



Deadline For Submission Of Abstracts Extended

The deadline date for the submission of abstracts for the 6th American Water Jet Technology Conference has been extended to **January 1, 1991**. Authors wishing to present papers are invited to submit abstracts for consideration. An Abstract Review Committee consisting of six referees, chosen from the Organizing Committee and the body of International Advisors, will review the abstracts and decide their suitability for inclusion in the Conference.

To submit an abstract(s), please complete the Abstract Submission Form enclosed and forward it to the attention of the Conference Coordinator at the Water Jet Technology Association. Authors will be advised by **February 15, 1991**, regarding the decision of the Abstract Review Committee.

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

It is the practice of the association to review our *Recommended Practices* at our bi-annual meetings, the next of which will be held in Houston in August. In order to prepare for that meeting, any comments and recommendations for change to the current booklet (which is available from association headquarters) should be sent to **Dr. David A. Summers, University of Missouri-Rolla, Rock Mechanics Facility, Rolla, MO 65401**.

It is intended to assemble all the comments and suggested changes in the newsletter before the conference so that the membership will have an opportunity to review them before the document itself is reapproved. It would therefore, be appreciated if comments could be submitted fairly soon to allow sufficient time for this to take place.

Water Jets Apportion Food And Cut Space-Age Materials



The Portioner™ system from Design Systems, in Redmond, WA, utilizes state-of-the-art vision guidance equipment to direct automated waterjets in the efficient cutting or trimming of poultry and fish.

Baxter Springs, KS, October 29, 1990 – Waterjet cutting is quickly expanding beyond the realm of nonconventional cutting methods as applications proliferate and innovations in the industry establish it as one of the most efficient cutting methods available. Ingersoll-Rand (I-R) has played a key role in this evolution from the introduction of the first waterjet system in 1971 to the development of today's contemporary systems.

Making significant strides in the industry, I-R's Waterjet Cutting division spans applications from aerospace to electronics with its latest innovations in slitting systems, cutting tables and abrasive cutting systems. Engineers are also working on the development of a compact, low-cost cutting system, bringing the advantages of waterjet cutting to small business applications.

(continued on page 2)

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It is arrogance to expect that our life always will be music. It is false pride to demand to know the score. Harmony, like a following breeze at sea, is the exception. In a world where most things wind up broken or lost, our lot is to tack and tune.

- Harvey Oxenhorn

Water Jets Apportion Food And Cut Space-Age Materials, from page 1

At an I-R installation in Redmond, WA, fiber-optic scan lines transmit contour width and depth information via video cameras to a microprocessor. In seconds, 23 separate cutting decisions are made signaling high-pressure waterjets to bisect the programmed cutting path with precision accuracy.

The system, dubbed the Portioner™, is designed for efficient cutting, trimming or portioning of food, and was introduced by Design Systems, Inc. as the first of its kind to combine state-of-the-art vision guidance systems with waterjet cutting technology. A breakthrough in the food processing industry, the Portioner I optimizes product output, limits waste and dramatically reduces labor cost - making traditional blade cutting systems virtually obsolete.



Dale Crane, President, Crane Technology standing inside the 8-ft Inconel rings cut by the Ingersoll-Rand Water Jet Cutting System for the Space Shuttle

With 20 years of experience in the aerospace industry, Dale Crane, President of Crane Technology, turned to waterjet cutting in 1986 for use in his Inglewood, CA, job shop. The addition of the waterjet system helped accommodate the increasing number of nonmetallic composites (Kevlar, graphites), laminated composites with metals, and the new high temperature alloys (aluminum titaniums, titanium, composites) being used in aerospace. "There are so many strange, exotic materials emerging in aerospace components that can only be cut with waterjets, says Crane. "They also enable just-in-time manufacturing. As a result, we provide the much needed service of cutting small numbers of oddly shaped, difficult materials to exacting NASA specifications in record time with no heat affected zones." Crane has custom built equipment for specific projects such as cutting 8 ft, 8 inch- by 2.5-inch- width Inconel rings for the Space Shuttle.

In Moorpark, CA, harnessed water power, blasted in needle-thin jets at twice the speed of sound to cut one of nature's hardest substances, enables Parker Berteau Aerospace to help keep America's aircraft flying.

Parker Berteau's Metal Bellows division in Moorpark, a subsidiary of Parker Hannifin Corp., is a precision manufacturer specializing in custom designed fabricated assemblies and hoses for a wide range of aerospace applications, including the Space Shuttle. The division's staff of metallurgical and manufacturing engineers work with materials including aluminum, stainless steel, titanium, Inconel and other high-temperature alloys, and supports various government and commercial applications.

About 18 months ago, the Metal Bellows division purchased a waterjet from Ingersoll-Rand Waterjet Cutting Systems to cut the periphery on several key titanium and aluminum components. The waterjet's



Roger Smith, Senior Manufacturing engineer at Parker Aerospace, Moorhead, CA, uses a waterjet from Ingersoll-Rand Cutting Systems to trim a titanium panel for the Boeing 737.

(continued on page 6)

When you need quality High Pressure Valves, Fittings and Tubing delivered on time . . . specify Autoclave Engineers

In the water jet industry, it's mandatory you have reliable high pressure components capable of operating at pressures to 60,000 psi. Autoclave Engineers has more than 40 years experience in high pressure technology. We build our valves and fittings by the book . . . our Quality Control Manual, because we have high regard for high pressure and for our water jet customers. This manual is your assurance you are getting the highest quality product available . . . at any cost.

Autoclave has a wide range of high pressure components for the water jet industry in addition to our valves, fittings and tubing. Autoclave also is a source of supply for manifold blocks and valves, accumulators/attenuators and custom articulation coils. Eleven coned and threaded tubing sizes are available as well as all types of specialty and custom designed high pressure products. Autoclave is your one-stop source for quality high pressure components. And we ship from stock to arrive just-in-time to meet your schedule.

Remember, the Autoclave difference is in the book — and in the valve. For additional information, contact:



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From The President's Desk...

The Board of Directors met on Saturday, November 17, 1990, at the Westin Oaks Hotel in the Galleria in Houston to review the accommodations for the Sixth American Water Jet Conference to be held August 24-27, 1991. The following schedule of events was set:

A Water Jetting Short Course will be held from 8:00 a.m. to 5:00 p.m. on Saturday, August 24. A welcoming reception will be held the evening of August 24. On Sunday, August 25, the exhibition hall will be open from noon until 5:00 p.m. Two parallel technical sessions will be held from 8:00 a.m. to 5:00 p.m. with a break for lunch. One of these technical sessions will be comprised of the traditional format of the presentation of papers. The other session will be more informal and will be aimed at practical aspects of waterjetting such as water jet cleaning and hydrodemolition.

A meeting of members of the Water Jet Technology Association will be held at 4:30 p.m. on Sunday night. At this meeting, we will elect officers for the 1991-1993 biennium and discuss the business of the Association. On Monday, August 26, the General Session will continue from 8:00 a.m. to noon followed by a lunch in the exhibit hall. The afternoon will be spent viewing the demonstration of water jetting equipment at a remote site. Delegates will be bussed to this site. A banquet will be held Monday evening. The General Session and the exhibition will continue on Tuesday. The convention concludes at 4:30 p.m.

Several decisions were made by the Board in Houston. These included the publishing of a text on water jet technology, the adoption of wording for a disclaimer to be included in the *Recommended Practices for the Use of Manually Operated High Pressure Water Jetting Equipment* pamphlet published by the Association, and to advertise in the Sixth Water Jet Technology Conference in technical periodicals.

- George A. Savanick, Ph.D.

NLB Corporation Announces Building Extension



Ground breaking ceremonies for NLB Corporation expansion. (l. to r.) John Stimson, Vice President/Treasurer - NLB; Wayne Glessner, Wixom Mayor; Bill Barlow, Wixom City Manager; Forrest Shook, President - NLB; and Ian Schonsheck, President - Schonsheck, Inc.

Wixom, Michigan, September 28, 1990 - NLB Corp., a world-leading manufacturer of high pressure water-jetting systems for the automotive and other industries, has begun construction of an addition to its headquarters complex.

Schonsheck, Inc., also of Wixom, has been selected to design and build the addition of approximately 30,000 square feet to NLB's existing facilities, which will total over 100,000 square feet when construction of additional offices and manufacturing space in Wixom will make room for approximately 50 new employees.

A ground-breaking ceremony was held in September to kick-off the construction. NLB president, Forrest Shook said, "This expansion will give us more operating room both in office space and for manufacturing. This is especially necessary to meet our project growth and handle additional product lines."

The Wixom location is home to NLB corporate headquarters, engineering and manufacturing, R&D, customer service, and central parts warehouse. Additionally, NLB operates regional sales and service offices in Houston, TX, Mickleton, NJ, Atlanta, GA, and Los Angeles, CA.

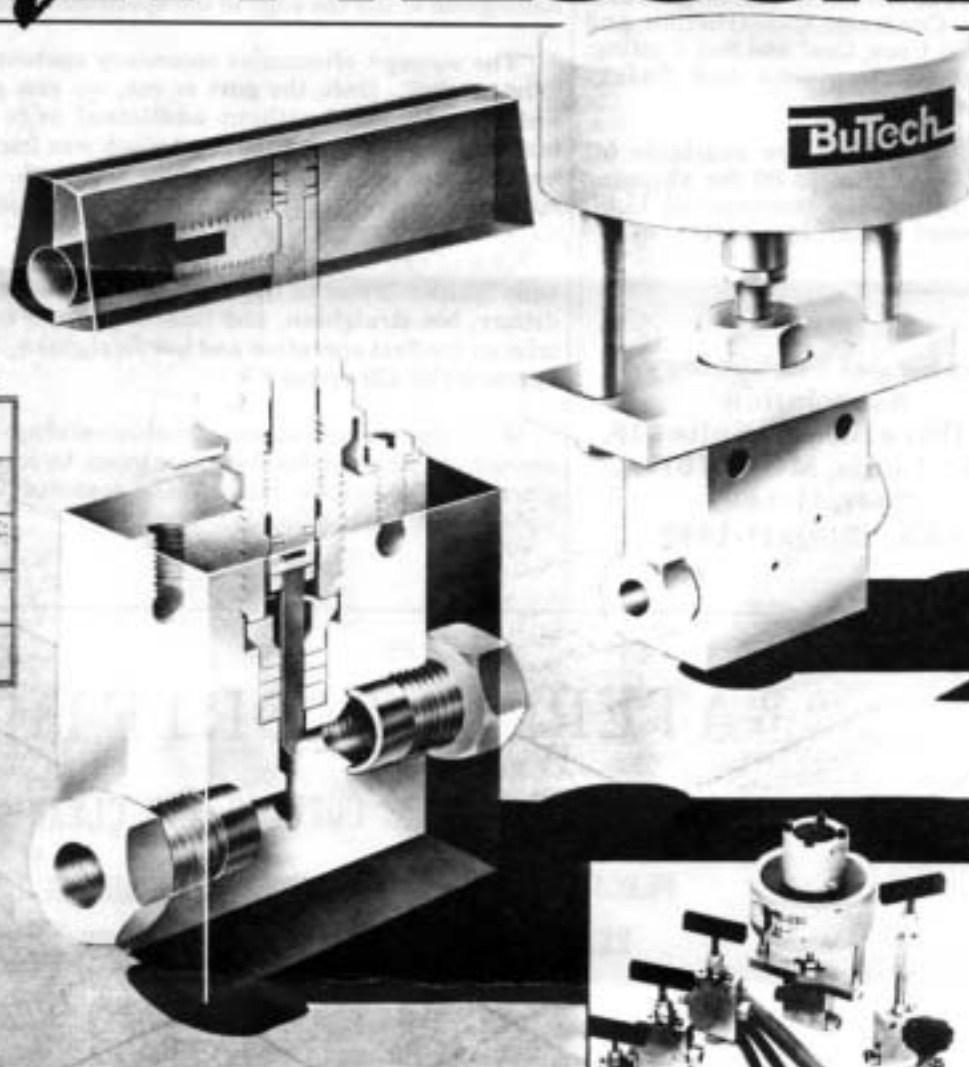
Established in 1971, NLB is the largest manufacturer in North America of high pressure waterjetting systems and accessories used for heavy-duty industrial cleaning and plan maintenance operations. NLB Corp. supplies its automated SPIN JET™ waterjetting systems to most major automobile manufacturers throughout the world, as well as numerous other industries.

Performance UNDER PRESSURE



SPECIFICATIONS

MATERIAL:	316 C.D. STAINLESS STEEL
WORKING PRESSURE:	UP TO 150,000 PSI
TEMPERATURE RANGE:	-400°F TO 1200°F
C.V. RANGE:	.004 TO 7.7
ORIFICE SIZES:	.062" TO .600"



...Up To 150,000 PSI.

To illustrate a point, Butech high pressure valves and fittings take water jet technology to the extremes. Our all corrosive resistant construction, with a choice of exotic alloy stem tips, guarantees long lasting pressure performance under extreme conditions. The non-rotating stem design, with adjustable packing below threads, allows precise control of gas and liquid flow at pressures from vacuum up to 150,000 psi. A variety of configurations and end connections are readily available.

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When you need to take water jet technology to the extremes, call Butech. Because when the pressure's on . . . Butech performs.



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Conference Proceedings Available

A limited supply of the official Proceedings of the 5th American Water Jet Conference, held August 27-31, 1989, in Toronto, Ontario, Canada, are available in a single, hard cover volume. A variety of presentations relating to the following general topics are included: Rock Cutting; Basic Studies; Concrete, Construction and Industrial Uses; Coal and Soil Cutting; Medical Applications and Safety Considerations.

The Proceedings are available for \$75.00 each, plus \$5.00 for shipping and handling (in continental U.S). Additional shipping charges apply for destinations outside the U.S. To order, contact:

**Water Jet Technology
Association**
818 Olive Street - Suite 918,
St. Louis, MO 63101
(314)241-1445
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Water Jets Apportion Food And Cut Space-Age Materials, from page 2

omni-directional cutting capability simplified the trimming of complex or irregularly shaped three-dimensional parts.

"Formerly, we used band saws, but waterjet cutting is twice as quick because it eliminates secondary operations," explains Roger Smith, Senior Manufacturing Engineer. "With both band saws and the waterjet, we can cut 8 to 14 inches per minute, depending upon the part, but we had to hand-grind or file the edge to the specified dimensions after band sawing."

"The waterjet eliminates secondary operations that are required after band sawing. Once the part is cut, we can go to the next assembly or welding operation without additional edge preparation. One of the techniques we used on thin sheet stock was friction sawing. This created a heat-affected zone which had to be removed. Because waterjet is a cold-cutting operation, this problem has been eliminated."

"One example of cost savings was in the trimming of the bump pan," adds Smith. "Prior to the waterjet, we would rough trim on a band saw, deburr, hot straighten, and final trim on a tracing mill. Now, we final trim on the first operation and hot straighten. This reduced the cost of this operation by 420 percent."

With these innovations revolutionizing industry in America and abroad, waterjet technology continues to advance. From aerospace to electronics, plastics to poultry, the accepted "conventional" technology of waterjet cutting has finally taken hold.

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Deadline Date For Abstract Submission Extended To January 1!

**6th American Water Jet Technology Conference
August 24-27, 1991
Westin Galleria
Houston, Texas**

Abstract Submission Form

To submit your abstract(s) for consideration, please complete this form. Abstracts are to be submitted **NO LATER THAN JANUARY 1, 1991**, to ensure consideration. Authors will be advised by February 15, 1991, regarding the decision of the Abstract Review Committee.

Author, Delegate Information

(Please print or type)

Name _____

Position/Title _____

Company _____

Street Address _____

City, Province _____ State _____

Country _____ Zip, Postal Code _____

Business Telephone _____ Facsimile _____

Signature _____ Date _____

Authors _____

Synopsis (Up to 500 words. Use separate sheet if necessary.)

Mail completed form and abstract, NO LATER THAN JANUARY 1, 1991, to:

**Conference Coordinator
6th American Water Jet Technology Conference
Water Jet Technology Association
818 Olive Street - Suite 918
St. Louis, MO 63101, USA
(314)241-1445, FAX: (314)241-1449**

Fluid Facts For Water At 60° F

Equivalents

1 atm	= 14.7 psi	1 L	= .264 gallon
1 bar	= 14.5 psi	1 gal.	= 231 in. ³
1 Kg/cm ²	= 14.28 psi	1 gal.	= 8.336 lb.
1 KPa	= .145 psi	1 Kg	= 2.20 lb. mass
1 ft H ₂ O	= .423 psi	1 N	= .225 lb. force
1 MN/m ²	= 1 MPa = 145 psi	1 m/s	= 3.28 ft/s
1 Hp	= (550 ft) lbf/s = .746 KW		

Formulae

$$V = 12.186 * P^{1/2} = .4085 * Q/d^2$$

$$Q = 29.91 * d^2 * P^{1/2} * C_d$$

$$Hp = 0.0174 * d^2 * P^{3/2} * C_d = P * Q/1714$$

$$P = .0012 * Q^2/d^4$$

$$T = \pi/2 * d^2 * P * C_d = .0522 * P^{1/2} * Q = .043 Q/d$$

$$C_v = Q/\Delta P^{1/2}$$

$$\Delta P = (Q/C_v)^2 * 7.6 * 10^{-4} * L * Q^{1.85}/D^{4.87} \text{ (Hazen-Williams, } C=110)$$

$$\Delta \text{Temp} = \Delta P/337.6$$

V is velocity in ft/s

Q is flow in gpm

Hp is power in horsepower

T is thrust in pounds

L is length in feet

ΔTemp is in degrees Fahrenheit

ΔP is the change in pressure

P is pressure in psi

D is tube diameter in inches

d is orifice diameter in inches

C_v is flow coefficient

C_d is discharge coefficient

C_d of sapphire orifice = .7

C_d of tapered carbide = .9

C_d of drilled steel = .65

Courtesy of Stone Age, Inc., Durango, Colorado

The Cutting Edge

by George A. Savanick

Many inquiries are received by the Association regarding the size of the U.S. market in water jetting equipment. The best estimates are that \$200,000,000 are spent annually for sales of equipment for in-plant cutting applications. About \$125,000,000 of this amount goes for motion equipment (robotics, etc.) and the remaining \$75,000,000 for pumps, fittings, and accessories. The size of the market for equipment for conventional out-of-plant applications not requiring robotics is estimated at \$200,000,000. The fees for contractor services could reach \$1,000,000,000. The market is large and expanding.

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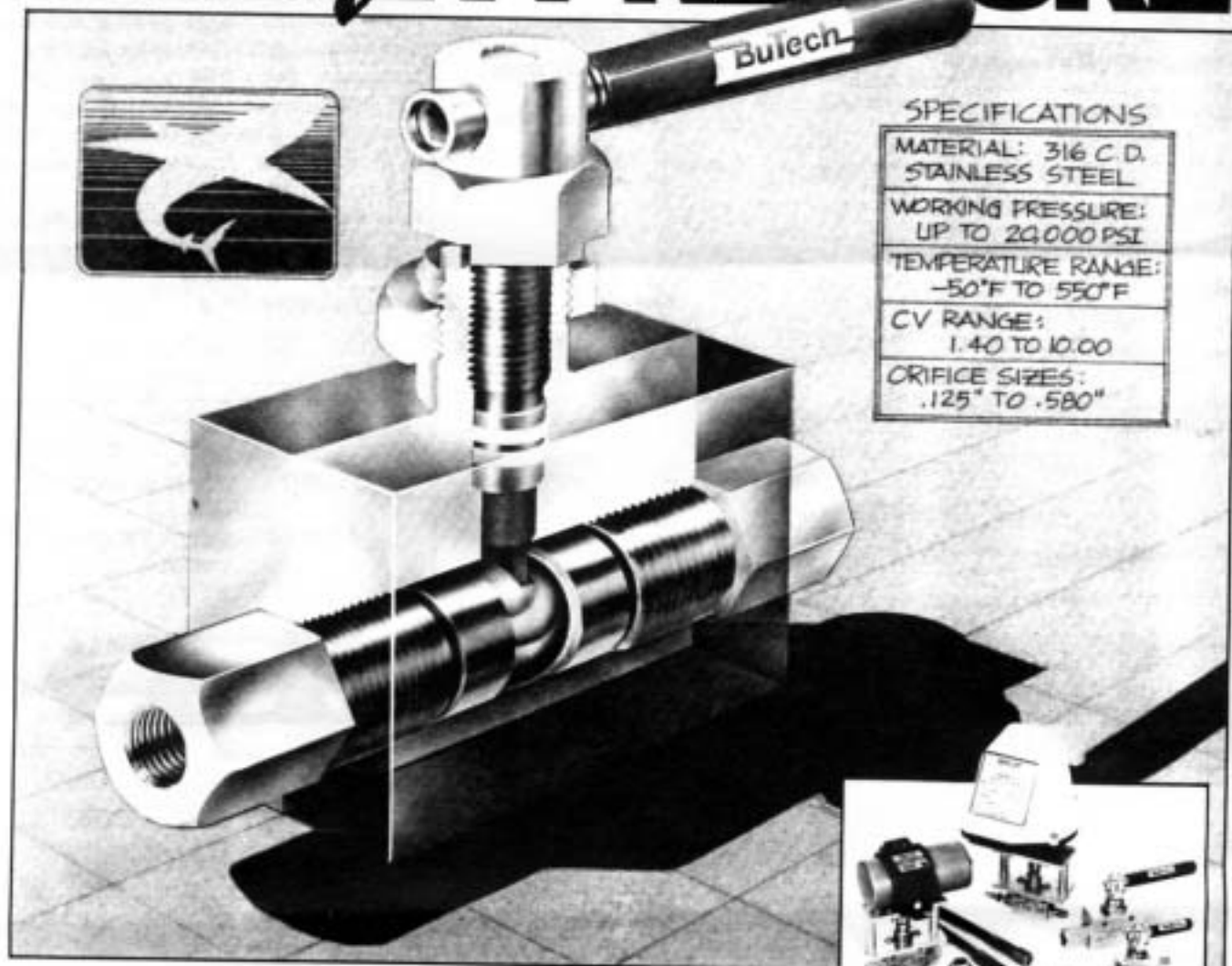


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Performance UNDER PRESSURE



SPECIFICATIONS

MATERIAL:	316 C.D. STAINLESS STEEL
WORKING PRESSURE:	UP TO 20,000 PSI
TEMPERATURE RANGE:	-50°F TO 550°F
CV RANGE:	1.40 TO 10.00
ORIFICE SIZES:	.125" TO .580"

...Up To 20,000 PSI.

To illustrate a point, Butech ball valves are the ultimate in design and performance. Our 316 cold drawn stainless steel construction assures long lasting pressure performance. The blow-out proof stem and ball design, with 1/4 turn positive shut-off, guarantees precise control of liquid or gas flow up to 20,000 psi. A variety of configurations and end connections are readily available.

We also offer a complete line of high pressure fittings, carefully engineered to meet all of your specific requirements.

When you're ready for the ultimate design and performance in high pressure ball valves and components, look to Butech. Because when the pressure's on ... Butech performs.



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