



**JET  
NEWS**

JULY 1989

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

### From The President's Desk

A copy of the 1989 Membership Directory is enclosed with this issue of *Jet News*. You will note that we have 126 members from 11 countries and 33 corporate sponsors. The Association is undergoing a period of controlled growth.

We are approaching the Fifth American Water Jet Conference cosponsored by the Water Jet Technology Association and the National Research Council of Canada. The conference will be held at the Inn on the Park in Toronto, August 29-31, 1989. So far, 50 people have registered and 25 exhibitors have reserved space in the exhibition hall.

Manuscripts of papers to be presented at the conference are arriving and will be bound into a volume which will be available at the registration desk.

Please plan to attend the meeting of the members of the Association to be held after the close of the afternoon session on Tuesday, August 29. The purpose of the meeting will be to elect directors and officers for the 1989-1991 biennium, to discuss proposed changes in the bylaws (see article in this issue of *Jet News*), and to take up other business suggested by members.

On Monday, August 28, a short course will be presented on the fundamentals and practice of waterjet technology. We have engaged a talented list of presenters (see article in this issue of *Jet News*). Attendance at this course is a good way to become informed on the state-of-the-art of water jetting.

I look forward to seeing many of you at the Fifth American Water Jet Conference.

*Life is change...  
Growth is optional...  
Choose wisely.*

Karen Kaiser Clark

### Water Jet Technology Course

A short course on the fundamentals of waterjet technology will be held on Monday, August 28, 1989, in conjunction with the Fifth American Water Jet Conference in Toronto, Ontario, Canada. This course is aimed at users and covers the basics and applications. Subject areas of the course include a historical perspective, fluid mechanics of various types of jets, parameters which influence basic jet performance, high-pressure safety, and abrasive jets. High-pressure equipment, including intensifiers, plunger pumps, fittings and hoses, will also be included. Applications will include cutting, cleaning, and deburring in industrial, construction and mining environments. Water-only, abrasive, and waterjet-assisted mechanical applications will be addressed. Integration of water jets with various forms of automation equipment, including robots will be included. Instructors for this course are researchers and experienced users covering all aspects of the technology. Questions concerning the course should be directed to Prof. T. Labus, University of Wisconsin-Parkside, telephone (414)553-2114.

The following program lists subject matter covered and instructors. The instructors are Dr. David Summers of the University of Missouri-Rolla, Tom Labus of the Wisconsin-Parkside, Mohamed Hashash of Flow Industries, Inc., Ray Jordan of NLB, Charles Taylor of the U.S. Bureau of Mines, John Wolgamott of Stone Age, Inc., and Don Fryer of Autoclave Engineers.

#### PROGRAM

8:00-8:30	a.m.	Registration
8:30-9:00	a.m.	<b>Historical perspective</b> <i>D. Summers</i>
9:00-9:30	a.m.	<b>Fluid mechanics of jets</b> <i>T. Labus</i>
9:30-10:00	a.m.	<b>Basic jet parameter influences</b> <i>T. Labus</i>
10:00-10:15	a.m.	Coffee break
10:15-11:15	a.m.	<b>Abrasive jets</b> <i>M. Hashash</i>
11:15-11:45	a.m.	<b>High-pressure equipment</b> <i>R. Jordan</i>
11:45-12:00	p.m.	Questions and answers
12:00-1:30	p.m.	Lunch
1:30-2:30	p.m.	<b>Waterjet-assisted technology</b> <i>C. Taylor</i>
2:30-3:15	p.m.	<b>Mining/construction applications</b> <i>J. Wolgamott</i>
3:15-3:30	p.m.	Coffee break
3:30-4:30	p.m.	<b>Industrial applications</b> <i>T. Labus</i>
4:30-5:00	p.m.	<b>Safety</b> <i>D. Summers and D. Fryer</i>

## International Journal of Water Jet Technology

Although individual subscriptions are welcome, we need corporate donations and institutional subscriptions to accomplish the publication of this journal. The National Research Council of Canada, as a patron, has assisted in several ways in launching this journal. Congratulations to AUTOCLAVE ENGINEERS, Erie, PA, who became a PATRON by donating \$1,000. We look forward to having more patrons to support this worthy cause. Make your checks payable to "International Journal of Water Jet Technology" and mail to the Editor.

**Dr. M. M. Vijay, Editor**  
Gas Dynamics Laboratory  
National Research Council of  
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## Cool Cutting of Aluminum With Abrasive Waterjet

Aluminum is easy to machine - usually. But engineers dream up shapes, alloys, composites and laminates that may call for special techniques. They could use a new cutting tool without bulky blades, harmful heat or distorting stress. Now there is one: an abrasive waterjet can cut almost anything with a wire-thin jet at supersonic speed. Barely a decade old, it's already serving in commercial applications.



*Charles D. Burnham, a graduate student, cutting aluminum at the University of Rhode Island.*

"There are commercial systems cutting aluminum 2-inches thick and above," says Mohamed Hashash, a pioneer in abrasive waterjet cutting. Hashash, senior research scientist at Flow Research in Kent, Washington, told *Aluminum Developments Digest* he began waterjet work in 1974 at Concordia University, Montreal, and took up abrasive waterjets at Flow in 1979. "The first abrasive waterjet cut was in 1980, and the first commercial system was in 1983, for glass cutting." Since then abrasive waterjet has entered aerospace and other specialized machining.

Flow International, the parent firm of Flow Research, is one manufacturer of abrasive waterjet equipment. Another is Ingersoll-Rand Corp., Baxter Springs, Kansas, whose applications engineer Curtis Wade listed some of its advantages for cutting aluminum: "It's cold-cutting, so there's no heat-affected zone. It doesn't need a starter hole; it can pierce one. There's no dust. It's omnidirectional: you can put the nozzle on a five- or six-axis robot and cut at any angle. With computer control, changing configuration only takes reprogramming, not new tooling."

"It cuts very thin or very thick material; but the kerf is only about .035-inches wide. You can cut intricate shapes and fine detail, with one time through." Cutting speeds are good. "We've cut aluminum about .050-inches thick, at up to 200 inches a minute," Wade said. "We've cut 3/4-inch aluminum at 20 inches per minute; 3 inches at 2.5 inches a minute; and 6-inch-thick aluminum at 1.5 inches a minute. The cut edges have a smooth sandblasted finish."

Charles Burnham, a graduate student at the University of Rhode Island's Abrasive Waterjet Laboratory, explained the process. "An intensifier pump pressurizes the water, which is then focussed through a sapphire or diamond orifice .003 to .020-inch in diameter into a coherent non-turbulent stream. Then abrasive is mixed in at 0.3 to 3.0 pounds per minute, and the jet emerges through a ceramic or tungsten carbide focussing nozzle. Any abrasive from beach sand to diamond dust can be used. On aluminum, it's often 80 mesh garnet sand." Jet pressure ranges from 30,000 to 55,000 pounds per square inch. (At the bottom of the Pacific, 36,000 feet down, pressure is about 16,000 psi.) The waterjet exits at about 2,000 feet per second, roughly twice the speed of sound.

Thomas J. Kim, Director of the University of Rhode Island's laboratory, said the lab wants to improve the precision of abrasive waterjet cutting from around .010 inch to .001 or .002 inch. "About 16 process variables complicate tolerance control, but I think it's achievable." His lab and others are pursuing further improvements.

The Rhode Island lab demonstrates aluminum cutting for industry and cuts aluminum matrix composites for Air Force testing.

(continued page on 5)

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## Water Jet Rescue Subject of TV Special

Water jet technology helped save the life of 18-month-old Jessica McClure who fell down a narrow well in Midland, Texas, in September 1987. This rescue is portrayed in a TV special which has already been shown in selected cities and will be shown in other areas soon.

## San Francisco Man Telephoned Idea to the Rescuers

by Michael McCabe

Like thousands of other people around the country, Dean Alioto, of San Francisco, was tormented by the plight of 18-month-old Jessica McClure. So, he got on the phone to Midland, Texas, and offered rescuers some advice on how to get her out of a deep well. As it turned out, his suggestion - the use of a high-powered water jet to blast through the granite-like rock - may have proved crucial in saving the little girl. "By using this drill, we saved 8 to 10 hours over conventional drills," said Hal Curlett of Hyperdrill Corp. of Fort Worth, before rescuers brought her safely to the surface.

Although other callers apparently made the same suggestion, Alioto's call may have helped galvanize officials into calling in the high-tech equipment. "Even if I was only able to reiterate an idea that everyone was already thinking about, I feel very good about the outcome," said Alioto, 23, who said he is a distant relative of former Mayor Joseph Alioto.

Alioto, a San Francisco writer and film maker, was watching television reports on the rescue attempts when it was reported that rescue workers were only able to dig 1-inch per half-hour with the diamond-tipped drill. He immediately recalled an article he read in the San Francisco Chronicle that told of recent gains in water-jet technology and its power to blast through the hardest materials in minutes. "I never throw stuff like that away, so I got a copy of the article, called the Midland Fire Department and read most of the article to them over the phone," Alioto said.

Alioto's suggestion was just one of several hundred widely varying ideas, said Sammie Stucks, secretary to Midland County Sheriff Gary Painter. "Many of the people who called had tears in their voices," Stucks said. "A lot of them were parents and grandparents, and the calls came from almost every state and Canada."

*San Francisco Chronicle*, 1987. Reprinted by permission.

## Cool Cutting of Aluminum, from page 2

McDonnell Douglas Helicopter Co. cuts fuselage panels of aluminum-graphite-fiberglass laminates by abrasive waterjet. Manufacturing research engineer Thomas Klingler said, "With this method there's no heat-affected zone, you need less fixturing, and there's less cutter load on the part. You can control orientation and parameters very precisely."

"At Flow," Hashash said, "we are working on an abrasive waterjet lathe; controlled-depth milling; and drilling small holes about .015 inch in diameter. Such small holes, hard to drill conventionally at steep angles, could make cooling channels in high-tech parts. Meanwhile, abrasive waterjets are cutting thick aluminum commercially in Taiwan and in a U.S. shipyard."

Hashash said, "On aluminum, abrasive waterjet is good on very thick sections, small holes, complicated shapes, composites, laminates and honeycomb - things that are difficult for conventional tooling."

"I see a very good future for abrasive waterjet cutting in aluminum applications."

Reprinted with permission from the Spring 1989 issue of *Developments Digest*, a publication of the Aluminum Association, Inc.

## INTERNATIONAL JOURNAL OF WATER JET TECHNOLOGY

## CALL FOR PAPERS

The Premier issue of the *Journal* will go to the press in November 1989. Authors who wish to publish their papers in the Premier issue, should send three copies of their manuscripts to the editor in English as soon as possible, but no later than August 31, 1989.

The publication of the first issue has been made possible by the generous contributions, as DONORS & PATRONS, by:

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## Water-jet Cutting Seminar

Milwaukee, October 12-13, 1989

The Center for Continuing Engineering Education of the University of Wisconsin-Milwaukee is offering a two-day seminar in Milwaukee, WI, on October 12-13, 1989, entitled "Water-Jet Cutting."

This seminar will provide you with practical technical information on water-jet technology, including basic fundamentals, advantages and disadvantages, application, integration with robotic systems, and economic feasibility. The seminar will include a demonstration of the Water Jet Lab at the UW-Milwaukee and also a tour of an industrial water-jet installation.

For more information, call or write, Roger W. Hiron, UW-Milwaukee, Center for Continuing Engineering Education, 929 North Sixth Street, Milwaukee, WI 53203, Phone: (414) 227-3105.

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## Fifth American Water Jet Conference Set for August 29-31, 1989

The U.S. Water Jet Technology Association will hold its fifth biennial conference August 29-31, 1989, at the Inn on the Park in Toronto, Canada. This hotel is located in a park and is very beautiful, especially in the summer. All functions, including a banquet, will take place in the hotel. Entertainment will be provided during the banquet. The papers accepted for presentation will be published in a hard-bound volume and will be distributed to the delegates at the conference.

The conference is being sponsored by the U.S. Water Jet Technology Association and the National Research Council of Canada. The conference will be designed as a forum in which researchers and practitioners can make contacts, exchange ideas, and review advances in this rapidly developing technology.

There will be an exhibition hall at the Inn on the Park. All 25 exhibition spaces available have been reserved by firms and organizers to exhibit their products or literature.

In addition to the table top exhibition at the Inn on the Park, a technical tour will be held on the afternoon of August 30. This tour will include stops at firms in the Toronto area which specialize in water jetting and at the grounds of Atomic Energy of Canada, Ltd. at Mississauga, Ontario, for a demonstration of equipment. Firms wishing to demonstrate the operation of their equipment should contact Mr. A. D. (Doug) Hink at the following address to inform him of their requirements:

Mr. A. D. (Doug) Hink, General Manager  
Advanced Systems Applications  
Atomic Energy of Canada, Ltd.  
2251 Speakman Drive  
Mississauga, Ontario, Canada L5K 1B2  
Telephone: (416) 823-9040  
Fax: (416) 823-6120  
Telex: 06-982372

The fee for participating in the equipment demonstration is \$500.00 (Canadian) payable immediately after requesting a place. The checks should be made payable to: "NRC - Fifth American Water Jet Conference" and mailed to Mrs. H. Lacoste, the Conference Coordinator.

## General Meeting of the Association at the Fifth American Water Jet Conference

A meeting of the members of the Water Jet Technology Association will be held after the close of the afternoon session of the Fifth American Water Jet Conference in Toronto on Tuesday, August 29, 1989. The purpose of this meeting will be to report on the state of the association, to elect officers and directors for the 1989-1991 biennium, to discuss changes to the bylaws, and to take up other matters suggested by members.

Dr. Mohan Vijay has informed the Association that he intends to present the following motions for a vote at the meeting.

1. The name of the Association should be changed from "U.S. Water Jet Technology Association" to "American Society of Water Jet Technology (ASWJT)", in keeping with other societies, such as ASME, ASCE, etc., in the United States.
2. Approximately 18 percent of the members in the Association are from countries other than the United States. Therefore, there should be at least two (2) members as directors on the BOARD, ONE from Canada and the other from any other country.
3. In view of the fact that there is a Worldwide support for the Publication of the *International Journal of Water Jet Technology*, the Association, should become a Patron by donating a minimum of \$5,000.