



**Jet
News**
March 1988

5629 Minnehaha Ave. South, Minneapolis, MN 55417, USA 612/725-4543

Jessica McClure Rescued from a Well

Water jet technology helped save the life of 18-month-old Jessica McClure, who fell down a narrow well in Midland, Texas, in September. Midland officials used a water drill to extricate the girl from the well. "By using this drill we saved 8 to 10 hours over conventional drills," said Hall Curlett, of Hyuperdrill Corp. after rescuers brought the girl out of the drill.

1989 U.S. Water Jet Conference

The Fifth U.S. Water Jet Technology Conference will be held in Toronto, Ontario, Canada, in late August 1989.

The conference will include a water jet exhibition and demonstration of water jetting equipment. Dr. Mohan Vijay, of the National Research Council of Canada and Dr. George Savanick, of the U.S. Bureau of Mines, are co-chairmen to the conference.

Expert Sources & Resources

BHRA Fluid Engineering, Cranford, Bedford UK43 OAJ, England. Providing journals, reports, symposium proceedings, bibliographies, and books in the broad area of fluid engineering including many on water jetting technology.

The U.S. Water Jet Technology Association, 5629 Minnehaha Ave. S., Minneapolis, Minnesota 55417, U.S.A. provides proceedings of its biannual meetings and a bimonthly newsletter.

The International Journal of Water Jetting will be launched in 1989. Dr. Mohan Vijay, National Research Council of Canada, Ottawa, Ontario, Canada KIA OR 6, is the editor.

Water Jet Slashes Steel

Michael Hood remembers turning on his new cutting machine a few months ago on the ground floor of the Hearst Mining Building on the University of California at Berkeley campus.

With a screech, but little vibration and no heat, the device blasted a hole through 4 inches of hard rock, the tabletop, bucket of water, ball bearings on the floor and was working its way through a steel reinforcing bar in the concrete floor when, after a minute or two, Hood and his students shut it off.

"We just sort of stood there wondering at it," he said. "Who knows how deep it would have gone?"

Was the wonderful new cutting tool a laser, a synthetic diamond drill, a beam of atomic particles? Nope, just water.

Although the power of water is celebrated--it dug the Grand Canyon--its ability to do precise, high-speed cutting and drilling was only recently developed.

Hood, a professor of mining and materials science at UC, was co-chairman of the Fourth U.S. Water Jet Association Conference on the Berkeley campus, where about 150 specialists gathered last August to discuss the phenomenal progress made in the past 10 years on using tiny streams of water moving at up to three times the speed of sound to do work performed by metal tools or explosives.

New Applications

Most of the water-jet industry today is still occupied with routine tasks such as blasting the oil and rubber off airport runways, peeling chewing gum off sidewalks or scouring rust from industrial boilers.

But now the technique is also used to cut steel, copper, granite, frozen chickens and parts of airplane wings -- usually faster, cheaper and more safely than traditional methods. Some water jets can slice through granite slabs 3 feet thick at a rate of 4 inches a minute. Sculptors are examining water jets as high-tech chisels.

Many cutting jobs will probably always be done more simply with traditional machine tools, "but heck, we can cut anything," said Willard F. Hall, president of Jet Edge Construction, Inc.

The Minneapolis company specializes in slicing concrete, reinforcing steel, and other tasks, but has a full line of water-jet cutters. "Right now, we're bidding to cut up fish at a plant in Hawaii," he said.

The Cadbury chocolate company in England uses jets of cocoa butter to slice and decorate chocolate bars. Italian pizza makers slice their goods with streams of olive oil using machines adapted from the water-jet industry.

Robots using water jets are cutting up the half-melted core of the Three

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U.S. Water Jet Technology Ass'n

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"The man who thinks out what he wants to do, and then works and works hard, will win; and no others do, or ever have, or can. God will not have it so."

International Water Jet Symposium:Beijing,China, Sept. 9-11,1987

Awards

Career Award: Professor Tang Dequan

The recipient of this award is recognized for his original and substantial contribution in the development of hydraulic coal mining and slurry transport in China. His dedication and inspiration has facilitated the rapid development of high-pressure water jet technology in recent years in China.

Merit Award: Mr. Douglas Uthus

This award is installed in recognizing Mr. Uthus' leadership, vision, support, and valuable services in the development and application of water jet technology as well as the enhancement of major international cooperation.

Achievement Award: Dr. David Summers

Dr. David Summers has been a consistent and dedicated contributor in water jet technology since the late 1960's. His outstanding research work in water jet drilling, longwall coal mining, cavitation and other theoretical work and applications has had major impact in water jet technology. He is recognized for his invaluable activities in organizing and contributing to the water jet conferences and technology transfer.



Delegates to the International Water Jet Symposium, Beijing, China, September 9-11, 1987.

From the President's desk

The INTERNATIONAL WATERJET SYMPOSIUM was held in Beijing, China, September 9-11, 1987.

Papers were presented from the United States, China, Japan, Canada, India, Poland, The Federal Republic of Germany, Austria, and Brazil.

The most exciting developments reported related to the abrasive jet cutting of hard materials and the use of computer-controlled cutting robot systems. Abrasive jet applications reported included a tool for nuclear facility decommissioning, machining ceramics, removal of oil of grease, removal of mill scale, removal of paint, cutting hard rock, cleaning castings, and tunneling.

Computer-controlled waterjet cutting appears to be a burgeoning field. The development of such waterjet cutting systems for the machining of plastics in the automobile and aircraft industries was reported. Experiments are underway in the application of computers with waterjet cutting systems with multi-axis robot system.

Hydraulic coal mining received much attention. The Coal Mining Research Center of Japan announced development of an automated hydraulic coal mining system. This system was successfully tested in the Sunagawa Coal Mine and is commercially available. This system couples a waterjet cutting system with a monitoring system. This monitoring system uses TV cameras, acoustic sensors and is computer controlled.

Bergbau-Forchung's work on waterjet cutting in roadheading in Germany was reviewed. It seems that this work is still in the laboratory stage.

The Chinese have tested a longwall shearer and a roadheader fitted with high-pressure waterjets. The mined 22,460 tons with the longwall shearer. The roadheader advances at the rate of 3 meter per hour.

Professor Tang Dequan, Mr. Douglas Uthus, and Dr. David Summers received awards at the meeting. Professor Tang Dequan received the Career Award for his substantial contributions in the development of hydraulic coal mining and slurry transport in China. Mr. Uthus received the Merit Award for his enhancement of major international cooperation in waterjet technology. Dr. Summers received the Achievement Award for his outstanding research work.

As president of the U.S. Waterjet Association, I acted in concert with representatives from India, Canada, Japan, and China on the Board of Directors of the International Waterjet Association. We decided to hold the next meeting in Singapore, and to establish

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New Journal

Dr. Mohan Vijay, National Research Council of Canada, as some of you know, is looking into the possibility of publishing a quarterly international journal on waterjet technology. Since initial inquiries indicate that such a publication could be expensive to produce, Dr. Vijay has asked anyone interested in the new journal to send him their comments, particularly in answer to the following questions:

- 1) Would you be willing to subscribe to the journal or would you prefer to include its cost in the membership fee of your National Association of Waterjet Technology?
- 2) Would you be willing to pay page charges to publish your paper in the journal? The suggested rates in US\$ are 20, 30, 35, 40, 45, or 50.
- 3) Would you be willing to advertise your company's products in the journal?
- 4) Would you be willing to review papers?

All correspondence on the new journal should be directed to:

Dr. M.M. Vijay
Gas Dynamics Laboratory
Division of Mechanical Engineering
National Research Council of Canada
Ottawa, Ontario
Canada K1A 0R6
Telephone (613) 993-2731, Telex 053 3386

Manually Operated Water Jetting Equipment

The U.S. Water Jet Technology Association has developed recommended practices for the use of manually operated high pressure water jetting equipment. These recommended practices cover the personnel requirements, operator training, operating procedures, and recommended equipment for the proper operation of all types of high pressure water jetting equipment as normally used by industries concerned with construction, maintenance, repair, cleaning and demolition work. Attention is drawn to the relevant or proposed, OSHA, ASTM, and ANSI Standards. It is intended that extensions to this code will be produced, in due course, to cover specialist applications, e.g. multiple-gun operation, pulsed jets, cutting with the use of abrasives and high pressure intensifiers, but in the meantime these practices should be used as far as practicable.

The use of high pressure water jets for cutting and cleaning is a rapidly evolving technology, with current developments occurring. For this reason, these practices are dated, and the Association biannually reviews these practices for any required changes and makes the revised document available for distribution.

A Rapid Way to Measure Flow Losses

Many attempts at water jet cutting or cleaning fail because high energy losses occur between the pump and the workpiece. These losses can be easily measured by removing the nozzle and reading the pressure at the outlet of the pump. This is the pressure drop required to overcome resistance to flow downstream of the nozzle. If a high pressure is read (more than a few hundred psi) on this gage; it is a good idea to redesign the flow path in order to reduce these losses.

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Water Jet slashes steel

Mile Island nuclear reactor in Pennsylvania, working where no living thing can venture and where conventional tools would be nearly impossible to manipulate by remote control.

An East Bay company, Berkeley Chemical Research, Inc., peddles something formally known as Super Water. One employee said the usual -- and more descriptive -- term is "snot." It's sort of jellied water, made by mixing in a thickener, a non-toxic polymer chemical called polyacrylamide.

The slimy stuff can be shot out of a jet and resists widening into a diffuse spray. "We say it has high coherence," said David A. Summers, a mining engineer and director of the High Pressure Waterjet Laboratory at the University of Missouri at Rolla. "I can take the bark off a tree at 40 feet" with a stream of it, he said.

Stonehenge Recreated

A more impressive feat stands on the campus of his university--a half-scale replica of Stonehenge, carved from Georgia granite by a water jet Summers' built in his lab. Among waterjet fanciers, Summers' is known as "Crazy Dave."

The university's president wanted the monoliths to depict the symbolic roots of scientific thought, and "after a bit of drinking one night between the two of us," Summers said, "I told him I could do it with water."

He did such a good job that he was called upon again when the administration building needed a new doorway through a 2-foot-thick wall of concrete.

He is also a consultant to the Italian stone-cutting industry, which hopes to use jets of water mixed with abrasives to trim costs.

Summers is a walking history book on the subject of water jets and traces their history to the hydraulic miners of the Gold Rush, who used nozzles to wash gold-bearing sands from embankments in the Sierra foothills in the 1850's and 1860's, leaving immense scars on the landscape that have not healed yet.

Hydraulic mining was outlawed when it silted up the Sacramento River drainage, but the Soviets borrowed the technology for open-pit coal mining, and recently both they and the British have begun using water jets for underground coal mining.

Mine Tunnels

At the UC conference, several displays showed automobile-size machines designed to use high-pressure water to dig mining tunnels. The amount of water consumed would actually be less than water already used to suppress dust in conventional mining. "It's a huge potential market," Hood said.

Much of the water-jet cutting business was restricted to soft materials like cardboard until the past 5 years or so, when engineers and manufacturers learned to design pumps that can run for days or weeks turning out water at a pressure of 55,000 pounds per square inch. They also began using additives like polymers or abrasive grits of sand or garnet to give the water a longer reach and harder bite.

Summers' said water jets will probably replace thousands of jackhammers and high-speed saws now used to knock and cut deteriorated concrete form crumbling highways and bridges.

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Water Jet

High-pressure water can be adjusted automatically to scour cracked concrete but leave still-solid roadways and bridge decks alone.

The market for water-jet cutting equipment is now around \$35 million per year, which is not considered very large, but advocates think the technology is about to take off.

James Reichman, vice president for technology for a division of Flow Industries, Inc. in Kent, Washington, thinks the method will take over the oil-well drilling industry.

Michael J. Woodward, new products manager for Weatherford Water Jetting Systems of Houston, said, "We used to be regarded like aluminum siding salesmen when we told people we would cut things with water. Now, people listen."

[Reprinted with permission from the September 8, 1987, issue of the San Francisco Chronicle. Written by Charles Petit, Science Correspondent]

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From the President desk.....

the International Journal of Waterjet Cutting, Dr. Mohan Vijay, of Canada, will act as editor. The first issue will appear in 1988.

After the meeting, I toured the research facilities at the China Institute of Mining and Technology (CIMT) at Xuzhou and the Qi Shan Coal Mine in Jiangsu Province. Waterjet research at CIMT is concerned with the development of an oscillating jet cutter, an abrasive jet cutter, a roadheader, and a coal car cleaner. The laboratory is doing very creditable work, even though it is only 2 years old.

Barton High Performance Garnet For Abrasive Water Jets

A full range of high performance garnet abrasives are available from the Barton Mines Corporation of North Creek, New York. Mining a one-of-a-kind deposit in the central Adirondacks of upstate New York, Barton Mines produces the hardest, sharpest, and most angular garnet abrasive in the world. State-of-the-art mining-and-milling techniques optimize particle angularity and maintain the highest degree of purity possible.

Barton HP Garnet is recommended by both Flow Systems, Inc. and Ingersoll-Rand Waterjet Cutting Systems. Graded to dust-free specifications, Barton HP Garnet offers superior performance in all facets of abrasive water jet cutting.

With over 100 years of worldwide sales in a wide range of technical applications, Barton Mines is the oldest and largest supplier of quality garnet abrasives. Barton Mines assures constant availability of high quality garnet abrasives due to strict quality control, large inventories, and year-round operations.

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