WJTA WaterJet Technology Association

Jet News

Published by the WJTA-IMCA for the benefit of its members.

June 2013

IMCA Industrial & Municipal Cleaning Association

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Emerging Technology, New Applications Featured at the 2013 WJTA-IMCA Conference and Expo

The pictures below were excerpted from the abstract, "Application of Abrasive-Waterjet for 3D Machining," by H.-T. Liu, Ph.D. *See page 2 for more details and other selected abstracts of papers to be presented in Houston, September 10-11, 2013.*

Surgical clamp cut with multiple steps at different orientations.

Carbon fiber knee brace - thermally formed from AWJ-cut 2D components.

a. Space Needle models b. Decorative tube

Rotary Axis machined 3D parts.

On the inside

2013 WJTA-IMCA Conference and Expo

September 9-11, 2013

George R. Brown Convention Center • Houston, Texas

See pages 18-23 for details

a. Blisk machined with A-Jet

b. Titanium honeycomb with beveled edges

A-Jet machined 3D parts

Photographs courtesy of OMAX Corporation

Emerging Technology, New Applications Featured at WJTA-IMCA Conference and Expo, from page 1

Below are just a few of the abstracts submitted for presentation at this year's Conference and Expo. A complete list of abstracts appears on page 22. Register to hear all the presentations. You can register online at www.wjta.org or use the registration form on page 23.

Application of Abrasive-Waterjet for 3D Machining[§]

H.-T. Liu
OMAX Corporation
Kent, Washington

ABSTRACT

Abrasive-waterjets (AWJs) have several technological and manufacturing merits that are superior to most existing machine tools. Recent advancements in automation, precision, and control have elevated AWJs as a mainstream machining tools competing on equal footings with CNC tools, laser, EDM, and others. One of the characteristics of AWJs is that the spent abrasives, if not "tamed," possess considerable residual cutting power to induce damage to other parts of the workpiece. In other words, AWJs are not inherently suitable for 3D machining, particularly for parts with complex 3D features. Although there are multi-axis AWJ systems available commercially for 3D machining, their 3D capability is limited due to difficulty in designing and maneuvering a "perfect" catcher to block the spent abrasives completely from damaging the workpiece. Because the simplest and most effective means to dissipate the residual energy of spent abrasives is to let the spent AWJ shoot into a column of still water, most AWJ systems are built on top of a water tank that also serves to support the traversing mechanism. Such AWJ systems are generally designed for 2D machining.

There are several methods to machine 3D parts using a 2D AWJ system. One of the methods is to cut the part multiple times with the workpiece set to different orientations. Figure 1 illustrates a surgical clamp that was cut several steps from a 9 mm OD stainless steel rod. The second method is to cut 2D parts first and then form the 3D final shapes by secondary processes (e.g., folding), as illustrated in Figure 2. In some cases, 3D parts could be unfolded into a 2D components, cut with AWJs, and then be reassembled via folding of the components. The third method is to enable 3D machining by incorporating special accessories together with control firmware and software into a 2D AWJ system. At OMAX, two accessories (the Rotary Axis and A-Jet or articulate jet) were specifically designed to facilitate 3D machining.[1] The Rotary Axis oriented horizontally is a robust, waterproof rotary head that allows the waterjet to cut XYZ paths to create axisymmetric and/or 3D parts. The A-Jet is a complete software-controlled, multiaxis accessory permitting the flexibility to cut severe angles to a maximum of 60° off the vertical. Figures 3 and 4 are examples machined with the Rotary Axis and A-Jet, respectively. The combination of the Rotary Axis and A-Jet, with their axes perpendicular to each other, facilitates complex 3D features to be machined (sample parts will be presented in the full paper). The fourth method is to apply layer machining technique to cut components of 3D parts which were assembled by orderly stacking the individual layers. The layers are indexed and often machined with 3D features using the Rotary Axis and/or A-Jet.

In this paper, the above and other methods of AWJ 3D machining will be discussed in some details through demonstration of a collection of sample parts.

[§]This work is supported by an NSF SBIR Phase II grant #1058278 and an OMAX R&D fund

[1]Olsen, J. H. (2012) "Abrasive waterjets move into 3-D shapes, including pipe intersections," Feature Article, the www.fabricator.com, August (http://www.thefabricator.com/article/waterjetcutting/abrasive-waterjets-move-into 3-d-shapes-including-pipe-intersections)

Figure 1. Surgical clamp cut with multiple steps at different orientations.

Figure 2. Carbon fiber knee brace - thermally formed from AWJ-cut 2D components.

a. Space Needle models b. Decorative tube
Figure 3. Rotary Axis machined 3D parts.

a. Blisk machined with A-Jet

b. Titanium honeycomb with beveled edges

Figure 4. A-Jet machined 3D parts

Photographs from this paper are featured on the front cover of this issue of ***Jet News****. Photographs are courtesy of OMAX Corporation.*

(continued on page 4)

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Emerging Technology, New Applications Featured at WJTA-IMCA Conference and Expo, from pg. 2

Abrasive Water Jet Cutting (AWJC) of Co-Cr-Mo Alloy Investment Castings in the Medical Device Industry

M. Cashman[1], L. Soo[2], D. Shepherd[2], A. Rabani[3], and S. Ramirez[1]
[1]DePuy Ireland, Cork, Ireland
[2]School of Mechanical Engineering, University of Birmingham, UK
[3]School of Mechanical Engineering, University of Nottingham, UK

ABSTRACT

This paper presents the results of research that is being carried out within the EU-funded MedCast Project entitled "Development of Foundry Casting Methods for Cost-Effective Manufacture of Medical Implants" (MedCast). The partnership is led by DePuy Ireland, University of Birmingham and University of Limerick.

Traditionally investment castings have been separated from the casting tree with 2D abrasive wheel cutting. This is a relatively inaccurate process that generally requires further finishing operations. This research investigates the feasibility of replacing abrasive wheel cutting and subsequent operations with 3D abrasive waterjet cutting. ASTM F-75 is a high strength cobalt-chromium-molybdenum alloy commonly used for orthopedic implants. The optimum cutting parameters of this alloy are experimentally derived for thicknesses up to 40 mm. Aspects of investment castings pertaining to AWJC are highlighted, such as cast tree configurations and gate shape. The significance of abrasive grit embedment is also discussed. The effect of investment casting refractory shells on water treatment systems is examined. In addition to this work, a comparative analysis of cost and performance with alternative cutting methods is performed.

Acknowledgements: The authors would like to acknowledge the EU for the funding support under the Marie Curie IAPP scheme, GA# 251269. The authors would also like to acknowledge the EU for the funding support for FP7 ConforM-Jet.

Abrasive Waterjet Texturing as a Method to Enhance the Embedment of Metallic Inserts in Composite Materials

A. Alberdi, T. Artaza, J. Olite, J.L. Latapia, and A. Suárez
Tecnalia Research & Innovation
Donostia-San Sebastián, Spain

ABSTRACT

This research work arises from the need of embedding metals in composite materials to improve mechanical performance of structures by improving the inertia, while strengthening and decreasing the total weight of the structure. The resin union itself or with adhesives may not be enough to achieve the high requirements demanded by industries like the boat industry, civil engineering, aerospace industry or wind sector, where high loads are commonly employed.

This work proposes an innovative bonding method to assure a rigid and secure embedment of the metallic insert, thus, avoiding problems related to the decoupling of the metal-composite interface. This method consists on generating a "mechanical restraint" by texturing the metallic surface by abrasive waterjet technology, which has demonstrated to be a flexible method to generate different surface textures in metallic surfaces.

(continued on page 28)

Job Opportunities

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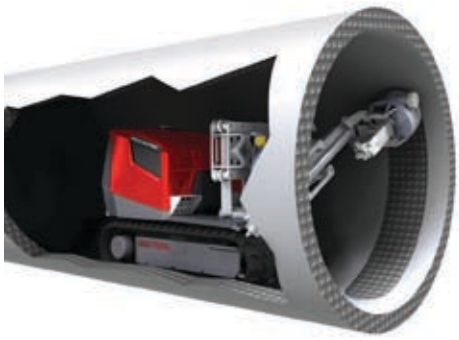
World's Smallest Hydrodemolition Robot Launched by Aquajet

Aquajet Systems AB has launched the world's smallest hydrodemolition robot, the Aqua Cutter 410, designed for hydrodemolition applications in confined areas such as concrete sewer pipes in urban locations, small tunnels, and inside buildings with restricted space.

With dimensions of just 2.0 x 0.78 x 0.99 m (LxWxH) the new robot can go through an ordinary door opening and operate inside a concrete pipe, on vertical, horizontal or overhead surfaces. With a weight of just around 1000 kg it can also operate from scaffolding.

Working typically with between 700 to 2500 bar pressure and 60 to 180 l/min, the robot handles most concrete removal tasks on floors, walls and overhead applications.

It will also replace many applications currently performed using manual hand lances – a high pressure gun operating at 2500 bar or more – providing a more safe and accurate operation with the robot.



The 410 robot features a number of 'tools' including a rotor for surface preparation and work inside pipes, a single lance with a 1.5 m front shroud for surface removal and a hydraulically operated articulated arm with a reach up to 4 m.

Aqua Cutter 410 (left) and 710 (right).

The first tool to be released is a tunnel operation kit that can operate in tunnels up to 3 m in diameter. The kit is based on the Aqua Spine system, which makes it extremely flexible since most of the Aqua Spine accessories can also be used. The tunnel kit also features automatic detection of the distance to the tunnel surface, making it easy to operate in uneven tunnel shapes or oval tunnels.

The Power Control Module (PCM) can be disconnected from the tracked crawler. This allows the crawler to be driven into unfriendly environments, for example small tunnels suddenly flooded by heavy rains. In this mode, the PCM is connected to the track crawler by a cord, and the removal process is controlled remotely. This is ideal when, for example, sewer pipes can be suddenly flooded. The work can continue and not be disrupted by the water.

The operator controls and monitors the operation by a remote radio controller so that the machine can be run from a safe distance, ensuring complete control over the robot.

Features of the Aqua Cutter 710 series of robots such as EDS (Equal Distance System), the ISC (Intelligent Sensing Control), and Smart Lance system have been updated and integrated in to the new 410 robot.

The Aqua Cutter 410 robot is equipped with the patented EDS. Regardless of the set lance attack angle, the system controls and maintains the nozzle distance from the concrete surface.

Maintaining an optimum distance, EDS ensures that no power is lost due to the nozzle being too far from the surface which will ensure a 15%-20% increase in removal capacity.

ISC

The patented ISC is an advanced sensing system and features no electronics, such as sensors or cables, exposed to the moisture environs, resulting in more efficient production with fewer stops due to problems with sensors, etc.

The rugged 410 robot offers the same reliability, versatility and easy maintenance and low operating costs as Aqua Cutter 710 robot, and uses many of the same parts.

For more information contact: Stefan Hilmersson, Aquajet Systems AB, by telephone at +46 385 5801 or email at stefan.hilmersson@aquajet.se.

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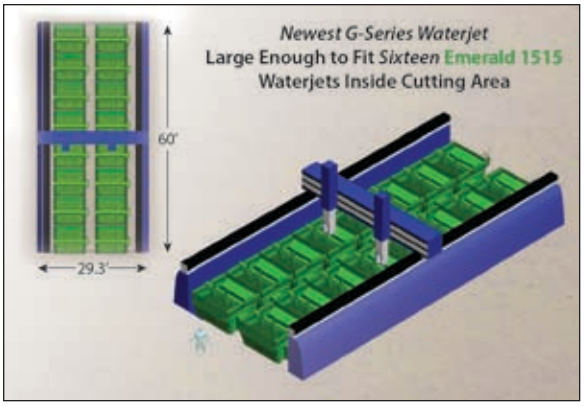
WARDJet Announces Plans for a New G-Series Waterjet to be Built on the East Coast

WARDJet is expanding its waterjet portfolio by beginning production on the newest, largest G-Series waterjet yet, G-4816. Slated for final location in eastern Pennsylvania, the newest G-Series waterjet will be the second installed in the United States. In fact, the new G-Series has potential to be the largest waterjet in North America.



WARDJet's largest waterjet to date, the G-Series waterjet slated for installation in Eastern PA.

WARDJet created and named the G-Series for their use in 'giant' applications. The G-Series waterjet is engineered to cut large objects and materials that other waterjets cannot handle. All G waterjets feature five feet of Z-axis travel, allowing extraordinary range of motion. The G-Series also incorporates Infini Winder technology which enables the operator to rotate the cutting head an infinite number of times without having to stop and unwind cables and abrasive lines. Because of these extraordinary characteristics, the G-Series waterjets have been found to be extremely useful in industries such as aerospace, composites and industrial machine manufacturing. Since G-Series waterjets are often custom-engineered to fit a specific application, WARDJet offers many upgradeable features and options. Customers can still expect the same quality, software and support that come standard with WARDJet products.

The latest G-Series has a high rail gantry design that will make its

(continued on page 24)

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EQUIPMENT

The range of THE PEINEMANN 2LTC cleaning equipment is continiously being expanded.

A single investment will give you multiple cleaning solutions that were previously hard to complete. Solutions have been developed to assist in tight areas such as with air fin coolers, and evaporators. Peinemann even developed flex frame solutions for mounting on bundle flanges as well as vertical set ups (see above photos). Besides being easy to set up it brings a much safer and efficiënt way of cleaning heat exchanger tubes.
Please feel free to visit our website which will show the type of configurations possible in more detail.

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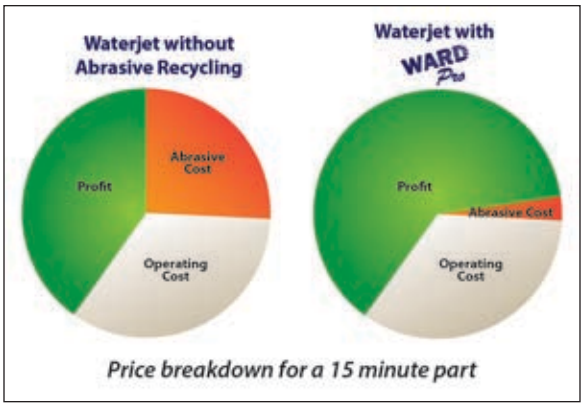
Recycling Proven to Cut Costs

WARDJet, Inc. Tallmadge, OH, has announced a revolutionary, cost-saving improvement to its patented WARD Pro Waterjet Abrasive Recycling System, making recycling more profitable than ever before. WARDJet is continually improving and perfecting a patented process of recycling used waterjet abrasive. As a result of recent design enhancements, abrasive recycling is now possible for all waterjet companies and is more affordable than ever. WARDJet has proven abrasive cost per part can be drastically reduced with this standalone system.

In previous years, waterjet abrasive recycling was found to be most successful for companies using large volumes of abrasive who could recoup their investment in a short period of time. With recent groundbreaking advancements to the WARD Pro system, this money saving process can be used by waterjet companies of all sizes. The latest WARD Pro has a new design that is more efficient, requires less maintenance and extends the life of consumables.



Price breakdown for a 15 minute part

Every waterjet company has sludge abrasive which is collected and then often thrown away. Typically, at least half of this sludge is recoverable as usable abrasive. The WARD Pro takes this sludge from the tank in a controlled manner and after separating only the good, reusable abrasive, dries it. The resulting dry abrasive is mechanically transported into bags or a bulk feed hopper for immediate reuse in just 3 minutes. Recycled abrasive has been proven to cut at the same speed with the same abrasive flow rate

(continued on page 28)

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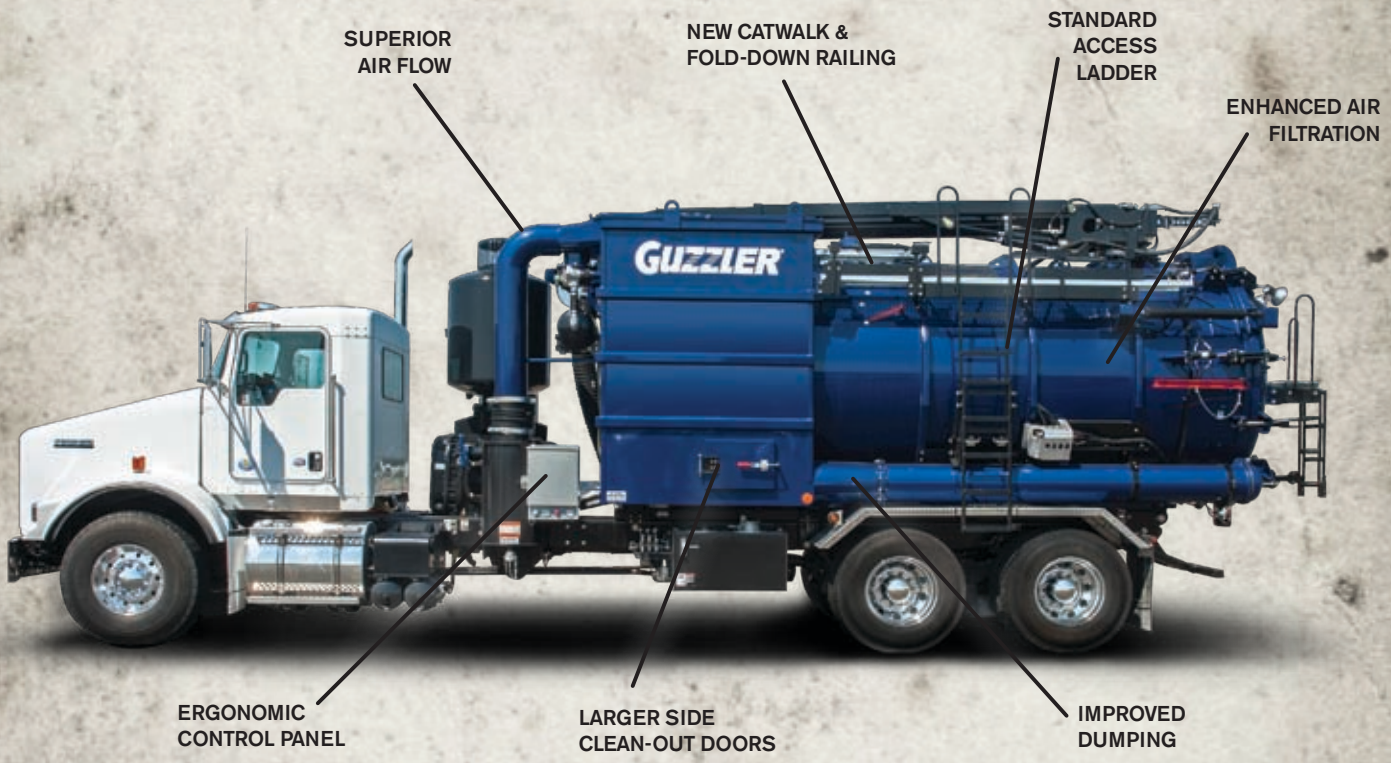

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Z-Series: WARDJet's Flagship Waterjet

Dual 4.6 m wide Z-Series waterjets with three independent Z carriages.

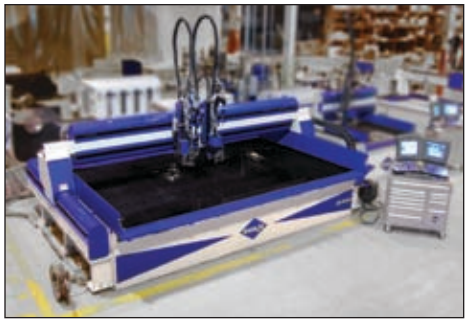
WARDJet's Z-Series waterjets offer a wide range of features that are customizable to fit virtually any application. The Z-Series has been designed with expandability in mind, allowing for the addition of various accessories such as 5-axis heads, touch probes, rotary axis, drills, taps, cameras, cell phone pendant control, and more. Numerous other additions are available to suit customer needs including the option to expand the tank depth, length, and width. The Z-Series gives you the flexibility to handle the largest variety of jobs.

The Z-Series is fully upgradeable, making it the perfect waterjet to grow with your company. Designed with a standard capacity of 12" vertical travel on the Z-axis, owners also have the option to increase vertical travel to 36" or customize Z travel entirely. The heavy-duty cross beam allows for multiple, independent Z carriages. One cutting head is typically mounted on each Z carriage. With the use of a spreader bar, multiple cutting heads could be mounted on each carriage for greater production. The flexibility of design featured in the Z-Series permits owners the ability to create a machine that best meets their needs.

Some previously manufactured Z-Series waterjet features include the Z-2546 with an extended tank and three independently programmable Z-carriages. WARDJet recently shipped a Z-2543 with a three foot Z carriage with Infini Winder 5-axis head for a customer with an aerospace trimming application.

All customized and standard Z-Series waterjets include the outstanding quality and support of WARDJet products. WARDJet's intuitive software and controller provide ease of use for the operator with minimal training necessary. The Z-Series incorporates the proven technology of ball screw drives for accuracy, repeatability and reliability.

For more information, visit www.wardjet.com.



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WardJet Introduces the Emerald Series Waterjet

After nearly twenty years of industry experience creating the best quality waterjets on the market, WARDJet is excited to announce the value-engineered Emerald Series. When compared to other low-cost waterjets, the Emerald stands alone. Made exclusively in America from top to bottom, the Emerald is designed to offer many of the same features as larger, custom waterjets at an affordable price.

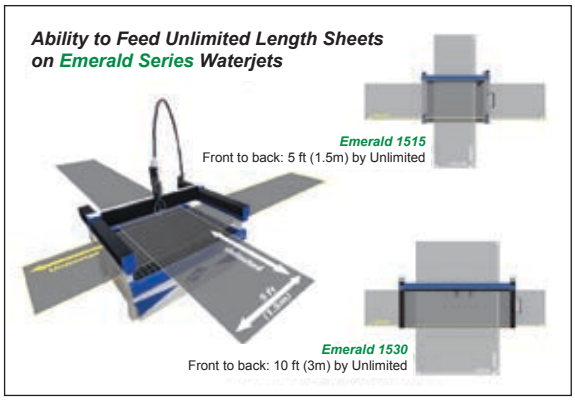
WARDJet Emerald 1515 waterjet.

The Emerald sets itself apart from competitors' systems by featuring greater accessibility - operators are able to load material through the table in both directions as well as work from all four sides. In addition, the Emerald is capable of indexing sheets of unlimited length through the cutting area (with maximum width of 5' for the 1515 model or 10' for the 1530 model). Other features include a dynamic mini-hopper, which allows for up to 9 pre-set abrasive flow rates as well as WARDJet remote diagnostics and control. The Emerald is capable of cutting up to 500 inches per minute with linear tolerance +/- .003" and repeatability of +/- .001".

Although the Emerald Series waterjets are smaller sized and lower priced, the quality that customers come to expect from WARDJet is not compromised. The Emerald utilizes the proven technology of a ballscrew driven system with 25 mm linear rails to provide accuracy equal to our Z-Series waterjets. WARDJet knows that a quality system is only as good as the software controlling the waterjet. For that reason, the controller and software on the Emerald are the same as they are on million dollar WARDJet machines trusted by aerospace companies and hundreds of other WARDJet customers around the world. Free training and remote support come standard to ensure smooth operation.

The Emerald Series waterjets are so easy to install that qualified companies are able to do this themselves. The Emerald's reduced footprint and unitized gantry allows for more manageable relocation than other systems. With minimal set up, an Emerald could be running the same day as it is delivered!

For more information, visit www.wardjet.com or call (330)677-9100.



Emerald Series design allows for cutting of unlimited length sheets.

Jet Edge Names TECHJET 2012 International Distributor of the Year

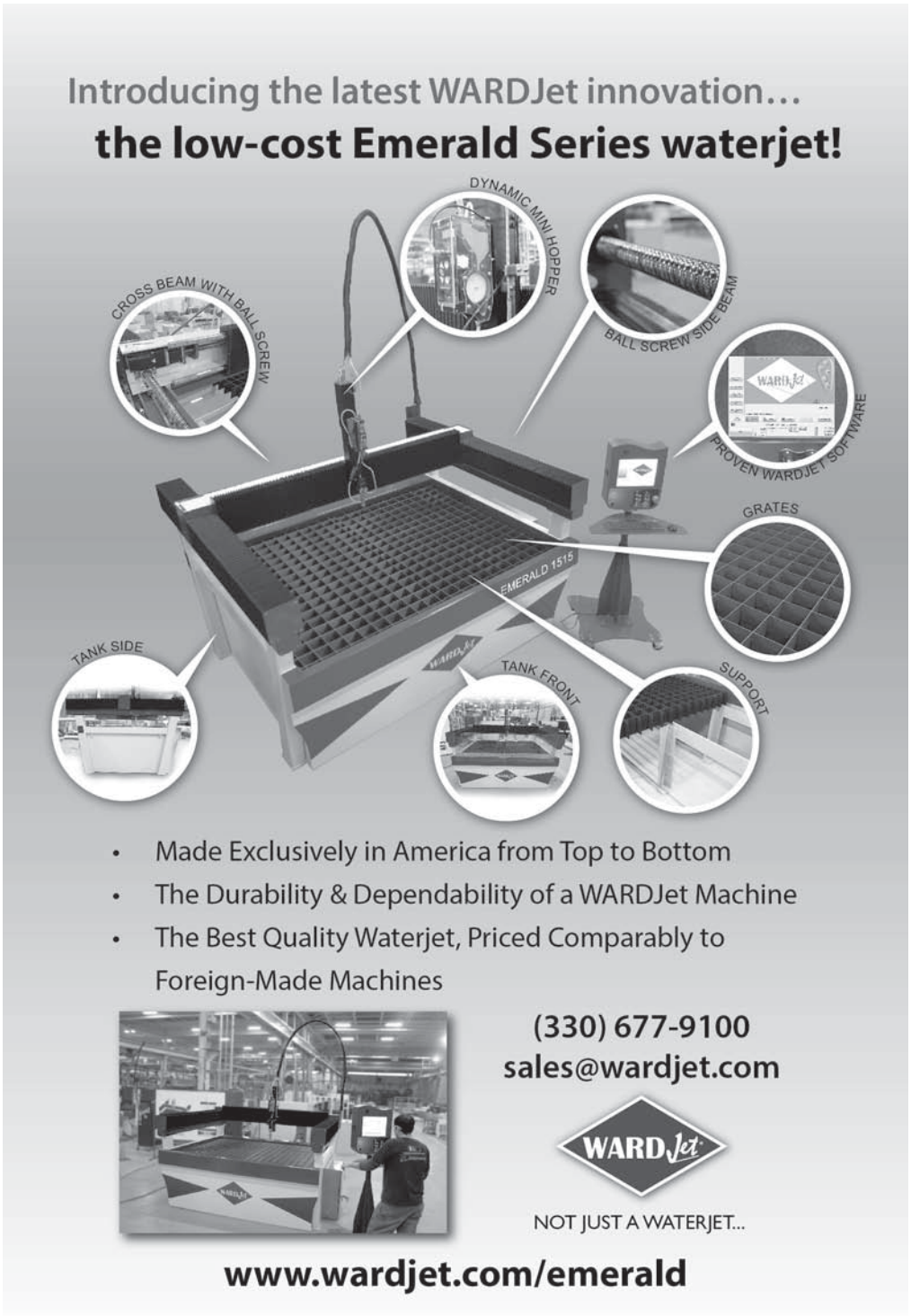
Jet Edge, Inc. has named TECHJET of Malbork, Poland, 2012 International Distributor of the Year.

TECHJET carries Jet Edge's full line of ultra-high pressure water jet pumps for precision cutting, mobile cutting and surface preparation, including 2500 bar, 4100 bar and 6200 bar models, electric and diesel, from 20-280 hp. In addition to supplying Jet Edge pumps, TECHJET also offers precision waterjet cutting tables, waterjet parts and service.

"TECHJET has done an outstanding job introducing Jet Edge's ultra-high pressure waterjet technology to Eastern Europe," says Jet Edge President Jude Lague. "We have been very impressed by their knowledge of the waterjet process and local manufacturing needs, as well as by their genuine desire to help their customers succeed."

For more information about TECHJET, visit http://www.techjet.eu, call +48 55 273 52 78 or e-mail techjet@jetedge.com.

Jet Edge presents a recognition plaque to TECHJET April 7 at the Virginia 500 at Martinsville Speedway. (From left to right) Paul Lague, president T/C American Monorail, Inc.; TECHJET owners Adam Cegielski and Marcin Cegielski; Jude Lague, president Jet Edge, Inc.



Vacuum Truck Rentals Adds to Rental Fleet

Vacuum Truck Rentals will be adding Sewer Equipment Co. of America's models 800 HPR ECO Truck Jet and 747-FR2000 ECO Trailer Jet to their rental fleet.

Vacuum Truck Rentals has 400 units in their rental fleet and locations in Indiana, Louisiana, Massachusetts, Mississippi, New Jersey, South Carolina, and Texas. They offer a variety of units for rental in the industrial and municipal markets and also offer leasing and rent-to-own options. Visit www.vactruckrental.com for more information.

The Sewer Equipment Co. of America's 800 HPR ECO Truck Jet and 747-FR2000 ECO Trailer Jet offer a quieter work environment, use less fuel, give off fewer emissions, and are a reduced threat to the ecosystem.

Family owned and operated, the Sewer Equipment Co. of America manufactures sewer equipment, drain cleaning equipment and vacuum trucks and trailers used by municipalities and contractors all over the world. Sewer Equipment Co. of America was founded in 1941 and has built a reputation in the last 72 years as a leading manufacturer in the sewer industry.

For more information, visit www.sewerequipment.com or call(815) 835-5566.

Jet News is published by the WaterJet Technology Association (WJTA)-Industrial & Municipal Cleaning Association (IMCA) and is a benefit of membership in the Association.

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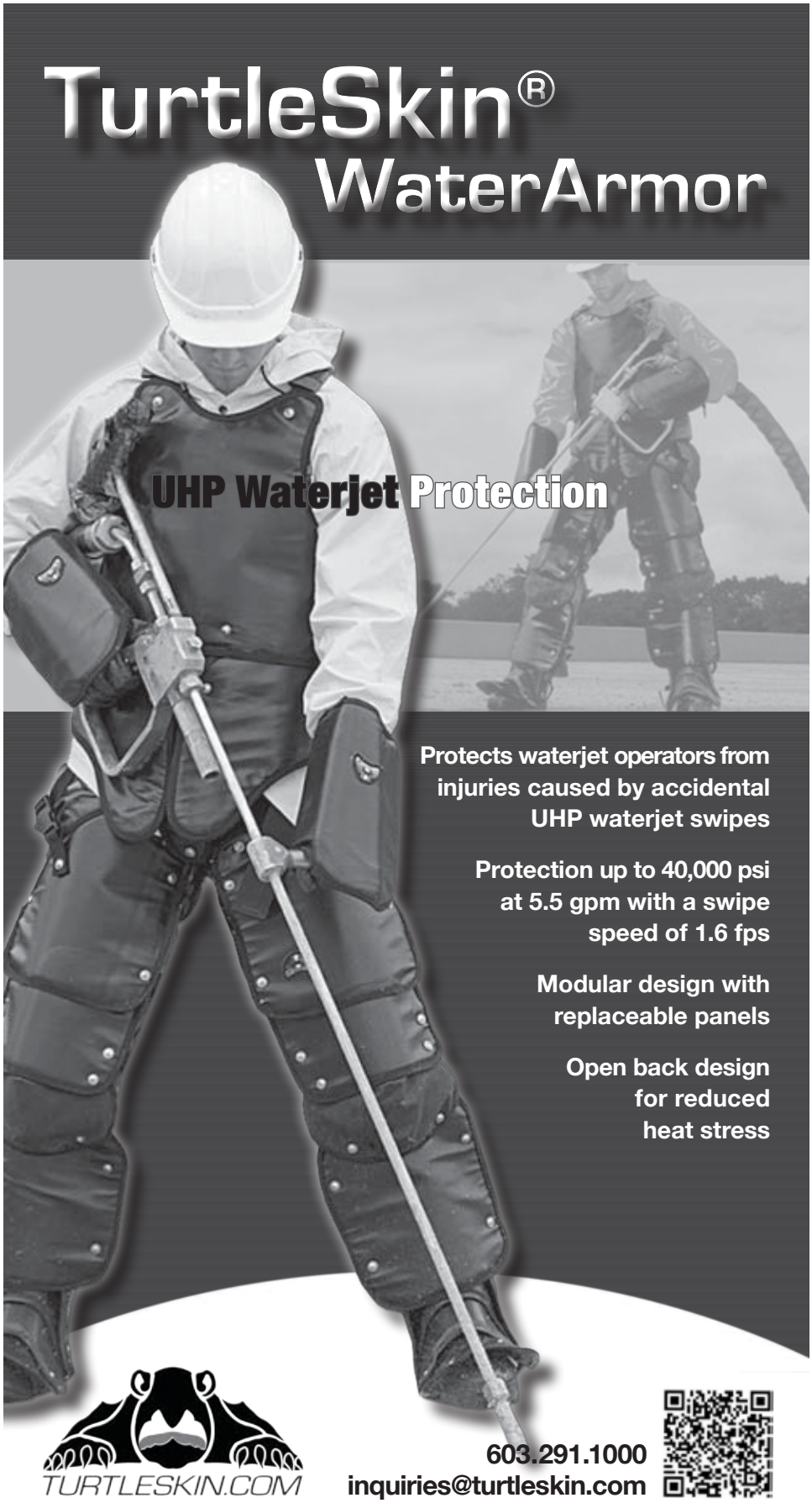
Flow Introduces Dynamic Waterjet® Cutting on the Affordable Mach 2c

High-speed, accurate cutting is now achievable on an affordable waterjet system. The Mach 2c, the newest member of the Flow Mach Series waterjet line, is now available with Dynamic Waterjet® taper compensation. Dynamic Waterjet was previously only available on Flow's advanced Mach 3 and Mach 4 waterjet systems.

Dynamic Waterjet produces faster, more accurate parts by adjusting taper angle with speed. Stream lag and taper are inherent issues in all waterjet cutting, previously only minimized by reducing cut speed. Dynamic Waterjet with Active Tolerance Control™ counters taper and stream lag using advanced SmartStream™ mathematical models. More than just a tilting cutting head, SmartStream technology changes the angle dynamically, based on cut speed, producing a better part in less time.

"The new Mach 2c with Dynamic Waterjet allows our customers to expand their applications to higher precision work," comments Chip Burnham, vice president of marketing for Flow International Corporation. "The precision motion system is capable of up to 800 ipm travel while maintaining tight tolerances. Paired with our Dynamic Waterjet, we expect the Mach 2c to be a new workhorse for the waterjet machine tool industry."

Released in 2011, the Mach 2c Waterjet system is available with multiple cutting head options including: pure waterjet, standard abrasive waterjet, and now Dynamic Waterjet.



Jetstream Introduces 3000HT Hydrostatic Test Unit for Oil and Gas Market

Jetstream of Houston has introduced the 3000HT hydrostatic test unit for accurate BOP pipeline and wellhead testing. Mounted on a heavy-duty, galvanized skid with integrated fluid containment, this rugged, versatile unit features a choice of a 125 hp John Deere Tier 3 or Tier 4i diesel engine, high-capacity water tank, Jetstream HTV test valve and the dependable Jetstream UNx® system that gives users greater flexibility to meet the various exploration, drilling and production needs of the oil and gas market.

"The 3000HT is engineered for accurate hydrostatic testing in challenging conditions," says Richard Scruggs, product manager at Jetstream. "As the demand for oil and gas continues to increase, our customers in the oil and gas market will continue to require reliable, high-performance equipment that is backed by strong parts and service support. The Jetstream 3000HT delivers on all accounts."

Like all Jetstream units, the 3000HT offers greater ease of operation and maintenance compared to competitive models.

For more than 20 years, Jetstream UNx pumps have enabled cleaning contractors to perform pump maintenance in the field quickly and efficiently, without compromising durability. Additional fluid ends can be installed within minutes, without the need for special tools, allowing the 3000HT to cover a full range of operating pressures.

"The UNx system gives contractors the flexibility to tackle the toughest jobs, the efficiency to keep their operating costs low and the performance to maximize productivity every hour on the job," Scruggs says.

For more information, visit www.waterblast.com or call 1-800-231-8192.

2013 WJTA-IMCA Co

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George R. Brown Conventi

Preliminary Schedule of Events

Monday, September 9, 2013

8:00 a.m.-4:30 p.m.
Pre-conference Workshop – Basics and Beyond

4:30 p.m.-5:30 p.m.
WJTA-IMCA General Membership Meeting

Tuesday, September 10, 2013

8:00 a.m.-10:30 a.m.
Live Demonstrations

10:30 a.m.-5:00 p.m.
Exhibit Hall Open

Time TBA
Indoor Robotics Demonstrations

10:30 a.m.-5:00 p.m.
Boot Camp Sessions

10:30 a.m.-5:00 p.m.
Emerging Technology, New Applications - Papers

5:00 p.m.-7:00 p.m.
Industry Appreciation Reception and Awards Ceremony

Wednesday, September 11, 2013

8:00 a.m.-10:30 a.m.
Live Demonstrations

10:30 a.m.-1:00 p.m.
Exhibit Hall Open

Time TBA
Indoor Robotics Demonstrations

10:30 a.m.-1:30 p.m.
Boot Camp Sessions

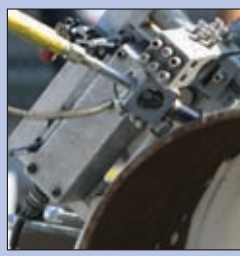
10:30 a.m.-1:00 p.m.
Emerging Technology, New Applications - Papers

- ***Exhibits and Live Demons***
- ***One-day Workshop, Water Technology - Basics and***
- ***Boot Camp Seminars***
- ***Network with Industrial P***
- ***Emerging Technology, Ne Applications - Paper Pres***

Live Demonstrations, including Indoor Robotic Demonstrations for Industrial Cleaning Applications

- **GapVax, Inc.**
- **Hammelmann Corporation**
- **NLB Corp.**
- **Peinemann Equipment**
- **StoneAge Inc.**
- **Stutes Enterprise Systems, Inc.**
- **TurtleSkin WaterArmor by Warwick**

As of 6-5-13



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Exhibitors

24 Hr Safety
Advanced Pressure Systems
BIC Alliance
Blasters, Inc.
CSM Supply
Carolina Equipment & Supply (CESCO)
Cleaner Times/IWA
D&S Professional Services
Diesse Rubber Hoses S.p.A.
Dragon Products, Ltd.
FS Solutions
Fruitland Manufacturing
GHX Industrial, LLC
GapVax, Inc.
Gardner Denver Water Jetting Systems, Inc.
General Pump, Inc.
Giant Industries, Inc.
Global Vacuum Systems, Inc.
Guzzler Manufacturing
Hammelmann Corp.
High Pressure Equipment Co.
HoldTight Solutions, Inc.
Idrojet, s.r.l.
Jack Doheny Companies, Inc.
Jetstream of Houston, LLP
LaPlace Equipment Co., Inc.
Maxpro Technologies, Inc.
NLB Corp.
Newson Gale, Inc.
Parker Hannifin-EPD
Peinemann Equipment B.V.
Powertrack International Inc.
Presvac Systems
Ramvac Vacuum Excavators
Reliable Pump Consultants, Inc.
Safety Lamp of Houston, Inc.
Sewer Equipment Company of America
SPIR STAR
Stewart R. Browne Manufacturing Co., Inc.
StoneAge, Inc.
Stutes Enterprise Systems, Inc.
Terydon, Inc.
Trans Lease, Inc.
Trillium Industrial Services
TurtleSkin WaterArmor by Warwick
US Jetting, Inc.
Under Pressure Systems, Inc.
Vac-Con, Inc.
Vactor Manufacturing
Vacuum Truck Rentals LLC
Veolia Environmental Services
Wilco Supply, LP
WOMA/Kärcher Group

As of 6-5-13

Register online at www.wjta.org or use the registration form on page 23

Waterjet Technology Basics & Beyond

Monday, September 9, 2013

7:00 a.m.-8:00 a.m.	Registration
8:00 a.m.-8:05 a.m.	Welcoming Comments & Introductions
8:05 a.m.-8:30 a.m.	**History of Waterjet Technology** Speaker: *Mike Woodward, Ph.D.*, Hammelmann Corporation
8:30 a.m.-9:00 a.m.	**Applications of Waterjet Technology** Speaker: *Bill Shires*, StoneAge, Inc.
9:00 a.m.-10:00 a.m.	**Equipment Considerations** Speaker: *Hugh Miller, Ph.D.*, Colorado School of Mines
10:00 a.m.-10:15 a.m.	Break
10:15 a.m.-10:45 a.m.	**UHP & Abrasive Cutting Applications** Speaker: *Mohamed Hashish, Ph.D.*, Flow International Corporation
10:45 a.m.-11:45 a.m.	**Safety** Speaker: *Gary Tooth*, FS Solutions
11:45 a.m.-12:45 p.m.	Lunch
12:45 p.m.-1:45 p.m.	**Cleaning Applications** Speaker: *Bill Shires*, StoneAge, Inc.
1:45 p.m.-2:30 p.m.	**Field Cutting Applications** Speaker: *Terry Gromes*, Terydon, Inc.
2:30 p.m.-3:15 p.m.	**Surface Prep** Speaker: *Lydia Frenzel, Ph.D.*, Advisory Council
3:15 p.m.-3:30 p.m.	Break
3:30 p.m.-4:30 p.m.	**Robotic Applications** Speaker: *Jim Van Dam*, NLB Corporation

Hotel Information - Hilton Americas - Houston

The Hilton Americas - Houston, 1600 Lamar, Houston, TX 77010, is directly connected to the George R. Brown Convention Center via two indoor skybridges. The room rate is $165 single/double occupancy. For reservations, call toll-free (800)236-2905, contact the Hilton directly at (713)739-8000, or register online (a link can be found on the WJTA-IMCA website). When calling be sure to ask for the group rate for WaterJet Technology Association (WJTA)-Industrial & Municipal Cleaning Association (IMCA).

Monday, August 17, 2013, is the deadline for guaranteed room availability. Reservations received after August 17 will be confirmed on a space available basis. Rooms may still be available after August 17, but not necessarily at the rate listed above.

WJTA-IMCA 2013 Expo Sponsors

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As of 6-19-13

For more information and to register visit www.wjta.org

Boot Camp Seminars

Tuesday, September 10, 2013

Hydroexcavation in the Oil and Gas Industry

Neil McLean, Hydroexcavation Consulting Unlimited, will discuss hydroexcavation applications for contractors serving the oil and gas industry. Mr. McLean will share tips on ways to increase the productivity of your hydroexcavation unit and operate in a safe and efficient manner.

Refractory Removal by High Pressure Waterjets

Doug Wright, Director of Research and Development, StoneAge, Inc., will discuss the benefits of refractory removal by high pressure waterjet and the most effective operating parameters for refractory removal. Mr. Wright will review typical applications and teach you how to estimate rates of refractory removal.

Grounding and Bonding

Mike O'Brien, Product Manager, Newson Gale, will give you an in-depth look at how vacuum trucks can be grounded and protected from electrostatic ignition hazards. Learn why static electricity presents a potential source of ignition in combustible atmospheres, what grounding is, and why it is so important to do it correctly.

The Basics of Efficient Manual Waterblast Use

Gary W. Toothe, CET, Training Manager, FS Solutions, will review how to use the horsepower formula to solve questions about horsepower, flow, and pressure. Mr. Toothe will show you how to calculate the differences between pump pressures and actual cleaning pressures and how to minimize pressure losses in waterblast systems.

Nozzle Selection

Bill Shires, Director of Marketing and Business Development, StoneAge, Inc., will present an overview on understanding and controlling pressure loss, and he will demonstrate the importance of jet quality across all pressure ranges. Mr. Shires will evaluate stand-off distances, material jet-ability, and other aspects of nozzle selection.

Overcoming the Barriers to Hands Free Hydroblasting

Tyler Bargas, Maintenance Contract Administrator, The Dow Chemical Company, will discuss how the Louisiana operations of The Dow Chemical Company have reduced the potential for injuries through implementation of hands-free cleaning requirements. Learn more about required training for hydroblasting technicians and continued compliance with Dow's global hydroblasting safety standard.

Waterblasting Safety – Everyone's Responsibility

Edward Twaddell Jr., Application Engineer, TurtleSkin WaterArmor by Warwick, will discuss the dangers involved in waterjetting work and how to avoid waterjet accidents. Mr. Twaddell will address equipment and checks, procedures, and leadership responsibilities.

High Pressure Hydroblasting Hose Failure and Life Cycle Analysis

Rick Pitman, CSP, Director, PSC Industrial Services' Environment, Health, and Safety Technology (EHST), will discuss why high pressure hose failures are a leading cause of loss in the hydroblasting industry. No widely known quantifiable data exist regarding life span, run time, and failure rates. PSC began the first comprehensive study of such data in January 2012 and Mr. Pitman will share the first year's worth of data. Such data should help contribute to a greater understanding of hose life expectancy and methods to more safely handle and utilize high pressure hoses in hydroblasting operations.

Industrial Vacuuming – Emissions Free

Christopher J. Bourg, Director of Special Services South, Aquilex HydroChem, will review the different types of technology available to control emissions on vacuum trucks and the advantages and disadvantages of each type of system. Find out how different emissions control systems can affect your work schedule, and discover ways to reduce time and resource constraints.

Wednesday, September 11, 2013

Understanding the Power of Vacuum

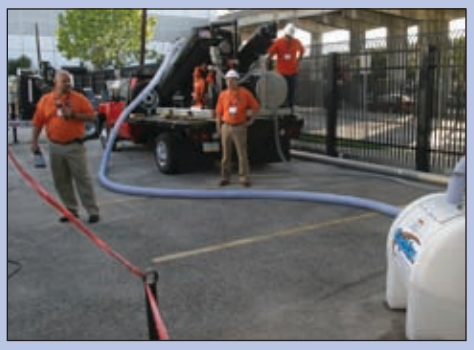
"Professor" Phil Stein, a consultant in the industrial vacuum industry, will present this "nuts and bolts science lab" for first-time users and experienced vacuum truck operators. Topics include basic types of trucks, how pressure works, measuring vacuum and pressure, why hose diameter and length is important, viscous materials, air mover configuration, special operations, when things go wrong, and major safety concerns.

Maximizing Efficiency in Manual Waterblast Applications

Gary W. Toothe, CET, Training Manager, FS Solutions, will discuss how to best determine proper nozzle configurations for pipe cleaning, tube cleaning, and surface cleaning. Mr. Toothe will share tips to determine thrust in pipe cleaning and back thrust in surface cleaning, and he will offer suggestions for maximizing production.

Emerging Technology, New Applications - Paper Presentations

- Abrasive Water Jet Cutting (AWJC) of Co-Cr-Mo Alloy Investment Castings in the Medical Device Industry, by *M. Cashman, L. Soo, D. Shepherd, A Rabani and S. Ramirez*
- An Experimental Study of Thermally Enhanced Abrasive Water Jet Machining of Hard-to-Machine and Ductile Materials, by *D. Patel and P. Tandon*
- Application of Abrasive-Waterjet for 3D Machining, by *H.-T. Liu*
- Characteristics of Air Coated Abrasive Suspension Jets Under Submerged Condition, by *H. Ito, G. Peng and S. Shimizu*
- Experimental Study of a High Efficient Jet Nozzle in Coiled Tubing Radial Drilling Technique, by *D. Ma, G. Li, Z. Huang, J. Niu, X. Song, and R. Guo*
- Extending Ability of the Micro-hole Radial Horizontal Well Drilled by Hydrojet, by *H. Chi, G. Li, Z. Huang, S. Tian and F. Di*
- Hydrajet Energized Fracturing Mixed Nitrogen Treatment Design and Parameters Calculation, by *C. Cai, G. Li, and Z. Shen*
- Impact Force of High Pressure Waterjets, by *D. Wright*
- Interpretation of Intricate Drawings into Actual Objects, by *V. Cutler*
- Is Lowering of AWJ Cutting Costs by an Increasing Pressure Economic Feasible?, by *A. Perec*
- Mechanism of Hydraulic Pulsed and Cavitating Jet Improving ROP and Application in China Offshore Drilling, by *H. Shi, G. Li, and Z. Huang*
- Paint Removal of Airplane & Water Jet Application, by *S. Xue, J. Su, Z. Chen, F. Lu, and H. Zhu*
- Present Situation and Development of Chinese Cleaning Industry, by *C. Ma*
- Pressure Boosting Effect in Perforation Cavity During Supercritical Carbon Dioxide Jet Fracturing, by *Y. Cheng, G Li, H. Wang and Z. Shen*
- Pulsed Jet to Improve Drilling Speed in Deep Wells, by *L. Cui, H. Wang, and F. Zhang*
- Pumping Efficiency's Effect on Cutting Optimization, by *A. Henning and P. Miles*
- Rz: A Better Measurement of Abrasive Waterjet Cut Surface Finishes, by *A. Henning and P. Miles*
- Reconditioning of Solid Radioactive Waste Using Forced Pulsed Waterjet (FPWJ), by *A. Tieu, B. Daniels, M. Xu, W. Yan and M. Vijay*
- Refractory Removal by High Pressure Waterjet, by *D. Wright*
- Removal of a Failed Coating System from a High-rise Using Automated UHP Water Jets, by *T. Kupscznk and J. Van Dam*
- Robot-assisted Displacement Osteotomy by the Abrasive Waterjet – Concept and Technical Realization, by *D. Zaremba, R. Westphal, C. Krettek, F.M. Wahl, Fr.-W. Bach, and T. Hassel*
- Study on Photoelectric Confrontation of Water Mist Screen System, by *B. Ren, HJ. Zhang, HG Xu and M. Guan*
- Technical and Economical Comparison of Waterjet and Abrasive Blast Methods to be Used in De-Coating and Cleaning Processes, by *H. Teimourian*
- The Use of High Pressure Water Jets to Improve Performance of Rotary Cutter Head Dredges from the Inside Out, by *C. Wyatt and H. Miller*
- Top Ten Challenges in Milling Using Abrasive Water Jet Machining Process, by *VKG Thammana*
- UHP/LV Waterjet – Surface Re-Texturizing for Bitumen Flushing/Bleeding, by *S. Robinson*
- Verification of Turbulent Correlation and Impact Study of High-Pressure Abrasive Water Jet, by *C. Kang, H.X. Liu and M.G. Yang*
- Wet Abrasive Blast – When Will We Ever Get a Standard?, by *L. Frenzel*



Complimentary Full Registration

VLN Advanced Technologies, Inc., Ottawa, Ontario, Canada, is sponsoring complimentary registrations for the 2013 WJTA-IMCA Conference and Expo.

Any individual who is interested in attending the Conference, but unable to do so without financial assistance, is encouraged to apply.

For more information visit the WJTA-IMCA website at www.wjta.org.

2013 WJTA-IMCA Conference And Expo Registration Form

Name _____ Member # _____

Company _____ Title _____

Address _____ Mailing Address: ❑ Home ❑ Work

City _____ State _____ Country _____ Postal Code _____

Telephone # [ ]( )_____ Fax # [ ]( ) _____

Email Address: _____

Information for name tag _____

Print name as you wish it to appear on your name tag

HOW TO REGISTER

- **Online** with a credit card at www.wjta.org.
- **Telephone:** call (314)241-1445 with credit card information.
- **Fax:** fill out the registration form with credit card information and dial, (314)241-1449.
- **Mail:** fill out the registration form and mail with applicable payment to: WJTA-IMCA 2013 Conference and Expo, 906 Olive, Suite 1200, Saint Louis, MO 63101-1448.

Payment Method: ❑ Enclosed is my check, payable to **WaterJet Technology Association** (U.S. DOLLARS ONLY).
Please charge my ❑ MasterCard ❑ VISA ❑ AMEX ❑ Discover

Credit Card # _____ Expiration Date ____/____ CVC _____
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Join WJTA-IMCA now and receive a substantial discount off Conference registration fees.

	WJTA-IMCA MEMBER		NONMEMBER		
	By 8/26/13	*After 8/2613*	*By 8/26/13*	*After 8/26/13*	
❑ **OPTIONAL TRIP to NASA's Johnson Space Center,** Sunday (9/8)	$ 30	$ 30	$ 30	$ 30	= $ _____
❑ **Expo Pass — One-Day** (select day below)					**COMP**
❍ **Exhibit Hall - Tuesday, September 10.** Includes admittance to the exhibit hall, boot camp, live demonstrations, and the Industry Appreciation Reception on Tuesday (9/10). (Valued at $70.)					
❍ **Exhibit Hall - Wednesday, September 11**. Includes admittance to the exhibit hall, boot camp, and live demonstrations on Wednesday (9/11). (Valued at $30.)					
❑ **Expo Pass — Two-Day**					**COMP**
Exhibit Hall - Tuesday & Wednesday, September 10 & 11. Includes admittance to the exhibit hall, boot camp, and live demonstrations on Tuesday, (9/10) and Wednesday, (9/11); and the Industry Appreciation Reception on Tuesday (9/10). (Valued at $100.)					
❑ **Full Conference**	$ 299	$ 359	$ 359	$419	= $ _____
Registration includes admittance to the Industry Appreciation Reception on Tuesday (9/10); and exhibit hall, boot camp, emerging technology, new applications sessions, and live demonstrations on Tuesday (9/10) and Wednesday (9/11). You will also receive one copy of the *Conference Proceedings* on CD-ROM and two (2) lunch vouchers that can be used on Tuesday and Wednesday (one per day).					
❑ **Author Registration**	$ 229	$ 229	$ 229	$229	= $ _____
Registration includes all the activities in the Full Conference. Author Registration applies to individuals presenting a paper during the emerging technology, new applications sessions or listed as an author on a paper.					
❑ **Combo**	$ 399	$ 459	$ 459	$ 519	= $ _____
Registration includes all the activities in the Full Conference PLUS the Pre-Conference Seminar on Monday (9/9). You will also receive one copy of the *Conference Proceedings* on CD-ROM, one (1) lunch ticket, and two (2) lunch vouchers that can be used on Tuesday and Wednesday (one per day).					
❑ **Pre-Conference Workshop -** Monday, September 9	$ 119	$ 179	$ 179	$ 239	= $ _____
Registration includes admittance to the Pre-Conference Workshop and lunch.					
❑ **Student**	$ 20	$ 20	N/A	N/A	= $ _____
Registration includes admittance to the Pre-Conference Seminar on Monday (9/9); and Industry Appreciation Reception on Tuesday (9/10); exhibit hall, boot camp, emerging technology, new applications sessions and live demonstrations on Tuesday (9/10) and Wednesday (9/11). Registration does **NOT** include a copy of the *Proceedings* or lunch ticket/vouchers. **NO** discount is available for students that are not members of WJTA-IMCA. WJTA-IMCA student members must be enrolled **full-time** in a university graduate or undergraduate program.					
❑ **MULTIPLE CORPORATE REGISTRATIONS** (Applies to third and subsequent registrants from same company)					
❑ **Full Conference**	$ 259	$ 319	$ 319	$ 379	= $ _____
❑ **Combo**	$ 359	$ 419	$ 419	$ 479	= $ _____

❑ **WJTA-IMCA MEMBERSHIP** (US, Mexico, Canada)	❑ $60 Individual	❑ $20 Student	❑ $400 Corporate	= $ _____
❑ **WJTA-IMCA MEMBERSHIP - International** (all other countries)	❑ $100 Individual	❑ $40 Student	❑ $500 Corporate	= $ _____

❑ **Conference Proceedings** ____ Copies x $89.00 **SPECIAL OFFER!** = $ _____

2013 WJTA-IMCA 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 9/30/13.**

Cancellation Policy: Fees will be refunded in full for cancellations received at least four (4) weeks prior to the Conference. Cancellations received more than ten (10) days and less than four (4) 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.

TOTAL ENCLOSED $ _____

NLB Introduces 1,000 HP Convertible Waterjet Unit

NLB's latest convertible units, the NLB 1005 Series, are the first in the waterjet industry to combine the power of 1,000 hp (746 kW) with 4,000 psi-to-20,000 psi convertibility (275 bar to 1,400 bar) for really big jobs. These rugged units offer the same reliability, easy maintenance and low operating cost as other NLB convertible units — 24 in all, the most in the industry — and use many of the same parts.

NLB 1005 Series – 1,000 hp convertible waterjet pump unit

The 1005 Series includes two models whose in-line fluid end can be easily converted with a simple kit to any of five operating pressures and flows, up to a maximum flow of 333 gpm (1,262 lpm). These diesel-powered units are built around NLB's slow-running quintuplex plunger pump, which is known for minimizing wear and maintenance. They feature internal gearing that eliminates the need for large pulleys or belts, reducing the overall footprint.

Other high-uptime features include a forged steel crankshaft mounted in heavy-duty bearings and drive pinion output shafts on both sides of the pump to accommodate opposite-hand drive. All operating controls, including the by-pass valve and pressure gauge with snubber, are mounted on a separate accessory manifold for extra protection.

For more information, visit www.nlbcorp.com or call (248)624-5555.

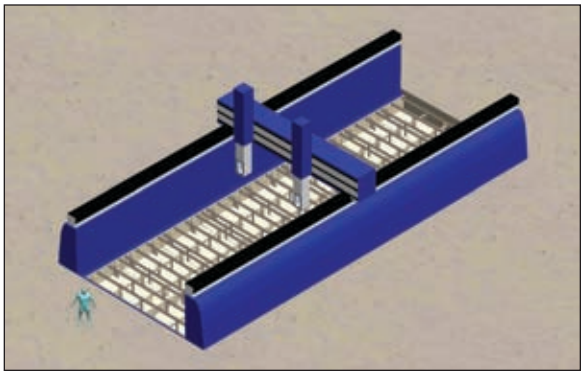
WJTA-IMCA
Celebrating 30 years

WARDJet Announces Plans for a New G-Series Waterjet to be Built on the East Coast, from page 8

debut in the US in the winter of 2013. Many design characteristics for this new machine are loosely based on another large-scale WARDJet machine known as the GCM, which is installed at the AMRC with Boeing in the United Kingdom. The GCM in the UK was designed with a five axis milling head and five axis waterjet to be used in research of manufacturing and composites. The new G-series in the US will be similar, but will feature waterjet heads only to be used in large industrial manufacturing. Also, this G-Series will feature a sunken-tank design to make loading easier and the cutting area more accessible.

WARDJet will release more information on this exciting project as plans progress. For more details, visit www.wardjet.com or call (330)677-9100.

Size comparison between newly designed G-Series waterjet and existing GCM at the AMRC with Boeing.



WARDJet's newest G-Series waterjet features 5 feet of Z travel, expanded cutting area and sunken tank design.

NLB Introduces 24,000 psi Multi-gun Valve

NLB Corp. has introduced the MGV24-1200, a new multi-gun valve that allows two or more high-pressure waterjet lances (or other accessories) to be operated from the same 24,000 psi pump unit and can be rebuilt in the field in just five minutes.

The MGV24-1200 can be used with any dump-style lance, and the lances can have nozzles of different sizes. The valve operates at pressures up to 24,000 psi (1,680 bar) and flows up to 24 gpm (91 lpm) — 12 gpm (45.5 lpm) per operator — and weighs just 33 lbs. (15 kg).

The MGV24-1200 not only allows two operators to independently control the loading and dumping of pressure to their own lances, but introduces a

modular design that accommodates additional bodies to supply more lances. It also features NLB's quick-change, stainless steel cartridge for five-minute field repair and a new cam-lock pressure adjuster that locks the pressure without tools.

For more information, visit www.nlbcorp.com or call (248)624-5555.

IMPORTANT NOTICE REGARDING SPAM

Email addresses and other member contact information published in the WJTA-IMCA Membership Directory are meant to encourage helpful, informative communication between members. The information is not provided to circulate spam or junk mail.

The WJTA-IMCA leadership requests that members respect the contact information of fellow members and not use that information for the dissemination of spam or junk email. Membership information is not meant to be circulated beyond the WJTA-IMCA membership.

Candidates Sought for 2013 WJTA-IMCA Awards

You are invited to submit candidates for the special awards presented by the WJTA-IMCA to honor a company, organization, or individual who has made a significant contribution to the industry through accomplishments that directly enhance waterjet technology and/or industrial cleaning.

Award recipient(s) will be selected by the WJTA-IMCA Awards Committee and honored at a presentation ceremony on Tuesday, September 10, 2013, in conjunction with the 2013 WJTA-IMCA Conference and Expo in Houston, Texas.

Candidate nominations must be received **NO LATER THAN JULY 15, 2013.**

Process for submitting nominees for awards:

- An official form for candidate nominations appears on page 27. Complete one form for each nomination submitted. Make additional copies of the form as needed.
- Attach a narrative **and** biographical sketch to support each nominee.
- Return completed forms and supporting documentation to the WJTA-IMCA by email: wjta-imca@wjta.org, fax: (314)241-1449, or mail: WJTA-IMCA, 906 Olive Street, Suite 1200, Saint Louis, MO 63101-1448, USA.

2013 WJTA-IMCA Conference & Expo

Reserve Your Exhibit Space for 2013

For more information, contact Peter Wright at the WJTA-IMCA office by telephone: 314-241-1445, fax: 314-241-1449, or email: wjta-imca@wjta.org.

Barton Adds a BART® Tip Hopper

Barton International has announced the addition of a Tip Hopper to the Barton Abrasive Removal Tool (BART®) product offering.

Designed to be placed next to a waterjet cutting table, the self dumping BART Tip Hopper serves as a disposal vessel for waste garnet abrasive. During abrasive removal, overflow water is returned to the waterjet table. The ¾ cubic yard BART Tip Hopper includes a liner to simplify the dumping of waste garnet from hopper.

"Customer requests lead us to expand our BART product line to include the Tip Hopper. The BART system offers exceptional abrasive removal flexibility to shops of all sizes," says Waterjet Market Manager, Alan Bennett.

Introduced in 2010, BART is a convenient, portable system for removing waste abrasive from a waterjet cutting table. With removal rates greater than 2,000 pounds an hour, BART is used in waterjet shops nationwide.

Visit www.barton.com/bart for details or call 800-741-7756.

2013 WJTA-IMCA Awards Nomination Form

Instructions: Complete sections below and submit a narrative (300-word maximum) and biographical sketch 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 2013 WJTA-IMCA Award (please print or type full individual, company, or organization name):_____

❑ Distinguished Pioneer Award

The nominee must:

- Have made contributions to the waterjet and/or industrial cleaning industries
- Have made contributions to the achievement of the goals of WJTA-IMCA
- Have high moral character
- Have strong personal and business ethics
- Be dedicated to the future of the waterjet and/or industrial cleaning industries and to the growth of WJTA-IMCA

❑ Service Award

How has the nominated company, organization, or individual contributed in time and talent toward improvement in the industry or in the WJTA-IMCA?

❑ 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 and/or industrial cleaning industries.

❑ 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 that increases the overall safety of waterjet and/or industrial cleaning 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 15, 2013.

For a prompt response, fax completed form to (314)241-1449, or mail to the WJTA-IMCA, 906 Olive Street, Suite 1200, St. Louis, MO 63101-1448, USA.

This paper presents the experimental work done in steel and fiberglass/epoxy laminate. Firstly, abrasive waterjet parameters were adjusted and tool path strategies were selected to obtain two types of textures in the metallic surface, which consisted on a rough surface with R_z of 100 µm, and on a knurled-like surface. Besides, three manufacturing processes of fiberglass and epoxy resin have been analyzed: 1) infusion lamination, 2) pre-preg lamination, and 3) structural adhesive bonding. Finally, steel-glass/epoxy bonding quality were evaluated by tensile and fatigue tests of the structure.

Characteristics of Air Coated Abrasive Suspension Jets Under Submerged Condition

H. Ito, G. Peng, and S. Shimizu
College of Engineering, Nihon University
Koriyama, Fukushima, Japan

ABSTRACT

A ventilated sheathed nozzle for producing abrasive suspension jets (ASJs) has been developed as a means of extending the effective standoff distance and improving the cutting capabilities under submerged conditions. In the present investigation, submerged cutting tests are conducted with aluminum specimens at a jetting pressure of 30 MPa to clarify the effect of air flow rate on the cutting capability of ASJs. The nozzle diameter *d* used in the tests is 1 mm and the length of the sheath L_{sheath} is 16 mm. Measurements of the flow rate distribution of water jets are also carried out at a jetting pressure of 10 MPa in order to investigate the flow structure of air coated ASJs under submerged conditions. Figure 1 shows variations of cutting depth *h/d* with the distance *X/d* for various air supply rates. The cutting capability is found to improve for small standoff distances since air coated ASJs are formed downstream of the sheath exit.

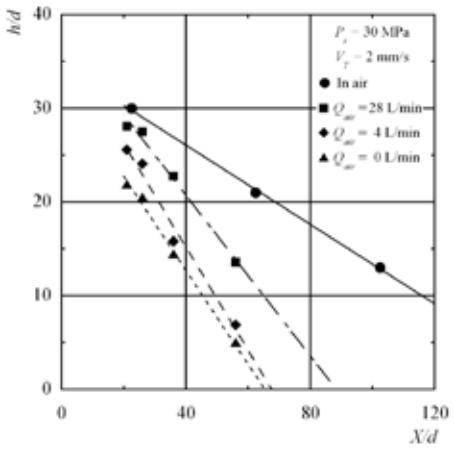


Fig. 1 Variations of cutting depth h/d with distance from nozzle exit X/d for various Q_{air}

Impact Force of High Pressure Waterjets

D. Wright
StoneAge, Inc.
Durango, Colorado, U.S.A.

ABSTRACT

One mechanism of a waterjet to penetrate or remove a material is the force of impact produced by the velocity and mass of the water reaching the surface. The mechanisms by which a material is cut or removed by a high pressure waterjet are also dependent on a particular material's properties. A considerable number of past tests have been conducted to determine and express the performance of a waterjet on particular

(continued on page 30)

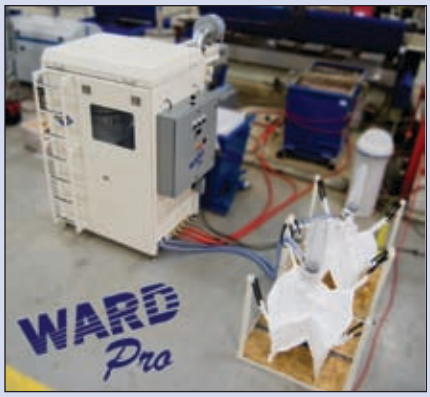
Recycling Proven to Cut Costs, from page 10

as new. Who hasn't heard the cry to "Go Green"? With the WARD Pro, the volume of abrasive going to a landfill can be significantly reduced.

WARDJet first developed and patented a waterjet abrasive recycling system over 10 years ago (the WARD = Waterjet Abrasive Recycling Dispenser). Any company that already has the WARDJet AROS (Abrasive Removal Only System) is already on their way to recycling as this is one modular portion of the WARD Pro, reducing the investment in a system.

Visit WARDJet's website: www.wardjet.com, and use the WARD Pro Savings Calculator to input specific information to discover how to reduce abrasive costs (to as low as $0.03 per pound).

For more information call (330)677-9100, ext. 6; email: sales@wardjet.com or visit www.wardjet.com.



WARD Pro waterjet abrasive recycling system.

Machinery Forum Representing Jet Edge Water Jet Systems in Australia

Jet Edge, Inc. has announced that Machinery Forum NSW Pty. Ltd. has been selected as its newest waterjet systems dealer covering the Australian market.

Machinery Forum carries Jet Edge's full line of waterjet cutting and surface preparation equipment, including waterjet cutting machines, waterjet intensifier pumps and portable waterjetting systems. The company also carries Jet Edge waterjet parts and is authorized to service Jet Edge waterjet equipment.

Based in Brisbane, Melbourne and Sydney with plans for other states, Machinery Forum has been a supplier of leading edge manufacturing technology to the Australian manufacturing industry since 1956, and has extensive experience in diverse fields of manufacturing including metal cutting, foundry equipment, electronic PCB, cable manufacturing, wire processing, concrete reinforcing, steel processing, solar panel manufacturing, and many others.

"Jet Edge is very proud to be represented by Machinery Forum," says Jude Lague, Jet Edge president. "Their highly skilled and experienced sales and technical staff will be a tremendous asset to our Australian customers."

For more information visit www.machineryforum.com.au, e-mail machinery@mafosyd.com.au or call (02) 9638 9600.

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materials. This paper presents the results of testing performed to measure the impact force of a waterjet as varied by jet quality, standoff distance, pressure, and flow rate. These data are then compared to past performance results obtained in various materials to determine the relationship of the force of impact to the overall performance in material removal.

Pumping Efficiency's Effect on Cutting Optimization

Axel Henning and Peter Miles
OMAX Corporation
Kent, Washington

ABSTRACT

Since the introduction of the abrasive waterjet cutting technology as a manufacturing process in the 1970s, there has been considerable research into predictive modeling of the cutting performance as a function of the various process parameters. The results of these research efforts have greatly expanded their capabilities and the ease of use in almost every sector of manufacturing. With the manufacturing industry continually striving for improving the overall operational efficiency of manufacturing technologies, improving the output performance versus the input operational costs is one of the primary goals. The purpose of this paper is to present a comparison of actual fixed pumping hardware assets to net cutting performance. As opposed to a parameter by parameter academic comparison, this comparison is based on various industrial pumping technologies, their input power, and their constraints on process parameter selection, and the resulting cutting performance in terms of costs per unit length of cutting. This analysis will help manufacturing organizations better assess the various available technology options in choosing the best solution for their needs.

Refractory Removal by High Pressure Waterjet

D. Wright
StoneAge, Inc.
Durango, Colorado, U.S.A.

ABSTRACT

The removal of refractory from lines and vessels in the petrochemical industry is necessary for inspection, repair, maintenance, and replacement. The small spaces and difficulty of access have otherwise limited the methods of removal to manual labor with handheld chipping hammers. This allows only the limited power and force that an individual can support, while exposing these workers to the hazards of silica dust, extreme noise, vibration, and physically exhausting labor in a confined space.

These refractory materials can be safely removed through the proper application of high pressure waterjets and mechanization, from localized repairs to complete vessel cleaning. The use of high pressure water allows the transmission of hundreds of times the power of handheld chippers, with resulting refractory removal rates on the order of days to weeks faster than manual methods. This paper presents the results of multiple tests to define the key operating parameters for the successful removal of several refractory types with high pressure water, the possible rates of removal, and other considerations necessary for the successful execution of field work.

Removal of a Failed Coating System from a High-rise Using Automated UHP Water Jets

Ted Kupscznk and Jim Van Dam
NLB Corp.
Wixom, Michigan

ABSTRACT

The paper documents the removal of a failed coating system from the exterior of a 54 story building in the Midwest. The removal was accomplished through the use of UHP water jet tools. Other removal processes were considered, and some were able to meet required production rates, but none could address the unique issues that an urban setting offers. Thousands of pedestrians and automobiles passed by the work site every day, and there was zero tolerance for paint residue or excessive noise.

The key elements in the success of this project was the ability to deliver UHP water through a customized delivery

(continued on page 31)

WJTA-IMCA Election for Board of Directors

An official ballot listing the eligible nominees and a brief biographical sketch for each individual was forwarded on June 10, 2013, to all members in good standing.

This is your chance to vote directly for your board of directors. WJTA-IMCA is unique among organizations in that you have the opportunity to vote directly for the candidate of your choice rather than voting at a general membership meeting.

Take advantage of this opportunity to be heard. VOTE!

Emerging Technology, New Applications Featured at WJTA-IMCA Conference and Expo, from pg. 30

system to the work site nearly 50 stories overhead. In addition, a filtration system allowed recirculation of the use of water.

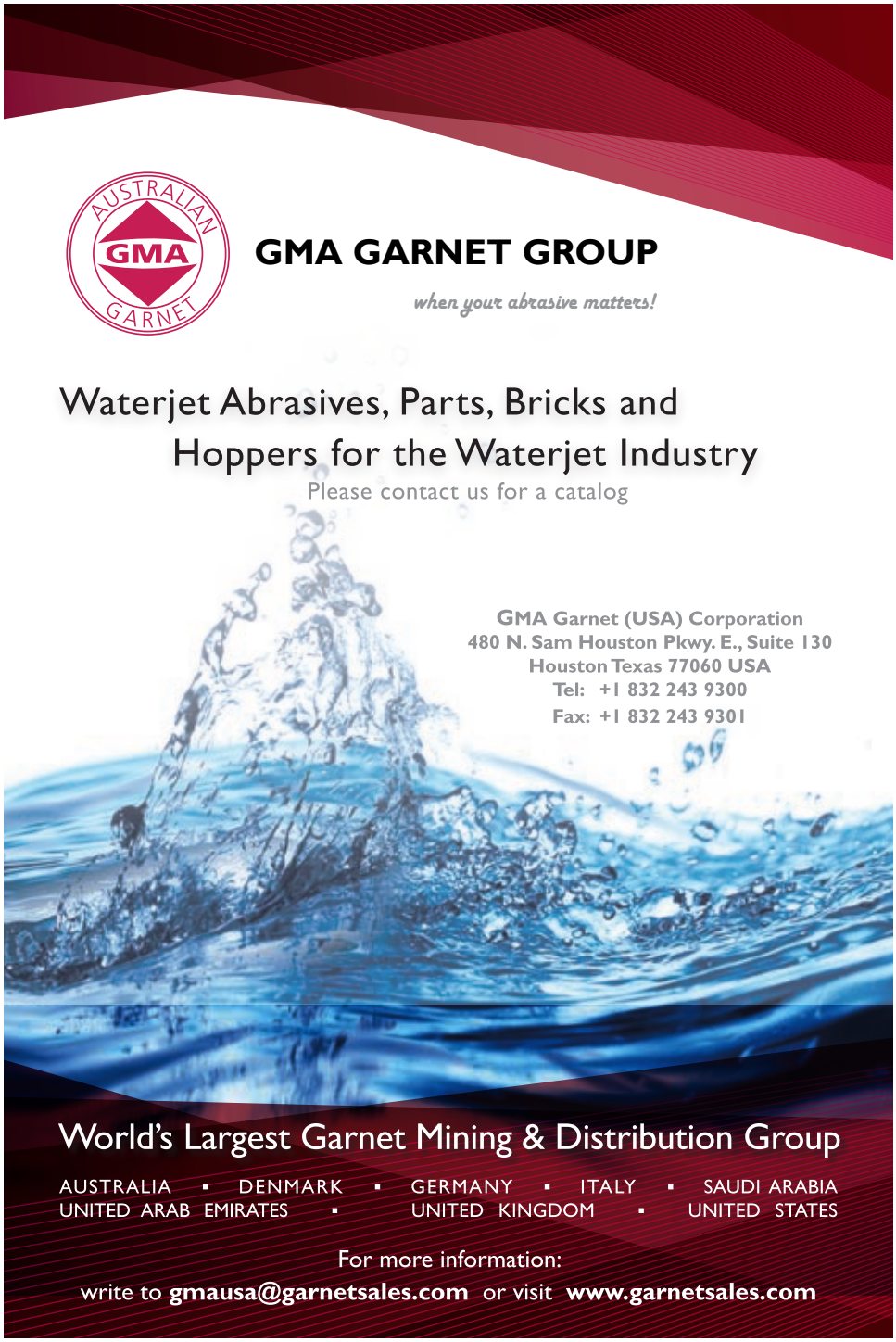
Robot-assisted Displacement Osteotomy by the Abrasive Waterjet – Concept and Technical Realization

D. Zaremba, R. Westphal, C. Krettek, F.M. Wahl, Fr.-W. Bach, and T. Hassel
Institut für Werkstoffkunde
Garbsen, Germany

ABSTRACT

The displacement osteotomy is an operative method for the load relieving of pre-damaged joints through the correction of skeleton-caused, abnormal displacement of the leg axes. For this purpose, the tibia or femoral bone is cut through and fixed in a mechanical and physiological reasonable position. Conventional cutting techniques used in osteotomy today implicate physiological disadvantages like the denaturation of bone caused by heat transmission from the tool. Regarding a short healing time and an exact positioning of the cutting contour, the use of an automatable, cold cutting process is preferable.

For the preparation of clinical application, an experimental operating room was set up. For physiological reasons, the AWIJ process was adapted with an ingested magnesium suspension. The tool guiding was managed through an industrial robot, controlled through an optical navigation system. The soft tissue protection could be managed through a self-developed jet absorber. Finally, a focal dome osteotomy cut could be carried out.■



Comments Solicited on Improvements to Recommended Practices

Comments are solicited regarding improvements to the WJTA-IMCA publications, *Recommended Practices for the Use of High Pressure Waterjetting Equipment* and *Recommended Practices for the Use of Industrial Vacuum Equipment*. While both publications are reviewed periodically at the WJTA-IMCA conferences and throughout the year, your comments and suggestions for improving the publications are invited and welcome anytime.

Please address your comments and suggestions to: WJTA-IMCA, 906 Olive Street, Suite 1200, St. Louis, MO 63101-1448, phone: (314)241-1445, fax: (314) 241-1449, email: wjta-imca@wjta.org. Please specify which publication you are commenting on.

WJTA-IMCA Welcomes New Members

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Index of Advertisers

OMAX® Hires Regional Sales Manager for Southeast Europe and Middle East

OMAX Corporation recently named **Lorant Keseru** regional sales manager for Southeast Europe and the Middle East. Keseru will use his experience in machine tool purchasing and project management to further enhance the company's distribution partnerships and market position in these regions.

Lorant Keseru

According to Steve Ulmer, vice president of international sales for OMAX, there are significant growth opportunities for OMAX in Southeast Europe and the Middle East as manufacturers are showing increased need for precision-engineered, multi-axis abrasive waterjet systems.

"Today's challenging and continuously evolving global marketplace requires comprehensive manufacturing solutions and our advanced waterjet technology can optimize even the most complex machining applications," says Ulmer.

He also notes that with Southeast Europe and the Middle East, which includes Romania, Bulgaria, Turkey, UAE, Saudi Arabia, Qatar and Oman, being key target markets for OMAX, it became critical to hire a proven professional to closely serve distributors in these regions.

"We are thrilled to have Keseru on our sales team. With his machine tool background, engineering knowledge and customer support experience, I'm confident he will take both OMAX and our distributor partners to even higher levels of success," concludes Ulmer.

Prior to joining OMAX, Keseru worked as a purchasing manager where he played a pivotal role in procurement, supplier and customer development, and negotiation. As such, he successfully planned, organized, directed, controlled and evaluated the company's purchasing activities. Keseru has an electrical engineering degree from BMF – Kandó Kálmán College Electric engineering faculty, Székesfehérvár, Hungary.

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____	SPECIAL OFFER* - **Proceedings CDs of The 2009 and 2007 American WJTA Conference And Expo** @	$ 19.95	$ 29.95	= $_____
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____	**Industrial Vacuum Equipment Seminar** (8/18/09 PowerPoint presentations in printed format) @	$ 20.00	$ 25.00	= $_____

❑ **Waterjet Equipment Recommended Practices. English, Fourth Edition, 2011 - NEW, Revised and Updated**

❑ **Waterjet Equipment Recommended Practices. Spanish, Third Edition, 1994**

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