WJTA Jet News

Water Jet Technology Association

DECEMBER 1994

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Decoating With High-Pressure Waterjets

By: E. Ray Tanner, President & CEO, United Technologies Corporation, Waterjet Systems, Inc.

The current market for robotic waterjet systems is dominated by abrasive cutting tools, with annual worldwide revenues of more than $300 million and an annual growth rate of 20%. Today, waterjet is used to cut everything from diapers to frozen foods! However, waterjet *decoating* systems represent less than 5% of that market, with applications primarily in the aerospace and automotive industries.

Both cutting and decoating systems include similar components, such as a high-pressure water pump and a robotic manipulator for precise control of the waterjet nozzle. But right about there, the similarities end because the applications are so different.

First, a waterjet cutting stream is good if it's so thin it can't be seen. But a decoating stream is good only if it looks like your bathroom shower!

Second, a cutting system is designed to "slice and dice," but a decoating system is designed to "peel and pamper."

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Typical Decoating Stream

Bullet Resistant Glass

By: Paul Mulloy, Sales Engineer, Vulcan Waterjet Cutting Services

It was time to install the specially constructed bullet resistant glass panels in their frames at the new Milwaukee County Prison, Milwaukee, Wisconsin. But, due to last minute design changes, the glass windows were too large for the existing frames. The glass contractor scrambled to find a solution—*fast*.

The bullet resistant glass is actually comprised of five separate layers: 0.250" of

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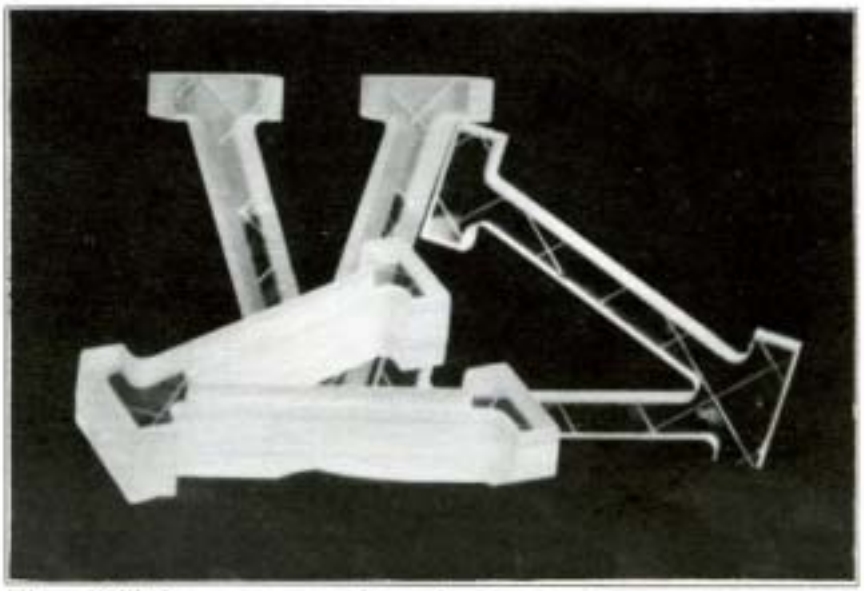

These "V" shapes were cut from the five tiered bullet resistant glass. Photograph courtesy of Vulcan Waterjet Cutting Services.

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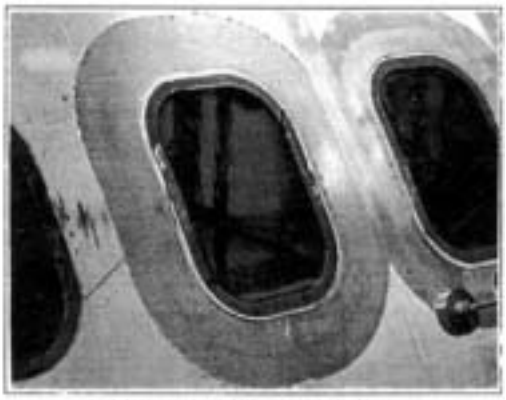
Decoating With High-Pressure Waterjets, from page 1

Current applications for robotic decoating systems include:

(1) Stripping thermal barrier coatings from turbine engine parts.

(2) Stripping paint from aircraft fuselages, radomes, flaps and other airframe parts.

(3) Stripping foulants and paint from large ships, barges and other marine vessels.



Removing Top Layer Of Aircraft Paint

A cost-effective and durable decoating system must have a flexible, heavy-duty robot...flexible enough to reach all surfaces of complex parts, yet strong enough to work all day, with unfailing precision, against a constant backthrust from the high-pressure stream. To understand the role and importance of the robot in these systems, imagine moving a 100-pound weight around with one arm...straight out...all day...then keeping the weight exactly 1/2-inch from a part that costs as much as a Ferrari! Only a robot is crazy enough to try that!!

Manually Decoating A Space Shuttle Motor Segment

But that's the primary purpose of today's industrial robots, isn't it? They do things we're too sane to try or too weak to do. They perform complex, repetitive tasks with unfailing strength, precision and durability.

When we first sprayed water in 1978, as part of United Technologies' USBI Company it was a manual process. Using hand-held wands, we stripped insulation from Space Shuttle Solid Rocket Booster segments after their splashdown and retrieval. By 1987, we were robotically spraying water and applying coatings on booster flight hardware, using the largest gantry robots in the world.

In 1992, United Technologies spun off Waterjet Systems, Inc. to develop and market robotic decoating systems for other aerospace and commercial applications.

The first time we told a commercial engine refurbisher that we could remove their toughest plasma-sprayed jet engine coating with a 55,000 psi

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Pushcart Available From Flow International

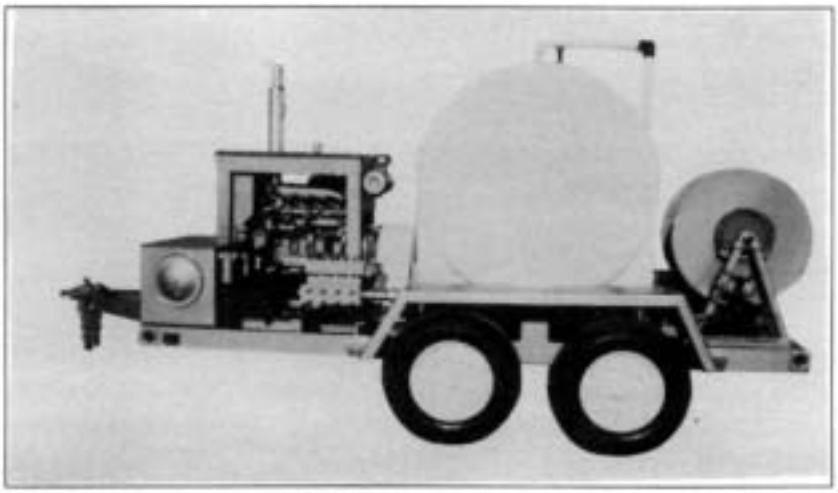
The new **Pushcart**, available from Flow International Corporation, meets the needs of customers seeking a portable ultrahigh-pressure waterjet cleaning system for factory cleaning applications. Compact in size, yet powerful in performance, the Pushcart pressurizes water to 40,000 psi and generates .5 gallon per minute. Applications include removing paint, rust, scale and other coatings in factory cleaning and equipment maintenance operations.

The Pushcart is fully self-contained and includes a propane-powered ultrahigh-pressure pump, an A-3000 hand-held cleaning tool and 50 feet of hose. The pump comes mounted on a cart for easy mobility and fits through a standard size door.

For more information, contact Flow International Corporation, P.O. Box 97040, Kent, Washington, 98064-9740, phone: (800)446-3569, fax: (206)813-3285.

Happy Holidays and Best Wishes for a Healthy and Prosperous New Year from the WJTA Officers, Board of Directors, and Staff

Butterworth Introduces New High Pressure Sewer Cleaner, Ultralite Rotary Jet



104SC Sewer Sweep

Butterworth Jetting Systems Inc. has introduced the **104 SC Sewer Sweep**, a powerful new sewer cleaner built for simple, safe one-man operation for all types of drain and sewer cleaning problems. The Sewer Cleaner is also designed for cleaning pipes from 2" to 36" in diameter using a maximum pressure of 4,000 psi with a flow rate of 27.8 gpm. The maximum flow rate is 58.8 gpm at a pressure of 1,850 psi.

The heart of the Sewer Cleaner is Butterworth's 75 hp T-275L pump which features a solid block fluid end and forged alloy steel crankshaft. Valves and valve seats are stainless steel and the plungers are chrome plated stainless for the "L" fluid end design. The packing is spring loaded and water lubricated while the power end uses a combined splash gravity lubrication system.

Other standard features of the Sewer Cleaner are a John Deere diesel engine, a 730 gallon water tank and an articulating hydraulic hose reel with an 800 foot capacity. Six hundred feet of 5/8" hose rated to 4,000 psi working pressure, a 20 gallon hydraulic reservoir for hose reel operation and a conveniently mounted control panel located at the rear of a heavy duty, reinforced skid are also included. The remote PTO control lever is positioned adjacent to the control panel for maximum operator convenience.

The **Ultralite Rotary Jet**, a new compact, lightweight rotating nozzle for 10,000, 15,000 and 20,000 psi water jetting, provides a superb cleaning pattern with its inline flow and self-propelled swivel. The Ultralite Rotary Jet weighs only two pounds and features minimal water leakage, long seal life and ease of maintenance.

The two tapered tungsten carbide nozzle inserts allow for broader cleaning, deeper penetration and faster job completion. The ultra light design reduces operator fatigue and the unique construction ensures minimal pressure and flow loss.

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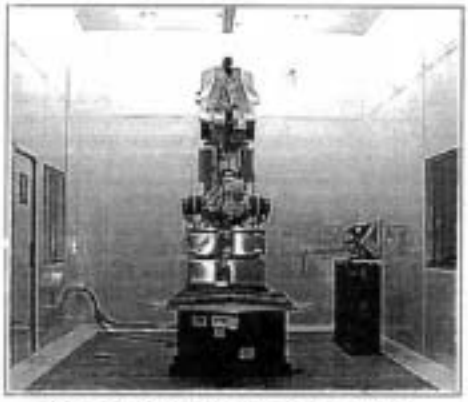
Decoating With High-Pressure Waterjets, from page 2

stream of water, their response was something like: "You want to do *what* to my parts?"

Needless to say, we had some trouble getting high-pressure waterjet within ten miles of the first $100,000 jet engine part! But, today, it's more a question of when can the system be installed and should we be one or two inches away!



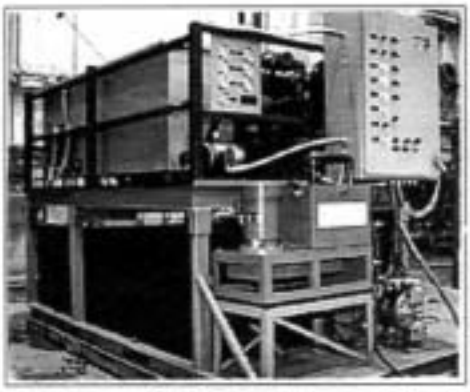
Jet Engine Decoating System

We now have a marketable product line for decoating and depainting jet engine parts, aircraft fuselages and airframe parts, and ships and other marine vessels.

Our Engine ARMS™ Decoating System uses 55,000-psi waterjet to strip tough coatings from jet engine parts. The waterjet process replaces four traditional decoating methods: grit blasting, grinding, machining and chemical soak.

Decoating A Turbine Engine Liner

The system includes a heavy-duty 6-axis pedestal robot that had previously been used primarily for assembly-line welding. Parts are fixtured on a slow-rotating or indexable turntable adding a seventh axis of coordinating motion.



Water Reclamation System

It also includes a water reclamation system that filters the process water and recycles it back to the pump. With today's environmental concerns, a closed-loop system that uses pure water, contains all effluent, and reuses the same water captures the imagination. (I know it captured mine when my engineers first told me what they were planning.)

By mounting the same pedestal robot on a linear track and using a water pump with lower pressure and higher flow rate, the Engine ARMS™ becomes a Component ARMS™ Depainting System. On the track, the robot can depaint larger objects such as wing flaps, or even small vehicles such as Army Humvees.

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New Tools Available From StoneAge

New tools for a variety of water jetting operations are available from StoneAge Waterjet Engineering of Durango, Colorado.

The **FB Swivel**, a heavy duty rotary union for concrete demolition, is rated for 20,000 psi and up to 60 gpm. The FB Swivel is big and strong for tough jobs. An optional hydraulic drive and mounting hardware are also available.

The **SP Positioner** is an alternative to the standard Unidex Positioner for StoneAge lancing machine systems. Designed for working on slabs when moving between many tube bundles, the SP Positioner is self-supporting on four large wheels.

The **SG-Air** is a versatile and economical powered swivel package available in 10,000 and 20,000 psi working pressures with flow rates up to 100 gpm. The SG-Air includes rugged airmoter and gearbox combinations with a wide range of available speeds and works great in floor cleaners, bundle blasters, and spray booths.

The **RS-20K** air powered tool is for lightweight, manual blasting. It has a built-in dump and single trigger control. Now offered in a 20,000 psi version for increased cleaning power. The RS-20K is especially suited for low flow applications (less than 4 gpm) and has been used in paint stripping, asbestos remediation and coatings removal.

For additional information, contact StoneAge Waterjet Engineering, 54 Girard Street, Durango, CO 81301, phone: (303)259-2869, fax: (303)259-2868.

NLB Water-Jets Remove Metal Burrs, Deflash Plastic Parts

Water-jet systems from National Liquid Blasting Corp. (NLB) are helping manufacturers reduce scrap, downtime and warranty claims by quickly and effectively removing the burrs that cause them. Throughputs of 250 parts per hour are common, depending on part configuration and operating conditions.

NLB Water-Jet Systems Remove Burrs Quickly And Clearly.

Deburring is essential to product quality, since the burrs left on machined components by boring, grinding, honing, and other operations can hamper assembly and cause scoring or system damage if they break loose and travel through the system. Manual deburring is labor intensive and often inconsistent while methods using abrasives, steel shot or other media can leave residue which can also cause system problems.

NLB high-pressure water-jet cleaning systems deburr and remove chips quickly, precisely and cleanly, using nothing but water. Patented, rotating SPIN JET® units direct water exactly where it is needed, at the proper flow and pressure to remove the burrs and blast out the chips. NLB systems can even clean the entire part surface at the same time.

In an NLB deburring system, parts can be loaded manually or automatically (e.g., pick-and-place robot, dial index or pallet transfer). An engine component manufacturer, for example, robotically loads a seven-station NLB system to deburr a series of bores and threaded surfaces. Fixed probes and rotating SPIN JETs deliver the high-pressure water. Typical water pressures for deburring are 3,000 to 13,000 psi, and typical systems require horsepower ranges from 15 to 500 hp.

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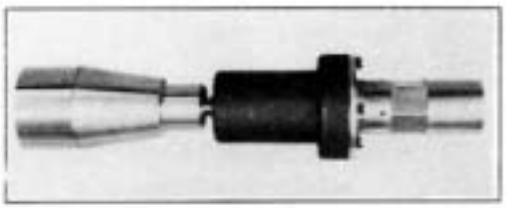
Butterworth Introduces New High Pressure Sewer Cleaner, Ultralite Rotary Jet, from page 3

The standard Ultralite Rotary Jet is designed for 10K, 15K or 20K psi with flow rates that include 11 gpm at 10,000 psi, 8 gpm at 15,000 psi and 6 gpm at 20,000 psi.

The Ultralite Rotary Jet features a stainless steel rotating head, anodized aluminum rotor housing, aluminum bronze body and radial and thrust ball bearings. The nozzle is equipped with a centrifugal speed limiter and rotates at approximately 1,500 to 2,500 rpm.



Ultralite Rotary Jet

Laser-like water jets deliver power for controlled, uniform cleaning or milling of concrete, rusty steel or other hard to clean surfaces. The Ultralite Rotary Jet is adaptable for all guns and for "fixed in place" installations.

For more information, contact Butterworth Jetting Systems Inc., 3721 Lapas Drive, P.O. Box 230312, Houston, Texas 77223-0312, phone: (800)231-3628, fax: (713)643-1514.

CORRECTION

In the **Phillips Machining and Repair Service** advertisement that appeared in the September 1994 issue of *Jet News*, a reference to HP tubing lists an incorrect tubing size. HP tubing available from Phillips Machining includes 1/4, 3/8 and 9/16. Our apologies for the error.

For additional information regarding Phillips Machining and Repair Service prototype work, custom machining and designing, contact Joe Phillips at 28624 27th Place South, Federal Way, Washington 98003, phone: (206)839-2582, fax: (206)941-6893.

Member News

ASME Honors Thomas Kim, Jim Surjaatmadja

Thomas J. Kim, Ph.D., of Wakefield, Rhode Island, and **Jim B. Surjaatmadja, Ph.D., P.E.**, of Duncan, Oklahoma, have each been named Fellows of the American Society of Mechanical Engineers (ASME). The Fellow grade is conferred upon an ASME member with at least ten years of active engineering practice who has made significant contributions to the field.

Dr. Thomas J. Kim is dean of the College of Engineering at the University of Rhode Island, Kingston, Rhode Island. A career engineering educator, Dr. Kim has taught at Villanova and the University of Rhode Island, where he has risen steadily to associate professor, professor, department chairman, and, in 1991, dean of the College of Engineering.

Dr. Jim B. Surjaatmadja is the principal engineer for Halliburton Energy Services, Duncan, Oklahoma. Educated in Indonesia and the United States, Dr. Surjaatmadja has provided innovative solutions to many important oilfield serving problems. His 17 patents cover a range of topics from laboratory instrumentation and high-pressure pump valves to computer hardware and software for efficient data handling.

Dr. Kim and Dr. Surjaatmadja are members of the Water Jet Technology Association. Dr. Kim also serves on the WJTA Board of Directors. Congratulations, gentlemen, on your achievement!

Robert Frankish Joins Blast Technology

Robert C. Frankish was recently named sales manager for Blast Technology, Inc., North Royalton, Ohio. Mr. Frankish is responsible for all sales and marketing of high pressure water jetting products offered by the Cleveland-based firm.

Mr. Frankish joins Blast Technology after spending over 20 years with American Water Blaster and three years with Butterworth Jetting Systems.

Blast Technology rents and distributes high pressure water jetting equipment throughout the Midwest and Eastern United States.

Mike Woodward Joins Butterworth

Mike Woodward, Ph.D., recently joined Butterworth Jetting Systems as a regional sales manager. Dr. Woodward is responsible for

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Catalogs Available

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Tube Bending Equipment Available From Autoclave Engineers

A complete line of tube fabricating equipment designed to produce a high quality bend on a tight center line radius is available from Autoclave Engineers. This equipment uses the rotary draw bending method of tube fabricating to ensure accurate bend locations and angles.

Autoclave Engineers Tube Fabricating Equipment

Autoclave Engineers' tube bending equipment features a three piece family of tools (clamp, slide and radius block) to repeatedly achieve tight tolerances with no tube wrinkling and flattening of less than 5%. The tube benders will facilitate O.D. tube sizes up to 1-1/2" in a variety of tube materials and thicknesses.

The complete line of tube fabricating equipment includes manually operated models, hydraulically operated models with presetable angles, complete tool kits and a carrying case for manual benders. In addition, there are units designed for production beading, flaring and squaring-deburring of tubing.

Autoclave Engineers Fluid Component Division markets valves, fittings and tubing, liquid pumps, gas boosters and air amplifiers, and instrument manifold valves.

For more information, contact Autoclave Engineers Group, 2930 West 22nd Street, Box 5051, Erie, PA 16512, phone: (814)838-5700, fax: (814)838-5811.

Five-Axes Waterjet System Available From Flow International

Flow International Corporation now has available the AF-5800, a five-axes, ultrahigh-pressure waterjet system. Available for less than $300,000, the AF-5800 cuts three-dimensional shapes from metallic and non-metallic materials.

Designed for high- and low-volume applications, the AF-5800 cuts at speeds of up to 400 inches per minute and to accuracy of ±.005 inch. The 5 feet by 8 feet by 2 feet work envelope easily accommodates large pieces of material. The AF-5800 comes integrated with a menu-driven Allen Bradley 9/Series CNC controller for ease of use and enhanced performance.

An optional enclosure keeps the area surrounding the AF-5800 clean of over spray. The enclosure minimizes noise and enables the operator to observe cutting operations through a window.

Manufacturers and job shops may purchase the AF-5800 as a two-axes X-Y machine tool and upgrade to a five-axes system at a later date. The five-axes conversion kit installs easily, allowing users to perform the upgrade in-house.

For more information, contact Flow International Corporation, 23500 64th Avenue South, Kent, Washington 98032, phone: (800)446-3569 or (206)813-3364.

Bullet Resistant Glass, from page 1

glass with stainless steel mesh imbedded in it, three strips of polycarbonate that together total 0.500" and a final sheet of 0.125" glass. All are solidly bonded together. The manufacturer could have refabricated the custom laminated pieces to the new size, but the lead time of six to eight weeks was unacceptable.

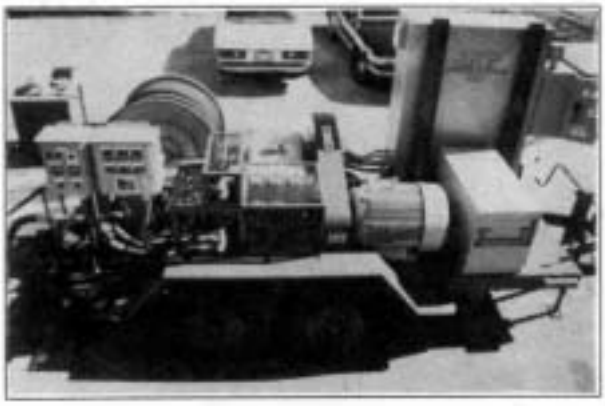
After exploring traditional methods of cutting these unusual glass pieces, the contractor opted to utilize Vulcan Waterjet Cutting Services. His choice was based on time, cost and the quality of the end result.

The abrasive waterjet's high speed erosion process cut cleanly through all five layers of the laminated bullet resistant glass at the rate of ten inches per minute. The total cost of reworking all the windows on the waterjet was significantly less than the price of two diamond tipped saw blades that would have been consumed during a more traditional cutting procedure. Since the waterjet's cool erosion creates no heat, no induced stress or distortion, no hairline cracks and no burrs, there was no additional finishing required on the material's edges.

"The turnaround time was even more phenomenal than the quality of the finished pieces," a relieved glass contractor was overheard remarking at the job site. "We called Vulcan Waterjet on Tuesday morning with this problem, and they delivered the downsized windows to us Wednesday afternoon!"

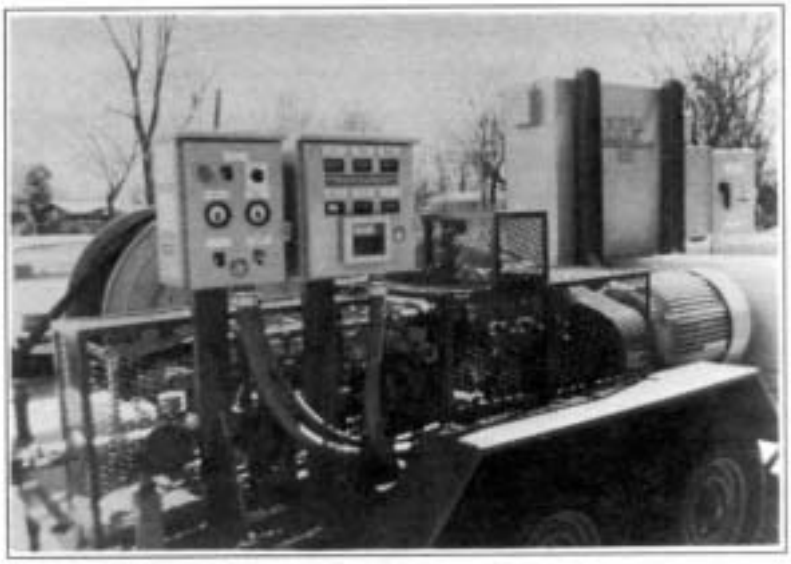
Vulcan Waterjet Cutting Services was created to provide a broad range of customers the advanced technology of high speed abrasive cutting. Advantages of the waterjet include prototype to production with no tooling, full CNC capability, no thermal deformation, multidirectional cutting and environmentally sound kerf and water recovery. To demonstrate these unique capabilities, Vulcan provides free sample cuts. For more information, call Vulcan Waterjet Cutting Services, (800)932-5323 or (414)645-2040.

Jetting Systems Ships Radiation Decontamination Unit



Jetting Systems and Accessories, Inc., of Houston, Texas, recently shipped its second pumping package to Westinghouse Hanford Co. in Richland, Washington. The units are to be used at a Department of Energy site for decontaminating radioactive equipment.

The pumping systems may have the most sophisticated instrumentation packages ever installed on a water jetting unit. A variable frequency drive permits the operator to "dial in" the desired flow (from 0-50 gallons per minute). Signals from transducers and a turbine meter permit the operator to monitor inlet water temperature and pressure as well as discharge pressure, water temperature, flow rate and total flow. The equipment was also furnished with connections to permit total operation and monitoring from a remote location.



Jetting Systems and Accessories, Inc., specializes in custom water jetting packages and accessories. For more information, contact JSA, 10110 Hardison Lane, Houston, Texas, phone: (713)939-0015, fax: (713)939-7326.

Mike Woodard Joins Butterworth, from page 6

Butterworth pump and Liqua Blaster sales for the Western United States, Central and South America, Australia, New Zealand, Japan, Hawaii and Alaska.

Previously employed by American Water Blaster and AquaDyne, Woodward brings his extensive knowledge of mechanical engineering and, in particular, water jetting pump design, to assist in developing new water jetting products for Butterworth.

Woodward was one of the founding members and board members of the Water Jet Technology Association in 1985 and one of the original committee members who helped to develop the safety recommendations and procedures for the water jetting industry.

Flow Names Dick LeBlanc Vice President, Sales

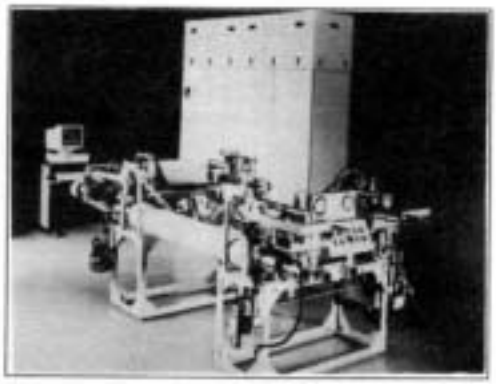
Dick LeBlanc has been named vice president, domestic sales of Flow International's waterjet material separation division. LeBlanc will manage Flow's sales activities from the company's Detroit facility.

LeBlanc possesses extensive experience in marketing turnkey waterjet cutting systems to automobile and aerospace manufacturers and their suppliers.

Prior to joining Flow, LeBlanc worked for ASI Robotics, Detroit Michigan, a manufacturer of motion control systems and an integrator of Flow waterjet equipment. LeBlanc was also a sales manager for Duramation, Inc., Oak Park, Michigan, where he was responsible for direct sales in the Midwest area and managing the company's domestic sales team, and a sales engineer at MPT Drives, Inc.

Autoclave Engineers and Hughes Aircraft Announce Agreement

Autoclave Engineers, Inc. and **Hughes Aircraft Company**, a subsidiary of GM Hughes Electronics Corporation (GMHE), have signed an exclusive worldwide license and technical support agreement to commercialize systems for cleaning manufactured parts. The systems, which do not degrade the environment, utilize super-critical fluid technology developed by both companies. They offer a safe alternative to traditional chlorofluorocarbons (CFCs) and other chlorinated solvent based cleaning systems which are harmful to the environment. Globally, the Montreal Protocol and the U.S. Clean Water and Air Act call for replacement of the chlorinated cleaning systems by the end of 1995.



Autoclave Engineers Enviropro® System

The Autoclave Engineers Group, an operating unit of Autoclave Engineers, Inc., through its EnviroPro Technologies® business segment will design, manufacture, market and service the systems worldwide. Hughes will assist with the commercialization efforts in the areas of customer support, cleaning chemistry, process technology, and equipment design.

Super-critical fluid cleaning is an ideal process for cleaning precision manufactured parts using non-toxic carbon dioxide as the cleaning agent. The EnviroPro® System can remove organic and inorganic contaminants from a wide range of surface materials. The system provides a number of process, environmental and cost advantages over CFCs and other chlorinated solvents.

GMHE is a global company engaged in the design, manufacture and marketing of advanced electronic systems. GMHE specializes in defense electronics, automotive electronics, telecommunications and space, and commercial technologies.

Autoclave Engineers, Inc., headquartered in Erie, Pennsylvania, with subsidiaries in Erie; Yorba Linda, California; and Nogent, France, is a recognized leader in providing high quality precision flow control products and systems to the semiconductor, chemical, petrochemical and related industrial process markets worldwide.

Newly Revised Recommended Practices Now Available

The new ***Recommended Practices for the Use of Manually Operated High Pressure Water Jetting Equipment***, third edition, is now available.

The ***Recommended Practices***, third edition, was prepared by the Safety Committee (formerly the Standards Committee) of the Water Jet Technology Association and represents months of review and study in order to provide you with the most up-to-date information. The ***Recommended Practices*** includes suggestions for personnel qualifications, operator training, and procedures for the proper operation of all types of manually operated high pressure water jetting equipment used by the construction, maintenance, repair, cleaning, and demolition industries.

The ***Recommended Practices*** may be purchased from the Water Jet Technology Association. Discounts are available on bulk orders. To place your order, complete the form at the right.

☐ **YES,** please accept my order for *the WJTA's Recommended Practices.*

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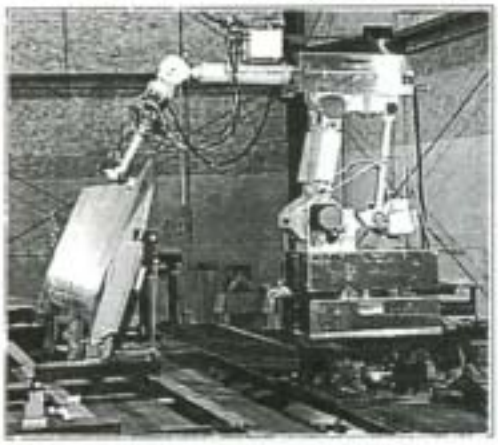
By Mail – Fill out the order form and mail with applicable payment to: **WJTA, 818 Olive Street, Suite 918, St. Louis, MO 63101-1598.**

Decoating With High-Pressure Waterjets, from page 4



Component Depainting System

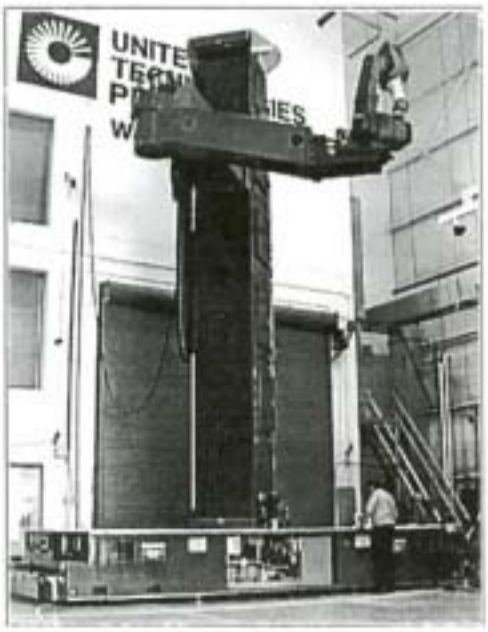
The Aircraft ARMS™ Depainting System is the world's largest mobile robot. It includes a 6-axis manipulator that can reach over its head and under its base. The manipulator is positioned by a 21-foot arm on a 30-foot vertical column...all transported on an automatic guided vehicle. The system uses pure water in a closed-loop process that will replace traditional toxic chemicals and labor-intensive sanding processes.

Recently, we demonstrated a Ship ARMS™ Depainting System. It includes a 6-axis robotic manipulator on a standard 5-axis teleoperated lift. It not only strips multilayered marine paint, but also captures the effluent at the nozzle. The paint particles are filtered out and the process water is reused!

While these products would not be possible without robotics, they would only be fancy—and expensive—"blasting" machines without a high-tech nozzle. For precision decoating, the nozzle must distribute the waterjet energy evenly across the surface to be decoated. That's "where the rubber meets the road," so to speak. We've developed a proprietary computer program to design what we call "Even-Energy™" nozzles.

With these nozzles, we can use a precise single-pass decoating process, rather than multiple passes, to remove all the coating. We can also rework any area that might not clean up, such as small hot spots in an engine combustor liner. The single-pass process is also ideal for decoating asymmetric objects, such as helicopter rotor housings or aircraft radomes; for these, a large number of coordinated 7-axis motions must be used to assure that the waterjet nozzle tracks the complex geometry of the part.

While we've proved that the technology works, most buyers have to justify a system based on return on investment, or payback, calculations. With more than two years of R&D and field use, our data shows that an Engine ARMS™ can decoat parts an average of 86% faster than conventional methods...some parts up to 97% faster! An engine system, operated one shift and decoating only 10 parts a day in a $50-per-hour shop, will pay for itself in about 12 months.



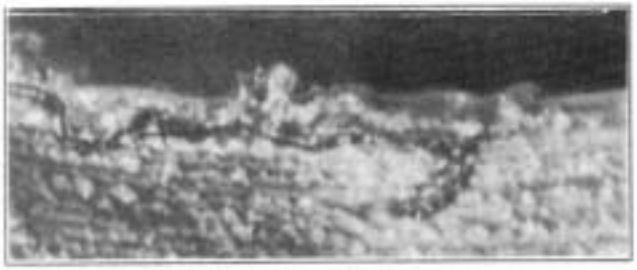
Aircraft Depainting System

continued on page 15

NLB Water-Jets Remove Metal Burrs, Deflash Plastic Parts, from page 5

Plastic parts for everything from automobiles to computer circuits have something in common—removing the flash, or excess material, that results from the injection molding process. Increasingly, molders are finding that high-pressure water-jet cabinets from NLB deflash parts cleanly, quickly and cost-effectively.

High-Pressure Water-Jets Deflash 100,000 Parts Daily



Before Deflashing

After Water-Jet Deflashing

(Photos at 70x magnification)

An automotive components manufacturer, for example, deflashes 100,000 parts per day in three cabinets powered by a single NLB pump. High-pressure water (3,000 to 10,000 psi), directed through precision nozzles, consistently trims the flash from two critical surfaces. The half-inch-diameter parts are oriented after entering a cabinet, then are deflashed and discharged into a chute. Water is retained, filtered and recirculated in a closed-loop system.

Waterblasting offers several advantages for deflashing applications. Media blasting can trap media on the parts, requiring additional cleaning. The media can also plug small holes in the parts. Waterblasting, however, thoroughly cleans in just one operation. NLB deflashing systems can save thousands of dollars annually in secondary cleaning and warranty claims.

NLB manufactures a full line of quality water-jetting systems for many uses, including parts cleaning, deburring, tank cleaning, descaling, paint removal, surface preparation, concrete demolition, concrete and pipe cutting and more. For more information, contact NLB Corp., 29830 Beck Road, Wixom, MI 48393-2824, phone: (810)624-5555, fax: (810)624-0908.

Abstracts Due Now For 8th American Water Jet Conference

Authors who wish to present papers at the 8th American Water Jet Conference should submit abstracts immediately to ensure consideration. Although the deadline date for abstract submission has passed, abstracts will be accepted through December 30, 1994.

To submit an abstract(s), please complete the Abstract Submission Form on page 14 of this issue and forward to the attention of the Conference Coordinator at the Water Jet Technology Association.

University of Rhode Island Receives Best Technical Paper Award

A paper presented by the researchers at the Waterjet Research Laboratory of the University of Rhode Island was selected as the best technical paper at the 12th International Conference on Jet Cutting Technology held at Rouen, France on October 24-27, 1994. The paper, "Development of a Parameter Prediction Model for Abrasive Waterjet Turning" was coauthored by **Dr. Jay Zeng** of Ingersoll-Rand; **Samuel Wu** of Aqua-Dyne, Inc., and **Dr. Thomas Kim** dean of the College of Engineering, University of Rhode Island. The award was sponsored by Boride Products Inc. and was presented by Boride representative **Greg Mort** at the gala dinner reception.

8th American Water Jet Conference

August 27-30, 1995 • JW Marriott Hotel • Houston, Texas • USA

Announcement And Call For Papers
Deadline For Abstracts Extended to December 30, 1994

Impressive progress and a fast-growing understanding of the diversified applications of water jet technology is generating a growing excitement in the industry. New techniques and applications are being developed and current ones are being improved upon. Water jet technology, now being used in nearly all types of industry — manufacturing, mining, construction, concrete, stone, aerospace, engineering, process, and medical industries — continues to expand at a rapid pace.

The **8th American Water Jet Conference** will focus, from a practical and scientific viewpoint, on the most up-to-date industry advances in water jetting equipment, techniques, and applications. Some of the areas to be addressed include but are not limited to:

- **Contractor Applications and Processes**
- **Jet Mechanics**
- **Jet-Material Interaction**
- **Safety and Environmental Protection**
- **Process Modeling and Control Studies**
- **Excavation, Tunneling, and Mining Applications**
- **Drilling Applications**
- **Rock Cutting**
- **Cleaning and Coating Removal**
- **Construction and Non-Manufacturing Applications**
- **Manufacturing Processes**
- **Advanced Industrial Applications**
- **Components and Systems**
- **Novel Jets and Applications**
- **High Pressure Equipment and Systems**
- **Abrasives, Water, and the Environment**
- **Advances In High Pressure Technology**
- **Market and Future Needs**

Commercial and academic authors are encouraged to submit titles and abstracts for consideration. To submit an abstract(s), please complete the Abstract Submission form on the back of this sheet and forward to the attention of the Conference Coordinator at the Water Jet Technology Association. **The deadline date for submission of abstracts has been extended to December 30, 1994.**

An Abstract Review Committee consisting of six referees, chosen from the Organizing Committee and the International Advisors, will review the abstracts. Authors will be advised by **January 31, 1995**, regarding the decision of the Abstract Review Committee.

The 8th American Water Jet Conference is organized by the **Water Jet Technology Association** and is endorsed by the **International Society of Water Jet Technology**. The Water Jet Technology Association looks forward to providing this forum and to your involvement and participation.

8th American Water Jet Conference

August 27*-30, 1995
JW Marriott Hotel Houston, Texas

Abstract Submission Form

To submit your abstract(s) for consideration, please complete this form. Abstracts are to be submitted **NO LATER THAN DECEMBER 30, 1994**, to ensure consideration. Authors will be advised by January 15, 1995, regarding the decision of the Abstract Review Committee.

Author Information

(Please print or type)

Name _____

Position/Title _____

Company/Organization _____

Street Address _____

City, Province _____ State _____

Country _____ Zip, Postal Code _____

Business Telephone _____ Fax _____

Signature _____ Date _____

Paper Information

Authors/Titles _____

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Extended abstract (500-1,000 words. Use separate sheet as needed.)

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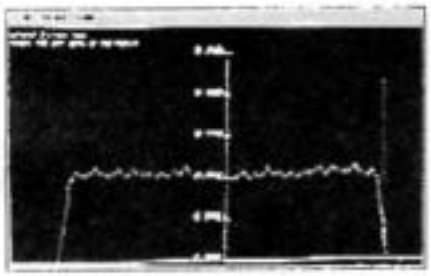
*August 27 is reserved for a Waterjet "Short Course" and Conference Reception.

Mail completed form and abstract, **NO LATER THAN DECEMBER 30, 1994**, to: **Conference Coordinator, 8th American Water Jet Conference, Water Jet Technology Association, 818 Olive Street, Suite 918, St. Louis, MO 63101-1598, USA, telephone: (314)241-1445, fax: (314)241-1449.**

Decoating With High-Pressure Waterjets, from page 11

Ship Depainting System

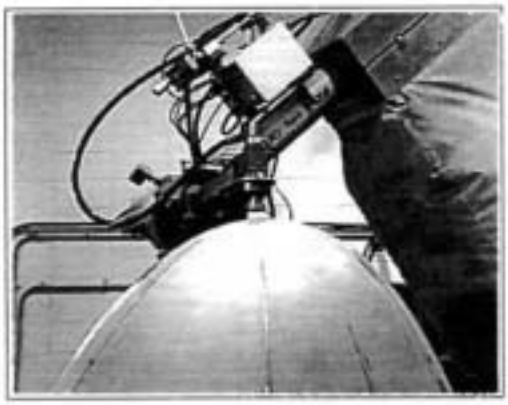
In summary, robotic waterjet decoating is finding many new applications in commercial, industrial and military maintenance...and robotics made it all possible.



Even-Energy Nozzle™ Pattern

Now, we're ready to depaint that Ferrari (if the owner will let us get close enough)!

E. Ray Tanner is the president and CEO of United Technologies Corporation, Waterjet Systems, Inc., P.O. Box 070019, Huntsville, Alabama 35807-7019, phone: (205)721-5561, fax: (205)721-5550.



Depainting An Aircraft Radome

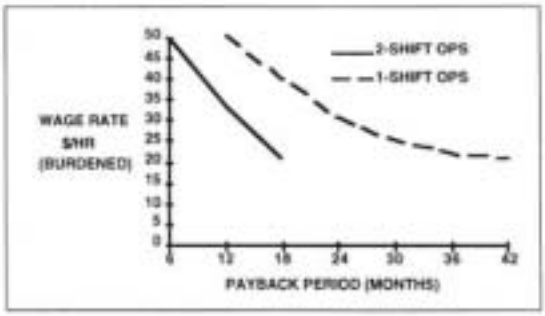
Acquisition Of Water Jet Patents By Dynaflow, Inc.

Dynaflow, Inc. is pleased to announce its recent acquisition of all patents concerning the cavitating and self resonating interrupted fluid jet technologies denoted by the names CAVIJET™, SERVOJET™, and STRATOJET™.[1] These fluid jet technologies greatly increase the erosivity of the fluid jet by the deliberate introduction of cavitation and/or acoustic resonance, resulting in improved cutting and cleaning capabilities and reduced pump power requirements. The CAVIJET™ technology utilizes cavitation to produce extremely high, very localized stresses during collapse of vapor bubble cavities resulting in greatly enhanced erosivity for cutting and cleaning. SERVOJETS™ create a passive acoustic resonance by flow interaction with the nozzle that results in the production of a series of high speed liquid drops or slugs. The unsteady water hammer type pressures generated by these drops impacts on a surface and greatly enhances jet erosivity. The STRATOJET™ technology utilizes passive acoustic resonance to produce a series of vortical rings of cavitation which have been found to be very effective in cutting and drilling at high ambient pressures such as in oil wells. All of these patented methods of jet erosivity enhancement are accomplished passively by nozzle design and employ no moving parts. Members of the Dynaflow staff have been centrally involved in the past and ongoing development of these technologies. Through its R&D activities, Dynaflow is presently continuing to improve these technologies and develop new jet technologies.

Dynaflow, Inc. is an applied sciences research and development company located in Fulton, MD that provides contract R&D, consulting, and testing services in fluid mechanics, applied mathematics, environmental sciences, software development, and materials studies. Dynaflow, Inc. has been actively involved in water jet technology research, development, and applications since its inception and provides a range of water jet technology services. These include custom nozzle and system design, scale model testing, cavitation effects assessment, and jet erosivity characterization and enhancement. Dynaflow, Inc. is actively seeking to commercialize and license its jet technology.

For more information, contact Dr. Kenneth M. Kalumuck, Dynaflow, Inc., 7210 Pindell School Road, Fulton, MD 20759, phone: (301)604-3688, fax: (301)604-3689.

[1]A non-exclusive license to come of this technology is held by Hydro-Services.



Payback Period For An Engine System