The Official Publication of the U. S. Water Jet Technology Association

U.S. Water Jet Technology Association / JET NEWS

MARCH 1989

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

Automated Waterjet Cutting Processes

May 9-10, 1989
Detroit, Michigan

The Society of Manufacturing Engineers will present a two-day educational clinic specifically addressing **"Automated Waterjet Cutting Processes."** This clinic is designed to present the latest advances in abrasive and non-abrasive waterjet cutting technologies. Experts from industry and academia will be presenting topics combining theory with practical cutting applications for manufacturing operations.

Robotic and water jet suppliers, as well as industry users, will discuss effective applications and capabilities of waterjets, abrasive jets, robotic and computer integration, plus flexible waterjet workcells for manufacturing.

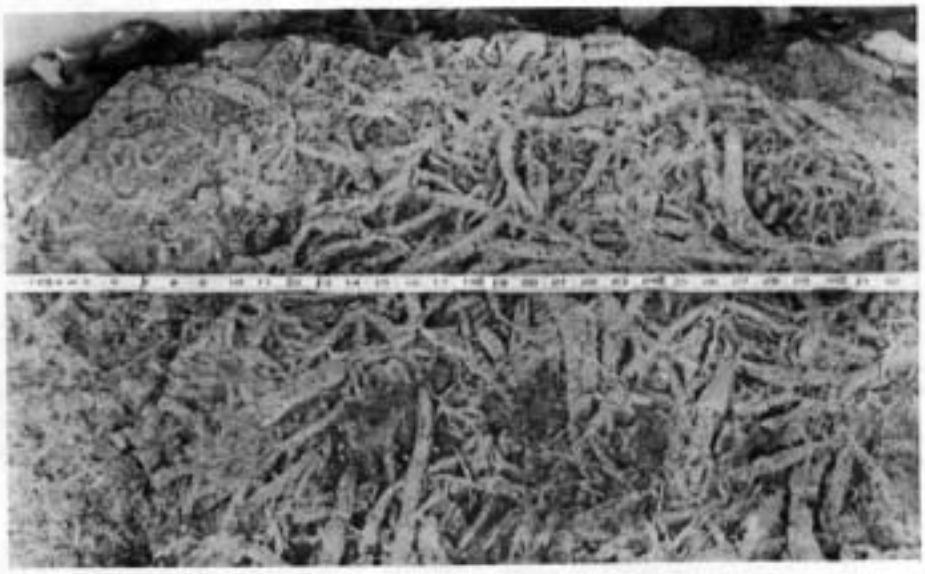
For more information, contact Kristen Dudash at the Society of Manufacturing Engineers, (313) 271-1500, extension 399.

International Journal of Waterjet 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. Mohan Vijay.

Dr. M. M. Vijay, Editor
Gas Dynamics Laboratory
National Research Council of Canada
Ottawa, Ontario, Canada, K1A 0R6

Waterjets and Fossils



Etched Fossiliferous Rock

Water jets cut selectively, i.e., they are very sensitive to differences in the hardness of the target. This property is put to good use in removing defective concrete from structures. Unsound concrete can be selectively removed while leaving good concrete and the reinforcing bars intact.

The selectivity of water jet cutting can also be put to good use in etching fossiliferous rock so that the fossils are made to stand out in low relief on the rock surface. An example of this phenomenon is shown in figure 1. This figure shows a block of Oneota dolomite from Winona, Minnesota, which has been etched with 2,500 psi, 9.5 gpm water jet containing 12.5 lb/minute of sandblasting sand. The etching was performed with a hand-held lance fitted with an abrasive feed port. The abrasive jet from the lance was moved across the surface of the rock for 45 seconds. A portion of the rock was left unetched to show the effect of etching.

Water jet etching of fossils will be successful if the fossils are harder than the surrounding material. The photograph above shows fossil worm burrows which became visible because the softer material filling the space between the fossils has been selectively removed.

Etched fossiliferous rock surfaces give an interesting effect and could have architectural applications. Anyone interested in etching fossiliferous rock should contact Dr. George Savanick at the U.S. Water Jet Technology Association office.

Fifth American Waterjet Conference to be held in August

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. See related article on page 6.

From the President's Desk . . .

The Association receives many inquiries concerning water-jetting safety. Recently many of these inquiries have been related to bursting hoses and abrasive jet cutting in flammable atmospheres.

Both of these problems have been the object of research, but much uncertainty remains. Bureau of Mines Information Circular 9126 *Hose Safety During High-Pressure Water Jet Cutting* is a recent look at failure modes of high-pressure hoses. BHRA Fluid Engineering in the United Kingdom has published work in *Water Abrasive Cutting in Flammable Atmospheres.*

I know of nobody who can predict when a hose will fail. There is even a debate about hose ratings, the factor of safety to be applied, and the efficacy of containment sleeves. There is some sentiment for a hose safety standard which takes into account the number of pressurizing cycles experienced by the hose. All of this indicates a lack of consensus on the subject of hose safety.

The same can be said for abrasive jet cutting in flammable atmospheres. The abrasive jet has

(continued on page 5)

Administration

Association Office ... 314/241-1445
U.S. Water Jet Technology Ass'n
ATTN: Dr. George Savanick
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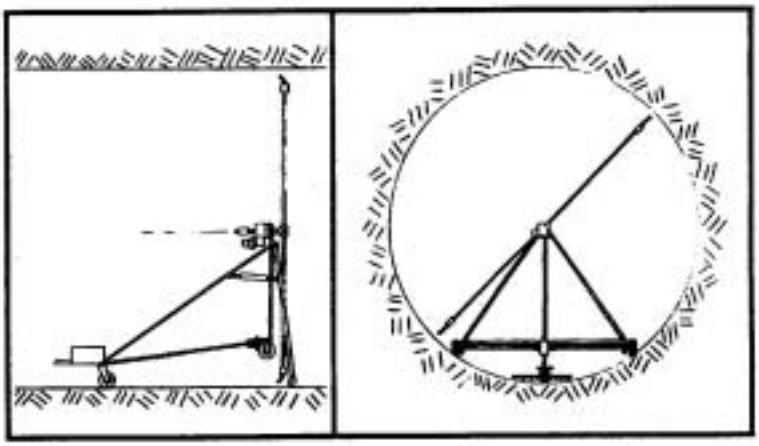
Tunnel Cleaning Apparatus

by Stone Age, Inc., Durango, CO



A recent caller to StoneAge, Inc., asked if we might have some equipment to clean a water line. When asked for the size, the caller replied "20 feet." Having the length, we then asked for the inside diameter. He replied that 20 feet **was** the diameter and that the length was about 3,000 ft. This water line was one of the main conduits bringing water into Los Angeles, California.

Although a bit larger than ordinary we were intrigued by the task and offered to design and fabricate the equipment.

The water tunnel was concrete lined with a very round, 20.5 foot inside diameter. Originally the specifications called for dry sandblasting, but the contractor demonstrated the benefits of waterblasting. The tunnel was to be relined and clean surface was desired for good bonding. Old laitance, lime deposits and natural oil infiltration were the primary targets to be cleaned. The earlier testing indicated that a high pressure pump producing 20 gpm at 9,000 psi would be adequate.

One additional challenge was the time schedule. We were only given 2 weeks to design, fabricate and deliver the equipment to the jobsite.

The design we chose was a two armed "windmill", mounted on a tripod frame, with three rubber wheels. At the top of the frame was a high pressure water swivel held at the centerline of the tunnel. Rotating the swivel was an air motor operating through a gearbox.

A tee fitting on the swivel output connected the two ten foot arms. A stiffener brace was used to make the pipe arms more rigid. At the end of each arm was a single 15 degree fan spray nozzle.

Two of the wheels supporting the frame were driven in unison and the third could pivot to provide steering. Another air motor and gearbox combination provided the power to drive the apparatus along the tunnel.

An air sweep was used to prevent the water and debris from running back into the cleaned tunnel. It consisted of a 4 ft. long horizontal bar with multiple air jets. The bar was swung back and forth a distance of three feet and was synchronized to extend past the rotating arms. The air jets were adequate to 'puddle up' the water deep enough so that a vacuum pickup was effective.

A remote control panel was provided for the operator to independently regulate the rotation speed from 1 to 5 rpm and the travel rate from 4 to 34 in/min. A foot operated pressure dump was also used.

The entire apparatus was assembled and tested at StoneAge. It was then dismantled and packaged for air freight shipping. Total weight was 550 lbs. Our chief engineer was then flown out to assist with the reassembly of the equipment at the jobsite. After assembly the unit was lowered several hundred feet down the access shaft. The pump and vacuum units followed in sequence.

Preliminary testing with the unit found it to operate successfully at 2 rpm and travel rate of 6 in/min. The fan jets were cleaning a 3 inch wide swath and each jet overlapped the preceding path by 1-1/2 inches. This resulted in every portion of the tunnel wall being struck twice by cleaning jets.

The contractor was very pleased with the performance of the equipment. The cleaning was fast, effective and quite uniform. Only a few old epoxy patches resisted removal. The apparatus was operated 24 hours a day, over nine days. Approximately 30 hours were lost due to associated equipment failures, (i.e., high pressure pumps, vacuum systems, etc.), but none due to the cleaning machine. A total of 2940 feet were cleaned during this time. This averages to 16 ft./hr. or 2.3 in/min. for the cleaning apparatus.

Total elapsed time from initial phone call to job completion – 30 days. Our name may sound old and slow, but we can move very quickly.

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Recommended Practices for the Use of Manually Operated High Pressure Water Jetting Equipment

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Fifth American Waterjet Conference set for August 29-31, 1989

The Fifth American (formerly U.S.) Water Jet Conference will be held August 29-31, 1989, at the Inn on the Park in Toronto, Ontario, Canada. A short course on water jet cutting will be held on August 28 at the Inn on the Park.

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. Exhibitors are reminded that there is room for 25 booths and to date, five have been reserved. Firms or organizations wishing to exhibit their products or literature at the Conference, should reserve a booth now by paying the fee of $375.00 (Canadian) per booth immediately. Please contact:

Mrs. H. Lacoste, Conference Coordinator
Conference Services
National Research Council of Canada
Ottawa, Ontario, Canada K1A 0R6A

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 the Atomic Energy of Canada 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.

A business meeting of the members of the U.S. Water Jet Technology Association will be held after the close of the afternoon session on Tuesday, August 29. The purpose of this meeting will be to elect directors and officers for the 1989-1991 biennium, to discuss changes to the publication *Recommended Practices for the Use of Manually Operated High-Pressure Water Jetting Equipment*, and other business of the Association.

Message from the President, cont'd from page 2

been shown to be an effective way to cut steel casing and tanks. There are many applications, especially in the petroleum industry, where abrasive jet cutting could be put to good use. However, sparks occur when abrasives cut metal even though the abrasive is inside a water jet. The question is whether these sparks are capable of igniting gas. No explosions occurred in the BHRA study referred to above, but some workers are not willing to accept the BHRA work as conclusive proof that explosions cannot occur.

The lack of consensus on hose safety and abrasive jet cutting in flammable atmospheres is a reflection of inexactitude in our knowledge of the physics of these safety problems. Enhanced understanding will enable the industry to make better informed safety decisions and to write better safety standards.

Recommended Practices for the Use of Manually Operated High Pressure Water Jetting Equipment

Copies of the U.S. Water Jet Technology Association publication, "Recommended Practices" developed by industry, government, and university representatives to the Standards Committee of the U.S. Water Jet Technology Association are available for purchase. The publication includes personnel requirements, operator training, operating procedures, equipment care and maintenance, protective clothing, personnel protection, freeze precautions, and accident precautions for manually operated high pressure water jetting equipment commonly used by industries involved with construction, maintenance, repair, cleaning and demolition work. Attention is drawn to the relevant or proposed OSHA, ASTM, and ANSI standards.

Copies are available at the following prices (excluding shipping and handling): 1-10, $5.00 each; 11-99, $4.00 each; 100 or more, $3.00 each. To order, please complete the form on page 5.

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"The work will teach you how to do it."

Estonian Proverb

Waterjet Cutting Course

The New Jersey Institute of Technology, Newark, NJ, in cooperation with Ingersoll-Rand Waterjet Cutting Systems is offering a 2-day course called **"Introduction to Waterjet Cutting,"** to be offered in their waterjet cutting lab on Monday and Tuesday, April 10 and 11.

"We are happy to be working with the New Jersey Institute of Technology," says George Reinbold, Manager of Marketing, Ingersoll-Rand Waterjet Cutting Systems. "NJIT faculty and students are currently using an Ingersoll-Rand Cutting System to explore futuristic manufacturing applications and to develop the technology for computer-integrated manufacturing to encourage new industries for New Jersey. Based on NJIT's strong commitment to industrial progress, a 'Factory of the Future' is being built with plans for a special room to house Ingersoll-Rand's waterjet."

"Because production environments are requiring more sophisticated machining techniques to cut the newer, more-conventional man-made materials that have superior qualities and strengths, the waterjet cutting laboratory of the Mechanical Engineering Department at NJIT is carrying out continuing education courses in the theory and technology of this dramatic cutting tool," explains Dr. Ernest S. Geskin, Associate Professor of Mechanical Engineering, NJIT; Director, Waterjet Cutting Laboratory. "The course will combine lectures, demonstrations and case studies to cover the basic theory of waterjet cutting, detailed description of the equipment, and equipment operation, including numerical control systems and the technology of the shaping of different materials."

Conducted by Dr. Geskin, the most recent applications of waterjet cutting will be discussed. Participants will be encouraged to bring their own samples to evaluate the applicability of the shaping of this technology for use by their individual companies.

Ingersoll-Rand representatives present at the course will include: Damon Schroter, Senior Product Manager; and John Romano, Regional Sales Manager/Northeast.

Current waterjet applications are wide-ranging, cutting everything from frozen tuna to Black Forest cake to concrete and glass with fine precision.

For more information about the waterjet cutting course, contact: Phil Levy, Division of Continuing Education, (201) 596-3062.

Postmaster: Please send Form 3579 to:

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