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A Method For Suppression Of Building Fires, While Providing Access For Interrogative Equipment

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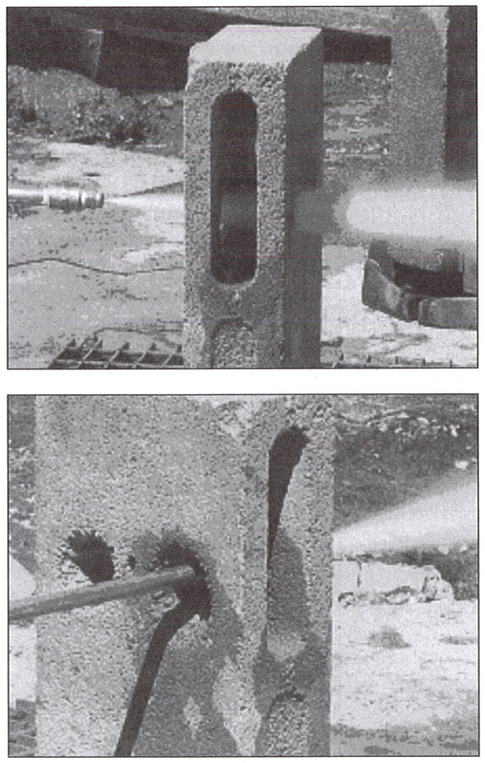

Hole drilled through concrete.

ABSTRACT

This paper describes the development of a light-weight tool that can be easily transported to a site where there has been a building collapse or fire (whether natural or man-induced). The tool is a small abrasive slurry waterjet that can drill through all the components of the collapsed building, including steel and concrete beams, so that water can be brought to the center of any fire in the structure and so that microphones and other instruments to detect survivors can also be carried through the channel created to the heart of the structure.

1. INTRODUCTION

When a building is destroyed due to either a man-made or natural cause, one will want to inspect the inside structure to find any survivors in the shortest possible time and without further injuring anyone that has been trapped inside. As of today there is no single method that can create a consistent hole through the different materials that will form the pile of rubble created by such an event. Uniquely it is possible that an abrasive waterjet tool may be one way to do this.

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August 21-23, 2005
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A Method For Suppression Of Building Fires, from page 1

Occupied buildings collapse for a number of reasons: both natural, through fire, flood and earthquake and through man-made events such as war, or terrorist attack. In the collapse of the building the outer walls and part of the roofing structure can cover the central part of the building, which can catch fire, and which frequently contains victims.

Access to the heart of the rubblized building is often difficult to achieve since the blocks are hap hazardously stacked and the inter-layers can contain steel, concrete and other materials. This poses a particular problem in that the tools most effective in cutting concrete (drills, impact breakers and splitting tools) do not work well in cutting steel. Likewise the tools that are most effective in cutting steel (flame torches for example) do not work well in cutting concrete. The problem is exacerbated since rubble piles can be quite unstable and thus high impact forces on the pile can cause movement and increase the risk to any rescuers or trapped victims.

Further, if such a tool is to be developed it must be readily available, be not too expensive or difficult to operate and be operable by people without a high degree of technical skill or training. But, if versatile tools can be developed that have multiple uses, then some of these constraints may no longer apply. Further, if the tools can be made to be relatively inexpensive and lightweight then they can be distributed around the community without great cost. And if they can be developed to have a more normal use in other applications, then their availability at a time of sudden critical need becomes more assured. This then provides a different set of constraints on the development of rescue tools, but one that can be addressed in their evolution. As an example of such a tool this paper will consider the use of an abrasive waterjet system as one of the versatile tools for the rescue professional. It exemplifies a process and approach that may have value in the development of other tools for use in these circumstances.

1.1. The Perceived Need

There are a number of critical problems that arise when a building collapses. In the immediate aftermath of the collapse there is the need to determine if any survivors are trapped within the debris pile. Secondarily, there is often a need to extinguish a burning zone within the structure. Both needs are best served by gaining access to the interior of the remaining structure. However, this structure is usually precariously balanced and made up of randomly oriented layers that can be made from a wide variety of materials. This means that conventional access from outside the zone is difficult because of the presence of these beams and walls and their varied composition. And if a hole were to be drilled, it must be able to penetrate through all the materials that it might encounter. It must be able to do this without disturbing the structure, and without causing an additional threat to any survivors that might be present. The presence of cracks and open voids also make conventional drilling difficult.

2. BACKGROUND

High-pressure waterjets have, in their modern resurgence, had two basic industries that they have developed to serve. The first of these is the cutting application in manufacturing. Water under very high pressure can easily cut through relatively soft materials, such as wood and paper.

The narrow range of applications that are available for plain water use, even at these high pressures has, however, limited the overall application of this tool.

Concurrent with the growth of an industry at the high end of the waterjet spectrum another industry has also developed. This has been the use of high pressure waterjet systems for cleaning surfaces. Initially, these operations were not much more than portable car-wash units, operated at relatively low pressure, and used for cleaning large areal surfaces such as houses and the like. With the passage of time the pumps available have been able to generate higher pressures, and have created a sufficiently large market that more manufacturers have been drawn to the industry. This increased competition has resulted not only in cheaper and more reliable systems, but also systems that operate at higher pressure. In the United States one can obtain a pressure washer that operates at around 10 MPa for a cost of less that $200. Units are also available locally (this in a small Midwestern town) that operate at pressures of up to 50 MPa and at relatively low cost.

In a practical sense, conventional waterjets are limited in applications to cutting and drilling materials that are usually fibrous, porous, granular or soft. Hard and dense materials, such as glass, metals and fired ceramics call for more powerful jets. However, there are practical limits to the operational pressure that can be used for this purpose. This pressure is typically around 100,000 psi and this is

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		WJTA Member Price	Non Member Price	Shipping & Handling	
____	**Proceedings CD-ROM of The 2003 WJTA American Waterjet Conference** (2003)	@ $ 35.00	$ 55.00	$ 8.00	= $_____
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____	**An Overview of Waterjet Fundamentals And Applications,** Fifth Edition (2001)	@ $ 55.00	$ 70.00	$ 8.00	= $_____
____	**An Overview of Waterjet Fundamentals And Applications** 8/17/03 PowerPoint presentations in printed format	@ $ 30.00	$ 35.00	$ 8.00	= $_____

Minimum charge of $8 per order. $8 for 1-3 sets; $16 for 4-7 sets; for 8 or more sets, contact the WJTA office.

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1 - 10 copies	____ # of copies	x $ 5.00 ea.	$ 10.00 ea.	= $_____
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100 - or more copies	____ # of copies	x $ 3.00 ea.	$ 6.00 ea.	= $_____

Recommended Practices, Spanish Edition

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1 - 10 copies .... $0.50 per book, 11 - 99 copies .... $0.40 per book, 100 - or more copies .. $0.25 per book # of copies x $_____ = $_____

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WJTA Decal	____ # of decals - 3" x 5"	x $ 1.00 ea.	N/A		= $_____
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For shipping and handling charges outside the USA, contact the WJTA Office.

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2005 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 2005 WJTA Award (please print or type full individual, company or organization name):

_____

company, organization, or person

❒ 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.

❒ Service Award

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

❒ 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.

❒ 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.

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, 2005.

For a prompt response, fax completed form to (314)241-1449, or mail to the WJTA, 906 Olive Street, Suite 1200, St. Louis, MO 63101-1434, USA.

Nominations Open For WJTA Board Of Directors

"Nominations for the WaterJet Technology Association (WJTA) Board of Directors are now open," says WJTA Secretary Jack Russell. "The duties of the directors are truly challenging and rewarding."

The terms of office of Craig Anderson; G.J. DeSantis; Mohamed Hashish, Ph.D.; Randy Kruger; George A. Savanick, Ph.D.; and David A. Summers, Ph.D.; will expire in August 2005. Therefore, nominations are sought for six (6) board members, each to serve a four-year term of office beginning August 20, 2005.

The WJTA bylaws provide that no more than one of the elected board members may be from the same company or organization. Therefore, board members may not be nominated from the same company or organization already represented on the board by individuals whose terms expire in 2007, including: DeBusk Industrial Services Company (Pat DeBusk); Advisory Council (Lydia Frenzel, Ph.D.); High Pressure Equipment Company (Larry Loper); NLB Corp. (Forrest Shook); and StoneAge, Inc. (John Wolgamott).

According to the WJTA bylaws, any WJTA member in good standing (2004 membership dues paid) may submit a nomination(s). Nominees must also be WJTA members in good standing. The deadline for making nominations is **March 18, 2005.** Your nomination(s) should reach the WJTA office **no later than March 18, 2005.** To submit a nomination(s), complete the Nomination Form and return to:

Chairman, Committee on Nomination
WaterJet Technology Association
906 Olive Street, Suite 1200
Saint Louis, MO 63101-1434
Phone: (314) 241-1445
Fax: (314) 241-1449

Remember, nominations must be received **no later than March 18, 2005.**

Nominations/Elections Procedures

In accordance with the bylaws of the WaterJet Technology Association, revised in 2002, nominations and elections to the Board of Directors include the following procedures:

- At least two calls for nominations to the board of directors will be published in the *Jet News*. The first call for nominations appears in this issue. **Nominations will be accepted through March 18, 2005.**
- An official ballot listing the eligible nominees and a brief biographical sketch for each individual will then be forwarded by mail to all eligible voting members of the Association on May 18, 2005. **Signed and executed, ballots must be mailed to the Association's office for tallying by July 1, 2005.**
- The names of newly elected board members will be announced in the *Jet News* and on the WJTA web site.

Only eligible members of the WaterJet Technology Association may submit a nomination and nominees must be eligible members of the WaterJet Technology Association.

WJTA WaterJet Technology Association Nomination Form

Name Of Nominee_____ Title _____

Address _____

City _____ State _____

Country _____ Postal Code _____

Telephone

In US/Can (____)_____ Outside US/Can [____] (____)_____
(area code) [country code] (city code)

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In US/Can (____)_____ Outside US/Can [____] (____)_____
(area code) [country code] (city code)

Attach biographical information with a brief statement of your nominee's mission and vision for WJTA.

Name Of Nominator_____ Title _____

Address _____

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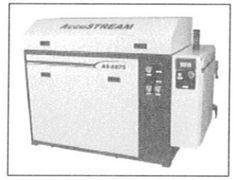
Accustream Introduces New Intensifier Pump

Accustream, a leading supplier of quality products for waterjet users, now introduces the new AS-Series line of intensifier pumps. The AS-6050 and AS-6075 pumps are rated at 50 and 75 horsepower respectively and operate continuously at up to 60,000 psi.



These reliable full-featured pumps are the result of 19 years of waterjet design experience. Innovative design and quality manufacturing produce the most economical operating cost in the industry. The AS-6050 pump is ideal for single cutting head use or smaller dual head combinations while the AS-6075 is best suited for multiple head applications.

The pumps come as a complete ready-to-use package. Some of the features include:

- State-of-the-art intensifier design
- Large volume attenuator for minimal pulsation and high cut quality
- Dual pressure select for piercing and cutting brittle materials
- Built-in filter/booster with 3 in-line filters
- Key switched remote control for operation from the integrator's CNC
- Wye-delta soft start with high efficiency TEFC motor

For more information contact Accustream at 763-717-7099 or toll free at 866-566-7099 or info@accustream.com.

Safety Committee Solicits Comments On Improvements To Recommended Practices

The WJTA Safety Committee hereby solicits comments regarding improvements to the publication, Recommended Practices for the Use of Manually Operated High Pressure Waterjetting Equipment. While Recommended Practices is reviewed periodically at the biennial conferences of the WaterJet Technology Association, your comments and suggestions for improving the publication are invited and welcome anytime.

Please address your comments and suggestions to: Safety Committee, c/o WJTA, 906 Olive Street, Suite 1200, St. Louis, MO 63101-14134, fax: (314)241-1449, e-mail: wjta@wjta.org, web site: www.wjta.org.

2005 WJTA Conference Registration Form

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By Mail: Fill out the registration form and mail with applicable payment to: **WJTA, 906 Olive Street, Suite 1200, St. Louis, MO 63101-1434.**

Join the WaterJet Technology Association now and receive a substantial discount off Conference registration fees.

Seven Ways To Register

	WJTA MEMBER By 8/1/05	WJTA MEMBER After 8/1/05	NONMEMBER By 8/1/05	NONMEMBER After 8/1/05	
❑ **Full Conference** ONLY	$ 495	$ 555	$ 555	$ 615	= $ _____
❑ **Combo** (Full Conference PLUS Preconference Seminar)	$ 665	$ 725	$ 725	$ 785	= $ _____
Specify preconference workshop: ❑ Waterjet Short Course ❑ Advanced Topics on Surface Prep					
❑ **Daily**					
❑ Sunday (includes lunch)	$ 280	$ 340	$ 340	$ 400	= $ _____
Specify: ❑ Waterjet Short Course ❑ Advanced Topics on Surface Prep					
❑ Monday (includes Luncheon in Exhibit Hall)	$ 265	$ 295	$ 295	$ 325	= $ _____
❑ Tuesday (includes Luncheon in Exhibit Hall)	$ 265	$ 295	$ 295	$ 325	= $ _____
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❑ Monday (does NOT include Luncheon in Exhibit Hall)	$ 25	$ 25	$ 25	$ 25	= $ _____
❑ Tuesday (does NOT include Luncheon in Exhibit Hall)	$ 25	$ 25	$ 25	$ 25	= $ _____
❑ **Student** (WJTA members ONLY)	$ 20	$ 20	N/A	N/A	= $ _____
MULTIPLE CORPORATE REGISTRATIONS (Applies to third and subsequent registrants from same company)					
❑ **Full Conference** ONLY	$ 445	$ 505	$ 505	$ 565	= $ _____
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WJTA MEMBERSHIP (US, Mexico, Canada) ❑ $60 Individual ❑ $20 Student ❑ $400 Corporate ..... = $ _____

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❑ **Conference Proceedings** ____ Copies x $89.00 ..... = $ _____

2005 WJTA Conference registrants may purchase extra copies of the Conference *Proceedings* on CD-ROM for only $89. Regularly priced at $109, you will **SAVE $20**. **Offer valid through 8/31/05.** **SPECIAL OFFER!**

❹ **EXTRA TICKETS** — The Full and Combo registrations include one ticket per registration for the Exhibit Hall Luncheons (Monday and Tuesday), Welcoming Reception in Exhibit Hall (Sunday evening) and Awards Presentation/Party (Monday evening). Each Daily registration includes a luncheon ticket for the day registered: Sunday, Monday and/or Tuesday. Sunday daily includes Welcoming Reception in Exhibit Hall. Additional tickets may be purchased as follows:

❑ **Welcoming Reception in Exhibit Hall** - Sunday	$ 60	$ 60	$ 60	$ 60	= $ _____
❑ **Luncheon in Exhibit Hall** - Monday or Tuesday or both ($60)	$ 35	$ 35	$ 35	$ 35	= $ _____
❑ **WJTA Awards Presentation/Party** - Monday	$ 75	$ 75	$ 75	$ 75	= $ _____

TOTAL ENCLOSED $ _____

A Method For Suppression Of Building Fires, from page 2

often insufficient to effectively cut some of these harder materials (Ref. 1). The use of an abrasive feed into the waterjet stream provides a way of solving this problem. It is possible to enhance the performance of waterjets by changing the structure of the available energy using methods such as the addition of long-chain polymers (Ref. 2), the use of jet pulsation (Ref. 3), and the development of segmented (Ref. 4) and cavitating jets (Ref. 5).

However the most effective of all jets as of today for cutting hard materials, is that wherein the jet contains abrasive, and where fine abrasive particles are injected into the jet stream to aid in cutting. By feeding the high pressure jet through a small chamber and then into a second collimating nozzle, suction is created in the chamber. This can be used to draw a small amount of abrasive into the chamber and to mix it with the water to create an abrasive cutting stream. This combination, known as an Abrasive Water Jet (AWJ) is now sufficiently powerful that it will cut through a wide variety of metals and other materials. Operated at pressures of up to 400 MPa and with roughly 8% abrasive in the stream, this tool has found a growing range of application. The tool has a number of advantages. Because the cut is made by the multitude of very small particles (typically on the order of 150 μm in size) it can be made very precisely and without any impact on the material surrounding the edge of the cut. Since it does not generate significant heat in this process (and the water can dissipate some of that generated) it is known as a cold cutting tool. In addition the reaction force exerted by the jet is small. Labus (Ref. 6) quotes this force as being

$$Thrust(Newtons) = 0.745\ Q\ \sqrt{P}$$

where Q is the flow rate in liters/min and P is the jet pressure in MPa.

This means two separate but encouraging things for our overall purpose, firstly that the jet will not exert much force on the piece being cut, and secondly that it will not require a lot of force to hold the cutting nozzle in place.

The impact that this new tool had on industry has been steadily growing. The low reaction force required to

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A Method For Suppression Of Building Fires, from page 5

hold the tool meant that it could be integrated with robotic systems for precise and repetitive cutting of parts. The ability of the tool to precisely cut through as much as 30 cm of glass meant that it became a tool of choice for precise cutting of optical parts, while the cool cutting operation made it also very useful for cutting metals such as titanium. Thus, over the years, a significant number of small cutting shops have developed around the world where these systems are available and are used to cut everything from advanced composites to polished stone for floors and walls.

The development of this tool has therefore gone a considerable way towards the creation of the universal cutting tool that is required for use in cutting through buildings that have collapsed. In its original form, however, it still has a number of disadvantages. The first of these is the expense of the system, pumps that operate at 400 MPa come at a cost that makes them impractical for most common applications. Further the equipment that is available must contain this pressure, and thus all the components require highly precise machining, and considerable skill in maintenance and operation. The waterjet machine tool market, for precision cutting of small metal and composite material parts, has emerged as one of the faster growing market segments, with a growth rate forecast at 9.1 percent for the period [1997-2004].

The idea of adding abrasive to the waterjet before it exits the primary nozzle was developed into a system that has since become known as DIAjet (Direct Injection of Abrasive jet) system. More recently, given the proprietary nature of that name this has been changed to the more generic description of Abrasive Slurry Jetting (ASJ). This design overcomes some of the disadvantages of the conventional method of introducing abrasives into a waterjet stream. Instead of mixing the abrasive in a chamber, following the acceleration of the water, the abrasive is metered into the flow of water from the pressurizing pump to the nozzle. This is achieved by first adding the abrasive to a tank, which can be pressurized to the delivery pressure, and then connecting this tank into a loop attached to the delivery line. The connections are made through valves, and a metering valve controls flow through the loop. In this way the concentration of abrasive feeding into the line can be controlled (Figure 1). The system provides an alternative to the conventional AWJ system, and to differentiate it from that system it has been called the Abrasive Slurry Jet (ASJ).

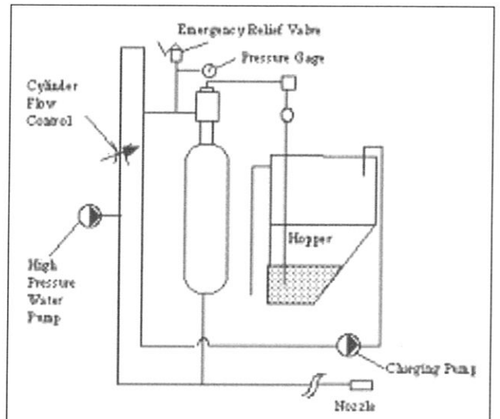

Figure 1. Schematic of the flow circuit of an abrasive slurry jetting system (Ref. 4).

Subsequent experiments have shown (Ref. 10) that when the water and abrasive are mixed in this way, the jet can cut material (other things being equal) at a quarter, or less, of the pressure required with the AWJ system. Not only does this reduce the power required by 75% but it also has the advantage of bringing the operating pressure of the system down to a range of pressures that can be supplied by the pumps developed for the cleaning industry.

This is an additional advantage because the pumps developed for the cleaning industry are operated in a wide variety of conditions and must be mobile. Factory installed very high pressure systems are usually permanently mounted and thus do not need to be as robust. The cleaning industry, however, requires a system that can be moved rapidly to a site, set up and operated by a workforce that is often casual labor, with little training. Thus, the pumps that have developed are, at this pressure level, already robust, simple to operate and easy to maintain. Further, while rescue operations require that all diligent speed be achieved in carrying out operations, the performance criteria are not as stringent as being able to consistently cut through 2-cm thick titanium sheet at a steady rate for 8 hours leaving a surface edge that is perfectly perpendicular to the facing surface. Rather, cuts do not need to be that precise, time scales are more flexible, and cutting is needed on an intermittent basis.

Thus, (and these conditions will change as the equipment continues to become more popular and developed) while it is possible now, for example, to cut through 8 mm of steel at a rate of 60 cm/min using a system at 70

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Seven Easy Ways To Attend The 2005 Waterjet Conference

1. FULL CONFERENCE

Includes admission to all research and applications sessions (except preconference workshops on Sunday, August 21), onsite live demonstrations, pass to Welcoming Reception in Exhibit Hall (Sunday, August 21), exhibits, luncheon on Monday, August 22, and Tuesday, August 23, coffee breaks, and WJTA Party on Monday, August 22. **Each full registration also receives one copy of the Conference *Proceedings* on CD-ROM.**

2. COMBO

Includes everything listed under Full Conference **PLUS** a preconference workshop on Sunday, August 21.

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 research and applications sessions, onsite live demonstrations, exhibit hall, coffee breaks, and luncheon on that day. Register for one day and receive a "50% off" coupon for the *2005 Conference Proceedings* on CD-ROM. Register for two days and the *Proceedings* are included. **NOTE:** Admission to the WJTA Party on Monday is **NOT** included in the daily registration fee, and tickets for this event must be purchased separately.

5. PRECONFERENCE WORKSHOPS

- **Waterjet Short Course**
- **Advanced Topics in Surface Preparation**

Includes handout materials for workshop, coffee breaks, luncheon, and August 21 Welcoming Reception in Exhibit Hall.

6. EXHIBIT HALL and/or LIVE DEMO PASS

A $25 exhibit hall and/or live demonstration pass for one day includes admission to the WJTA Exhibit Hall where you'll see waterjet equipment, supplies, and services, onsite live demonstrations between the hours of 8:00 a.m.-10:00 a.m., and designated contractor programs. Passes do **NOT** include luncheon in the exhibit hall. Tickets for lunch can be purchased separately.

You must purchase a ticket to attend the Welcoming Reception in the Exhibit Hall on Sunday, August 21, if you are not registered as a Full or Combo, or you are not registered for one of the two Preconference Workshops.

7. STUDENTS

The registration fee for WJTA student members is $20. Student registration includes admittance to technical programs, onsite live demonstrations, and the exhibit hall on Monday and Tuesday, but does **NOT** include copies of the *Proceedings*, Welcoming Reception in Exhibit Hall on Sunday, August 21, or admittance to any food/social functions. **NO** discount is available for students that are not members of the WJTA. WJTA student members must be enrolled **full-time** in a university graduate or undergraduate program.

WJTA members and early-bird registrants SAVE up to $120!

WJTA members receive a special discount off the regular registration fees. You will also receive a discount if your registration is postmarked or received in the WJTA office by **August 1, 2005**. Total Savings: Up to $120!

2005 WJTA AMERICAN WATERJET CONFERENCE PROCEEDINGS

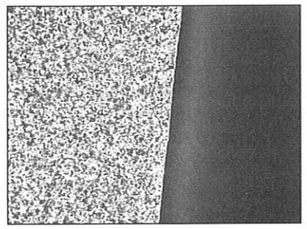
The *Conference Proceedings* for 2005 will be on CD-ROM only. The two-volume books that were available in past years will not be produced.

CANCELLATION POLICY

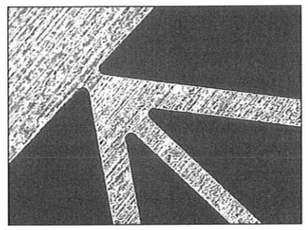
Fees will be refunded in full for cancellations received at least four weeks prior to the Conference. Cancellations received more than 10 days and less than four weeks prior to the Conference will be subject to a $50 charge. No refund will be made for cancellations received less than 10 days prior to the Conference. However, substitutions may be made at anytime. Refunds will not be processed until after the Conference.

WaterJet Technology Association
Telephone: (314)241-1445
Fax: (314)241-1449
Web Site: www.wjta.org

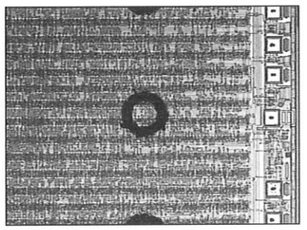
Waterjet Guided Laser, from page 13



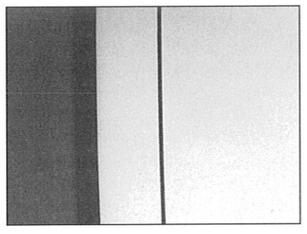
©Synova SA. Insert in polycrystalline diamond (PCD) (tooling). Through-cut of a 0.5 mm thick PCD layer, back side; a green laser has been used (wavelength 532 nm, average power 80 W) and the nozzle diameter was 40 um; cutting speed: 10.9 mm/min.



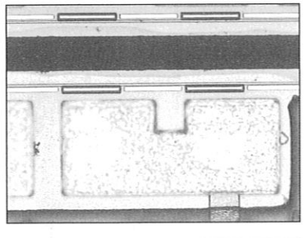
©Synova SA. Stents are employed to improve and ensure the blood flow in human blood vessels affected by insufficient width due to arteriosclerosis or other vascular afflictions (medical device). Detail of a stent structure realized in stainless steel (thickness: 250 um), directly after cutting (no post-processing).



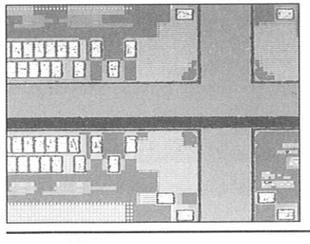
©Synova SA. Marking – Process used to mark defective chips after detection (semiconductors). Ring marking (diameter 400 um, 2 mm between the marks) using a 50-um nozzle; speed: 8 marks/second.



©Synova SA. Edge Grinding – Removal of the wafer edge (containing micro cracks) to reduce thin wafer breakage (semiconductors). Grooving in a 725-um thick silicon wafer, before back grinding, 1 mm from the edge; infrared fiber laser (wavelength 1064 nm, average power 80 W); 75-um nozzle; grooving depth 80 um; grooving speed 50 mm/s.



©Synova SA. Gallium arsenide (GaAs) is a III-V compound semiconductor presenting several advantages over silicon (semiconductors). Dicing of a 100-um thick wafer; Nd:YAG laser (wavelength 1064 nm, average power 50 W); 25-um waterjet; cutting speed 60 mm/s; kerf width 26 um.



©Synova SA. Low-K – The upper layers of low-K wafers have a low dielectric constant, and are very brittle (semiconductors). 100-um thick low-k wafer diced at a speed of 50 mm/s; the cut is very close to the die (between 3 and 5 um); kerf width 30 um.

American Waterjet Conference

Preliminary Schedule Of Events

Sunday, August 21, 2005

8:00 a.m. - Noon	Short Courses*
Noon - 1:30 p.m.	Luncheon For Short Course Participants*
1:30 p.m. - 5:00 p.m.	Short Courses (continued)
6:30 p.m. - 9:30 p.m.	Welcoming Reception In The Exhibit Hall -- Exhibit Officially Opens*

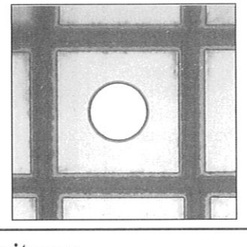
Monday, August 22, 2005

8:00 a.m. - 10:00 a.m.	Live Demonstrations
10:00 a.m. - 11:30 a.m.	Poster Session in Exhibit Hall
10:00 a.m. - 5:00 p.m.	Exhibits Open
11:30 a.m. - 1:00 p.m.	Lunch In Exhibit Hall*
1:30 p.m. - 5:00 p.m.	Research and Development Paper Presentations
2:00 p.m. - 3:00 p.m.	Contractor Topic
5:00 p.m. - 6:00 p.m.	WJTA Membership Meeting
7:30 p.m. - 10:30 p.m.	Awards Presentation/ Party*

Tuesday, August 23, 2005

8:00 a.m. - 10:00 a.m.	Live Demonstrations
10:00 a.m. - 11:30 a.m.	Poster Session in Exhibit Hall
10:00 a.m. - 3:00 p.m.	Exhibits Open
11:30 a.m. - 1:00 p.m.	Luncheon In Exhibit Hall*
1:30 p.m. - 5:30 p.m.	Research and Development Paper Presentations
1:00 p.m. - 2:00 p.m.	Contractor Topic

*Ticket will be required.



©Synova SA. Silicon carbide (SiC) is another brittle III-V compound semiconductor (semiconductors). Through-cutting of a 70-um thick SiC wafer; kerf width 25 um.

A Method For Suppression Of Building Fires, from page 6

MPa, the reduced cost, size and increased flexibility of a 35 MPa system suggests that this is currently a better choice for use in an ASJ system application.

At the 15th International Waterjet Symposium in Ronneby in Sweden the company CCS Cobra demonstrated that an abrasive waterjet could cut through the wall of a steel container and extinguish, relatively rapidly, the fire burning within. (See article on page 11.)

It has been known for some years that sending a mist of droplets in the size range of around 150 microns is a very effective way of extinguishing the fire. This is because the droplets have sufficient energy to enter the flames, but are then small enough to vaporize in the fire, creating steam and cutting off the oxygen to the fuel. This can lead to fires being extinguished in as little as 30 seconds and with very little of the water damage which is often the greatest part of the damage resulting from fire. (Ref. 11)

Over the time that this new tool has developed it has been used to cut a very wide range of materials successfully. This is one of the requirements if we are to find a tool that can cut access into the heart of a collapsed building.

3. DEVELOPMENT OF A DISASTER RESCUE TOOL

The conventional use of a mist as an extinguisher has however, not been generally adopted since the mist rapidly attenuates in air, and thus a fire hose must approach the fire quite closely. However, the use of the mist will create a draft around the fireman and this will draw the fire down upon him. The tool has not therefore been adopted. However, if the mist can be delivered through a wall, then the fireman can be protected by that wall, while the mist can be directed into the heart of the fire. Thus, drilling the hole through the wall with the abrasive waterjet has a potentially large benefit.

The potential benefit of using this drill as a tool not only to penetrate the outer wall of a burning building, but also the rubble of a destroyed building is evident. Consider that after the World Trade Center was destroyed on September 11, 2002 there was a residual fire in the ruins for over four months. This is because there was no tool that could easily penetrate the mass of rubble to reach the heart of the fire. The intertwined mass of concrete and steel was not stable, and was largely accessed only by surface

(continued on page 8)

A Method For Suppression Of Building Fires, from page 7

exploration. Water applied at the surface encountered the same sort of problems in reaching this flame as was found at a site in Montana (Ref. 12). The structure of the debris was such that channels existed that would carry the water away from the fire zone, and until the area was excavated no clear channel into the fire existed.

The original intent was to develop a small light-weight drilling system that could easily be carried to the site, and that would be small enough and simple enough that it could be used to drill a small diameter, but long straight hole into the rubble pile. By cautiously advancing this tool, which is capable of drilling through all the materials likely to be encountered, a conduit could be created into the pile through which instrumentation (including small video cameras and acoustic sensors) could be moved to give a better search capability within the body of the rubble. The low reaction force should not disturb the rubble pile, while the slow feed forward of the drill, through subsequent layers, with stops to check before penetrating each layer, should allow examination without posing additional risks to any survivors within the pile.

The equipment built has a capacity of delivering 35 MPa at 35 liters/min of water. Included water reservoir has a capacity of 500 liters. The pump, water reservoir, fuel reservoir and basic piping was attached to a support platform. The unit has been designed in such a way that it can be set in back of a pickup truck. The whole system is firmly mounted on a steel plate (size: Length – 2 meters, Width – 2 meters). In addition, two cylinders that would hold a pressure of 35 MPa were also included in the assembly so that abrasive could be added to the water before it reached the cutting nozzle. A high-pressure hose carried the abrasive slurry from this platform to the drilling unit. (Figure 2 and Figure 3.)

The first unit built was designed to be light and simple. However, the nozzle at the end of the drilling rod must rotate to ensure that the hole was large enough in size to allow the nozzle assembly to pass. An abrasive jet will normally cut a slot some 3–4 times the width of the nozzle and the nozzle was around 0.75 mm in diameter. The nozzle body is around 4 cm in diameter.

To demonstrate the initial capability of the device it was used to drill through sequential targets that included concrete blocks and steel plates. As a measure of performance the nozzle drilled through a solid concrete wall 30 cm thick in 2 minutes. In order to demonstrate the lack of vibration a glass of water was set on top of one of the lighter construction blocks, and the ASJ system drilled through the block underneath without spilling any water (Figure 4). The speed of advance of the drill had to be controlled to ensure that it maintained hole diameter as it advanced.

During further studies, nozzles were modified so as produce a larger jet from the orifice and to further simplify and lighten the structure of the drill.

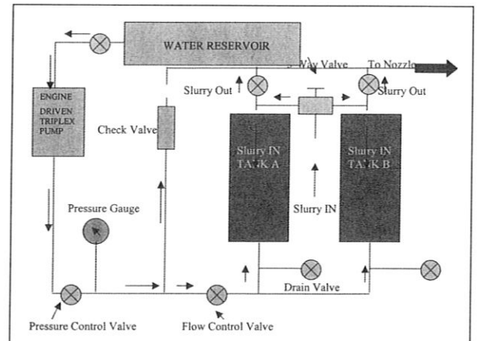


Figure 2. Schematic of Abrasive slurry system.

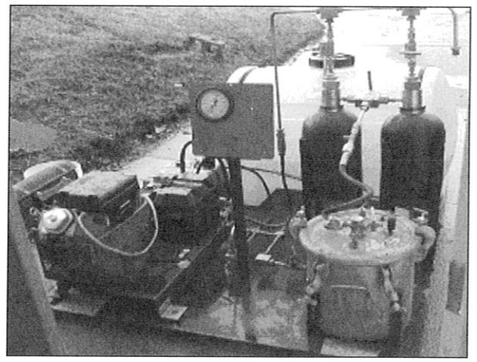


Figure 3. 35 MPa abrasive slurry system assembled to fit in the bed of a pickup truck.

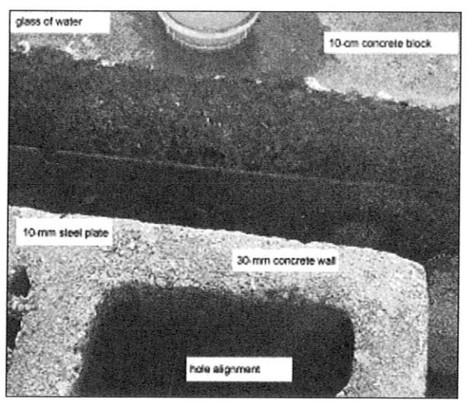


Figure 4. Hole drilled through concrete and steel, note the glass of water.

(continued on page 10)

Gardner Denver Rental Fleet

Gardner Denver Water Jetting offers a range of rental equipment available at a competitive price for contractors whose requirements for short-term equipment use are as important as long-term capital investments. For shellside machine, tube lancer, and multi-gun operations, Gardner Denver has 500 HP multi-speed waterblasters (skid and trailer mounted versions) with flows up to 155 GPM and pressures to 25,000 PSI.

Gardner Denver's Turnaround Trailers are available for large, long-term contracts that require on-site availability of a wide range of accessories and spare parts. Trailers are fully equipped with a workbench and vise, 15K and 20K hand and foot guns, safety shrouds, hoses, flex lances and fittings.

Gardner Denver's Articulated Arm Shellside Machine is a highly productive unit designed to help complete jobs in a safe and efficient manner.

Other waterjetting tools available include Gardner Denver's Single TLE for flex lancing jobs where you need to keep the operator's hands away from the high pressure stream, and yet have no restriction as to lance length or operating pressure, and the Hurricane 3D Nozzle for vessel jobs requiring high impact, high flow, cleaning.

For more information, visit www.waterjetting.com or call (800) 231-3628, ext. 520.

The ***Jet News*** is published by the WaterJet Technology Association (WJTA) and is a benefit of membership in the Association.

FLOW Introducing The Dynamic Contour Follower (DCF) At Westec 2005

Flow International Corporation, developer and manufacturer of ultrahigh-pressure (UHP) waterjet technology equipment used for cutting, cleaning (surface preparation) and food safety applications, will introduce its latest technology at WESTEC 2005, April 4 - 7, 2005, at the Los Angeles Convention Center.

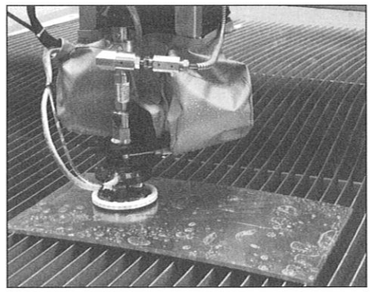
Flow will introduce its newest waterjet technology advancement, the Dynamic Contour Follower (DCF), as well as showcase the latest bike from Orange County Chopper's, stars of the *Discovery Channel's American Choppers* series at its booth number 3350.

The DFC provides greater protection for a variety of cutting needs. The DCF is a key component of an abrasive waterjet system in helping customers achieve superior cut quality and part accuracy by maintaining perfect standoff height. Whether the waterjet is cutting at 90-degrees or dynamically with a tilted angle, the DCF allows for automatic set and track of the stand-off distance between the mixing tube tip and the material being cut. If the DCF senses material, the Z-axis vertical position rises to avoid crashing. The DCF is designed to work in conjunction with the PASER ECL Plus cutting head system and Dynamic Waterjet cutting heads.

The DCF is ideal for job shops, metal service centers, and aerospace companies needing to cut precise parts with cut quality that is independent of height variation, or applications that require extra protection when cutting material that is warped, stacked, stressed (such as tool steel), or slightly curved.

Stop by Flow's booth and look at the latest creation from Orange County Choppers' Mikey and Vinnie, appropriately named the "Mikey/ Vinnie Bike." Many of the parts on this chopper were cut using Flow's waterjet cutting machine, which has become an integral part of OCC's operations, giving them a fast, easy way to profitably fabricate parts for OCC's signature bikes.

In addition to showcasing its state-of-the-art Dynamic Contour Follower technology, Flow will present a technology session, "The Latest in Waterjet Technology," which will feature an overview of waterjet technology, case studies of successful



waterjet applications, and will conclude with a live demonstration at Flow's booth. This session is being held Thursday, April 7 from 8 a.m. – 11 a.m.

For more information, visit www.flowcorp.com.

WJTA 2005 American Waterjet Conference

Hotel Information

Marriott Houston Westchase Hotel

2900 Briarpark Drive, Houston, Texas 77042

Room Rate: $105 single/$115 double occupancy.

Call toll free 1-800-228-9290 or
call the Marriott direct at 1-713-978-7400 for reservations.

Be sure to identify yourself as a participant in the WJTA Conference.

Waterjet Guided Laser

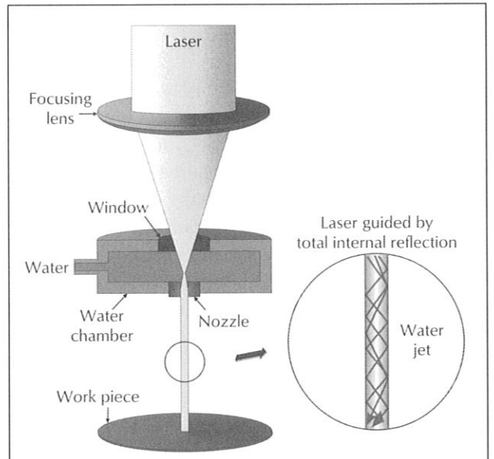
Synova S.A. has invented and patented a unique, new, laser process: the waterjet guided laser, named by its inventors Laser-Microjet® or LMJ. The laser beam is guided loss-free inside a hair-thin low-pressure waterjet, by total reflection at the air-water interface, allowing an unsurpassed cutting quality, far superior to traditional lasers, while avoiding heat damage, deposition and material changes.

Synova provides fully automatic laser cutting, dicing and edge grinding systems for the semiconductor, electronic, medical, energy, and automotive industries.

Photographs 01, 02, and 03 below illustrate the waterjet guided laser process. The remaining seven photographs illustrate waterjet guided laser applications.

The Laser Dicing System (LDS) is a laser machining system applying the waterjet guided laser technology, perfectly adapted to dicing wafers. Additionally, the LDS can be used for edge grinding,

(continued on page 13)



©Synova SA. Principle of the waterjet guided laser.

A Method For Suppression Of Building Fires, from page 8

4. DEVELOPMENT OF A TOOL WITH WIDESPREAD USE POTENTIAL

Fire services will be the most likely users who will be called to use this tool. The majority of their operations deal with the small-scale disasters that occur in small communities where individual buildings and factories catch fire. The tool developed and marketed by the CCS Cobra Company (Ref. 13) (see article on page 11) has shown that it is possible to drill through building walls and roofs to gain immediate access to the heart of a fire without going through the normal doors and windows.

This capability has considerable importance, since in conventional fire fighting the most effective water distribution to cool and quench the fire is a very fine mist of water (droplet size above 100 μm) that penetrates to the burning zone (Ref. 11), but then the water vaporizes creating a blanket of steam, and not remaining to create large quantities of water damage. As discussed earlier, however, the use of water mists, while known, is not widely practiced. This is because the mist dissipates under normal delivery conditions quite close to the nozzle. Thus, for a fireman to use this tool the nozzle must be brought close to the fire, and if this requires that the fireman enter the building, then it creates a greater risk of injury. By drilling a hole through the side of the building the mist can be injected closer to the fire and with a reduced risk to the fireman. In the conventional design of the Cobra head, the jet creates a small hole through the side of the building and the nozzle and lance remain outside the building.

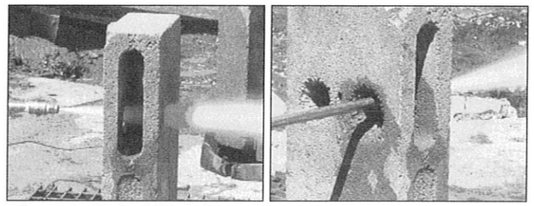


Figure 5. Hole drilled through concrete. Also pictured on the cover.

Experiments at UMR have shown that a small fire can be extinguished extremely rapidly with this method. Small fires were set within a steel barrel. The abrasive jet cut through 15 cm concrete block and the wall of the barrel (Figure 5) before reaching the fire – which went out as the jet penetrated the barrel wall (Figure 6).

Although this is a very effective way of using the technology, it suffers from a slight disadvantage when the nozzle is not carried into the fire. Because the hole is drilled at 35 MPa, the jet that cuts through into the burning room is moving at a speed of over 200 m/sec. This tends to draw air in with the stream so that any fire not directly in front of the jet, while knocked down, will continue to burn under the air drawn in by the jet velocity. To effectively extinguish the fire, therefore, the jet that cuts through the wall must be capable of being moved into the room, and maneuvered around it to reach the pockets of burning material not accessible from the hole in the wall.

The small size of the pump and delivery system required for fire fighting, with the benefits that it brings to the operation in terms of speed of fire fighting (the finer mist is generally a much faster cooling mechanism that conventional fire hose spray) has two ways in which it can be used. The first is similar to that supplied by CCS Cobra in which the system is mounted in a small mobile vehicle. This can bring a fire fighting capability into regions where access for larger fire fighting vehicles is difficult. For example in fighting a forest fire a Fire Chief may be reluctant to send a large engine down a narrow country road to fight a house fire, if there is the likelihood that the engine would have difficulty withdrawing if the fire spread. A smaller, and more mobile unit may well not have that problem. Similarly in an urban environment, small vehicles can more easily penetrate into the heart of a disaster than larger ones, and if the same fire can be extinguished, or brought under control with considerably less water,

(continued on page 15)

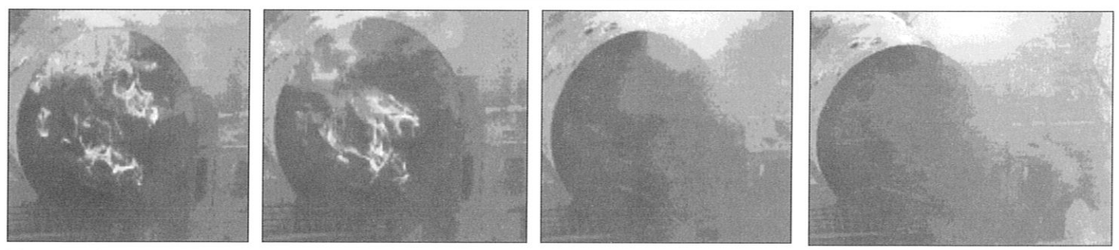


Figure 6. Sequence of frames taken from video of jet penetration into a barrel fire. (The frames are from a sequence so that there is one second between the first and last frames. The jet drill has gone through a concrete construction block and the wall of the barrel.)

A Method For Suppression Of Building Fires, from page 15

assembled from components, which are more readily available and reliable. The uses to which they can be put, particularly in unconventional applications are only just beginning to be explored, yet they hold the promise of solving some otherwise intractable problems.

6. ACKNOWLEDGEMENTS

Several UMR students contributed to the development of the equipment used in this work, over and above the graduate students included as authors, that help and the help of the technical and administrative staff in the Rock Mechanics and Explosive Research Center at UMR is gratefully acknowledged.

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11. See http://www.fogtec.com

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13. See http://www.ccs-cobra.com/

Christian Waters Joins Barton Mines Company

Christian Waters

Barton Mines Company, L.L.C. is pleased to announce the appointment of Christian Waters as Regional Sales Manager for the Northeastern United States and Eastern Canada.

Since joining the company in 1997, Mr. Waters has held several positions within the organization. For the past five years, he has successfully managed sales for Barton's Waterjet Products Division, in the Southern United States and portions of Mexico. Recently, his responsibilities were expanded, to include the company's line of Garnet Blasting Abrasives.

"I am very excited about this opportunity," said Mr. Waters. "I look forward to representing Barton Mines, and to serving the many fine companies that operate in this new territory."

Barton produces garnet abrasive products for many diverse applications such as waterjet cutting, surface preparation, coatings removal, bonded and coated abrasives, and specialty lapping and grinding media. The company owns and operates mining and milling operations in the Adirondack Mountains of upstate New York and on the coast of Western Australia. More about the company can be found on its Web site: www.barton.com.

Aqua Pure® Removes Dissolved Metals From Wastewater

Carolina Equipment & Supply Co., Inc. (CESCO), has introduced the Aqua Pure inhibitor, an additive for wastewater to convert heavy metals to non-leachable waste.

Aqua Pure offers a wide range of alternatives for removing metals from a variety of water streams (wastewater, contaminated ground water, and process water), including:

- Stabilization of soil containing heavy metals (arsenic, barium, cadmium, lead, selenium, silver).
- In-line treatment of waste from manufacturing or tank waste.
- Stabilization of metals in mixed radioactive hazardous waste.
- Treatment of waste and sludge containing metals.
- Insitu treatment of shallow soil containing metals.
- Stabilization of metals in dredge spoils and mining waste.
- Treatment of wastewater and ground water containing metals.
- Aids in removal of soluble salts.

A large southeastern contractor selected Aqua Pure to add to the water in his CESCO water blaster. The Aqua Pure was metered into the inlet water of the 40K water blaster. The Aqua Pure uses the fundamental treatment process involving bonding of metals with sulfides to form insoluble metal sulfides.

Certificate of analysis of the paint chips removed before the job was started: Contained 147mg/l lead using SW8463010/601013 method, and non-detectable using the SW8463010/601013 method after the coating was removed.

Aqua Pure is provided in three forms (liquid, powder, and granular solid), allowing a variety of treatment alternatives. In treatment of contaminated waters, metals drop out of solution as a non-leachable precipitant, whereas in soils, Aqua Pure reduces the metals to a non-leachable metal sulfide. These reactions typically require relatively small quantities of treatment chemicals due to strong reaction efficiency, thereby substantially reducing sludge generation and waste bulking. In addition, the metals are tightly bound in the sludge and are less susceptible to leaching, particularly under acidic conditions.

Remediation of contaminated soils, sludges, industrial waste and mixed radioactive wastes is achieved by blending Aqua Pure liquid or powder with the contaminated media. Treatment of liquid wastes is accomplished by forcing the water through the granular media, which provides solid surfaces for metals interaction. Leachates from a contaminated site can be treated by use of a permeable barrier produced by trenching around the site and filling it with Aqua Pure granules. As water passes through the barrier, the metals are bound up into harmless metal sulfides.

For more information, contact: Carolina Equipment & Supply Co., Inc., phone: 843-760-3000, fax: 873-760-3500 or visit www.Aquamiser.com.

CSS-Cobra – A Cutting Extinguisher For Efficient Firefighting And Rescue

CCS-COBRA is an efficient tool for rescue and fire fighting. This abrasive waterjet technique for cutting produces a spray and mist, which has a cooling and extinguishing capability. This method has a broad range of applications in rescue work and in fire fighting.

CCS-COBRA is a hydraulic operated system and may be remotely controlled. The very first applications were mounted on ladder platforms and aerials to tackle roof fires and fires in high rise buildings. Today you may find the Cobra system on any type of fire apparatus – pumpers, rescue vehicles, rapid intervention vehicles, and on board marine rescue vessels. The Cutting Extinguisher consists of the following main parts:

- A high pressure water pump – 300 bar/50 liters per minute
- Slurry pressure cylinder of 20 liters
- Panel for flow control
- Hydraulically operated lance for cutting and extinguishing

Ladder platform, ©Cold Cut System.

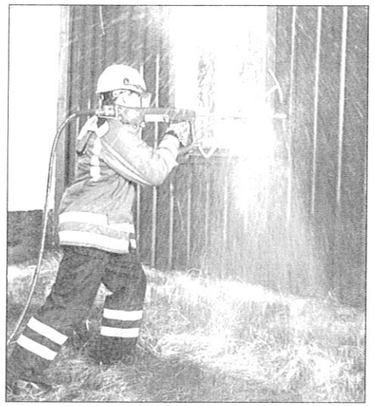
CCS-COBRA is a patented system specially developed as a rescue and firefighting tool. CCS AB, Sweden, has employed and developed cutting methods and the fire fighting techniques since 1988. (US patent #340,060 B1 – 2002)

Firefighting with the CCS COBRA

CCS-COBRA may cut any size of hole in a roof, wall, or door of a house

(continued on page 12)

in order to ventilate/evacuate heat and smoke. At the same time as cutting takes place the water-mist transforms into steam. This process consumes a lot of energy taken from the heat of the fire. The environment around the fire is cooled down as well as oxygen is 'consumed' – the steam inerts the fire room and dampens the fire.



Cutting, ©Cold Cut System.

CCS-COBRA has a very efficient extinguishing capability with the use of a limited amount of water, whereby the secondary damage from water and destroyed structures can be minimized. The mist of water, created by the high pressure and by the patented nozzle, transforms into steam when it reaches the fire. This transformation from mist to steam cools the often-dangerous gases and at the same time extinguishes the fire.

Backdraft and flashover are controlled and the gas temperature is greatly reduced creating a far safer working environment for the firefighters. It can also be used to control backdraft allowing the firefighters to choose their method and timing of entry. Key advantages are rapid deployment, increasing the firefighters' safety, and efficiency. The COBRA has proven very useful in attic, floor and cellar fires and school buildings. The Cobra has been effectively used in both train and lorry fires as well as in some difficult and extensive silo fires.

Working in hazardous areas

CCS-COBRA and its patented cold cutting method facilitates cutting in hazardous areas. Cutting takes place with no appreciable temperature rise and is the safest known cutting method for use in a flammable environment. It can be used i.e. for cutting in and around petroleum cisterns, gas pipes, airplanes, tanker vessels, etc.

Rapid Intervention Vehicles - RIV

The COBRA-system can easily be built into many types of rescue vehicles, such as the Chrysler Mercedes Sprint shown below.

©Cold Cut System. Mercedes Sprint.

This apparatus is powered by a strong turbo diesel (159 hp) and is equipped as a "rapid intervention vehicle" for any type of fires and traffic accidents. The concept is developed by the Swedish Rescue Services Agency in close co-operation with two very progressive and safety oriented municipalities, i.e., Öckerö on the west coast of Sweden and Sörmlandskusten on the east coast. Today more than 40 Swedish fire departments operate with this system.

Cobra units mounted on E-One aerials are being used in several fire departments in the US, and COBRA units have been sold in 17 different countries. The Rotterdam Airport has opted for the Cobra system for rescue and firefighting in airplanes. The Swedish Navy has just installed the system on board their new frigate, the 'Visby Class' stealth vessel.

For more information, visit www.ccs-cobra.com, or contact: Cold Cut System AB, PO Box 10181, SE-434 22, Kungsbacka, Sweden, phone: +46 300 56 80 70, fax: +46 300 56 80 79.

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Authorized Distributor And Assembly Center In Canada

SPIR STAR, manufacturers of high pressure hose to 50,000 psi, announces that Associated Industrial Rubber in St. John's Newfoundland, Canada, is now an authorized distributor and assembly center for the provinces of New Brunswick, Prince Edward, Nova Scotia, Newfoundland and Labrador. Associated Industrial Rubber will now be able to better service local customers by having a complete stock of hose and fittings in addition to being able to repair high pressure hose assemblies.

For further information, please contact Allan Barnes at 709-747-1112.

NLB Introduces On-Line Waterjetting Forum

A new on-line forum at the NLB Corp. website gives visitors a 24/7 source of answers to virtually any high-pressure waterjet question. Accessible from a button on NLB's home page, the easy-to-use forum lets visitors post questions about applications or equipment and get feedback from NLB or other waterjet users. Registered users can choose to have their answers posted privately.

Visitors can use an index to focus their search. For example, someone researching "Water Jetting Equipment" can choose Diesel and Electric Units, Accessories, Hoses and Nozzles, Maintenance, or Miscellaneous. "Waterjetting Applications" offers six sections – Surface Preparation; Tank Cleaning; Pipe and Tube Cleaning; Hydrodemolition; Deburring, Deflashing and cutting; and Miscellaneous.

User options include posting a question for future reference, participating in an online discussion and joining a user group dedicated to a specific aspect of waterjetting.

"We invite everyone in the industry to use these forums" says Jim Van Dam, NLB marketing manager. "There's no sales pitch; we just want waterjetters to get the information they need to do their jobs productively and safely."

NLB, a leader in high-pressure and ultra-high pressure waterjet technology, manufactures a full line of quality water jetting systems and accessories for many uses, including surface preparation, industrial cleaning, tank cleaning, descaling, paint and sludge removal, concrete demolition, concrete and pipe cutting, and more.

Visit www.nlbcorp.com.

Candidates Sought For 2005 WJTA Awards

You are invited to submit candidates for the special awards that are presented biennially by the WaterJet Technology Association to honor a company, organization or individual who has made a significant contribution to the industry through accomplishments that directly enhance waterjet technology and the industry as a whole. A list of previous WJTA award recipients appears at the right of this sheet.

Candidate nominations must be received no later than July 2, 2005. The award recipient(s), to be selected by the Awards Committee of the WaterJet Technology Association, will be honored at a presentation ceremony on Monday, August 22, 2005, in conjunction with the 2005 WJTA American Waterjet Conference in Houston, Texas.

An official form for candidate nominations appears on page 26. Complete one form for each nomination submitted. Please make additional copies of the form as needed. Completed nomination forms may be faxed to (314)241-1449 or mailed to the WaterJet Technology Association, 906 Olive Street, Suite 1200, St. Louis, MO 63101-1434, USA.

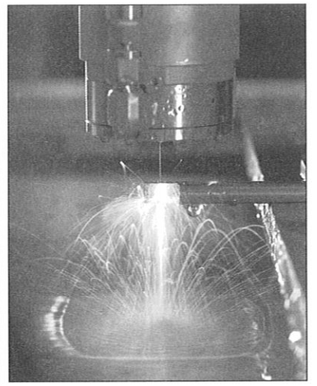
Previous Award Recipients

1981	Pioneer Award	Jacob Frank (deceased)
1983	Pioneer Award	H.D Stephens, Bedford, England
1985	Pioneer Award	William Cooley, Chevy Chase, MD
1987	Pioneer Award	Norman Franz, Ph.D., Vancouver, BC, Canada
1989	Pioneer Award	Richard Paseman, Houston, TX
1991	Pioneer Award	John H. Olsen, Ph.D., Kent, WA
1993	Pioneer Award	Fun-Den Wang, Ph.D., Golden, CO
	Safety Award	David Summers, Ph.D., Rolla, MO NLB Corporation, Wixom, MI
	Service Award	George A. Savanick, Ph.D., Apple Valley, MN Mohan Vijay, Ph.D., Gloucester, ON, Canada
	Technology Award	Mohamed Hashish, Ph.D., Kent, WA Autoclave Engineers, Erie, PA Hammelmann Corporation, Dayton, OH
1995	Pioneer Award	George Rankin, Houston, TX
	Safety Award	Autoclave Engineers, Erie, PA
	Service Award	Thomas J. Labus, Lake Geneva, WI
	Technology Award	Thomas J. Kim, Ph.D., Kingston, RI
1997	Pioneer Award	David A. Summers, Ph.D., Rolla, MO
	Service Award	Andrew F. Conn, Ph.D., Baltimore, MD
	Technology Award	Prof. Dr-Ing. Hartmut Louis, Hannover, Germany
1999	Pioneer Award	Mohamed Hashish, Ph.D., Kent, WA
	Safety Award	Bruce Wood (deceased)
	Service Award	John Wolgamott, Durango, CO
	Technology Award	Ryoji Kobayashi, Ph.D., Ishinomake, Japan
2001	Pioneer Award	George A. Savanick, Ph.D., Apple Valley, MN
	Technology Award	Richard Ward, Kent, OH
2005	Pioneer Award	Pat DeBusk, LaPorte, TX
	Service Award	Mohamed Hashish, Ph.D., Kent, WA
	Technology Award	Ernest S. Geskin, Ph.D., Newark, NJ

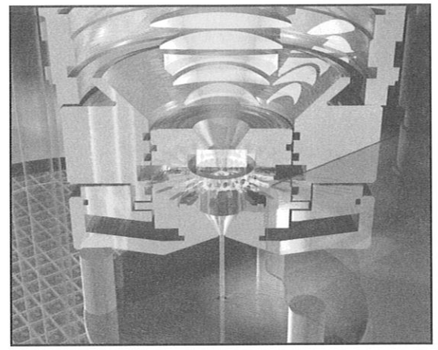
Waterjet Guided Laser, from page 9

hole drilling, slotting, grooving, inking, isolating, and marking. Materials cut are Silicon, Gallium Arsenide, Germanium, Indium Phosphate, and other compound semiconductor materials. Wafers are fixed on laser-dicing tape (Laser-Tape®) then placed on a vacuum chuck. The machine can process wafers from 1 inch to 8 inches in diameter. A 12-inch (300mm) laser dicing system is also available (LDS 300).

Synova SA, founded in 1997, manufactures cutting-edge laser systems based on the waterjet guided laser technique, which was invented by the founder in the early nineties at the Federal Institute of Technology in Lausanne, Switzerland. The technology was subsequently patented by Synova's owners.



©Synova SA. Tube processing with the waterjet guided laser.



©Synova SA. Coupling water and laser, basic principle.

For more information, visit www.synova.ch, or contact Synova SA, Chemin de la Dent d'Oche, 1024 Ecublens, Switzerland, phone: +41 21 694 35 00, fax: +41 21 694 35 01.

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(pictures continued on page 22)

Caution Urged Concerning 800 Number For Waterjet Injuries

WJTA Safety Card Is Best Alternative

An article in the December issue of *Cleaner Times* urges anyone who works with high pressure water to carry a certain toll-free telephone number and to provide that number to medical staff treating an injection injury.

According to *Cleaner Times*, a call to the number is automatically routed to one of 62 U.S. poison control centers, where physicians are qualified to advise physicians on injection injury treatment.

Sounds good, so we tried it. We were indeed routed to the nearest poison control center (in St. Louis), where we were informed that the St. Louis Poison Control Center, although able to provide advice on the toxicity of the fluid being injected, was not prepared to provide physician consultation on treating a traumatic injury as is usually encountered in a waterjetting accident. And since the fluid injected is water, they further advised us that there is no toxicity to the injected fluid.

Just to be sure, we contacted the American Association of Poison Control Centers (AAPCC), which operates the 800 number published by *Cleaner Times*. We spoke to RoseAnn Soloway, RN, associate director of the AAPCC, who told us that personnel at their poison control centers are not experts in treating the trauma associated with waterjet injuries. Ms. Soloway also confirmed that their poison control centers' expertise is limited to the toxicity of the fluid being injected (for example, if paint were injected instead of water, a poison control center can advise a physician about the toxic properties of chemicals in the paint, such as lead). And finally, Ms. Soloway said that to her knowledge the AAPCC had not granted permission to *Cleaner Times*, or anyone else, to publish their 800 telephone number as a reference for treating waterjet injuries.

The important thing to remember is that beyond treating the trauma (cuts and tissue damage) from a waterjet injury, the greatest danger comes from subsequent infection caused by bacteria and viruses contacted in the non-sterile water used in waterjetting operations. These infections, if left untreated, can quickly cause gangrene, resulting in the potential loss of life or limb.

WJTA Safety Card Addresses Issue Of Infections From Waterjet Injuries

The WJTA Safety Card, prepared by a physician specializing in industrial accidents deals directly with the need to prevent potential infections from waterjet injuries. The WJTA Safety Card contains information to be presented to emergency room and other attending physicians about the nature of a waterjet injury and the need to take immediate action to prevent, or at least limit, infections from the resulting injuries. This is especially important information for "pin-point" injection injuries where the visible damage to the skin at the site of the waterjet injection injury may be virtually invisible to the naked eye.

The WJTA Safety Card is wallet-sized, laminated to protect it from wear and water exposure, and inexpensive.

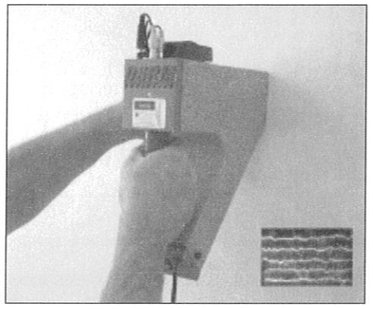
So, here's the bottom line:

The WJTA recommends that all personnel working with waterjets carry the WJTA Safety Card with them when operating waterjet safety equipment. In the event of a waterjet injury, present the WJTA Safety Card to the attending physician, whether or not the surface wound appears serious. Remember that a seemingly harmless waterjet injection wound at the skin surface can still be a very serious injury if not treated properly to prevent infection.

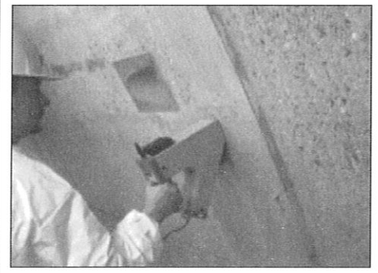
To order the WJTA Safety Card, see page 27.

A Digital Surface-Measuring Device

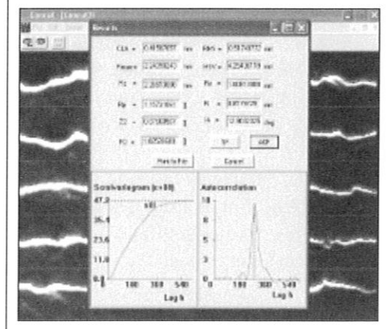
The roughness of the concrete substrate is crucial to the effectiveness of many remediation processes. It affects the adherence and thickness requirements of paints, epoxies and other coatings. Fiber reinforced polymers function best when the substrate is at an optimum roughness. Until now there has been no effective way to characterize roughness in the field.



A new concrete surface roughness-measuring device, developed at the University of Missouri-Rolla, uses the principal of laser striping to generate five separate surface profiles. These are imaged using an embedded camera and transmitted to a laptop computer using wireless video transmission.



Advanced image analysis techniques are used to isolate the five profiles, and measure various surface roughness characteristics such as Rp, RMS, CLV, FD and others. Measurements are recorded on the computer and can be output to any spreadsheet or similar application.



For more information on how this device might help you, contact: norbert@magana-instruments.com, phone: (573) 341-6714, fax: (573) 364-9262.

A Method For Suppression Of Building Fires, from page 10

then it can be fought more rapidly and effectively.

Fire rescue services are, however, not only called upon to fight fires. In many locales they are the only professionals trained to rescue occupants when motor vehicles crash. In such circumstances rescue can be delayed while parts of the vehicle are severed and removed before access can be gained to the injured. The use of an ASJ system can provide a tool that can cut through the different materials (mainly metal) that trap the victim, and with such a localized cold cutting action that it is possible to achieve the cut without risk to the occupant even in the presence of gas vapors. The ASJ system has been used for cutting on the platforms in the North Sea and abrasive waterjets were used almost exclusively to cut through and remove the destroyed wellheads in Kuwait, after the Gulf War, prior to repair.

5. CONCLUSION

Disasters cannot be predicted and may occur at any point and time. To meet the response that is required, effective rescue tools must be readily available that can provide access to the site and increase the chance for finding and recovering trapped individuals. However, such equipment if large, can be too expensive to provide in sufficient numbers and locations that it can be readily available when needed.

Alternately, if small but effective tools that have other uses in more normal life are available, and with personnel that are trained in their use and use them regularly, then a more rapid and effective response to the disaster can be provided. The development of an abrasive slurry waterjet drill is given as an example of the development of such a tool. Its integration into conventional small-scale rescue can be the basis for providing a tool that can be easily modified to assist in the efforts required in a more major disaster.

Experiments at UMR have shown that the use of a small abrasive slurry waterjet at a pressure of 35 MPa is capable of drilling through both concrete layers over 30 cm thick, and can also cut through more than 25 mm of steel. As the jet drilled through a concrete block it did not disturb a full glass of water placed on the top of that block.

Abrasive slurry jets are a relatively new development in cutting, yet their cost is not as great as that of conventional systems and they can be

(continued on page 19)