WJTA WaterJet Technology Association

Jet News

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IMCA Industrial & Municipal Cleaning Association

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Hydro-Excavation: Digging with Precision and Safety

Multiple Utility Lines Safely Exposed

Long Reach Applications

Limited Access Areas

Minimal Disruption to Landscape

Live Gas Lines Exposed

Repairing Steam Line Under Foundations

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Photographs provided courtesy of Vactor Manufacturing, Inc., a Division of Federal Signal Corporation.

On the inside

2012 WJTA-IMCA Expo

Hydro-Excavation: Digging with Precision and Safety

Introduction

Every day, contractors, municipalities and utilities excavate for installation of underground facilities, or must locate existing pipes, cables and lines for maintenance and repairs. In the past, this usually involved digging by hand (often a slow and tedious process) or with a mechanical excavator, backhoe or similar machine.

Every year, there are numerous reports of injuries, deaths, explosions and fires from unsafe or poorly planned excavations that strike underground facilities or result from collapsed trenches. Many of these incidents can be avoided and the risks minimized by utilizing techniques such as vacuum excavation.

Definitions

Vacuum excavation is a general term that may include processes using either water (hydro-excavation) or high-pressure air to loosen soil. In either case, an air vacuum is used to move the loose soil and rocks, often into a debris tank for later disposal or back-filling the hole that's been made.

Hydro-excavation is a process that utilizes pressurized water to break up and remove the soil via air conveyance (vacuum) into a debris tank, providing a non-destructive means to safely locate utilities and precisely excavate an area.

This white paper will focus specifically on hydro-excavation and its origins, benefits, safety factors, applications and economic value.

Historical Perspective

Hydro-excavation as we know it today can trace its growing popularity to the Canadian oil and gas industry, which realized years ago the efficiency of using a hydro-excavation machine to "daylight" buried gas pipes and other utility lines. With cold weather and permafrost, petrochemical plants and facilities in Canada found that using heated water made hydro-excavation the only viable option to excavate year-round.

In the early 1960s, catch basin cleaners were adapted for hydro-excavation use, but the technology was crude. Vactor® built its first hydro-excavation machine, the "ExcaVactor," in 1969. However, the market then was immature and it was the only unit built.

In the 1970s and '80s, customers modified vacuum trucks and sewer cleaners for hydro-excavation use. Some took vacuum components off the trucks and mounted them on all-terrain vehicles to get into remote locations. In the 1990s, a number of companies saw a growing demand for hydro-excavation machines and began manufacturing truck- and trailer-mounted units in varying configurations.

By 2000, hydro-excavation was widely used across Canada and was moving into the United States. In recent years, the practice has rapidly gained acceptance in the U.S. and is now widely used by utility contractors for locating and non-destructive digging.

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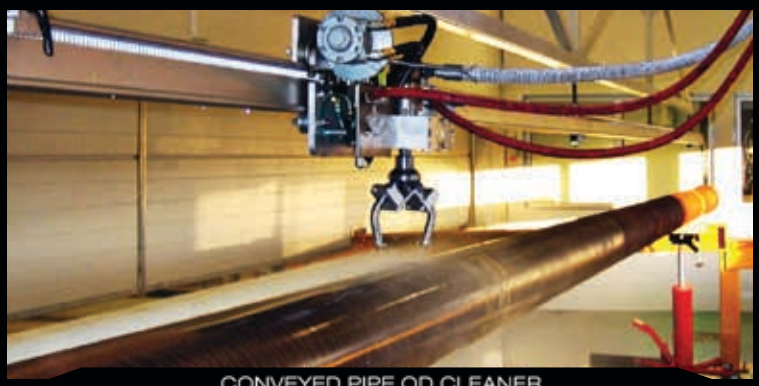

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WJTA-IMCA Color Coding Scheme for Pressure Hoses

In September 2011, the WJTA-IMCA Board of Directors approved a color coding scheme for pressure hoses to be added to the *Recommended Practices for the Use of High Pressure Waterjetting Equipment.* The goal of this recommended practice is to help ensure on-the-job safety by making the various hoses more easily identifiable on sight.

The new text reads as follows:

> Pressure hoses are designed for various pressures and could present a safety hazard if not used for the designated working pressure. In order to better identify the pressure in use, it is recommended that the following color coding scheme is used for the applicable maximum working pressure:

PSI	Bar		Color
10,000	690	-	Yellow
15,000	1,034	-	Green
20,000	1,379	-	Blue
30,000	2,068	-	Silver
40,000	2,758	-	Orange
55,000	3,792	-	Red

> The color scheme should be easily identifiable at least two feet from both hose ends.

January 1, 2013, is the effective date for implementation.

The new wording appears in the current edition of the *Recommended Practices for the Use of High Pressure Waterjetting Equipment*.

For more information, contact the WJTA-IMCA.

Super Products' Mud Dog 1200 Hydro-Excavator

The latest hydro vac offering from Super Products LLC — the Mud Dog 1200 — offers a 12-yard collector body and many of the features found on the company's Mud Dog 1600 including a powerful waterjetting and air flow combination, outstanding boom range of motion, and a "one-of-a-kind" debris unloading system.

Designed, engineered and built as a result of direct input from contractors specializing in a wide variety of hydro-excavation services, the Mud Dog® 1200 offers a standard water tank capacity of 1000 gallons and a pump rated at 14 GPM at 3000 PSI for effective, dependable digging performance.

An onboard boiler can sufficiently heat the water to break up frozen ground and materials making operation in cold, harsh environments possible. Its positive displacement vacuum pump offers air flow rated at 5800 cfm/28 inches hg to remove even the most stubborn material and debris.

The rear-mounted, eight-foot telescoping boom found on the Mud Dog 1200 can reach 19 to 27 feet, rotate up to 335 degrees, and pivot downward 25 degrees allowing operators to cover a large work area and dig deeper without the need to halt operation to reposition the truck.

For fast, thorough debris tank unloading and cleanout, the Mud Dog 1200 features Super Products' unique ejector plate technology and the ability to raise the collector body two feet to tilt. And this easy-to-use debris removal system can be operated safely where overheard obstructions may present difficulty for traditional dump body hydro-excavators.

As well as the many features that come standard on the unit, an array of additional equipment options can also be specified to tailor the Mud Dog 1200 to specifically meet customers' most common and toughest hydro-excavation challenges.

For more details on the Mud Dog 1200 or any of Super Products' truck-mounted hydro-excavators, visit www.muddogeasy.com.

2012

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See details throughout this issue


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Hydro-Excavation: Digging with Precision and Safety, from page 2

Safety and Damage Prevention

Improved safety and damage prevention top the list of key benefits of hydro-excavation. An underground utility strike can be catastrophic, affecting thousands of people and costing millions of dollars. A single incident may cause personal injury or death, property damage, lost work opportunity, community disruption, ecological damage and insurance liability.

More than 40 percent of pipeline system leaks and ruptures are caused by damage from outside force, and more than half of all cable service outages are caused by excavation damage.

While disruption of a telecommunications network is not as inherently dangerous, it can be expensive and inconvenient, impacting traffic control systems, health services and emergency response activities. The importance of minimizing underground utility strikes and their consequences cannot be denied.

Using hydro-excavation in such situations can avoid:

- "Hits" or "strikes" on underground utility lines, cables and pipes
- High costs to repair damaged infrastructure
- Costs and inconvenience of interrupted utility services
- Serious injury or death to workers and the public
- Liability and increased insurance costs
- Loss of a company's reputation, revenues and employee morale

In addition, hydro-excavation can improve overall productivity and efficiency for contractors, municipalities and utilities.

Government regulation

The U.S. presently has more than 14 million miles of buried utilities and pipes. Current laws prohibit the use of mechanical means to dig within 18 inches of buried cable and pipe in the U.S., and 45 cm in Canada. Buried utilities are often mis-marked or maps are inaccurate, requiring underground facilities to be located by sight, either by hand-digging or another means, to maximize safety. This is often called "daylighting." Unfortunately, digging by hand is often time-consuming, and mechanical excavation is inherently risky.

The U.S. Department of Transportation's Damage Prevention Quality Action Team views the situation this way:

> *The United States has a vast underground infrastructure of pipelines, conduits, wires, and cables that affect every individual. This underground infrastructure is critical to our way of life, constantly providing oil and natural gas, telecommunications, electricity, water, sewage, cable TV, and other vital products and services. Disruption of any of these underground facilities could affect the safety of the public, the environment, and continued service reliability that could impact our entire economy.*
>
> *One of the leading causes of disruption to our country's underground facilities is external force damage (sometimes called 'third-party damage') that occurs during excavation activities. This has been recognized by both industry and government. Although such damage occurs far too frequently, it is usually preventable. Respon-*

(continued on page 8)

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Hydro-Excavation: Digging with Precision and Safety, from page 6

Drilling Mud Removal

Heavy Clay Soil

Water Shutoff Repair

Low Water Usage

sibility for preventing excavation damage is shared by all stakeholders. Advanced planning, effective use of one-call systems, accurate locating and marking underground facilities, and the use of safe-digging practices can all be very effective in reducing underground facility damage. In most states, increased and mandatory use of the state's one-call system has significantly reduced the incidence of excavation damage. However, damage still occurs.

Risky business

Strikes on natural gas lines are particularly hazardous and occur all too often, resulting in significant property damage, injuries and even deaths. The following tables illustrate incidents for natural gas distribution pipelines during the years 2006-2011.

Natural Gas Pipeline Operators
Incident Summary Statistics By Year 2006 – 2011

Distribution Operators

Year	No. of Incidents	Fatalities	Injuries	Property Damage
2006	142	18	30	$23,891,866
2007	151	9	33	$25,909,710
2008	147	7	52	$39,009,884
2009	157	9	49	$31,984,310
2010	121	11	44	$20,316,483
2011	122	13	57	$21,562,329
Totals	**840**	**67**	**265**	**$162,674,582**

Totals include accidents from 2006–2011. Source: Office of Pipeline Safety Statistics.

These statistics show that, despite a decrease in incidents and damages from 2009 to 2010, property damage from gas distribution pipeline incidents remains a significant concern and cause of injuries and deaths. Of the 122 incidents reported in 2011, 27 were caused by third-party excavation, resulting in more than $3.5 million in property damage.

Distribution Pipeline
Incident Summary By Cause - 1/1/2011-12/31/2011

Cause	No. of Incidents	% of Total Incidents	Property Damages	% of Total Damages	Fatalities	Injuries
Car, truck of other vehicle not related to excavation activity	11	9.0%	$385,468	1.7%	1	4
Fire/explosion as primary cause	14	11.4%	$4,642,518	21.5%	2	5
Operator excavation damage	3	2.4%	$304,332	1.4%	0	6
Third-party excavation damage	27	22.1%	$3,556,558	16.4%	2	10
Totals for 2011	**122**		**$21,562,329**		**13**	**57**
Average			**$176,740**			

Totals and averages include all accidents from 2011. Source: Office of Pipeline Safety Statistics.

(continued on page 21)

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

Inconel® Pipe Cutting Project

When a Louisiana contractor needed a faster method of cutting holes into Inconel® pipe for a unique refinery project, they called Jet Edge in St. Michael, Minnesota.

Midwest Mobile Waterjet of St. Paul, Minnesota used a Jet Edge-powered waterjet system to cut eight 10-inch holes into four 1.625-inch thick 24-inch diameter Inconel pipes for a high-temperature, high-pressure Louisiana refinery project. Photo courtesy Midwest Mobile Waterjet.

The contractor was in a bind. After two days of throwing everything they had at the 1.625-inch thick Inconel with a hole boring drill, they had yet to cut a single hole, and they needed to cut eight 10-inch holes. Jet Edge confirmed that abrasive waterjet could quickly cut through the superalloy and referred them to Midwest Mobile Waterjet (MMW), a St. Paul, Minnesota-based mobile waterjet contractor with the expertise and equipment to complete the challenging project.

"Inconel is very difficult to machine or shape using traditional machining methods because it causes rapid work hardening," explained David Arthur, Jet Edge's Southeast regional manager. "Often after just the first pass, it will plastically deform either the work piece or the cutting tool. Waterjet works best for Inconel due to the fact that it is a cold hypersonic grinding process. We referred the contractor to our customer Midwest Mobile Waterjet because they have the perfect Jet Edge equipment for the project and they could get it done fast."

MMW President Brian Gleeson took on the challenge and headed to Louisiana, armed with one of his many Jet Edge waterjet intensifier pumps and a special cutting tool that he designed for the project.

Gleeson performed a test cut and demonstrated that a 36,000 psi waterjet could cut a 10-inch hole in the Inconel in less than 30 minutes without damaging the inside of the 24-inch diameter pipe, and maintain a required tolerance of +/-1/8-inch. He made the cut using 3 lbs of abrasive per minute and 3 gallons of water per minute.

"It was obvious then and there that abrasive waterjet cutting was the right choice," he said. "Total cutting time went

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SSPC Updates PA 2, Revises Waterjetting Standard

Summary of the Society for Protective Coatings (SSPC)-PA 2 Revisions 2012

SSPC-PA 2, Procedure for Determining Conformance to Dry Coating Thickness Requirements has been revised. The scope and title of PA 2 have changed to reflect the 2012 revision of American Society for Testing and Materials International (ASTM) D7091-12 Standard Practice for Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to Ferrous Metals and Nonmagnetic, Nonconductive Coatings Applied to Non-Ferrous Metals. ASTM D 7091 committee chair Dave Beamish and SSPC chair Bill Corbett have worked closely together to ensure that the revised standards will not overlap or conflict. The title of the revised PA 2 reflects the modification of its scope.

The technical revisions to SSPC-PA 2 2012 are summarized below:

1. Much of the descriptive language about operation of the gages has been eliminated. Descriptions of gages and their operation is included in the revision of the ASTM D 7091 standard. The 2012 revision of PA 2 contains procedures for determining compliance with project requirements for dry coating thickness, and procedures for performing accuracy checks to ensure that the gages are reading accurately.
2. The section (Section 9) on determining compliance with specified Dry Film Thickness (DFT) has been rewritten to allow the specifier to reference a greater or lesser "coating thickness restriction" than the default requirement, which requires that an acceptable spot reading must be within 80% of minimum, 120% of maximum specified DFT).
3. New language has been added for determining and documenting extent of nonconforming areas. This language is found in Section 8.2.4 and subsections.
4. The nonmandatory note on Overcoating has been modified to allow use of ultrasonic gages that have the ability to distinguish coating layers for measurement of DFT on overcoated structures.
5. Two new non-mandatory appendices have been added, one for measuring the DFT of coatings on edges, the other for measuring DFT on coated steel pipe exteriors.

Other revisions are considered editorial clarifications.

Revision of SSPC/National Association of Corrosion Engineers - Intl. (NACE) Waterjetting Standards

The 2012 revision of the 2002 version of SSPC-SP 12/NACE No. 5 standard, "Surface Preparation of and Cleaning of Metals by Waterjetting Prior to Coating" divides the standard into 4 separate documents, each addressing a different level of surface cleanliness. The organization of the four resulting standards has been revised to more closely parallel the organization of the dry abrasive blast cleaning standards, and allows the specifier to specify levels of cleanliness for waterjetting by use of separate standards, as is done when specifying levels of dry abrasive blast cleaning.

The titles of the new standards are:

- Waterjet Cleaning of Metals: SSPC-SP WJ-1/ NACE WJ-1, Clean to Bare Substrate
- Waterjet Cleaning of Metals: SSPC-SP WJ-2/ NACE WJ-2, Very Thorough Cleaning

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Hughes' Pumps Pack a Real Punch

Recent research has shown that the Hughes range of pumps has one of the highest power to weight ratios in the industry, making for compact, lightweight installations.

A comparison of all leading European and US water jetting pump manufacturers showed the 220 hp (160 kW) Hughes Pumps HPS2200 had the lowest crankshaft speed (400 rpm), the lowest plunger speed (1.07 m/sec / 3.5 ft/sec) and the highest rated rod load compared to other manufacturers equivalent pumps. Reduced crankshaft and plunger speed means less cycles for plungers, seals, springs and valves, which equates to reduced wear and running costs.

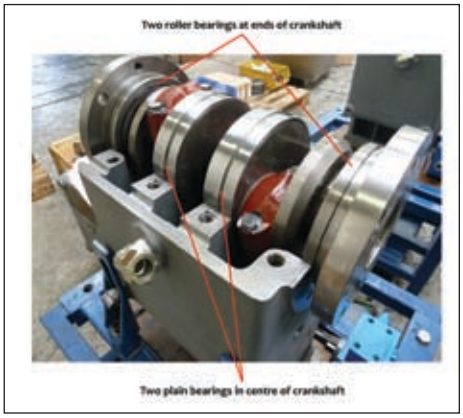
Hughes HPS2200 pump with integral gearbox, SAE engine adaptor and flange mount pressure adjusting valve.

How can so much power be produced by some of the most compact pumps available?

This is possible because all pumps in the Hughes' range have fully supported crankshafts with a bearing between each cylinder. Hughes' three cylinder pumps have four crankshaft bearings with five cylinder pumps having six crankshaft bearings, which eliminates crankshaft flexing, allowing enormous power to be utilized.

To help further, all pumps are pressure lubricated at 4 bar/60 psi using an integral oil pump driven from the end of the crankshaft. The lubricating oil is constantly filtered, monitored for pressure and pumped via a small oil cooler that uses inlet water to cool the oil.

An integral reduction gearbox and unique SAE engine combination makes this one of the simplest pumps in the market to package. The pump bolts directly to an engine, guaranteeing perfect alignment, and all torque is removed from the pump skid that can be made lighter as a result.



Other benefits of the Hughes range of pumps are that bareshaft pumps are supplied fitted with shutdown switches, pumphead mounted pressure adjusting valves, safety valves and pressure gauges. Literally "Plug & Play."

For more information, visit www.hughes-pumps.co.uk or e-mail sales@hughes-pumps.co.uk.

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The ***WJTA-IMCA****ListServ* enables you to take advantage of prompt email interaction with your colleagues. ***WJTA-IMCA****ListServ* is a **FREE** email broadcast system developed by WJTA-IMCA to help you communicate and network with other waterjet and industrial cleaning and vacuuming professionals.

Participation is limited to WJTA-IMCA members in good standing. You must sign up in order to participate. To sign up for the ***WJTA-IMCA****ListServ*, contact Pete at the WJTA-IMCA office by email: wjta-imca@wjta.org, phone: 314-241-1445, or fax: 314-241-1449.


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Boot Camp Sessions

Preliminary Program

TUESDAY, SEPTEMBER 11, 2012

10:00 a.m.-10:30 a.m.
Hydro-Excavation
By Brett Hart, Product Manager, Vactor Manufacturing, Inc., Streator, Illinois

10:45 a.m.-11:15 a.m.
PSC's Hydroblasting Integrity and Reliability Program
By Sean Benoit, CSP, Program Compliance Director, PSC-Industrial Services Division, Westlake, Louisiana

11:30 a.m.-12:00 p.m.
Elimination of Manual Hydroblasting – The Path Forward
By Hans Borgt, Global Subject Matter Expert, Industrial Cleaning, The Dow Chemical Company, The Netherlands

12:30 p.m.-1:00 p.m.
Strong Safety Management Systems…A Customer Perspective
By Kathy Krupp, Maintenance Process Leader, The Dow Chemical Company, Freeport, Texas

1:15 p.m.-1:45 p.m.
Safe Use and Care for Ultra High Pressure Hose
By Jerry Carter, Sales Manager, SPIR STAR Ltd., Houston, Texas

2:00 p.m.-2:30 p.m.
Safety in Waterjetting – Everyone's Responsibility
By Edward Twaddell, Application Engineer, TurtleSkin Safety Products Division, Warwick Mills Inc., New Ipswich, New Hampshire

2:45 p.m.-3:15 p.m.
Scrubbing Vapors - Vapor Filtration Equipment
By Brad Varley, Vapor Technologies Inc., Hitchcock, Texas

3:30 p.m.-4:00 p.m.
Nozzle Selection – Pressure Loss, Jet Quality, and Other Technical Aspects
By Kevin Simmons, Customer Service Representative, StoneAge, Inc., Durango, Colorado

WEDNESDAY, SEPTEMBER 12, 2012

12:00 p.m.-2:00 p.m.
Understanding the Power of Vacuum and How Industrial Vacuum Loaders Work
By Phil Stein, Consultant

2:00 p.m.-3:00 p.m.
High Pressure Waterblasting Applications
By Gary Toothe, CET, CIT, Training Manager, FS Solutions, Trenton, South Carolina

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 sky-bridges. The room rates are $146 single/$156 double occupancy. Reserve your room online at www.wjta.org, or call toll-free (800)236-2905 or call the Hilton directly at (713)739-8000.

Friday, August 17, 2012, 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 rates listed above.

Alternate Hotel

The Hyatt Regency Houston, 1200 Louisiana Street, Houston, TX 77002, is a 15-minute walk from the George R. Brown Convention Center. The deadline for guaranteed room availability at the Hyatt has passed. Rooms may still be available, but not necessarily at the group rates: $146 single/$156 double occupancy. Reserve your room online at www.wjta.org or call (888)421-1442. When calling, be sure to mention the group code G-WAJJ.

WJTA-IMCA Night at the Ballpark
Houston Astros vs. Chicago Cubs
Tuesday, September 11, 7:00 p.m.
Buy tickets online: www.wjta.org

Preliminary Schedule of Events

Monday, September 10, 2012
5:30 p.m.-7:30 p.m.
Industry Appreciation Reception – Exhibits Open

Tuesday, September 11, 2012
8:00-10:00 a.m.
Live Demonstrations
10:00 a.m.-4:00 p.m.
Exhibit Hall Open
10:00 a.m.-5:00 p.m.
Boot Camp Sessions

Wednesday, September 12, 2012
8:00-10:00 a.m.
Live Demonstrations
10:00 a.m.-1:00 p.m.
Exhibit Hall Open
12:00 Noon-3:00 p.m.
Boot Camp Sessions

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Carolina Equipment & Supply (CESCO)

CESCO manufactures the Aqua Miser Ultra Boss high pressure water blasters, water filtration, closed-loop containment rooms, and safety suits. CESCO will be demonstrating the D-115 Aqua Miser with the patented BOSS ABRASIVE INJECTION system for surface preparation. It profiles steel much like sandblasting with very little abrasive and zero dust.

GapVax, Inc.

The GapVax MC series is our Combination JetVac that is a wet only vacuum unit. We will demonstrate the ease and efficiency of our front hose reel jetting a line as well as vacuuming water from a 125 gallon tank with the boom hose submerged.

With our superior CANbus monitoring system the operator can observe and troubleshoot the entire system. The display screen (one inside cab/one outside) will control hydraulics, blower, and water pump operations with a complete compliment of gauges. All body functions, boom and hose reel functions, vacuum break, throttle, area and safety lighting are wireless controlled. GapVax will have the most wireless functions available while still maintaining proportional boom and hose reel control. We'll demonstrate our proportional controls as well as jetting and vacuuming.

Gardner Denver Waterjet Jetting Systems, Inc. and The Blast Bag Company Inc.

Gardner Denver Water Jetting Systems, Inc is partnering with The Blastbag Company, Inc for its live demo at the 2012 WJTA-IMCA Expo. We will showcase our GD 325 horsepower 10/15/20K convertible water blast unit along with a StoneAge 20K rigid lance machine for a live demo on cleaning/lancing a tube bundle. The Blastbag Company will exhibit their Blastbag at containing water/debris during the cleaning on their trailer mounted tube bundle.

Hammelmann Corp.

Hammelmann will be demonstrating our wireless remote unit for pump operation. We will also show how we can run two units in tandem without the need for two operators. Hammelmann will be showcasing many different tools which are beneficial for the industrial cleaning sector.

NLB Corp.

NLB will be demonstrating how the new 3760-50 tank cleaning head quickly strips away chemicals, resins and other build-up with the power of high-pressure water jets. Coupled with NLB's heavy-duty 605 Series 600 HP pump, the 3760-50 is rated for pressures up to 20,000 psi and is designed to fit small openings of 6" or larger. The head features two high velocity water jets, which spin vertically while the head spins horizontally, resulting in complete 3D coverage.

Peinemann Equipment B.V.

Peinemann will be demonstrating heat exchanger cleaning machines, both flex lance and rigid lance.

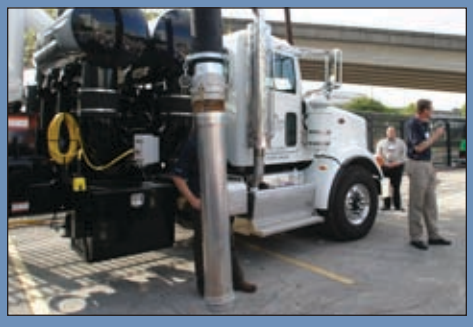
Red-D-Arc, Inc.

Red-D-Arc will be demonstrating two of the latest environmental blasting technologies.

The demo will include non-abrasive dry ice blast cleaning and the Farrow slurry blasting abrasive system.

Both systems will showcase the latest addition into Red-D-Arc's rental offering, the 375HH Sullair high pressure air compressor.

(continued on page 20)



OMAX® Appoints New Vice President of Product Engineering

OMAX Corporation recently hired Doug Kelley as its new vice president of product engineering.

Holding a Bachelor of Science degree in mechanical engineering from the University of Washington, Kelley's career diversity ranges from utility subsurface installation services to enhanced oil well drilling technology to new developments in supercomputers. He has spent more than 30 years as an engineer for a variety of global high-tech industries and has earned 15 patents in a variety of technical applications. His most recent patent came in late 2011 for air conditioning systems for computer systems and associated methods.

"Our talented engineering team is constantly developing new and improved abrasive waterjet technologies to meet the diverse and ever changing needs of manufacturers worldwide," said Dr. John Cheung, CEO of OMAX Corporation. "Because innovation is at the core of everything we do, we are extremely excited to have Mr. Kelley as part of our team. His engineering expertise and proven successes will be a great asset to us and our customers."

Before joining OMAX, Kelley spent 13 years as a senior mechanical engineering manager for Cray, Inc., a company that designs and manufactures world-class supercomputers. In this position, he conceptualized and orchestrated the company's first commercial research and development contract, and developed an innovative two-phase cooling system, allowing the world's most powerful computer to save 1MW of power. Kelley was Cray's only hardware engineer to meet for six consecutive years with key customers at the International Supercomputing Convention, the world's oldest and one of the most important conferences for the high-performance computing community.

Prior to Cray, Inc., Kelley was the founding engineer for the start-up UTILX Corp. and was involved in the concept and commercialization through an initial public stock offering of proprietary technology used to install underground utilities without surface restoration. He also was director of engineering for FlowDril Corp., where he promoted leading-edge designs and analysis for high-pressure technology for the oil and gas drilling industry.

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Live Demonstrations, from page 18

StoneAge, Inc.

StoneAge, Inc. will be demonstrating the benefits of the new Sabertooth Flex-Lancing System. The new system will utilize automated positioning of a SpitFire shotgun tool as well as horizontal tube cleaning.

Stutes Enterprise Systems, Inc.

Stutes will be showcasing their new line of Quick Change convertible waterjetting units by Gardner Denver. These units can be converted from 10K-20K PSI with only removing the plunger and packing from the rear of the stuffing box saving time and money due to not removing the head, stuffing boxes and valves. 40K PSI change over only requires a quick manifold change. In addition, Stutes will demo the Stone Age BANSHEE nozzle cutting through concrete, rock and many others.

Terydon, Inc.

Terydon will demonstrate the NHR-1000, its rotary hose reel which enables tube cleaning with ultimate safety "no hands on the hose" operation, and confined entry operation at pressures up to 40k PSI.

TurtleSkin WaterArmor by Warwick Mills

Seeing is believing! TurtleSkin will provide a live demonstration of its MFA WaterArmor PPE system resistance to a UHP waterjet. This flexible component PPE system is the only product currently certified to meet the new proposed EN standard of a 40,000 psi, 2,800 Bar, 0 deg. waterjet at the standoff of 3 inches, 7.6 cm, and a swipe speed of 1.6 ft/sec., .5 m/sec. at a flow of 5.5 gal/min., 21 l/min.

FS Solutions and Super Products, LLC will also be participating in the Live Demonstrations.

Hydro-Excavation: Digging with Precision and Safety, from page 8

Applications

Virtually every construction contractor, municipality and utility does underground construction and/or has subsurface facilities. At times, a subcontractor with expertise or specialized equipment is needed to handle certain excavation jobs. There are many potential applications in which hydro-excavation is a viable option. These include:

- Line location, installation and repair for utilities and pipelines
- Sewer and pipe rehabilitation
- Telecommunications maintenance and repair
- Slot trenching
- Waterline maintenance and repair
- Directional drilling
- Sign and pole installation
- Landscaping (i.e., digging holes for new trees and shrubs)
- Repair work or excavation in tight spaces and congested areas
- Potholing

With hydro-excavation, buried natural gas and petroleum pipelines can be uncovered without risk of puncture. Fiber optic cables, telephone lines, water mains and other utilities can be efficiently located without damage. This method also causes less surface damage, traffic disruption and other potential digging drawbacks. Operators can use hydro-excavators to dig with precision, offering a less invasive method for slot trenching, potholing or pipe location. In grassy areas, sod can be replaced and, within a week, a casual observer would never know a hole had been dug there.

Cost/Benefit Analysis

To effectively evaluate the costs versus benefits of hydro-excavation compared to mechanical excavation methods, worksheets such as the ones on the next page can be used. The first worksheet in each of the two sets includes typical figures for the example shown. Use the second, blank worksheets to plug in your own numbers and compare conventional digging and hydro-excavation.

In most cases, a yard-for-yard comparison between a hydro-excavator and a bucket machine favors the bucket machine. However, the actual removing of the dirt is only a small part of the overall job.

Let's look at the following job as an example: Acme Utility Co. has contracted you to uncover a 2 ft. x 2 ft. area they believe to be six feet underground, then backfill with clean material and restore to its original condition.

Option 1

Option 1: Conventional method

Open hole with sloped sides to allow for legal hand digging for exposure of utility.

Operation	Time	Cubic Yards	No. in Crew	Amount
Unchain, unload & stage equipment	0.5 hr.			
Uncover utility	3 hrs.	13.3	4	
Backhoe, Dump truck				
Backfill (compacted)	2 hrs.	12.1		
Restoration (196 sq. ft.)	1.5 hrs.			
Reload equipment	0.5 hr.			
Totals	**7.5 hrs.**	25.4		

Operation	Time	Cubic Yards	No. in Crew	Amount
Unchain, unload & stage equipment				
Uncover utility				
Backhoe, Dump truck				
Backfill (compacted)				
Restoration (196 sq. ft.)				
Reload equipment				
Totals				

(continued on page 22)

Hydro-Excavation: Digging with Precision and Safety, from page 21

Option 2: Hydro-excavation method

Open hole for exposure of utility. There's no need to slope the sides, because this process keeps workers on the surface, not in the excavation.

Option 2

Operation	Time	Cubic Yards	No. in Crew	Amount
Park truck, turn on vacuum & water	5 min.			
Uncover utility	0.5 hr.	0.9	2	
Hydro-excavator				
Backfill (compacted)	25 min.	0.9		
Restoration (sod was cut & peeled back at start of excavating)	1.5 hrs.	1.2		
Totals	**2.5 hrs.**	3		

Operation	Time	Cubic Yards	No. in Crew	Amount
Park truck, turn on vacuum & water				
Uncover utility				
Hydro-excavator				
Backfill (compacted)				
Restoration (sod was cut & peeled back at start of excavating)				
Totals				

These tables illustrate the time, labor and cost savings between the different methods. The Option 1 crew will likely be occupied onsite almost all day, while Option 2's crew has time for multiple jobs in one day. This may or may not be a typical example in your area.

Cost/benefit analysis worksheets used with permission of www.safe-shovel.com.

Today's Technology

The most effective hydro-excavators today are dedicated units designed and built specifically for hydro-excavation. They combine high-pressure water systems that cut through and break up sod and soil with a high-flow air vacuum that lifts soil and small rocks out of the excavation area.

In the late 1990s, Vactor® Manufacturing saw that customers needed a dedicated machine, resulting in the Vactor HXX Hydro-Excavator introduced in 1999.

Fan System or Positive Displacement (PD) System

On most dedicated hydro-excavators available today, customers may choose either a fan system or a positive displacement (PD) blower as the vacuum source. Each has distinct advantages:

- A fan system moves an incredible amount of air, excavating more rapidly than other systems. It's also easier to operate and maintain, and the unit's overall weight is usually less. Also, fan units are generally less expensive than the PD versions.
- A PD blower moves air over longer distances and generates higher amounts of vacuum, allowing for excavation at greater depths, but at slower speeds, than fan units.

Vactor® Manufacturing understands that users often have unique applications that lead to a preference for one type of vacuum system, so both positive displacement blower and fan machines are available.

In either the fan or PD configuration, a simplified air-flow path design will maximize pickup and filtration effectiveness. Additional features that improve the unit's overall productivity include extendable or telescopic booms offering a wide range of rotation and mounted on the curb side, large-capacity water tanks and debris bodies, heavy-duty solid construction, heated pump and hose reel cabinets, convenient operator controls and tool storage.

Advantages of Hydro-Excavation (with the use of waterflow and pressure)

- Acts as its own lubricant
- Controls static electricity
- Avoids the sandblasting effect of air
- Works in almost all soil conditions
- Can be heated to excavate frozen ground

Advantages of Air Excavation

- No need to refill water tanks
- Dryer material for backfilling
- Very efficient for loose soil
- Faster clean-up time
- Compressor available for air tools

Vactor recommends in most cases using three to nine gallons per minute (gpm) of water volume for hydro-excavation. Contractors are paid to excavate the soil, not to dump debris, recover water or get more water. Therefore, using the proper water volume is cost-effective and saves time. In addition, the resulting debris has minimal water content, not a slurry as with systems using high water volumes, which often allows debris to be put back into the excavation.

Vactor recommends using water pressures between 1,500 and 2,000 psi. Pressure higher than 2,500 psi is unsafe. Operating a hydro-excavator at the proper water pressure virtually eliminates the chance of damaging line covers or casings, as well as operator injury.

(continued on page 25)

Free Mobile Phone App Calculator for Waterjetters

Terydon, Inc., has introduced a user-friendly mobile phone application utility calculator for waterjetters. The application consists of compiled formulas and equations that are used on a daily basis. Whether in the office or in the field, quick solutions for PSI, orifice size, metric conversion, and many more are available at the touch of a button.

For more information, visit www.terydon.com or email sales@terydon.com.

WJTA-IMCA Administration

Chairman of the Board
Bill Gaff
Email: bgaff@vactruckrental.com
Phone: (815)341-3171

President/Jet News Editor
George A. Savanick, Ph.D.
Email: gsavanick@frontiernet.net
Phone: (952)432-7594

Vice-President
Pat DeBusk
Email: pat.debusk@teaminland.com
Phone: (713)898-8098

Secretary
Hugh B. Miller, Ph.D.
Email: hbmiller@mines.edu
Phone: (303)273-3558

Treasurer
Larry Loper
Email: sales@highpressure.com
Phone: (800)289-7447

2011-2013 Directors

Kay Doheny
Email: kaydoheny@dohenysupplies.com
Phone: (800)336-4369

Kathy Krupp
Email: kakrupp@dow.com
Phone: (979)238-1032

Luis Garcia
Email: lgarcia@csmsupply.net
Phone: (281)471-3368

Gary Noto
Email: gary.noto@veoliaes.com
Phone: (713)307-2145

Mohamed Hashish, Ph.D.
Email: mhashish@flowcorp.com
Phone: (253)850-3500

Kerry Petranek
Email: kerry.petranek@stoneagetools.com
Phone: (970)259-2869

Forrest Shook
Email: shookfa@nlbusa.com
Phone: (248)624-5555

Association Managers

Mark S. Birenbaum, Ph.D. • Kenneth C. Carroll
Email: wjta-imca@wjta.org
Phone: (314)241-1445

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Hydro-Excavation: Digging with Precision and Safety, from page 22

Industry Outlook

Many facilities and areas in Canada have experienced intolerance to utility strikes and, as a result, they now rely heavily on hydro-excavation. The U.S. still has somewhat of a tolerance for hits as a "cost of doing business," although that's changing.

Enhanced enforcement from a government level may drive contractors increasingly toward vacuum and hydro-excavation in coming years. While legislation has been enacted in a few cities and states across the U.S., those examples are limited. However, many people in the industry say it's just a matter of time.

The vacuum excavation market will have to deal with plenty of unknowns in the near future — a recovery of directional drilling, the possibility of a fiber resurgence, and further legislation to prevent "hits" and enforce existing one-call regulations.

Conclusion

At the time of this publication, it looks like hydro-excavation will continue to grow in acceptance and popularity for the foreseeable future. Contractors are increasingly finding value in hydro-excavation for themselves and their customers. More municipalities are gaining confidence in the practice as new projects are completed.

Hydro-excavation can significantly reduce the unknown or unintended consequences from any project involving drilling, trenching or excavation. Whatever the future holds, hydro-excavation is here to stay and gaining ground.

Photographs courtesy of Vactor Manufacturing, Inc.

Article reprinted by permission from the Hydro-Excavation White Paper published by Vactor Manufacturing, Inc, 1621 S. Illinois St., Streator, IL 61364, phone: 815-672-3171, toll-free: 800-627-3171, fax: 815-672-2779, email: sales@vactor.com, web: www.vactor.com. Vactor Manufacturing is a division of Federal Signal Corporation.

NOTE: Tables on page 8 have been updated by WJTA-IMCA to reflect data for 2006-2011.

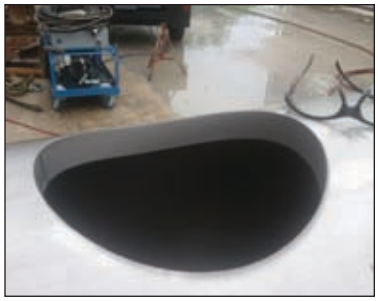
Frozen Ground Excavation

Inconel® Pipe Cutting Project, from page 10

from days to hours and left a fantastic cut quality with no heat affected zone."

Gleeson noted that his Jet Edge iP36-250DX intensifier pump performed flawlessly throughout the project, and said he was grateful for Jet Edge's referral.

"We like representing Jet Edge and are proud they trust our work quality enough to refer work to us," Gleeson said.



A close up of one of the 10-inch holes Midwest Mobile Waterjet cut into the Inconel pipe. Note the clean edge left by the waterjet. Photo courtesy Midwest Mobile Waterjet.

For more information about Midwest Mobile Waterjet, visit http://mmwaterjet.com or call 651-755-7089.

For more information about Jet Edge, visit www.jetedge.com or call 1-800-538-3343.

SSPC Updates PA 2, Revises Waterjetting Standard, from page 12

- Waterjet Cleaning of Metals: SSPC-SP WJ-3/ NACE WJ-3, Thorough Cleaning
- Waterjet Cleaning of Metals: SSPC-SP WJ-4/NACE WJ-4, Light Cleaning

Although now contained in separate standards, the definitions of the four surface cleanliness levels have changed very little from the definitions in the 2002 version of the standard. Clarification that permissible staining or tightly adherent matter must be evenly distributed over the surface has been added to WJ 2 and WJ 3. In addition, a clarification of "tightly adherent" (cannot be lifted with a dull putty knife) has been added to WJ 2, WJ 3 and WJ 4 definitions.

Descriptions of three degrees of flash rusting are provided in each of the waterjetting standards. These descriptions are based on the degree to which the rust obscures the carbon steel substrate and the degree of adhesion to the substrate, the color of the rust is no longer addressed. A non-mandatory appendix has been added to each standard describing two methods that may be used to assess the amount of flash rusting present on the surface. Each standard also contains examples of language that can be used in project specifications to establish the maximum amount of flash rust permitted on the surface prior to coating.

Copies of the 2012 Waterjetting standards may be downloaded from the SSPC Marketplace (www.sspc.org). Users may also be interested in obtaining copies of SSPC-VIS 4/ NACE VIS 7, Guide and Reference Photographs for Steel Surfaces Prepared by Waterjetting, and Recommended Guidelines for Evaluating Flash Rust. Both of these publications are available only in paper format, and contain color photographs that may be useful supplements to the four waterjetting standards.

For more information, visit www.sspc.org.

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.

WJTA-IMCA 2012 Expo

George R. Brown Convention Center • Houston, Texas

Wednesday, September 12
12:00 p.m.-2:00 p.m.

Understanding the Power of Vacuum and How Industrial Vacuum Loaders Work

by *"Professor" Phil Stein*

Geared to contractors, employees, and end users who use industrial vacuum equipment, are first-time users, or who are considering adding industrial vacuum technology to their services, this session will cover:

- Basic Types of Trucks
- How Pressure – High or Low – Works
- How to Measure Vacuum and Pressure
- Why Hose Diameter and Length is Important
- Viscous Materials
- Air Mover Configuration
- Special Operations
- When Things Go Wrong
- Major Safety Concerns

Stein has been working in the industrial and municipal cleaning industry since 1969. His specialized "Science Lab" presentations have been given to over 2,000 individuals since the training programs started in 1996.

All participants in the 9/12/12 vacuum session will receive a video recording of Phil Stein's presentation on CD-ROM, courtesy of the course sponsor **Vacuum Truck Rentals LLC**.

Comments Solicited on Improvements to Recommended Practices

Comments are solicited regarding improvements to the WJTA-IMCA publications, R*ecommended 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.

BART® – Barton Abrasive Removal Tool to be featured at IMTS 2012

Barton International will present live demonstrations of the Barton Abrasive Removal Tool (BART®) at IMTS 2012, September 10-15.

Introduced in 2010, BART® is a convenient, portable system for removing waste abrasive from waterjet cutting machines. The tool is designed to fit between the waterjet table's slats and can be operated while the waterjet is running, reducing downtime.

BART is easy to operate and achieves removal rates greater than 2,000 pounds an hour.

Visit IMTS booth N-6011 to participate in a demonstration.

For information visit www.barton.com, e-mail info@barton.com or call (800) 741-7756.

WJTA-IMCA Welcomes New Members

Corporate

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Terry Lyons
762 Lancaster Avenue
Bryn Mawr, Pennsylvania 19010
Phone: (610)525-7802

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William Deaton
P.O. Box 241427
511 Scholtz Road
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Phone: (704)529-8177
Fax: (704)529-5444

Paprima Industries, Inc.
Robert Brousseau
Dieter Hilker
Georges-Phillipe Cote
75 Guthrie
Dorval (Montreal),
Quebec H9P 2P1 Canada
Phone: (514)422-9555
Fax: (514)422-9777

Prisma CID, S.A. de C.V.
Cesar Ivan Guillen
Rio Coalcoman #46, Col. Lomas de Rio Medio
Veracruz, 91809 Mexico
Phone: [52](229)2000834
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Team Industrial Services
Clint Griffin
Dave Lothian
25 Bodrington Court
Markham, Ontario L6G 1B6
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Phone: (905)940-9334
Fax: (905)940-1626

Total Blasting
Bradley Storer
Mark van Heerden
24 Buwbes Street, Sebenza
Edenvale, Gauteng 1613
South Africa
Phone: (27)(11)4527578
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Corporate Individuals

Brent A. Cameron
Gardner Denver Water Jetting Systems
12300 N. Houston Rosslyn Rd.
Houston, Texas 77086
Phone: (281)448-5800
Email: brent.cameron@gardnerdenver.com

Individuals

Ayad Y. Noueyhed
Hajjan Trading and Industrial Services Company Ltd.
P.O. Box 991
Bugshan Center, Building #2,
3rd Floor, Prince Sultan Street
Al-Khobar, 31952
Saudi Arabia
Phone: [966](3)8820323
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Mark Parenteau
Premium Plant Services
3108 E. Beltline
Hibbing, Minnesota 55746
Phone: (218)263-4444
Email: mark@premiumplantservices.com

Wiliam Matozinhos Passos
Pyton Serviços Tecnicos
Ludwik Macal 985 Ap 101
Vitoria, Espirito Santo 29060030
Phone: [55](27)92393842
Email: wiliam.matozinhos@pyton.com.br

William Pratt
Mundy Companies
11150 S. Wilcrest
Houston, Texas 77099
Phone: (281)772-0921
Fax: (281)530-8561
Email: billpratt@mundycos.com

David Sweet
Mark III Plant Construction, Ltd.
1000 Hwy 90 East
Sealy, Texas 77474
Phone: (979)885-4141
Fax: (979)885-7174
Email: dsweet@mkiii.com

Scott A. Younger
Hi-Tech Industrial Services
5655 East U.S. Route 36
Suite C
Decatur, Illinois 62521
Phone: (217)864-1318
Fax: (217)864-1326
Email: scott.younger@hitechindustrial.com

Index of Advertisers

MultiCam® Inc. Appoints Chris Haltom as North American Sales Manager and Lance George as South Central Sales Manager

Chris Haltom has joined global CNC cutting system manufacturer MultiCam® Inc. as North American sales manager. He brings a strong machine and software background to his new position.

Chris Haltom

For 17 years, Haltom managed sales territories, manufacturer reps and distributors at several industrial companies, mostly in the Dallas area. Chris was district sales manager at THK America that serves the waterjet, plasma and router industries. At Avatech Solutions, he sold software products including AutoCAD.

"With his direct experience and dedication to increasing sales and serving our Technology Centers, Chris is a great addition to the MultiCam family," Director of Sales and Marketing John Harris said.

Haltom also handled sales for Nachi America Inc., General Bearing Corporation and Textron Power Transmission. He earned a Bachelor of Science degree in industrial distribution at Texas A&M University.

MultiCam Inc. also appointed **Lance George** south central sales manager in Memphis, Tennessee He has 20 years of experience selling routing/cutting equipment and software.

At Piedmont Plastics, George sold industrial-grade plastics to fabrication and manufacturing facilities. He was responsible for dealer and direct plotter and flatbed cutting equipment sales at Graphtec America in Santa Ana, Calif. George also sold routers and CAD software at Gerber Scientific Products in South Windsor, Connecticut.

Lance George

"In addition to Lance's wealth of industry knowledge, he has the experience and eagerness to serve our customers and meet higher sales goals," said North American Sales Manager Chris Haltom.

George earned a BA in marketing from the University of Memphis.

For more information, visit www.multicam.com, email sales@multicam.com or call (972)929-4070.

Jet Edge Receives Manufacturing Excellence Award

Jet Edge, Inc. was honored recently with the I-94 West Chamber of Commerce Manufacturing Excellence Award.

Awarded to a business or organization that delivers excellence in service to and/or operational practices within the manufacturing or industrial services sector, the award recognizes Jet Edge's sound business practices, utilization of industry systems, and leadership in its field when compared to industry benchmarks.

"We are honored to receive this prestigious recognition from the I-94 West Chamber," said Jude Lague, Jet Edge president. "It is a tremendous compliment to be recognized by our local business community, and humbling to be honored alongside some of our community's finest leaders and businesses."

Nancy Lauseng of Jet Edge and award sponsor Jeff Mueller of 21st Century Bank. Courtesy I-94 West Chamber of Commerce.

The 21st International

Water Jetting

Conference and Exhibition is coming to the Ottawa Convention Centre, Ottawa, Canada

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Or visit the Conference's website at:

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Safely delivering water at elevated pressures for cutting and cleaning applications demands reliable operation from your valves, fittings and tubing. It demands Performance Under Pressure. For over 50 years, HiP has been focused on producing a complete line of the highest quality valves specifically designed for just such waterjet applications.

We're committed to providing our customers with the consistent quality and responsive service that helped us earn ISO9001 certification. We stock an extensive inventory of valves and accessories, allowing us to offer same day shipping of many products. For special orders, including custom manifolds, we have short lead times and experienced engineering assistance.

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