



Aqua-Dyne's unique patented Shape Jets offer an advancement in nozzle design technology.

Shape Jets

Aqua Dyne Inc. of Houston, Texas, has recently obtained US patent number 5,170,146 for its "Shape Nozzle For High Velocity Fluid Flow." The outline of the nozzle is not circular, but has other shapes such as triangular. The performance and effectiveness of these jets are promising. The figures above illustrate the cohesiveness of the jet issuing from these new nozzles.

Aqua Dyne is offering these shape nozzles for sale and a variety of shapes are available. The shape jet insert is tungsten carbide [replaceable] and fits in a 1/4" MNPT stainless steel holder or 9/16" AE to adapt to Autoclave fittings.

7th American Water Jet Conference Fluid Jet Technology In the Service of Industry

August 28-31, 1993
Red Lion Hotel
Sea-Tac International
Airport
Seattle, Washington

- Research and Development Papers
- Fluid Jet Technology Short Course
- Contractor's Workshop
- Manufacturer's Workshop
- Field Demonstration and Technical Tour
- Technical Exhibit

**Plan now to join industry
professionals from around
the world!**

See details beginning on page 5.

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CRS Power Flow Announces A New Line Of Water Blasting Control Guns

CRS Power Flow has introduced the HG & FG Series Water Blasting Control Guns with working pressures from 5,000 psi to 20,000 psi and flow rates in excess of 100 gpm on some foot control models. The new series of hand held and foot operated control guns is one of the most extensive lines on the market today.

Featuring the CRS Quick Change Valve System, all models can be overhauled in less than 60 seconds. For more information on these and other water blasting products contact CRS Power Flow by telephone at (713)939-1631 or by fax: (713)939-1628.

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Flow Completes Move Into New Headquarters

Flow International Corporation (FLOW) has completed moving into its new worldwide headquarters in Kent, Washington. The building consolidates three previously separate FLOW facilities, and operations of recently acquired Spider Staging Corporation.

The 140,000 square-foot facility houses the corporate offices, manufacturing, warehousing and distribution operations for FLOW and Spider Staging. "We have a world-class facility that will result in a more productive and cost-effective company," said Ronald W. Tarrant, president and CEO. "This in turn will allow us to provide our customers with the very best in technical support, quality products and on-time delivery."

Flow International's new address is 23500 64th Avenue South, Kent, Washington 98032. The company can be reached at (206)850-3500 or (800)446-3569.



The centerpiece of the fountain at FLOW's new world headquarters was cut in FLOW's in-house laboratory with an abrasive waterjet from 0.84-inch granite, 0.775-inch aluminum and 0.11-inch stainless steel.

Contractor/Manufacturer Workshops Featured At 7th American Water Jet Conference

Workshops designed specifically for contractors and manufacturers involved in water jet technology will be featured at the 7th American Water Jet Conference.

The Contractor's Workshop will be held on Sunday, August 29, from 8:30 a.m. - 4:30 p.m. Topics include safety standards and requirements, surface preparation, jetting and the environment, repair and cleaning.

The Manufacturer's Workshop will be held on Monday, August 30, from 8:30 a.m. - 4:30 p.m. Topics include process control, advanced machining methods, automated water jet systems, new components/ processes for applications in the automotive and aerospace industries, advanced materials machining, jet assisted machining of metallic materials, and adaptive control methods for on-line process control.

For more information about these and other Conference programs, see page 5.



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Barton's service, experience, and reliability have made us the world's largest supplier of garnet abrasives. Barton has been the world standard since 1878, and the water jet standard since 1982.

(518) 251-2296

Fax: (518) 251-3655

Barton Mines Corporation, North Creek, New York 12853

Cores and Core Boxes Clean Up Faster And Better With NLB Water-Jet System

High-pressure water-jet cleaning systems from National Liquid Blasting Corporation (NLB) clean cores, core boxes and investment castings in minutes instead of hours without the risk of damage.

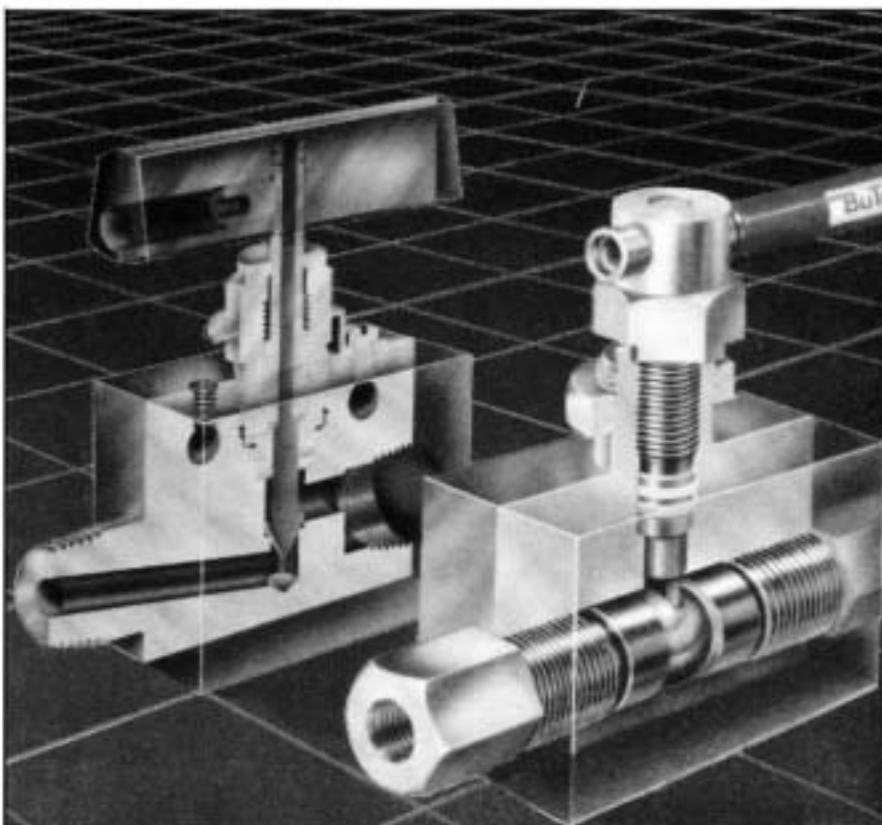
The sand that gets packed in and around core boxes, cores and valuable investment castings can make it difficult to maintain casting quality, and manual cleaning can often take hours. Sandblasting may be quicker, but can cause damage or premature wear. NLB water-jet systems remove the sand in minutes without harming castings, cores, boxes or screens. And with an NLB system, pattern makers no longer have to spend hours removing tiny bits of sand with air-driven wire brushes and dental picks.

One foundry removes baked-on sand with an NLB model 10100 electric pump, capable of delivering water at up to 10,000 psi. This application also features NLB's high-speed rotating Spin-Jet® spray system. A custom-designed NLB cleaning cabinet encloses the system for maximum cleaning efficiency, and a control panel simplifies operation.

NLB Corporation, a leader in high-pressure water-jet technology, manufactures a full line of quality water-jetting systems for many uses, including paint, rust and sludge removal; concrete cleaning and demolition; and sewer cleaning.

For more information, contact:

David Yared
NLB Corporation
29830 Beck Road
Wixom, MI 48393-2824
Telephone: (313)624-5555
Fax: (313)624-0908



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Butech introduces a line of pipe valves, fittings and accessories that really handle the pressure.

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When you need to take your high pressure equipment to the extremes, call us. *Butech... "Performance Under Pressure".*



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7th American Water Jet Conference

Fluid Jet Technology In The Service Of Industry

August 28-31, 1993

Red Lion Hotel

Seattle, Washington

RESEARCH & DEVELOPMENT PAPERS

Over 90 scientific papers covering a wide range of topics, including jet material interaction; modeling and parametric studies; mining, drilling, construction, novel, and miscellaneous applications; jet mechanics; high pressure technology; water and abrasives; and surface coatings removal.

FLUID JET TECHNOLOGY SHORT COURSE

An optional one-day course on the fundamentals of fluid jet technology. Presented by a team of leading educators, the course covers the basics of fluid jets, including an historical perspective, the fluid mechanics of various types of jets, and basic jet performance, equipment, and applications.

CONTRACTOR'S WORKSHOP

A full-day seminar designed specifically for the water jetting contractor and user. Topics include safety standards and requirements, surface preparation, jetting and the environment, repair and cleaning.

MANUFACTURER'S WORKSHOP

A full-day symposium especially for manufacturers involved in fluid jet technology. Topics include process control, advanced machining methods, automated water jet systems, new components/processes for applications in the automotive and aerospace industries, advanced materials machining, jet assisted machining of metallic materials, and adaptive control methods for on-line process control.

FIELD DEMONSTRATION & TECHNICAL TOUR

A tour of several firms specializing in fluid jet systems. See live field demonstrations of systems and equipment at each site.

TECHNICAL EXHIBIT

Plan ahead to get the most out of this market place of high tech fluid jet equipment and supplies. Learn about new services and equipment that can improve your company's competitive edge.

CONFERENCE PROCEEDINGS

Each full or combo Conference registrant will receive one (1) two-volume set of the complete Conference Proceedings. Extra copies will also be available for purchase. The Conference Proceedings contain all the papers, complete with illustrations and photographs, presented during the Conference.

HOTEL ACCOMMODATIONS

The Red Lion Hotel is the official hotel for the 7th American Water Jet Conference. Reserve your hotel accommodations now to take advantage of the low group room rates of \$92 single occupancy or \$107 double occupancy. To reserve your room(s), use the convenient form on page - or call the hotel directly at (206)246-8600. Be sure to identify yourself as a participant in the WJTA Conference.

PRELIMINARY SCHEDULE OF EVENTS

SATURDAY, AUGUST 28		Cutting Applications
8:30 a.m. - 4:30 p.m.		Water Jetting Short Course
Noon - 1:30 p.m.		Luncheon for "Short Course" Participants
6:30 p.m. - 8:00 p.m.		Welcoming Reception
SUNDAY, AUGUST 29		
8:30 a.m. - 4:30 p.m.		Water Jetting Contractors and Users Workshop
8:30 a.m. - 4:30 p.m.		Presentation of Scientific Papers
11:30 a.m. - 5:00 p.m.		Exhibits Open
12:30 p.m. - 1:30 p.m.		Luncheon in Exhibit Hall
4:30 p.m. - 6:00 p.m.		WJTA Biennial Business Meeting
6:00 - 7:30 p.m.		Reception in Exhibit Hall
MONDAY, AUGUST 30		
7:30 a.m. - 5:00 p.m.		Exhibits Open
8:30 a.m. - 4:30 p.m.		Symposium on Manufacturing Applications
8:30 a.m. - 4:30 p.m.		Presentation of Scientific Papers
Noon - 1:30 p.m.		Luncheon in Exhibit Hall
6:00 p.m. - 11:00 p.m.		President's Reception and Awards Banquet Cruise
TUESDAY, AUGUST 31		
7:30 a.m. - 10:30 a.m.		Exhibits Open
8:30 a.m. - Noon		Presentation of Scientific Papers
12:15 p.m. - 6:15 p.m.		Technical Tour and Field Demonstrations

The 7th American Water Jet Conference is endorsed by the International Society of Water Jet Technology.

7TH AMERICAN WATER JET CONFERENCE TOPICS

General Technology

Jet Material Interaction

1. "Experimental Study Of The Striation Formation And Spectral Analysis Of The Abrasive Waterjet Generated Surfaces," by J. Chao and E. Geskin
2. "Surface Texture And Kerf Geometry In Abrasive Water Jet Cutting: Formation And Optimization," by N.S. Gao, Prof. Dr. Ing H. Louis, and G. Meier
3. "An Optical Technique To Visualize The Abrasive Waterjet Generated Stress Fields," by H. Yeh, F.X. Wang, and M. Ramulu
4. "Mechanisms Of Material Removal In Abrasive Waterjet Machining Of Graphite/Epoxy Composite Materials," by D. Arola and M. Ramulu
5. "A Model For Milling With Abrasive Water Jets," by A. Laurinat, Prof. Dr. Ing H. Louis, and G. Meier
6. "Transient Boiling Heat Transfer To A High Speed Water Jet Impinging Onto A Heated Material & The Thermal Shock Fracture," by Dr. H. Kiyohashi, M. Ogasawara, & M.
7. "Experimental Study on Rust-Removing With Abrasive Waterjet," by Huan Jun, Xu Shuhong, Zhong Donghua, and Zhao Zhiliang

Modeling Studies

1. "A Transient Model For Material Removal In The Abrasive Waterjet Machining Process," by S.P. Raju and M. Ramulu
2. "On A Simplified Model For Hydro Abrasive Jet Machining Prediction, Control And Optimization," by Edoardo Capello and Roberto Groppetti
3. "Parameter Prediction And Cost Analysis Of Abrasive Waterjet Cutting," by Jiyue Zeng and Thomas Kim
4. "Cost Optimization Of Abrasive Waterjet Cutting Systems" by Pawan J. Singh
5. "Mathematical Modeling Of The Accelerating Process Of Particles In DIA Jet," by Dr. Guo Chirwen
6. "Prediction Models For AWJ Machining Operations," by Mohamed Hashish, Ph.D.

Parametric Studies

1. "The Effects Of High Pressure Waterjets On The Paint Stripping Characteristics And Mechanical Properties Of Aluminum 2024-T3 And Aluminum 7075-T6" by M. Anthony J
2. "The Influence Of Rock Properties On Waterjet Performance," by M. Agus, A. Bortolucci, R. Cicci, R. Lussandro, P.P. Manca, and G. Massocci
3. "Abrasive Waterjet Processing Of Portuguese Marbles - A Parametric Study," by R.M. Miranda, I. Fernandes, M. Henriques, and T.J. Kim
4. "Water Jet Hard Rock Cutting," by Dr. J. Vasek and P. Martinek
5. "Studying The Movement Parameters Of Space Type Waterjet Rotary Head," by Zhang Leyao, Zhang Qiuwang, and Jiao Yang

Mining

1. "Application Of Water Jet Energy In The Borehole Mining," by Adam Klich, W. Jura, A. Marek, and M. Mazurkiewicz
2. "Certain Chosen Problems Of Hydromechanical Mining With Disk Tools," by Adam Klich, K. Korwicz, and M. Mazurkiewicz
3. "Borehole Mining Of Gold From Frozen Placers," by Arthur L. Miller and George A. Sawanick, Ph.D.
4. "Prewakening Of Hard Rocks With Water Jets," by Dr. Mohan Vijay and Jerzy Remisz, Ph.D.
5. "Recent Development Of High Pressure Waterjet Technology Used In China's Coal Mining Industry," by Cheng Dazhong
6. "High Efficient Cutting - Experimental Study On Deep Slotting With Parallel Swinging Waterjets," by Mai Jingming

Drilling

1. "Jet Assisted Exploration Drilling - A Review Of Its Status And Potential In The Malaysian Oil And Gas Industry," by Dr. A.G. Bin-Ujang, A. Aroon, and S.C. Han
2. "Water Jet Drilling 20,000,000 Feet (6096m) Later," by Michael J. Kirby
3. "Jet Assisted Mechanical Drilling Of Oil And Gas Wells," by Scott Veerhuizen, Tomas Butler and Douglas Kelley
4. "Performance Enhancement Of DIA Drill Operations," by Douglas Wright and Dr. David Summers

Construction

1. "Recent Developments In Water Jet Usage In Ground And Traffic Area Rebuilding," by Dr. Ing Andreas Mombner
2. "Studies On Catastrophic Mechanisms Of Self-Controlled Hydro-Pick Cutting," by Dr. Daan Xiong
3. "Why Yes And Why No For Hydrodemolishing," by Jerzy Remisz, Ph.D. and Wojciech Remisz
4. "Development Of A Portable Abrasive Water Jet Cutting Machine For Field Applications," by John Johnson and Robert Todd

Jet Mechanics

1. "Examination Of The Range Of Jet Action In An Aqueous Medium," by Dr. Ing Antoni Kajakiewicz
2. "A Numerical Investigation Of Turbulent Behaviors Of Water Flow Inside Nozzle," by M.E.H. Khan and E.S. Geskin
3. "Wall Effect On A Submerged High-Speed Water Jet," by Dr. Yasuhiro Katsuya and Fujiwara Tokachi
4. "Enhancing The Performance Of Cavitating Water Jets," by Dr. Mohan Vijay, Shougen Hu, and Mark Lai
5. "The Influence Of Ambient Pressure And Nozzle Shape On Submerged Water Jet Velocity And Spreading," by Kenneth Kolmuck, Georges Chahine, and Gary Frederick
6. "On The Dynamic Characteristics Of Axial Symmetry Jets," by You Mingqing
7. "Flow Characteristics Of The Collimated Abrasive Waterjets," by J. Wang and J. Sun

High Pressure Technology

1. "Designing To Avoid Fatigue In High Pressure Equipment," by Dr. W.A. Lees and Dr. P.S.J. Crofton
2. "Development And Applications Of A HYDREX Pulse Generator," by Jack Kolbe
3. "Advances In Direct-Drive Pump Technology Brings The Competitive Edge Back To Ultrahigh-Pressure Waterjets," by Terry Alkire
4. "Anti-Phase Pumping Using Standard Double Piston Intensifiers," by Raja Raghavan and Kralj Kostohrov
5. "Development Of Waterjet System Components - A Progress Report," by Gene Fir

Miscellaneous Applications

1. "The Prospects Of The Application Of Waterjet In The Timber And Wood-Based Industry In Malaysia," by Dr. A.G. Bin-Ujang, A. Abd-Jaffi, and H.S. Mohd Nor
2. "Performances Of HP Fluid Jet To Cut Food Products," by Claude Merle, Jean Vasseur, and Marielle Bouix
3. "The Premajet Dewatering System And Its Abrasive Recovery System," by Ben-Li Liu
4. "Study On The Structure Of Long Impulsive Jet And Its Applications In Medicine," by Cheng Dazhong

Water And Abrasives

1. "Abrasives, Their Applications And Use In Waterjet Cutting," by John Ohman
2. "Influence Of Properties Of Garnet On Cutting," by J. Vasek, P. Martinek, and J. Foldyna
3. "Water Treatment Methodologies Used To Meet Standards For Discharge And Re-Use," by M. Hawahaw

7TH AMERICAN WATER JET CONFERENCE TOPICS

General Technology

Novel Applications

1. "Diamond Polishing With Abrasive Suspension Jets," by Mohamed Hashish, Ph.D. and David Rothell
2. "Abrasive Waterjet Milling - An Experimental Investigation," by Christian Gjermatz
3. "Waterjet Assisted Machining Of Titanium Alloys," by F. Schoenig Jr., et al.
4. "Study On A DEA Jet System," by You Mingqing

Stripping

1. "Thermal Spray Removal With Ultrahigh-Velocity Waterjets," by Jeffrey Watson
2. "Large Aircraft Robotic Paint Stripping (LARPS) System," by Scott A. Hofacker
3. "Advances In Cleaning And Coating Removal Using Ultrahigh Pressure Jet Technology," by Spencer T. Johnson
4. "Ultra-High Pressure Waterjet Removal Of Thermal Spray Coating," by Pawan Singh, et al.
5. "Aquastripping The Ecological Alternative To Coating Removal," by James J. Park

Contractors Workshop

Safety, Legal, And Standards

1. "How To Do Safer Jetting," by a contractor director
2. "Workplace Injury And Illness Reporting Requirements," by Motra Rankin
3. Panel Discussion, by representatives from major contractors

Surface Preparation

1. "Contractor Applications In Refineries And Chemical Plants," by J. Richard Sloan
2. "Waterjet Nozzle Design For Complex Surfaces," by Darcy Harbaugh and Hank Fischer
3. "Surface Preparation Techniques Employed By Some Major Malaysian Shipyards Constraints And Prospects For High Speed And Cavitating Jets," by A.G. Bin-Ujang, J. Chok, C.F. Chuah, A.B. Ferns, and A. Braithwaite

Jetting And The Environment

1. "Environmental Protection In High Waterblasting," by Michael Gracey
2. "Environmental And Safety Attributes Of Waterjet Cutting And Cleaning," by C. Burnham and Glenda Podesta
3. "Water Soluble Abrasives," by Mike Woodward
4. "Safe Water Abrasive Cutting Of Ammunition," by H. Alba and Dr. Ing. R. Huber
5. "Personnel and Environmental Risk Reduction Through High Pressure Jet Cleaning Of NORM," by Alan McArthur

Repair And Cleaning

1. "Maintenance Inspection Of Re-Bar & For Concrete Marine Structures Of Malaysia," by A.G. Bin-Ujang, J.R. deJong, M.R. Samsuddin, J.W.M. Lee, and A.W. Hassan
2. "Air Jet Cutting Technology For Repairing Covered Clay In Radioactive Waste Storing Place," by Hiroshi Yoshida, Takahisa Isobe, Ryoji Kobayashi, and Teruo Yabiro, Masahiro Takei, Kiyoshia Horii
3. "Nuclear Reactor Repair With Water Jet Cutting," by Bruno Mainbourg and Pierre Fortvianne
4. "New Development Trends Of Waterjet Cleaning In China," by Liu Wengui, Liu Jinying, Cheng Dazhong
5. "Cleaning Technology Of Waterjet For The Fouling Of Heat Exchanger," by Li Fenghua

Manufacturing Workshop

New Components/Processes

1. "Waterjet Components For Efficient, Reliable Operation," by Eric Chalmers
2. "A New AWJ Nozzle For Automated And Intelligent Machining," by Mohamed Hashish, Ph.D. and W. Coleman
3. "Abrasive Suspension Jet Machining," by Lawrence Rhoades

Automated Waterjet Systems

1. "Successful Implementation Of Two & Three Dimensional Hydro Machining, Abrasive & Non-Abrasive, Within Automotive And Aerospace Industries," by Dick Lettlow
2. "High Pressure Integration Of Special Systems," by Gary Ajers and Bruce Amundsen
3. "Innovative Designs For X-Y Cutting Systems," by Charles Johnston

Process Control

1. "On The Adaptive Control Constraint (ACC) Of Hydro-Abrasive Jet Machining," by Roberto Gropetti, Mauro Bocchi, and Roberto Romano
2. "Simulation And Control Of High Pressure Waterjet Pump Discharge Pressure Fluctuation," by F. Hu and J. Robertson
3. "Process Controlling And Monitoring Of Jet-Cutting," by Michael Knaupp
4. "Detection Of Abrasive Waterjet Nozzle Wear Using Acoustic Signature Analysis," by L. Wang, R. Kovacevic, and Y.M. Zhang

Advanced Machining

1. "Waterjet Machining In Relation To Design Engineering For Manufacturability," by Richard Woolman
2. "Application Of Advanced Abrasive Waterjet Machining At GE Aircraft Engines," by James Whalen
3. "Abrasive Water Jet Technology Applied To Ultra-Lightweight Mirror Fabrication," by D. Crowe and C. Abplanalp

Market And Future Needs

1. "Expanding The Market For Abrasive Water Jet Cutting Systems," by D.S. Miller
2. "Next Generation Waterjet Technology," Presentation to be given by NCMS
3. Panel Discussion On Future Research Needs, A number of scientists will be asked to present their views and an open discussion will follow

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PHILLIPS Machining *invites you to come to the 7th American Water Jet Conference in Seattle, Washington. You'll see new products, learn new ways, see old friends, and make new ones.*

We look forward to seeing you in Seattle August 28-31, 1993. Look for us in Booth 114. Need information about points of interest, hotels, motels, etc. give us a call or fax.

Seven Easy Ways To Attend the 1993 WJTA Conference

- 1. FULL CONFERENCE:** Includes admission to all technical and scientific sessions (except Short Course), exhibition, coffee breaks, luncheons, receptions, banquet, and technical tour and demonstration. **Each full registrant also receives one hardbound copy of the Conference Proceedings.**
- 2. COMBO:** Includes everything listed under Full Conference **PLUS** admission to the Water Jet Short Course.
- 3. SAVE \$ ON MULTIPLE EMPLOYEE FULL/COMBO REGISTRATIONS:** Companies that purchase three or more full or combo registrations receive a special discount for each additional employee registered after the first two. To take advantage of the special discount, register the first two (2) employees from your company at the regular FULL/COMBO rates and receive the discounted rate for the third and subsequent employee registrations.

- 4. DAILY ATTENDANCE:** Includes admission to all technical and scientific sessions, exhibition, coffee breaks, and luncheon for one day. Daily registration on Tuesday also includes the technical tour and demonstration.
NOTE: The official Conference Proceedings and admission to receptions and/or banquet are **NOT** included in the daily registration fee. The Proceedings and tickets to the receptions/banquet must be purchased separately.
- 5. WATER JETTING SHORT COURSE:** Includes the manual *Fluid Jet Technology - Fundamentals and Applications*, coffee breaks, and luncheon.
- 6. EXHIBIT HALL ONLY:** Includes admission to the WJTA Exhibit Hall where you'll see water jetting equipment, supplies, and services on display.

- 7. TECHNICAL TOUR ONLY:** Includes round-trip bus transportation, luncheon, and admission to company sites where you'll see live water jetting demonstrations.

CANCELLATION POLICY

Fees will be refunded in full for cancellations received at least six weeks prior to the Conference. Cancellations received more than 21 days and less than six weeks prior to the Conference will be subject to a \$50 charge. No refund will be made for cancellations received less than 21 days prior to the Conference. However, substitutions may be made at any time.

Discounts for WJTA members and early-bird registrants!

WJTA members receive a special discount off the regular registrations fees. You will also receive a special additional discount if your registration is postmarked or received in the WJTA office by August 1, 1993.

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7th American Water Jet Conference August 27-31, 1993

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<input type="checkbox"/> Full Conference ONLY	\$440	\$470	\$490	\$520	= \$ _____
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<input type="checkbox"/> Daily (check day) <input type="checkbox"/> Sunday <input type="checkbox"/> Monday <input type="checkbox"/> Tuesday	\$175/day	\$190/day	\$195/day	\$210/day	= \$ _____
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New 500 Hp Water Jetting Unit Introduced By Butterworth

Butterworth Jetting Systems, Inc. has announced the addition of a new 500 horsepower Liqua-Blaster unit to their line of high pressure water jetting equipment.

The new 1000 Series unit is designed to provide reliable, safe operation and is equipped with the field proven, low maintenance Partek Quintuplex pump (QF-450H or QF-450S), designed to provide water jet blasting power with pressures up to 20,000 psi.

The QF-450H high pressure pump produces flow rates ranging from 43.2 gallons per minute at 20,000 psi to 54 gpm at 15,000 psi while the medium pressure pump, QF-450S offers flow rates from 66 gpm at 12,500 psi to 153 gpm at 5,000 psi. Pump crankshafts are forged steel and the power end is equipped with a reduction gear assembly manufactured by Butterworth.

Other pump features include separate oil circulation, cooling and filtration systems for both power end and gear box as well as rupture disc and relief valve assemblies. The QF-450H pump utilizes the patented Partek Inline fluid end design while the QF-450S is fitted with Butterworth's new Sectionalized fluid end.

The new unit is available with Cummins, Detroit or Caterpillar diesel engines and heavy duty Fuller transmissions for either single speed or variable speed operation. All components are mounted on a fully welded, heavy duty channel frame skid, equipped with 1/4" tread plate deck, fork lift slots and lifting eyes. Diesel powered units include a 300 gallon fuel tank with gauges.



Butterworth's new 500 hp Liqua-Blaster unit offers pressures to 20,000 psi and flows to 153 gpm.

Optional equipment and features available on the 1000 Series Liqua Blasters are safety shutdowns on pumps and engines, electric or air clutch actuation, complete gauging for engine and pump monitoring, and remote control operations. Additional equipment induces multi-gun systems with patented Pressure Regulators, 50' hose sections and new 20,000 psi stainless steel quick connect couplers.

Also available are a variety of hand or foot activated guns - (Shut-Off or Dump style), a wide assortment of high pressure hardware, tungsten carbide or sapphire nozzles and an 82 gallon (310 liters) galvanized pressurized water tank with 100 mesh Y-strainer and 5-50 micron bag filter system.

High pressure water or air driven multi-jet spinning nozzles are available for up to 20,000 psi service as gun attachments or for fixed installations. Units may also be mounted on truck or trailer, and painted virtually any color.

The 1000 Series Liqua-Blaster is ideal for high energy applications such as concrete demolition, tube bundle cleaning, vessel cleaning, runway cleaning, roadway stripe removal and multi gun operations. Butterworth Jetting Systems, Inc. has been building high pressure water jetting units for over 20 years and is the only water jetting manufacturer in the United States that produces all its own products. Butterworth manufactures over 8,000 items in its modern machine, fabrication and assembly plant in Houston, Texas. Included are 14 different Partek pump models ranging in size from 75 horsepower to 500 horsepower and eight Liqua Blasters models.

Butterworth also has its Western European headquarters in The Netherlands and exports water jetting products throughout the world.

For more information contact:

Dennis Williams
Butterworth Jetting Systems, Inc.
3721 Lapas Drive, P.O. Box 230312
Houston, Texas 77223-0312
Telephone: (713)644-3636 or (800)231-3628

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and how to do it, suitable materials for high pressure equipment, and more.

'Designing for High Pressures' was presented at the American Society of Mechanical Engineers (ASME) National Design Engineering Conference in Chicago in March, 1993, and is part of Rogan and Shanley's total commitment to excellence in high pressure engineering.

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<small>The Society shall not be responsible for statements or opinions advanced in papers or in discussions at meetings of the Society or of its Divisions or Sections, or printed in its publications. Opinions are printed only if they relate to subjects within the scope of the meeting. Papers are available from ASME for 12 months after the meeting. Printed in U.S.A.</small>		
DESIGNING FOR HIGH PRESSURES William A. Lott Rogan and Shanley, Inc. Houston, Texas		
ABSTRACT Although hydrostatic pressure is the ideal, in typically in the 1000 psi range, the advantages to be gained from such higher pressures are becoming more readily appreciated by designers. Basic, practical, design equations and correlations are needed for many high pressure applications are presented.	1. Basic yield stress 2. Pressure to yield flow 3. Collapse pressure 4. Design pressure 5. Burst pressure 6. Outer diameter 7. Outer diameter - inner diameter 8. Outer diameter - inner diameter 9. Outer diameter - inner diameter 10. Outer diameter - inner diameter 11. Outer diameter - inner diameter 12. Outer diameter - inner diameter 13. Outer diameter - inner diameter 14. Outer diameter - inner diameter 15. Outer diameter - inner diameter 16. Outer diameter - inner diameter 17. Outer diameter - inner diameter 18. Outer diameter - inner diameter 19. Outer diameter - inner diameter 20. Outer diameter - inner diameter 21. Outer diameter - inner diameter 22. Outer diameter - inner diameter 23. Outer diameter - inner diameter 24. Outer diameter - inner diameter 25. Outer diameter - inner diameter 26. Outer diameter - inner diameter 27. Outer diameter - inner diameter 28. Outer diameter - inner diameter 29. Outer diameter - inner diameter 30. Outer diameter - inner diameter 31. Outer diameter - inner diameter 32. Outer diameter - inner diameter 33. Outer diameter - inner diameter 34. Outer diameter - inner diameter 35. Outer diameter - inner diameter 36. Outer diameter - inner diameter 37. Outer diameter - inner diameter 38. Outer diameter - inner diameter 39. Outer diameter - inner diameter 40. Outer diameter - inner diameter 41. Outer diameter - inner diameter 42. Outer diameter - inner diameter 43. Outer diameter - inner diameter 44. Outer diameter - inner diameter 45. Outer diameter - inner diameter 46. Outer diameter - inner diameter 47. Outer diameter - inner diameter 48. Outer diameter - inner diameter 49. Outer diameter - inner diameter 50. Outer diameter - inner diameter 51. Outer diameter - inner diameter 52. Outer diameter - inner diameter 53. Outer diameter - inner diameter 54. Outer diameter - inner diameter 55. Outer diameter - inner diameter 56. Outer diameter - inner diameter 57. Outer diameter - inner diameter 58. Outer diameter - inner diameter 59. Outer diameter - inner diameter 60. Outer diameter - inner diameter 61. Outer diameter - inner diameter 62. Outer diameter - inner diameter 63. Outer diameter - inner diameter 64. Outer diameter - inner diameter 65. Outer diameter - inner diameter 66. Outer diameter - inner diameter 67. Outer diameter - inner diameter 68. Outer diameter - inner diameter 69. Outer diameter - inner diameter 70. Outer diameter - inner diameter 71. Outer diameter - inner diameter 72. Outer diameter - inner diameter 73. Outer diameter - inner diameter 74. Outer diameter - inner diameter 75. Outer diameter - inner diameter 76. Outer diameter - inner diameter 77. Outer diameter - inner diameter 78. Outer diameter - inner diameter 79. Outer diameter - inner diameter 80. Outer diameter - inner diameter 81. Outer diameter - inner diameter 82. Outer diameter - inner diameter 83. Outer diameter - inner diameter 84. Outer diameter - inner diameter 85. Outer diameter - inner diameter 86. Outer diameter - inner diameter 87. Outer diameter - inner diameter 88. Outer diameter - inner diameter 89. Outer diameter - inner diameter 90. Outer diameter - inner diameter 91. Outer diameter - inner diameter 92. Outer diameter - inner diameter 93. Outer diameter - inner diameter 94. Outer diameter - inner diameter 95. Outer diameter - inner diameter 96. Outer diameter - inner diameter 97. Outer diameter - inner diameter 98. Outer diameter - inner diameter 99. Outer diameter - inner diameter 100. Outer diameter - inner diameter	BASIC DESIGN Major design considerations are: Working Pressure Design Corrosion Fatigue Heat Sealing In and out piping Weight Carefully select all design variables and be guided by the experience, and sense of these variables for a reasonable, useful design may need to be considered. For example, in designing a pressure vessel, the design pressure is not usually a problem for the working pressure and material may have to be carefully selected to maintain weight.
<small>Presented at the National Design Engineering Conference March 1-4, 1993, Chicago, IL</small>		

Water Jet Short Course

Learn about the basic techniques and applications of water jet technology from a panel of leading experts at a one-day review course to be held on Saturday, August 28, 1993, in conjunction with the 7th American Water Jet Conference.

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- applications of water jet technology in industrial, construction, and mining environments,
- integrating jets with automated equipment, and
- safety procedures for operating water jetting equipment

The course is designed for the novice to the experienced water jet user, production and maintenance employees, research and development personnel, students, and safety officers.

Each participant will receive a copy of *Fluid Jet Technology - Fundamentals and Applications* packed with over 200 pages of information about water jets.

To register for the water jetting short course, see page 5.

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Omission

In the April 1993 issue of *Jet News* an article appeared entitled, "Additives For Water Blasting." Unfortunately the article did not state the suppliers of soluble polymers and water soluble abrasives by name. They are respectively Berkeley Chemical Research, Inc. [(510)526-6272] and Aqua-Dyne, Inc. [(800)324-5151]. The heavy-duty industrial cleaner (detergent) referred to under soluble polymers is also available from Berkeley Chemical Research, Inc.

Injection Module For The Injection of SUPER-WATER® In Industrial Applications

A Portable Injector Module for SUPER-WATER® induction is now available from Hydro-Power Systems of Lafayette, Louisiana.

This module allows precise metering of SUPER-WATER® concentrate into the inlet water stream of virtually any commercial water blaster.

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For more information, contact Hydro-Power Systems Technical/Sales Office, 631 Middleton Avenue, Cary, North Carolina. Sales and rental information may be obtained by calling (919)460-1704.

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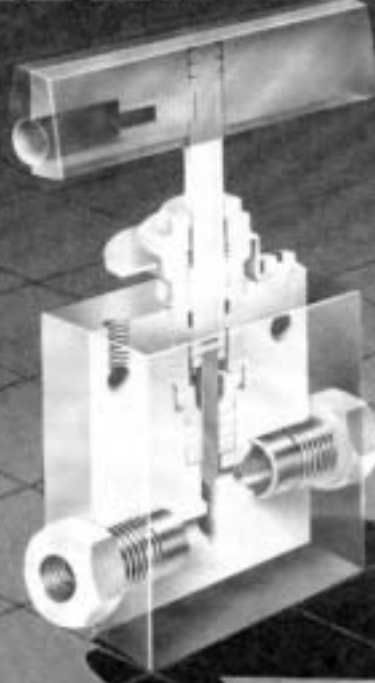
Water Jet Technology Association
ATTN: Dr. George Savanick
818 Olive Street - Suite 918
St. Louis, MO 63101-1598, USA
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Fax: (314)241-1449

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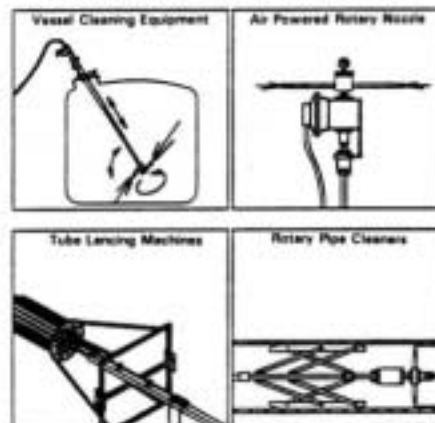
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