltage that should be applied to maintain proper clearances. Developed with support from NASA's Lewis Research Center, the intelligent seal offers a new approach to an old problem for the liquid-fueled rocket motors that power most vehicles. For further information, contact Dr. Richard Salant at 404/894-3176.

In most complex mechanical systems, lubricants help reduce friction and protect moving parts against wear. But research at **Georgia Institute of Technology** suggests that under extreme conditions, lubricants in systems such as computer disk drives may behave in unexpected ways that in certain cases can harm the very systems they are intended to protect. Using molecular dynamics simulations, researchers at the Georgia Institute of Technology predict that *ultrathin films of the organic lubricants used in nanometer-scale devices may act more like solids than liquids when subjected to high pressures*. The simulations also warn of possible damage from cavitation effects, as well as fatigue failure caused by repeated surface deformation. For further information, contact Uzi Landman at 404/894-3368.

Designing tailor-made thin films for coatings and electronic devices may become easier if *a new method for simulating surface growth* under development at **Pennsylvania State University** works out. The Penn State method is a hybrid of the molecular dynamics and the dynamical Monte Carlo methods. All of these approaches try to describe the physical structure, on an atomic level, of a film surface. Atomic-scale events that occur during vapor deposition of the surface coating determine this structure. The surface structure influences the physical properties of the thin film including magnetic, optical, mechanical, electrical, magnetic, and catalytic properties. The research is specifically looking at adsorption and surface diffusion of copper atoms on a copper substrate with a specified lattice structure. Adsorption occurs when atoms from a gas

land on the substrate and bind to the solid surface. Surface diffusion is how the surface atoms move around on the thin film. For further information, contact Dr. Fichtorn may be reached at 814/863-4807.

Finding a way to put more and more random access memory (RAM) onto silicon chips may have just become more complicated, according to **Penn State** researchers. Random access memory is made up of a series of tiny capacitors, each capable of storing one bit of information. One megabit of memory requires a million capacitors and 1 gigabit requires a billion. Originally, flat capacitors were made of a tiny square of silicon dioxide on the silicon wafer with a metallic conductor attached to the top and bottom of the capacitors. As more and more memory was needed, trench-shaped capacitors of silicon dioxide and silicon oxynitride were fabricated on the chip to provide more memory in the same space. *The research is considering a single, conducting element that is compatible with both silicon and a binary oxide*. Germanium, an element known to be compatible with silicon, will be the first interlayer material investigated. Once again the approach will be through theoretical thermodynamics rather than experimentation. While computer memory is the most likely near-term application for combining complex oxides and semiconductors, other applications do exist. Combining superconducting oxides with silicon would allow miniature antennas to be made on silicon chips. For further information, contact Dr. Schlom at 814/863-8579.

Researchers at **Penn State** have fabricated *a thin film of the only known superconducting material that has the same layered structure as high-temperature oxide superconductors, yet does not contain copper*. The material, a strontium/ruthenium oxide with a layered perovskite structure, was originally grown in single crystal form by a Swiss team and proved to be superconducting at about 1 degree K—about -430 °F. This new material has the same structure as the high-temperature oxide superconductors, but has ruthenium oxide layers instead. The absence of copper, in the strontium/ruthenium oxide superconductor, indicates that this element is not essential for superconductivity in layered perovskites. For further information, contact Dr. Schlom at 814/863-8579.

Literature/Data Sources

InterPort Corporation offers *Trakker, a fully integrated manufacturing planning and control system*, from order processing through invoicing. Trakker's functions include product costing, sales and production order processing, purchasing, production and inventory control, material requirements planning, and much more. Trakker now includes configure-to-order features allowing specification of options such as colors, finishes, hardware, etc. A direct link with cutting optimizers allows batching of production orders. Full-featured accounting is also available to complete the system. Trakker is implemented in Microsoft Access, and is fully Microsoft Office compatible. For more information, contact InterPort, P.O. Box 381887, Germantown, TN 38183-1887; tel: 800/347-3300.

The Institute of Materials 1995/96 publications catalogue *details the Institute's entire primary and secondary publishing program covering all engineered materials including ceramics, composites, metals and polymers*. New sections describe the abstracts, databases, and CD-ROM products available from Materials Information (MI), a service jointly owned by The Institute of Materials and ASM International, new software packages, materials technology foresight reports. For a free copy contact The Institute of Materials, 1 Carlton House Terrace, London SW1Y 5DB, England; tel: (0171) 839 4071; fax: (0171) 839 2078.

NACE International announces the publication of *Corrosion and Corrosion Control of Aluminum and Steel in Lightweight Automotive Applications*, a compilation of 23 technical papers presented at NACE's annual forum CORROSION/95. The proceedings address two major topic areas—the environmental durability of lightweight and alternative materials and the environmental durability of precoated steels. To order, contact the NACE Membership Services Department at 713/492-0535, ext. 81, or write to P.O. Box 218340, Houston, TX 77218-8340. Orders may also be placed by fax; send to 713/579-6694. Reference Item #37390 when ordering.

Several product bulletins are now available from **Pelmor Laboratories, Inc.** The two-page data sheet describes the various characteristics of PELSEAL and PEL-

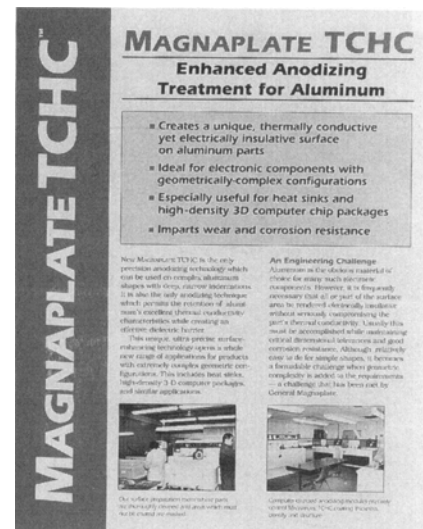
STAL PG fluoroelastomer caulks and sealants, cites numerous industrial uses (e.g., acid-resistant joint sealant for steel and concrete, door gasket adhesive on industrial opens, etc.), includes a chart of physical properties and typical values, and provides application data. Another *describes the properties, uses, and technical specifications for two new colors, blue and white*. A product bulletin is also available describing the properties, uses, and technical specifications for its electrically conductive fluoroelastomer coating/adhesive/sealant. For a copy contact Pelmor Laboratories, Inc., 401 Lafayette Street, Newtown, PA 18940-0309; tel: 800/772-6969; fax: 215/968-6415.

A CD-ROM series produced by the **U.S. Bureau of Mines** provides easy access to a mother lode of minerals information. The latest edition of *U.S. Bureau of Mines Minerals and Materials Information* includes 1994 summary statistics on U.S. production and consumption of more than 90 nonfuel minerals; historical data on 34 key commodities; recent annual statistical reports on 45 different minerals; and selected mineral industry survey reports. The USBM updates this CD-ROM each quarter; the next disk should be issued in October. Future editions will include a general introduction to the Bureau and its programs, an overview of the agency's successful technology transfer efforts, and a dictionary of mineral and mining terms. The latest CD-ROM is available from the Superintendent of Documents, Government Printing Office; stock number is 024-00402408-9. Fax orders to 202/512-2250 or call 202/512-1800.

Miller Thermal, Inc., introduces new technical literature for tube mill metal coating applications. *The four-page brochure describes the arc spray process as used for tube mill applications*. Arc sprayed coatings are used in the aerospace, biomedical, and automotive industries, among others. For more information, contact the Sales Department at Miller Thermal Inc., P.O. Box 1081, N670 Communication Drive, Appleton, WI 54912; tel: 414/734-9292.

Technical information concerning TCHC technology is available from **General Magnaplate**. The process allows the retention of aluminum's excellent thermal conductivity characteristics while creating

an effective dielectric barrier. Specifications include thickness uniformity of $\pm 2 \mu\text{m}$, dielectric strength of 50 V DC for 15 μm , thermal conductivity of 2 W/m · K, combined with excellent abrasion resistance. For copies of the TCHC data sheet, contact General Magnaplate Corp., 1331 Route 1, Linden, NJ 07036.

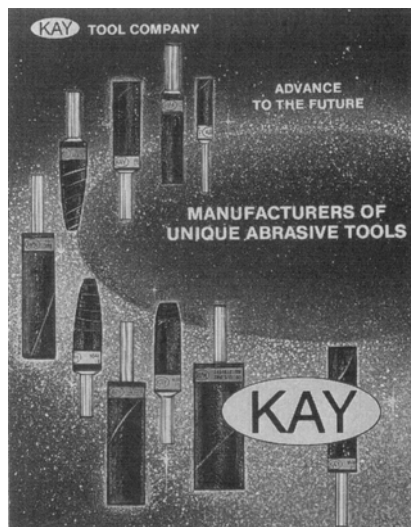


General Magnaplate Corp.

A new brochure from **Vulcanium Corporation** describes economical ways to solve application problems using the company's design and production expertise with coils and other in-tank heat-transfer equipment. The brochure describes Vulcanium's gridcoils, serpentine, "U," and helical coils, as well as custom coils and performance accessories. For a free copy of the new brochure, call Vulcanium Corporation at 708/498-3111 or fax 708/498-3392.

TAFI Inc. has established a home page on the World Wide Web containing graphic and verbal displays of its thermal spray equipment, including arc spray, HVOF, plasma, and integrated automation systems. In a parallel move to increase accessibility to the thermal spray industry, TAFI's product literature is available from the Thomas Register's Literature by fax service. The toll free number is 800/432-9228. For additional information, contact: Joan Rich, TAFI Inc., Concord, NH 03301; tel: 603/224-9585; fax: 603/225-4342.

A new brochure describing the patented line of small abrasive tools has been released from **Kay Tool Co.** A detailed description illustrates the difference between the old method of reduced tool working surface and the new Kay Tool 100% usable abrasive surface. For a copy contact Norman Bevan, President, Kay Tool Company, 3714 Esto Ave., El Monte, CA 91734; tel: 818/575-5224; fax: 818/ 575-5906.



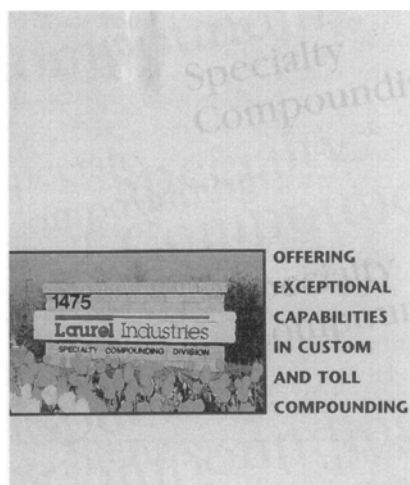
Kay Tool Company

To better serve the materials and metals community's training needs, **ASM International** has created the complete training CD-ROM that covers basic metallurgy, heat treating, materials engineering/science, mechanical working/forming/joining, nonferrous metals, and testing and inspections/quality control. The Training Library on CD-ROM contains 25 homestudy courses totaling 298 individual lessons from ASM's Materials Engineering Institute. A test is included at the end of each lesson so users can gage their knowledge of the lesson. To order the Training Library on CD-ROM preview CD (\$10 credited toward purchase) contact ASM's Member Services Center, ASM International, Materials Park, OH 44073-0002; tel: 800/336-5152, ext. 300; fax: 216/338-4634.

SAE International, the premier source for worldwide vehicle technology information, announces **SAExpress Global Document Service**, a one-stop shop for global vehicle documents. Approximately 81,000 documents from 400 publications,

journals, standards, and conference papers produced by 24 societies around the world are available through this storehouse of technical information. For more information, contact SAE Customer Sales and Satisfaction; tel: 412/776-4970; fax: 412/776-9790.

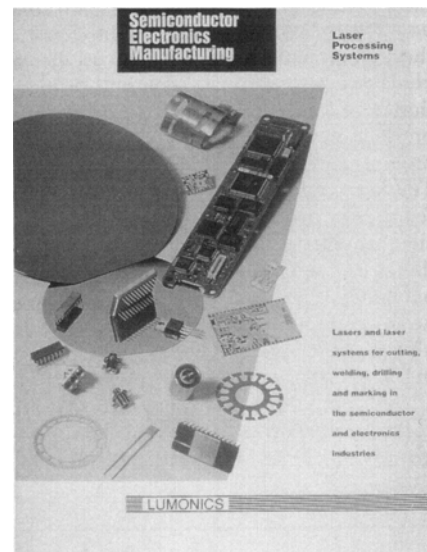
A new color brochure from the Specialty Compounding Division of **Laurel Industries** highlights the company's custom and toll compounding capabilities, which include twin-screw compounding, FCM compounding, resin drying, and metal detection. The brochure also details the facility's laboratory capabilities and company experience with resin, color matching, and the production of color concentrates, precolor compounds, additives, and multifunctionals. For more information, and a copy of this new brochure, contact Laurel Industries, Specialty Compounding Division, 1475 Wolf Creek Trail, Sharon Center, OH 44274-0329; tel: 800/239-0101; fax: 216/239-0102.



Laurel Industries

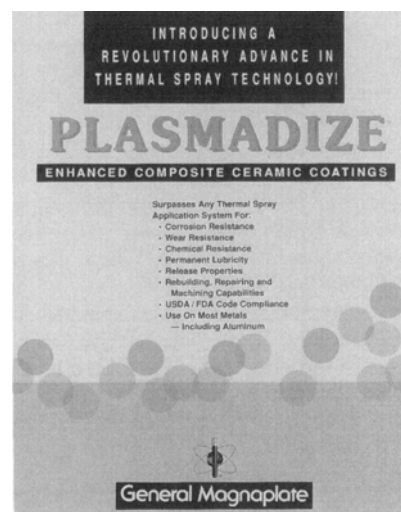
New full color eight-page illustrated brochure presents typical applications in the semiconductor/electronics industries for **Lumonics** lasers and laser systems, including laser marking, cutting, welding, and drilling systems. The text, which explores new, state-of-the-art applications for these systems, is generously supported by photographs of actual applications. Contact Lumonics/Oxnard Operations, 130 Lombard Street, P.O. Box 9010,

Oxnard, CA 93031-9010; tel: 805/485-5559; fax: 805/485-3310.



Lumonics

The plasmadized group of composite coatings composed of layers of metallic and/or ceramic particles infused with polymers is described in an illustrated brochure available from **General Magnaplate Corp.** Brochure shows how PLASMADIZE is ideal for protecting new parts as well as for restoring or repairing worn surfaces. For a copy of the PLASMADIZE brochure, contact General Magnaplate Corp., 1331 Route 1, Linden, NJ 07036.



General Magnaplate

Hamilton Precision Metals Inc. has introduced a new *24-page technical brochure detailing compositions, properties, and specifications of the company's precision tolerance metal alloy strip and foil*. The new literature also includes technical data sheets and charts listing thermal expansion coefficients, electrical resistivity, and thermal conductivity figures for Hamilton's metals and alloys. For free copies of the brochure, call 800/HPM-7065; fax: 717/569-7642; write to: Hamilton Precision Metals, Inc., 1780 Rohrerstown Road, Lancaster, PA 17601-2334.

The 13th Edition of the Materials Handbook has been published by **McGraw-Hill**. It covers the basic properties and characteristics of 15,000 plastics, metals,

alloys, minerals, chemicals, and composites. To order, call 800/2MCGRAW.

Technomic Publishing Co. Inc. has published several books on materials, including *a guide to rheo-physics of multiphase polymer systems, a handbook of industrial textiles, and a compilation of pressure-volume-temperature data for more than 180 important polymers*. To order, contact Technomic Publishing Co., Inc., 851 New Holland Ave., Box 3535, Lancaster, PA 17604; tel: 717/291-5609 or 800/233-9936; fax: 717/295-4538.

TMS has recently published *16 conference proceedings on a wide range of materials, including intermetallics, high-temperature coatings, aluminides,*

and lightweight alloys. Other topics include recycling of metals, solidification processes, and superplasticity. For further information, contact TMS Customer Service at 800/759-4867; fax: 412/776-3770.

MRS has published a number of *conference proceedings on a wide range of materials, including porous materials, thin films, electronic packaging materials, dielectrics, and optical materials*. Other topics include microelectronics reliability, modeling techniques, defect engineering, and surface preparation processes for semiconductors. For further information, contact the Materials Research Society, 9800 McKnight Road, Pittsburgh, PA 15237; tel: 412/367-3003; fax: 412/367-4373.

In Business

Uniroyal Adhesives and Sealant, a division of Uniroyal Technology Corporation, has been named the winner of the annual Inner Circle of Quality Award by Firestone Building Products.

Cancarb Limited has increased production capacity by one-third as a result of construction of a \$16 million expansion to its carbon manufacturing plant, which is expected to be in service by July 1996. Capacity will be increased by 20 million pounds annually.

The Alfred P. Sloan Foundation has awarded the **Minerals, Metals & Materials Society** a grant of \$441,550 as primary funding for the development of a career resource center for the field of materials science and engineering. The center has also received a commitment for financial support from the American Institute of Mining, Metallurgical, and Petroleum Engineers.

The **Advanced Particulate Materials Council** has been formed by the Metal Powder Technology Association to promote and expand the understanding of advanced particulate materials as distinguished from other conventional P/M processes and other competing manufacturing technologies.

ECC International has announced that it has signed an agreement to acquire the business assets, including the mineral reserves, of the **Calcium Products Division of Redland Genstar**. The Calcium Products Division produces ground calcium carbonate products supplied to the plastics, paint, adhesives, caulks, sealants, and paper industries.

GS Technologies Corporation and Georgetown Industries, Inc. have merged to form **GS Industries, Inc.**, which will be the largest producer of steel wire rods in North America.

PPG Industries has begun rebuilding the melting tank at a cost of \$27 million at the company's Meadville plant. This plant produces glass for automotive applications. The company is also doubling its domestic powder coatings production capacity with a new plant in Greensboro, NC.

Pechiney International has agreed to sell its Turbine Components business, which includes Howmet Corporation and the Cercast Group, to a newly formed joint venture between the Carlyle Group and Thiokol Corporation.

BIEC International announced that **Yieh Phui Enterprise Company Ltd.** of Taiwan has taken a license to produce 55%

Al-Zn coated sheet steel, which they will market under the **GALVALUME** trade-name.

Scortec, Inc. has granted a license to the **General Electric Company** for the Scorm plastic injection molding process and has supplied one of its units for installation on a 320-ton Mitsubishi press at GE's Polymer Process Development Center for evaluating the Scorm technology.

Textron Specialty Materials has been awarded an exclusive multiyear life-of-part contract by a major North American automaker for its carbon friction material, which will be used on new automatic transmission designs.

Feralloy Corporation and Armco Inc. have signed an agreement to form a steel processing joint venture, to be known as **Feralloy-Armco Specialty Processing Company**. The company will have the capacity to produce over 100,000 tons of galvanized steel.

NORAN Instruments Inc. has opened an office in Seoul, Korea, to provide international sales and support operations in that country.

PPG Industries has sold its architectural coatings business in France to **Compagnie**

Des Vernis Valentine, the French paints business of Imperial Chemical Industries of Great Britain.

Superconductivity, Inc. has signed a Cooperative Development Agreement with **Silicon Group of Kolding**, Denmark to develop power quality enhancement products for utilities and industries worldwide.

Davy International and Dunaferr RT of Hungary have signed a cooperation agreement for the transfer of training and technology between the two companies. Davy has also been awarded a contract for the supply of an automation gage system for Dunaferr's hot strip mill. Other contracts awarded to Davy include: a continuous galvanizing line and color coating line by **Groupsteel (Malaysia) Ltd**; an aluminum cold mill to **P.T. Alumindo of Indonesia**; a hydraulic automatic gage control system at Algoma's plate mill in Canada; two sets of hydraulically operated interstand loopers at **Hoogovens IJmuiden** of Netherlands; two single-stand slab casters at **Tata Iron and Steel Company of India**; and for cooling systems and slag splashing control systems for **Bethlehem Steel**.

PPG Industries has announced that all production models of the Beech King Air plane will have windshields incorporating PPG's hydrophobic-coated glass, which provides exceptional visibility in rain conditions even without the use of windshield wipers.

The European Powder Metallurgy Association presented its 1995 awards to the following: the Premier award for Innovations in Powder Metallurgy to **Impac Technologies** of Cornelles-le-royal, France for the production by metal injection molding of bracelet clasps; the Award of Merit for New PM Materials to **Mannesmann Demag Huttentechnik-Meer Pulvermetall** of Monchengladbach, Germany, for its development of a water-at-

omized prealloyed steel powder; the Award of Merit for New Developments in PM Processing Technology to **Hoganas AB** of Sweden and **Hoeganaes Corporation** of New Jersey for their warm compaction process; and the Award for Innovation to **Sintertech** of Grenoble, France, for its light sectioned sintered timing pulley supplied to Peugeot-Citroen.

Cabot Corporation has completed a \$2.7 million expansion at its Cabot Performance Materials Division, which doubles capacity for producing flaked tantalum powders used in solid state capacitor applications in the electronics industry.

CIATEQ Engineering has opened a foundry in Mexico, which has a controlled atmosphere cupola furnace designed to handle large castings up to 20 tons. **CIATEQ USA, Inc.**, designers and engineers of special-order metalworking machinery, has moved to its new facilities at Huntingdon Valley, PA 19006.

The International Society for Measurement and Control has merged with its international subsidiary, **ISA International**, which will now be known as **ISA**. The merger assures that international members will receive equal representation and benefits comparable to U.S. and Canadian counterparts.

Advanced Technology Materials, Inc. has acquired the Guardian Systems business of **MG Industries**, which manufactures environmental systems for the semiconductor industry for approximately \$6 million.

Laurel Industries, North America's largest producer of antimony oxide products, has moved its corporate headquarters to a larger facility at 30195 Chagrin Boulevard, Cleveland, OH. Its joint venture partner, **Consolidated Murchison (RSA)**, is also spending \$25 million to develop

additional antimony ore mining operation in South Africa.

Metaullics Systems Co. L.P. has signed an agreement with **EMP Technologies Ltd.** to be the exclusive distributor in North America for the Electromagnetic Metal Pumping System.

In order to consolidate its core work areas for precious metals, **Degussa AG** has incorporated the three work areas—semifinished products, preparations, and electroplating technology—of its Hanau subsidiary **Demetron GmbH** into its Precious Metal Division.

The Arnold Engineering Company has appointed **Dexter Corporation**, Magnetic Materials Division, as exclusive authorized North American Distributor of its molypermalloy powder, Hi-Flux, and Super MSS Magnetic Cores. Dexter will also be a nonexclusive European distributor of these products.

UCAR International Inc. and Konus Icesa S.A. of Rio De Janeiro, Brazil, have signed an agreement for Konus to be a licensee for the UCAR Spray-Cooled Systems business in Brazil, Argentina, Chile, and India.

LTV Steel has reorganized its flat rolled steel commercial functions to improve the company's ability to serve the changing needs of its customers. The company has also consolidated its flat rolled steel order management and customer service functions at a new customer service facility to be located in Cleveland.

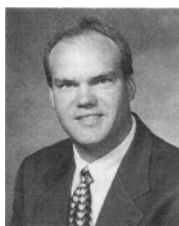
Leica and Carl Zeiss, two manufacturers of electron microscopes, have formed a joint venture called **LEO Electron Microscopy Ltd.**

Kudos

Heatbath Corporation has appointed **Terry Hawk** to a Technical sales position to cover the New England territory in Western Massachusetts. **Dennis Spittler** has been appointed for its Northern Ohio Territory.



Terry Hawk



Dennis Spittler

The **Aluminum Extruders Council** has appointed **David L. Kanagy** to Vice President, who will report to the Council's president.

Michele J. Hooper has been elected to the board of directors of **PPG Industries**. She is vice president of Caremark International and president of its International Business Group. **Dan W. Kiener**, previously corporate controller, has been elected treasurer.

Mike Foster has been named Chief Executive and **Graham Raper** as Vice Chairman at **Davy International**.

Janice Van Deusen and **Mark Blitshtey** have been named Corporate Controller and Vice President, Equipment, respectively, at **Dymax Corporation**. Dymax provides adhesive system technology.

Herbert A. Tews and **Sydney M. Kaufman** have joined forces to form **Technology Management Associates, Inc.** The new consulting firm will provide a broad range of consulting services to clients in the powder metals and advanced materials industries, including aluminum, ceramics, composites, plastics, and polymers.

Republic Engineered Steels, Inc. has named **Joseph F. Lapinsky** as General Manager, Hot Rolled Bar Operations. In this position, Lapinsky



Joseph F. Lapinsky

will be responsible for efforts to improve on-time delivery, increase profitability, maximize cost savings initiatives, etc.

Structural Integrity Associates, Inc. has created a New Product Development organization, and has named **Tony Mucciardi** as director. The organization will be responsible for new software products and modules, new technology, and funded NDE research and development.



Tony Mucciardi

Arthur J. McEvily, a professor at the university of Connecticut, has been named a Fellow of the **American Society of Mechanical Engineers**.

Patrick R. Taylor has been appointed Head of the Department of Metallurgical and Mining Engineering at the **University of Idaho**.



Patrick R. Taylor

The **Fabricators & Manufacturers Association, International** has appointed **Dennis Warwick** to the position of President & CEO of the Croydon Group, Ltd., FMA's publishing arm.

Thomas A. Zeliznak has been appointed Product Manager, Electromagnetic Systems of **Metaulics Systems Co. L.P.**



T.A. Zeliznak

The **American Vacuum Society** announced that the following have received 1995 honors: **Emily Carter**, University of

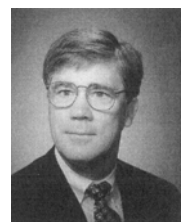
California, the Peter Mark Memorial Award for her work in heterogeneous catalysts and semiconductor processing; **Gerhard Ertl**, Fritz-Haber Institut der Max-Planck Gesellschaft, the Medard W. Welch Award for his work in surface chemistry; **Jan-Eric Sundgren**, Linkoping University, the John A. Thornton memorial Award and Lecture for his contributions in hard coatings; and **Donald M. Mattox**, Management Plus, Inc. the Albert Nerken Award for the invention of the ion plating process.

John G. Merkle received the 1995 **American Society for Testing and Materials** Award of Merit for his work on Committee E-8 in developing standards for characterizing fracture behavior of metals under elastic-plastic conditions.

The following have been appointed 1995-1996 officers of **ISA**: **Ronald B. Jones**, Dow Chemical Company, as President; **Paul T. Arbuckle**, CavCon Systems, Inc., as President-Elect Secretary; **Robert M. Bailliet**, Shell Offshore Inc., as Vice President of the Industries and Sciences Department; and **Terry L. Tolliver**, Monsanto Company, as Vice President-Elect of the same department.



R. Lee Sholley



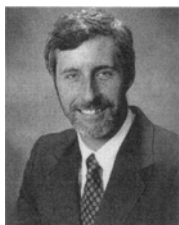
Michael J. Hill



Roger D. Knudsen

The **Timken Company** has named **R. Lee Sholley** as general manager of manufacturing strategy execution, **Michael J. Hill** as general manager of Faircrest Steel Plant, and **Roger D. Knudsen** as director of purchasing and logistics.

Tosoh SMD has promoted *Jeff Stewart* to Vice President, Quality and Human Resources, and *John Hajohn* to Quality Manager. Tosoh provides thin film materials technology.



Jeff Stewart



John Hajohn

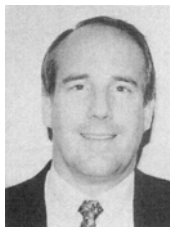
Cold Metal Products, Inc., a producer of specialty strip steel, has appointed *Robert S. Johnson* and *Mark Long* to sales representatives for its Chicago territory.

Richard J. Goldstein, Regents' Professor, University of Minnesota, has been elected president of the **American Society of Mechanical Engineers**.

The American Association of Engineering Societies has selected *Thomas J. Price* as Executive Director. He was previously Director of the Washington office of SAE.

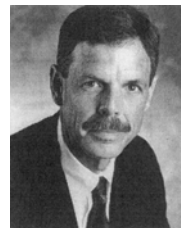
Advanced Refractory Technologies, Inc. has named *Daniel J. Kester* Senior Engineer of Advanced Coatings; *Peter R. Mundt* Engineer of R&D; and *Michael R. Maratin* Engineer of R&D.

Jim Shriner has been appointed Midwest regional sales manager at **Daewoo Machinery Corp.** His responsibilities will include management of the new Midwest technical center.



Jim Shriner

The Budd Company has named *Harold T. Hoffman*, Manager, Management Information Systems, who will be responsible for all company computer operations.



Harold T. Hoffman