

## **Jet News**

OCTOBER 1995

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

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Water jets were used to cut this 2,500 square foot stained glass window in the world headquarters of the Reorganized Church of Jesus Christ of Latter Day Saints in Independence, Missouri. The window was designed by David Weln and constructed by Doug Hallberg Studios, Oneonta, New York. Doug Hallberg contracted with a water jetting company for the complex repetitive cutting in the window. The results were very positive.

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#### Scientific Papers, Exhibits and Equipment Demonstrations Highlight The 8th American Water Jet Conference

The 8th American Water Jet Conference was held August 26-29, 1995, at the J. W. Marriott in Houston, Texas. Over 700 engineers, scientists, educators, contractors, manufacturers, and suppliers gathered to learn the latest information about applications for water jet technology and see live field demonstrations of a variety of fluid jet systems and equipment. With the rapidly growing water jetting industry the Conference attendance surpassed previous conferences.

The Conference began Saturday, August 26, 1995, with a short course on the basic techniques and applications of fluid jet technology, including suggested safety procedures for operating water jet equipment. Each participant receive the textbook, Fluid Jet Technology — Fundamentals and Applications.

Research and applications sessions were held concurrently featuring papers covering a wide range of scientific and technical topics. These papers are published in the *Proceedings Of The 8th American Water Jet Conference*.

Conference participants also attended programs on customer service and sales and marketing. Steven R. Edwards, owner of Edwards & Associates, examined different methods of communicating allowing participants to improve their individual communications skills for maximum impact with customers. Richard G. Cross, chief operating officer of Mr. Rooter Plumbing, Aire Serv Heating and Air Conditioning, and Mr. Electric Expert Electrical Services, explained how you can be a winner at sales and in life. Participants learned how to motivate themselves to better sell their company and its products and services.

To see the newest in water jetting equipment, supplies, and services, participants visited the exhibit hall. The doors to the exhibit hall opened Saturday evening with a welcoming reception.

On Tuesday, August 29, the Conference concluded with equipment and applications demonstrations by Aqua-Dyne, Inc., Butterworth Jetting

Systems, Inc., Flow International Corporation, Jet Edge, Inc., Jetech, National Liquid Blasting (NLB) Corporation, and StoneAge, Inc.

Related Conference news and photographs can be found throughout this issue of the Jet News.

#### Water Jetting Publications Available

Proceedings Of The 8th American Water Jet Conference, a two volume set, hard cover, over 900 pages long. Includes a compilation of 66 papers, including photos and illustrations, presented at the Conference.

Fluid Jet Technology — Fundamentals and Applications, Third Edition, newly revised and updated. Ten chapters cover the basics of water jetting technology.

For information on ordering your water jet publications, see page 13.

#### Water Jet Cutting: Changing The Face Of The Decorative Stone Industry

#### Benefits of Water Jet Cutting

Water jets offer numerous benefits for the architectural and interior design industries. Omni-directional shapecutting capabilities allow for the cutting of complex shapes not possible with conventional tools or by hand. Fabricators can cut with ease any shape drawn on paper or generated on a computer, including complex inlays, medallions, borders and other challenging shapes.

Also, the low level of mechanical stress exerted on the work piece by water jet cutting alleviates the fracturing of fragile materials. This, in turn, minimizes tooling and fixturing requirements.

Automation is another key benefit.

Operators interface with the water jet through a PC-based or computer numerical control (CNC) controller, simplifying the fabrication process as compared to a manual cutting method. Operators simply

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download computer aided design (CAD) files into the controller to fabricate designs with their water jet. The CNC controller of the machine also enables the operator to easily recall programs and recreate pieces using the computer-generated drawings. The machine cuts every piece with precision, accuracy and consistency.

And water jets typically cut faster than conventional machinery. As a result, fabricators can ship the finished product to their customers in a shorter time frame than with conventional cutting methods. Garnet entrained in the water jet stream helps ensure a smooth, finished cut requiring little, if any, finishing.

And if a company has its own designers on board, all that is needed is a fax of the design. For those who have only a concept and not too much artistic skill, many water jet design and cutting companies employ full-time CAD operators who are graphic designers and artists. "They are able to take a concept in the form of a photograph or crude sketch through to the reality of shaping the design in stone or tile," says Richard Ward, manager of Daily Industries, Kent, OH.

#### A Good Combination

In particular, good water jet cutting allows different materials to be combined together.

"Imagine different shapes of marble, granite, travertine, ceramic tile, brass, stainless steel, glass and even wood, all combined within one amazing wall mural. The limits for stone design virtually disappear," says Harri Aalto, executive vice president/creative director of Creative Edge Corporation.

"These seemingly impossible creations can be done perfectly every time, from any drawing. And whatever is created by the water jet process can be repeated ad infinitum," he says.

#### Brass, Stainless Steel & Alloy Inlays

Brass, stainless steel and various alloys for inlaying into stone and tile, is an area that Ward says, "is in growing demand."

(continued on page 4)

#### New Developments, Products, Services

Flow International Corp. will introduce the new PASER 3 at FABTECH '95 in Chicago, Illinois, October 9-12. PASER 3 features include a redesigned cutting head that reduces the number of components from fourteen to five, a fixed metering disk and performance monitor, a bulk transfer unit and redesigned abrasive metering system and new Qbic mixing tube and ruby orifice. For more information about PASER 3, contact Laura Marinaro toll free at 1-800-446-3568.

Jetting Systems & Accessories Inc.
has announced the publication of its new
Conventional Nozzle & Line Mole
Catalog, featuring photographic
illustrations of more than 100 stock body
styles and almost unlimited orifice sizes
and configurations.

The new catalog complements the recently released Coned and Threaded Nozzle Catalog which lists stock nozzles for 20,000 psi and 35,000 psi working pressures.

For a free copy of both publications, call 1-800-580-JETT.

Parker Hannifin Corp. (formerly Rogan and Shanley, Inc.) has announced that the Polyflex 4000 Series hose, recognized for its reliability, durability and distinctive orange color, is being changed to a new gray color. The 4113ST Polyflex hose has already been changed to the new gray color and the remainder of the 4000 Series hose will also be changed as current inventory is depleted. The color orange is used by some industries as an indication of nonconductivity and, since the Polyflex hose is reinforced with high strength steel wire, Parker Hannifin feels the color change is desirable for customer safety.

For more information, call toll free 1-800-446-5236.

#### Water Jet Cutting: Changing The Face Of The Decorative Stone Industry, from page 3

"More companies are wanting various alloys inlaid into stone, ceramic tiles and reconstituted tiles for corporate logos, foyers, lobbies and furniture.

There are a few limitations, however.

"Some materials cut better than others; some are not recommended. An experienced water jet company will advise you relative to what you should and shouldn't use. And, very importantly, water jet is not a three-dimensional process. The technology, as of today, is only formulated to cut on flat surfaces," Aalto adds.

#### The Boundaries Of Imagination

But can you imagine paging through books of pre-engineered designs (or dreaming up your own) ranging in size from 3' to 12', selecting the materials of your choice, allocating which colors you want where, then placing the order and having the design delivered right to your door weeks later?

This is happening every day for those who are using water jet cutting technology to shape their floor designs, wall murals, corporate logos, furniture and the like.

"Drawing upon our 91 years of experience in working stone, combined with the latest water jet cutting technology, we have been working hard at building up an awareness of what can be done with water jets in the stone and tile world by investing in consistent advertising for several years," says Ward.

"Of course we rely on magazines such as *Dimensional Stone* to keep the industry up to date with the latest developments in the application and use of natural stone products."

"To a large extent," Ward adds, "we have been helping educate installers, fabricators and suppliers as to how easy and accessible even the most intricate design in any medium is."

#### A Giant Leap In Time Savings

Detailed mosaic inlays have provided elegant upgrades for natural stone flooring for thousands of years. But until recently, intricate patterns were time consuming, and limited to the patience and artistry of a finite number of highly skilled artisans — and their rich patrons.

"Water jet technology," says Richard Zenobio, founder of Madera Custom Marble, "now enables fabricators to cut impossible shapes out of slab materials in a time frame which would appear as a blink of an eye to an old-world craftsman."

Water jet work in the stone industry has grown tremendously in the last few years, and the envelope is just beginning to open as designers and architects realize they are no longer restricted to simple, geometric patterns and begin to challenge their suppliers with more sophisticated demands.

Many companies first began creating marble inlay designs by hand, using a variety of bandsaws, grinders and tile saws that were time consuming and limited its size, shape and thickness of materials.

(continued on page 7)

#### George Rankin Receives 1995 Pioneer Award

The Water Jet Technology
Association's (WJTA's) highest
honor was bestowed on George Rankin in
recognition of his significant contributions
toward the advancement, development,
and applications of fluid jet technology.

Mr. Rankin, founder of Aqua-Dyne, is one of the founding members of the WJTA and has served three terms on its board of directors.

The Pioneer Award was presented by Forrest Shook of NLB Corporation at the Awards Banquet held Sunday, August 27, 1995



George Rankin (left) and Forrest Shook

Reprinted below are comments from George Rankin.

Being presented to your peers as someone whose work has in some measure added value to their work is a profoundly gratifying experience.

Looking around this room I recognize scholars and scientists, entrepreneurs and practitioners whose special contributions to the waterjetting industry are of such magnitude and importance that they, perhaps rightfully, should stand in my place to receive this prestigious award.

When I graduated from the university in Houston as an engineer almost 30 years ago it was fashionable to go to work for NASA or an oil company. Not much was known or published about waterjetting then.

After explaining to a classmate, who had gone to work as an engineer for NASA, that my work was part science, part art and somewhat like applying a Roto-Rooter, his opinion was I had dumped my formal education down the drain.

In reality though, looking back, I had fallen into a career which has been immensely challenging and rewarding and for 25 years I have participated in a global growth industry which has become well known for the essential environmental health care related services it provides.

Recently I had an opportunity to test how well known our industry has become when I served on a panel judging University of Houston graduate students as they gave oral presentations prior to award of their masters degrees in marketing.

During a coffee break in the graduate students' presentations a young lady, who had just given her oral presentation, was bubbling over with nervous energy. She knew she had given a good presentation and she really wanted to ask me if I thought she was an A- or B+, but tactfully asked instead, "so what do you do for a living."

Dr. David Summers' college level textbook titled, "Waterjetting Technology," was in the university library and I reasoned that with

(continued on page 7)

#### 1995 WJTA Awards And Honors

Safety Award

Autoclave Engineers Group



From left Mohan Vijay, Ph.D., Paul Bowser of Autoclave Engineers Group, and George Savanick, Ph.D.

Technology Award Thomas J. Kim, Ph.D.



From left Mohan Vijay, Ph.D. and Thomas J. Kim, Ph.D.

Service Award Thomas J. Labus



From left Mohan Vijay, Ph.D. Thomas Labus, and George Savanick, Ph.D.

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#### Water Jet Cutting: Changing The Face Of The Decorative Stone Industry, from page 4

While researching a way to fabricate inlay work more efficiently, the solution kept pointing to water jet technology.

#### Water Jet Design & Cutting In Action

The evidence is in. Artists and designers no longer need to worry about the limitations of fabrication tools when creating elaborate designs, thanks to water jet design and cutting technology whose end result can be witnessed in a recently completed residential project in Atlanta, GA.

Jet Stream, Inc., a West Conshohocken, PA, fabricator brings designs to life with water jet cutting. Jet Stream utilizes a water jet system from Kent, WA-based Flow International Corporation.

"Abrasive water jet is a powerful machine tool that gives architects and artists freedom of expression," says Dave Surbeck, AIA, president of Jet Stream.

With this residential project in Atlanta, Flow's water jet recently demonstrated how it can assist in converting a computerized drawing into a fabricated part.

Atlanta Tile & Stone, a distributor of ceramic and stone products also located in Atlanta, contacted Jet Stream concerning a local residential

project which centered around a two-story foyer in a custom built home. Atlanta Tile & Stone's artist wanted to ensure the continuity of a scroll border woven into the custom made carpet on the stairway with a similar border inlay in the stone floor at the entry way.

#### Fragile Stone? No Problem

Atlanta Tile & Stone chose to fabricate the floor from honed limestone and polished marble. The brittle characteristics of some of these materials can make them difficult to cut with traditional machine tools as machinery used to cut them must exert a minimum level of mechanical stress in order to avoid shattering the pieces.

But since water jet cutting exerts less than five pounds of force on the work piece, the Flow water jet was able to cut intricate shapes without damaging the material's structural integrity. It eliminated possible fracturing of the fragile limestone and marble pieces during the project.



Foyer of residence in Atlanta, GA fabricated from honed limestone and polished marble. Photo country of let Stream and Flore International.

(continued on page 8)

#### George Rankin Receives 1995 Pioneer Award, from page 5

access to Dr. Summers book and the availability of numerous publications about our industry that I could safely tell her I was involved in waterjetting without having to resort to the Roto-Rooter analogy.

I told her "waterjetting." Her face lit up. "Do you rent them?" Thinking my lucky day had arrived I said, "yes." "Well what kind are they," she asked. I was in the middle of a well rehearsed sales pitch when she interrupted to tell me she and her friends like Kawasakis when they go to the lake.

Since its inception the WJTA association has brought together scholars, scientists, toolmakers and practitioners who work with high pressure water to develop the potential inherent in the most inexpensive and plentiful natural resource available for performing industrial cleaning, cutting and manufacturing tasks.

In recent years environmental health care has become synonymous with personal health care and these interrelated issues have driven technological advances in our industry which confront us with new challenges and opportunities as we prepare to continue our essential work into the 21st century.

I am especially proud to have had the privilege of serving on the WJTA board of directors.

When first elected to the board I had expectations of its meetings being held in Hawaii or Bermuda, but after serving for three terms the majority of meetings have been held in Chicago in January during blizzards. So I opted not to seek reelection to the board this term.

Joking aside, the WJTA boards I've served on were made up of an admirable group of dedicated professionals who unselfishly put aside their own interests to work for the good of our association and industry.

Continuing to serve on the board with them would have extended the period of "a high point in my life." But I believe the time has come for the association to elect people to serve on its board who best represent the interests of the ultimate end users of our industry's services.

The WJTA was founded by visionary scholars and scientists who were looking for a way for waterjetting researchers, toolmakers and practitioners to work together effectively.

During its first eight terms the WTJA Board of Directors has been made up primarily of scholars and scientists with a few toolmakers, while practitioners have been sparingly represented on the board.

In the coming era, end user feed back from practitioners is vital if our association's growth and the diversification of waterjetting applications are to take place.

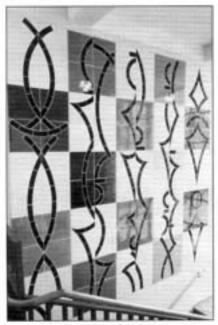
(continued on page 11)



Marble floor in condo lobby in Los Angeles, CA. Photo contray of Rodoo Marble and



Lobby area of Scudder, Stevens and Clark building, Chicago, IL. Photo courtesy of Daily Industries and Flow International.



Ceramic tile wall mural at Staten Island College, Staten Island, NY. Phase courtery of let Stream and Flore International

#### Water Jet Cutting: Changing The Face Of The Decorative Stone Industry, from page 7

Water jet cutting also left a smooth, finished edge that required little or no secondary finishing. As a result, Jet Stream was able to reduce the cost and time required for product development.

Surbeck assisted Atlanta Tile & Stone in modifying the final floor design from field measurements of the entry way performed by the distributor. Jet Stream used this data to size the pattern, ensuring a precision fit.

Jet Stream translated field templates of the entry way's curved stair area into its computer and then customized the floor scroll border to parallel the staircase floor plan. Once the various border configurations were loaded into the CAD system, the computer-integrated water jet cut the limestone and marble to the design's precise specifications.

#### Seeing Is Believing

About two years ago, Aalto was introduced to Keith Youngquist of Aumiller Youngquist PC, one of the most progressive and successful hospitality architectural firms in the world. Youngquist's firm had designed restaurants all over the place, many of which had amazing designs where tile, stone, glass mosaics, terrazzo, wood and other materials were combined. When Aalto introduced him to the water jet concept, he said he was amazed that Youngquist had no idea of its vast capabilities. Now, after just two years have elapsed, Aumiller Youngquist PC is utilizing water jet work on floors, walls and on furniture. (This summer in Chicago, Widow Newton's restaurant will debut with some of the most beautiful water jetcut stone dining tables imaginable). "He is a believer," says Aalto.

And so are some of the most high-profile companies and institutions in this country, including Disney, Hilton, Florsheim, Merrill Lynch, Denver's new Airport (the water jet-cut stone map of the world stands as the very model of a successful and beautiful installation) and others.

#### The Future

"I see the market becoming more competitive in the future. There are several companies entering the market, which is good for the end-user. This will help keep prices down and continue to make this kind of work more affordable," says Ward.

"We are constantly faced with clients who, prior to coming to us, have given this kind of work a shot only to be left wary of doing it again due to bad experiences. It is vital that the water jet contractor selected be experienced in working stone and tile to minimize risk of a mishap. Just crating the work is as important an art as doing the work itself.

Perhaps the single most important item Aalto says he would like to convey is that water jet work is something that virtually everybody likes and can appreciate for a very long time.

"Water jet work is not an added expense to the purchase of stone material. It is an investment that if produced correctly, will make any stone installation a veritable masterpiece in stone design," he adds.

"Water jet has arrived," Aalto believes. "And, water jet is here to stay."

Article adapted by permission from the August 1995 Dimensional Stone magazine.

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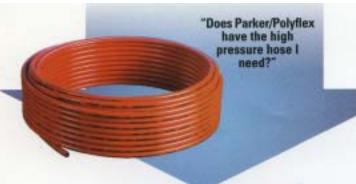
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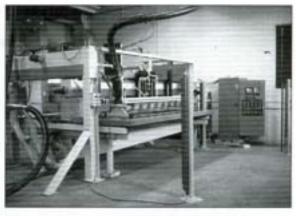
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#### CNC Multiple Head Water Jet Gasket Cutter

Jet Edge, in association with Chukar Industries, recently completed a major ultra-high pressure water jet cutting system for a manufacturer of industrial gaskets. The cutting application was for high speed removal of rubber flashing from ten complexgeometric gaskets simultaneously with twenty gaskets cut in a cycle time of only three minutes. The water jet cutting system designed for this application includes two shuttles mounted over an eight foot by four foot cutting table with 10 water jet cutting heads mounted over the work area. An innovative tooling plate concept is used to support the gaskets and permit removal of the flashing with a repeatability of +/-0.002 inches. The twenty tooling plates incorporated on the two shuttles feature unique pneumatic "grippers" that allow for rapid manual insertion and removal of the gaskets from each plate as well as highly accurate placement for the trimming process. The total system also includes a sophisticated safety subsystem that features light curtains, safety guards, pressure sensitive tread mats, and sound abatement treatments.



Two-shuttle, 10-head, high pressure water jet system for removing flashing from gaskets. Note electronic safety curtain.

The system is now in full operation, two shifts per day, using a Jet Edge Model 55-75 ultra-high pressure intensifier pump supplying 1.6 gpm of water through the 10 OmniJet™ cutting heads, each with 0.005 inch diameter diamond orifices. This application clearly demonstrates the advantages of water jet cutting are speed, accuracy, cut quality and cycle time over conventional die trimming.

For more information contact: Eric Chalmers, Jet Edge, 825 Rhode Island Avenue South, Minneapolis, MN 55426, phone: (800)JET-EDGE, fax: (612)545-5670.

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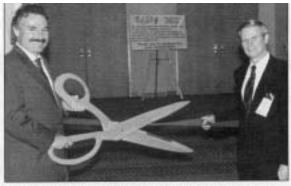
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#### Conference participants view the latest in equipment and supplies in WJTA's exhibit hall:







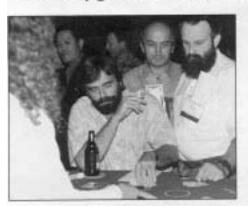
George Savanick, WJTA President, cuts the ribbon held by George Rankin, Conference Chairman, to open the WJTA Exhibit Hall.







Conference participants gathered at the WJTA Saloon to enjoy a Texas barbecue dinner, karaoke, games of chance, and prizes.



From left, Robert Fossey, Jaroslav Vasek, and Greg Galecki.



From left, Greg Mort, Dan Benson, and Helen Watson.



From left, Mike Hannigan, Christy Cienkus, and Dan Richards.



Participants try their luck at the roulette table.



Scott Light sings karaoke.



From left, George Savanick, Mohamed Hashish, and Brenda Cundiff.



Moira Rankin and Andrew Conn lead a sing along.



Participants place their bets (with "water jet bucks," not real money) at the craps table in the WJTA casino.

#### Abrasive Water Jets Cut Aluminum For British Sculptor Anish Kapoor's "Mountain Range"

The "Mountain Range," consisting of 171 layers of 12 interlocking aluminum sections comprised of 1700 strips at 1.75" x 1.5" x 96" maximum, gives new meaning to the term dimension and demonstrates yet another application for water jets.

RCI Waterjet Cutting Services, Mississauga, Ontario, Canada, performed the computer programming, water jet cutting and installation of the unique aluminum mountain sculpture. The structure was commissioned by Simcoe Place developer Cadillac Fairview Corp. through the city of Toronto Parks and Recreation.



Anish Kapoor's five-peak "Mountain Range," assembled from layers of abrasive water jet-cut aluminum, is located on the grounds of Simcoe Place, a new 30-story office tower development in downtown Toronto, Ontario, Canada. Phongraph convey of BCT Woorjet Canada Strakes, Mountain Canada.

Using a tracing head and MasterCam software, technicians at RCI Waterjet Cutting Services transferred the information from Kapoor's original drawing on 24 pieces of heavy mounting board to a compatible CAD format. CAD work included combining the 24 scanned sections into one complete topographic plan of the "Mountain Range," optimizing a pattern from 40 sheets of 48" x 96" over the mountain topography for cutting, and placing a series of location holes on each piece to ensure proper alignment. RCI used 450 megabytes of memory to accommodate the program that drove the cutting process.

Aluminum was selected over other metals for the "Mountain Range" project, including bronze and steel, because of its light weight and durability in outdoor elements. RCI used an abrasive water jet with a sapphire-tipped nozzle, cutting at a pressure of 55,000 psi, to cut 1700 aluminum strips. Each shape was numbered to ensure correct positioning within the five-peak "Mountain Range" and shipped to the site for assembly. Six hundred feet of 1/8" aluminum rod was cut to two-inch lengths to serve as location pins. In addition to the location pins, 15 liters of adhesive were used to help anchor the layers. Assembly was completed in 12 weeks.

The "Mountain Range" infrastructure is hollow with "U" channel and "I" beam supports.

#### George Rankin Receives 1995 Pioneer Award, from page 7

The history of the AMA and the WJTA have in common that they were founded by scholars and scientists with visions for the improvement of health care, and in common, too, it took a long time before the AMA's practitioners decided to become its leaders.

The problem practitioners had assuming leadership of the AMA was that they were too busy selling and guarding their secret cures. Health practitioners in the early days of the AMA didn't have much need for scholarly advice and they were concerned that scholars or toolmakers would undermine their proprietary interests.

There are encouraging signs that our industries' practitioners are now better prepared to take active leadership roles in the WJTA and several talented "practitioner oriented" candidates have been nominated for election to the board this next term.

In the future, the strength of our industry will depend on the value and effectiveness of its practitioners work and industry growth will depend on how well toolmakers identify and harness cost effective resources to assist practitioners to improve their work.

With rising demand from manufacturing industries to perform "production work" with waterjetting related tools, introduction of new techniques and discoveries by scholars and scientists must compliment the work of toolmakers and practitioners.

The noble road our industry is headed along leads to a promising future and I am honored to have been picked from among you for my contribution as one of its early builders.

In closing I wish to thank the WJTA Awards Committee for selecting me to be the recipient of this the 8th WJTA pioneer award. Thank you.

George Rankin

#### Authors Recognized For Achievements



In recognition of achievements as authors of outstanding papers presented at the 1993 WJTA Conference, (from left) Augusto Bortolussi and Raimundo Ciccu receive plaques from Dr. William A. Lees. Other "best paper" award recipients not pictured are M. Agus, W.M. Kim, P.P. Manca and Jack Kollé.

#### Demonstrations of equipment and applications were observed during the technical tour of Houston water jetting sites.



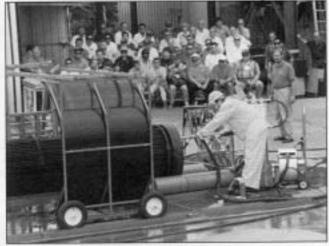
Jet Edge, Inc. demonstrates its abrasive jet pipe cutter.



Participants examine NLB Corporation's abrasive jet pipe cutter.



Jetech demonstrates the power of its jet gun by cutting the WJTA logo in 1/2" plywood.



Butterworth Jetting Systems, Inc. demonstrates its system for cleaning the inside of a heat exchanger tube bundle.



Aqua-Dyne, Inc. demonstrates CNCcontrolled abrasive water jet metal cutting using shapejets.



A demonstration of scarifying a concrete surface by StoneAge, Inc.



Flow International Corporation demonstrates paint removal.

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#### 1995 Calendar Of Events

October 11-14: CETA PowerClean '95, Georgia World Conference Center, Atlanta, Georgia, (800)441-0111.

October 31-November 2: Marble Institute of America 1995 Annual Convention & Exposition, Long Beach Convention Center, Long Beach, CA. Contact: MIA Annual Exposition, 475 Frontage Road, Suite 101, Burr Ridge, IL 60521, phone: (708)323-7212, fax: (708)323-6989.

#### 1996

January 19-20: Glass Expo Rocky Mountain, Adams Mark Hotel, Denver, Colorado. Contact: USGlass, P.O. Box 569, Garrisonville, VA 22463, phone: (540)720-5584, fax (540)720-5687.

February 1-4: Stona '96, 3rd International Granites & Stone Fair, Bangalore, India, phone: 91-80-3342541, fax: 91-80-3347433.

February 6-9: GlassLat '96, Glass & Machinery Show, Monterrey, Mexico. Contact: USGlass Magazine, P.O. Box 569, Garrisonville, VA 22463, USA, phone: (703)720-5584, fax: (703)720-5687.

March 1-2: Southeast Glass Expo '96, Orlando, Centroplex, Orlando, FL. Contact: USGlass Magazine, P.O. Box 569, Garrisonville, VA 22463, phone: (703)720-5584, fax: (703)720-5687.

September 3-6, 1996: The International Conference Geomechanics '96. Contact Dr. Z. Rakowski, Institute of Geonics, Studentska 1768, 708 Ostrava Poruba, Czech Republic, phone: (42)696914164, fax: (42)696919452.

October 29-31: 13th International Conference on Jet Cutting Technology, Sardinia, Italy. Contact: Mrs. Tracey Wheeler, BHR Group Limited, Cranfield, Bedford MK43 OAJ, United Kingdom, phone: +44 (0) 1234 750422, fax: +44 (0) 1234 750074.