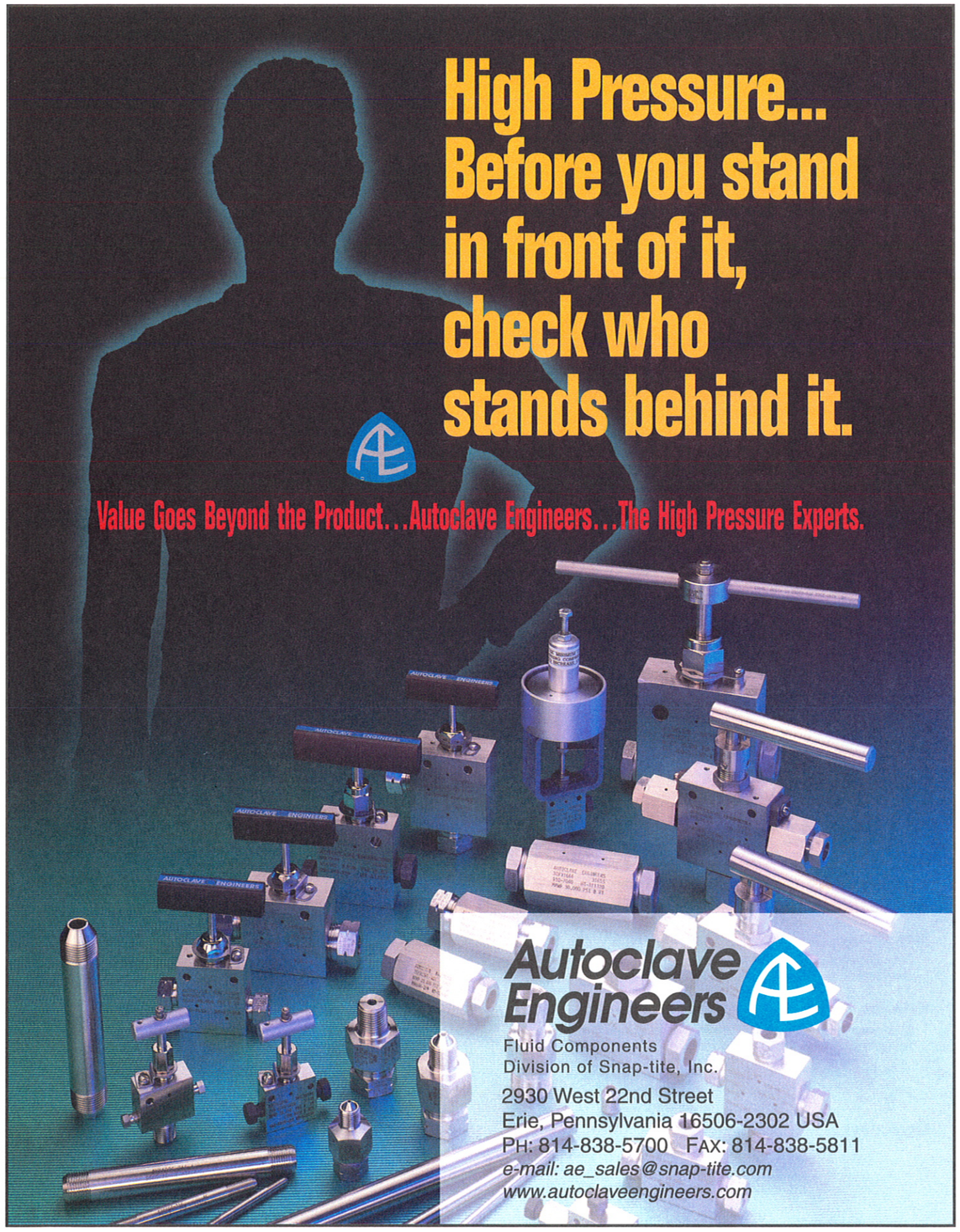

WJTA Jet News

WaterJet Technology Association

JUNE 2001

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The Laughing Water of Minnehaha Falls

Attendees at the 2001 WJTA American Waterjet Conference, August 18-21, 2001, should visit Minnehaha Falls while they are in Minneapolis. This waterfall (53 feet high) plays a role in Henry Wadsworth Longfellow's poem, "The Song of Hiawatha."

The Falls of Minnehala
Flash and gleam among the oak trees
Laugh and leap into the valley
From the waterfall he named her
Minnehaha, Laughing Water.

- From "The Song of Hiawatha"

Safety Practices For Line Moleing

A pressurized flexible lance and/or mole out of control among the waterjet crew is the most hazardous situation confronting the waterjet cleaning industry today. It is universally recognized as a hazard in the industry. There have been at least two fatalities and many other accidents which have occurred because the crew lost control of the flex lance and/or mole while cleaning out a tube or pipe.

An out-of-control lance is extra hazardous because the lance/mole moves very quickly and unpredictably while carrying a high pressure waterjet which can maim or kill. People have been hit in the neck, chest, abdomen and leg. They have also been hit from the rear because the mole is often blown out of the pipe beyond the position of the nozzle operator.

Because of these hazards, the cleaning of tubes and pipes is automated where possible so that the waterjet crew is out of harms way. Several automated machines have been built for routine jobs such as cleaning heat exchanger tubes.

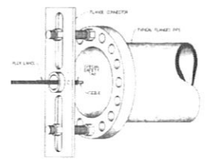
There are many jobs, however, for which no appropriate automated machine exists. It is universally accepted in the waterjet industry concerning these jobs that the crew must never lose control of the flex lance/mole. To this end, the industry suggests the use of methods designed to help prevent the lance/mole from reversing in the pipe and being expelled backwards from the pipe.

One method involves the use of a foot valve controlled by the nozzle operator.

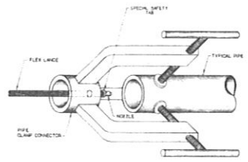
(continued on page 6)

Figures 1 and 2

1. Flange end application:



2. Non-flange end application:



In both cases, these tools will prevent the line mole from being pulled out under pressure and potentially causing injury to the worker.

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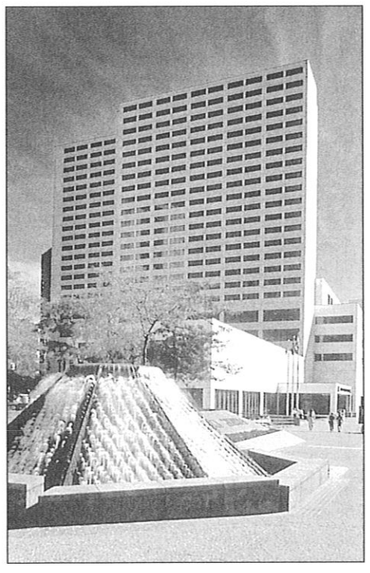

A fountain on the Nicollet Mall in Minneapolis adjacent to the Hyatt Regency Hotel. The Hyatt Regency on Nicollet Mall is the site of the 2001 WJTA American Waterjet Conference, August 18-21, 2001.

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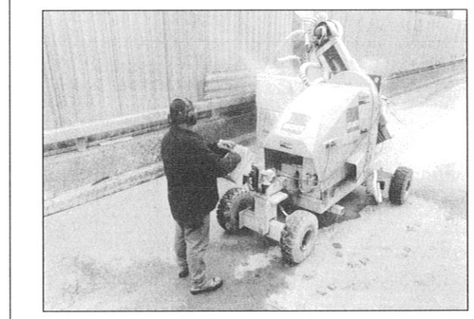
Conjet Quiets Hydrodemolition On Major Zurich Bridge

Specialist Swiss hydrodemolition contractor Wan-Jet AG has responded to local environmental pressure and developed an acoustic shroud, which has considerably reduced the noise level of its versatile Conjet high-pressure water-jetting Robot. The exceptionally quiet 361 Robot allowed Wan-Jet AG, and fellow Swiss contractors Locher AG and Brugger Aquajet AG, with identically shrouded Conjet Robots, to increase daily working time with the silenced water jetting machines by nearly 30% and boost productivity of their joint venture concrete removal contract on the 1.9km long Sihlhölzli to Brunau bridge in the centre of Zurich.

The major dual two lane multi-span concrete viaduct carries part of the A3 from Zurich to Sargans. It was built about 30 years ago, directly above and following the course of the river Sihl and is supported on concrete piers bearing on materials in the riverbed. Corrosion of the reinforced concrete deck, caused by de-icing salts, together with the need to strengthen the viaduct to take heavier trucks, forced bridge owner Baudirektior Kanton Zurich to embark on the approximate CHF61M repair and strengthening scheme. The project, designed by consulting engineers Edy Toscano AG together with Dobler & Schällibaum AG, is believed to be the largest bridge strengthening and repair project in Switzerland.

Locher AG, Brugger Aquajet AG, and Wan-Jet AG are working together as the specialist joint venture hydrodemolition subcontractor on their approximate CHF3M concrete removal contract, for the main bridge repair and strengthening contractor, a joint venture of Locher, Walo, Zschokke Locher, and Spaltenstein. The main contractor started on its repair and strengthening contract in the autumn of 1999 and aims to complete the original four-year project in three years. The main contractor is carrying out the repairs and placing new materials during the summer months, while Locher and Brugger Aquajet and Wan-Jet are performing the concrete removal, spread over the separate winter periods.



The Conjet Robots, equipped with different water jetting attachments, are preparing and scarifying the concrete deck for a new and stronger overlay. They are also cutting out concrete to receive new joints and strategically removing concrete from the edges of the deck, between the 4,500 transverse pre-stressing tendons across the carriage ways, to expose reinforcement in preparation for the main contractor casting on wider and stronger concrete parapets. A hydraulically driven spinning rotor head, equipped with four nozzles, is used to scarify the concrete deck, while a standard single oscillating nozzle, fixed to a multi-purpose articulating arm, selectively removes concrete from the deck joints and edge beams.

Wan-Jet's special accoustic shroud, which also has the benefit of acting as a secondary debris cover and fits over the Robot's standard protective shield, has dramatically cut noise level of the Conjet water jetting machines. Independent tests on site revealed the shroud reduced noise level of the standard Conjet Robot 361 from 115 dBA L_{eq} to 93.1 dBA L_{eq} taken at 3m in front of the machine. A reduction of 3dBA is equivalent to halving the noise. Ambient noise levels on the site range between 76dBA to 82dBA.

"I'm very impressed with the noise shroud, which has enabled us to work the Conjet Robots an extra two hours a day over the previous seven hours we used to work them without the special covers," says main joint venture contractor site manager Andreas Ackeret. "I also prefer hydrodemolition to other concrete removal methods as the technique only removes the damaged concrete, either above or below the rebar, and provides a rough, textured and clean surface to give a good bonding for the new concrete. Hydrodemolition does not cause any micro cracks in the concrete left behind and leaves all the rebar intact and cleaned, unlike

(continued on page 8)

High Pressure Hydraulic Systems

Tempress Technologies Inc., Kent, Washington, develops high-pressure hydraulic systems for commercial applications. Current projects include:

- HydroPulse drilling and seismic tools for the oil and gas industry
- CO_2 Jet-Assisted Drilling for lateral well completions in oil and gas reservoirs
- PulseBond fastening tools for automotive and aerospace applications
- Ultra-high-pressure water cannons for civil engineering

Tempress also provides consulting, engineering analysis, design, fabrication and testing of advanced fluid dynamic systems for federal and commercial clients. Tempress Technologies was recently awarded two grants for systems development. On August 1, 2000, the National Science Foundation awarded Tempress a Phase II SBIR grant to develop ***Blind Fastener Inflation for Structural Joining of Aluminum***. The work will include the development and testing of a hand-held PulseBond tool and aerospace fasteners.

On September 2, 2000, the U.S Department of Energy awarded Tempress a Phase I SBIR grant for ***Real-Time Pore Pressure Prediction Ahead of the Bit Using a Suction Pulse Seismic Source***. This project will involve vertical seismic profiling while drilling with the HydroPulse tool.

HydroPulse *Patent Pending*

The HydroPulse tool is designed to enhance oil and gas drilling rates by generating intense suction pulses around the bit. This system is mounted on a conventional drill string and powered by mud hydraulics. The bottom-hole assembly is compact and the system is compatible with downhole motors.

(continued on page 15)

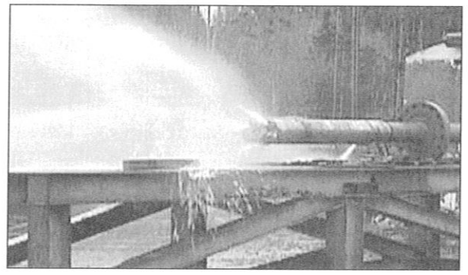
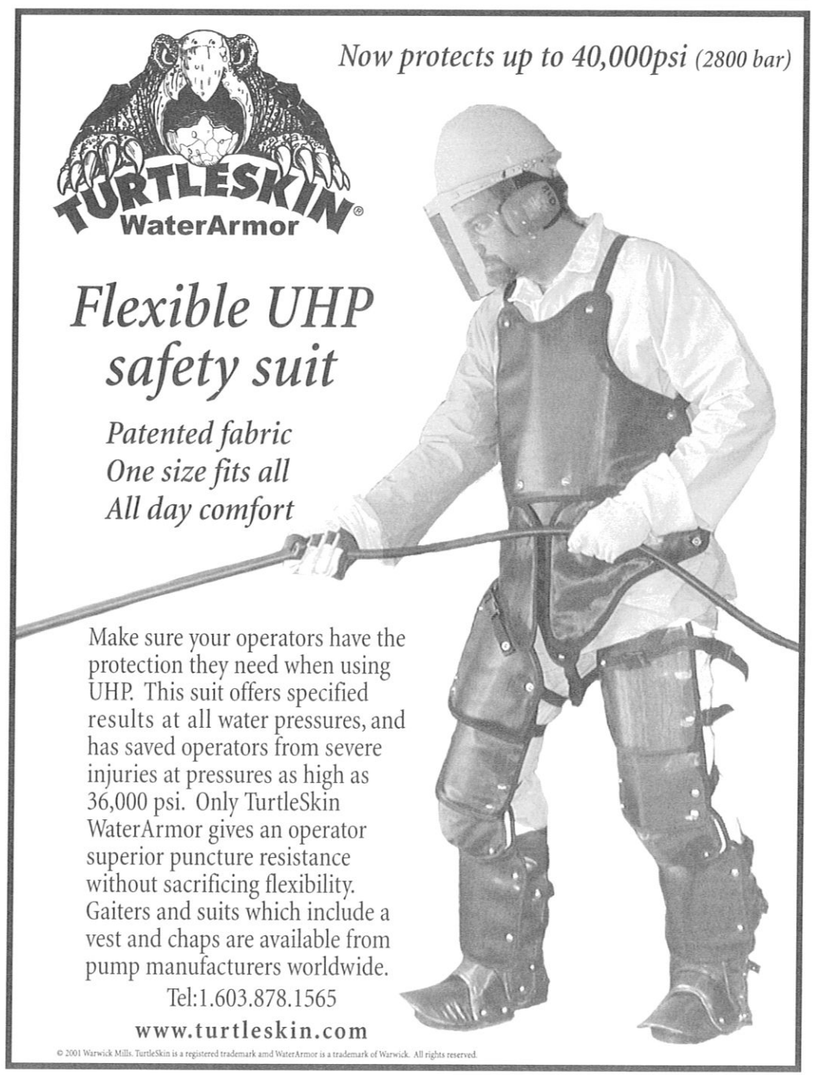


Figure 1



2001 WJTA American Waterjet Conference - Accepted Abstracts

- Investigation of Metal Piercing Using High-Speed Water Slugs, *O. Petrenko, E .S. Geskin, B. Goldenberg and G.A. Atanov*
- Laboratory Researches for Water Jet Material Surfaces Cleaning, *S. Radu, N. Ilias and A. Magyari*
- Limitations to the Use of Waterjets in Concrete Substrate Preparation, *G. Galecki, N. Maerz, A. Nanni and J. Myers*
- Micro Abrasive Waterjet Cutting, *D.S. Miller*
- Modeling and Simulation of Abrasive Water Jet Cut Surface Topography, *N.R. Babu and G. Vikram*
- Modulated vs. Continuous Jets: Performance Comparison, *J. Foldyna and L. Sitek*
- Numerical Investigation of Chaotic Motion for Cavitation Bubble in Oscillating Pressure Field, *F. Zhang, Z. Liao, C. Tang and L. Yang*
- Numerical Simulation of Abrasive Water Jet, *D. H. Ahmed, E. Siores, J. Naser and F. L. Chen*
- Numerical Study of the Turbulent Flow Inside a Pure Waterjet, K. Babets and E.S. Geskin
- Optical Method for Surface Analyses and Their Utilization for Abrasive Liquid Jet Automation, *J. Valíček, M. Držík, M. Ohlídal, V. Mádr and L. M. Hlávač*
- Optimizing Water Blast Power, *D. Wright, J. Zink, and J. Wolgamott*
- Performance of Water Jet Cutting System in Dimension Stone, *C. T. Lauand, G. R. Martin C. and W. T. Hennies*
- Reducing Abrasive Consumption by using SUPERWATER® for Venturi Abrasivejet Cutting, *W. G. Howells and V. L. Imlay*
- Removal of Non-Skid Coatings From Aircraft Carrier Decks, *T. Kupscznk and J. Van Dam*
- Research of Waterjet Interaction with Submerged Rock Materials, *L. M. Hlaváč, I.M. Hlavá čová, M. Kušnerová and V. Mádr*
- Researches of High Pressure Rotating Water Sand Blasting, *W. Qingguo and Z. Dan*
- Results of Comparative Nozzle Testing Using Abrasive Waterjet Cutting, *D.A. Summers, R.D. Fossey, J.W. Newkirk, G. Galecki, M. Johnson, D. Burch and G. Olson*
- Study on the Flow Characteristics of Free Water Jet Based on Hyperbola Flow Line Structure, *S. Jiang and M. Fang*
- Testing of Mineral Types of Abrasives for Abrasive Water Jet Cutting, *J. Foldyna, P. Martinec and L. Sitek*
- The Development of Improved High Pressure Valves, *G. G. Yie*
- The Electro-Aerosol Jet Cleaning the Grease and Impurity on the Metal Surface, *Z. Liao, C. Tang, F. Zhang, X. Deng and S. Zhang*
- The Hydro-Cannon Nozzle Optimization, *G. Atanov*
- The Macrogeometrical Quality of the Kerf in the Process Parameters Selection Procedures, *M. Annoni and M. Monno*
- The Removal of Hardened Grease Deposits from Steam Dryers in a Paper Mill: First Successful Contract Application of Forced Pulsed Waterjet, *M. M. Vijay, W. Yan, A. Tieu, C. Bai and J. Szemeczko*
- The Study on the Breaker of Self-Excited Oscillation Pulsed Jet to Scour the Hard Clay and Rocky Beds Under Water, *C. Tang, F. Zhang, L. Yang, Z. Liao*
- The Use of the Theory of Sonics for Producing High Pressure Pulsatory Water Jets, *A. Magyari, N. Ilias, Gh. Roman and S. Radu*
- Turning a Liability Into an Asset! The Story of an Old Power Plant, *R. Dupuy, R. Ashworth and L. Frenzel*
- Ultra High Pressure Waterjet Peening - Part I: Surface Characteristics, *S. Kunaporn, M. Ramulu and M. Hashish*
- Ultra High Pressure Waterjet Peening - Part II: Fatigue Performance, *S. Kunaporn, M. Ramulu, M. Jenkins, M. Hashish and J. Hopkins*
- Using Porous Lubricated Nozzles to Prevent Nozzle Wear in Abrasive Water Suspension Jets (AWSJ), *U. Anand and J. Katz*
- Waterjet Cleaning of Truck-Mounted Concrete Mixing Tanks, *A.L. Miller, G.W. King and G.A. Savanick*
- Waterjet Technology Challenge to Meet New Expectation, *J. Russell*
- Waterjet Use in Sculpting Large and Small Objects, *D.A. Summers*

Safety Committee Solicits Comments On *Recommended Practices*

The Safety Committee hereby solicits comments regarding improvements to the publication *Recommended Practices for the Use of Manually Operated High Pressure Waterjetting Equipment*. The *Recommended Practices* is reviewed periodically at the biennial conferences of the WaterJet Technology Association. The next review will be at the 2001 Conference, August 18-21, 2001, in Minneapolis, Minnesota. We invite your comments and recommendations for consideration.

Please address your suggestions to: Safety Committee, c/o WJTA, 917 Locust Street, Suite 1100, St. Louis, MO 63101-1419.

2001 WJTA American Waterjet Conference - Accepted Abstracts

- 800 MPa Pure Waterjet and Abrasive Waterjet Cutting - What's Next, *F. Trieb and K. Zamazal*
- AWJ To Machine Free Form Profiles in Natural Stone, *L. Carrino, M. Monno, W. Polini and S. Turchetta*
- Abrasive Cutting Comparisons, *R. D. Fossey, D. A. Summers, M. Johnson, D. Burch, J.W. Newkirk and G. Galecki*
- Abrasive Fragmentation, the Workpiece Interaction Effect and Its Economics, *J. Munoz and I. Kain*
- Abrasive Waterjet & Metal Material Interaction Dynamics, *J. F. Urbanek*
- Abrasive Waterjet Cutting a Comparative Study Between Open Catcher Tank and Water Catcher Tank, *I. Kain and J. Munoz*
- Abrasive Waterjet Machining of Aluminum with Local Abrasives, *O.V. K. Chetty and M.K. Babu*
- Advanced High Pressure Waterjet Cleaning Systems for Investment Casting Foundries, *J. Tebbe*
- Advanced Waterblast Tools Pay for Themselves, *J. Wolgamott, D. Wright and M. House*
- Comparison of Surface Preparation Using Different Methods, *L.E.O. Trotter*
- Cutting of Hollow Structures with Polymer Supported Abrasive Water Suspension Jets, *H. Louis and Ch. von Rad*
- Cutting of Reinforced Concrete Using Abrasive Suspension Jet, *A. Bortolussi, R. Ciccu and B. Grosso*
- Development and Design of Self-Rotating Forced Pulsed Waterjet: Basic Study and Applications, *M. M. Vijay, W. Yan, A. Tieu and C. Bai*
- Development of a Generic Procedure for Modeling of the Waterjet Cleaning, *K. Babets and E. S. Geskin*
- Development of a Technology for Fabrication of Ice Abrasives, *D. Shishkin, E. S. Geskin and B. Goldenberg*
- Development of the PREMAJET Derusting Machine, *Z. Dongsu, L. Benli, J. Beihua and L. Lihong*
- Difference and Sameness of Glue Removal for Airport Concrete Runway and Bitumen Runway, *S. Xue, Y. Fan, H. Peng, W. Huang, Z. Chen, T. Jiang and L. Wang*
- Disintegration of Rocks Exposed by Laser Beam by Waterjet, *L.M. Hlaváč, P. Martinec and A. Jančárek*
- Effect of Orifice/Nozzle Combination on AWJ Nozzle Wear, *D. G. Taggart and T. J. Kim*
- Electrostatic Charge Generation in Waterjet Systems, *P. L. Miller*
- Empirio-Analytical Method as a Good Means of Water Jetting Technology Investigations, *B. V. Radjko*
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- Experimental Studies of Swirling Jet for Hole Drilling, *Y. Yang, Z. Shen, R. Wang and W. Zhou*
- Field Experiments of a City Street Fence Water Jet Cleaner, *J. Wang, L. Yang, X. Li, S. Jing and W. Liu*
- High Pressure Water Jet for Mining Red Sea Egyptian Phosphate, *A. A. El-Saie*
- Hydro-Balanced Packing System for High Pressure Pumps, *M.T. Gracey*
- Hydrodynamic Generator for Ultrasonic Modulation of the Jet: Basic Study, *L. Sitek, Z. Řiha, J. Foldyna and L. Lhoták ová*
- Impact Initiation Mechanisms of High Explosive Materials During Waterjet Demilitarization, *P. L. Miller*
- Influences on Structure Formation at the Cutting Edge with Abrasive Waterjets, *A. Henning, R. Friedrich, T. Ditzinger, T. Kübler, E. Westkämper and G. Radons*
- Investigation of a New Cutting Head Concept Based on an Annular Driving Jet, *U. Suchy*

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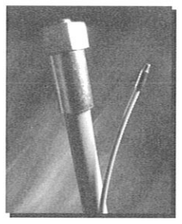

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Candidates must be received no later than July 2, 2001. The award recipient, to be selected by the Awards Committee of the WaterJet Technology Association, will be honored at a presentation ceremony on Monday, August 20, 2001, in conjunction with the 2001 WJTA American Waterjet Conference in Minneapolis, Minnesota.

Following is an official form for candidate nominations. Complete one form for each nomination submitted. Please make additional copies of the form as needed. Nominations providing complete written information specified on the form may be faxed to (314)241-1449 or mailed to the WaterJet Technology Association, 917 Locust Street, Suite 1100, St. Louis, MO 63101-1419, USA.

Previous Award Recipients

1981	Pioneer Award	Jacob Frank (deceased)
1983	Pioneer Award	H.D Stephens (deceased)
1985	Pioneer Award	William Cooley, Fairfax, VA
1987	Pioneer Award	Norman Franz, Ph.D., Vancouver, BC
1989	Pioneer Award	Richard Paseman, Houston, TX
1991	Pioneer Award	John H. Olsen, Ph.D., Auburn, WA
1993	Pioneer Award	Fun-Den Wang, Ph.D., Golden, CO
	Safety Award	David Summers, Ph.D. NLB Corporation
	Service Award	George A. Savanick, Ph.D. Mohan Vijay, Ph.D.
	Technology Award	Mohamed Hashish, Ph.D. Autoclave Engineers Hammelmann Corporation
1995	Pioneer Award	George Rankin, Houston, TX
	Safety Award	Autoclave Engineers
	Service Award	Thomas J. Labus
	Technology Award	Thomas J. Kim, Ph.D.
1997	Pioneer Award	David A. Summers, Ph.D., Rolla, MO
	Service Award	Andrew F. Conn, Ph.D.
	Technology Award	Prof. Dr-Ing. Hartmut Louis
1999	Pioneer Award	Mohamed Hashish, Ph.D., Kent, WA
	Safety Award	Bruce Wood
	Service Award	John Wolgamott
	Technology Award	Ryoji Kobayashi, Ph.D.

2001 WJTA Awards Nomination Form

Instructions: Complete sections below and submit a narrative (300-word maximum) to support your nomination on a separate sheet of paper. Please print or type all information.

I nominate the following company, organization, or person as a candidate to receive a 2001 WJTA Award
(CHECK ONE AWARD):

❒ **Distinguished Pioneer Award**

The nominee must:

- Have made contributions to the waterjet industry;
- Have made contributions to the achievement of the goals of WJTA;
- Have high moral character;
- Have strong personal and business ethics;
- Be dedicated to the future of the waterjet industry and to the growth of WJTA.

❒ **Technology Award**

What has the nominated company, organization or individual done to introduce new and innovative ideas in engineering or manufacturing? This could include, but is not limited to, new products, new manufacturing techniques, patents . . . any unique activity that advanced the technology of the waterjet industry.

❒ **Service Award**

How has the nominated company, organization or individual contributed in time and talent toward improvement in the WaterJet Technology Association?

❒ **Safety Award**

What has the nominated company, organization or individual done to introduce new and innovative ideas in safety? This could include, but is not limited to new products, new concepts, new safety techniques . . . any unique activity which increases the overall safety of waterjet equipment.

(nominations form on page 23)

Safety Practices For Line Moleing, from page 2

The person inserting the mole should be the one who controls the foot pedal. This is universally recognized and followed in the industry. The reason is that the person feeding the lines into the pipe is closest to the action -- he/she will sense a problem before anyone else in the crew. He/she will then be able to deactivate the mole faster than anyone else. The foot pedal acts as a "deadman" switch because stepping off the pedal immediately shuts off the water to the mole and eliminates the waterjet.

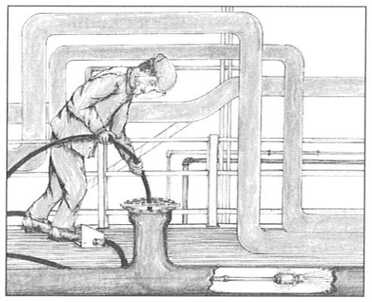


Figure 3

Section 10.9.1. of the *Recommended Practices for the Use of Manually Operated High Pressure Waterjetting Equipment* states regarding line moles or flex lances, "The feed assembly to the flexible lance or hose **shall** be fitted with either a dump system or a dry shutoff control valve. The operator inserting the nozzle **shall** maintain control of the dump system." These *Recommended Practices* were developed by the Waterjet Technology Association with extensive input from the waterjet industry. Most waterjet industry companies have safety manuals that also contain this rule.

A second method to help avoid these accidents is to use a length of rigid pipe (a stinger) on the flex lance just behind the mole to prevent the lance from reversing direction and shooting out the pipe.

A stinger should be used in line with the mole. Should the situation arise when the force on the mole becomes so configured that the mole is rotated toward the rear the stinger should become wedged crosswise in the pipe thereby preventing the mole from being repelled backward out of the pipe. The Contractors Safety Association of Ontario has publicized a safety manual, *High Pressure Water Blasting*. In section 7 of this manual, it states, "To prevent a nozzle from reversing direction inside a tube and shooting its way back out with out warning a straight piece of pipe should be attached between the nozzle and the end of the hose." Most safety manuals of waterjet companies contain a similar requirement for the use of stingers in line moleing.

A third method to help avoid these accidents is to install a retention device similar to those shown in figures 1-4.

A retention device at the end of the pipe (similar to those shown in Figures 1, 2, 3 and 4) is a third way to help prevent the line mole from exiting the pipe while under pressure. The use of a retentive device is especially critical because it represents the last opportunity to contain an out-of-control lance.

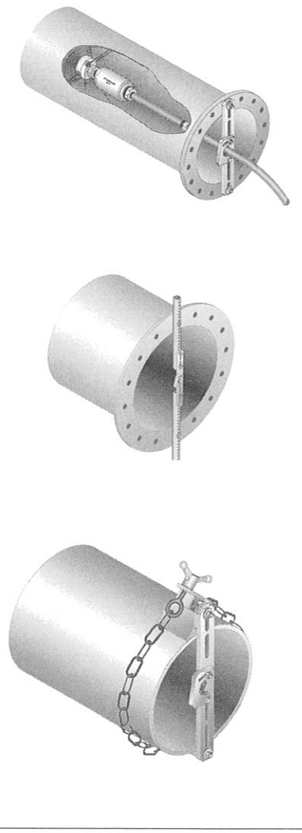
The most recent advance in waterjet safety is the development of safety suits using the fiber Kevlar®.

These suits were described in the March 1998 issue of *Jet News*. They are designed to protect waterjet workers from being cut by high pressure waterjets traversing across the body such as could occur with an out-of-control line mole. And thus it is the last line of defense. These suits are presently being tested on the job by several waterjet contractors.

These safety suggestions have to be considered in conjunction with all other possible safety steps to design the safest system under your particular circumstances.

Figures 1 and 2 reprinted courtesy of HydroChem Industrial Services, Houston, Texas, from HydroChem's *Safety and Operations Manual*, 6th edition. Figures 3 and 4 reprinted courtesy of StoneAge, Inc., Durango, Colorado.

Figure 4



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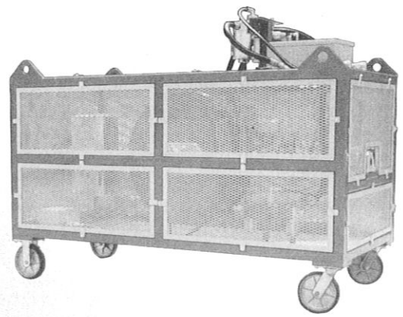

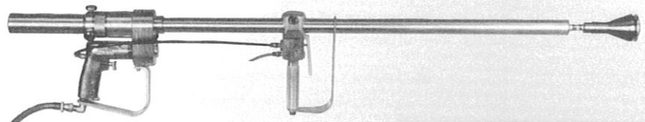

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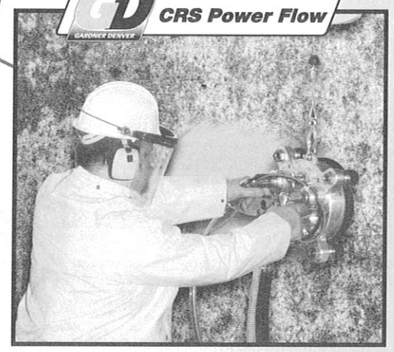

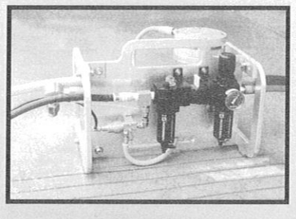

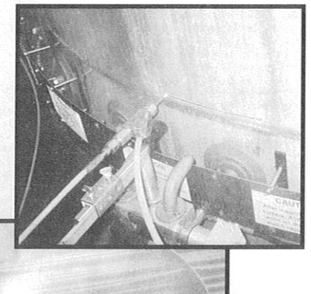

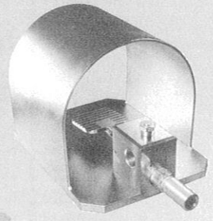

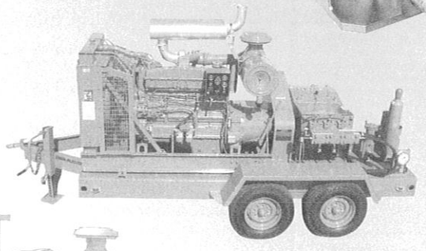

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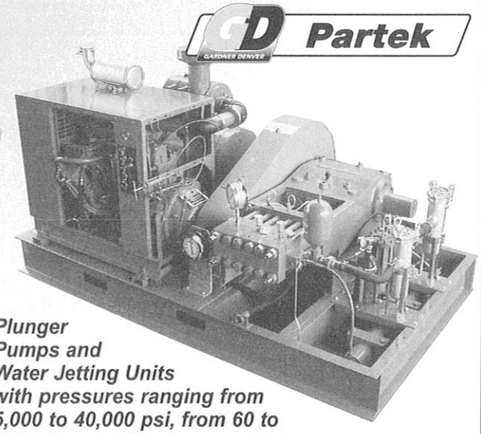

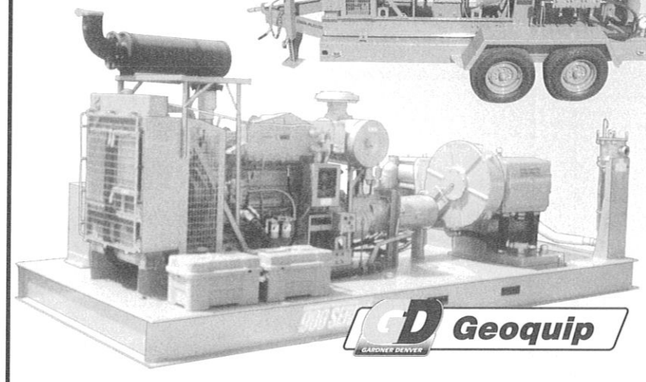

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extruded into different profiles for use as ejection material in flatbed dies and rotary steel dies.

These Durometer 55-60 EPDM resins will likely be as amenable to cutting with SUPER-WATER as the EPDM materials for the following reason:

Previously 90 Durometer rubber (four-ply and one-inch thick) was cut at 49 inches/minute with a 0.3% SUPER-WATER solution (0.22 gpm at 48,500 psi) and a 0.007-inch nozzle at a standoff distance of 1/16-inch, and notably, with a virtual absence of striations while cuts with plain water were slower (39 inches/minute) and had very marked striations.

6. Reduced Substrate Wetting

SUPER-WATER reduces the wetting of substrates as would be expected from a jet in air characterized by distinct coherence and an essential absence of spray.

Because of the absence of spray, the tendency for a SUPER-WATER jet to wet substrates is diminished.

Similarly the extent of a SUPER-WATER jet's coherence can be correlated with the effectiveness of cutting thick materials.

7. Cost Effectiveness

Cost-effectiveness was determined over a three-year period using a Flow International intensifier at 40,000-45,000 psi.

Relative to plain water, use of SUPER-WATER was found to improve the quality of cut quality of fiberglass, i.e., no subsequent sanding is required, saving $15,000 annually in labor costs.

Increased cutting speeds of 30%-200% were obtained providing an estimated annual production increase of $420,000 in receivables.

Additionally intensifier operating and maintenance costs were reduced by 38%.

For an annual expenditure of $200 for SUPER-WATER, Decoustics (Toronto) achieves a return on investment (ROI) of >2,000 to 1.

This application of cutting fiberglass gives an unambiguous demonstration of the economic advantages of using SUPER-WATER in ultra-high pressure waterjet cutting.

8. Critical Importance of SUPER-WATER Injection Systems

SUPER-WATER, as sold, is in the form of a water-in-oil emulsion. The internal water phase contains the polyacrylamide. In order to use the product, the emulsion has to be broken or, to be precise, inverted to an oil-in-water emulsion. This absolutely necessitates use of specific types of injection systems which, placed after the filters, accurately meter the requisite amount of SUPER-WATER into the water stream.

Filters cause elongational shearing of macromolecules, leading to a reduction in molecular weight and a parallel reduction in effectiveness as does centrifugal pumping.

The diluted SUPER-WATER then flows through a static mixer, in which complete and uniform emulsion inversion is ensured, to the main stream of the waterjetting fluid.

Prior to use, SUPER-WATER requires five to six minutes at 70°F to become fully hydrated. The molecular weight of SUPER-WATER ranges from 16 to 18 million so the bonding of water molecules (or hydration) takes a finite time because each monomeric unit bonds 13 to 14 molecules of water.

Obviously this bonding of polymer and water cannot take place instantaneously because it must proceed by formation of sequential layers of the 13 to 14 water molecules to finally furnish 2.9 million water molecules bonded to each SUPER-WATER macromolecule.

The hydration can be achieved in either a holding tank, a bank of polyvinyl chloride tubing or in a length of low pressure tubing. A series of four photographs details this process using a non-electrical proportional DOSATRON injection unit and a TAH static mixer.

9. Safety and Environmental Considerations

The usual safety precautions employed during hydroblasting are appropriate for ultra-high pressure precision cutting with SUPER-WATER.

Because of its incisive cutting ability, the SUPER-WATER jet should be handled with care.

The OSHA Material Safety Data Sheet for SUPER-WATER describes general precautions, but upon appropriate dilution (i.e., 0.1%-0.3%), the properties, apart from flow characteristics, closely approach those of water.

Neither polyacrylamide nor polyacrylic acid, or combinations, are listed in the EPA Consent Decree, nor are they included in the list of chemicals described as being carcinogenic.

SUPER-WATER is biodegradable and does not foul oxidation ponds.

The chemical oxygen demand of SUPER-WATER is 706 g/L (at a use concentration of 0.1% it is 0.7 g/L), and the biological oxygen demand is 87 g/L (at 0.1% it is 0.09 g/L). The LC 50/96 hr is 53 ppm (Rainbow Trout) and 84 ppm (Blue Gill Sunfish). The acute oral toxicity (rat) is 10 ml/Kg and the dermal toxicity LC 50 (rabbit) is also >10 ml/Kg.

SUPER-WATER conforms to the Federal Food, Drug and Cosmetic Act as amended in 1958 and 1960, specifically Chapter 21 CFR, Section 176.110 as a component of paper and paperboard in contact with food and Section 175.105 as a component of adhesives in contact with food. Other SUPER-WATER components conform to CFR 21, Sections 178.3400 and 178.3650.

Because SUPER-WATER is a "non-regulated material, liquid, cleaning compound, NMFC 48580 class 55," it is shipped by truck, ship, and air, including UPS.

Sincerely yours,

W. Glenn Howells, PhD
Berkeley Chemical Research, Inc.

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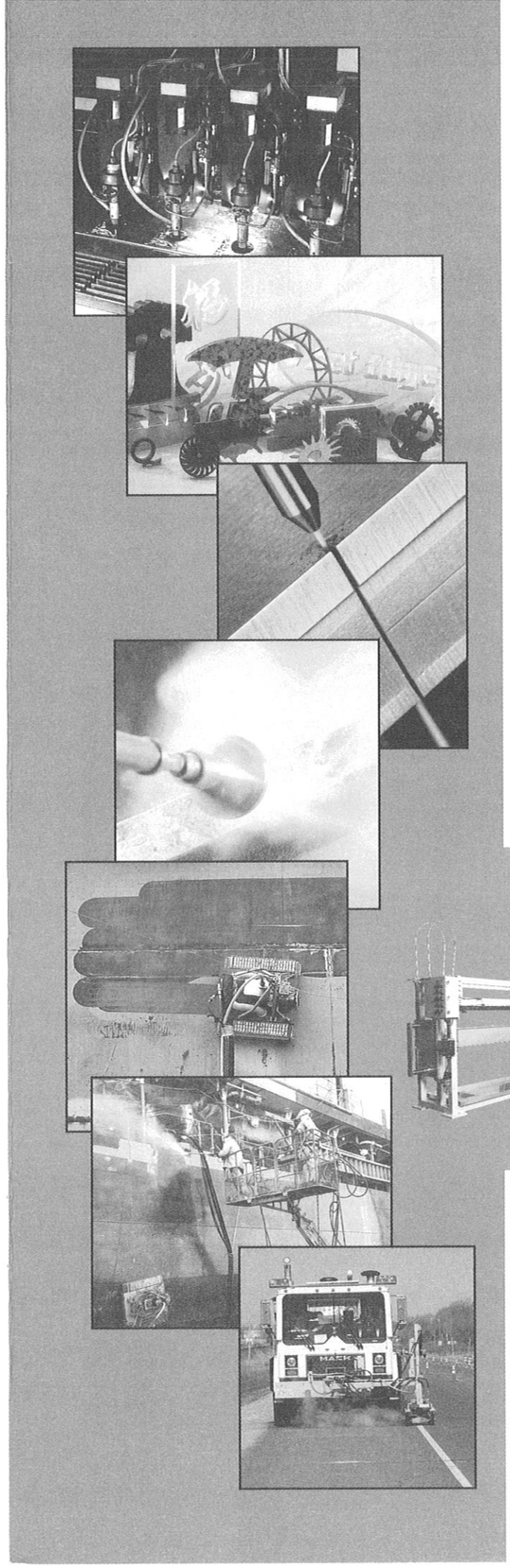

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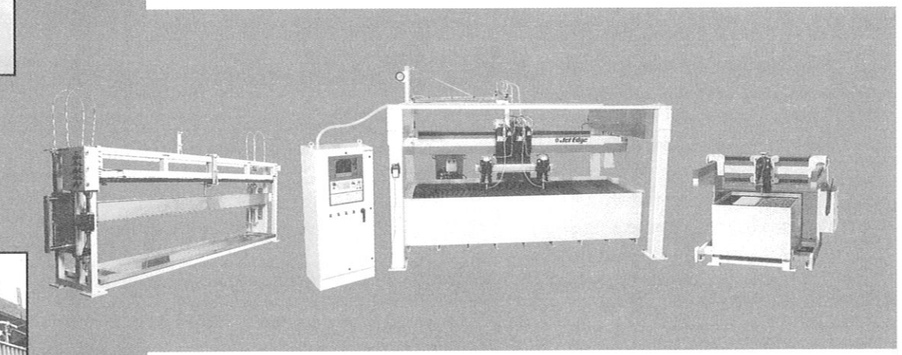

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Conjet Quiets Hydrodemolition On Major Zurich Bridge, from page 3

pneumatic breakers, which can hit and vibrate the rebar and do a lot of extra damage by breaking the bond between the reinforcement and good concrete."

Locher, Brugger Aquajet and Wan-Jet started on the first phase of the hydrodemolition contract in the winter of 1999 using Robots without the special shrouds. "The project is close to a residential area and to try and reduce the noise we started developing the shroud initially for our Robot 361. But it has been very successful so it has also been fitted to Brugger Aquajet's Conjet 360 Robot and Locerh's 363," says Wan-Jet AG managing director Reinhard Frick, who is also president of Schweizerischer Fachverband für Hydrodynamik am Bau, Switzerland's hydrodemolition association. "Since we fitted the shrouds this winter, production has improved as we can now work nine high pressure hours/day instead of only seven hours in our first year."

The Conjet Robots, equipped with the rotor attachment, are scarifying the deck and removing between 4mm and 15mm of concrete at a rate of up to 30m²/high pressure hour. Wan-Jet's Robot 361 is powered by a Hammelmann water jetting pump operating at 1500 bar and flow of 105 litres/min., while the other two Conjet Robots are both working at 1200 bar and 140 litres/min. About 50,000 mm² of concrete deck surface, with strength of about 18N/mm², will be scarified and peppered with 200,000 drilled holes to accept epoxy glued key bolts. This will be followed by a mesh of 12mm diameter bars spaced on a 150mm grid and topped with a layer of up to 200mm thick salt resistant 50N/mm² concrete.

After deck scarifying the Robot's rotors will be replaced with standard feed beam and single nozzle to cut out alternate blocks of concrete along the edge and the full depth of the deck between the pre-stressing tendons to expose the reinforcement. About 3,700m³ of concrete has to be cut off the edge beams and from inside the box girders. Additional reinforcement will be tied into the edges of the decking prior to in-situ casting the new taller and stronger parapet.

The strengthened concrete deck will be finished off with a new waterproofing membrane and a 70mm thick asphalt base course and a final 35mm thick asphalt wearing course prior to a return to traffic. The main contractor is splitting the 24m wide twin concrete box girder viaduct into three separate longitudinal sections, one for each year of the contract. The two outer 6m wide lanes will be tackled first followed by the final 10m wide central section, with the intention of returning the finished and strengthened viaduct back to full traffic by the end of summer 2002.

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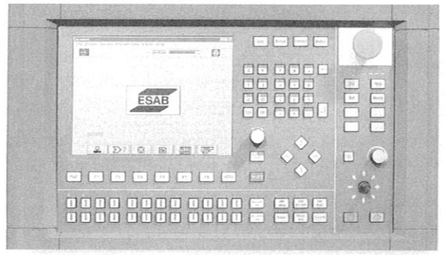

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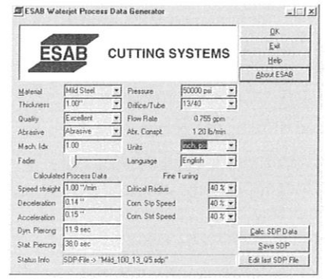
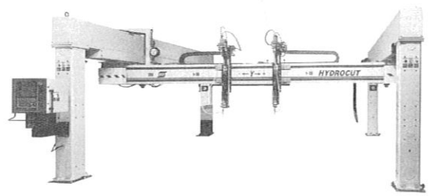


ESAB's **Vision PC** CNC controller for waterjet cutting combines remarkable ease of operation with powerful software tools like real-time tool path display and kerf-on-the-fly with kerf-override to offer the most technologically advanced control in the industry. This Windows-based controller features menu-driven operation, color LCD display, 8-position joystick, hand wheel, hard drive, 3.5" floppy drive, and speed potentiometer for easy operator use. Station and process control are integrated in a single ergonomic operator's panel. A 333 mHz processor and advanced features such as multi-level return, zoom while running, and program continue after power failure further add to the power of this control.



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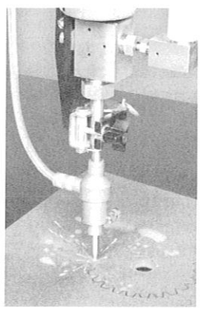

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Letter to the Editor, from page 19

required accuracy using a pump pressure of 46,000 psi. However, compared to plain water, 0.3% SUPER-WATER gave an equal edge quality and increased cut speeds by 250%, 300% and 290%, respectively.

Strict dimensional and geometric requirements were obtained by computer aided design (CAD).

The overall project, carried out with an Ingersoll Rand 40 HP Streamline-I intensifier, was completed approximately three times faster than if plain water had been used.

4. Cutting Polyethylene Foam

Samples of PolyPlank® closed-cell polyethylene foam were also tested.

Waterjet Inc. (Columbus, IN) determined that a 0.007-inch nozzle and 0.3% SUPER-WATER gave edge qualities equal to those obtained with plain water using a 0.008-inch nozzle.

However, with SUPER-WATER the cut speeds were significantly faster, i.e., 50-250%.

Three samples were cut:

- The first sample, 2½-inch thick PP224108-4# polyethylene (with a density of 4-lb per cubic foot), was cut with at a 50% increase in cutting speed.
- The second sample, 3-inch RLPP324108 (reclaimed material), was cut at a 250% increase in cutting speed.
- The third sample, 2¼-inch thick FRPP224108 (flame retardant), was cut at a 100% increase in cutting speed.

Clearly, cutting PolyPlank closed-cell polyethylene foam with SUPER-WATER has potential.

5. Horsepower Reduction

Results of cutting EPDM closed-celled rubber sponge are provided. They are for 0.3% SUPER-WATER with a 0.007-inch sapphire orifice and for plain water with a 0.008-inch sapphire orifice.

The client (who requests anonymity) wished to reduce the required horsepower and increase the number of layers in the stacks being cut. Using SUPER-WATER, either the number in the stack was increased (from four to six, from three to five, and from five to eight) with the same cut quality or, in two cases, the same number in the stack was cut but an improved quality of cut.

By using a 0.007-inch nozzle with SUPER-WATER instead of a 0.008-inch nozzle with plain water, a decrease in required horsepower of 31% (i.e., from 10.1 to 7.0 horsepower) was achieved.

In the packaging industry (as well as in print and die-cutting operations) Durometer 55-60 EPDM resins are

(continued on page 26)

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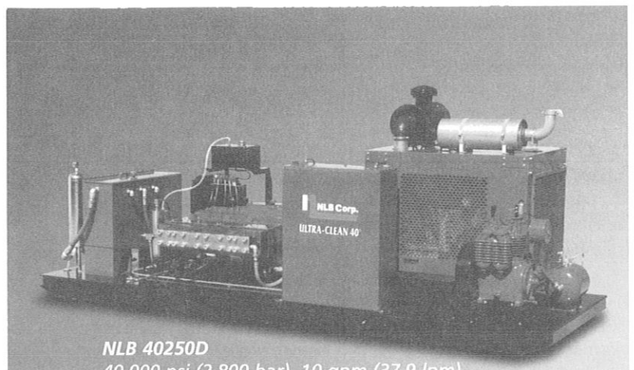
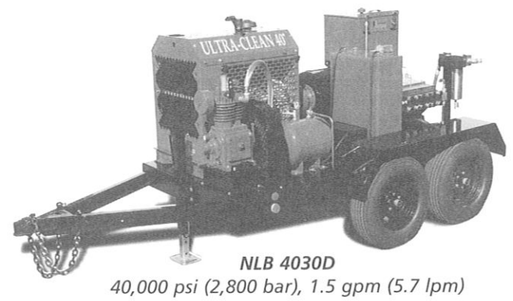


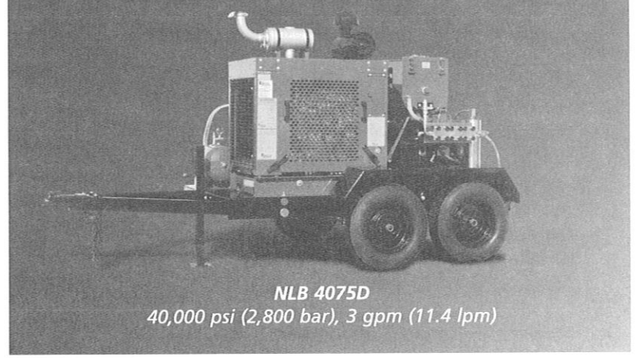
NLB 40250D
40,000 psi (2,800 bar), 10 gpm (37.9 lpm)



NLB 4030D
40,000 psi (2,800 bar), 1.5 gpm (5.7 lpm)

Contractors around the world tell us our UHP pumps are the most reliable.

NLB 40201D
40,000 psi (2,800 bar), 6 gpm (22.7 lpm)



NLB 4075D
40,000 psi (2,800 bar), 3 gpm (11.4 lpm)

When equipment goes down, you stop making money. That's why you need an ULTRA-CLEAN® water jet pump from NLB. Contractors who use NLB pumps report that they set the standard for reliability.

Our simple pump design, proven over nearly three decades, minimizes wear and helps keep your operating costs the lowest they can be.

No other manufacturer has as many models delivering pressures up to 40,000 psi (2,800 bar). Flows range from 1 to 10 gpm (3.8-38 lpm) and engines from 30-250 hp (22-186 kw), all available with diesel or electric power.

You can buy, lease or rent an ULTRA-CLEAN® pump... separately, or as part of a HydroPrep™ surface preparation system, featuring an automated NLB Crawler or a manually-operated VertaJet™. Like all NLB equipment, it's supported with top-quality replacement parts (delivered when promised), comprehensive training and factory service.

Want to see just how productive surface preparation can be? Call NLB today. (In North America, call toll-free: **1-877-NLB-7989**.)

Distributorships still available in some countries.

NLB Corp.

NLB North America
29830 Beck Road, Wixom, MI 48393, USA
Phone: 01-248-624-5555, Fax: 01-248-624-0908
Texas: (281) 471-7761, New Jersey: (856) 423-2211
e-mail: nlbmktg@nlbusa.com, www.nlbcorp.com

NLB Europe
Gentianenlaan 17
3233 VC Oostvoorne, Netherlands
Phone: 31-(0) 81-482811, Fax: 31-(0) 81-485238
e-mail: watercle@publishnet.nl

Meet The Candidates For 2001-2003 WJTA Board of Directors

Craig L. Anderson

Craig L. Anderson is Business Unit Manager of the *polyflex* Business Unit of Parker Hannifin Corporation, Stafford, Texas, a position he has held since 1996. He has managed all aspects of various product lines of hose and polymer products. Mr. Anderson also held the positions of product manager and senior sales engineer at Parker Hannifin. Mr. Anderson attended Bowling Green State University, Bowling Green, Ohio, where he earned a bachelor's degree in construction engineering and management.

Mission: To form a triangle of engineering/marketing/user safety as the WJTA's central focus; to form an active committee system to focus on areas of high-pressure water development such as engineering, safety, product standards and marketing; to evaluate product testing as a potential service and revenue stream; to enhance the WJTA's recognition as a technical resource through interaction with ASME, SAE, and API; to expand the *"Recommended Practices"* to include a user-friendlier format, including a CD version; to expand the member education offerings; to evaluate participation in seminars, trade shows and conferences held by related associations and industry groups; and to increase WJTA membership through value-added and expanded services.

Nominated by: Richard Schmid, Business Unit Manager, Flow International Corporation, Kent, Washington.

Andrew F. Conn, PhD

Andrew F. Conn, PhD, was one of the founding members of the first Board of Directors of the WaterJet Technology Association, and he has served as a member of the Board or member of the Executive Committee for most of the years of existence of the WJTA. After working for 20 years at Hydronautics, where he participated in the development and application of several unique erosive waterjet nozzle systems, he then began independent consulting with the founding of Conn Consulting, Inc. He is now also a part-time member of the faculty at Johns Hopkins University, teaching several courses in the Mechanical Engineering Department.

Mission: If re-elected to the Board, I would attempt to continue my efforts of the past several years to increase the level of participation of waterjetting contractors, by enhancing the opportunities and benefits the WJTA could provide to them. Foremost would be a Group Insurance Plan, which would enable WJTA member companies to enjoy reduced premiums. The combined benefits of increased corporate participation in the WJTA, increased opportunities for workers to attend WJTA-supported training courses, reduced numbers of accidents, and reduced insurance premiums — would lead to raising the professional level of the waterjetting industry — which is what I feel should be a prime objective for the WJTA

Nominated by: Thomas J. Kim, Professor, College of Engineering, University of Rhode Island, Kingston, Rhode Island.

Jerry De Santis

Jerry De Santis is the President and CEO of Jetech, Inc., Battle Creek, Michigan, and he has been a member of the WJTA since the second US Waterjetting Conference held at the University of Missouri-Rolla in May 1983. Mr. De Santis has written a number of technical articles on pumping equipment including a paper presented at the 3rd US Waterjet Conference held at the University of Pittsburgh in May 1985. Mr. De Santis received a Bachelor of Science degree in Mechanical Engineering from Fairleigh Dickinson University in New Jersey and a certificate of completion in a course of study in the Fundamentals of Finance and Accounting from The Wharton School of the University of Pennsylvania. Mr. De Santis is the recipient of several patents on the subject of pumps and waterjetting equipment.

Mission: To assist in continuing the good work of the WJTA in the identification, development and application of waterjetting technology and to foster a universal participation of end users, manufacturers and academia within the association for the enhancement of the waterjetting industry.

Nominated by: Lydia M. Frenzel, PhD, Executive Director, Advisory Council, San Marcos, Texas.

Mohamed Hashish, PhD

Mohamed Hashish, PhD, is a founding member of the WJTA and recipient of its technology and pioneer awards. As a Senior Vice President of Technology at Flow International Corporation, he is responsible for Flow's research and development activities. He started working in the field of waterjet cutting in 1973 as a graduate student. Dr. Hashish invented the abrasive waterjet process in 1980 and continued to pioneer new applications for waterjet technology for both field and factory applications such as deep kerfing, underwater cutting, precision drilling, milling, turning, polishing, and cryogenic jets.

(continued on page 11)

Full-Time Students Invited To Apply For Complimentary Conference Registrations

The WaterJet Technology Association (WJTA) has available three (3) complimentary combo registrations for full time students who are also members of the WJTA at the time of application. The complimentary registrations are for the WJTA 2001 American Waterjet Conference to be held August 18-21, 2001, at the Hyatt Regency Minneapolis on Nicollet Mall in Minneapolis, Minnesota.

Each complimentary registration covers the pre-conference seminars, presentation sessions, party, tour and luncheons. It does not include room or travel. Applications will be taken up to **July 1.** Preference will be given first to students and then to other visitors traveling the furthest distance. The complimentary registrations will be awarded on or before **July 15.**

For more information, contact the WJTA office.

WJTA Membership Services

2001 Membership Directory

The new **2001 WJTA Membership Directory** was mailed to members on May 2, 2001. The **2001 Directory,** produced in the larger 8-1/2 x 11-inch format, contains listings of all WJTA corporate and individual members, their addresses, phone and fax numbers and when available, e-mail numbers and web site addresses.

The Services Section is included to help you locate a company capable of providing specific services or equipment. And, if you are searching for an individual or corporate member in a specific location, members are sorted alphabetically within geographic locations in the Geographical Section.

We hope that you find the new **2001 Directory** to be helpful and informative. If you have not yet received your copy, please contact the WJTA office.

WJTA Membership Card

The WaterJet Technology Association is introducing this year a new membership card that identifies you as a member of a professional association and as such, recognizes your dedication to professionalism in the industry.

The new membership card is being made available for the first time this year to WJTA members in good standing for the year 2001. Your new membership card will be enclosed with this issue of *Jet News* if you have already renewed your 2001 membership. If your membership card is not enclosed, please contact the WJTA office.

Publication Discounts

Remember that WJTA members are eligible for substantial discounts on WJTA publications, including **Conference Proceedings, the Recommended Practices and the Safety Cards.** See the order form on page 31 for details.

Candidates Sought For 2001 WJTA Awards, from page 5

Nominations Form

CANDIDATE: _____ Company: _____

Address: _____

City: _____ State: _____ Country: _____ Postal Code: _____

Phone In US/Canada (_____) _____ Fax (_____) _____
area code area code

Phone Outside US/Canada [____] (____) _____ Fax [____] (____) _____
country code city code country code city code

CANDIDATE SUBMITTED BY: _____ Company: _____

Address: _____

City: _____ State: _____ Country: _____ Postal Code: _____

Phone In US/Canada (_____) _____ Fax (_____) _____
area code area code

Phone Outside US/Canada [____] (____) _____ Fax [____] (____) _____
country code city code country code city code

Nominations must be received no later than July 2, 2001.

For a prompt response, fax completed form to (314)241-1449, or mail to the WJTA, 917 Locust Street, Suite 1100, St. Louis, MO 63101-1419, USA.

with few moving parts. There are virtually no consumable items, with the exception of the screen, and you only operate it when necessary. The WARD is easy to move and operate at multiple locations.

A simple call to request a demonstration could result in a test at your own facility. This will allow you to see it in operation, thus proving how well it will work with your abrasive. You can then test the results immediately and specifically by using the recycled abrasive and studying whether there are differences in cutting quality, speed, tolerance and finish.

Most importantly, look us up at www.easijet.com, to see more detailed information. EasiJet will be tracking where and when the truck will be in various cities across the nation.

Flow International's new Integrated Flying Bridge

Flow International Corporation displayed the Integrated Flying Bridge (IFB) waterjet machine tool and recently redesigned 60,000 psi operating pressure intensifier pump at EASTEC 2001.

The IFB is a flat stock waterjet machine capable of cutting metal sheets in sizes of up to 6' x 12' and 8" thick. The machine is equipped with full digital drives, closed loop rotary encoders and tachometers, and Flow's patented rotating nut technology to ensure quick, precise motion at up to 500 inches per minute, accuracy of +/- .005 inches and repeatability of +/- .003 inches.

Operator convenience played an integral role in the machine's design. With a roll around operator's console and full accessibility on three sides of the cutting envelope, the machine is ideally suited for a job shop environment. The design also makes it easy for an operator to load and unload raw materials and finished products.

The IFB is equipped with FlowMaster® 4.1, the latest generation of Flow's PC-based control software. FlowMaster 4.1 offers users advanced capabilities such as plate alignment, compatibility with a wide range of CAD file formats such as DXF, IGES, CDL, and HPL, built-in part/job costing modules, and Flow's proprietary corner strategy technology (CST), a first in the waterjet industry. CST allows abrasive waterjet users to have complete control over the finished quality of parts coming off their machines by optimizing corners and ensuring that no matter what speed is selected, the part's corners are perfect each time.

The IFB, like all Flow waterjet systems, features a newly redesigned ultrahigh-pressure (UHP) pump that continuously operates at 60,000 psi. Compared to pumps operating at lower pressures, these systems are capable of cutting up to 12 percent faster at a lower cost per inch of finished cut. Combined with the optional garnet removal and recovery system, this machine is equipped to be extremely productive and cost efficient.

Flow International's UHP waterjet shapecutting systems are quickly becoming the global "machine technology of choice" for many applications. Flow International's abrasive waterjet cutting systems are ideally suited for cutting tough and lucrative materials such as titanium, Inconel, brass, steel, aluminum, glass, stone, composites, and other materials from 1/16 to 8 inches thick with accuracies between +/- 0.003 to +/- 0.010 inch.

Flow International Corporation develops and manufactures UHP waterjet technology for cutting, cleaning and food safety applications. Flow provides total system solutions for industries including automotive, aerospace, paper, surface preparation and food processing.

SPIR STAR releases new catalog in CD format

SPIR STAR, Inc., manufacturer of high pressure hydraulic hose, now offers its product catalog on CD.

The wire reinforced thermoplastic hose line covers a wide range of pressures from 5,000 to 50,000 psi and

sizes up to 1 inch ID. With just one click, you can now access each hose section according to the type hose and pressure you need. End fittings, accessories, and quick connect couplings are also categorized to help you find what you need quickly. With just one mouse click, you can also print the entire catalog if needed.

If you have any questions or would like a CD, please call Kristi Frederick at 800-890-7827 or fax (713) 856-8999 or write SPIR STAR, Inc., 11983 FM 529, Houston, TX 77041.

Dr. Hashish is also an expert in the areas of high-pressure design, and tribology. He developed new concepts in ultrahigh-pressure seals for 100,000 psi pumps, high-speed rotary joints, hand tools, and quick-change nozzles. He holds 16 patents in the areas of jet cutting and high-pressure technology, and has published more than 200 papers in many journals and conference proceedings. He edited several proceedings for WJTA and ASME.

Mission: To spread the waterjet technology awareness in a wide range of industries; to maintain the WJTA as the world's premier waterjet technology association; to enforce the quality of proceedings and conferences; to enhance waterjet visibility for job shop and contractors' work; to contribute to waterjet safety practices for job shops and contractors' work; to broaden and enhance the quality of information transfer to members; to present members views and their input to WJTA plans; to increase the membership base; to control cost of meetings and fees to members; and to interact with other societies to further promote waterjet technology.

Nominated by: Dick LeBlanc, Executive Vice President, Sales and Marketing, Flow International Corporation, Kent, Washington.

Randy Kruger

Randy Kruger is the President and CEO of Onyx Services, Inc., Baytown, Texas, where he has been employed for 36 years. Mr. Kruger has deep knowledge and insight in the use of high pressure jetting equipment for cleaning, cutting and surface preparation in the industrial services business. Onyx's current international presence enables Mr. Kruger to have a worldwide perspective of waterjetting technologies in the industrial services business. Mr. Kruger is currently a WJTA Board Member.

Mission: I believe that the WJTA is a good forum for aiding in the advancement of waterjetting technology. The WJTA should be a key group in standard setting in the areas of water jetting safety. I believe that I can assist in bringing more contractors and end users to WJTA and promote more practical paper presentations. I believe that we can emphasize more studies on applications and mechanical manipulators for applications.

Nominated by: Lydia M. Frenzel, PhD, Executive Director, Advisory Council, San Marcos, Texas.

Fabio LaFerla

Fabio La Ferla is a 1992 graduate in industrial chemistry from the University of Catania and he received his PhD in industrial chemical plants from the University of Weszprem, Hungary, in 1993. Mr. La Ferla became technical manager of Idrojet S.a.s. Italy, dedicating his efforts to ensuring the quality of Idrojet and Peinemann Equipment Products (produced at that time by Idrojet S.a.s.). In 1997, Mr. La Ferla moved from Idrojet's technical department of the position of Manager of International Sales. During Mr. La Ferla's tenure, Idrojet has received numerous citations from industrial corporations that have used and relied upon Idrojet equipment. Mr. La Ferla has contributed to solving tough industrial problems, expanding contractor opportunities by focusing on customer demand and continuing the development of innovative solutions for the waterjet technology industry.

Mission: Mr. La Ferla's mission is to promote the development of innovative high pressure waterjetting systems and accessories, and while doing this, putting the best efforts on quality, reliability and safety of the same. Mr. La Ferla will dedicate his time to solving the most difficult cleaning and cutting problems of industrial firms and contractors and he will do this as an exceptional personal honor if he is elected as board member of WJTA.

Nominated by: Antonio Di Grazia, Managing Director, Idrojet S.a.s., Piano Tavola, Italy.

Pete Mitchell

Pete Mitchell is the Technical Sales Manager for the Waterjet Division of Universal Minerals, Inc. (a corporate sustaining member since 1992). Universal Minerals, Inc. is a vendor to both the abrasive waterjet cutting industry and the water blasting industry. UMI's product line includes garnet abrasives, water soluble abrasives, replacement parts, patented rotary abrasive injected profile nozzle and other mechanized equipment for water blasters using 5,000 to 40,000 psi pumps. Mr. Mitchell also served as General Manager for AST Waterjet, Inc., a precision waterjet cutting job shop.

Mission: I have solid work experience in the waterjet industry from both a vendor and end user standpoint. Currently, as a vendor providing technical support, I work on a one to one basis with my customers in job shops, manufacturing facilities and the surface preparation industry. I have become familiar with the issues that my customers face on a daily basis. I will enthusiastically bring these issues to the attention of our organization. As a board member, I will be in a great position to provide technical and practical support to our growing industry.

Nominated by: Daniel C. Schulse, Vice President of Sales, Universal Minerals, Inc., Tucson, Arizona.

Jack Russell

Jack Russell is Subject Matter Expert (SME) for Global Process Cleaning Technologies at Dow Chemical, Freeport, Texas. He has been with Dow for 25 years, and he has been a member of the WJTA for 12 years. Mr. Russell is responsible for working with plants and waterjet companies to help improve cleaning applications.

Mission: I believe the WaterJet Technology Association provides major contribution to both the waterjet users and process cleaning companies. The WaterJet Technology Association has provided technical and practical information throughout all industries and promoted the integrity of equipment design and manufacture. I would like to help promote the ever-increasing needs to help the waterjet industry to succeed because it is a vital part of our business success.

Nominated by: Lydia M. Frenzel, PhD, Executive Directory Advisory Council, San Marcos, Texas.

George A. Savanick, PhD

George A. Savanick, PhD, has been involved in waterjet technology since 1971. He has been an independent consultant in waterjet technology and hydraulic mining since 1996. Dr. Savanick performed and directed research in the use of

(continued on page 12)

Meet The Candidates For 2001-2003 WJTA Board of Directors, from page 11

waterjets and managed a hydraulic mining laboratory at the US Bureau of Mines, Twin Cities Research Center, Minneapolis, Minnesota, from 1971 to 1996. Dr. Savanick is a founding member of the WaterJet Technology Association, and he is currently WJTA President and Chairman of the WJTA Safety Committee. In the role of Safety Committee Chairman, he has overseen and been critically involved in the development of the *Recommended Practices*. This involvement has continued with his work in his overview of the upcoming WJTA videotape on the same subject. Dr. Savanick is the Editor of the WJTA publication *Jet News*, which he built up to its current substantial form, seeking and writing articles and creating a publication that is beneficial for the membership.

Mission: I believe that the WaterJet Technology Association can best further its mission of advancing the art and science of waterjet technology by increasing membership and enhancing the reputation of the WaterJet Technology Association as the premier waterjet association. To achieve this we need to communicate more effectively the capabilities and safe working practices for waterjetting to our members and to the public. We should enhance the quality and effectiveness of our publications, especially our newsletter *Jet News* and our safety manual, *Recommended Practices for the Use of Manually Operated High Pressure Waterjetting Equipment*. We also need to continually strive to add value to membership in the WaterJet Technology Association by developing programs that benefit the membership.

Nominated by: David A. Summers, PhD, Curators Professor of Mining Engineering, Director of the Rock Mechanics and Explosives Research Center and Director of the High Pressure Waterjet Laboratory, University of Missouri-Rolla.

David A. Summers, PhD

David A. Summers, PhD, is a Curators Professor of Mining Engineering, Director of the Rock Mechanics and Explosives Research Center, and Director of the High Pressure Waterjet Laboratory at the University of Missouri-Rolla. He helped found the WJTA in 1983 and has served as WJTA president, vice president and chairman of the board. He is presently a member of the board of directors and a WJTA delegate to the International Waterjet Society where he currently serves as president. Dr. Summers is very active in promoting safety in the use of waterjets. He led the WJTA effort that produced the safety manual *Recommended Practices for the Use of Manually Operated High Pressure Waterjetting Equipment*. This manual has become accepted as a statement of standard safety practices for manually operated waterjetting equipment in the United States. Dr. Summers is an acknowledged expert in the application of waterjetting technology to the solution of practical problems especially in mining, the deactivation of munitions, and the handling of radioactive waste.

Mission: There is a significant change occurring in the way in which people communicate. Until recently the use of paper and ink was the most common method of sending out information and communicating with others. Over the past three years the general access to the Internet has changed this. Increasingly information is transmitted through computers, and members of societies communicate through e-mail and list-serves. This change can lead to significant benefits to the members of the WJTA, and I hope to be able to help in making this change, both for the Association and also by working with the International Society of which we are a part.

Nominated by: George A. Savanick, PhD, Consultant, Apple Valley, Minnesota.

Jay Zeng, PhD

Jay Zeng, PhD, graduated in 1982 from the Guangxi University of China with a BS degree in Mechanical Engineering. Dr. Zeng was awarded a MS degree from the University of Washington in 1988 and a PhD from the University of Rhode Island in 1992. Both programs were focused on the research of abrasive waterjet cutting processes. Dr. Zeng joined Ingersoll-Rand Company, Waterjet Cutting Division, as a Research Engineer in 1992, and then he joined OMAX Corporation (manufacturer of abrasive waterjet cutting machines) as a senior scientist in 1998. Achievements include abrasive waterjet cutting models, nozzles, and other waterjet related products that are currently used in the industry. Dr. Zeng has been awarded three US patents, and he has published six journal articles and over 15 conference papers. Dr. Zeng received the best technical paper award in 1994 at the 12th International Conference on Jet Cutting Technology, and he has served as a reviewer for the *ASME Journal*, the *International Journal of WJ Technology*, and WEAR (journal). Dr. Zeng has also served as an instructor at waterjet short courses during American Waterjet Conferences and SME conferences.

Mission: The four objectives in the current WJTA mission statement have provided a solid foundation for an organization that has been proven to be successful in the waterjet industry. However, today's waterjet industry has grown up and thus needs an even more active organization that can fully support its functions and promote its interests. WJTA should play an even more active role as an information exchange and service center for the industry. It should also lead the way for setting industry standards and guidelines for safety, environmental impact, as well as product and process development. Lacking of such standards and guidelines is more evident in the ultrahigh pressure and the abrasive jet cutting sector. WJTA should gradually steer itself into the equivalent of a mainstream industry.

Nominated by: Thomas J. Kim, Professor, College of Engineering, University of Rhode Island, Kingston, Rhode Island.

Election Procedures

On July 2, 2001, an official ballot listing each of the eligible nominees will be forwarded by mail to all eligible voting members of the WaterJet Technology Association. Signed and executed ballots must be mailed to the association's office no later than August 11, 2001, for tallying.

The names of newly elected board members will be announced on Sunday, August 19, 2001, at the WJTA general membership meeting held in conjunction with the 2001 WJTA American Waterjet Conference in Minneapolis, Minnesota.

The WaterJet Technology Association's

2001 American Waterjet Conference

August 18-21, 2001
Hyatt Regency Minneapolis on Nicollet Mall
Minneapolis, Minnesota

Preliminary Schedule of Events

Saturday, August 18

8:00 a.m. - 4:30 p.m.	Preconference Courses • An Overview of Waterjet Fundamentals and Applications • Advanced Topics in Surface Preparation
6:30 p.m. - 9:30 p.m.	Welcoming Reception In The Exhibition Hall — Exhibition Opens

Sunday, August 19

8:30 a.m. - 5:00 p.m.	Concurrent Paper Presentations • Contractor Session • Research & Development Session
9:30 a.m. - 5:00 p.m.	Exhibition Hall Open (Lunch served Noon-1:30 p.m. in Exhibition Hall)
5:30 p.m. - 6:30 p.m.	WJTA Biennial Business Meeting

Monday, August 20

8:30 a.m. - 5:00 p.m.	Concurrent Paper Presentations • Contractor Session • Research & Development Session
9:30 a.m. - 2:30 p.m.	Exhibition Hall Open (Lunch served Noon-1:30 p.m. in Exhibition Hall)
6:30 p.m. - 11:00 p.m.	Awards Presentation/Party

Tuesday, August 21

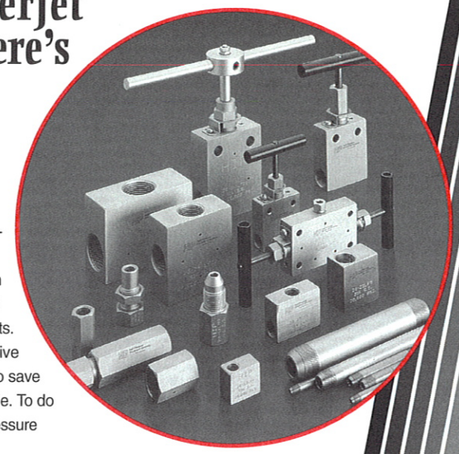
8:00 a.m. - 3:00 p.m.	Technical Tour And Field Demonstrations

Wednesday, August 22 (contingent upon demand)

8:00 a.m. - 4:30 p.m.	Advanced Topics in Surface Preparation

For the highest quality valves, fittings and tubing. . .

that will reduce your waterjet costs, there's only HiP



When you "turn up the pressure" on your waterjet system, you need to know you're working with the highest quality, most dependable fluid products. And in today's competitive environment you need to save money wherever possible. To do both, you need High Pressure Equipment Company.

Our ISO 9001 certified design and manufacturing operations are part of a quality focus that has helped us gain the trust of many new customers. And our on-time delivery has made us an integral part of our customers' inventory reduction efforts.

We stock an extensive line of valves, fittings and tubing in pressures ranging from 10,000 psi to 150,000 psi to satisfy your waterjet application. In addition, our technical staff is available to answer questions and custom design a solution to your problem.

There is a choice in high pressure valves, fittings and tubing… HiP. To find out more, give us a call at **800-289-7447**.

Call for our 112-page catalog also available on CD Rom or see it online at www.highpressure.com

High Pressure Equipment Company

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Erie, Pennsylvania 16505 U.S.A.
Phone: (814) 838-2028 • 800-289-7447
Fax: (814) 838-6075
E-Mail: sales@highpressure.com
Web Site: www.highpressure.com

ISO 9001

The handling and control of flexible cleaning lances is possible with the FlexLanceMaster®. This pneumatically driven feeding device can be used for the remote-controlled feed of high-pressure hoses with attached rotating cleaning nozzles. The hoses are guided by guide rollers, and the traverse speed can be controlled via a portable control panel. The operator controls the cleaning process standing at a safe distance. The FlexLanceMaster® should be used together with the PreventMaster® Safety frame which enables the horizontal and vertical movement of the feed system for positioning of the lance and cleaning of individual tubes in bundle. The PreventMaster® is equipped with a hose ejection preventer that prevents the unwanted uncontrolled ejection of the cleaning lance; the special preventer stops the nozzle carrier before it can exit the tube. The PreventMaster® is certified by the German Workers' Safety Authorities.

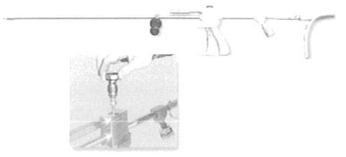
New NLB lance and foot control can be rebuilt in under 60 seconds

The latest high-pressure water jet accessories from NLB Corp. are lightweight and rugged, and feature a quick-change cartridge seal that can be replaced in the field in less than 60 seconds.

The new NCG10-285 lance and FC10-285 foot control valve are both rated for operating pressure up to 10,000 psi (700 bar). They use the same quick-change cartridge seal, so either can easily be rebuilt in the field and be back in service in about a minute.

The NCG10-285 lance has a fully adjustable shoulder stock and hand grip, and the trigger requires only a very light squeeze. It is designed for long operating life as well as ease of use, and is rated for a flow of up to 25 gpm (95 lpm).

NLB NCG10-285 Lance



The FC10-285 foot control valve has a dump port on each side, keeping the unit stable when pressure is released. It features rugged stainless steel construction, yet weighs just 21 pounds (9.5 kg).

NLB, a leader in high-pressure and ultra-high pressure water jet technology, manufactures a full line of quality water jetting systems and accessories for contractor and industrial uses. These include paint removal, surface preparation, tank cleaning, concrete hydrodemolition, concrete and pipe cutting, and more

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Live on-site demonstrations

EasiJet, Inc. announces that their fully equipped truck is now traveling across the United States, stopping at waterjet companies to perform live demonstrations of the WARD (Waterjet Abrasive Recycling Dispenser). The truck is self-contained and able to recycle abrasive right at your facility. It also contains patented mini-hoppers, bulk feed hoppers, and the EJAR-P, an abrasive removal only system.

The WARD has been in operation in the field for three years and is a proven success. It only takes 3 minutes from when you turn on the system to when you have dry ready-to-use abrasive with normal drying capacity of 120-180 lbs./hour. Typical recovery is 50-70% (depending on type of abrasive) and an optional splitter screen is available which will automatically and simultaneously produce two grades of abrasive, thus increasing your recovery rate by another 10-20%.

The WARD is simple to operate, easy to maintain and fully automated

(continued on page 22)

EasiJet inc.

Visit
www.easijet.com
to see when the WARD will be in your neighborhood!

The Waterjet Abrasive Recycling Dispenser is traveling throughout the USA giving **FREE**, on-site and group demonstrations.

Don't miss this exciting, one time opportunity to see the WARD in action!

Prove to yourself that abrasive recycling really works!

For more information please contact EasiJet:
Phone: (330) 633-7698 Fax: (330) 633-7670
Email: easijet@easijet.com www.easijet.com

abrasive recycling WARD Waterjet dispenser

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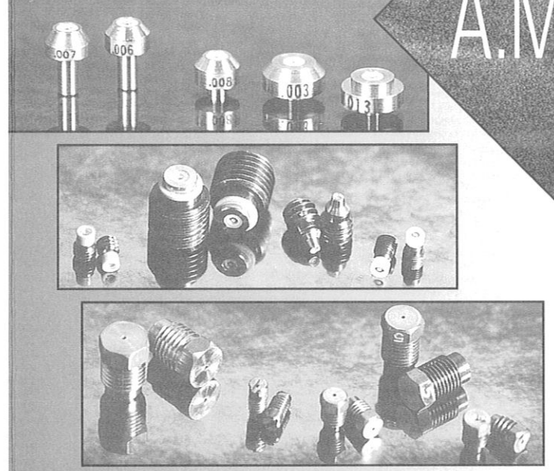
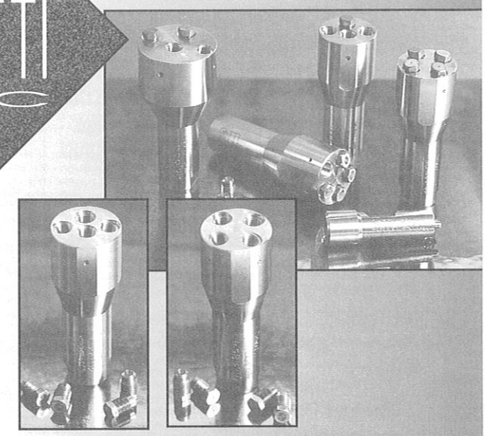
YOU CAN COUNT ON

79 YEARS OF EXCELLENCE
A.M. GATTI INC
1922 - 2001

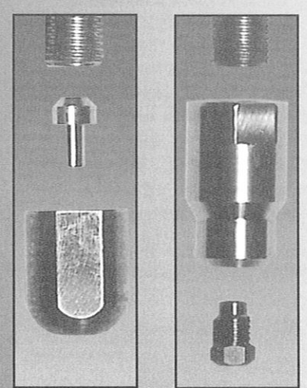
Orifice Assemblies
We offer many different types of mountings. Assemblies have the size clearly marked, for easy identification.



Multi-Orifice Nozzle Bodies
State-of-the-art nozzle bodies designed for even energy distribution.



Adaptors
Change your current orifice to our patented, high-cohesive assembly using a simple adaptor.
Change from this...to this!



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Use our high-cohesive assembly for better and faster cutting and coating removal
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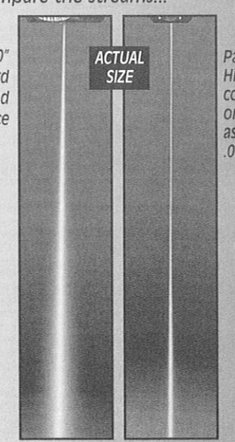

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Members News

Gardner Denver Water Jetting Systems, Inc., completes consolidation

Gardner Denver Water Jetting Systems has successfully completed the integration of its CRS Power Flow acquisition into its new facility at 12300 N. Houston Rosslyn Road in Houston, Texas. This integration completes the consolidation of its water jetting businesses that also include the former Butterworth Jetting Systems, Inc., and Jetting Systems & Accessories, Inc.

Gardner Denver, Inc. based in Quincy, Illinois, acquired the three companies over the past 18 months to significantly expand its presence in the water jetting industry and to leverage its extensive pump capability. Gardner Denver's broad product offering, which includes engineered pumping units, bare pumps, cleaning and cutting systems, and a complete line of parts and accessories capable of pressures up to 40,000 psi, is one of the most extensive and competitive in the industry.

Gardner Denver and its employees have worked diligently over the past six months to bring three independent businesses together into one operating unit. They were able to implement significant change while continuing to operate the day-to-day business. "The teamwork, cooperation, and dedication demonstrated by our employees have been outstanding. We are very excited about the potential within this newly consolidated operating unit," stated Frank Wierengo, the newly appointed Director of Operations.

This is an exciting time for both Gardner Denver's employees and customers. Gardner Denver Water Jetting Systems is committed to providing 'best in industry' products, quality, and customer service to its valued customer base. With knowledgeable and experienced employees, a complete product offering, and a newly consolidated base of operation, the future looks very bright.

Contact Gardner Denver Water Jetting Systems for more information:

Sales Phone: (800)231-3628 or (800)580-3569

Main Phone: (281)448-5800

Sales Fax: (281)448-7500

Main Fax: (281)448-7878

Internet:

www.waterjetting.com

www.gardnerdenver.com

Address:

Gardner Denver Water Jetting Systems, 12300 N. Houston Rosslyn Road, Houston, TX 77086.

Save Up To 15% Off Your Airfare For Travel To The WaterJet Technology Association's 2001 American Waterjet Conference

The WaterJet Technology Association has designated **Northwest Airlines, Continental Airlines** and **Trans World Airlines, Inc.** as official carriers for attendees of the WJTA's 2001 American Waterjet Conference. Special travel fares available from these airlines will enable you to save up to 15% off your airfares for travel to the WJTA Conference, August 18-21, 2001, in Minneapolis, Minnesota.

To take advantage of these discounts, call your travel agent professional or Northwest/ Continental MeetingWorks at 800-468-7022. Advise them to provide the Reservations Agent with your meeting Reference Number OYWRCL.

Northwest Airlines/Continental Airlines

Northwest/Continental is offering these special discounts for WJTA Conference participants:

- **A 10% discount** off Y8 and H8 fares (fares booked less than seven days from the first day of travel) booked in applicable class of service;
- **A 5% discount** off any other published fare booked in applicable class of service; **PLUS**
- **An additional 5% discount** on published fares if you purchase tickets 60 days or more before travel date.

Discounts are valid between June 1, 2001, to August 31, 2001.

Trans World Airlines, Inc.

Trans World Airlines (TWA) is offering these special discounts* for WJTA Conference participants:

- **A 12% discount*** off any published fares.
- **Additional discounts** may apply depending on flight origination and length and dates of stay.

Discounts are valid between August 12, 2001, to August 26, 2001. To take advantage of these discounts, call Gloria Morgan, Going Places Travel, (888)221-9042. If you are calling from area codes 314 or 636 (St. Louis), dial Gloria direct at (314)991-3563. Be sure to mention that you are attending the WJTA's 2001 Conference.

*TWA discounts available only through Gloria Morgan, Going Places Travel.

Letter to the Editor

This is a synopsis of the Internet article "SUPER-WATER® Jet Cutting of Packaging Foams" published on May 12, 2000, and available in full at www.packagingnetwork.com/read/n1200005161/133611. This synopsis contains no figures, tables or references (of which there are five, one and ten respectively in the original): for these, readers should log onto the Internet or contact the author by e-mail.

There are many cost-effective advantages in using SUPER-WATER jetting at ultra-high pressure to cut specific packaging foams.

These include more precise cutting at higher speeds accompanied by a 38% reduction in equipment operating and maintenance costs, a 31% reduction in horsepower requirement and an increase of up to six times in waterjet nozzle lifetime.

1. Objective and Background

SUPER-WATER, a linear macromolecular partially hydrolyzed polyacrylamide (with a molecular weight of 16 to 18 million), when dissolved in water at low concentrations (typically 0.1% to 0.3%), greatly increases cutting efficiency.

2. Cutting Materials With SUPER-WATER

The drag reduction capability of SUPER-WATER results in lubricity, and, consequently, ultra-high pressure intensifiers and nozzles experience less wear.

For intensifiers, this translates to a 38% reduction in operating and maintenance costs and for diamond nozzles a lifetime extension of 2.8-6.0 times.

In the full article the edges of clay rubber shoe soles cut with plain water and SUPER-WATER at 0.32 gpm are shown. These photographs, obtained at a magnification of eight times, clearly show the difference in quality of cut.

A 0.1% solution of SUPER-WATER costs approximately three cents/gallon after dilution of SUPER-WATER concentrate by a factor of 1,000. The advantages for cutting shoe soles, therefore, cost 57.6 cents/hour for the SUPER-WATER (or 0.32 x 3 cents x 60 = 57.6).

SUPER-WATER cuts are smooth and have markedly less striations, and good surfaces are provided for subsequent adhesion processes. Additionally, this technique includes the absence of a heat affected zone (HAZ) and the related mechanical distortion that occurs using many mechanical cutting methods.

3. Cutting Packaging Foams With SUPER-WATER

The following packaging foam substrates were cut:

- Two-inch thick 4# Crosslink (super-small pore size crosslinked polyethylene foam with a density 4-lb per cubic foot) for reusable packaging.
- Two-inch thick 6# Crosslink (density 6-lb. per cubic foot) for automotive reusable packaging and reusable packing racks.
- Three-inch thick version of 6# Crosslink.

Use of plain water on these materials indicated they could be cut with the

(continued on page 24)

Welcome WJTA New Members

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Hijet, Inc.
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Houston, TX 77031
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Fax: (713)963-8295

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Fax: (502)637-3322

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United Kingdom
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Fax: [44](151)420-02

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Fax: (281)474-6691

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Fax: (912)232-3272

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Fax: (319)264-3424

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Fax: (253)854-9281

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Rancho Santa Margartia, CA 92688
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Fax: (949)766-1919

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Canco
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Chester, SC 29706
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Fax: (803)581-1730

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10101 E. 91st Circle N.
Owasso, OK 74055
Phone: (918)272-8431
Fax: (918)272-8436

Tejinder Singh
Machining Consultants
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Unit #17 & 18
Brampton, Ontario L6T 5K1
Canada
Phone: (905)790-9356
Fax: (905)790-6366

Rick Starr
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P.O. Box 288
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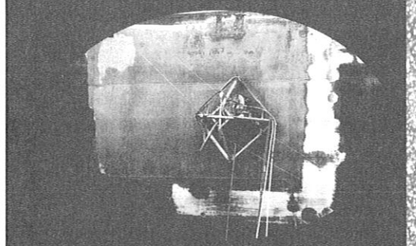
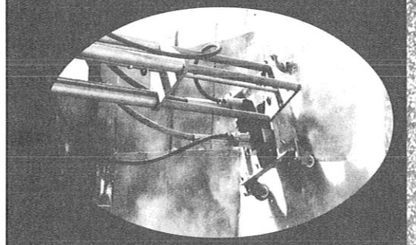
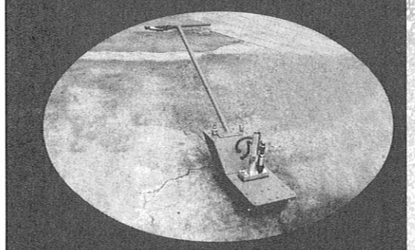


AQUA SPIDER
Removes paint and coatings from vertical surfaces with vacuum attachment for debris and water containment



AQUA SCRUBBER
12" wide cleaning head with self-adjusting quick clamp spring arm easily bolts to any man lift

MINI SCRUBBER
Handheld and lightweight cleaning head capable of cleaning 6" wide path



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High Pressure Hydraulic Systems, from page 4

- Suction pulses enhance the penetration rate of conventional roller-cone, PDC or diamond bits in hard rock and deep gumbo shale
- The suction pressure pulse pulls the bit into the rock allowing extended reach horizontal drilling with coiled tubing
- The pulses provide a source of intense seismic energy for look-ahead seismic detection of pore pressures and real-time bit tracking

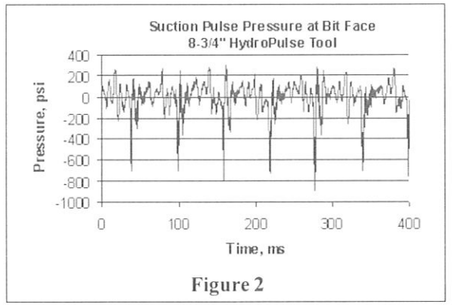


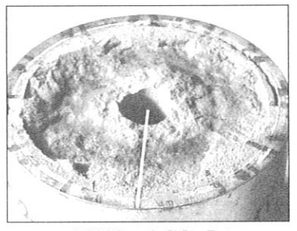
Figure 2

A prototype HydroPulse tool is currently undergoing flow loop testing to demonstrate sustained operations on abrasive drilling mud. In July, 2000, the tool was operated continuously for 3 hours at 500 gpm drilling mud with-out failure. Figure 1 shows open-flow testing with an 8-3/4" tricone bit. Closed-loop testing takes place in a pressure vessel to simulate downhole conditions. A plot of pulse pressures beneath the bit appears in Figure 2.

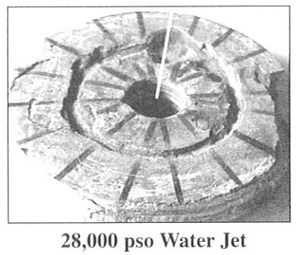
Partners: This technology is being developed with support from the U.S. Department of Energy under a cooperative research and development agreement (No. DE-FC26-97FT34367).

CO_2 Jet Drilling *Patent Pending*

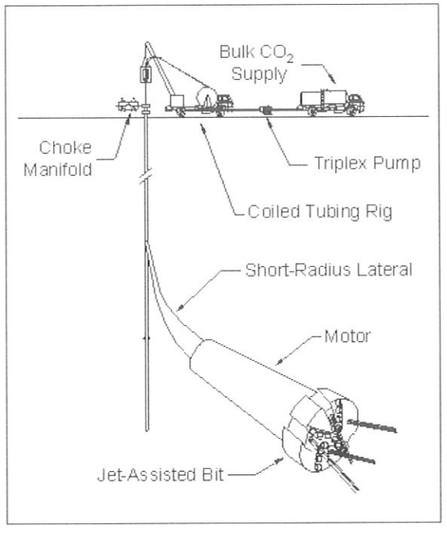
Jet erosion and drilling tests have demonstrated that supercritical - CO_2



13000 psi CO_2 Jet



28,000 pso Water Jet



(continued on page 16)

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High Pressure Hydraulic Systems, from page 15

cuts hard shale, hard limestone and granite at much lower pressure and power than water jets. Jet-assisted mechanical drilling with CO_2 allows fast drilling of small-diameter lateral drainage wells. CO_2 is a non-damaging fluid that will stimulate production of oil and gas.

The company is currently evaluating coiled tubing drilling with CO_2 for short radius lateral drainage wells.

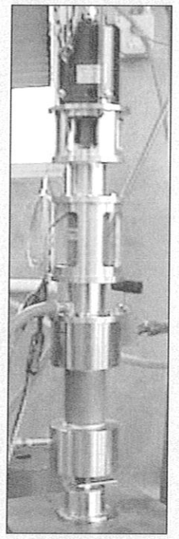
PulseBond *Patent Pending*

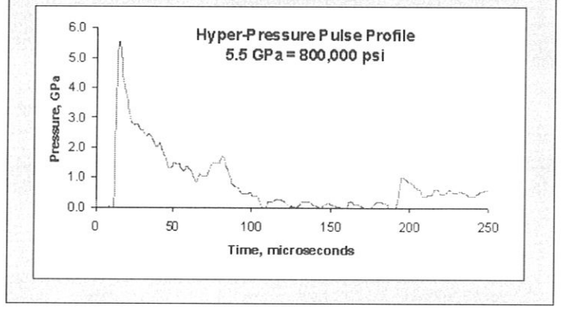
Technology: PulseBond systems generate hyper-pressure water jet pulses that can be used to inflate aluminum alloy rivets. The jet pulse is generated by a compact water cannon equipped with an unsteady flow amplification nozzle. The shock pressure produced when the hyper-pressure jet is arrested inside the rivet, is sufficient to inflate high-strength aluminum alloy rivets and cold-expand the surrounding panel. Blind structural fastening greatly reduces the time and cost of airframe assembly and repair. The same, compact tool may be used to clinch-bond sheet metal parts.

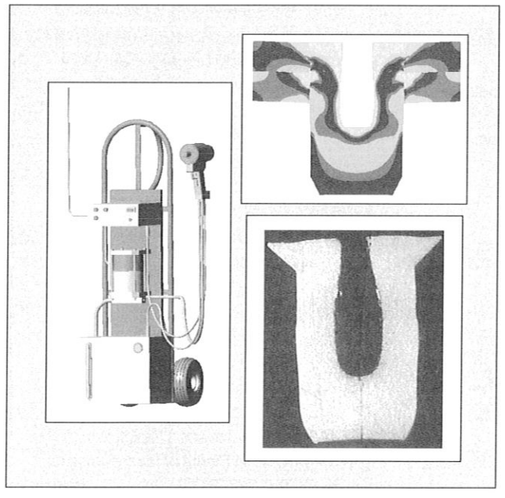
Partners: This work has been supported by grants from the U.S. DOE Innovative Concepts program and the National Science Foundation. Commercial development partners include Flow International Corporation, the Boeing Aircraft Company and the U.S. Consortium for Automotive Research.

Water Cannons

Tempress Technologies has developed a range of ultra-high-pressure water cannons. Energy is stored in these devices by compressing water to ultra-high pressure; 30,000 to 40,000 psi (200 to 400 MPa). A fast-opening valve discharges the compressed-water resulting in a high-power impulse. The water slug impact pressures can exceed 800,000 psi (5.5 GPa). The high-power, water jet impulse generated by a water cannon can be used for a variety of mining and construction applications including non-explosive excavation of hard rock, heavy concrete demolition, foundation soil improvement and soil perforation for environmental remediation.





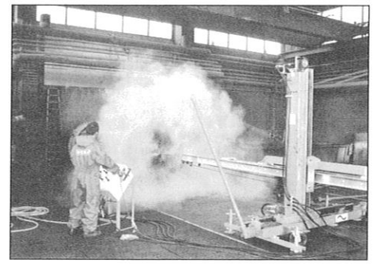


Prototype 2-liter (40 kJ) and .1-liter (1 kJ) pulse generators are available for application development and process demonstrations.

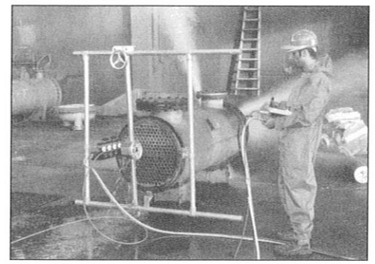
For more information, contact Dr. Jack Kolle, President, Tempress Technologies, Inc., Kent, Washington, email: jkolle@tempresstech.com, telephone: 425-251-8120 or fax: 425-251-8123.

New Products/Services

Safety in tube bundle cleaning with mechanical high-pressure water tools



LanceMaster® used for heat exchanger cleaning



Tube bundle cleaning with FlexLanceMaster® and PreventMaster®

For safety considerations, current regulations require the use of mechanically guided water tools wherever possible. Therefore, WOMA Apparatebau GmbH, Duisburg, has developed two mechanically guided remote-operated waterjet tools for the safe cleaning of tube bundles, such as heat exchangers, evaporators and coolers.

The handling and control of rigid cleaning lances with attached rotation nozzle carrier with lengths up to 7,000 mm (23 ft.) is possible with the LanceMaster®. This pneumatically driven lance feeding device is suitable for operating pressures up to 2,500 bar (36,000 psi). The operator controls positioning of the system as well as feed rate and rotating speed of the lance. Because of the tuned control, the lance can be fed quickly into the individual tubes with extremely high accuracy. The remote operation functions are controlled via a central control panel located outside the working area at safe distance. The LanceMaster® consists of easy to disassemble steel supports.

(continued on page 20)

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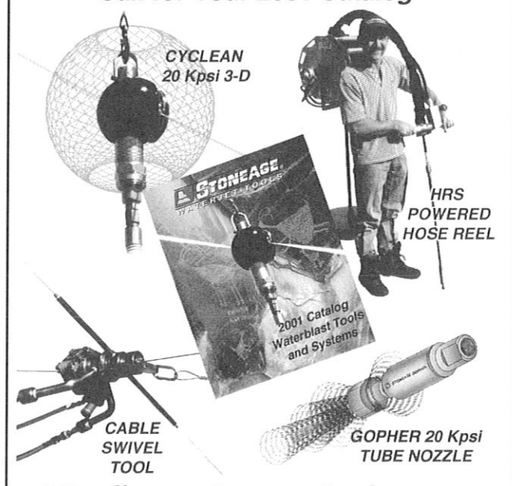

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