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### Vacuum Truck Safety Practices



The WJTA is working with the industrial vacuum industry to compile a manual of best safety practices for industrial vacuum truck operators. One such safety practice, shown at left, is the placement of an in-line vacuum relief valve (also referred to as a safety Tee) as close as possible to the working end of the vacuum hose whenever the hose is manipulated by hand. See a draft of the vacuum safety manual table of contents on page 13.

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### In Remembrance of William C. Cooley

William Crockett Cooley, rocket scientist, mechanical engineer, founding member of the WaterJet Technology Association (WJTA), and WJTA Pioneer Award winner, died in Anaheim, California, on October 27, 2006, after a long struggle with Alzheimer's disease. He was 81.

Dr. Cooley was born in Lakeland, Florida, in 1924 and raised in Randolph Center, Vermont. He graduated from Green Mountain College before joining the Navy V12 Program at the Massachusetts Institute of Technology (MIT), where he received a Baccalaureate degree in mechanical engineering in 1944. He then earned a Master's degree in aeronautics from the California Institute of Technology in 1947. He went on to receive a doctorate (ScD) in mechanical engineering from MIT in 1951. Dr. Cooley was a pioneer in jet propulsion technology. His career spanned 45 years from his early years as a rocket scientist with the Navy, North American Aviation in Los Angeles, and Fairchild Engine and Airplane Co., Ltd. He also worked at General Electric in Cincinnati as a nuclear propulsion engineer. In 1959, he joined NASA, where he became chief of the space propulsion and auxiliary power program. Dr. Cooley was a long-time resident of the Washington DC area.

In 1963 he left NASA to become technical director of an engineering firm, Exotech, Inc., where he served as project manager for the development of the first repetitivefiring water cannon in the U.S. He then founded his own engineering consulting firm, Terraspace, in Rockville, Maryland, which he directed from 1968-1984.



William C. Cooley cuts the first slice of a festive cake commemorating the WJTA's 10th Anniversary in 1993.

At Terraspace he directed research in hydraulic mining technology; the design of a jet cutting system for granite; correlation of data on liquid cutting of rock and other materials; fabrication and testing of a water cannon for rock cutting and hydraulic bursting for the excavation of rock and concrete. During this time, Dr. Cooley was a pioneer in acquainting the Western world with the advances in waterjet technology achieved in the former Soviet Union. He was instrumental in translating many Russian books, and he published a summary of their basic findings.

Dr. Cooley worked as an associate professor of computer science and engineering at George Mason University in Fairfax, Virginia, from 1985-1991. He was active in the Learning In Retirement Institute where he served as a board member, studied, and taught. He also tutored high school students as a volunteer. A lifelong skier, Dr. Cooley won awards from NASTAR when competing as a senior. He enjoyed playing tennis, ballroom dancing, swimming, and, in his later years, wrote poetry.

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### It All Started With Them!



Twenty-three years ago in Rolla, MO, the WaterJet Technology Association's first board of directors was elected during the Second U.S. WaterJet Conference. Elected were: Front row, left to right -- Dr. David Eddingfield, secretary; Dr. Fun-Den Wang, president; Dr. William Cooley, chairman of the board; Dr. George Savanick, board member; Back row, left to right -- Dr. David Summers, vice president; and Dr. James Riechman, board member. Robert Evans, treasurer, is not pictured.

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### **KMT Acquires Two American Companies**

MT has acquired Robotic Production Technology (RPT), a leading robotic trimming solutions provider in North America, as well as H2O Jet Inc., a US-based manufacturer and distributor of pumps, spare parts and components for waterjet equipment including diamond nozzles. The combined annual revenue of the acquired companies amounts to approximately SEK (Swedish Krona) 300 million.

As a result of the acquisitions, KMT becomes a global leader in robotic waterjet and trimming applications, including waterjet pumps for automotive applications and the spare parts market. KMT also gains process knowledge in trimming applications outside waterjet technology, such as laser cutting and router- and knifetrimming. Through the acquisition of RPT, KMT Cutting Systems will have a global reach and its sales will more than double. RPT's growing non-automotive business provides KMT with a greater ability to access this business in both Europe and North America.

"By combining KMT Cutting Systems' and KMT Waterjet Systems' existing organizations, international experiences and distribution channels with RPT's strong brand, and H2O Jet's strong know-how in nozzle technology, we see considerable growth opportunities globally. Moreover, the acquisitions of RPT and H2O Jet will create cost synergies with KMT's Waterjet Product Area, as well as providing access to new exciting market segments with significant potential," says Lars Bergström, president and CEO of KMT.

Both companies were consolidated in the KMT Group as of December 1, 2006, as part of the Waterjet Product Area, where RPT will be consolidated with KMT Cutting Systems, and H2O Jet with KMT Waterjet Systems. The total purchase price for both companies amounts to USD \$36 million, with an additional earn-out of maximum USD \$2 million based on the financial performance for the year 2007. The acquisitions will be financed through a bank loan. A preliminary acquisition analysis will be reported in the year-end report, scheduled for release on February 15, 2007.

The two acquisitions will have a negligible effect on KMT's profits in 2006, but will have a positive impact on earnings from 2007 and onwards. Management for both companies will remain working for KMT following the acquisitions.

Privately owned Robotic Production Technology (RPT), based in Auburn Hills, Michigan, is a leading turnkey robotic manufacturing systems provider in North America. Established in 1986, the company specializes in high precision trimming applications such as waterjet cutting, router trimming and laser cutting. The served market segments include aerospace, appliance, automotive, composites, construction, consumer goods, marine and plastics industries. The global market size for its business is estimated to be USD \$100 million with an estimated annual growth rate of 3-5%. RPT has a staff of 80 employees and an annual turnover of approximately USD \$35 million with good profitability. The business has an installed base of approximately 3,000 robotic systems.

H2O Jet Inc., founded in 1991 and based in Olympia, Washington, is a privately owned custom manufacturer of high pressure waterjet cutting products and waterjet pump replacement parts. H2O Jet is a

(continued on page 16)



WJTA on the web: www.wjta.org

December 2006



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### Portland Cleans Sewer Line With High Pressure Waterjets

When Portland, Oregon, needed to increase the flow rate through one of its sewer lines, the city decided to put a sleeve in the line to reduce the pipe diameter. In order to slip the sleeve into place with a good fit, CCS (A Division of PNE Corp.), was called in by the lead contractor to clean the existing 102-inch diameter line.

Based in Longview, Washington, CCS has a total of five offices throughout the northwest. CCS's most distinct operations include environmental emergency response (land and marine), industrial cleaning, commercial sweeping, hazardous and non-hazardous disposal and environmental and ecological services.



A rigid lance from the hose of a Jetstream high pressure pump was attached to a skid steer bucket, so that the loader could be used to pull the hose through the pipe while keeping the jets centered.

"The project was tailor made for one of our Jetstream high pressure pumps," says Matt Worel, Longview division supervisor for CCS. "We hooked up a 2D head to a rigid lance." The 2D head was designed to spray high pressure water in two horizontal directions in a way that covers the entire circumference of the interior of the pipe, according to Worel. The 2D head involved a standard rigid lance with a T connection at the end. Each side of the T extended out from the center and was mounted with a head attachment that directs the spray. As the head was spun, the water blast covered the full diameter of pipe.

"The challenge then was how to pull 700 feet of hose through the sewer line," says Worel. CCS has tackled projects like this in the past and the solution they developed involves attaching the head and lance to the bucket of a skid steer loader with the

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#### Portland Cleans Sewer Line With High Pressure Waterjets, from page 6



Skid steer loader emerges from sewer line after pulling hose from Jetstream high pressure pump used in the cleaning of the pipe's interior surface.

hose trailing behind. With the sewer line opened at both ends, the crew was able to lower the skid steer loader into one of the openings and move forward to the second opening while cleaning the pipe as it went.

To begin the cleaning once the skid steer loader was in position, the operator raised the bucket so that it was approximately in the center of the pipe. This was low enough to give the operator excellent visibility over the bucket and high enough for the spray to clean the entire interior surface of the sewer line wall as planned.

With the lance in position on the raised bucket, the operator began the cleaning operation, using the muscle of the skid steer loader to pull the hose behind the machine.

"Using the skid steer loader moves the hose more efficiently and is less labor intensive," says Worel.

#### 10,000 PSI powers away build-up

The cleaning project involved a Jetstream 10,000 psi, 260 horsepower diesel-powered high pressure pump equipped with a work bench and vise. While the unit is equipped with a conversion feature that allows it to be set up for as high as 40,000 psi, this application required a lower psi, reports Worel.

CCS relies on its Jetstream high pressure pumps at or near the 40,000 psi mark when working on projects such as heavy tank cleaning or a surface prep project. They also report using high pressure waterjets when preparing steel for xray and inspection.



Jetstream high pressure pump delivers the waterjets needed to clean a section Portland's sewer line in preparation for the installation of a sleeve.

Among the more unusual projects CCS has been called upon to perform, was the cleaning of grain from the hold of a ship. In this case, the project involved some of the company's six Guzzler vacuum loaders.

"We rely on newer equipment," says Worel. "When municipalities are depending on you 24/7 for emergency work, you have to show up with equipment that works."

"Minor breakdowns are inevitable when the equipment is used as often as ours, but Jetstream makes it easy to repair on the spot, so we don't lose much time on the job," adds Steve Johnson, Industrial Services Division manager for CCS. "The relationship between CCS and Jetstream keeps us coming back. We know they are there to serve us, and they go above and beyond to answer our questions and make sure we have a full understanding of how their product will help our business grow."

"Each year we purchase a new Guzzler to provide our customers the benefits of the features this equipment has to offer," says Johnson. "We pride ourselves on safety and training at CCS, and value the training techniques Guzzler has offered."

"Like Jetstream and Guzzler, Vactor is also a step ahead in quality and production. Its training technique is an asset to our new hire training program," reports Johnson.

"With constant industrial and mill type work, CCS knows the importance of a strong fleet," says Johnson. "The Federal Signal brands, like Jetstream, Guzzler and Vactor, provide CCS with the dependability and power we've come to expect from our equipment."

#### IMPORTANT NOTICE REGARDING SPAM

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

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# Trim Tool & Machine Cuts Ahead Of The Competition With Jet Edge Abrasive Waterjet

*O* ne of the nation's largest steering wheel trim die manufacturers routinely cuts 4 to 6-inch thick heat-treated steel with abrasive waterjet.

If you've driven a car, truck or SUV lately, chances are the trim die used to make your steering wheel was manufactured by Trim Tool & Machine, Inc. of Cleveland, Ohio.

In business since 1999, Trim Tool & Machine is a traditional mom and pop shop that offers abrasive waterjet cutting, CNC milling, stamping and diecast tooling, and machine building. The eight-person company serves a wide range of industries, from automotive to arts and architecture, and prides itself on its ability to turn work around within two to three days of an order, or even the same day, if necessary.

"We turn work around for people," says owner Dane Willis. "We get it in there and get it done. If the customer needs it today, we get it done. I will stay late and operate the equipment myself. We do the job when we say we are going to do it."

Trim Tool & Machine specializes in gages, fixtures, trim dies, special machines, custom metal art and repairs, but is best known as one of the largest producers of steering wheel trim dies in the United States. In fact, the company has produced trim dies used by nearly every auto manufacturer in the country.

A trim die is a specialized stamping tool made of thick hardened steel that is used to trim away excess metal from diecast castings, creating precise and consistent parts. While many companies use wire EDM to cut their trim dies, Willis says he uses a Jet Edge abrasive waterjet system because it is much faster and more costeffective.

"That gives me a competitive edge," Willis notes. "With waterjet it costs \$3 to \$5 to cut

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The material is 6-inch thick 4150 heat-treated to 28/32 RC. The piece being cut is an internal component for a trim die.



#### Trim Tool & Machine Cuts Ahead of Competition, from page 9

one inch versus \$10 to cut with wire. It's twothirds more to wire cut something. You can utilize wateriet for about 85 percent of the die."

While waterjet is best known for cutting thinner materials, Trim Tool & Machine routinely uses their system to cut thick hardened metals, including 9-inch thick 4140 heat-treated steel.

"We typically cut 4 to 6 inches all day long," Willis says. "Anyone that comes in says 'wow, you cut thick.' We cut more thick steel than anybody. We design around it, and utilize spacers, if necessary, to reduce the taper."

Five years ago, to set himself apart from the competition, Willis invested in a 4-foot by 8-foot precision high-rail gantry waterjet system manufactured by Jet Edge of St. Michael, Minnesota. The machine is powered by a 50-



Upper half of a trim die. Waterjet was used to cut the outside cutters, stripper and punch spacers. Trim die was produced for Magnesium Aluminum Corporation of Cleveland, Ohio.

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#### Trim Tool & Machine Cuts Ahead of Competition, from page 10

horsepower Jet Edge intensifier pump capable of producing up to 60,000 psi of ultra-high pressure water. Willis equipped his Jet Edge system with an extra large 5-foot by 13-foot tank to allow for future expansion with a spreader bar.

"I bought the largest and best one I could," he says.

Willis researched numerous waterjet systems for several years before deciding on Jet Edge. The system's bridge-style overhead gantry appealed to him, as did Jet Edge's commitment to customer service.

"I was a one man show, and to be perfectly honest, Jet Edge was one of the only companies that talked to me," he recalls. "It looked like it was constructed better, and upon researching it, everyone raved about the pump."

Willis says Jet Edge has exceeded his expectations, and that when a friend asked him what type of machine he should buy, he told him he could only recommend three manufacturers, but that he would go with Jet Edge over the other two, mainly because of the company's excellent support.

"Jet Edge has been very good," he says. "The support has been good, the sales staff has been great and the service staff has also been great."

Willis says his Jet Edge system has helped him increase productivity and reduce costs, saving customers' thousands of dollars and enabling him to expand his business.

"We have been able to maintain the cost of tooling despite the steel

increase because we are using waterjet," he notes.

Willis recalled one project where a customer needed to have twentyeight .281- inch holes cut in half-inch thick hardened A-2 material. He was able to do the project for only \$90 with his Jet Edge system.

"For someone to burn it or carbide it, it would have been hundreds of

#### (continued on page 12)

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#### Trim Tool & Machine Cuts Ahead of Competition, from page 11

dollars," he says. "Waterjet can tackle hardened steel."

Trim Tool & Machine also has saved its stamping industry customers thousands of dollars by using its Jet Edge system to cut precise stamping strips that customers can use to make sample hits prior to making final adjustments to the cuts in the die.

"It saves them thousands of dollars in tryout time," Willis says. "The waterjet mimics the stamping process perfectly. Laser and plasma leave a case-hardened edge. When I talk a customer into waterjetting, they never go back to laser or plasma."

Willis notes that his Jet Edge system has resulted in a huge boom to his business, and that his sales doubled the first year after he bought his waterjet.

"At that point I was able to start hiring people," he says. "I believe I would not have survived the post-911 industrial crash if I hadn't



Group photo: from left to right, John See, Art Cramer, Dave Spoonamore, Rick Steimle, Fred Willis, Dane Willis, Jon Wojcik, Mike Chatal and Ben Nowagarski.

had the waterjet. Without the waterjet, there is no way we would have been able to grow."

**For more information, contact:** Trim Tool & Machine, Inc., 216-889-1916, trimtoolmachine@aol.com or Jet Edge, Inc., 1-800-JET-EDGE (538-3343), sales@jetedge.com, www.jetedge.com.

### **Vacuum Truck Safety Practices**

The WJTA committee developing a recommended safety practices document for industrial vacuum operations is continuing its work on the text and illustrations. Excerpts from the draft document appear below, including the draft introduction and table of contents.

#### 1.0 Introduction. This

compilation of best safety practices for industrial vacuum truck operation was developed by gathering the opinions of the industrial vacuuming industry as to what practices should be followed in order to use industrial vacuum trucks safely. These Recommended Practices are what we believe to be consensus safety practices for industrial vacuum trucks.

**1.1** The purpose of these Recommended Practices is to improve the level of safety in the operation of industrial vacuum trucks and to provide a basis for safety training of vacuum truck operators.

The committee invites your comments and suggestions regarding topics and issues that could be included in the recommended safety practices document. Please address your comments and suggestions to:

Recommended Safety Practices for Vacuum Operations c/o WJTA 906 Olive Street, Suite 1200 St. Louis, MO 63101-1434 Phone: 314-241-1445 Fax: 314-241-1449 Email: wjta@wjta.org

#### Recommended Practices for Industrial Vacuum Services Draft Table of Contents

#### 1.0 Introduction

1.1 Purpose

#### 2.0 Types of Trucks

- 2.1 Wet/ Dry Vacuum Trucks
- 2.2 Dry Vacuum Trucks
- 2.3 Wet Vacuum Trucks (each of these to include recommended practices, method [pump, suction])
- 2.4 Liquid, Air Machines and Dry Vacuum Combo

#### 3.0 General Safety

- 3.1 Do's and Don't's
- 3.2 Seeking Medical Attention
- 3.3 Variable Hazards
- 3.4 Constant Hazards
- **4.0 PPE** (to include hard hat, safety boots, gloves, hearing protection, safety glasses and fall protection (top of truck))

#### 5.0 Training Requirements

5.1 Hazcom/WHMIS

#### 6.0 Operational Requirements

- 6.1 Operational Checklist
- 6.2 Tie-Down Requirements
- 6.3 Confined Space Safety (Vacuum Trucks)
- 6.4 Vacuum Relief Valves
- 6.5 Cross Contamination
- 6.6 Last Contained Commodity
- 6.7 Wheel Chocks
- 6.8 Safety Tee/ Lanyard/ Vacuum Breaker
- 6.9 Grounding/ Bonding
- 6.10 Signage
- 6.11 Equipment Set-Up (Movement and Transportation)

#### 7.0 Loading/Offloading

- 7.1 Hazards
- 7.2 Methods
- 7.3 Pinch Points

#### 8.0 Material Handling

- 8.1 Awareness
- 8.2 Material Containment
- 8.3 Carbon Steel vs. Stainless Steel
- 8.4 Caustics/Acids

#### 9.0 Hoses and Fittings

- 9.1 Types
- 9.2 Hose Size/ Capacity
- 9.3 Connections/ Clearing/ Handling
- 9.4 Minimum Hose Requirements
- 9.5 Compatibility
- 9.6 Sharp Edges
- 9.7 Maintenance and Inspections

#### 10.0 Vacuum Team Responsibilities

- 10.1 Truck Operator
- 10.2 Hose Operator
- 10.3 Laborer

#### 11.0 Emergency Shutdown

- 11.1 Procedures (Manufacturer Specifications)
- 11.2 Equipment and Worksite
- 11.3 Communication

#### 12.0 Accidents

- 12.1 Injury Potential
- 12.2 Damage
- 12.3 Explosion

#### 13.0 Certifications

- 13.1 Schedule
- 13.2 Pressure Vessel
- 13.3 DOT Regulations
- 13.4 VIPKT
- 13.5 Placards
- 13.6 Weight (Local Requirements and Awareness)
- 14.0 Glossary (to include symbols, decals, trucks vs. products chart, etc., and definitions [for example, define combo machine, high pressure water, vacuum breaker, safety tee and sewer flusher, etc.])
- 15.0 References

#### William C. Cooley, from page 2

Dr. Cooley's involvement with the WJTA began at the beginning of the association. He participated in the first meeting of the WJTA on May 24, 1983, at the University of Missouri -Rolla. At that meeting Dr. Cooley was elected to be the first chairman of the WJTA Board of Directors. In 1985 the WJTA awarded Dr. Cooley its highest honor - the Pioneer Award for his outstanding contributions to the field of waterjet technology. In 1993 Dr. Cooley led the WJTA 10th Anniversary celebration during a dinner cruise and awards banquet held aboard the Spirit of Puget Sound. This dinner cruise was held in conjunction with the 7<sup>th</sup> American Waterjet Conference, August 28-31, 1993, in Seattle, Washington.

In 1998, Dr. Cooley delivered the keynote lecture at the 5<sup>th</sup> Pacific Rim International Conference on Water Jet Technology in New Delhi, India.

Dr. Cooley lived in Montgomery County, Maryland, for over 25 years before retiring in Fairfax, Virginia, in 1991, and moving to California in 2004.

Dr. Cooley is survived by a brother, Robert Cooley, of Taos, New Mexico, and four children: Jean Cooley of Forks, Washington; Brian Cooley of Mequon, Wisconsin; Stuart Cooley of Newport Beach, California; and Laura Cooley of Seattle, Washington. Dr. Cooley is also survived by three grandchildren.

Contributions may be made in Dr. Cooley's behalf to neuroscience research through the UCI-Institute for Brain Aging, 1113 Gillespie, Irvine, California 92697-4540.

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Hotel Reservations at the Marriott Houston Westchase. The Marriott Houston Westchase, 2900 Briarpark Drive, Houston, Texas 77042, is the central location for the WJTA Conference and Expo activities. The Marriott is a **smoke-free** facility. For reservations, call toll-free **1-800-452-5110** or contact the Marriott directly at **1-713-978-7400**. Be sure to identify yourself as attending the WaterJet Technology Association Conference to receive the special group rates of **\$109 single/\$119 double occupancy**. August 10, **2007**, is the deadline for guaranteed room availability. Reservations received after August 10, 2007, will be confirmed on a space available basis. Rooms may still be available after August 10, but not necessarily at the rates listed above.

The Hilton Houston Westchase, an alternate hotel, is located two blocks from the Marriott at 9999 Westheimer, Houston, Texas 77042. Smoking and non-smoking rooms are available. For reservations, call 1-713-974-1000. Be sure to identify yourself as attending the WJTA Conference to receive the special group rate of \$114 single or double occupancy. August 6, 2007, is the deadline for guaranteed room availability. Reservations received after August 6, 2007, will be confirmed on a space available basis. Rooms may still be available after August 6, but not necessarily at the rates listed above.

Visit WJTA's website, www.wjta.org, for updated Conference information or contact: WJTA, 906 Olive Street, Suite 1200, St. Louis, MO 63101-1434, phone: 314-241-1445, fax: 314-241-1449, email: wjta@wjta.org



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Services Co. Issam Abu-Hamad Petrus Van Gestel Wassim Abu-Hamad PO Box 5238 Manama Kingdom of Bahrain Phone: [973] 17-623723 Fax: [973] 17-624082

#### Individual

#### Dave Coons Motive Systems, Inc. 442 Sherwood Road PO Box 668

Paso Robles, CA 93447-0668 Phone: (805) 238-7122 Fax: (805)238-0436

#### **Corporate Alternate**

Colin Addison Hydrolink Co. Ltd. PO Box 21327 Port Khalid, Sharjah United Arab Emirates Phone: [971] (6) 5280801 Fax: [971] (6) 5280830

#### Lindsey R. Adkins

IVS Hydro Inc. 15903 Emerson Avenue PO Box 245 Waverly, WV 26184 Phone: (304) 464-4340 Fax: (304) 464-5612

Peter Anestis Pratt & Whitney Automation 113 Wells Street, M/S 802-39 North Berwick, ME 03906 Phone: (207) 676-4236 Fax: (207) 676-4234 Corporate Alternate (continued)

#### Jerry Carter SPIR STAR 10002 Sam Houston Center Drive Houston, TX 77064 Phone: (281) 664-7800 Fax: (281) 664-7850

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#### **Corporate Individual**

Joseph Brown Taplin Plant Services 5100 West Michigan Avenue Kalamazoo, MI 49006 Phone: (269) 375-9595 Fax: (269) 375-2830

#### **KMT Cutting Systems Wins Order From Boeing**

**K** MT Cutting Systems AB has won an order from Boeing, the world's leading aerospace company and the largest combined manufacturer of commercial and military aircraft. The new order further strengthens KMT's share of the aerospace market, and it is KMT's first sale to Boeing.

Under the new order, KMT Cutting Systems will construct, assemble, deliver and install a complete robotized abrasive waterjet cutting system for use by Boeing Fabrication at its plant in Auburn, Washington, USA, building parts for the Boeing 787. Delivery will take place during the first quarter of 2007.

Ulf Andersson, project manager for KMT Cutting Systems, says: "The new Boeing order includes additional equipment, fixtures and programs for machining of details in titanium alloys used in the engine nacelles of the new Boeing 787 Dreamliner. The new Boeing order represents a major success in the ongoing business development programmed at KMT Cutting Systems, to expand the company's products and service solutions into other markets beyond its traditional stronghold in the global automotive industry."

"It is very pleasing to see that the work we are putting in at KMT Cutting Systems to expand the solutions we offer to markets beyond automotive is really bearing fruit," says Sten Camitz, president of KMT Cutting Systems. "We see great potential in the aerospace industry and the latest order from Boeing shows that we're on the right track. Since the demands of the aerospace industry are very high in terms of technology, accuracy, quality and reliability, it's very satisfying that Boeing chose KMT Cutting Systems for this project."

Robotized abrasive waterjet cutting is designed for cutting harder materials such as metals, glass fiber and ceramic materials. A fine abrasive is added to the high-pressure waterjet, which cuts materials through a process of microerosion. Typical industrial applications include deburring and grinding of castings, trimming of titanium alloys, glass fiber and composite details or cutting larger metal tubes.

KMT Cutting Systems AB, a fully owned subsidiary of the industrial group, KMT, is a leading supplier of robotized waterjet cutting, routing and cleaning systems to the automotive and general industries.

#### KMT Acquires Two American Companies,

from page 4

pioneer in the development of diamond nozzle technology for Ultra High Pressure (UHP) applications – as one of only two companies in the world – and leads the industry in the implementation of this extremely durable and cost effective technology. In addition, H2O Jet supplies components and replacement parts for waterjet cutting equipment, along with the H2O Jet family of Advantage UHP Intensifier Pumps. H2O Jet has a staff of 30 employees and annual sales of approximately USD \$10 million, of which the majority of sales are derived from the aftermarket segment. The company enjoys good profitability.



### Enhanced Abrasive Waterjet (AWJ) Cutting Through Modulation

The research community of the waterjet industry is constantly striving for improvement of productivity and quality of cut. One of these efforts was from Henning and Westkamper\*, on enhancing AWJ cutting through modulation. Here are the highlights.

Two main characteristics that affect AWJ quality of cut are jet lag and striation marks. Striation marks mainly affect the appearance of the part while jet lag will cause inaccuracy around corners and small arcs. Currently reduction of jet lag and striation is done by reducing the cutting speed. In this experimental study, three kinds of modulation were tested, targeting reduction of jet lag and striation without reducing the cutting speed. Two of these were done by superimposing a constant linear cutting speed with a sineoscillation, parallel or perpendicular to

the cutting direction. The average cutting speed was kept unchanged. The oscillation frequency varied from 0.5 to 3 Hz and amplitude from 0.3 to 1.2 mm. The third modulation was done by periodically interrupting the abrasive flow while maintaining the same average flow rate. The interruption frequency was 1 Hz. The proportion of Off time-vs-On time varied from 1:2 to 1:10.

Among the three modulations, the parallel oscillation has the most favorable impact on jet lag and striation. Significant jet lag reductions were shown for all the tested oscillation frequencies and amplitudes while low frequencies were slightly better.

Perpendicular oscillation and abrasive modulation also showed slight reduction of jet lag. Striation magnitude was also reduced with parallel oscillation, but not as significant as the jet lag reduction. Small oscillation amplitudes (0.3 and 0.6 mm) and high frequency (2.5 Hz) produced the best result for striation reduction. Striation got worse with perpendicular oscillation and toggling abrasive had a mixed result, with the best result achieved at 1:6 OFF/ON ratio. For overall performance parallel oscillation at high frequency and low amplitude was recommended.

\* Henning, A. & Westkamper, E. (2003) Modulation of cutting operation with abrasive waterjets, Proceedings of the 2003 WJTA American Waterjet Conference, Houston, Texas, USA, August 17-19, Paper 5-G.

Article reprinted with permission from the *Quality Waterjet Newsletter*, September 26, 2006, published by QualJet LLC, www.qualjet.com.



#### Innovative Uses Of Abrasive Waterjets (AWJs) For Glass Artworks

T his article reviews the work of V. Cutler\* on the use of AWJs for glass artworks.

Abrasive waterjet cutting often requires piercing starting holes. These starting holes are made by allowing the jet to dwell long enough to go all the way through the material. A blind hole can be made by controlling the time of pierce.



Cutler made an array of such blind holes on a piece of glass to create an effect of "a bed of white nails burying themselves into the material" (pictured above). To avoid cracking the glass, piercing should be done at low pressure. However, cracking can also be caused by internal stresses of the glass. Cracking caused by stresses can occur right away or at a much delayed time. These cracks often initiate at top surface or halfway below. A piece of highly stressed glass can be identified under a spectrometer, which makes the stress condition visible to human eyes. The glass should be annealed fully throughout before piercing and cutting.

AWJs were also used by Cutler to cut joined-up text and handwritten text to create glass artworks designed by other artists. A joined-up text artwork was made on a piece of 6 mm thick Float glass, 2400 mm in height and 700 mm in width. It consists of the text "I am fine" in Times New Roman font and in decreasing scale as it ascends the height **(pictured below)**. Once cut it was slumped to create an irregular effect.



Another piece of artwork was joined-up handwritten text. This type of artwork presents several challenges to abrasive waterjet cutting. Fragility was one. Because the thickness of the lettering varied between 1 and 4 mm, the work was extremely delicate and difficult to move once cut. Stability was another. The fragility of the glass made the entire shape unstable and the handling difficult. Programming was very complex, especially for the handwritten text. Because of limitation of the machine and also the risk associated with various factors (e.g. operator fatigue, abrasive shortage, etc.), the cutting was broken down to several programs.

Another innovative use of AWJs was to create "Scribbles" on glass (see below). The complexity of programming was emphasized.



\* Cutler, V. (2006) An investigation into the creative uses of waterjet and the difficulties encountered through the development of personal artwork and artworks for other artists working with glass, in Peter Longman (Ed.), Proceedings of the 18<sup>th</sup> International Conference on Water Jetting, Gdansk, Poland, September 2006, pp 213-226.

Article reprinted with permission from the *Quality Waterjet Newsletter*, October 31, 2006, published by QualJet LLC, www.qualjet.com.

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

Please address your comments and suggestions to: Safety Committee, c/o WJTA, 906 Olive Street, Suite 1200, St. Louis, MO 63101-1434, phone: (314)241-1445, fax: (314)241-1449, email: wjta@wjta.org, web site: www.wjta.org.

### WARDJet's Pneumatic Drill Mount

Aterjet cutting can be a valuable tool to many fabricators, but there are certain materials that have always proven difficult to work with. Some materials such as laminated shim stock, certain laminated composites and phenolics, may de-laminate during the waterjet piercing process. WARDJet's Pneumatic Drill allows a hole to automatically be drilled through the material at a specific offset from the waterjet cutting head. Once the hole is drilled, the waterjet will then start the cut inside the pre-drilled hole. The CAD/CAM program, IGEMS, can automate this entire process. In order to use this tool, an air compressor capable of 25 cfm at 90 psi must be provided. This will allow these materials to be cut regardless of any necessary holes.



This unique drill feature also comes in useful when cutting high tolerance holes in various steel and stainless steel materials. By using the reaming capabilities, a customer can pierce the initial hole with the waterjet and then come back and ream it out to get the higher tolerances that are required. This can be substantially faster than using a waterjet alone to create these higher accuracy holes.

The pneumatic drill feature is available to be mounted on any WARDJet waterjet cutting system. This is just one of many unique features that WARDJet offers to allow their waterjet to be used in a variety of applications. If you have a difficult application, give WARDJet a call and see what they can offer as they work with you and your team to find the best solution possible.

For a free brochure, contact: Julie Kaiser or Ben Gerhardt, WARDJet, Inc., P.O. Box 517, Tallmadge, OH 44281, USA, ph: 330-677-9100, fax: 330-677-9121, email: sales@wardjet.com or visit www.wardjet.com.

### Jetstream Upgrades Durasafe Control Guns

J etstream of Houston recently released improved handle assemblies for the popular DuraSafe series of hand control guns. The upgrades feature a redesigned trigger linkage that reduces the force required to properly engage the valve by fifty percent.

Standard on all new DuraSafe shutin and dump style hand control guns, the new handles are also available as simple bolt-on retrofits for existing guns to take advantage of the improvement.

"The reduction in required trigger force lessens operator fatigue and increases valve cartridge life by making it easier for an operator to maintain the force needed to securely engage the valve," says Mike Bullard, parts marketing specialist, Jetstream.



"We spend a great deal of time looking for ways to reduce the energy required to perform waterblasting tasks because evidence clearly indicates that it helps the operator remain more alert and allows them to work more safely and effectively."

Jetstream is widely recognized for several significant advancements in waterblast control gun design, most notably the introduction of the cartridge-style valves for fast, easy field maintenance and hydraulicallybiased valving for safer, more positive operator control. The company has manufactured innovative control guns for more than twenty years and launched production of the versatile DuraSafe series in 1998.

Jetstream manufactures industrial high-pressure waterblasting equipment for pressures up to 40,000 psi (2750 bar) for use in a wide range of applications, including industrial cleaning and surface preparation. Product offerings include a complete line of skid- and trailer-mounted pump units, control guns, valves, nozzles, hoses, and replacement parts.

For more information, call 800/231-8192, or visit Jetstream online at www.waterblast.com.

### **Nominations Open For WJTA Board Of Directors**

**64** N ominations for the WaterJet Technology Association (WJTA) Board of Directors are now open," says WJTA Secretary Craig Anderson. "The duties of the directors are truly challenging and rewarding."

The terms of office of Craig Anderson, Pat DeBusk, Lydia Frenzel, Ph.D., Larry Loper, Forrest Shook, and John Wolgamott will expire in August 2007. In addition, the recent resignation of Dr. David Summers from the board has resulted in a seventh open position. Therefore, nominations are sought for seven (7) board members. Six (6) board members will be elected to serve a fouryear term of office beginning August 17, 2007. The candidate receiving the seventh highest number of votes will be elected to complete Dr. David Summers' unexpired term of office and will serve the remaining two years of the four-year term ending August 2009.

The WJTA bylaws provide that no more than one of the elected board members may be from the same company or organization. Therefore, board members may not be nominated from the same company or organization already represented on the board by individuals whose terms expire in 2009, including the Colorado School of Mines (Hugh B. Miller, Ph.D.), Flow International Corporation (Mohamed Hashish, Ph.D.), OMAX Corporation (Carl Olsen), and Veolia Environmental Services (Bill McClister).

According to the WJTA bylaws, any WJTA member in good standing (2006 membership dues paid) may submit a nomination(s). A nominee who has not paid his/her dues by March 31, 2007, shall be declared ineligible to run for office in the 2007 election. The deadline for making nominations is **March 31, 2007.** Your nomination(s) should reach the WJTA office **no later than March 31, 2007.** 

To submit a nomination(s), complete the Nomination Form and return, <u>along</u> <u>with biographical information and a</u> <u>brief statement of your nominee's</u> <u>mission and vision for WJTA</u>, to:

> WJTA Administrative Office 906 Olive Street, Suite 1200 St. Louis, MO 63101-1434 phone: (314) 241-1445 fax: (314) 241-1449.

Remember, nominations must be received **no later than March 31, 2007.** 

#### **Nominations/Elections Procedures**

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

- At least two calls for nominations to the board of directors will be published in the *Jet News*. The first call for nominations appears in this issue. Nominations will be accepted through March 31, 2007.
- An official ballot listing the eligible nominees and a brief biographical sketch for each individual will then be forwarded by mail to all eligible voting members of the Association on **May 28, 2007**. Signed and executed ballots must be mailed to the Association's office for tallying by June 25, 2007.
- The names of newly elected board members will be announced in the *Jet News* and on the WJTA web site.

Only WJTA members in good standing (2006 membership dues paid) may submit a nomination(s). A nominee who has not paid his/her dues by March 31, 2007, shall be declared ineligible to run for office in the 2007 election.

WJTA Nomination Form		
Name Of Nominee		
Address		
City	State	
Country	Postal Code	
Telephone		
In US/Can ()	Outside US/Can [] ()	
(area code) Fax	[country code] (city code)	
In US/Can ()	Outside US/Can [] ()	
Attach biograph your nom Name Of Nominator	hical information with a brief statement of hinee's mission and vision for WJTA. Title	
City	State	
Country	Postal Code	
Telephone		
In US/Can ()	Outside US/Can [] ()	
rax	Outside US/Con [ ]( )	
(area code)	[country code] ()	
1		

### Jet Edge Appoints New Regional Sales Manager for Southeast U.S.

J et Edge, Inc., has appointed has appointed David Arthur as its new regional sales manager for the Southeast United States. Arthur is responsible for sales of Jet Edge systems in Tennessee, North Carolina, Alabama, Georgia, South Carolina and Florida. He brings to Jet Edge nearly 20 years of experience in sales, manufacturing engineering and management, including previous experience as Jet Edge's southeast regional sales manager.

In addition to Jet Edge, Arthur has held positions most recently with Machinery Solutions, Inc. and Coldwater Seals/Coldwater Resins. Arthur also served as president of Cole Machine Technologies Inc., a job shop that provided precision CNC machining, fabricating, and design and



**David Arthur** 

build services to Fortune 500 companies. He also owned Cole Consulting and Design, a consulting firm that provided technical instruction, curriculum design and skill assessment for maintenance personnel, as well as mechanical design, CAD drafting and other services. Arthur has an agricultural engineering degree from the University of Georgia. He is based in Atlanta.

For more information about Jet Edge, visit www.jetedge.com, call 1-800-JET-EDGE (1-800-538-3343) or e-mail: sales@jetedge.com.

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

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### 2007 American WJTA Conference And Expo

August 19-21, 2007

Marriott Houston Westchase Hotel 
 Houston, Texas, USA



#### **Announcement and Call for Papers**

Impressive progress and a fast-growing understanding of the diversified applications of waterjet technology are generating a growing excitement in the industry. New techniques and applications are being developed and current ones are being improved. Waterjet technology, now being used in nearly all types of industry — manufacturing, mining, construction, concrete, stone, aerospace, engineering, process, and medical industries continues to expand at a rapid pace.

The **2007 American WJTA Conference And Expo** will focus, from a practical and scientific viewpoint, on the most up-to-date advances in waterjetting equipment, techniques, and applications. The areas to be addressed include, but are not limited to:

- Abrasives, Water, and the Environment
- Advanced Industrial Applications
- Advances In High Pressure Technology
- Automotive and Aerospace Applications
- Cleaning and Coating Removal
- Components and Systems
- Construction and Non-Manufacturing Applications
- Contractor Applications and Processes
- Demilitarization, including Removal of Land Mines (Demining)
- Drilling Applications

- Excavation, Tunneling, and Mining Applications
- High Pressure Equipment and Systems
- Hydrodemolition
- Jet Mechanics
- Jet-Material Interaction
- Manufacturing Processes
- Market and Future Needs
- Novel Jets and Applications
- Process Modeling and Control Studies
- Rock Cutting
- Safety, Training, and Environmental Protection

Commercial and academic authors are encouraged to submit titles and abstracts for consideration. To submit an abstract(s), please complete the abstract submission form on the back of this sheet, attach a copy of your abstract(s), and forward to the attention of the Conference Coordinator at the WaterJet Technology Association. The deadline date for submission of abstracts has been extended to January 26, 2007.

An Abstract Review Committee consisting of five referees will review the abstracts. Authors will be advised by **February 28, 2007**, regarding the decision of the Abstract Review Committee.

The 2007 American WJTA Conference And Expo is organized by the **WaterJet Technology Association**. The WaterJet Technology Association looks forward to providing this forum and to your involvement and participation.

#### **Authors - Please Note**

- Papers must be original. Papers must not have been published elsewhere or be pending publication.
- Publication Fee. A nonrefundable publication fee (equal to the price of a member Full Conference registration) is required. This publication fee will be waived if at least one author registers (Full or Combo) for the WJTA Conference. (Authors must pay the applicable member or nonmember price.) Also, one registration is good for multiple papers. The deadline date for receipt of your final paper will be April 20, 2007. The publication fee or payment for a Full or Combo registration is due no later than June 1, 2007. Your paper will NOT be included in the *Proceedings* if the publication fee or registration fee is not paid by this date.
- Papers and presentations must be in English. Papers should be no longer than 15 printed pages. A "Paper Guide" containing directions for submitting papers will be forwarded to you after your abstract is accepted. Papers that do not follow the "Guide" will be returned to the author(s) for correction(s) or charged a fee for revisions made by the WaterJet Technology Association office.
- Papers should be free of commercialism.
- Papers should be submitted as a Word file and a PDF file. If an author cannot produce a PDF file, a fee may be charged to convert a Word file to a PDF file if the Word file requires significant reworking (e.g., page breaks, pictures moving).

#### 2007 WJTA Conference Committee

Pat DeBusk

Co-Chairman DeBusk Industrial Services Company

Bill McClister Co-Chairman Onyx Industrial Services

Craig Anderson Parker Polyflex

Mohamed Hashish, Ph.D. Flow International Corporation



#### 2007 American WJTA Conference And Expo

August 19-21, 2007 

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Houston, Texas

#### Abstract Submission Form For each paper to be submitted for consideration, please complete this form, attach a copy of the abstract, and mail or fax to WJTA by January 26, 2007. Authors will be advised by February 28, 2007, regarding the decision of the Abstract Review Committee. Please mail or fax this form even if you email your abstract. **Paper Information** Paper Title Authors (First Name) (Surname/Family Name) **Contact Person** (Please print or type) Name \_\_\_\_\_\_(First Name) (Surname/Family Name) Position/Title \_\_\_\_\_ Company/Organization \_\_\_\_\_ Street Address City, Province \_\_\_\_\_\_ State \_\_\_\_\_ Zip/Postal Code \_\_\_\_\_ Country \_\_\_\_\_ Business Telephone \_\_\_\_\_ Fax \_\_\_\_\_ Web site \_\_\_\_\_ Email Signature \_\_\_\_\_ Date \_\_\_\_\_ Please check the category that best describes the topic of your paper. Applications Research Contractor Key words (Check the boxes under the different categories that apply to your paper): Type of Study Process Related Industry Modeling (theoretical) Cutting Generic Experimental study Drilling □ Shipvard Hardware development Surface preparation Mining Cleaning Contractor case study Construction Stripping Manufacturing case study Aerospace/Aircraft □ Software development □ Automotive Safety Oil/Gas/Refinery Economic analysis Milling □ Jet-assisted Legal Quarrying Other\_\_\_\_ Other Other Jets Material Environment Waterjet Metal Field work □ Abrasive-waterjet Rock □ Factory work Glass Abrasive suspension jet □ Submerged

- - Nuclear
  - Demilitarization
  - Offshore
  - Other

\*August 19 is reserved for the short course(s).

Other\_\_\_\_\_

Pulsed

Cavitation

Polymer Jets

Mail completed form and abstract, NO LATER THAN JANUARY 26, 2007, to: Conference Coordinator, 2007 WJTA American Waterjet Conference, WaterJet Technology Association, 906 Olive Street, Suite 1200, St. Louis, MO 63101-1434, USA, telephone: (314)241-1445, fax: (314)241-1449, email: wjta@wjta.org, web site: www.wjta.org

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