WJTA Jet News

Water Jet Technology Association

FEBRUARY 1991

Published by the Water Jet Technology Association for the benefit of its members

818 Olive Street, Suite 918 • St. Louis, MO 63101, USA • Telephone: 314/241-1445, FAX: 314/241-1449

From the president's desk...

Plans are advancing for the Sixth American Water Jet Conference to be held in Houston, TX, August 24-27, 1991. Abstracts of the prospective papers have been examined and a tentative program has been selected. Notices will be sent to authors by the end of February. Final papers will be due on May 15.

The conference will begin on Saturday, August 24, with a short course on Water Jetting Technology. It will end on Tuesday, August 27 with a tour of five sites where water jetting will be demonstrated.

Fifty technical papers will be presented on such topics as Abrasive Jets-Material Removal Mechanisms; Excavation/Tunneling Applications; Construction and Nonmanufacturing Applications; Mining Applications; High Pressure and Systems; Abrasive Jets-Fluid Mechanics and Nozzle Design; Novel Jets and Applications; and Direct Pumping of Abrasive Suspension Jets.

In addition, panel discussions will be held on practical aspects of water jetting.

The Board of Directors will review plans for the convention at a meeting in Chicago on March 2. Members are urged to contact the President if they wish to have an item placed on the meeting agenda.

– George A. Savanick, Ph.D.

In this issue

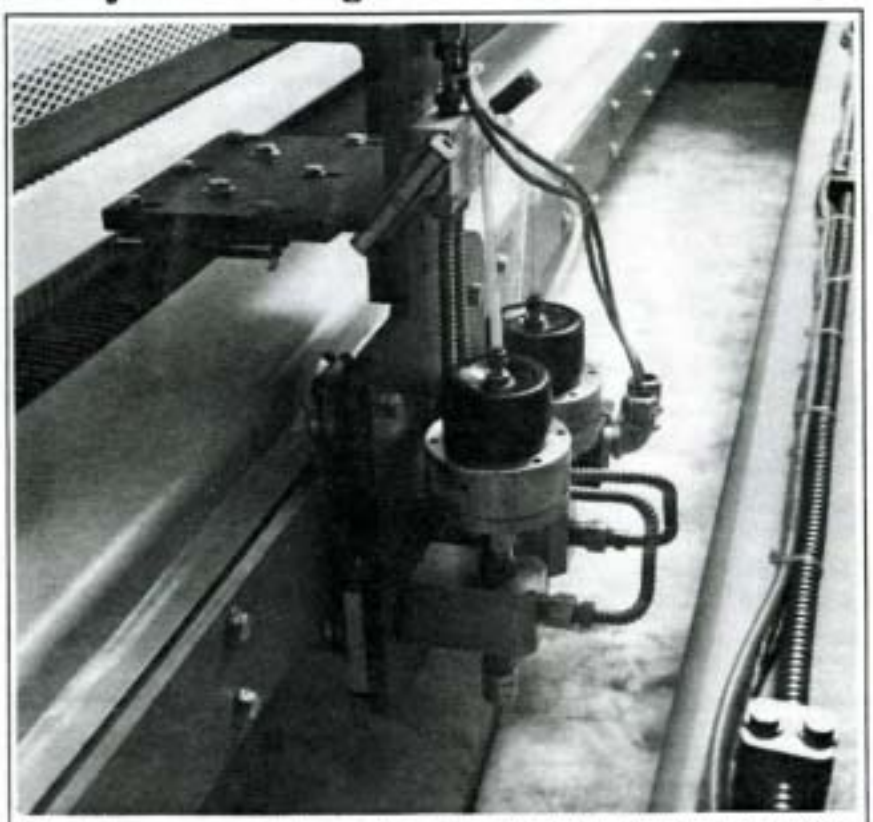
Abrasive jets cut jet engine parts ..... *pg. 2*

6th American Water Jet Conference ..... *pgs. 4-5*

Abrasive jets cut metal, marble and glass ..... *pg. 7*

Plasma torch vs. abrasive water jet for stainless steel .. *pg. 9*

Water jets cut fiberglass insulation uniformly



Ultra high-pressure water jet crosscutting systems from Flow International Corp. offer high-accuracy and dust-free cutting of fiberglass insulation up to R-38. Photo courtesy of Flow International Corp.

One of the toughest problems in manufacturing fiberglass insulation is slitting the blanket to make small, uniform sheet sizes. The teeth of traditional guillotine shears tend to compress the blanket, backing up the line for a fraction of a second and making it hard to calibrate for the next cut.

To solve this problem, Flow International Corp. has developed a water jet crosscutting system for use on insulation up to R-38. A hair-thin stream of water, pressured to 55,000 psi, slits easily through fiberglass blankets, at line speeds as high as 300 feet per minute. This finely focused stream offers clean cuts with minimal wetting.

Previously, manufacturers using shears were required to leave a tolerance of 1 to 1¼ inches when slitting batt lengths to 4 and 8 feet. With Flow water jet slitters, the tolerance can be as little as ¼ inch. Reduction in product loss alone can more than pay for the Flow water jet cross-cutting system in less than one year.

The crosscutter carriage is equipped with two water jet cutting nozzles for complete operational redundancy. A second carriage is often installed on the opposite side of the beam, allowing for shorter cut lengths and backup redundancy of the carriage.

For more information, contact Flow International, 21440 68th Avenue South, Kent, WA, 98032, (206)872-4900.

Administration

Association Office

Water Jet Technology Association
ATTN: Dr. George Savanick
818 Olive Street - Suite 918
St. Louis, MO 63101, USA
(314)241-1445 FAX: (314)241-1449

Jet News is published by the Water Jet Technology Association and is a benefit of membership in the Association.

The use of specific product names in the *Jet News* does not imply endorsement by the Water Jet Technology Association.

Abrasive jets improve quality, reduce cost of jet engine parts

Flameco, a division of Barnes Group, Inc., Ogden, UT, recently purchased a PASER™ II abrasive jet (AWJ) cutting system to improve fabrication of aircraft engine components and air-frame structures. Parts and assemblies produced by Flameco are used in the C-17, F-16, F-15, F-14, the Advanced Tactical Fighter, and many other military and commercial aircraft.

Flameco abrasive jet operator Robert Kirchmer times the set-up of the PASER II™ cutting head to produce military aircraft engine parts from stainless steel, titanium and other materials. Photo courtesy of Flow International Corp.

Manufactured by Flow International Corp., Kent, WA, the PASER™ II is the newest and most technologically advanced AWJ cutting equipment on the market today. It is rapidly replacing both traditional cutting tools and older, competitive abrasive jet cutting systems.

According to Jerel Arnell, manufacturing manager, Flameco chose the AWJ system "because we do a lot of short runs and we're often cutting contour parts. Abrasive jets work well in each case." Arnell estimates 70-80 percent of the material cut is titanium, but Flameco also uses the PASER™ II on aluminum, Inconel and other high-temperature alloys.

Before installing the AWJ system, Flameco people usually hand-trim parts, using scribe and saw methods. AWJ's reduces operator intervention, resulting in lower labor costs and less scrap. "Abrasive jets don't cut as fast as a laser," explains Arnel, "but they also don't create heat-affected zones – and that is critical in working with titanium."

Flameco uses two separate PASER™ II abrasive jet cutting systems, one of which is integrated with a Westinghouse five-axis Unimate 600 robot.

A sheet metal shop serving the aerospace industry, Flameco has 225 employees and has been in business 22 years. Customers include the U.S. Air Force, McDonnell Douglas, General Electric, Pratt & Whitney, Boeing, and other major manufacturers.

For more information, contact Flow International at (206)872-4900.

Ingersoll-Rand and ABB Robotics create European joint venture

Woodcliff Lake, NJ, January 1 – Ingersoll-Rand Company and ABB Robotics, Vasteras, Sweden, a unit of Asea Brown Boveri, today announced the formation of a joint venture company that will market robotized water jet cutting systems throughout Europe. Robotized water jet cutting systems currently are used within the automotive industry for cutting automotive trim parts, such as door panels, head liners, carpets and instrument panels. The joint-venture company, ABB I-R Robotized Waterjet AB, will be based in Ronneby, Sweden.

(continued on page 12)

When you need quality High Pressure Valves, Fittings and Tubing delivered on time . . . specify Autoclave Engineers

In the water jet industry, it's mandatory you have reliable high pressure components capable of operating at pressures to 60,000 psi. Autoclave Engineers has more than 40 years experience in high pressure technology. We build our valves and fittings by the book . . . our Quality Control Manual, because we have high regard for high pressure and for our water jet customers. This manual is your assurance you are getting the highest quality product available . . . at any cost.

Autoclave has a wide range of high pressure components for the water jet industry in addition to our valves, fittings and tubing. Autoclave also is a source of supply for manifold blocks and valves, accumulators/attenuators and custom articulation coils. Eleven coned and threaded tubing sizes are available as well as all types of specialty and custom designed high pressure products. Autoclave is your one-stop source for quality high pressure components. And we ship from stock to arrive just-in-time to meet your schedule.

Remember, the Autoclave difference is in the book — and in the valve. For additional information, contact:

Autoclave Engineers

Autoclave Engineers, Inc. 2930 W. 22nd St.
Box 4007 Erie, PA 16512 USA (814) 838-2071

6th American Water Jet Technology Conference

August 24-27, 1991

Westin Galleria Houston, Texas

- *Identify new markets!*
- *Learn the newest water jetting techniques and applications!*
- *Trade information with colleagues from around the world!*
- *See the largest-ever collection of water jetting equipment, components and related products!*
- *See live demonstrations of water jetting equipment in a variety of settings!*

Whether you are an expert, researcher, or novice in the rapidly growing industry of water jet technology, this conference is ideal for you. You will meet colleagues from around the world and review, discuss, and exchange ideas on all aspects of water jetting.

RESEARCH & DEVELOPMENT PAPERS

In addition to scientific and technical sessions, over 50 research papers will be presented covering topics such as abrasive jet borehole mining, concrete cutting, cavitating water jets, abrasive water jetting, new developments in nozzle heads, water-jet-cut surface quality, cutting metallic materials, rock tunneling, control valves, inseam longhole drilling in coal, maneuvering and controlling high pressure jets, rock kerfing, robotic water jetting cells within the automotive and aerospace industries, concrete demolition, cutting thin sheet metal, precision machining, abrasive suspension jets, and hydro-abrasive cutting.

WATER JETTING SHORT COURSE

An OPTIONAL one-day course on the fundamentals of fluid jet technology will be held on Saturday, August 24. This course covers the basics of fluid jets, including a historical perspective; fluid mechanics of various types of jets; and basic jet performance, equipment and applications. The Short Course is taught by a team of leading educators from the water jetting field.

TECHNICAL TOUR AND FIELD DEMONSTRATIONS

A technical tour of five firms specializing in water jet systems will be held on August 27. Field demonstrations of various systems and equipment will be held at each site.

EXHIBITION

Plan ahead to get the most out of this marketplace of high-tech water jetting equipment and supplies. Learn how these industry vendors can best serve you.

CONFERENCE PROCEEDINGS

Each full or combo Conference registrant will receive one (1) hardbound copy of the complete Conference Proceedings. Extra copies will also be available for purchase. The Conference Proceedings contain all the papers, complete with illustrations and photographs, presented during the Conference.

HOTEL ACCOMMODATIONS

The Westin Galleria is the official hotel for the 6th American Water Jet Technology Conference. Reserve your hotel accommodations now to take advantage of the low group room rates of $79 single occupancy or $84 double occupancy. To reserve your room(s), complete the hotel reservation form on page 11, or call the Westin Galleria directly at (713)960-8100. Be sure to identify yourself as a participant in the WJTA's 1991 Conference.

SIX WAYS TO ATTEND

1. **FULL CONFERENCE:** Includes admission to all technical and scientific sessions (except Short Course), exhibition, coffee breaks, luncheons, receptions, banquet, and technical tour and demonstration. **Each full registrant also receives one hardbound copy of the official Conference Proceedings.**
2. **COMBO:** Includes everything listed under Full Conference **PLUS** admission to the Water Jet Short Course.
3. **DAILY ATTENDANCE:** Includes admission to all technical and scientific sessions, exhibition, coffee breaks, and luncheon for one day. Daily registration on Tuesday also includes the technical tour and demonstration.

   NOTE: The official Conference Proceedings and admission to receptions and/or the banquet are NOT included in the daily registration fee. The Proceedings or optional function tickets must be purchased separately.
4. **WATER JETTING SHORT COURSE**
5. **EXHIBIT HALL ONLY**
6. **TECHNICAL TOUR ONLY**

WJTA members receive a special discount off the regular registration fees. You will also receive a special additional discount if your registration is postmarked or received in the WJTA office by **August 15, 1991**.

To register, complete all portions of the form on page 5. Please print or type all information.

THREE EASY WAYS TO REGISTER

BY PHONE

Just call **(314)241-1445** and have your credit card information ready. (MasterCard/VISA ONLY).

BY FAX

Here's our 24-hour FAX number for your convenience **(314)241-1449**. Fill out the registration form with your credit card information.

BY MAIL

Fill out the registration form and mail with applicable payment to:

WJTA
818 Olive Street - Suite 918
St. Louis, MO 63101 USA

☐ **YES,** I want to learn the latest water jet technology developments and applications. Please register me for the 6th American Water Jet Conference.

☐ Please keep me on your mailing list for additional information.

Name: _____

Title: _____

Company: _____

Address: _____

_____ Postal Code: _____

Telephone No.: ( )_____ Fax No.: ( )_____

Information for name badge:

_____

(give name as you wish it to appear on badge)

PAYMENT METHOD

☐ Check enclosed payable to **6th American Water Jet Technology Conference** (U.S. DOLLARS ONLY).

☐ MasterCard ☐ VISA

_____ _____

Credit Card Number Exp. date

_____

Print name as it appears on card

_____

Cardholders signature (required for validation of payment)

CONFERENCE REGISTRATION FORM:

Join the Water Jet Technology Association now and receive a substantial discount off Conference registration fees.

WJTA MEMBERSHIP

☐ $40 Individual membership ☐ $250 Corporate membership = $_____

	WJTA MEMBER		NON-MEMBER		
	Before 8/15/91	*After 8/15/91*	*Before 8/15/91*	*After 8/15/91*	
☐ **Full Conference** ONLY	$375	$405	$415	$445	= $_____
☐ **Combo** (Full Conference and Water Jet Short Course)	$510	$540	$550	$580	= $_____
☐ **Daily** (check day)	$150/day	$165/day	$165/day	$180/day	
☐ Sunday ☐ Monday ☐ Tuesday	____ days × $_____				= $_____
OPTIONAL					
☐ **Water Jet Short Course** ONLY	$195	$210	$215	$230	= $_____
☐ **Extra Conference Proceedings** (1 copy included in Combo and Full registration packages)	$ 75	$ 90	$ 75	$ 90	= $_____
☐ **Extra Banquet Tickets** ____ @	$ 45	$ 50	$ 45	$ 50	= $_____
☐ **Exhibit Hall Admission** ONLY	$ 10	$ 10	$ 10	$ 10	= $_____
☐ **Technical Tour & Demonstration** ONLY	$ 75	$ 85	$ 75	$ 85	= $_____

TOTAL ENCLOSED $

Performance UNDER PRESSURE

...Up To 20,000 PSI.

To illustrate a point, Butech ball valves are the ultimate in design and performance. Our 316 cold drawn stainless steel construction assures long lasting pressure performance. The blow-out proof stem and ball design, with 1/4 turn positive shut-off, guarantees precise control of liquid or gas flow up to 20,000 psi. A variety of configurations and end connections are readily available.

We also offer a complete line of high pressure fittings, carefully engineered to meet all of your specific requirements.

When you're ready for the ultimate design and performance in high pressure ball valves and components, look to Butech. Because when the pressure's on . . . Butech performs.

ButTech
PRESSURE SYSTEMS

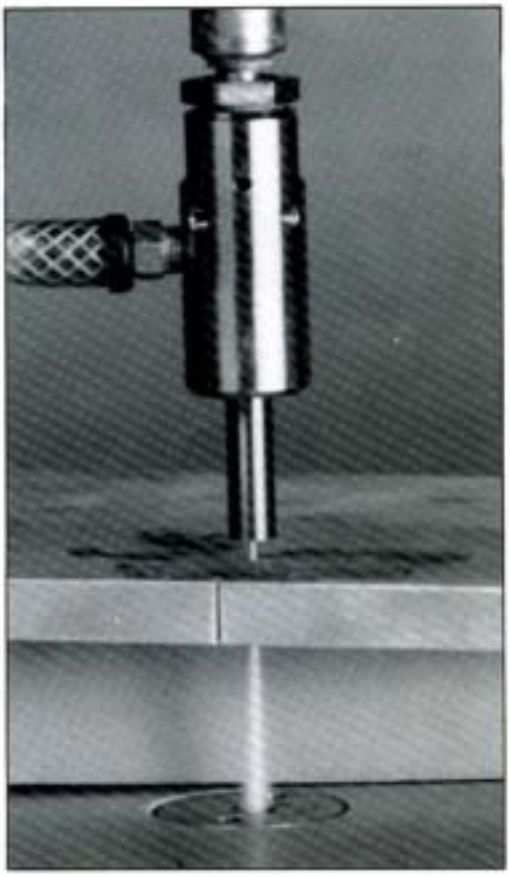
4928 Pittsburgh Avenue • Erie, PA 16509 • 814/833-4904 • FAX 814/833-2612

Make your reservations now to attend this one-of-a kind clinic...

SUCCESSFUL APPLICATION AND IMPLEMENTATION OF WATERJET CUTTING SYSTEMS

Learn the latest in . . .

- Robotic and computer integration
- Applications for abrasive and non-abrasive jet cutting
- Cost justification, setting parameters, fixturing
- Operation safety
- Water treatment, and waste handling



March 19-20, 1991

Sheraton Cleveland City Centre Hotel
Cleveland, Ohio

Sponsored by the Society of Manufacturing Engineers

Continuing Education for Productivity and Technological Growth.

SUCCESSFUL APPLICATION AND IMPLEMENTATION OF WATERJET CUTTING SYSTEMS

March 19-20, 1991

Sheraton Cleveland City Centre Hotel
Cleveland, Ohio

Waterjet Cutting is an effective technique for cutting metals and tough non-metallics such as: metals bonded or hybridized with plastics, including epoxy, graphite, Kevlar(TM), fiberglass, aluminum, titanium, and steel. A cost effective cutting and trimming tool, waterjet technology can:

- Eliminate tool sharpening requirements
- Increase production speeds
- Reduce dust, noise, heat, warpage, and sanitary problems
- Achieve net shape accuracies
- Produce finished-cut quality

10 Clinic Benefits

By attending this clinic you will...

1. Find out the latest developments in automated waterjet cutting technology
2. Evaluate and compare complimentary and competitive methods
3. Learn how water treatment can improve your tool life
4. Discover practical applications and limitations
5. Meet others like yourself who are willing to share experiences
6. Have your questions answered in a professional and educational environment
7. Find out how robotic and computer integration can maximize your operation's performance
8. Grasp the facts on key issues for successful implementation
9. Strengthen your understanding of the waterjet cutting process during open information exchange sessions
10. See equipment from system manufacturers and integrators during the tabletop product displays

Receive Your Free Clinic Proceedings

A bound volume of materials directly related to automated waterjet cutting technology is being prepared for each attendee. A copy of this valuable resource tool will be reserved for you when your registration is received. This one-time printing is only available to clinic attendees.

Tabletop Product Displays

Examine state-of-the-art equipment at the tabletop product display on Tuesday evening. Exhibitors will display parts, models, equipment, company products, informational literature, and more. This is an excellent opportunity to ask questions on a one-on-one basis, and speak with others who have direct knowledge of applications similar to yours.

Note: if your company is interested in exhibiting, contact Kristen Dudash at SME: (313) 271-1500, ext. 399.

Clinic Chairman

David A. Summers, Ph.D., Curators' Professor of Mining Engineering and Director, High Pressure Waterjet Laboratory, University of Missouri-Rolla, will chair this clinic. Dr. Summers has been actively involved in the field of high pressure waterjets for over 15 years. He has been involved with research and teaching in the areas of high pressure waterjets, mining engineering, and has published over 100 articles. Dr. Summers is a member of numerous professional associations, and is currently Chairman of the Board of the Waterjet Technology Association and Chairman of the Standards Committee.

Clinic Schedule:

Day One

Registration: 7:00–8:30 a.m.
Technical Sessions: 8:30 a.m.–4:30 p.m.
Tabletop Exhibits: 4:30–6:00 p.m.

Day Two

Technical Sessions: 8:00 a.m.–3:00 p.m.

Clinic Conclusion

Daily: Morning coffee and danish, and afternoon refreshment breaks will be provided. Group Luncheons will be served.

Please Note: Smoking will not be allowed in the meeting room.

Clinic Agenda:

Day One

Welcome and Opening Remarks

Kristen Dudash, SME
David A. Summers, Clinic Chairman, University of Missouri-Rolla

Waterjets – Their Place in Metals Processing

This paper will compare waterjets vs. die cutting, milling, EDM and lasers. Material utilization, cutting speed, surface finish, tooling costs and lot sizes will be included in the ratings. Single and dual cutting head waterjet machines and their hardware requirements will be included in the presentation.
Robert E. Kiehl, President, Remcon, Inc.

Alignable Abrasive Waterjet Nozzle System

Improper alignment between sapphire nozzle and carbide focusing tube is a key factor in poor cutting performance of abrasive waterjets. This presentation will discuss the development of a new alignable nozzle system that overcomes many of the shortcomings of traditional systems. The new system eliminates operator's subjectivity, and offers safety, off-line alignment and simultaneous alignment with respect to the cutting head.
Dr. Pawan Singh, Research, Ingersoll-Rand Waterjet Cutting Systems

Close Tolerance Abrasive Jet Cutting

In order to abrasive jet cut to very close tolerances (+/- .001") or less you need to have very sophisticated abrasive jet components along with a closed loop process control system. Through the use of our turbine blade cutting system as an example, we will discuss the parameters effecting tolerances and how they were addressed.
H. Steve Davis, Account Executive , Jet Edge, Inc.

Implementation of 5-Axis Robotic Waterjet Cells within the Automative and Aerospace Industries

This presentation will include case histories of various applications demonstrating the flexibility and capabilities of a robotic waterjet system. The following points will be discussed:

- Tooling concerns in relation to waterjet cutting
- Capturing spent water
- Noise abatement
- Off-line generated part programs

Dick LeBlanc, Sales and Marketing Manager, ASI Robotic Systems

Abrasive Waterjet Case Studies

Since the abrasive waterjet has evolved into a viable and versatile non-traditional machining process, a host of applications have emerged resulting in a large number of successful installations. Case studies of such installations will be presented covering the spectrum of the most common and cost-effective applications. In addition to the case studies, recent technological developments will be briefly discussed.
Tom Stefanik, Regional Manager, Flow International Corp.

Review of the Waterjet and Abrasivejet Cutting Techniques Developed from the Job Shop Production Practices

This presentation will discuss various methods and techniques to yield high quality cut parts. The cutting techniques for metal matrix composites, ceramics, thermoplastic and tool steel are discussed. The effects of process parameter setting on the life of consumable items are reviewed in depth for varied cutting conditions. The application limitations with respect to the equipment and the process are analyzed by using actual production data and job shop experiences of using abrasive waterjet cutting in the manufacturing environment.
Jayanta (Jay) K. Guha, President, Monaken Technologies, Inc.

SME Hosted Reception and Tabletop Product Exhibits

Day Two

Next Generation Waterjet and Abrasive-Waterjet Technologies

This presentation will discuss the on-going program designed to develop the next generation technology. The program is outlined as follows:

* Nonabrasive machining with super pressure
* Development of manipulator system requirements
* Direct suspension pumping
* Intelligent nozzle
* Process modeling and knowledge base development

Kerry Barnett, Project Manager, National Center for Manufacturing Sciences

Waterjet Cutting in a Production Environment

Waterjet cutting methods cover a vast spectrum of applications in a variety of industries. This presentation covers three different industry applications:

* Abrasivejet glass cutting for the electronic industry (x-y machine)
* Robotic cutting of Resin Transfer Molded (RTM) automotive components
* Multiple nozzle conveyors for de-casing bottling lines

Duane Snider, Sales and Marketing, Waterjet Specialties, Inc.

Laser Cutting and Waterjet Cutting: Complimentary Processes

This presentation will discuss how laser and waterjet cutting are being used as complimentary processes. Topics for discussion include:

* Advantages and limitations of both
* Sensativity to heat affected zones
* Isolation of work areas
* Cost justification
* Maintenance

Robert R. Ulrich, President, Laser Application, Inc.

Automated Abrasivejet Cutting of Graphite Epoxy Composite Panels

This case history will provide a comprehensive review of the process and system requirements for precision abrasivejet cutting of Graphite Epoxy Composite Panels. Included will be discussions pertaining to the composite material being processed, cutting speed and edge finish requirements, an overview of the high pressure cutting technology employed to satisfy these needs and a detailed review of the fully automated cutting cell developed to accommodate the specific pattern geometry and panel size.

David J. DiNicola, Manager, Robotics, Inc.

Water Treatment Processes for Waterjet Cutting

This paper will focus on the three major processes that are being used for raw water treatment for waterjet cutting applications:

* Softening
* Reverse osmosis
* Deionization

Robert McFaul, National Accounts Manager, Culligan International

Regulation of Wastewater From Machinery Manufacturing and Rebuilding

The U. S. Environmental Protection Agency has underway a project to collect basic information about and establish regulation of the wastewaters generated in the manufacture of metal machines and metal parts. This project which is collecting basic information from about 1,000 plants will serve as the data base for regulations to be proposed in 1993.

Ernst P. Hall, Chief, Metals Branch, U.S. EPA

Safety, Waste Handling, and Environmental Issues

David A. Summers, Ph.D., Curators' Professor, University of Missouri-Rolla

Wrap-up and Clinic Conclusion

Although changes are not anticipated, SME reserves the right to amend this agenda if necessary.

To register: Call the SME Customer Service Center at 1-800-733-4SME

Questions: Call Kristen Dudash at SME (313) 271-1500, extension 399.

[illegible]STRATION INFORMATION

TO ATTEND: Complete the registration form and mail to: Society of Manufacturing Engineers, Customer Service Department, One SME Drive, P.O. Box 930, Dearborn, MI 48121-0930.

REGISTRATION INFORMATION: Registration fees must be paid in advance of the event. The fee includes [illegible] **ON-SITE REGISTRANTS** [illegible]

To confirm your registration, phone SME directly at 1-800-733-4SME or mail the attached form. Upon receipt of your registration, SME will send an invoice confirming the arrangements. **MAIL ALL REGISTRATIONS AT LEAST 2 WEEKS PRIOR TO THE EVENT. ALL REGISTRATIONS AFTER THAT DATE MUST BE MADE BY PHONE.**

CANCELLATIONS: Registrations cancelled 7 days (or less) prior to the event are subject to a $50 service charge. Checks are refundable minus the $50 service charge. You must obtain a cancellation number from our registrar to verify cancellations. Participants with confirmed reservations who fail to notify SME of a cancellation prior to the event are subject to the full fee. [illegible] cancellations are subject to a 50% service charge.

TAX DEDUCTION: An income tax deduction may be allowed for expenses of education (including registration fee, travel, lodging, and meals) undertaken to maintain and improve professional skills (Treas. Reg. Sec. 1.162-5). Deductions for business and educational meals are generally limited to 80% of the cost. The sponsor(s) will be subject to this limitation for meals provided by the sponsor(s). It is presently unclear whether the limitation will be applied to the participant as well. Participants should consult a tax advisor to determine whether this limitation is applicable.

METHOD OF PAYMENT: All checks should be made payable to SME in U.S. funds. Registration and payment must be made before the event date to guarantee admittance. If payment has not been received prior to the event date, you will be asked to guarantee payment against a credit card (VISA, MasterCard or American Express) or provide a company or personal check, money order, or traveler's checks. We suggest if your payment has not been mailed to SME at least 2 weeks prior to the event that you plan to pay on-site. You may register by phone using your VISA, Master Card or American Express credit card.

TEAM REGISTRATIONS: A 10% discount is available to your organization if two people register at the same time and attend together. In the event of any cancellations, the 10% discount will not apply and full registration fees will be charged.

EDUCATOR/STUDENT REGISTRATIONS: Educational discounts are available to qualified full-time faculty or full-time students for many events. To take advantage of these discounts, [illegible] and students must respond in writing with verification full-time college or university [illegible] NO PHONE REGISTRATIONS, PLEASE. For complete registration information, contact [illegible] Professional Education Department of SME.

REGISTRATION FEE: SME Members: $455.00 Nonmembers: $555.00

NOTE: IF THE MEMBERSHIP NUMBER (for members of SME or one of its associations) IS NOT INDICATED, YOU WILL BE BILLED AT THE NONMEMBER RATE.

ONLY PAID REGISTRANTS WILL BE GRANTED ADMISSION TO THE EVENT.

☐ **Yes, I will attend the "Successful Application & Implementation of Waterjet Cutting Systems"** clinic, March 19-20, 1991 at the Sheraton Cleveland City Centre Hotel, Cleveland, Ohio.

Please Type or Print **No. 2745[illegible]**

NAME ______

TITLE ______

NAME ______

TITLE ______

COMPANY ______

DIVISION ______

COMPANY MAILING ADDRESS (include street and/or P.O. Box, City, State, Zip Code and Country)

______

______

______

TELEPHONE ( ) ______ ______ TELEX ______
AREA CODE EXT.

☐ SME Member No. ______

☐ SME Affiliate No. ______

☐ Nonmember

NOTE: IF THE MEMBERSHIP NUMBER IS NOT INDICATED, YOU WILL BE BILLED AT THE NONMEMBER RATE. MEMBERSHIP NUMBERS ARE NOT TRANSFERABLE.

METHOD OF PAYMENT

☐ Payment enclosed ☐ Authorized charge to my credit accoun[t]

☐ This confirms telephone registration P.O. No. ______

(If you are charging your registration to a credit card, please complete this section)

Note: For your reference only, this does not constitute payment)

Check one: ☐ VISA ☐ MASTERCARD ☐ AMERICAN EXPRESS

Signature ______

Card# ______

Exp. Date ______

SME CODE 1 2 3

Society of Manufacturing Engineers

SUCCESSFUL APPLICATION AND IMPLEMENTATION OF WATERJET CUTTING SYSTEMS

March 19-20, 1991

Sheraton Cleveland City Centre Hotel
Cleveland, Ohio

Members and Company Team Registrants Eligible for Discounts

If you are a member of SME, or any of its associations, you are eligible for the member discount rate. Just have your member number ready when phoning in your registration, or be sure to include it on the registration coupon. If you are not currently a member, but would like to receive information about joining SME, contact our membership representative at (313) 271-1088. Your membership application and dues must be received 30 days prior to the program to be eligible for the discounted member rate for this program. Please see the attached coupon for rate information and additional registration details.

Team Discount: A discount of 10% off each registration will also be extended if two or more members of your organization register at the same time and attend this clinic together.

Lodging Information

All sessions for the "Successful Implementation and Application of Waterjet Cutting Systems" clinic will be held at:

Sheraton Cleveland
City Centre Hotel
777 St. Clair Avenue
Cleveland, Ohio 44114

Room Reservations:
(216) 771-7600
(Mention SME to receive our reduced rates!)

A block of rooms at reduced rates of **$89 single** and **$99 double** is being held at the Sheraton Cleveland City Centre Hotel for attendees of this clinic. Rooms in the SME block not reserved by **February 25** will be released. After this date, reservations will be accepted on a space availability basis and the reduced rate will not be guaranteed. Make your reservations by calling the hotel directly at (216) 771-7600.

Location: The Sheraton Cleveland City Centre Hotel is conveniently located downtown in the heart of the business district, directly next to the Cleveland Convention Center and only 20 minutes from Hopkins International Airport. The Playhouse Square and the Flats entertainment district are within walking distance and the Cleveland Stadium and Galleria Shopping Complex are nearby.

Transportation: The hotel provides shuttle service for $8.00 each way to and from the Hopkins International Airport. Rates are subject to change. Vans leave the airport at exit 2 (lower level) every hour and ten minutes from 7:00 a.m.–11:45 p.m. Indoor parking is available at the hotel for $7.00 per day (hotel guests) and $8.00 per day (non-hotel guests).

The Manufacturing Engineering Certification Institute has approved this clinic for 12 Professional Credits toward the SME Recertification Program

Society of Manufacturing Engineers
Courses & Clinics Department
One SME Drive, P.O. Box 930
Dearborn, MI 48121-0930

SUCCESSFUL APPLICATION AND IMPLEMENTATION OF WATERJET CUTTING SYSTEMS

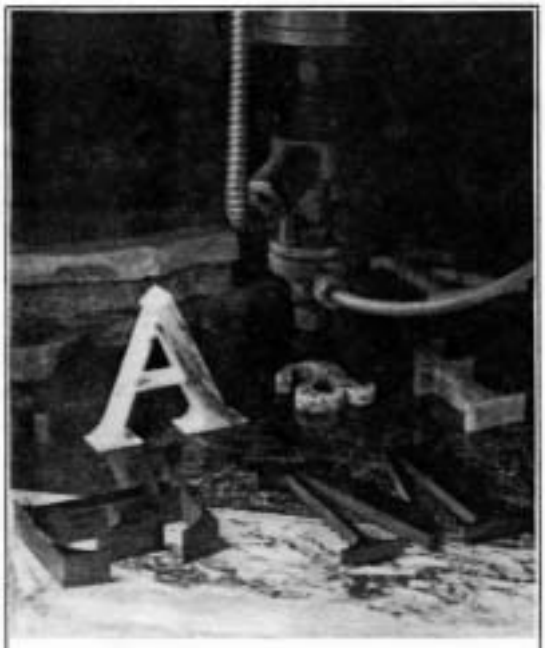
March 19-20, 1991
Sheraton Cleveland City Centre Hotel
Cleveland, Ohio

Steel Art uses abrasive jets to carve big niche in sign market

How does a family-owned sign company compete effectively on a national level?

In business since 1954, Steel Art began as a small regional sign shop serving end-users. By the early 1980's, company president John Borell, son of founder Norbert Bell, recognized his company had to specialize in order to survive in the highly competitive sign fabrication field.

"Instead of trying to be all things to customers, we chose to focus on what we did best," said VP Stewart M. Dobson. "That was the creation of unique, high-quality metal letters for interior and exterior signage and images for corporate identities."



Boston-based Steel Art Co. relies on advanced, computer-controlled abrasive jet cutting equipment from Flow International Corp. to maintain its position as the U.S.'s leading manufacturer of metal letters and logos for architectural signage. Photo courtesy of Steel Art Co.

In the next several years the company grew enormously to become the premier wholesaler of metal sign letters. Steel Art now grosses more than $2.5 million annually and employs 26 people. Its signs grace the lobbies and exteriors of such prestigious buildings as Ritz Carlton hotels, the Richard M. Nixon Library, the Chrysler Museum, the IBM Tower and countless Fortune 100 corporations including Ernst & Young, Merrill Lynch, Gillette and Westinghouse.

In 1986, Steel Art personnel saw a television show that revolutionized the company's business. The program, devoted to new manufacturing technologies, showcased an abrasive water jet cutting system invented by Flow International of Kent, WA. Known as the PASER™ (for "particle stream erosion"), the equipment uses thin streams of water, mixed with common abrasives and pressurized to 55,000 psi, to cut everything from tool steel to ceramic tile.

In the past, Steel Art used traditional routers and other mechanical cutters to profile letters, primarily from stainless steel. "They worked okay," said Dobson, "but we were really looking for a more reliable, flexible cutting system that could handle every metal we worked with, plus marble and glass."

Dobson contacted Flow International and robot manufacturer ESAB and they supplied a large-scale abrasive jet cutting table. The equipment was installed in late 1987, and today it cuts 100 percent of the Steel Art product line. It operates 12-16 hours per day, up to 6 days a week.

"We can now create images and finish letters in ways we only used to dream about," explained Dobson. "So when corporations – or their architects and interior designers want something really special, we can easily provide it."

Responding to Market Demand

Last year Steel Art purchased a new PASER II abrasive jet system and in doing so, created an extension of its product line and broadened its market.

(continued on page 11)

Butterworth buys Weatherford's Jetting Division

Houston, TX (Jan. 10, 1991) – Houston-based Butterworth Jetting Systems announced the purchase of the American Water Blaster Division of Weatherford U.S., Inc., a subsidiary of Weatherford International, Inc.

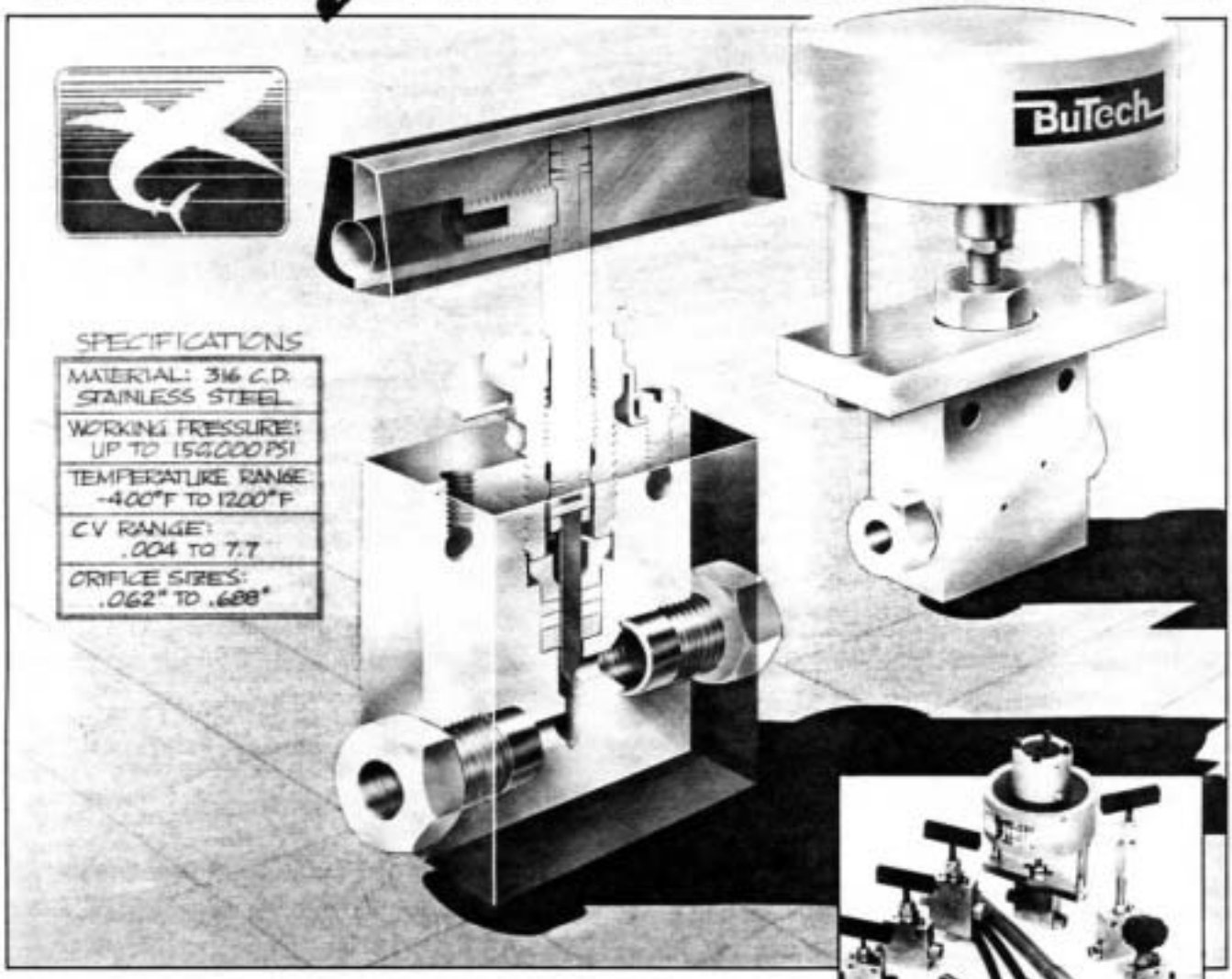
Butterworth Jetting makes high-pressure pumps and water-jetting equipment similar to products manufactured by the American Water Blaster Division. Customers for this equipment include industrial end-users and cleaning contractors who perform service work in process industries. The American Water Blaster Division supplies proprietary products to the U.S. military.

According to Mike Ginn, president of Butterworth Jetting, American Water Blaster's predecessor was one of the first U.S. companies to commercialize high-pressure water-blasting systems by offering portable units in the early 1960's. In the mid-1960's, Butterworth Jetting, then operated as Partek Corp., began manufacturing similar equipment. Partek was acquired by Exxon in 1979 and operated as Butterworth, Inc., until Ginn reacquired the company in 1986. Since its repurchase, it has been operated as Butterworth Jetting Systems, Inc., developing a complete line of high-pressure pumps and water-jetting systems. Butterworth Jetting employs 60 workers at its southeast Houston facility, and fiscal 1990 sales are expected to approach $9 million. Most of Weatherford's American Water Blaster Division employees have joined Butterworth Jetting.

Commenting on the acquisition, Ginn stated that "American Water Blaster is a good fit. We should increase market share while adding the military business and a line of complementary products." Ginn said that he expects Butterworth Jetting revenues to increase significantly because of the American Water Blaster acquisition.

A Weatherford spokesman said the sale was in keeping with Weatherford's strategy to shed noncore businesses and focus on its drilling and completion-oriented oil field services and products business.

Performance UNDER PRESSURE



...Up To 150,000 PSI.

To illustrate a point, Butech high pressure valves and fittings take water jet technology to the extremes. Our all corrosive resistant construction, with a choice of exotic alloy stem tips, guarantees long lasting pressure performance under extreme conditions. The non-rotating stem design, with adjustable packing below threads, allows precise control of gas and liquid flow at pressures from vacuum up to 150,000 psi. A variety of configurations and end connections are readily available.

We also offer a complete line of high pressure fittings, carefully engineered to meet all of your specific requirements.

When you need to take water jet technology to the extremes, call Butech. Because when the pressure's on . . . Butech performs.

BuTech
PRESSURE SYSTEMS

4928 Pittsburgh Avenue • Erie, PA 16509 • 814/833-4904 • FAX 814/833-2612

Abrasive jets cut stainless steel

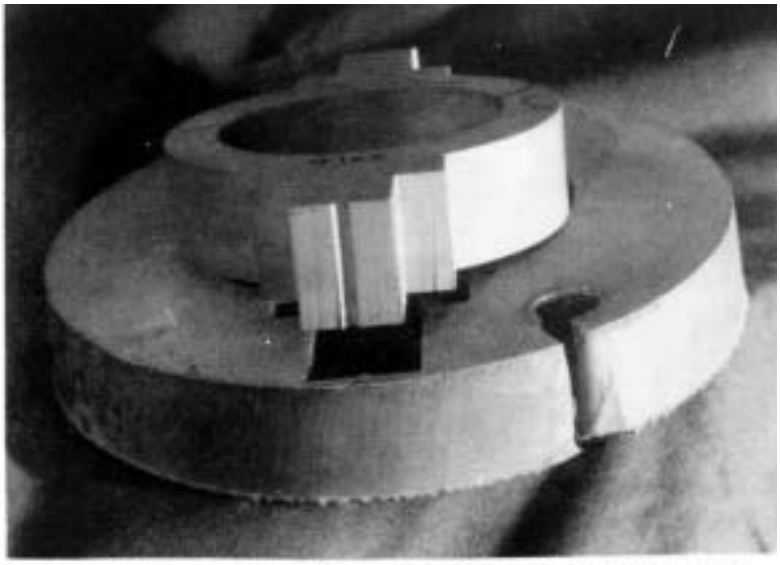
Dear Jet News:

The article entitled "Water Jets Apportion Food and Cut Space-Age Materials" in the December 1990 issue of the *Jet News* triggered us to contribute some potential editorial material and some information for the *Jet News*.

We would like to point out that HDE's "roots" are in laser cutting. In HDE's 14 years of history, abrasive water jet cutting is relatively new, and we have offered cutting services with it only for the past two years. It was HDE's Management's opinion that the two technologies are complementary rather than competitive. This exact point was presented by the Editor of *Manufacturing Engineering Magazine*, Mr. James R. Koelsch, in his article "Use the Beam," published this month. I enclosed a copy of this article for your reference, as well.

In closing I'd like to compliment you for the fine job being done with the *Jet News*. Small as it is, it packs lots of information and is interesting to read.

– **Simon L. Engle, President**
HDE Systems
615 N. Mary Avenue
Sunnyvale, CA 94086
(408)735-7272



This photo compares the cutting qualities of Plasma Torch (Plasma) and Abrasive Water Jet (AWJ) equipment.

The circular shape is cut with the Plasma. Please note the typical starting "blow-hole", the surface finish (>500 mu) and the residual molten slag on the lower edge of the cut.

The center portion, which is the profile of a yoke, is cut with AWJ. Please note the surface finish (<125 mu), the square edges, and the clean top and bottom edges. There is no visible or measurable Heat Affected Zone (HAZ) in the AWJ cut. Typical contouring accuracies with AWJ are better that ±0.010 inch.

Material:	*Type 304 Stainless Steel.*
Material thickness:	*2.00 inch*
Cutting Rate (AWJ):	*1.00 inch per minute*

Photo courtesy of HDE Systems, Sunnyvale, CA.

BARTON

Garnet Abrasives

the abrasive media of choice

CG Garnet
Mobile Applications

A wide variety of coarse, aggressive products produced specifically for mobile water jet applications.

HP Garnet
Precision Applications

A broad range of finer, tightly graded products produced specifically for high pressure, precision cutting.

- *The world standard since 1878*
- *At the leading edge of waterjet technology since its commercial inception in the early 1980's*
- *Products and application experience that can dramatically improve your cutting operations*

Call today to discuss your abrasive requirements and to schedule an evaluation.

Phone: (518) 251–2296 **Fax: (518) 251–3655**

Barton Mines Corporation, North Creek, New York 12853

Steel art uses abrasive jets, from page 7

With valuable experience and a more effective cutting system, Steel Art has developed product lines geared to the level of quality/price demanded by the project. "Pioneering flexible production, dictated by the market rather than traditional methods, was exciting as well as nerve wracking," said Dobson. "Fortunately our fears were relieved by the tremendous response we received. Sign companies are no longer locked into one price or level of quality."

The advanced PASER II cuts much faster than its predecessor and the life of consumable parts has been increased tenfold. The system can also maintain an exact cutting tolerance during a job of any duration, greatly reducing maintenance and labor costs. All this allows Steel Art to create low-cost letters and move to capture a much greater share of the commercial market.

"We used to wear out a carbide cutting nozzle every 90 minutes," Dobson conceded. "But the new ceramic PASER II nozzles last up to 100 hours before they need to be changed out."

Steel Art, which has purchased a new 20,000 square foot building to house its growing operations, is bullish on the market for upscale architectural signs, despite signals of a weakening economy.

Said Dobson: "Even when times are tough, companies keep looking for ways to improve their image. And well-designed, quality signage is one simple way to make a long-lasting impression."

For more information, contact Steel Art (617)566-4079 or Flow International Corp. (206)871-4900.

Westin Galleria Hotel Reservation Form - 6th American Water Jet Technology Conference

To reserve hotel accommodations for the 6th American Water Jet Technology Conference, please complete and return this form, along with one night's deposit, to: **Reservations Department, The Westin Galleria , P.O. Box 4487, Houston, TX 77210, USA, (713)960-8100.**

PLEASE DON'T FORGET - MAKE CHECK OR MONEY ORDER PAYABLE TO THE WESTIN GALLERIA

PLEASE PRINT OR TYPE

NAME _____ **COMPANY** _____

ADDRESS _____

CITY/STATE/ZIP _____

SHARING ROOM WITH _____

TELEPHONE NO. (_____)_____

Signature _____

Please include $_____ first night's deposit to confirm your reservation . . . Or use your American Express, Diners Club, MasterCard, VISA, Discover or Encore credit card to guarantee your reservation. (Refundable if reservation is cancelled 48 hours prior to arrival.)

Card # _____ **Expiration Date** _____

Please circle preferred rate below:

Bed type on space availability basis only:

Accommodations	
SINGLE OCCUPANCY (one person, one bed)	$79.00
DOUBLE OCCUPANCY (two people, one bed)	$84.00
DOUBLE OCCUPANCY (two people, two beds)	$84.00
TRIPLE OCCUPANCY (three people, two beds)	$114.00
QUAD OCCUPANCY (four people, two beds)	$144.00
SUITES - 1 Bedroom	$200.00
2 Bedroom	$300.00

Rollaway beds available at additional charge

___Please indicate (X) if requesting non-smoking accommodations

Arrival Date _____
Arrival Time _____
Number of Nights _____

Our check-in time is 3:00 p.m. Should your room not be available when you arrive, you may store your luggage with our bellcaptian. Our check-out time is 1:00 p.m.

WATER JET TECHNOLOGY ASSOCIATION
ANNUAL MEETING
AUGUST 23-27, 1991

RESERVATIONS MUST BE RECEIVED BY 8/2/91.

ANY RESERVATION REQUEST RECEIVED AFTER THIS DATE WILL BE CONFIRMED ON A SPACE AVAILABLE BASIS.

All rates are exclusive of tax. Every effort will be made to accommodate you in the hotel and bed type of your choice; however, reservations are taken on a first come, first served basis.

Upcoming events

May 7-8, 1991: First Asian Conference on Recent Advances in Jetting Technology, Singapore. Please contact CI-Premier PTe Ltd., 150 Orchard Road, #07-14, Orchard Plaza, Singapore - Tel: 733 2922; Fax: 235-3530.

August 24-27, 1991: Sixth American Water Jet Technology Conference, Houston, Texas. Please contact the Water Jet Technology Association, (314) 241-1445.

September 24-26, 1991: Geomechanics '91, Hrodec, Czechoslovakia. Please contact Z. Rakowski, Mining Institute of Czechoslovak Academy of Science, A. Rimana 176B, 70800 Ostrava Poruba, Czechoslovakia.

Not everything that is faced can be changed, but nothing can be changed until it is faced. - James Baldwin

6th American Water Jet Technology Conference

Westin Galleria Houston, Texas, USA

PRELIMINARY SCHEDULE OF EVENTS

Saturday, August 24, 1991

8:00 a.m. - 4:30 p.m.	**Water Jetting Short Course**
6:30 p.m. - 8:00 p.m.	**Welcoming Reception**

Sunday, August 25, 1991

8:30 a.m. - 4:30 p.m.	**General Session**
Noon - 5:00 p.m.	**Exhibits Open**
8:30 a.m. - 4:30 p.m.	**Concurrent Session on Applications for Water Jet Contractors**
4:30 p.m. - 6:00 p.m.	**WJTA Biennial Business Meeting**

Monday, August 26, 1991

7:30 a.m. - 5:00 p.m.	**Exhibits Open**
8:30 a.m. - 5:00 p.m.	**General Session**
7:00 p.m. - 11:00 p.m.	**Reception and Dinner Banquet**

Tuesday, August 27, 1991

7:30 a.m. - 10:30 a.m.	**Exhibit Hall Open**
8:30 a.m. - Noon	**General Session**
Noon - 7:00 p.m.	**Technical Tour and Demonstration**

See details inside, pages 4-5...

The cutting edge *by George A. Savanick, Ph.D.*

The USSR has developed water jet mining equipment to mine gold remotely from the surface through a borehole. This equipment has been tested in the USSR. The Tanzanian Government is seeking a U.S. company to cooperate in a borehole mining venture using the Soviet equipment. Tanzania will provide the mineral property and the USSR will provide mining expertise. Tanzania is looking for a U.S. company to provide financing and marketing expertise.

The search continues for an effective way to cut metal tubing with an abrasive jet. Abrasive jet cutting would avoid heat damage to the tubing and avoid the dust inherent to cutting with blades. Cutting is less than optimal because the jet dissipates after passing through the top surface of stationary tubes so that poor cutting occurs at the bottom of the tube.

This poor cutting can be avoided by cutting tangentially to a rotating tube. This gives good cutting around the circumference of the tube. Rotating the tube while cutting might be practical in some instances, but not for long tubes.

Ingersoll-Rand and ABB Robotics, from pg. 2

"The joint venture brings together two pioneers in the fields of water jet cutting and robotics," said Chuck Havill, vice president and general manager of Ingersoll-Rand's Waterjet Cutting Systems Division, Baxter Springs, Kansas. "The technical and marketing strengths of Ingersoll-Rand and ABB Robotics will enable the joint venture to achieve market leadership in Europe."

Specifically, Ingersoll-Rand's European water jet cutting systems engineering firm, AB Best Matic, Ronneby, will furnish the robotics system technology, commonly known as the "Cutting Box." In addition to robotics expertise, ABB Robotics lends extensive European marketing and service capabilities to the new joint venture.

Ingersoll-Rand Company, based in Woodcliff Lake, New Jersey, is a leading worldwide manufacturer of industrial machinery, construction equipment, mining machinery, pumps, tools, bearings, door hardware and security systems.